

**CRU**

# **Phosphate Rock** Market Outlook

**February 2016**





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# Phosphate Rock Market Outlook



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### Publication Schedule 2016

Product	Phos Fertilizer Market Outlook	Phos Fertilizer Cost Service	Phos Rock Market Outlook	Phos Rock Cost Service	Industrial /food Market Outlook	Inorganic feed Market Outlook
<b>Frequency</b>	Quarterly	Annual	Quarterly	Biennial	Biennial	Biennial
<b>Last publication</b>	Jan-16	Feb-16	Nov-15	Oct-15	Mar-15	Dec-12
<b>Forthcoming publications</b>	Apr-16 Jul-16 Oct-16	2017	Feb-16 May-16 Aug-16	2017	2017	2016

Unless otherwise noted in the text, the market statistics in this Report are drawn from CRU's fertilizer teams' database for fertilizers, minerals and chemicals. This database is assembled by the expert staff of CRU's fertilizer team, using information from a wide range of sources, including the International Fertilizer Industry Association (IFA), various regional and national agencies, and suppliers of international trade statistics, including Global Trade Information Services Inc. (GTIS), as well as individual producers and exporters of these products.





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# Executive Summary

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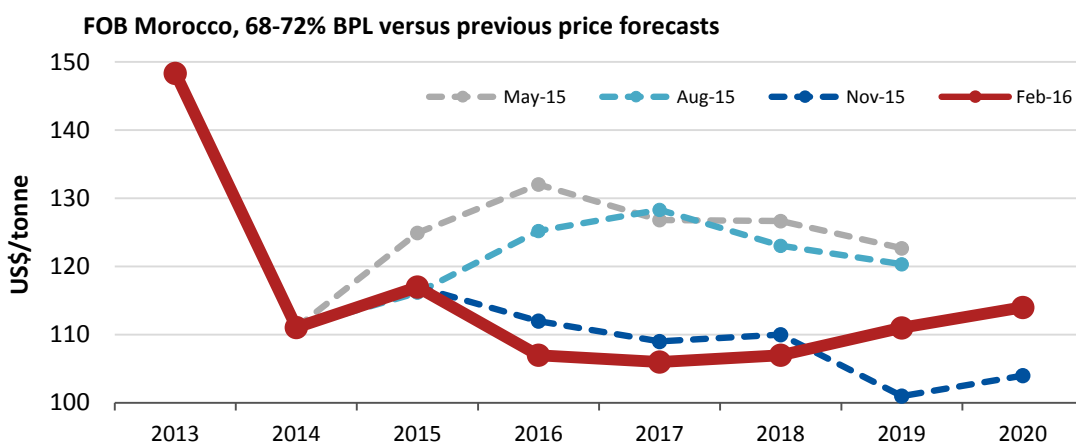
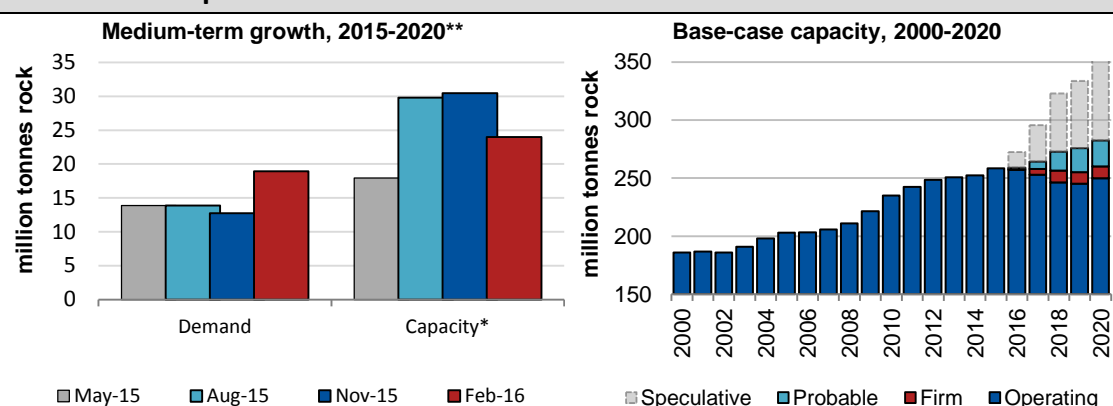
## Downstream strategy to determine future rock prices

Global phosphate rock demand has been revised upwards to 203.3 million tonnes in 2015, driven by better than expected phosphoric acid production in China, Europe/CIS and North America. While much of the additional requirement was supplied by captive producers within these areas, surprising gains were made in the by Senegalese exporters in 2015, where phosphate mining is booming. Our outlook sees the FOB Morocco 68-72% BPL price falling, but by less than expected, given the weakness forecast for DAP prices, as vast amounts of new fertilizer export focused capacity is commissioned in Morocco and Saudi Arabia. This is explained by the CRU view that OCP may limit future rock trade (by keeping prices high), as it aims to grow its presence in the fertilizer market.

## Phosphate Rock Market Outlook February 2016: Key indicators

COMPONENT	2014	2015	2016	2017	2018	2019	2020
<b>DEMAND/IMPORT SIDE INDICATORS (million metric tonnes rock)</b>							
Global phosphate rock demand	195.9	201.8	204.7	210.2	213.8	215.9	220.7
Demand for production of phosphoric acid	150.8	154.1	156.6	161.2	164.1	166.3	168.5
Indian phosphate rock imports	8.4	7.9	8.0	8.1	8.6	8.7	8.6
RoW phosphate rock imports	20.7	21.1	22.2	23.1	22.7	22.8	23.1
<b>SUPPLY/EXPORT SIDE INDICATORS (million metric tonnes rock, unless otherwise specified)</b>							
Global phosphate rock capacity	252.2	258.4	259.1	264.2	272.7	275.9	282.3
Average global utilization rates, %	78%	78%	79%	80%	78%	78%	78%
Moroccan phosphate rock exports	8.7	8.5	7.3	7.9	6.4	5.5	5.1
Jordanian phosphate rock exports	4.6	4.6	5.4	5.5	5.1	5.2	5.3
RoW phosphate rock exports	15.7	16.0	17.5	17.8	19.9	20.9	21.3
<b>PRICING INDICATORS (US\$/tonne)</b>							
FOB Morocco 68-72% BPL	110	117	107	106	107	111	114
FOB Jordan 68-72% BPL	103	113	103	98	99	103	105
FOB Peru 63-68% BPL	89	94	85	82	83	86	89
FOB Russia 78-87% BPL	160	167	153	143	135	141	143

### Headline Phosphate Rock forecasts:



Data: CRU

## Key risks to the February 2016 outlook

**Indian rock demand to grow as downstream processors prioritize the use of rock:** In 2015, Indian rock demand totalled 10.5 million tonnes. Our base-case sees demand for rock growing to 11.0 million tonnes by 2020. While this is feasible, India's buying patterns are set to be tested as a large amount of export focused fertilizer production capacity is commissioned in Morocco and Saudi Arabia through 2020, prompting intense competition for market share between them and the Chinese. If, as a consequence, DAP pricing moves towards a cost driven mechanism, we may see Indian consumers prioritizing imports of finished product, over rock, in greater quantities than currently expected. This could erode demand for raw materials.

**The impact that lower DAP prices will have on traded rock prices:** If we do move toward cost driven pricing in DAP markets, rock prices are also forecast to move downwards as export reliant DAP producers fight to remain competitive by looking for lower input costs. Under such a scenario we can see the Moroccan benchmark fall to US\$82/tonne in 2017, before recovering in the latter part of the forecast. While OCP will do its best to prevent this, the impact will be on lower grade benchmarks like FOB Egypt, which could fall below US\$50/tonne in 2017.

**Igneous rock availability is to remain tight in the future, which could prompt a larger premium over standard (sedimentary) grades in the future:** With Mine Arnaud having been removed from the base-case outlook, igneous rock availability is set to remain tight. Under our base-case we expect to see a loosening market as Foskor's production recovers, however, this may not materialize, in which case we could see the premium for igneous rock (over the fob Morocco 68-72% BPL) widen beyond our current estimate of US\$29/tonne in 2020.

### Highlights from the Outlook:

- Why has rock demand been adjusted upwards for 2015 and also in the future?
- How much of the 27.2 million tonnes of rock mined in the USA during 2015 did Mosaic and PotashCorp produce?
- In which African country did production increase in 2015, and for what reason?
- Can and will rock mining expansions in China continue in the future?
- How will OCP's rock exports fare, given their shift to focus on the production of fertilizer?
- Will JPMC overtake OCP, to become the largest rock exporter?
- Which new market did the Egyptian exporters target in 2015?
- Why will the FOB Morocco Benchmark fare better than other similar benchmarks?

## Output shrinks across Africa, but not in Senegal

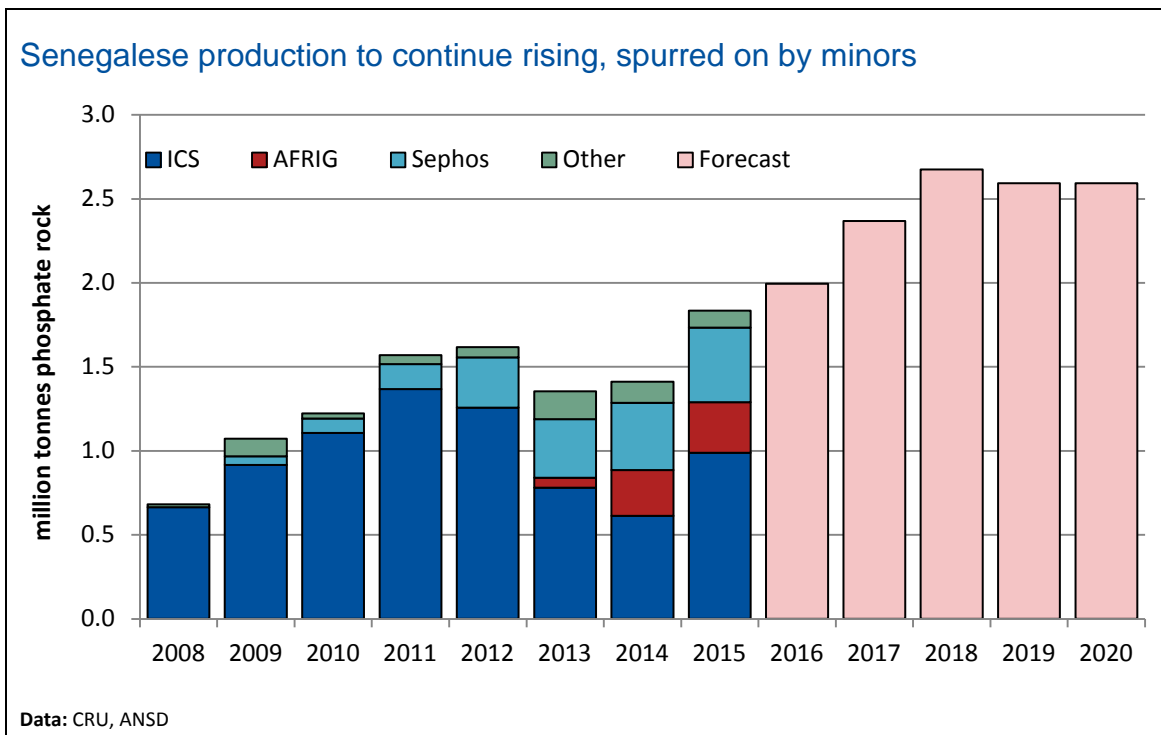
There were significant declines in production across **Africa** in 2015, while **Senegalese** output unexpectedly increased. **South African** producer **Foskor** fared particularly badly, and we have revised downwards 2015 rock production by 18% from the November 2015 Market Outlook. This decline in Foskor's annual output, around 44% down y/y at a total of 1.1 million tonnes, was because of a combination of factors including a need for maintenance/equipment replacement, a lack of useable infrastructure that limited accessibility to the Richards Bay plant, and a three/four-week strike of around 400 employees at Richards Bay between November and December 2015 that lowered phosphoric acid utilization rates to just 10%.

Rock production has declined across all countries in **North Africa**, and we estimate 2015 production to be 9% lower y/y at 34.7 million tonnes. In **Morocco**, where we estimate rock production to have declined by 6% y/y to 25.7 million tonnes, a combination of stock draw-downs, lower DAP/MAP production and a strategic shift towards the manufacture of NPK and NP+S, lowered captive rock demand and resulted in the lower domestic output of rock. In **Tunisia**, the recovery of **CPG's** production since its near paralysis over April-May 2015 boosted our estimates for production towards the end of the year, and we now estimate output to have only declined by 6% y/y down to 3.5 million tonnes. This reflects a 9% upwards revision since the November 2015 Market Outlook, when estimates were made without the nine-month production data. In **Egypt** and **Algeria (Somiphos)**, there were downwards revisions to production of 1% and 2% respectively, compared with the November Outlook. Both were because of lower traded volumes and because of the increased competition in the lower-grade phosphate rock market, resulting from the entry of **OCP into this sector**.

By contrast, **Senegal** provided some optimism for the continent during 2015. Its production increased by 31% y/y to 1.8 million tonnes, and we are forecasting this to increase further to 2.0 million tonnes in 2016 and to 2.7 million tonnes in 2018. Last year this was driven by the 435,000 tonne production increase at **ICS's** operations (following extensive maintenance), all of which was used in increased phosphoric acid production.

However, the longer-term growth trend has also been driven by small, export-oriented miners. These have shown that because of favourable permitting procedures, they are capable of quickly bringing on-stream lower grade  $P_2O_5$  rock that does not require substantial processing, which requires a lower CAPEX investment. Their impact is shown on the following chart: as recently as 2010, 91% of Senegal's production was attributed to ICS, but by 2015, this fell to just 54%. One such company driving this shift is **AFRIG**, which is 55% owned by **Grupa Azoty**. It began operating in 2013, and by 2015 its production was estimated at 301,000 tonnes. Another is **Sephos**, owned by **Grupo Tervalis**, which produced an estimated 445,000 tonnes in 2015 for use in the production of DCP/MCP in Spain.

Expansions from these smaller producers have impacted positively on Senegal's trade volumes, which have been well positioned to capitalize from disruptions in Syria and problems for Egyptian exporters. Data show an increase y/y of around 300,000 tonnes in exports from Senegal in 2015 to around 850,000 tonnes, mostly to markets consuming lower quality rock. For example, in 2015, around 200,000 tonnes was shipped to **Lebanon Chemical Company** in **Lebanon**, a company that had previously sourced most of its rock for the production of acid and TSP from the now-not operating Syrian mines.



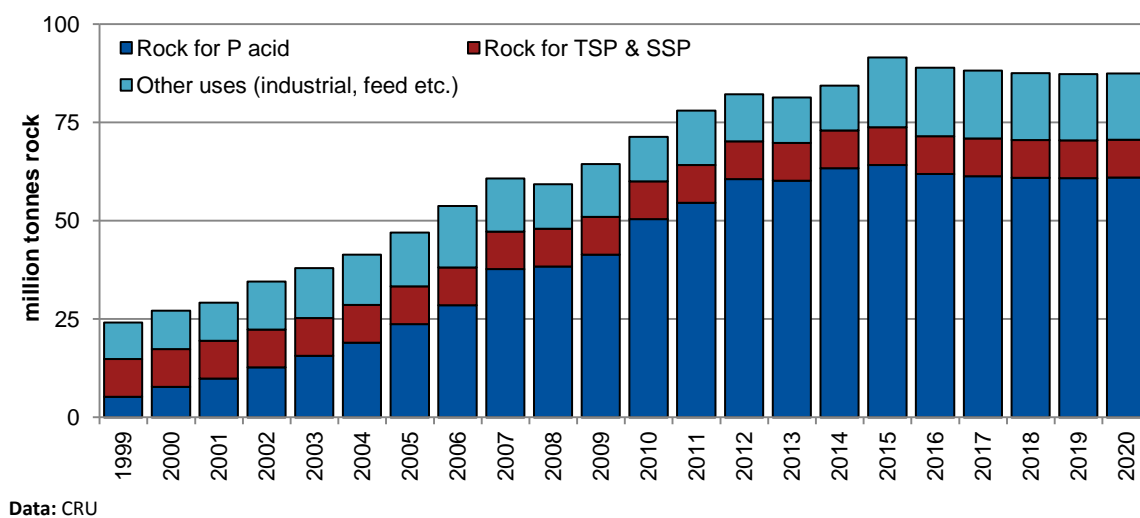
## Demand fuels a big increase in Chinese volumes

**Chinese** rock production was boosted in 2015 by strong domestic demand, partially fuelled by lower domestic rock prices and record ammoniated phosphate exports. The NBS reported that production increased by 14% y/y in 2015 though we believe this more accurately reflects ore production rather than concentrate production. Our estimate is that concentrate production increased by 9% y/y, reflecting a 3% upwards revision from CRU's estimates in the November 2015 Edition *Phosphate Rock Market Outlook* of 84.4 million tonnes.

However, the picture is varied for different producers in China, with a number facing problems with grades and stripping ratios. **Wengfu**, for example, has been struggling to find a market for the 1.0 million tonnes/year of lower quality Layer A rock that it produces at the **Chuanyandong** mine. The product is more suited for thermal acid production than wet acid and the company has not been able to find a use for it internally. A number of mines have also closed in **Henan**, where most ore resources are below 28% P<sub>2</sub>O<sub>5</sub>, pushing rock production in the province down

by 14% y/y. Lower grade resources were made uneconomic as domestic rock prices fell in 2014. The NBS reported falls in rock production of 14% y/y in the province.

### Chinese demand for phosphate rock for the production of acid to be squeezed



Whilst resource degradation threatens production in some regions, **Kailin** has announced the discovery of a major new deposit in the eastern part of the **Kaiyang mine**. The resource contains 834 million tonnes of ore averaging 33.8%  $P_2O_5$ , though at greater depth than the resources currently under exploitation there. This shows increased production potential, though it is currently unclear whether the company will move forward with the project there, given the complications associated with the depth of the ore.

Overall we maintain our view that production will decrease in China due to competitive pressures and economic rationalisation of the phosphate industry. We are forecasting production of 82.6 million tonnes in 2020, down by 5% from 86.9 million tonnes in 2015.

### Changes to the forecast will limit igneous availability

In recent months we have made important revisions to our base-case capacity forecast, with a number of projects being downgraded while others have had their start-up dates pushed back. Recent changes to the Firm category include delaying **Yihua's Jiangjiadun** project in **China** from 2016 to H2 2017 and of course the removal of **PhosAgro's** of underground expansion at **Apatit**, which was completed in H2 2015. Looking at Probable projects, with the exception of the **Avenir's Baoabab** project in Senegal, which has been upgraded to Firm, revisions have been negative overall. Four projects have been downgraded to Speculative status, including **Agrium's Rasmussen Valley** project in the US, due to the company's intention to exit phosphate production, **Anglo American Fosfatos'** brownfield expansion of **Ouvidor** due to budget constraints, **Investment Quebec** and **Yara's Mine Arnaud** project due to high capex



and opex costs, and the **Dadi Yuantong** project in because of the fall in iron ore prices (which would have provided the main revenue stream for the project).

While these changes go some way in tightening the future market balance for all rock, the impact is particularly important for the traded igneous rock market, which makes up an estimated 10% of global trade on an annual basis. In the last six months, we have re-classified two igneous projects from probable to speculative – the 1.2 million tonne expansion at **Ouvidor**, and the 1.4 million tonne mine at Sept Iles in Quebec.

This puts a different complexion on the future of igneous rock markets, and in particular, the strategic position of key buyers. The largest igneous rock importers globally are **EuroChem's Lifosa** plant in Lithuania, **Yara's NPK plants** in Norway, and **industrial phosphate and NPK buyers in Belgium**. The reduction in supply options for these buyers is strategically concerning for Western European buyers due to sanctions and potential disruptions that could result if European-Russian relations were to worsen. Likewise, we are expecting **South Africa** to step into the market as an important alternative, exporting over 1 million tonnes rock from 2018, but the strategic direction of **Foskor** is currently somewhat unpredictable. The company may choose to re-focus on acid production and not expand rock exports, or it could fail to invest the amount required to increase rock production volumes. There may be a strategic value in developing igneous capacity, which may rebalance potential high opex and capex requirements in doing so.

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## Morocco to balance the market, but risks abound

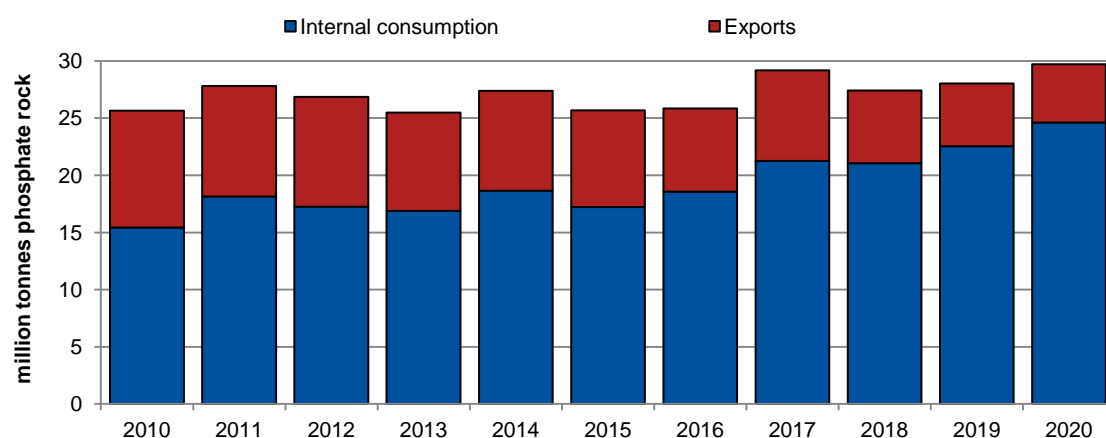
There are a number of risk factors affecting our forecast. Firstly, **OCP** is bringing substantial capacity online. Secondly, **Cominco** is expected to commission its 4.1 million tonne export-orientated **Hinda** mine in Republic of Congo in 2017. Thirdly, demand for traded rock could be hit by the decreases in phosphate fertilizer prices if non-integrated producers are forced into closures. However, our forecast is for steady downstream prices and no significant downturn in demand, reflected in rising rock prices in our forecast from 2018. This is premised on two key factors, namely:

- **OCP likely to limit sales of merchant rock and focus instead on the exports of fertilizer:** its exports of rock are forecast to fall as it tries to avoid competing with its own fertilizer products by providing cheaper inputs to competitors. In 2015, OCP is understood to have exported just short of 8.5 million tonnes of rock, compared to 8.7 million tonnes in 2014, and the lowest recorded volume since 2009. We are forecasting this volume to fall to 7.3 million tonnes in 2016, and further to 5.1 million tonnes by 2020.

- Indian granulators will prioritize rock imports over acid imports:** Indian rock imports are forecast to increase by 1% to 8.1 million tonnes in 2016. Further out in our forecast we are expecting some increases in imports, to a high of 8.8 million tonnes in 2017. This is mostly driven by steady increases in domestic phosphoric acid production as fertilizer demand increases in line with long term trends. We expect this increasing demand for rock in India to provide support to the traded rock market.

While both of these factors are plausible, both also pose a risk to our outlook. In the case of OCP, its developments in recent years have been oriented towards transforming into a bigger player in processed phosphates markets. In 2015, it commissioned one of its four new US\$600 million acidulation/granulation units. The remainder are scheduled on-line in 2016 and 2017. As a consequence, we are expecting rock usage in downstream processing to increase by 43% gross by 2020, as the company seeks to maximise its returns. However, it will also want to maximise its cost advantage in fertilizer and acid markets by encouraging higher phosphate rock prices. OCP remains the largest merchant rock supplier, accounting for 30% of global shipments, giving it a degree of pricing power in traded rock markets. By reducing exports, therefore, OCP can increase its advantage over competitors that must purchase rock. Furthermore, revenues lost in lower rock export volumes are likely to be at least partially recouped through increases in rock prices due to reduced global supply. That said, OCP may find it difficult to make inroads into the fertilizer markets, as the Chinese and state owned entities choose to prioritize employment instead of maximizing profit.

#### OCP rock production to grow, despite an erosion of exports



Data: CRU

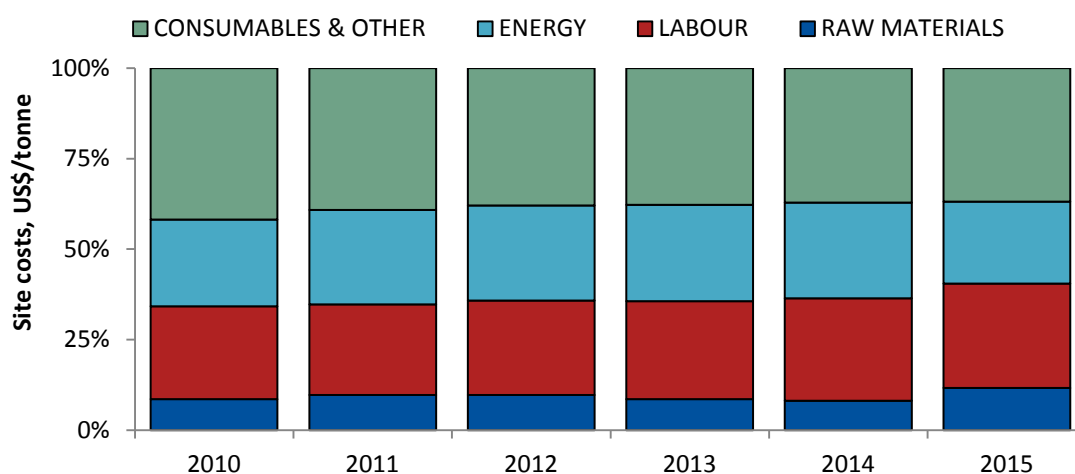
In the case of India, the country's phosphate fertilizer demand could disappoint for internal reasons or because of exogenous shocks such as poor monsoon years. In 2016, for example, high DAP stocks at the beginning of the year have dampened expectations for fertilizer demand. We are currently expecting this to impact DAP imports more than domestic production this year, but if this were to impact rock imports, it would be an important downside factor. In

addition, falling DAP prices could force Indian producers to cut back and substitute imports for domestic production. Results from CRU's *Phosphate Fertilizer Cost Report* show that some South Asian producers are not profitable without subsidies at current price levels. Subsidies are expected to continue to keep producers in operation, however, and discounts on raw materials could also be offered by suppliers such **JPMC** and **GCT** to keep JV partners in business, but if either of these support factors were to be threatened, rock demand in India would be significantly negatively affected.

## Have we seen the bottom of the cycle?

Mining costs across commodities, and in phosphate rock, have fallen in 2015 and January-February 2016, but we could now be seeing the bottom of this cycle. As CRU's *Phosphate Rock Cost Report*, published in November 2015, showed, a combination of falling oil prices and weaker emerging market currencies, have pushed average production costs downwards. Global weighted average phosphate rock mining costs fell by 5% y/y in 2015 and we would expect them to be even lower with oil prices at US\$30/barrel (Brent), as we have seen in early 2016. However, in recent weeks oil prices have stabilised, with Brent steady at around US\$35/barrel at the end of February. CRU's in-house economics analysis team is forecasting a stabilisation this year at US\$36/barrel and a long term rise, recovering to US\$76/barrel in 2020. Moreover, a number of emerging market currencies have also stabilised after falls in January. The rouble, for example, has not lost significant value versus the dollar since the end of January after a continuous slide from October 2015.

### Breakdown of phosphate rock site costs: energy component squeezed



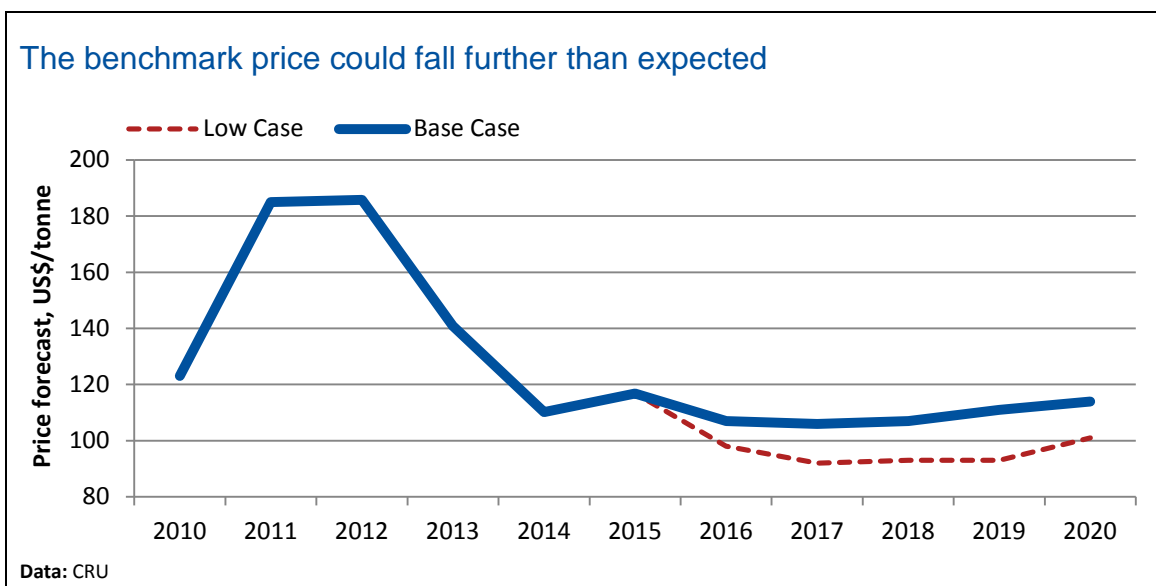
Data: CRU

Phosphate rock prices are not currently directly cost driven, with pricing above marginal costs for the industry. However, there is an interaction between costs and prices via the impact that rock mining costs have on fertilizer prices. Phosphate fertilizer prices have entered a strongly

supply driven phase, making prices far more sensitive to changes in costs. According to CRU's *Phosphate Fertilizer Cost Report*, published in January 2016, a number of producers in South Asia and China are operating with netbacks at or below marginal cost. Therefore, any falls in rock costs are likely to place downward pressure on fertilizer prices by impacting fertilizer costs. This impacts rock prices which are sensitive to changes in fertilizer prices.

In the chart below, we have presented an alternative analysis of phosphate rock prices given a situation where DAP pricing shifts towards a cost-based mechanism, driving rock prices below our current expectations. This alternative price forecast could occur should the following materialize:

- Competition between OCP, Ma'aden and China into India intensifies and remains strong for a lengthy period.
- Demand for rock in key importing regions, such as Indian falls below current expectations.
- A larger volume of export focused rock capacity is commissioned than originally expected for the 2015-2020 period, intensifying trade competition.
- Chinese exporters losing money on fertilizer exports, decide instead to re-focus on rock exports as both tariffs and quotas are relaxed on the basis that large undiscovered deposits are brought into production.



## Short-term prices revised downwards

Looking at price developments, **OCP** succeeded in raising the **FOB MOROCCO 68-72% BPL** price in September 2015 from US\$115/tonne to US\$123/tonne and prices for the benchmark remained steady over Q4. In Q1 2016 they have started to weaken, falling to US\$115/tonne in

February. **Yara** and **OCP** settled Q1 2016 rock prices at the end of December, marking an undisclosed decline in prices across all grades. The benchmark is expected to decline further between Q2 and Q4 2016.

Other producers had seen their rock prices hold steady at the end of 2015 and into early Q1 2016, but have since also reduced prices. **FOB Jordan 66-72% BPL** benchmark maintained US\$115/tonne over H2 2015 and January, but fell to US\$106/tonne in February. **FOB Jordan 63-75% BPL** prices followed a similar trend, falling from US\$134/tonne to US\$123/tonne over the same period – this represents a US\$2/tonne erosion of its grade premium. By early February, **JPMC** had settled most of its phosphate rock contracts with customers for Q1 at a US\$10-13/tonne decrease from prices in H2 2015.

Egyptian producer **Misr Phosphates** has reduced its phosphate rock prices from the Red Sea. The company is charging US\$34-70/tonne **FOB Egypt** for rock sales in the 24-30% P<sub>2</sub>O<sub>5</sub> range, a reduction from previous levels of around US\$6-7/tonne. The **FOB Egypt 60-68% BPL** benchmark stood at US\$59-79/tonne in February 2015, US\$3/tonne lower than in December. These three MENA benchmarks are also expected to decline over the course of 2016, driven lower by slackening demand from importers. The **FOB Egypt** price is forecast lower by 12% over Q1-Q4.

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Quarterly phosphate rock price forecast, US\$/tonne

	2015				2016				2017	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
fob Morocco, 68-72%BPL	115	115	117	123	115	107	105	101	107	104
fob Morocco, 80%BPL	132	138	145	150	135	124	120	114	123	119
cfr India, 71-75%BPL	143	143	143	146	137	127	123	118	123	121
fob Jordan, 68-72%BPL	112	113	115	115	107	99	96	92	97	95
fob Jordan, 73-75%BPL	133	133	134	134	126	117	114	109	114	111
fob Russia, 78-87%BPL	161	171	172	171	157	144	140	134	145	143
fob Syria, 60-73%BPL	85	85	87	91	86	80	78	76	80	78
fob Peru, 63-68%BPL	94	94	94	94	90	83	81	77	81	79
exw China, 61-65%BPL	62	61	60	59	66	63	62	60	64	62
fob Egypt, 60-68%BPL	69	68	68	71	69	64	63	61	64	62

**Data:** CRU, Fertilizer Week

After rising in December and January to US\$100/tonne, the **FOB Peru 63-68% BPL** benchmark fell back to US\$95/tonne in February. At present, **Vale** is understood to be negotiating contracts with its regular buyers, including those in India which are pushing for further reductions.

Most producers were impacted by declining **CFR India** rock prices in Q1 2016. Negotiations dragged into Q1 but the key benchmarks had trended lower: The **CFR India 65-70% BPL** benchmark stood at US\$105/tonne in February 2015, US\$13/tonne lower than in December – a

6.7% decline. The higher grade Indian benchmark, CFR India 71-75% BPL, declined but fared better – experiencing a 4.5% decline. This marginally increased the US\$/tonne premium of the high BPL benchmark. **IFFCO** settled its phosphate rock contract with **JPMC** for deliveries in H1 2016. The new price for 66-68% BPL is around US\$100/tonne CFR, according to sources in India. The CFR India benchmark is expected to fall over Q1-Q4 2016, but is then expected to rise over H1 2017 as with expected increases in demand.

## Medium Term: steady increases from 2017 onwards

We generally expect rock prices to hold steady over 2016-18, with better quality benchmarks doing better than lower quality ones. Stability will be driven by **OCP** which will look to protect rock prices and will scale back export volumes if they are threatened, instead focusing on establishing market share in fertilizer markets. However, the premium for Russian 78-87% BPL rock is forecast to decline partially – although Russian material will still maintain the highest differential over Moroccan 68-72% BPL rock as it is igneous. By contrast, the Chinese domestic rock price is expected to rise. Over 2019-20, most prices are expected to rise, supported by a broad-based improvement in demand.

Annual phosphate rock price forecast, US\$/tonne

Price point	2015	2016	2017	2018	2019	2020	Δ '15-20
fob Morocco, 68-72% BPL	117	107	106	107	111	114	-3
fob Morocco, 80% BPL	139	124	126	127	132	135	-4
cfr India, 71-75% BPL	143	126	121	119	115	117	-26
fob Jordan, 68-72% BPL	113	103	98	99	103	105	-8
fob Jordan, 73-75% BPL	133	118	116	112	110	113	-20
fob Russia, 78-87% BPL	167	153	143	135	141	143	-24
fob Syria, 60-73% BPL	87	80	79	80	83	85	-2
fob Peru, 63-68% BPL	94	85	82	83	86	89	-5
exw China, 61-65% BPL	61	63	67	69	73	74	13
fob Egypt, 60-68% BPL	69	64	63	64	67	68	-1

Data: CRU, Fertilizer Week

With respect to selected different benchmarks:

- We believe that **OCP** strategy will maintain Moroccan benchmark prices over 2016-18. The company's shift to downstream phosphate fertilizers and our belief that it will curtail rock exports in order to preserve rock sale margins should keep prices stable. After 2018, the benchmark prices are expected to rise in line with downstream demand. Moreover, OCP is building downstream capacity at **Bou Craa** – this could grow the wedge between the two Moroccan benchmarks by limiting the market supply of higher grade rock.
- The **FOB Egypt** benchmark is generally the lowest price owing to its variable quality. After 2018, rising global demand and the possibility of increased producer co-ordination in Egypt

(which would make it harder for traders to drive down prices) are expected to lift the benchmark.

- The **FOB Russian 78-87% BPL** benchmark is forecast to erode partially over 2015-18. This will see its premium over FOB Morocco 68-72% BPL fall from US\$50/tonne to US\$28/tonne over 2015-20. Despite these declines, the Russian product premium will be greater than all the other rock benchmarks we cover; it will be supported by being igneous. After 2018, rising demand for downstream fertilizers will lift this benchmark, but rouble appreciation will squeeze producer margins.
- **Ex-works China** rock prices will increase throughout the forecast period as rock production costs rise on the back of increasing labour and energy costs. The Chinese rock market is relatively insulated from developments elsewhere, allowing this benchmark to buck the global trend.
- **Peru** has key export destinations in slim margin Indian producers, we expect the **FOB Peru benchmark** to be just low enough to keep these producers in business and purchasing Peruvian rock. This explains why the rock is at a significant discount to most other international benchmarks. As Indian demand picks up after 2018, the Peruvian benchmark should rise. OCP's focus on the downstream could tighten rock supply around this time, providing further scope for price rises in the Peruvian benchmark. Our recent decision to remove the FOSPAC mine project in Peru from our base case forecast will exert downward pressure on the benchmark, due to the relatively high quality of the rock which the mine would have produced.



### Upside and downside risks to the February 2016 forecast:

#### Bearish drivers

**OCP chooses to maximise rock export volumes** as DAP prices fall in 2019 and 2020

**Curtailed production in Syria, Togo and Tunisia resumes** production quicker than expected, making more rock available for export.

**State-driven investments push uneconomical projects**, resulting in unnecessary rock tonnage.

**Long-term contracts return** as the preferred pricing tool, resulting in average lower prices and more stable volumes.

**A dramatic reduction in phosphoric acid prices** would have a knock-on effect on phosphate rock prices. Indian buyers are reportedly demanding significant reductions for H1 2016. We are forecasting a smaller fall to US\$704/tonne in H1, down from \$810/t in H2 2015.

**Increase in Chinese VAT on fertilizer sales**, if fertilizer producer margins are squeezed, affordability of rock for non-integrated producers will decline.

#### Bullish drivers

**Higher interest rates** restrict credit for equity markets, tightening supply prospects.

**Delay/cancellation of mine expansions** in Brazil and other import-orientated regions.

**Chinese market consolidates** faster than expected, tightening fundamentals & lifting prices.

**Tunisian production faces renewed disruption** from civil unrest and strikes.

**OCP decides to postpone or cancel further rock capacity** expansions to help balance the market.

**Foskor resolves acidulation problems** and rock exports fall from forecast levels.

*The next edition of the Phosphate Rock Market Outlook will be published in May 2016*

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# Chapter 1

## Demand

### 1.1 Overview of global phosphate rock demand

**Global phosphate rock demand in 2015** is estimated by CRU to have increased for a second consecutive year, up by nearly 3% y/y to nearly 201.8 million tonnes.

This mostly resulted from increases in East Asia where greater ammoniated phosphate production in China raised annual rock demand by nearly 8% y/y to over 86.6 million tonnes. There were also y/y increases in Russia and the Middle East that offset losses elsewhere, such as Africa and Central & South America, over the same period.

In the **short-term**, global phosphate rock demand is forecast to increase 1% y/y in 2016 to reach 204.7 million tonnes, as demand lost in East Asia is replaced by growth in North Africa, where OCP is set to commission the rest of its JPH II-IV hubs over the year.

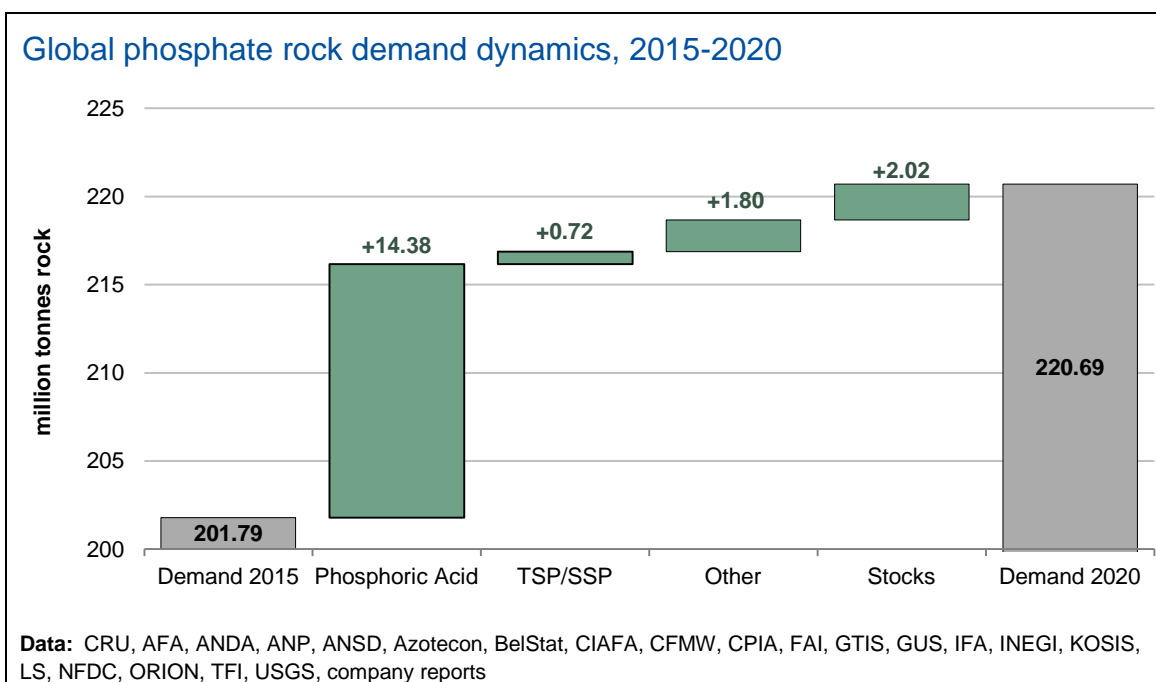
This growth in rock demand is forecast to continue at a rate of nearly 2% CAGR over the **medium-term** to over 220.7 million tonnes in 2020, with the most rapid growth occurring in Africa and the Middle East, following the commissioning of large downstream projects in Morocco and Saudi Arabia.

Rock demand is forecast to grow across most regions of the World with the exception of East Asia, where China is expected to see a contraction in rock demand over the next five-years as downstream production curtailments and closures are implemented.

Table 1.1: Annual global phosphate rock demand, million tonnes

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Africa	25.2	22.8	25.1	29.2	29.8	31.3	33.3	↑
C&S America	11.8	10.8	11.2	11.2	11.6	11.8	12.0	↑
East Asia	80.8	87.6	85.0	84.2	83.3	83.0	83.2	↓
Europe & CIS	19.4	21.2	22.1	22.2	22.3	22.1	23.0	↑
Middle East	10.0	10.4	10.7	11.7	14.5	15.6	16.3	↑
North America	29.8	30.0	30.8	31.1	31.1	30.9	31.8	↑
South Asia	10.4	10.3	10.1	10.2	10.8	10.9	10.8	↑
SE Asia & Oceania	7.9	8.6	9.6	10.2	10.4	10.3	10.3	↑
Total World	<b>195.9</b>	<b>201.8</b>	<b>204.7</b>	<b>210.2</b>	<b>213.8</b>	<b>215.9</b>	<b>220.7</b>	↑
year-on-year change	-	3%	1%	3%	2%	1%	2%	

**Data:** CRU, AFA, ANDA, ANP, ANSD, Azotecon, BelStat, CIAFA, CFMW, CPIA, FAI, GTIS, GUS, IFA, INEGI, KOSIS, LS, NFDC, ORION, TFI, USGS, company reports



In **East Asia**, rock demand in 2015 is estimated to have increased for a second consecutive year by around 8% y/y to over 87.6 million tonnes, mostly resulting from a 35% increase in ammoniated phosphates production in **China**, which CRU estimates to have totalled a combined 15.4 million P<sub>2</sub>O<sub>5</sub> tonnes. The *CPIA* reported both DAP and MAP production in China for the first nine-months of 2015 to have increased by 15% and 11% at 13.2 million and 9.0 million tonnes respectively.

In the **short-term**, we estimate rock demand in East Asia to decrease by 3% y/y as demand in **China** is expected to fall from a record high of nearly 86.6 million tonnes in 2015 to about 83.9 million tonnes in 2016, mostly due to a decline in ammoniated phosphates production. This trend is forecast to continue over the **medium-term** and as a result, rock demand in East Asia will decline by around 1% CAGR until the end of the decade. By then, rock demand will have fallen to 82.1 million tonnes in China following the commissioning of downstream export-oriented capacity, particularly in Morocco and Saudi Arabia, that will increase competition for downstream export-oriented production in China.

Despite the closure of downstream capacity in the **United States (US)**, the previous CRU forecast of a 5-6% y/y decline in rock demand for 2015 reported throughout the year is understood to have been negated by an increase in downstream utilization rates. We now estimate rock demand in North America to have increased marginally to around 30.0 million tonnes in 2015. Over the **short-term**, we estimated that rock consumption in the **US** will increase by nearly 3% y/y in 2016 to 30.8 million tonnes as utilization rates continue to rise.

In the **medium-term** CRU forecasts this growth to continue at around 1% CAGR and reach 30.9 million tonnes by 2020.

However, the consecutive annual increase in rock consumption forecast over 2016-2017 is expected to flatten and then decline over 2018-2019 with the commissioning of competing export-oriented downstream projects, particularly in Morocco and Saudi Arabia, before bouncing back at the end of the forecast period.

Rock demand in **Africa** in 2015 is estimated to have declined by 10% y/y down to around 22.8 million tonnes – the lowest figure since 2001. In **North Africa**, which represented 96% of all rock demand for the continent, rock demand in 2015 fell by nearly 6% y/y to 21.3 million tonnes – the lowest figure since 2009.

In the **short-term** we expect recovery of production in **Tunisia** and the ramping up of **OCP's** projects in **Morocco**, in combination with a ramping up of post-debottleneck phosphoric acid production in **Senegal** and a recovery from historically-low annual acid production in **South Africa**. This will raise rock demand across Africa by 10% y/y to nearly 25.2 million tonnes in 2016.

Likewise, in the **medium-term** CRU forecasts that the commissioning of **JPH IV-VII** in **Morocco** and, though not to the same extent, a continued recovery in phosphoric acid and downstream production in **Tunisia** will mostly contribute to the 9% CAGR growth in rock demand. This is forecast to reach 33.3 million tonnes across Africa by 2020.

Despite widespread civil unrest in the **Middle East** last year, rock demand in 2015 in the Middle East is estimated by CRU to have increased by 4% y/y to 10.4 million tonnes. Most of this increase was concentrated in **Israel** and **Saudi Arabia**, the prior from increased MGA sales at **ICL** following the temporary curtailment of SSP production following a fire in June 2015 and the latter by increased ammoniated phosphate production at MPC, which off-set losses in the rest of the region.

Over the **short-term**, we expect rock demand to increase in the **Middle East** by nearly 3% y/y to around 10.7 million tonnes in 2016. In **Israel** the return of SSP production will lower rock demand, whilst civil war in Syria, will also continue to apply downwards pressure rock demand. However, the completion of debottlenecking at the **JFIC – Aqaba** site will result in an increase in rock demand, along with a further rise in **Saudi Arabia** due to increased utilization rates.

Over the **medium-term** CRU forecasts that rock demand in the **Middle East** will increase by nearly 11% CAGR with consecutive annual growth over the five years to reach around 16.3 million tonnes. This will mostly be driven by the commissioning of the **MWSPC** projects in **Saudi Arabia**.

Rock demand in **Europe & CIS** is estimated to have increased by 9% y/y to over 21.2 million tonnes in 2015. This was mostly because of an estimated 21% y/y increase in rock demand in

**Russia** to 10.3 million tonnes, which offset declines across the rest of the region, where demand declined by 3% y/y to over 8.0 million tonnes.

In the **short-term**, we forecast annual rock demand to bounce back in Europe and increase for the third consecutive year in the **CIS** to result in a combined 4% rise y/y to over 22.1 million tonnes in 2016. This regional growth is forecast by CRU to continue over the **medium-term** at nearly 2% CAGR over the next five years, totalling near 3.0 million tonnes in 2020.

In **Central & South America**, rock demand is estimated to have declined by around 9% y/y to below 10.8 million tonnes in 2015 as demand fell in both **Brazil** and **Mexico**, the two largest markets in the region. However, despite the reduction, the two markets actually increased their share of regional rock demand from 90% in 2014 to 91% in 2015.

With the expected return of demand growth in **Brazil** over 2016 and the increased utilization forecast at **Fertinal** following its acquisition by **Pemex**, CRU forecasts that regional rock demand in the short-term will increase by 4% y/y to over 11.2 million tonnes.

Over the **medium-term**, the commissioning of the **Yara-Galvani** project at **Serra do Salitre** will drive a forecast regional increase in rock demand of 2% CAGR between 2017-2020 by when it will reach 12.0 million tonnes.

Rock demand in **South East Asia** increased by an estimated 7% y/y to over 4.8 million tonnes in 2015, mostly due to the third consecutive annual increase in rock demand of around 17% y/y in **Indonesia** to nearly 2.2 million tonnes. Indonesian demand has been boosted by the commissioning and ramp up of two separate rock consuming projects.

In the **short-term**, rock demand in **South East Asia** is estimated to increase by nearly 19% y/y to reach nearly 5.8 million tonnes as the ramp up of the **PKG – Gresik** expansion raises rock demand by 24% y/y to nearly 2.7 million tonnes in **Indonesia**.

Over the **medium-term**, CRU forecasts that rock demand in **South East Asia** will increase by close to 7% CAGR to over 6.4 million tonnes by 2020. The most noteworthy change in the region will be that the commissioning of more capacity in 2018 will help raise rock demand in **Indonesia** to 3.4 million tonnes, when it will become the largest consumer of phosphate rock in the region, overtaking **Vietnam** for the first time since 2007.

In **Oceania**, rock consumption is estimated to have fallen marginally to around 3.3 million tonnes in 2015 as the estimated 7% y/y increase in rock demand in **Australia** was offset by a decline of 19% y/y in rock demand in **New Zealand**.

In the **short-term**, annual rock consumption in **Oceania** is expected to increase marginally to 3.4 million tonnes, with increases in both **Australia** and **New Zealand**.



Demand is forecast to remain flat over the **medium-term** forecast, with demand in **Australia** and **New Zealand** marginally fluctuating around 2.8 million tonnes and 0.6 million tonnes, respectively.

In **South Asia**, rock demand is estimated to have declined by nearly 1% y/y to below 10.3 million tonnes in 2015, particularly due to the 2% y/y decline in demand in **India** to below 9.6 million tonnes, though there was a y/y increase of 54% in rock demand in **Pakistan** over the same period to nearly 0.6 million tonnes.

In the **short-term** we forecast regional demand to decline by 1% y/y to 10.1 million tonnes, mostly because of lower MGA prices that will favour the production of downstream phosphate fertilizers in **India** via the imported phosphoric acid route, demand is forecast by CRU to increase by around 1% CAGR over the **medium-term** and reach 10.8 million tonnes by 2020.

## The main drivers of phosphate rock demand

Phosphate rock refers to phosphate ore with recoverable quantities of  $P_2O_5$ , which can be classified as; high grade ( $>31\% P_2O_5$ ), medium grade ( $24-31\% P_2O_5$ ) and low grade ( $16-24\% P_2O_5$ ). Phosphate rock concentrate (post beneficiation) is classified as: high grade ( $>36\% P_2O_5$ ), medium grade ( $30-36\% P_2O_5$ ) and low grade ( $<30\% P_2O_5$ ).

Low grade concentrate is primarily converted into phosphoric acid by captive converters, but some is sold on the international market for SSP, DAPR etc. Higher grade rocks are primarily converted into phosphoric acid, an intermediate for the production of commercial fertilizers such as DAP or non-fertilizer phosphate products such as MCP.

In addition, a purer form of phosphoric acid is utilized in the manufacture of industrial phosphate products. The two basic process routes for the commercial production of phosphoric acid are:

- **Wet process:** phosphoric acid is produced via the reaction of phosphate rock with a strong acid, such as sulphuric acid ( $H_2SO_4$ ), though nitric and hydrochloric acid can also be used.
- **Thermal process:** phosphoric acid is produced via the oxidation of elemental phosphorus (manufactured by the carbon reduction of phosphate rock) and subsequent hydration of the intermediate phosphorus pentoxide ( $P_2O_5$ ).

Phosphate rock is consumed by a variety of industrial sectors, in addition to phosphoric acid production. Although data from these markets is often less accessible and transparent than for key industries, CRU does track these markets.

## Wet phosphoric acid (WPA)

WPA is used as a feedstock for the production of many downstream phosphate products. Since WPA production consumes around 80% of phosphate rock, its output conveys a high degree of positive correlation with overall phosphate rock demand.

Phosphoric acid produced via this route results in a cost advantage compared to production via elemental phosphorus in most situations, making it a primary source for many manufacturers, though the product contains a higher of impurities than that obtained via the thermal route.

In some regions, the gypsum by-product of the WPA route is regarded as an environmental concern, as it can contain unwanted impurities. This is the case for phosphate rock mined in Florida due to the presence of uranium and its decay products (e.g. radium) in the gypsum.

By comparison, in Brazil, gypsum is sold as a soil conditioner for use in agriculture, due to the liming effect of its calcium content, in addition to its 15-18% sulphur content.

WPA is primarily used for the production of ammoniated phosphate fertilizers (DAP and MAP) and triple-super-phosphate (TSP). These products account for in excess of 75% of the WPA market and the output of all products are strongly correlated to rock demand.

## Inorganic feed phosphates (IFP)

IFP supplements for animals provide essential nutrients, including calcium and phosphorous, and contribute to animal health and metabolism. However, IFP supplements are more closely related to concentrated phosphate fertilizers in terms of manufacturing technology, quality, end-uses, and unit market values – than they are to industrial phosphates.

FP demand totalled 7.7 million tonnes of 41%  $P_2O_5$  product in 2013, a rise of 15% over the past decade, resulting from GDP growth (facilitating greater meat consumption) and the intensification of livestock production in developing regions. The phosphate fertilizer production industry will become increasingly focused in such areas, at the expense of more developed regions.

## Other Fertilizers

**Complex fertilizers (NPKs)** are largely consumed in developed and customer-oriented markets, such as Europe, North America, and South-East Asia. **Nitro phosphates (NP) fertilizers** are obtained through the reaction of phosphate rock and nitric acid, which avoids the by-production of gypsum and is independent of sulphur.

However, it requires a highly complex manufacturing process, it is reliant on low cost natural gas, and it incurs high capital costs. NP production has remained relatively stable in recent years, at approximately 1.0 million tonnes/year, though short-term fluctuations have been driven by elevated sulphur prices.

The outlook for complex fertilizers is more uncertain, as it is highly reliant on many individual components. India has been at the centre of recent developments in this market, not just in terms of a progressive growth in consumption.

In April 2010, the introduction of the new nutrient based subsidy system (NBS) enabled the import of NPKs into India for the first time. Other significant developments have occurred in USA, where value-added P-fertilizers, containing macro and micronutrients, are gaining market share.

Due to its agronomic advantages, ground phosphate rock is often used as a source of phosphorous for direct application. **Direct application phosphate rock (DAPR)** is often used in acidic soils as it is a source of the secondary nutrient, calcium (Ca), which increases soil pH levels. DAPR use has declined over the last three decades, resulting from technical improvements in the fertilizer industry, which have increased the availability and accessibility of more refined products to farmers worldwide. However, the product is still consumed in certain key regions, such as South-East Asia, where demand is driven by the growing palm oil sector.

**Single super-phosphate (SSP)** accounts for approximately 12% of global  $P_2O_5$  demand. Low capital cost and non-reliance on ammonia are important advantages of SSP production, resulting in easy local production and supply, especially in areas with a local rock source and/or by-product sulphuric acid nearby.

**Double super-phosphate (DSP)** is a similar product, though it has a slightly higher grade, and production is largely confined to Indonesia.

**Speciality fertilizers**, (e.g. technical MAP/DAP) account for approximately 10% of technical grade phosphoric acid demand. These are highly water-soluble, making them attractive for the expanding practice of fertigation (the application of fertilizers dissolved in irrigation water). However, high prices have limited their demand as farmers tend to favour cheaper, generic substitutes.

## Industrial and food-grade phosphates

Demand for phosphate rock for **industrial application** has increased in correspondence with global GDP and population trends.

However, when considering the manufacture of some products, for example thermal phosphoric acid, these are being substituted with other products due to their high-cost production process.

Globally, **technical phosphoric acid** capacity was estimated at 6.0 million tonnes  $P_2O_5$  in 2012. China is currently the only country to produce significant quantities of thermal phosphoric acid. High energy costs are forecast to constrain the growth of the thermal phosphoric acid market, resulting in a likely preference in the use of purified WPA.

Phosphorus is used in a variety of **consumer products**, primarily in the form of sodium tripolyphosphate (STPP). However, the manufacture of STPP fell sharply in 2009 following the financial crisis.

Furthermore, phosphate detergents have become increasingly regulated in developed markets because of negative environmental effects concerning the eutrophication of aquatic systems. Although this is expected to restrict the industry, some growth in demand is likely to result in greater demand than the low levels reached after the financial crisis.

**Red phosphorus** has a high degree of stability at room temperature, and consequently, is used in different forms; primarily as a fire starter and fire retardant. It can also be used in metal treatment, though demand has suffered heavily because of the financial crisis.

**Non-fertilizer agricultural uses** include; insecticides, pesticides, and herbicides. These applications have declined due to environmental concerns that have resulted in a shift towards higher specificity products. However, chemicals such as thiophosphoryl chloride are essential to the production of high-specificity products.

Phosphates are used as **food additives** in the form of phosphate salts. Additionally, phosphoric acid is utilized in: the treatment of fresh dairy products, to support yeast development in oenology, and in the production of colas and root beers. Production of food phosphates is forecast to grow significantly, as it is correlated to growing food demand, resulting from population growth. Likewise, the same factors apply to forecasts of demand in non-fertilizer agricultural products.

Phosphate chemicals are widely used in **municipal and wastewater treatment**, in addition to water pre-treatment before desalination, as they are very effective anti-corrosion agents. Demand could grow more rapidly than our forecast, as municipal and industrial desalination and water management practices are growing rapidly in many regions.

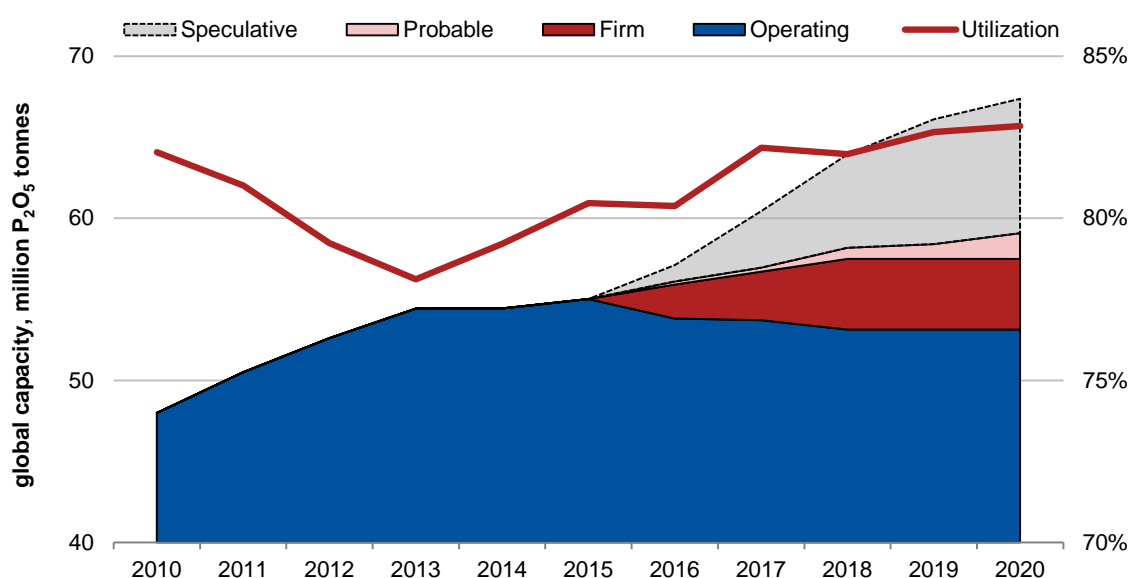
However, this application is not expected to result in major impacts on the overall phosphorous market in the near term.

## 1.2 Regional overview and forecast of phosphate rock demand

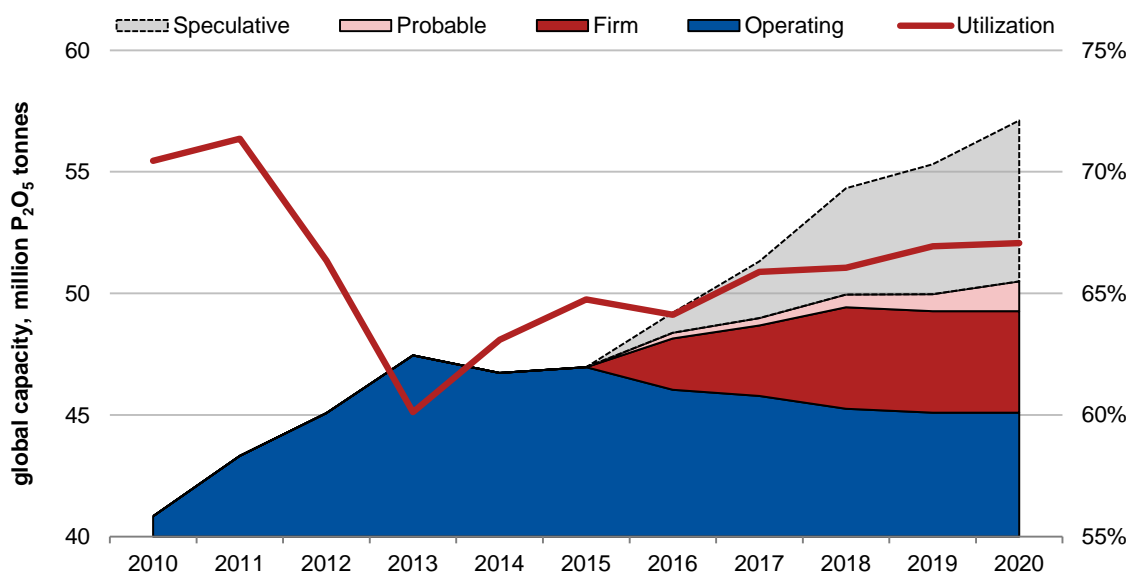
Section 1.2 of this *PRMO* provides a short-term and a medium-term overview and forecast of phosphate rock demand. In doing so, it incorporates both information published in the *Phosphate Fertilizer Market Outlook January 2016 Edition* – including the base-case capacity forecast, and any new monthly or quarterly publication of data through CRU subscriptions and media sources.

### Global phosphate supply outlook 2009-2020

#### Phosphoric acid capacity forecast by category, million $P_2O_5$ tonnes



#### Combined DAP, MAP & TSP Capacity forecast by category, million $P_2O_5$ tonnes



Data: CRU, AFA, ANDA, CPIA, company reports

## 1.2.1 East Asia

## East Asia phosphate rock demand metrics

## Overview/short-term outlook:

Rock demand in East Asia over 2015 is estimated by CRU to have increased for a second consecutive year by around 8% y/y to over 87.6 million tonnes. Most of this resulted from a 35% increase in ammoniated phosphates production in **China**, which CRU estimates to have totalled a combined 15.4 million P<sub>2</sub>O<sub>5</sub> tonnes in 2015. Indeed, the *CPIA* reported both DAP and MAP production in **China** for the first nine-months of 2015 to have increased by 15% and 11% each at 13.2 million and 9.0 million tonnes respectively. In 2016 we estimate annual rock demand in East Asia to decrease by over 3% y/y as rock demand in **China** is forecast to fall from a record high of nearly 86.6 million tonnes in 2015 to about 83.9 million tonnes this year, mostly due to a decline in ammoniated phosphates production.

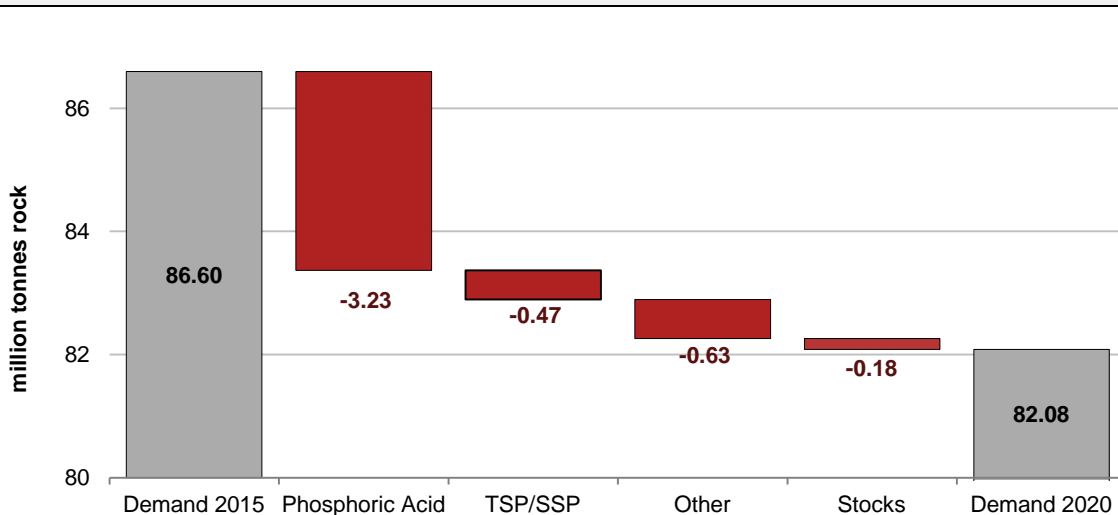
## Impact of downstream markets on rock consumption:

**DAP** Production in **China** in the first-nine-months of 2015 was reported by the *CPIA* at 13.2 million tonnes; a 15% y/y increase. The share of production pertaining to the *BIG4* increased q/q from 54% in Q1 2014 to over 60% in Q3 2015. For the calendar year, we estimate domestic production reached 18.0 million tonnes, around 15% above 2014 production reported by the *CPIA* of over 15.7 million tonnes. In 2016 the annual Spring Festival resulted in utilization rates reported by *CFMW* of nearly 57% as some producers enter seasonal maintenance shutdowns.

**MAP** Despite the prioritization of DAP by producers, the *CPIA* reported MAP production in **China** for the first-nine-months of 2015 to have increased by 11% y/y to 9.0 million tonnes. Likewise, we estimate that annual production reached 12.8 million tonnes, reflecting a 25% increase on 2014 production reported by the *CPIA* of over 10.2 million tonnes. So far in 2016 producers have been reported by *CFMW* to be producing at 65% utilization, with many operations idle over the Spring Festival.

**NPK** Since 2015Q4 *CFMW* has consistently reported low NPK sales across **China** and lower demand for MAP (physical blending) as stocks increased, ending the year at close to 2.0 million tonnes. This trend has continued into 2016 and over the Spring Festival NPK operating rates have been reported at below 35% by *CFMW*.

## China phosphate rock demand dynamics:



## East Asia phosphate rock demand forecast:

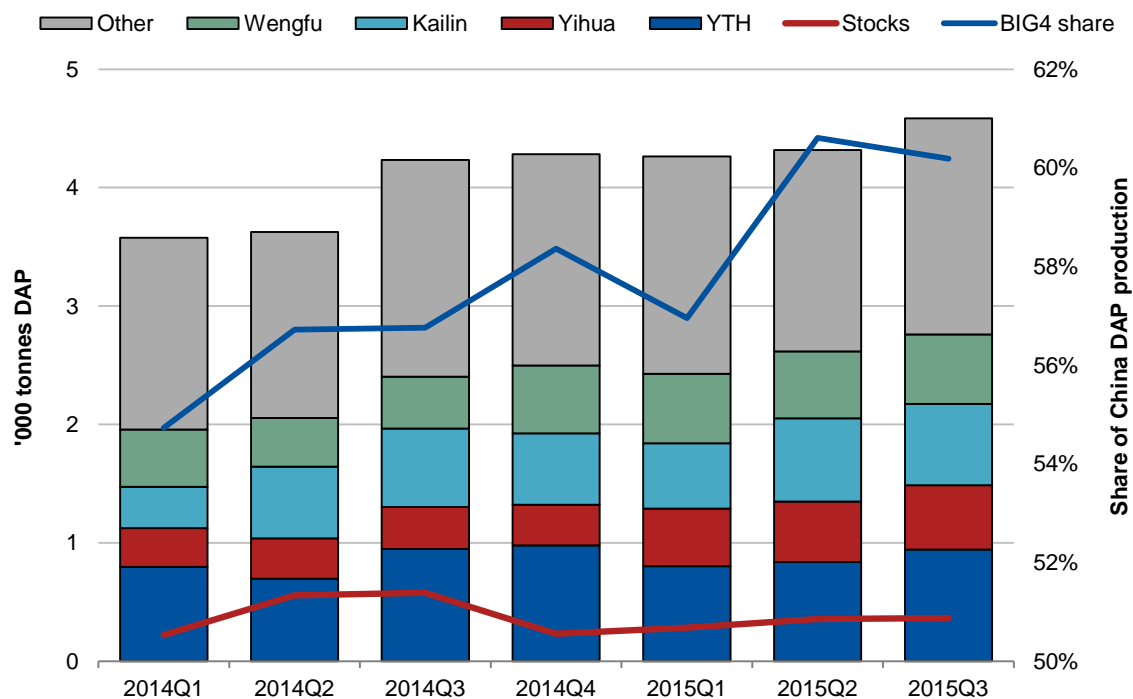
million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
China	79.7	86.6	83.9	83.0	82.3	81.9	82.1	↓
Others	1.1	1.1	1.2	1.2	1.1	1.1	1.1	↓
<b>Total East Asia</b>	<b>80.8</b>	<b>87.6</b>	<b>85.0</b>	<b>84.2</b>	<b>83.4</b>	<b>83.0</b>	<b>83.2</b>	↓
year-on-year change	-	8%	-3%	-1%	-1%	0%	0%	

Data: CRU, CFMW, CPIA, GTIS, IFA, KOSIS, company reports

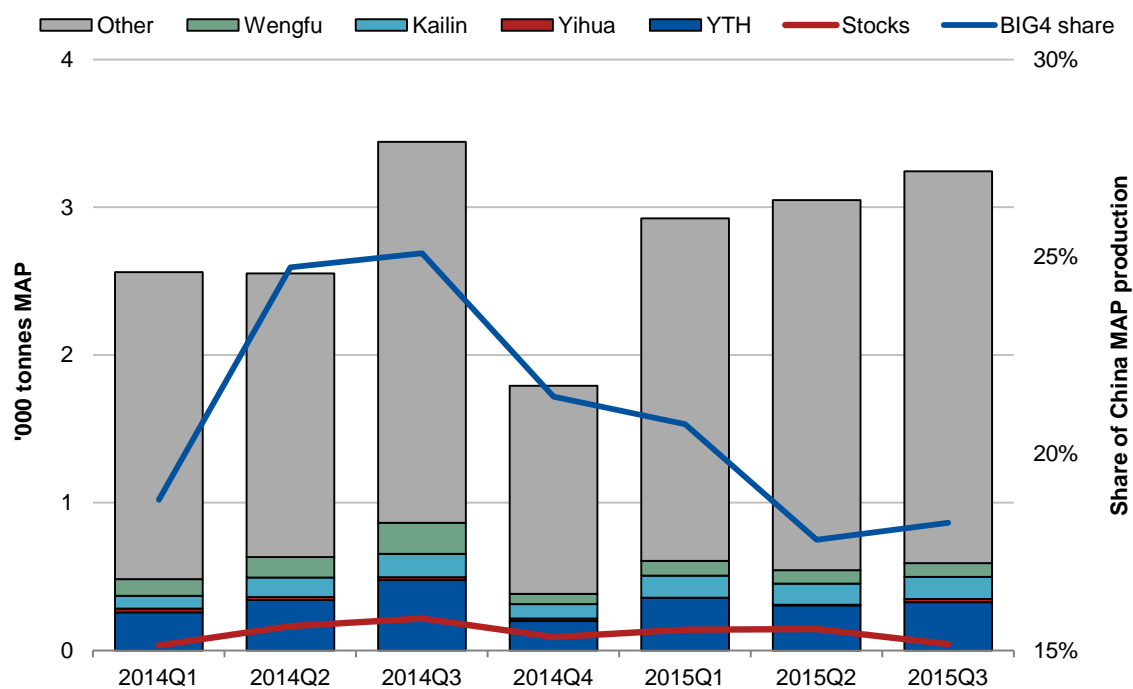
In most areas, demand from ammoniated phosphates production increased, but considering annual downstream production volumes, this was most significant in the provinces of **Guizhou**, **Hubei** and **Anhui**.

### Quarterly DAP/MAP production in China

#### Commissioning of DAP capacity at Yihua – Hubei Chuxing has helped raise Yihua output



#### BIG4 share in MAP production continues to be heavily outweighed by DAP contribution



Data: CRU, CPIA



The only area that saw a notable decline in demand for rock was **Jiangsu** province, driven by the 76% y/y decline in MAP production in the first-nine months of 2015 as reported by the CPIA to just 186,000 tonnes. This is an unique example, where producers (mostly MAP) operate at high-cost and have a favourable geographical location to the market. However, considering the decline in domestic MAP prices over 2014-2015 we have taken the view that MAP producers found it difficult to cover costs and reduced output accordingly.

Towards the end of the calendar year, the domestic rock market weakened. This trend continued into 2016 and the seasonal *Spring Festival*. Reduced demand for production was added to by the 6% y/y reduction in annual rock exports from China in 2015, which are forecast to remain below 0.5 million tonnes in the medium-term. Furthermore, declining crop prices over the winter have applied downward pressure on the domestic fertilizer market, as some farmers were unable to purchase desired volumes of seed, fertilizer and pesticides for the *Spring Ploughing* this year.

Elsewhere in **East Asia**, annual rock demand remained relatively flat y/y at around 1.1 million tonnes. This materialized despite the first full year without the production of DAP or phosphoric acid at Dongbu in **South Korea**. This suggests high utilization at NamHae Chemical Co., now the only producer of phosphoric acid and ammoniated phosphates in South Korea. The two aforementioned producers represent the majority of compound NPK capacity in South Korea, of which *KOSIS* reported annual production in 2015 to have totalled over 1.5 million tonnes, reflecting an 8% y/y decline. These production volumes represent an 89% utilization rate, when considering *IFA* annual capacity estimates.

## 1.2.2 North America

## North America phosphate rock demand metrics

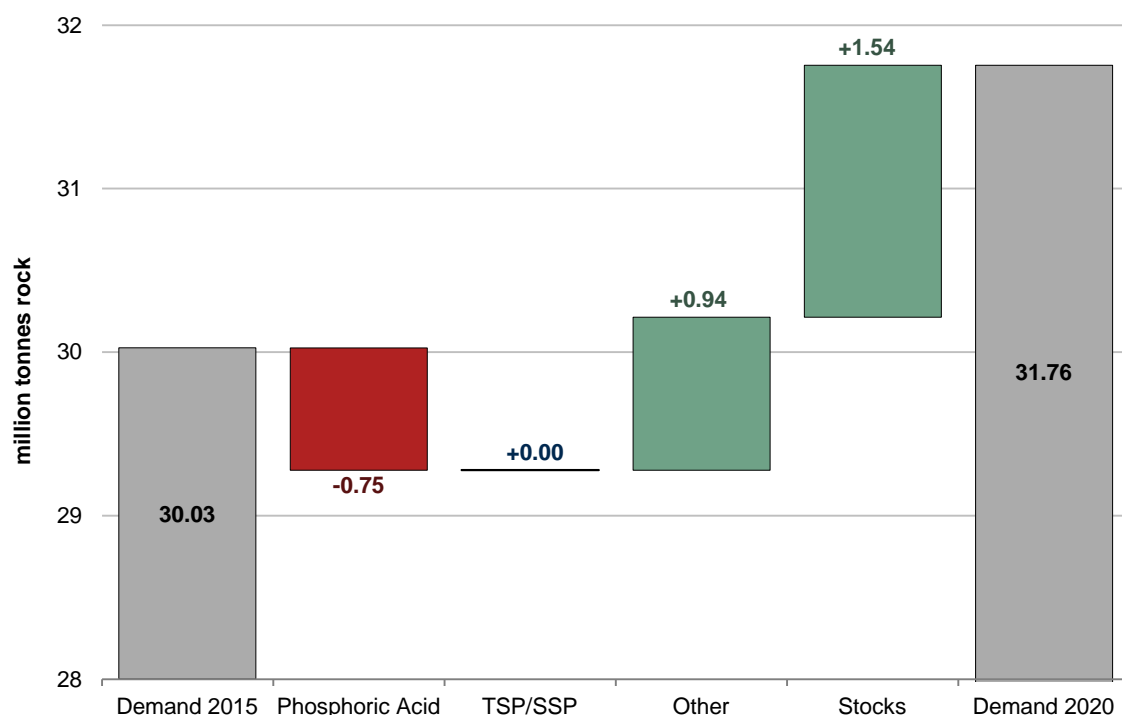
## Overview/short-term outlook:

Despite the closure of downstream capacity in the United States (US), the previous CRU forecasts of a 5-6% y/y decline in rock demand reported throughout the year are understood to have been negated through an increase in downstream utilization rates. Consequently, we now estimate annual rock demand in North America to have increased marginally to around 30.0 million tonnes last year. Over the short-term, we estimate that rock consumption in the US will increase by nearly 3% y/y in 2016 to close to 30.0 million tonnes as utilization rates continue to improve.

## Impact of downstream markets on rock consumption:

<b>DAP</b>	Annual DAP production in 2015 is estimated by CRU to have declined by around 6% y/y to below 4.6 million product tonnes.
<b>MAP</b>	Despite the closure of capacity at <b>PotashCorp – White Springs</b> , annual MAP production in 2015 is estimated by CRU to have only declined by around 3% y/y to over 4.6 million product tonnes.
<b>MES</b>	Annual production at <b>Mosaic</b> is estimated by CRU to have remained flat y/y at around 874,000 P <sub>2</sub> O <sub>5</sub> tonnes.
<b>Stocks</b>	Whilst there was a net draw-down of over 3.0 million tonnes of rock stocks in 2014, rock stocks are estimated to have shown a net increase of 580,000 tonnes in 2015. It is our view that the forecast closures of <b>Mosaic's South Fort Meade</b> and <b>Four Corners</b> mines, will require a future draw-down of stocks that may have already been commenced in 2015.

## North America phosphate rock demand dynamics:

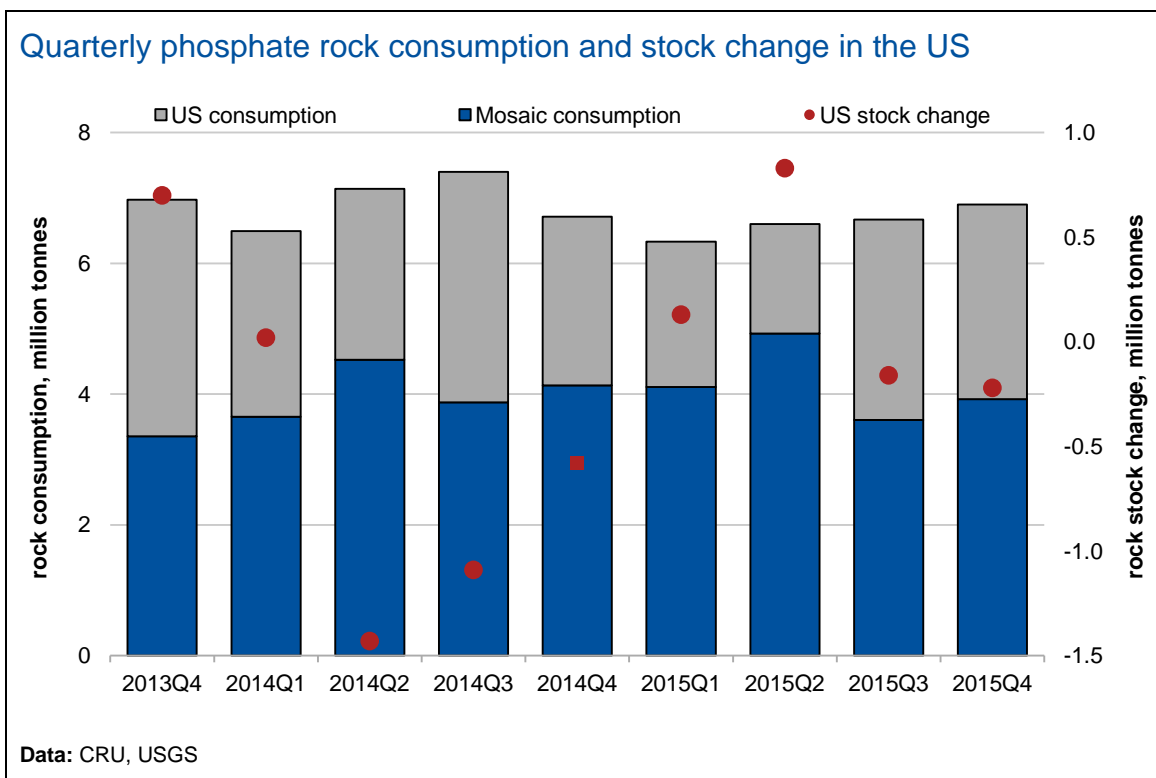


## North America phosphate rock demand forecast:

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Canada	0.9	0.9	0.8	0.8	0.8	0.8	0.8	↓
United States	28.9	29.2	30.0	30.3	30.3	30.0	30.9	↑
<b>Total North America</b>	<b>29.8</b>	<b>30.0</b>	<b>30.8</b>	<b>31.1</b>	<b>31.1</b>	<b>30.9</b>	<b>31.8</b>	↑
year-on-year change	-	1%	3%	1%	0%	-1%	3%	

Data: CRU, GTIS, IFA, TFI, USGS, company reports

Using month-end stock data from the *USGS*, we estimate that there was net increase in stocks in 2015 of around 580,000 tonnes, compared to the 3.0 million tonnes of stock draw-down the previous year.



**Mosaic** reported combined DAP/MAP/MES sales in Q4 2015 to have declined by 6% y/y to nearly 2.1 million tonnes, though calendar year production reflected a 2% y/y increase at over 9.1 million tonnes. As expected, rock consumption in Q4 2015 also declined by 5% y/y at over 3.9 million tonnes, though for the year it did increase by 2% y/y to nearly 16.6 million tonnes.

Conversely, **PotashCorp** noted a 3% y/y decline in annual phosphate production at a reported 1.6 million  $P_2O_5$  tonnes. This was mostly due to a bottleneck in rock production because of the mining of a temporary mining of lower-quality ore earlier in the year. Both Q3 and Q4 2015 phosphate production showed y/y increases of 3% and 4% respectively as operating rates reached their highest quarterly values in the last three years of 93% and 90%, raising rock consumption in the process and implying a recovery in ore quality.

Over the **short-term**, we forecast that rock consumption in the US will increase by nearly 3% y/y in 2016 to close to 30.8 million tonnes as utilization rates continue to improve.

In the **medium-term** CRU forecasts rock consumption in the US will increase by over 1% CAGR to reach 31.8 million tonnes by the end of the decade. However, the consecutive annual increase in rock consumption forecast over 2016-2017 is expected to flatten and then decline over 2018-2019 with the commissioning of competing export-oriented downstream projects.

## 1.2.3 Africa

## Africa phosphate rock demand metrics

## Overview/short-term outlook:

Annual rock demand in Africa in 2015 is estimated to have declined by nearly 9% y/y to around 22.8 million tonnes – the lowest figure since 2001. In North Africa, which represented nearly 96% of all rock demand for the continent last year, annual rock demand also declined by nearly 9% y/y to below 21.3 million tonnes – the lowest figure since 2009. However, in the short-term we expect a recovery of production in Tunisia and the commissioning and ramping up of OCP's projects in Morocco. This will be added to by a post-debottleneck ramp-up of phosphoric acid production in Senegal and a recovery in historically-low annual acid production in South Africa. Overall, these factors will combine to raise annual rock demand across Africa by 10% y/y to over 25.1 million tonnes this year.

## Impact of downstream markets on rock consumption:

**DAP** Both major producers of DAP in Africa saw declines in annual output; at OCP it was a voluntary part of its strategic shift towards greater NP/NPK output, whilst GCT suffered curtailments due to strikes. Combined, these events resulted in an estimated 28% y/y decline in continental DAP production to 1.9 million product tonnes.

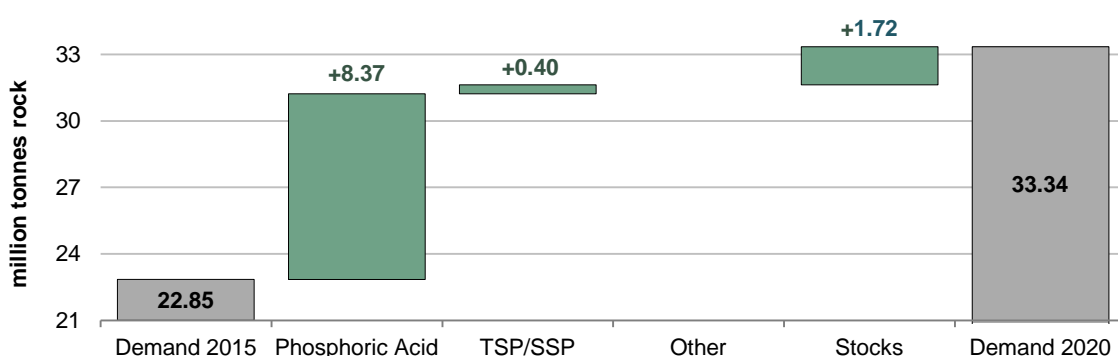
**MAP** The combination of a 72% y/y decline in annual output at **Foskor** and the switch towards NP/NPK production at **OCP** resulted in an estimated 21% y/y decline in annual MAP production to below 1.5 million product tonnes in Africa.

**MGA** The completion of refurbishments at **ICS – Darou** resulted in the highest quarterly phosphoric acid production in over three years, reported by the **ANSD** in 2015Q4 at 93,300 P<sub>2</sub>O<sub>5</sub> tonnes.

**Stocks** The curtailment of rock production at **CPG** through 2015H1 resulted in the depletion of stocks down to just 24,000 tonnes. These were replenished to 240,000 tonnes by August.

**TSP** Whilst **GCT** has prioritized TSP production, there has been a shift in product mix at **OCP**; the latter has contributed most to the 26% y/y decline in annual TSP production across Africa, estimated at about 1.4 million product tonnes in last year.

## Africa phosphate rock demand dynamics:



## Africa phosphate rock demand forecast:

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Egypt	2.0	1.2	1.3	1.3	1.3	1.3	1.3	↑
Morocco	16.8	17.2	18.6	21.3	21.0	22.5	24.6	↑
Senegal	0.7	1.0	1.0	1.4	1.7	1.6	1.6	↑
South Africa	1.8	0.5	0.9	1.2	1.1	1.0	0.9	↑
Tunisia	3.7	2.9	3.4	4.1	4.6	4.7	4.8	↑
Others	0.1	0.0	0.0	0.1	0.2	0.2	0.2	↑
<b>Total Africa</b>	<b>25.2</b>	<b>22.8</b>	<b>25.1</b>	<b>29.2</b>	<b>29.8</b>	<b>31.3</b>	<b>33.3</b>	<b>↑</b>
year-on-year change	-	-9%	10%	16%	2%	5%	7%	

Data: CRU, AFA, ANP, ANSD, GTIS, IFA, INS company reports

In **Morocco**, we estimate that rock demand in 2015 increased by nearly 3% to over 17.2 million tonnes – the highest annual figure since 2012. This materialized despite declining captive rock demand from the lower y/y output of ammoniated phosphates due to the changing product mix at **OCP** towards compound fertilizer (e.g. NP and NPK and NP+S) production, the ramping up of **Line E** and the commissioning of **JPH-I** in November.

The ramping up of JPH-I, in addition to the commissioning of the **OCP** projects **JPH II-IV** in **Morocco** are expected to raise annual domestic rock demand by nearly 8% y/y in 2016 to around 18.6 million tonnes.

Over the **medium-term**, the commissioning of **OCP's JPH V-VII** projects in **Morocco** is forecast to account for 71% of the overall 10.5 million tonnes of growth in the continent's annual rock demand. Domestic annual rock demand is expected to increase by close to 9% CAGR over the forecast period to over 24.6 million tonnes in 2020.

Rock demand is estimated to have fallen elsewhere across the region in 2015; a 39% y/y decline in annual rock demand was noted in **Tunisia**, where it fell to below 2.9 million tonnes. This was mostly due to the restriction of rock availability, particularly in 2015H1 when phosphoric acid production was limited by civil unrest and recurring blockades on rock transport.

Indeed, data from the *INS* indicates that **Groupe Chimique Tunisien (GCT)** and the **Tunisia-India Fertilizer Co. (TIFERT)** only produced 16,000 P<sub>2</sub>O<sub>5</sub> tonnes of phosphoric acid over May-June 2015 combined and the former produced no DAP or TSP over the two months. Accordingly, there were only around 7,100 tonnes of domestic rock sales in May 2015 – the lowest monthly figure recorded in recent history. However, the situation has now improved, leading to a more positive outlook for Tunisia over the forecast period.

In the **short-term**, we expect a 17% y/y increase in annual rock demand in Tunisia to around 3.4 million tonnes in 2016 and forecast an increase of 13% CAGR in annual rock demand over the **medium-term** as production at **GCT** and **TIFERT** continues to recover – though not to levels seen before the *Arab Spring*.

Similarly, in 2015 there was a third consecutive y/y decline noted in **Egypt** as annual rock demand fell by an estimated 39% down to 1.2 million tonnes. Most of this decline resulted from lower SSP production over the same period.

In **West Africa**, rock demand has been revised upwards for 2015 following the de-bottlenecking completed by **Industries Chimiques du Sénégal (ICS)** at its Darou plant in October 2015. The *ANSD* reported record quarterly phosphoric acid production in Q4 2015 and consequently our estimate of rock consumption has increased by an estimated 31% y/y to nearly 1.0 million tonnes.

We expect the ramping up of phosphoric acid production at **ICS** in **Senegal** to raise domestic rock demand by nearly 13% CAGR over the **medium-term**, with annual demand peaking at close to 1.7 million tonnes in 2018 and then remaining flat around 1.6 million tonnes as MGA markets become squeezed in its main export destination, India.

In **South Africa**, recurring blackouts and chronic infrastructure problems, in addition to a three-four week strike of 400 employees at **Foskor**'s **Richards Bay** plant from November until the 2<sup>nd</sup> of December, resulted in an estimated annual rock consumption decline of 70% y/y down to just over 0.5 million tonnes – the lowest figure in over two decades. Both annual phosphoric acid and MAP production at Foskor were estimated to have declined significantly last year, the latter by 62% y/y to around 115,000 tonnes.

In the **medium-term**, we forecast annual rock demand in **South Africa** to increase marginally, but peak at 1.2 million tonnes in 2016 as lower demand from the Indian MGA market will squeeze domestic phosphoric acid production at **Foskor** and result in consecutive annual rock demand declines down to about 0.9 million tonnes by the end of the forecast period.

Elsewhere, the commissioning of the **Sukulu** project in **Uganda** in 2017H2 is expected to raise annual rock demand in **East Africa** significantly from where it stood in 2015 at an estimated 24,000 tonnes to over 150,000 tonnes in Uganda alone once the project ramps up in 2018 over the medium-term forecast period.

## 1.2.4 Middle East

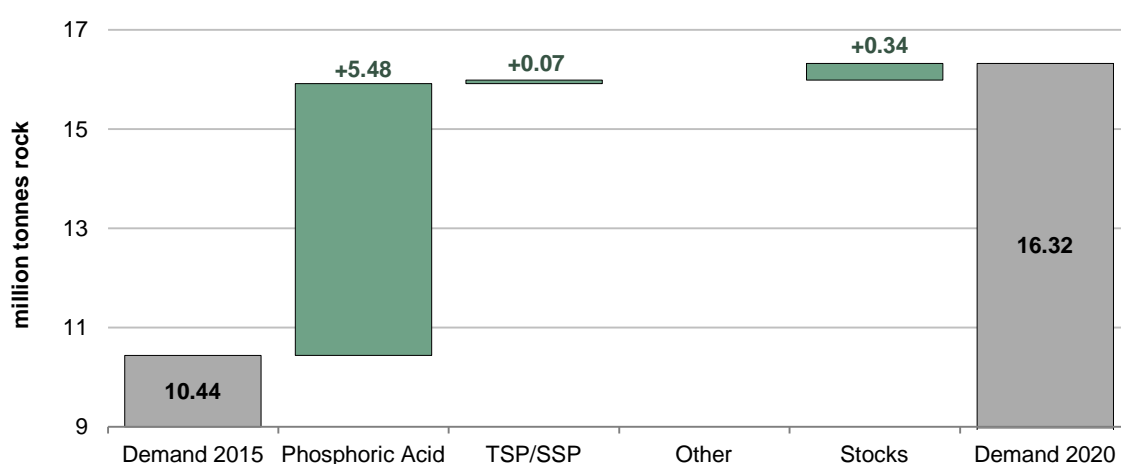
## Middle East phosphate rock demand metrics

**Overview/short-term outlook:**

Despite widespread civil unrest in the region last year, annual rock demand in 2015 in the Middle East is estimated by CRU to have increased by 4% y/y to around 10.4 million tonnes. Most of this increase was concentrated in Israel and Saudi Arabia, the former from increased MGA sales at ICL following the temporary curtailment of SSP production following a fire in June 2015 and the latter by increased ammoniated phosphate production at MPC, which offset losses in most of the rest of the region. In the short-term, we expect annual rock demand to increase in the Middle East by 3% y/y to nearly 10.7 million tonnes in 2016, though the dynamics of this increase will change significantly. In Israel the return of SSP production will lower demand again, whilst civil unrest in the rest of the region will continue to lower rock demand. However, the completion of de-bottle-necking at the JFIC – Aqaba site will result in an increase in rock demand, along with a further rise in Saudi Arabia.

**Impact of downstream markets on phosphate rock consumption:**

<b>DAP</b>	Annual DAP production fell marginally y/y at around 3.2 million tonnes, as debottlenecking limited downstream output at <b>JFIC – Aqaba</b> .
<b>MGA</b>	<b>ICL</b> reported record-high quarterly phosphoric acid production, which was reflected in record-high quarterly rock consumption of a reported 813,000 tonnes.
<b>SSP</b>	Rock demand for SSP production is expected to have declined significantly in the Middle East due to the curtailment of production at <b>ICL</b> following a fire in July 2015.
<b>Stocks</b>	Following the recorded export of an estimated around 731,000 tonnes of rock from stock over the first-nine-months of 2015, data from <i>GTIS</i> indicates that the export of stocks from <b>Gecopham</b> all but disappeared in Q4 2015.
<b>TSP</b>	An estimated increase of 18% y/y in annual TSP production across the region was mostly due to increases at <b>ICL</b> and <b>LCC</b> .

**Middle East phosphate rock demand dynamics:****Middle East phosphate rock demand forecast:**

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Israel	2.2	2.5	2.0	2.2	2.3	2.3	2.3	↓
Jordan	2.5	2.2	3.0	3.2	3.2	3.2	3.2	↑
Saudi Arabia	3.6	3.7	3.9	4.4	7.1	8.2	8.9	↑
Turkey	0.9	0.9	0.8	0.8	0.8	0.8	0.8	↓
Others	0.9	1.1	1.1	1.1	1.1	1.1	1.1	↓
<b>Total Middle East</b>	<b>10.0</b>	<b>10.4</b>	<b>10.7</b>	<b>11.7</b>	<b>14.5</b>	<b>15.6</b>	<b>16.3</b>	<b>↑</b>
<i>year-on-year change</i>	-	4%	3%	9%	24%	8%	4%	

**Data:** CRU, AFA, GTIS, IFA, JSA, LC, company reports

For the fourth consecutive year, **Saudi Arabia** remained the largest consumer of phosphate rock in the Middle East with an estimated rock demand in 2015 of over 3.7 million tonnes, accounting for nearly 43% of regional rock demand for the year. This 4% y/y increase in domestic rock demand resulted from increased ammoniated phosphates production, particularly DAP at both **Ma'aden Phosphate Co. (MPC)** and the **Saudi Arabia Fertilizer Co. (SAFCO)**, which increased by a combined 9% y/y to reach over 2.4 million tonnes of DAP product – buoyed by the 42% increase in DAP demand in India.

In the **short-term**, we estimate rock demand in **Saudi Arabia** to increase by around 3% y/y and reach close to 3.9 million tonnes in 2016. The commissioning of the **Ma'aden Wa'ad Al Shamal Phosphate Co. (MWSPC)** JV project in Q4 2017 will contribute most towards raising domestic rock demand by nearly 28% CAGR over the **medium-term**.

**Israel** leapfrogged Jordan to become the second largest consumer of rock in the Middle East over 2015, accounting for 24% of regional demand and seeing an estimated 14% y/y increase in annual rock demand at around 2.5 million tonnes. This came as a result of a fire at **Israel Chemicals Ltd.'s (ICL)** SSP plant in July 2015 that forced ICL into producing more MGA for export.

In the **short-term**, with the expected refurbishment at ICL's SSP unit, we expect that MGA production and sales will decrease and that increased competition will result in an 8% y/y contraction in domestic rock demand to a total of 2.0 million tonnes. Over the **medium-term** CRU forecasts that marginal consecutive y/y growth will result in rock demand a peak of around 2.3 million tonnes in 2017 and remaining flat thereafter.

In **Jordan**, rock demand for 2015 was limited by debottlenecking at the **Jordan Phosphate Mines Co. (JPMC)** **Aqaba** plant. The JPMC subsidiary, **Jordan Fertilizer Co. (JFIC)** was restricted to an annual output of below 0.5 million P<sub>2</sub>O<sub>5</sub> tonnes for the year and was the major contributor to an estimated 13% y/y decline in rock demand, which totalled below 2.2 million tonnes.

In the **short-term** we estimate that rock demand in Jordan will bounce back in 2016 and increase by 36% y/y to its highest levels since 2003 at nearly 3.0 million tonnes. With the expected successful implementation of debottlenecking at the JFIC – Aqaba site, we forecast that rock demand will increase by a further 9% y/y between 2016-2017 and remain flat thereafter until the end of the **medium-term** forecast.

Elsewhere in the **Middle East**, where the combined share of regional rock demand remained flat y/y at around 18% or equivalent to 2.0 million tonnes, rock demand increased 14% y/y as a result of combination of increased DAP production at **Razi Petrochemical Co. (RPC)** in **Iran** and greater TSP and SSP output from **Lebanon Chemical Co. (LCC)** in **Lebanon**. In the



former, rock demand increased by 350% y/y to nearly 0.3 million tonnes as the easing of sanctions allowed for cheaper importation of raw materials, whilst in the latter LCC managed to successfully switch its primary rock supply away from **Gecopham** in Syria to OCP in Morocco as it looked to increase its presence on the lower-grade market.

In **Turkey**, rock demand in 2015 declined marginally to below 0.9 million tonnes as producers favoured the production of NPK utilizing MGA imports. However; in **Iraq** and **Syria**, continued civil war resulted in another year of next to no intermediate or downstream production in the former, and in the latter a 28% y/y decline in annual rock demand at below 0.2 million tonnes.

In both the **short-term**, and the **medium-term** CRU forecasts that rock demand in these aforementioned countries in the rest of the Middle East will remain flat or decline marginally, combining to a total of 1.9 million tonnes, though its share of regional rock demand will decline from nearly 17% in 2016 to just 11% by the end of the decade.

## 1.2.5 Europe &amp; the Commonwealth of Independent States (CIS)

## Europe &amp; CIS phosphate rock demand metrics

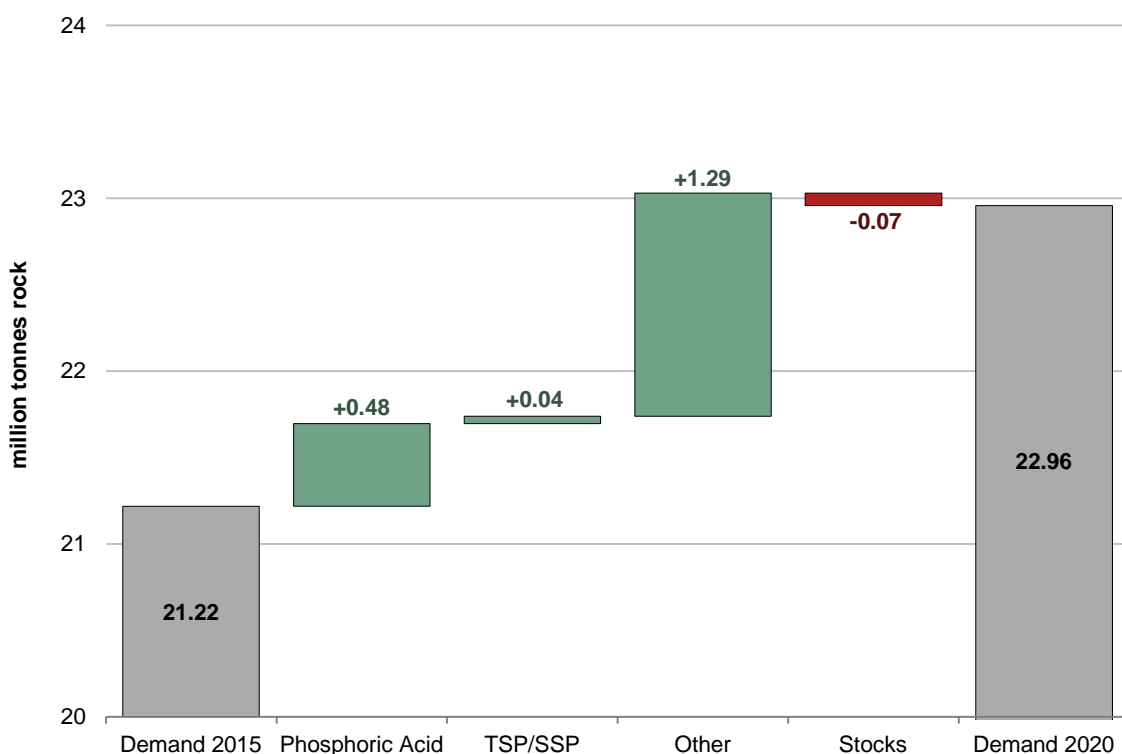
## Overview/short-term outlook:

Rock demand in Europe & CIS is estimated by CRU to have increased by 9% y/y to over 21.2 million tonnes in 2015, although this was mostly because of an estimated 21% y/y increase in annual rock demand in Russia at a total of 10.3 million tonnes. This offset marginal y/y declines in the rest of the CIS but mostly in Europe, where it fell by 3% y/y to just over 8.0 million tonnes. In the short-term, we forecast rock demand to bounce back in Europe and increase for the third consecutive year in the CIS to result in a combined 4% growth y/y to over 22.1 million tonnes in 2016.

## Impact of downstream markets on rock consumption:

<b>DAP</b>	Production at <b>AB Lifosa</b> is reported by <i>LS</i> to have marginally increased y/y to reach an annual total just shy of 800,000 tonnes in 2015. Over the same period, DAP output increased by 45% y/y in Russia to over 1.2 million product tonnes.
<b>MAP</b>	Rock production in Russia through 2015 is estimated to have declined 10% y/y to about 2.5 million product tonnes, mostly because of a combination of the prioritization of DAP for export and a disagreement on sulphur prices between <b>PhosAgro</b> and Gazprom.
<b>NPK</b>	<b>Maxam-Ammofos</b> commissioned its <b>Samarkandkimyo</b> NPK plant of 160,000 tonnes/year capacity in January 2016.

## Europe &amp; CIS phosphate rock demand dynamics:



## Europe &amp; CIS phosphate rock demand forecast:

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Kazakhstan	1.4	1.4	1.5	1.6	1.6	1.6	2.7	↑
Lithuania	1.7	1.7	1.6	1.7	1.6	1.6	1.6	↓
Russia	8.6	10.3	10.7	10.8	10.9	10.7	10.5	↑
Others	7.8	4.8	5.2	5.2	5.2	5.2	5.2	↑
<b>Total Europe &amp; CIS</b>	<b>19.4</b>	<b>21.2</b>	<b>22.1</b>	<b>22.2</b>	<b>22.3</b>	<b>22.1</b>	<b>23.0</b>	<b>↑</b>
year-on-year change	-	9%	4%	0%	0%	-1%	4%	

Data: CRU, Azotecon, BelStat, GTIS, GUS, IFA, LS, Uzkiyosanoat, company reports

Rock demand in **Russia** in 2015 is estimated to have increased by nearly 21% y/y as low production costs for exporters continued to favour domestic downstream production. This was particularly true of DAP, which reflected a 45% y/y increase in production estimated at around 4.5 million tonnes for the year. In the process, Russia increased its share of rock demand in the CIS from 77% in 2014 to an estimated 79% in 2015. Indeed, annual rock consumption is estimated by CRU to have increased at the three largest downstream phosphate companies:

- Based on data reported by **PhosAgro** for the first-nine-months of 2015, which saw a 10% y/y increase in phosphoric acid production, we estimate that rock consumption will have increased for the year;
- Rock consumption at **EuroChem** in 2015 is estimated to have declined y/y as the company reported a 3% decline in ammoniated phosphates sales over the comparative period; and
- **Acron** is understood to have increased its rock consumption in 2015 by around 8% y/y at a reported 774,900 tonnes.

In the **short-term**, rock demand in **Russia** is expected to continue to rise, though at a slower rate, reaching nearly 10.5 million tonnes in 2016. We forecast this growth in demand to continue up until 2017 when it will peak at 10.9 million tonnes. However, over the rest of the medium-term we forecast rock demand in Russia to fall to 10.5 million tonnes, whereby 2020 it will account for around 70% of rock demand in the CIS.

Elsewhere in the **CIS**, rock demand showed a 10% y/y increase to nearly 2.8 million tonnes in 2015, mostly resulting from the ramping up of production at **Kazphosphate – Taraz** in **Kazakhstan**. This growth is expected to increase by 4% y/y in the **short-term** to around 2.9 million tonnes this year, mostly due to the commissioning of new downstream capacity at the Kazphosphate – Taraz plant in Kazakhstan. Furthermore, the **Maxam-Ammofos – Samarkandkimyo** NPK plant in **Uzbekistan** will also help raise domestic rock demand by 3% y/y to over 0.7 million tonnes. This will contribute to raising rock demand in the rest of the CIS by close to 8% CAGR over the **medium-term**, to 4.0 million tonnes by the end of the decade.

In **Europe**, rock demand is estimated to have fallen by around 3% y/y to 8.0 million tonnes in 2015 as declines were noted across the continent. In the **short-term**, we expect this to recover with an increase of around 6% y/y this year, to reach 8.6 million tonnes. This was particularly because of a pick up in production at downstream sites in Eastern Europe, namely: **Belfert** in **Bulgaria**, **Elixir Prahovo** in **Serbia**, and producers in **Ukraine**.

Whilst in the **medium-term** CRU forecasts rock demand to remain flat around 4.0 million tonnes in West Europe, demand in East Europe is expected to decline from a peak of around 4.5 million tonnes in 2017 down to 4.4 million tonnes by the end of the decade.

## 1.2.6 Central &amp; South America

## Central &amp; South America phosphate rock demand metrics

**Overview/short-term outlook:**

Regional rock demand is estimated by CRU to have declined in 2015 by around 9% y/y to below 10.8 million tonnes as demand fell in both Brazil and Mexico. These two consumers increased their share of regional rock demand from 90% in 2014 to 91% in 2015. With the expected return of demand growth in Brazil over 2016 and the increased utilization expected at Fertinal following its acquisition by Pemex, we forecast that regional rock demand will increase by 4% y/y to over 11.2 million tonnes in 2016.

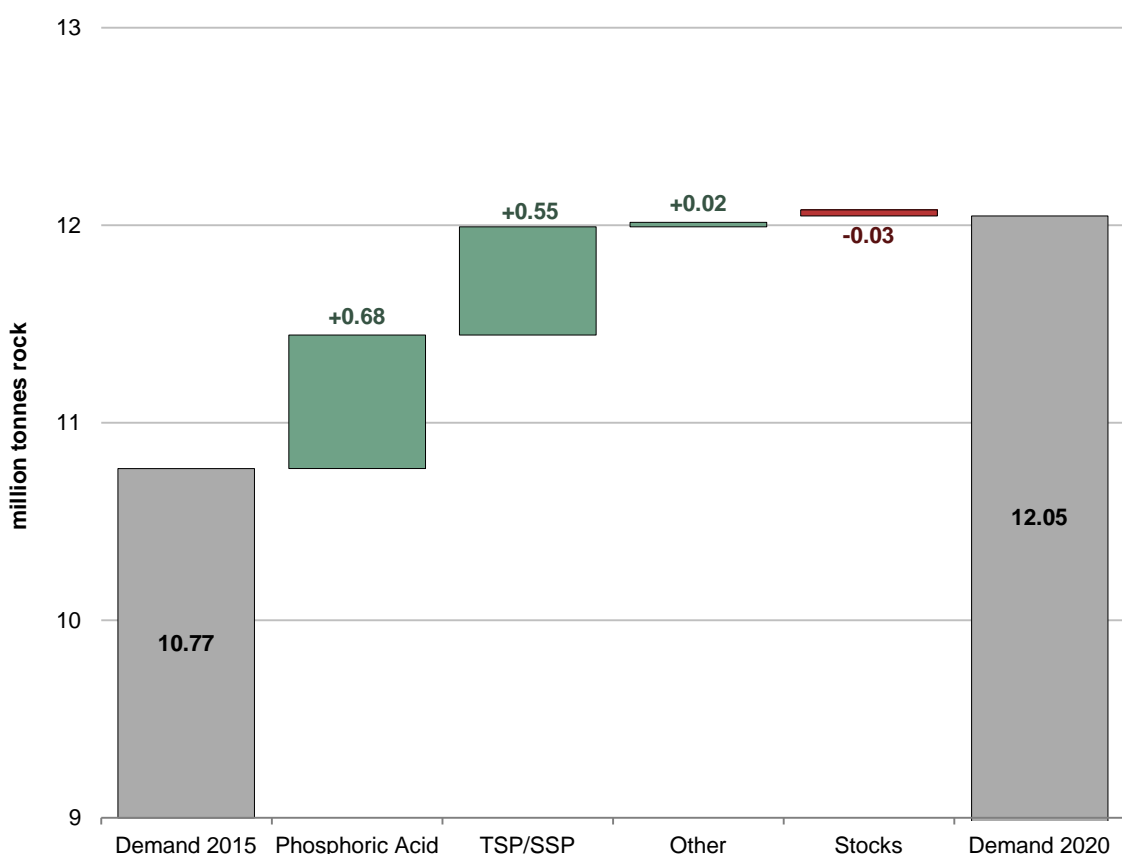
**Impact of downstream markets on rock consumption:**

**DAP** In Mexico, the output from **Fertinal** increased by 8% y/y to reach over 260,800 tonnes in 2015.

**MAP** Annual domestic production of MAP in Brazil is reported by *ANDA* to have increased by around 4% y/y to an estimated 1.2 million tonnes in 2015.

**SSP** Annual SSP production in Brazil in 2015 is reported by *ANDA* to have increased by around 3% y/y close to an estimated 4.8 million tonnes.

**TSP** The largest domestic decline in phosphate fertilizer production in Brazil resulted from the 6% y/y decline in annual TSP production, reported by *ANDA*, to an estimated 860,000 tonnes.

**Central & South America phosphate rock demand dynamics:****Central & South America phosphate rock demand forecast:**

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Brazil	7.5	7.2	7.6	7.5	7.8	7.9	8.2	↑
Mexico	3.0	2.6	2.6	2.8	2.8	2.8	2.9	↑
Other	1.3	1.0	1.0	1.0	1.0	1.0	1.0	↑
<b>Total Central &amp; South America</b>	<b>11.8</b>	<b>10.8</b>	<b>11.2</b>	<b>11.2</b>	<b>11.6</b>	<b>11.8</b>	<b>12.0</b>	<b>↑</b>
<i>year-on-year change</i>	-	-9%	4%	0%	3%	2%	2%	

**Data:** CRU, ANDA, CIAFA, GTIS, IFA, INEGI, ORION, SERNAGEOMIN, company reports

Rock demand in **Brazil** through 2015 is estimated by CRU to have decreased by over 4% y/y down to below 7.2 million tonnes. However, this was better than anticipated, following a record-high year of imports and a build up of stocks that was not helped by an extremely late and difficult economic position for farmers to buy fertilizer. The decline was felt across the markets with the exception of MAP and SSP where production is reported by *ANDA* to have increased by 4% and 3% y/y respectively, to an estimated 1.2 and 4.8 million tonnes.

In the **short-term**, we estimate rock demand in 2016 to bounce back and reflect a 6% y/y increase to nearly 7.7 million tonnes for **Brazil** as demand growth picks up.

However, over the **medium-term** CRU forecasts that this demand will decline by around 2% y/y through to 2017 to below 7.5 million tonnes, before growing again in 2018 to 7.8 million tonnes following the commissioning of the **Yara-Galvani** project at **Serra do Salitre**. The ramp-up of the project is forecast to result in an increase of 3% CAGR in annual rock consumption between 2018-2020 in Brazil.

In **Mexico**, rock demand in 2015 is estimated to have declined by around 13% y/y to 2.6 million tonnes, mostly attributable to an estimated decline in annual MAP production at **Fertinal** of around 24% y/y down to just 330,000 tonnes.

In the **short-term**, we estimate rock demand in **Mexico** to increase by 1% y/y and exceed 2.6 million tonnes as ammoniated phosphates production increases. This trend is forecast by CRU to continue over the **medium-term**, with rock demand in Mexico estimated to increase by around 3% CAGR over the next five years, whereby it will reach nearly 2.9 million tonnes by the end of the decade.

## 1.2.7 South &amp; South East Asia and Oceania

## South East Asia &amp; Oceania phosphate rock demand metrics

**Overview/short-term outlook:**

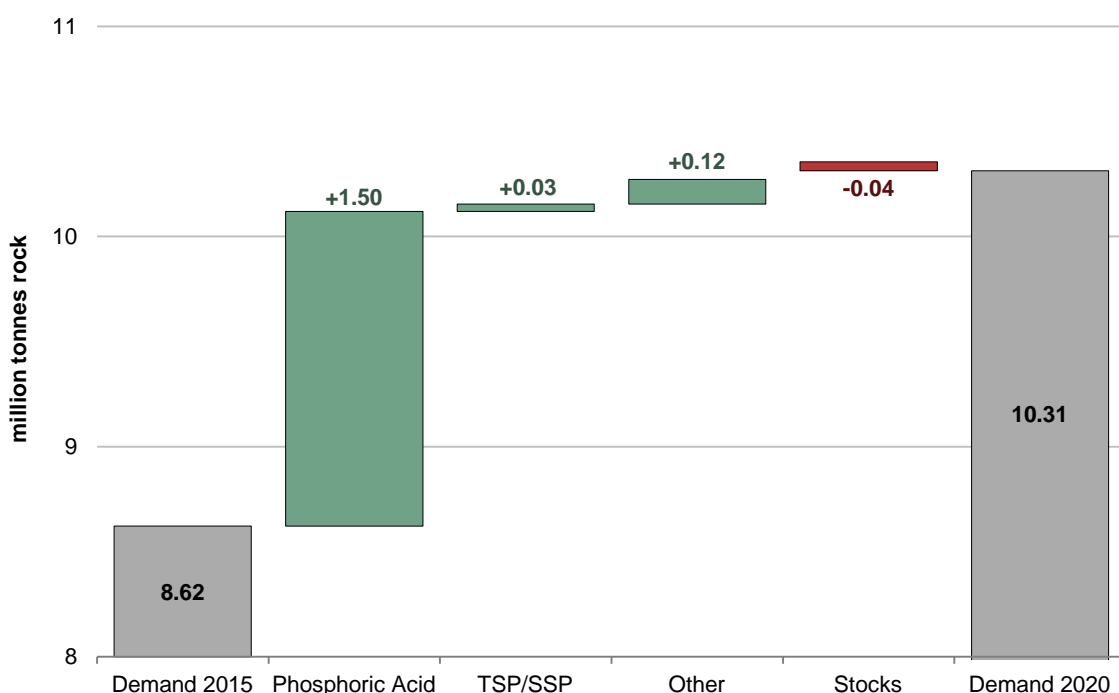
Rock demand in South East Asia increased by an estimated 7% y/y to over 4.8 million tonnes in 2015, mostly due to the third consecutive increase in annual rock demand of around 17% y/y in Indonesia to nearly 2.2 million tonnes, which resulted from the ramp-up and commissioning of two projects. In Oceania, rock consumption is estimated to have fallen marginally to around 3.3 million tonnes, as the estimated 7% y/y increase in rock demand in Australia was offset by a decline of around 19% in New Zealand. In the short-term, rock demand in South East Asia is forecast to increase by nearly 19% y/y to reach nearly 5.8 million tonnes as the ramp-up of the PKG – Gresik expansion raises rock demand by 24% y/y to nearly 2.7 million tonnes in Indonesia. Over the same period, rock consumption in Oceania is expected to increase marginally to 3.4 million tonnes, with increases in both Australia and New Zealand.

**Impact of downstream markets on rock consumption:**

**DAP** Following the first year of full production at **DLC** and **Vinachem DAP-II**, both located in Lao Cai, CRU now estimates annual DAP production in Vietnam to have increased by around 63% y/y to over 1.0 million tonnes for the first time in history in 2015.

**MAP** Production of MAP at **Incitec Pivot** is estimated by CRU to have declined by 42% y/y to just 171,000 tonnes, as more product was imported from China.

**TSP** There was minor TSP production for the first time in Vietnam this year at DLC.

**South East Asia & Oceania phosphate rock demand dynamics:****South East Asia and Oceania phosphate rock demand forecast:**

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Australia	2.5	2.7	2.8	2.8	2.8	2.8	2.8	↑
Indonesia	1.8	2.2	2.7	3.2	3.4	3.4	3.4	↑
Vietnam	2.3	2.7	3.1	3.1	3.1	3.1	3.1	↑
Others	1.2	1.0	1.0	1.0	1.0	1.0	1.0	↑
<b>Total South East Asia &amp; Oceania</b>	<b>7.9</b>	<b>8.6</b>	<b>9.6</b>	<b>10.2</b>	<b>10.4</b>	<b>10.3</b>	<b>10.3</b>	<b>↑</b>
<i>year-on-year change</i>	-	9%	11%	6%	2%	-1%	0%	

Data: CRU, GTIS, IFA, company reports

Rock demand in **South East Asia** increased by around 7% y/y to over 4.8 million tonnes in 2015 following the third consecutive increase in annual rock demand in Indonesia. This increased by around 17% y/y up to 2.2 million tonnes, resulting from the ramp up of production at the **Petro-Jordan Abadi (PJA)** phosphoric acid plant in **Gresik** and the commissioning of a second phosphoric acid unit at the **Petrokimia Gresik (PKG)** plant, both located in Gresik.

In the **short-term**, rock demand in **South East Asia** is forecast to increase by nearly 19% y/y to reach nearly 5.8 million tonnes as the PKG – Gresik unit ramps up production and raises annual rock demand by 24% y/y to nearly 2.7 million tonnes in Indonesia. Likewise, a ramp up in the production of downstream ammoniated phosphates and MGA in Vietnam, particularly MGA from **Duc Giang Chemicals Lao Cai (DLC)– Lao Cai**, is expected to raise rock demand in Vietnam by 17% y/y to over 2.7 million tonnes in 2016.

Over the **medium-term** CRU forecasts that annual rock demand in **South East Asia** will increase by close to 7% CAGR to over 6.4 million tonnes. The most noteworthy change in the region will be the commissioning of **Petro-Kaltim Abadi (PKA)** in 2018, which will help raise rock demand in Indonesia to 3.4 million tonnes, whereby it will become the largest consumer of phosphate rock in the region, overtaking Vietnam for the first time since 2007.

In **Oceania**, rock consumption in 2015 is estimated to have fallen marginally to around 3.3 million tonnes. The estimated 7% y/y increase in rock demand in Australia of around 2.7 million tonnes was offset by a decline of around 19% y/y in rock demand in New Zealand to just 0.6 million tonnes.

In the **short-term**, rock consumption in **Oceania** is expected to increase marginally to 3.4 million tonnes, with increases in both Australia and New Zealand. This regional figure is forecast to remain flat over the **medium-term** forecast, with demand in Australia and New Zealand marginally fluctuating around 2.8 million tonnes and 0.6 million tonnes, respectively.

In **South Asia**, rock demand is estimated to have declined by 1% y/y to around 10.3 million tonnes in 2015, particularly owing to the 2% y/y increase in demand in India at over 9.6 million tonnes, though there was also a y/y increase of 54% in annual rock demand in Pakistan over the same period at nearly 0.6 million tonnes.

Whilst in the **short-term** we forecast demand to decline by a further 1% y/y to 10.1 million tonnes in **South Asia**, mostly because of lower MGA prices that will favour the production of downstream phosphate fertilizers in India via the phosphoric acid import route, demand is forecast by CRU to increase by around 1% CAGR over the **medium-term** and reach 10.8 million tonnes by the end of the decade

## India phosphate rock demand metrics

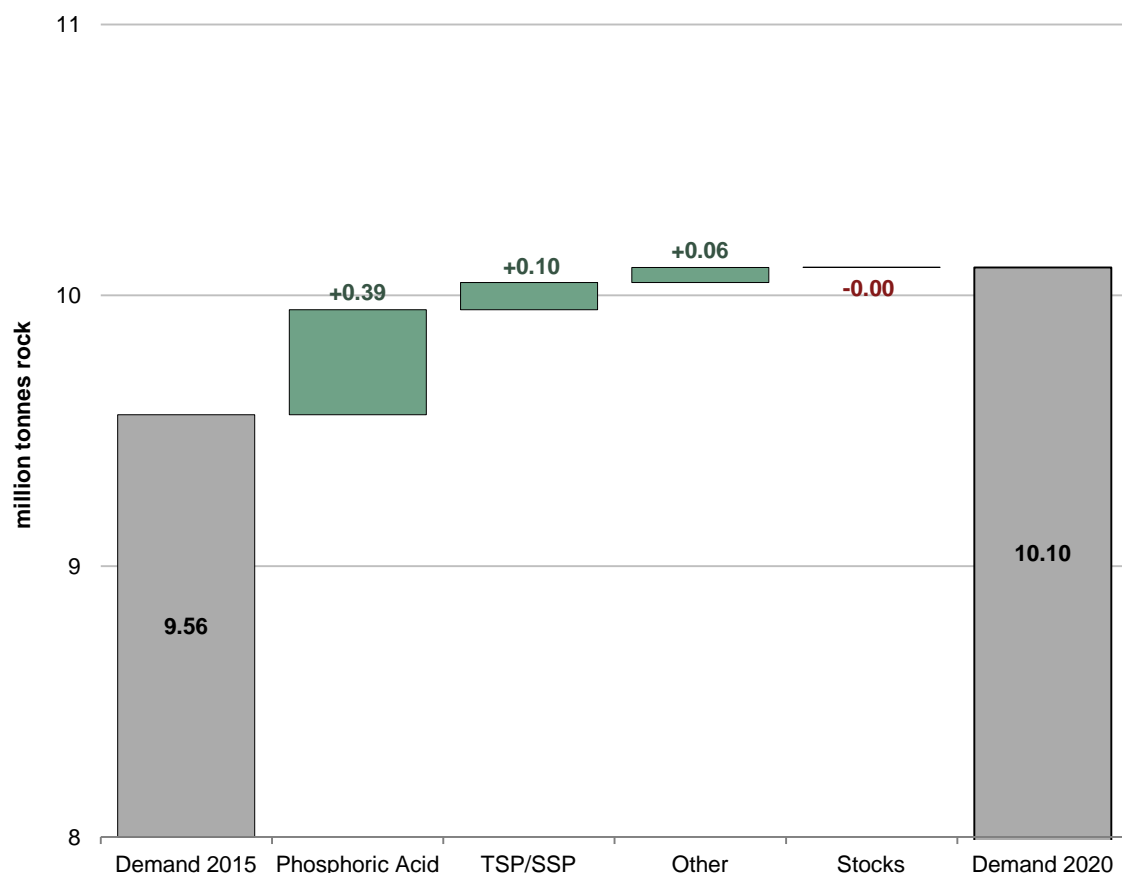
### Overview/short-term outlook:

In South Asia, rock demand is estimated to have declined by 1% y/y to around 10.3 million tonnes, particularly owing to the 2% y/y decline in demand in India at 9.6 million tonnes, though there was a y/y increase of 54% in rock demand in Pakistan over the same period at nearly 0.6 million tonnes. In the short-term we forecast regional demand to decline by a further 1% y/y to 10.1 million tonnes in 2016 across South Asia, mostly because of lower MGA prices that will favour the production of downstream phosphate fertilizers in India via the phosphoric acid import route.

### Impact of downstream markets on phosphate rock consumption:

<b>DAP</b>	Despite the 8% y/y increase in annual DAP production, reported by the <i>FAI</i> at nearly 3.6 million tonnes, the highest end-of-year stocks seen since 2012 are likely to subdue rock demand in 2016H1.
<b>NP/NPK</b>	Following the 12% y/y increase in annual complex fertilizer production in India, reported by the <i>FAI</i> at over 8.4 million tonnes, record-high end-of-year stocks of over 1.0 million tonnes will likely result in lower rock demand over 2016H1.
<b>SSP</b>	Annual production as reported by the <i>FAI</i> declined by 7% y/y down to below 3.9 million tonnes in India, indicating a lower annual demand from the sector for phosphate rock.

### India phosphate rock demand dynamics:



### South Asia phosphate rock demand forecast:

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
India	9.8	9.6	9.5	9.6	10.1	10.2	10.1	↑
Others	0.5	0.7	0.6	0.7	0.7	0.7	0.7	↓
<b>Total South Asia</b>	<b>10.4</b>	<b>10.3</b>	<b>10.1</b>	<b>10.2</b>	<b>10.8</b>	<b>10.9</b>	<b>10.8</b>	↑
year-on-year change	-	-1%	-1%	1%	5%	1%	-1%	

Data: CRU, FAI, GTIS, IFA, NFDC, company reports





# Chapter 2

## Supply

### 2.1 Overview of global phosphate rock supply

Global phosphate rock production in **2015** is estimated by CRU to have increased by 2% y/y to around 202.3 million tonnes – a third consecutive year of growth. Most of this increase resulted from the 9% growth in production in China over the same period, with smaller increases in the United States (US) and Russia balancing the declines across North Africa, South Africa and Latin America.

We forecast that in **2016** global rock production will increase by a further 1% y/y to total 204.7 million tonnes, though the dynamics for this growth are expected to change significantly.

Whereas the increase in global rock production in 2015 was primarily a consequence of growth in China, we expect consumption there to begin declining and continue on a similar trend over the medium-term. However, the recovery of rock production in areas troubled by civil unrest – predominantly the Middle East & North Africa – and the forecast increases in US rock utilization will more-than offset the decline in China.

In the **medium-term**, we forecast global rock production to increase by nearly 2% CAGR and reach 220.7 million tonnes. This growth will result from increased production across the Middle East & North Africa, where both rock mining and fertilizer processing projects should fuel a growth in respective regional demand and supply. We also forecast rock production to increase across Central & South America and the Commonwealth of Independent States (CIS), as new rock mining capacity is commissioned. This smaller growth in production should more than compensate expected declines across South Asia and Oceania. In India, declining rock grades and lack of capital investment will continue to inhibit the phosphate mining industry.

Table 2.1: Global phosphate rock supply forecast

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Operating	252.2	258.4	257.0	253.0	246.4	245.1	249.9	↓
Firm	0.0	0.0	0.8	4.8	10.0	10.0	10.1	
Probable	0.0	0.0	1.4	6.5	16.4	20.9	22.4	
Speculative	0.0	0.0	13.5	31.3	50.3	57.7	70.7	
<b>Base-case capacity</b>	<b>252.2</b>	<b>258.4</b>	<b>259.1</b>	<b>264.2</b>	<b>272.7</b>	<b>275.9</b>	<b>282.3</b>	↑
<b>Base-case production</b>	<b>197.7</b>	<b>202.3</b>	<b>204.7</b>	<b>210.2</b>	<b>213.8</b>	<b>215.9</b>	<b>220.7</b>	↑
<i>Operating rate</i>	<i>78%</i>	<i>78%</i>	<i>79%</i>	<i>80%</i>	<i>78%</i>	<i>78%</i>	<i>78%</i>	↓

**Data:** CRU, AFA, ANDA, ANP, ANSD, Azotecon, CFMW, CPIA, FAI, HCP, IFA, INEGI, SERNAGEOMIN, TFI, USGS, company reports

Rock production in **2015** in the **United States (US)** is estimated by CRU to have increased marginally y/y to over 27.2 million tonnes, slightly below the USGS annual estimate of 27.6 million tonnes. Most of this increase is understood to have been because of the near-4% y/y increase in output from Mosaic over the same period. Conversely, we understand that Simplot has produced less rock over the comparative period because of high magnesium content in its ore, earlier in the year, which was affecting the production of its SPA product.

In **2016** we forecast that annual rock production in the **US** will increase 3% y/y to around 28.2 million tonnes, in line with the expected increase in downstream plant utilization rates and the forecast 3% y/y increase in phosphoric acid production across North America spurs rock demand.

Over the **medium-term** CRU forecasts annual rock output to increase by over 1% CAGR up until the end of the decade, reaching around 29.1 million tonnes. There will continue to be no production in Canada according to our base case forecast following the downgrading of the Mine Arnaud project to speculative. Annual rock production volumes in North America last reached 29 million tonnes in 2012-2013, when annual capacity was 4.5 million tonnes above what we are forecasting in 2020, reflecting our belief that capacity will be operated at high utilisation rates during the forecast period.

Rock production across **Africa** in 2015 is estimated to have declined by 9% y/y to below 38.6 million tonnes with losses noted everywhere on a country-level, with the exception of Senegal.

In **North Africa**, rock production was negatively affected by a combination of factors – a downstream product switch resulting in lower captive consumption at OCP in **Morocco**, financial constraints for El-Nasr in **Egypt** and civil unrest in **Tunisia** – the net result was a 9% y/y decline in output to below 34.7 million tonnes. In **West Africa**, marginal y/y declines in production at SNPT in **Togo** were negligible compared to the raised output in **Senegal**, which increased regional production by 15% y/y to around 2.7 million tonnes. In **South Africa**, a combination of poor logistics, power shortages and strike action resulted in a loss of processing capabilities at Foskor, leading to a 40% y/y decline in rock production to around 1.1 million tonnes.

We forecast a 3% y/y recovery in production across all of **Africa** in **2016** to around 39.8 million tonnes – mostly driven by the commissioning and ramping up of rock mining capacity in West Africa, though we do also expect a recovery in production across both North and South Africa.

In the **medium-term**, we forecast rock production in **Africa** to increase by 6% CAGR and total 49.6 million tonnes in 2020, pushed by the 3% CAGR growth in North Africa over the same period.

Whilst we expect growth across most countries – with the exception of low-grade export-oriented **Egypt** and **Algeria** – the largest growth of 9% CAGR over this period is expected to be in **Tunisia**. We expect a recovery in rock production in Tunisia to 5.1 million tonnes by 2020.

Annual rock production in **2015** across the **Middle East** is estimated to have fallen marginally y/y to around 15.1 million. Increased output from MPC and ICL in **Saudi Arabia** and **Israel**, was offset by declines in **Syria** and **Jordan** – the former exacerbated by civil war and the latter by de-bottlenecking work at JPMC subsidiary JFIC – Aqaba, which restricted captive demand for rock.

In **2016** we expect regional rock production to increase by over 8% y/y to around 16.3 million tonnes, driven because of the increased captive rock demand in **Jordan** and further increases in downstream consumption in **Saudi Arabia**.

In the **medium-term**, we forecast a 9% CAGR growth in rock production across the Middle East, which we forecast to total 21.7 million tonnes by 2020. We expect a steady ramp-up in production from **Jordan** as JPMC increases its supply to joint-venture downstream projects in Indonesia, but it will be the commissioning of new upstream and downstream capacity in Saudi Arabia that will contribute most to the regional increase in output.

Record-high annual exports of ammoniated phosphates from **China** in **2015**, estimated by CRU to have totalled a combined 4.5 million P<sub>2</sub>O<sub>5</sub> tonnes, drove domestic rock demand and resulted in a 9% y/y increase in annual rock production at around 86.9 million tonnes.

We do not forecast such high downstream production in **2016** and therefore we estimate that rock production will decline by around 3% y/y to about 84.4 million tonnes, in accordance with lower domestic demand. This decline has been further fuelled by the delayed commissioning of projects, from the short-term, into the medium-term.

The depressed domestic rock market and the subsequent delays in the commissioning of rock projects included in our base-case forecast, results in the maintenance of high utilization rates, with an estimated 1% CAGR decline in annual production volumes across China in the **medium-term**, which we expect to fall to below 83.0 million tonnes by 2020.

The recovery of SSP demand in **Brazil** through 2015Q4 and consistent rock output from **Peru** and **Mexico** helped raise quarterly production but was not enough to prevent an estimated 7% y/y decline in annual rock production throughout Central & South America for 2015 at 11.1 million tonnes.

In **2016** we forecast annual rock production to increase by nearly 8% y/y to reach 12.0 million tonnes – mostly driven by an expected return in downstream demand for rock in **Brazil**, in addition to forecast y/y increases in production in both **Peru** and **Mexico**.

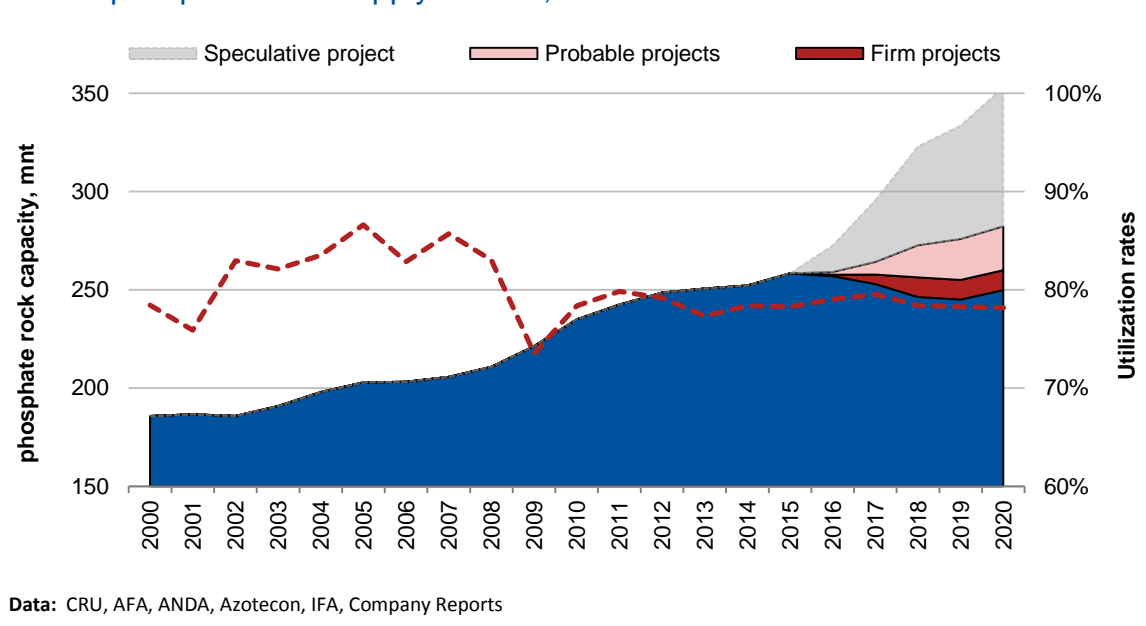
In the **medium-term**, rock production in Central & South America is forecast to increase by over 3% CAGR to 12.9 million tonnes by the end of the decade, spurred by the commissioning of the Yara-Galvani – Serra do Salitre project in late-2017 and its ramp-up. This will result in the share of regional rock production from **Brazil**, which accounted for around 48% in 2015, to increase to around 53% over the same period. Likewise, we also forecast an increase in rock production at Rofomex in **Mexico** to around 2.0 million tonnes by 2017 and flat thereafter. With no current base-case capacity expansions in **Peru**, we expect production to remain flat at around 4.0 million tonnes throughout the rest of the forecast period.

Rock production in **Russia** in **2015** increased by an estimated 16% y/y to around 12.4 million tonnes. However, its share of rock production in the **CIS** region of around 84% only increased marginally over the same period, as production in both **Kazakhstan** and **Uzbekistan** is also estimated to have increased by 3% and 14% at a total of 1.5 million tonnes and 690,000 tonnes respectively.

In **2016**, we forecast production in the **CIS** will increase a further 3% y/y and total 15.2 million tonnes; as PhosAgro ramps up production at the underground section of its Kirovsky mine in **Russia** and EuroChem ramps up production at its Taraz mine in **Kazakhstan**. The second of these will have the greatest impact on regional production, raising Kazakhstan rock production by 39% y/y to an estimated 2.1 million tonnes.

In the **medium-term**, we forecast rock production in the **CIS** to increase by 2% CAGR and to total 16.1 million tonnes by the end of the decade. Whilst **Acron** has planned expansions included in our base-case forecast, rock production in Russia is expected to decline by 1% CAGR to below 11.9 million tonnes over the same period. It is **Kazakhstan**, with the ramping up of production at Kazphosphate and the commissioning of more capacity at EuroChem, which is expected to raise domestic production by 27% CAGR over the next five years up to 3.6 million tonnes by 2020.








## Global phosphate rock supply outlook, 2000-2020



Since the *Phosphate Rock Market Outlook November 2015 Edition*, there have been a series of changes in regards to the outlook for phosphate rock projects; most of them concerning the downgrading projects formerly categorized as *probable*. The noteworthy changes in regards to *firm* projects are as follows:

1. The commissioning of **PhosAgro's** 600,000 tonnes/year underground expansion at its **Apatit** mine in Murmansk Oblast, Russia;
2. In **China**, we understand that the **Yihua – Jiangjiadun** project will likely be commissioned later than originally planned, previously set for 2016, because of a slowdown in investment;
3. The **Avenira – Baobab** project in **Senegal** appears to be developing swiftly and is still due to be commissioned in 2016H2. As a result, it has been upgraded from *probable* to *firm*.

Table 2.2: Firm additions to rock mining capacity, million tonnes/year












Project	Country	Company	Capacity <sup>a</sup>	Start-up <sup>a</sup>
Wawu Section IV		Xingfa	2.0	2016
Baobab		Avernira	0.5	2016
Jiangjiadun		Yihua	1.5	2017
Oleniy Ruchey, phase II		Acron	0.6	2017
Al-Khabra		MWSPC <sup>b</sup>	5.0	2017
Taraz (Araltobe)		EuroChem	0.4	2018
Oleniy Ruchey, phase III		Acron	0.3	2020
<b>Total firm additions</b>			<b>10.3</b>	

**Data:** CRU, AFA, ANDA, Azotecon, CFMW, company reports; **Notes:** (a) capacity refers to the full capacity added by the mentioned projects and start-up refers to the year of commissioning; (b) refers to the Ma'aden Wa'ad Al-Shamal Phosphate Co. project and its rock mine.

There has been much more change in the outlook for *probable* projects in the medium-term, most notably the downgrading of four projects to *speculative*:

1. After our site visit to **Agrium** in November 2015, CRU has a better understanding of the mining areas that serve the **Conda** beneficiation plant and the company's medium-to-long-term plans in the phosphate industry. Since mining commenced at the **Lanes Creek** deposit, the plan to seek permissions for the **Rasmussen Valley** mine, originally planned for commissioning in 2016, has slowed significantly. Consequently, we have downgraded the project to *speculative*.
2. Following the announcement of **Anglo American's** intended sale of its phosphates and niobium assets, both the rock and downstream projects at **Ouvidor**, have been downgraded to *speculative*.
3. The current and forecast depression of iron ore prices has resulted in the downgrading and pushing back of the **Dadi Yuantong – Hebei** project in **China** to *speculative* in 2020. Originally planned for commissioning in 2017, the planned magnetite mine that would beneficiate phosphate concentrate as a by-product, is unlikely to progress with any development in the short-term and may even seek to expand its currently very small concentrate by-product operations rather than create a new mine.
4. In its 2015Q3 results presentation **Yara** announced that it would be reducing its investment interests in the **Mine Arnaud** project in **Canada**. Consequently, we have downgraded the project to *speculative*.

Table 2.3: Probable additions to rock mining capacity, million tonnes/year

Project	Country	Company	Capacity <sup>a</sup>	Start-up <sup>a</sup>
Dianziping		Xingfa	1.2	2016
Yuhua		Kingenta	2.0	2017
Hinda		Cominco Resources	4.1	2017
West Coast Cape		Elandsfontein	1.3	2017
Sukulu		Government of Uganda	1.0	2017
Yangshui Mining Section <sup>b</sup>		Kailin	2.0	2017
South Pasture Extension <sup>c</sup>		Mosaic	1.6	2018
Ouled Fares		OCP	6.0	2018
Serra do Salitre		Yara-Galvani	1.2	2018
Kahualuo		Yihua	1.0	2018
Extension Centrale Zone		OCP	6.0	2020
<b>Total probable additions</b>			<b>27.4</b>	

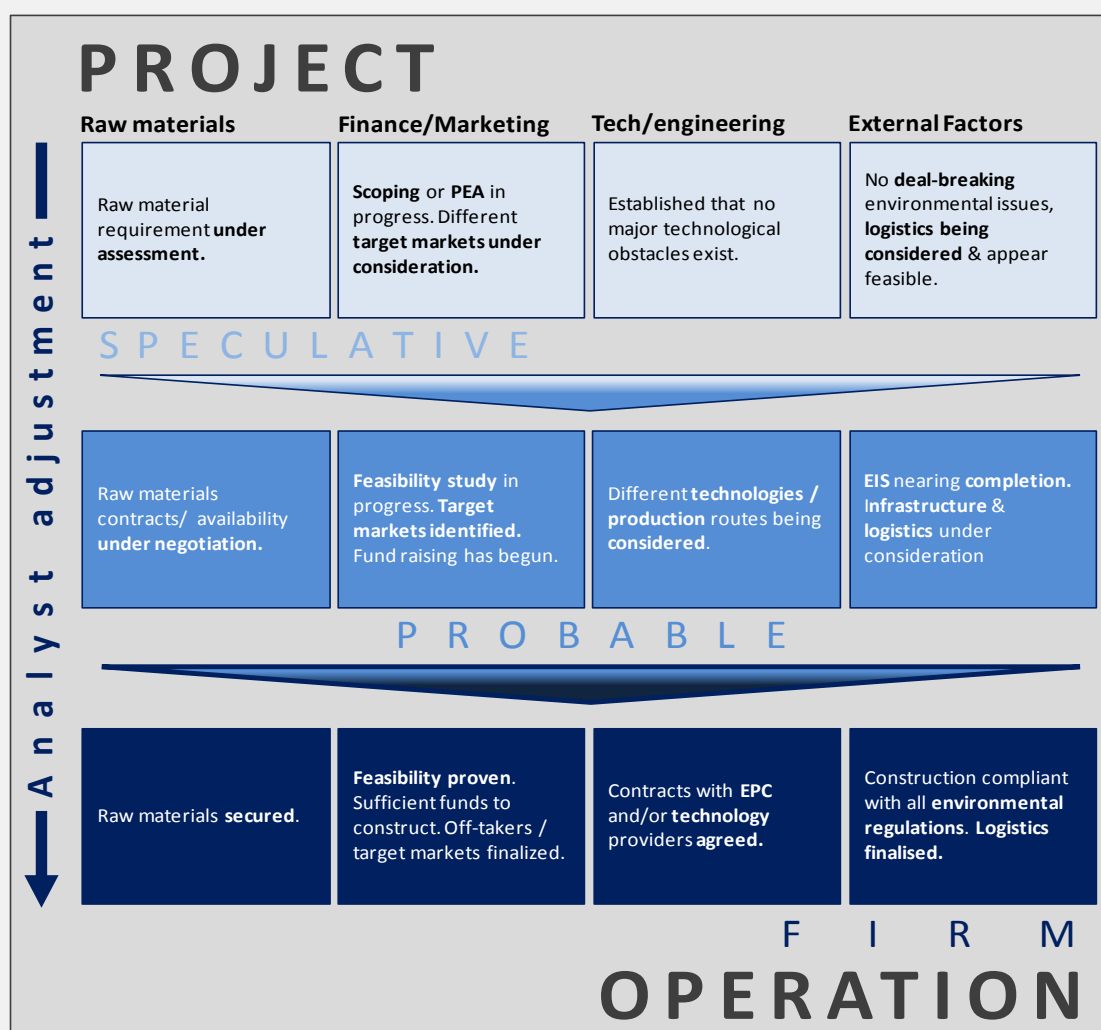
**Data:** CRU, AFA, ANDA, Azotecon, CFMW, company reports; **Notes:** (a) capacity refers to the full capacity added by the mentioned projects and start-up refers to the year of commissioning; (b) the Yangshui Mining Section project is a series of expansions over the forecast period that will total 2.0 million tonnes; (c) the South Pasture Extension is replacement capacity and therefore will not result in a net growth of capacity.

## 2.2 Overview of regional phosphate rock supply

### CRU's Project Gateway System

CRU classifies potential capacity additions according to the **Project Gateway System (PGS)**, which forms the basis of our capacity forecast. The PGS uses criteria across four categories (geology & feedstock, finance & marketing, technology & engineering and external factors) to assign each project a status in one of the following categories; firm, probable or speculative.

**Firm projects** are included in our base-case scenario, as they are close to either completion or solid in their set-up and not prone to possible shocks in their development. Committed capacity does not need to be scheduled for commissioning within the five-year forecast period. **Probable projects** represent advanced projects which are still missing some of the necessary features, but which are actively progressing towards their objective and are still included in our base case scenarios. **Speculative projects** are either projects at the early stages of development, or projects for which information is either not available or it is contradictory.





With the aim of classifying projects according to the above categories, CRU's PGS scores each project according to four categories:

- Whether the project has received official approval from the Board of Directors of the company;
- Whether the raw materials and feedstock required for the production inputs are available;
- Finance and marketing covering the status of capital raising and agreements for the injection of production into the market, as well as feasibility studies and sustainability simulations;
- Technology and engineering required for the design and construction of the project;
- External factors which include the status of compulsory permits (e.g. Environmental Impact Assessments), logistics (development of infrastructures, or access to existing ones), and social impact (stakeholder engagement, public perception of the project).

Note that the role of the analyst has not been reduced to the mere application of this methodology. Additional factors will play a focal role when providing the overall judgment for each project, including, among others:

- Type of project (greenfield vs. brownfield);
- Position of the company in the industry (junior, major, or state-owned enterprise);
- Past success history of the company and historical records of comparable projects;
- Economic support of the project's scope from CRU's forecasts;
- Availability of publicly available information and media news about the project.

Some general precautions need to be taken when evaluating information. For example, major companies generally release less project information into the public domain than junior companies, which are trying to raise external financing, while state-owned enterprises release even less. Less-strict criteria on demonstrating availability of necessary financing is applied to major companies. They are expected to fund projects primarily through free cash flow, particularly in the case of brownfield expansions.

Whenever possible, indirect sources (such as articles in industry media) have been cross-checked and assessed, capitalizing on CRU's experience and direct contacts in the industry. All of the categorizations are made to the best of CRU's knowledge and are regularly updated.

## 2.2.1 North America

## North America phosphate rock supply metrics

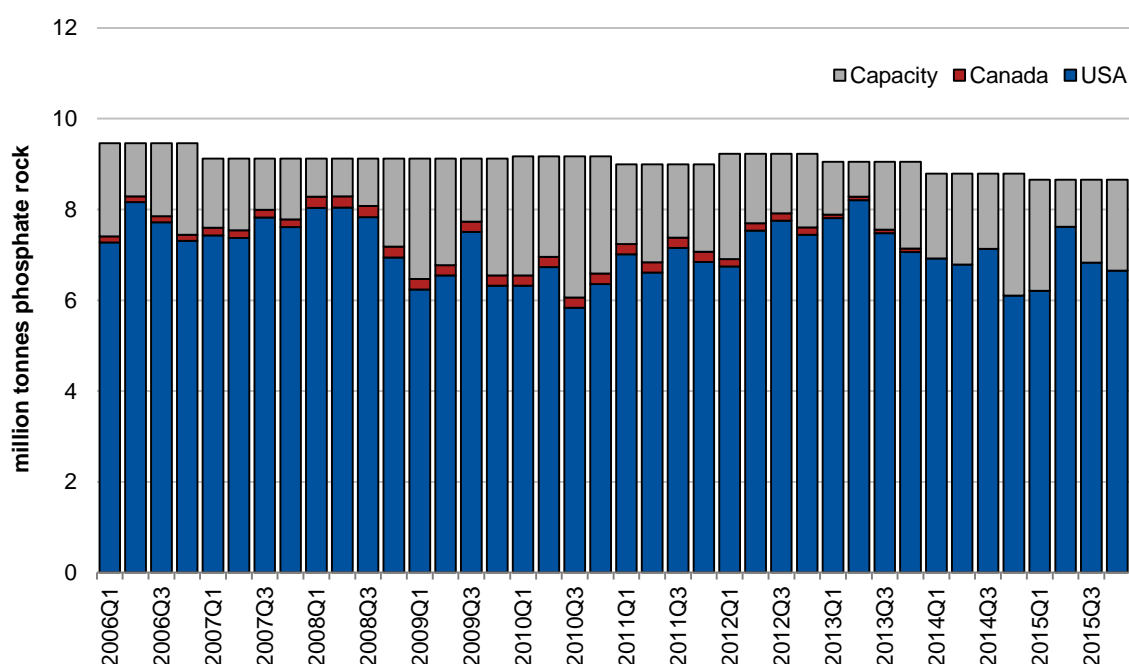
## Overview/short-term outlook:

Annual rock production in the **United States** in 2015 is estimated by CRU to have increased marginally y/y to over 27.2 million tonnes, slightly below the USGS annual estimate of 27.6 million tonnes. Most of this increase is understood to have resulted from the near 4% y/y increase in output from **Mosaic** over the same period. Conversely, **Simplot** is thought to have had a y/y decline in concentrate production because of high magnesium content in its ore. In 2016 we expect that annual rock production will increase 3% y/y to around 28.2 million tonne, in line with the expected increase in downstream plant utilization rates following a forecast increase of 3% y/y in phosphoric acid production in North America.

## Company tracker:

<b>Mosaic</b>	Rock production in 2015 increased by nearly 4% y/y at a reported 14.5 million tonnes for the year, with y/y increases at each of its four active mines.
<b>PotashCorp</b>	Reported rock production of 6.9 million tonnes in 2015 reflected a 9% y/y increase.
<b>Monsanto</b>	CRU estimates cumulative rock production in the first-nine-months of 2015 to have declined by 4% y/y at around 900,000 tonnes.
<b>Agrium</b>	Rock production in 2015 at Conda is estimated to have totalled 2.1 million tonnes.

## North America quarterly phosphate rock production/capacity:



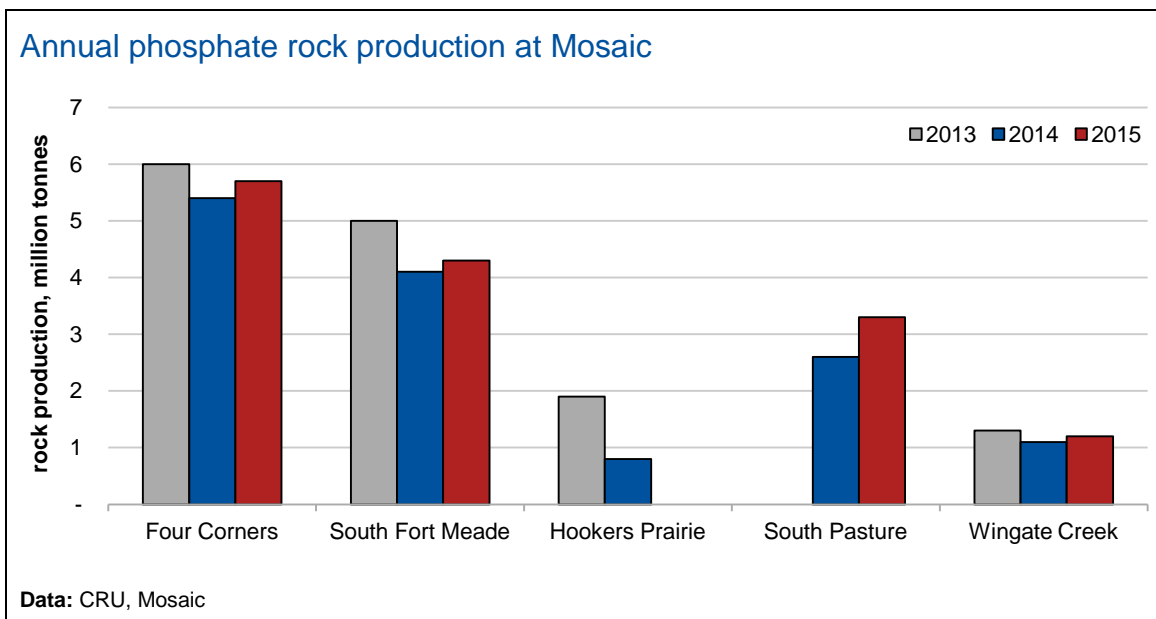
## North America phosphate rock medium-term supply outlook:

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Operating	35.2	34.6	34.6	34.6	32.0	30.7	30.7	↓
Firm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Probable	0.0	0.0	0.0	0.0	1.6	1.6	1.6	
Speculative	0.0	0.0	0.0	0.3	4.7	5.4	5.4	
<b>Base-case capacity</b>	<b>35.2</b>	<b>34.6</b>	<b>34.6</b>	<b>34.6</b>	<b>33.6</b>	<b>32.3</b>	<b>32.3</b>	↓
<b>Base-case production</b>	<b>26.9</b>	<b>27.2</b>	<b>28.2</b>	<b>28.5</b>	<b>28.5</b>	<b>28.2</b>	<b>29.1</b>	↑
<i>Operating rate</i>	77%	79%	81%	82%	85%	87%	90%	↑

**Data:** CRU, GTIS, IFA, TFI, USGS, company reports; **Note:** operating and probable supply forecast estimates also capture the changes at the **Mosaic – South Pasture** mine in Hardee County, where the extension will replace capacity lost at the active mine.

Annual phosphate rock production in the **United States (US)** in 2015 is estimated by CRU to have increased by 1% y/y to around 27.2 million tonnes. This increase occurred despite the closure of **Mosaic – Hookers Prairie**.

We understand that most of this change in annual rock production resulted from the near 4% y/y increase in **Mosaic's** output over the same period, which was reported at 14.5 million tonnes. This occurred across all of its four operating mines, with the largest increase of 27% noted at **South Pasture**.



**PotashCorp** also reported a y/y increase in rock production over 2015 of 9% at an annual total of 6.9 million tonnes. Company-wide utilization rates were around 72% over the year and mine-level production only increased at Aurora, by 16% y/y at a total of 5.0 million tonnes, whereas it declined by 5% y/y down to 1.9 million tonnes.

Cumulative rock production at **Monsanto – Blackfoot Bridge** for the first nine months of 2015 is estimated to have declined by 4% y/y to around 900,000 tonnes. Considering the annual capacity of 1.25 million tonnes, this represented a high utilization rate.

In the **short-term**, considering the forecast 3% y/y increase in US phosphoric acid production in 2016, rock utilization rates are expected to increase for a second consecutive year to reach 28.2 million tonnes.

Over the **medium-term** CRU forecasts annual regional rock output to increase by over 1% CAGR up until the end of the decade, whereby it will total around 29.1 million tonnes. There will continue to be no production in **Canada** following the downgrading of the **Mine Arnaud** project to *speculative*. Annual rock production in North America last reached 29.0 million tonnes in 2012-2013 when annual capacity was 4.5 million tonnes above our forecasted volume for 2020, reflecting our expectations for high operating rates in the US.

## 2.2.2 Africa

## Africa phosphate rock supply metrics

## Overview/short-term outlook:

Annual rock production in 2015 is estimated to have declined by 9% y/y in **Africa** to below 38.6 million tonnes, with losses noted everywhere on a country-level, with the exception of **Senegal**. In North Africa, rock production was negatively affected by a combination of factors – a downstream product switch resulting in lower captive consumption at OCP in Morocco, financial constraints El-Nasr in Egypt and civil unrest in Tunisia – that, combined, resulted in a 9% y/y decline in output to below 34.7 million tonnes. Elsewhere, in Western Africa, marginal y/y declines in production at SNPT in Togo were negligible compared to the raised output in Senegal, which increased West African production by 15% y/y to around 2.7 million tonnes. In South Africa, a combination of poor logistics, power shortages and strike action, resulted in a loss of demand that resulted in a 40% y/y decline in rock production at Foskor to around 1.1 million tonnes. We forecast a 3% y/y recovery in production across all of Africa in 2016 to around 39.8 million tonnes – mostly driven by the commissioning and ramping up of capacity in West Africa.

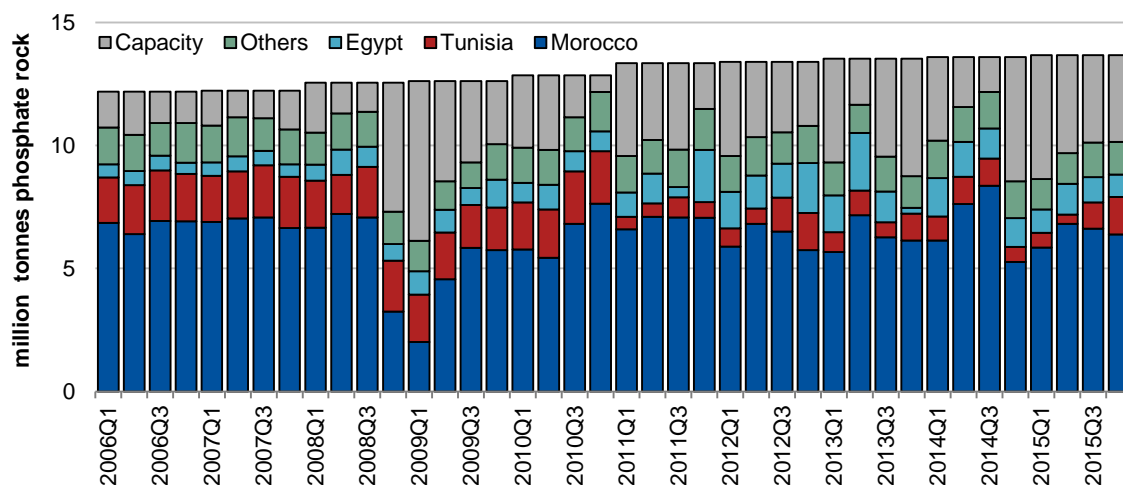
## Company tracker:

**OCP** Annual rock production is estimated to have declined by 6% y/y to 25.7 million tonnes in 2015, as lower captive downstream demand was triggered by a product switch to NPK and NP+K, which have lower P<sub>2</sub>O<sub>5</sub> requirements.

**CPG** Rock production in the first nine months of 2015 were reported by *INS* to have totalled just over 2.0 million tonnes. This 33% y/y decline resulted from the paralysis of production over 2015Q2 where only 102,100 tonnes of output was noted over April-May.

**ICS** The successful refurbishment of its **Darou** phosphoric acid plant has resulted in the de-bottlenecking of rock production, which reached its highest level since 2012Q2 at 366,000 tonnes. Annual rock production in 2015 reflected a near 32% y/y increase.

## Africa quarterly phosphate rock production/capacity:



## Africa phosphate rock medium-term supply outlook:

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Operating	54.7	61.9	61.9	60.9	60.9	60.9	65.7	↑
Firm	0.0	0.0	0.3	0.5	0.5	0.5	0.5	
Probable	0.0	0.0	0.0	2.8	7.9	12.4	13.9	
Speculative	0.0	0.0	3.7	13.3	17.4	19.2	26.7	
<b>Base-case capacity</b>	<b>54.7</b>	<b>61.9</b>	<b>62.1</b>	<b>64.1</b>	<b>69.2</b>	<b>73.7</b>	<b>80.0</b>	↑
<b>Base-case production</b>	<b>42.4</b>	<b>38.6</b>	<b>39.8</b>	<b>44.9</b>	<b>45.8</b>	<b>47.6</b>	<b>49.6</b>	↑
<b>Operating rate</b>	<b>78%</b>	<b>62%</b>	<b>64%</b>	<b>70%</b>	<b>66%</b>	<b>65%</b>	<b>62%</b>	↓

Data: CRU, AFA, ANP, ANSD, GTIS, HCP, IFA, INS, ONS, company reports

Annual rock production in **North Africa** in 2015 is estimated by CRU to have fallen by around 9% y/y down to 34.7 million tonnes. This decline is understood to have materialized across all producing countries in the region. Whilst in Morocco it was due to a lower captive downstream requirement resulting from a change in product mix, in **Egypt** and **Algeria** it was mostly because of the higher level of competition on the export market for lower-grade rock.

Furthermore, in the case of Egypt, the fall in production was also because of financial difficulties at the largest phosphate miner, El-Nasr. In Tunisia, the y/y decline in rock output was because of a continuation of strike action from employees, both down- and up-stream, in addition to logistics.

In 2015 the contribution of rock output from **Morocco** to the North Africa region increased by four-percentile-points to 74% at an estimated 25.7 million tonnes. This occurred despite annual rock production at OCP falling by an estimated 6% over the same period. This drop in output, resulted from the combined decline in MAP/DAP production and tightness of the rock export market that saw a marginal y/y decline in traded volumes over the same period.

We expect annual rock production in **Morocco** to recover marginally 2016 to around 25.8 million tonnes in response to an estimated 8% y/y increase in captive demand at OCP to around 18.6 million tonnes over the same period; exports of rock will decline as captive consumption increases. The ramping up of OCP's JPH-I project, which was commissioned in November 2015, and the commissioning of its JPH-II-IV hubs later this year, are expected to be the main driver for this increase in captive rock demand.

In the medium-term, the commissioning of its Ouled Fares and then Extension Centrale Zone projects in 2018 and 2020 respectively, which will supply its first (JPH-I-IV) and second (JPH-V-VII) wave of Jorf Hubs, are forecast to raise rock production by nearly 4% CAGR by the end of the decade, at which point annual production will exceed 30.4 million tonnes.

The largest y/y decline in annual rock production in percentile-terms in 2015 was in Egypt, estimated by CRU to have declined 23% to around 4.1 million tonnes. This mostly resulted from changes of mine-operation and ownership. The most significant change impacted the formerly **El Nasr** – El Sebaiya mine with an estimated annual capacity of 1.5 million tonnes – which is now being operated by **Misr Phosphate**.

In the short-term, we expect that rock production in Egypt will not recover until **El-Nasr** is able to address and invest to overcome the problems facing these mining assets. Indeed, we expect annual production volumes to decline by around 6% y/y to 3.9 million tonnes towards the end of the forecast period, as export-oriented mines from competitors are commissioned.

In Tunisia, rock production at **Compagnie des Phosphates de Gafsa (CPG)** in the first nine months of 2015 was reported by INS to have totalled just over 2.0 million tonnes. This 33% y/y

decline in rock production resulted from the paralysis in output over 2015Q2 when there was only 102,100 tonnes of production over the April-May period. However, this loss was mostly recouped by subsequent consecutive monthly production of over 350,000 tonnes, the highest seen since May 2014 and consequently, we estimate annual rock production to have only declined by around 6% y/y to around 3.5 million tonnes.

In 2016 we expect production in **Tunisia** to remain flat around 3.5 million tonnes for two reasons; (i) CPG has now re-built available stocks to around 0.5 million tonnes after they fell to just 24,000 tonnes over 2015Q2, and (ii) the socio-economic issues that have resulted in crippling strikes over the last few years are yet to be resolved. Over the medium-term, we do expect annual rock production to recover at a rate of nearly 9% CAGR in the next five years, by the end of which we forecast rock output to exceed 5.1 million tonnes – the highest volumes since the 8.1 million tonnes at the end of last decade.

Likewise in **Algeria**, we understand that increased competition on the international lower-grade rock market resulted in a decline in annual production at Somiphos, which we estimate to have declined by 8% y/y to over 1.3 million tonnes. With the traded market expected to increase in 2016 we expect annual rock production in Algeria to increase by 16% y/y to around 1.5 million tonnes and remain flat thereafter for the remainder of the medium-term forecast.

In **Western Africa**, we estimate annual rock production in 2015 to have increased by 15% y/y overall to over 2.7 million tonnes. This increase was because of the estimated 40% y/y increase in annual output from **Senegal** to over 1.8 million tonnes, which offset the marginal y/y decline over the same period in **Togo**, where Société Nouvelle des Phosphates du Togo (SNPT) produced around 900,000 tonnes.

In Senegal, production at **Industries Chimiques du Sénégal (ICS)** increased by nearly 32% to over 1.0 million tonnes in 2015, reflecting the first y/y output increment in five years, but its share of domestic production fell from 60% to 57% over the two years. This was because of an estimated 40% increase in export-oriented production over the same period, driven in particular by **Grupa Azoty subsidiary AIG – Lam Lam**, which we estimate to have raised its output (directed to Poland) by 11% to over 300,000 tonnes. With the expected commissioning of Avenir – Baobab in 2016Q3 and considering the successful de-bottlenecking of production at ICS – Darou, we now expect annual output in Senegal in 2016 to increase by 18% y/y to over 2.0 million tonnes. Furthermore, we expect annual rock production at SNPT in Togo to increase by 19% y/y in 2016 to reach 1.1 million tonnes.

Over the medium-term, CRU forecasts annual rock production in Senegal to increase by over 8% CAGR to reach 2.6 million tonnes by the end of the forecast period, as **ICS** continues to expand output and as export-oriented producers continue to ramp up production. This could potentially eat into **SNPT** markets, though we expect that growing global demand for rock will

offset some of this and that production in **Togo** will be maintained at around 1.0 million tonnes over the forecast period.

Elsewhere, in **South Africa** we estimate annual rock production at Foskor to have declined in 2015 by 44% y/y to around 1.1 million tonnes as the company was severely curtailed by a combination of factors. These included disrupted logistics, power-cuts and strikes – most notably a three-four week strike of 400 employees at its Richards Bay phosphoric acid plant, reducing utilization rates to 10% over the period. Consequently, we estimate phosphoric acid production in 2015 to have declined by 60% y/y and consequently this reduced captive rock demand and production. Foskor offset some of this by doubling its rock exports, but this was clearly not enough to offset domestic losses.

Although we expect rock production in 2016 to increase by 39% y/y to over 1.5 million tonnes, it is over the medium-term that we see production return to normality following a 5% CAGR increase in rock production over the next five years up to 2.5 million tonnes.

## 2.2.3 Middle East

## Middle East phosphate rock supply metrics

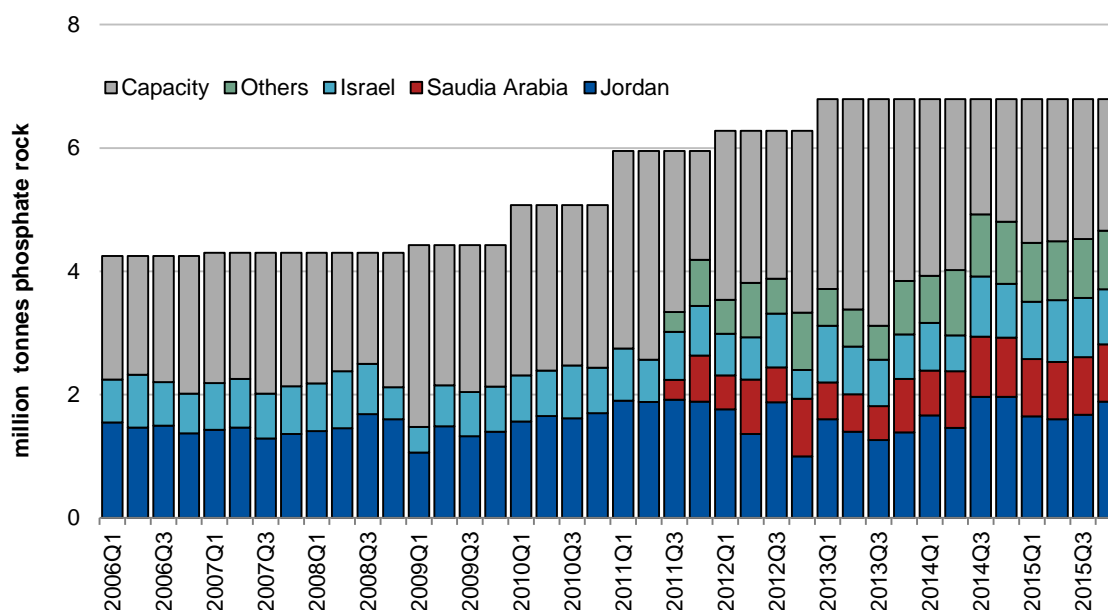
## Overview/short-term outlook:

Annual rock production in the Middle East in 2015 is estimate to have fallen marginally y/y to around 15.1 million tonnes. Increased output from MPC in Saudi Arabia and ICL in Israel, was offset by declines in Syria and Jordan – the former exacerbated by civil war and the latter by de-bottlenecking work at JPMC's subsidiary JFIC – Aqaba, which restricted captive demand. In 2016 we expect regional rock production to increase by over 8% y/y to around 16.3 million tonnes, driven mostly by the increased captive rock demand in Jordan and further increases in downstream consumption in Saudi Arabia.

## Company tracker:

<b>JPMC</b>	We estimate annual rock production in 2015 to have declined by 5% y/y to around 6.8 million tonnes as captive consumption was restricted by de-bottlenecking work at JFIC – Aqaba.
<b>MPC</b>	Spurred by increased DAP production for export, we estimate annual rock production in 2015 to have increased by 4% y/y to over 3.7 million tonnes.
<b>ICL</b>	The company reported annual rock production at over 4.4 million tonnes in 2015, reflecting a 32% y/y increase in output, though as of 2015Q4 reporting, this does include its share of production at <b>YPC – Haikou</b> .
<b>Gecopham</b>	As we previously forecast, a sharp decline in 2015Q4 export data reported by <i>GTIS</i> indicates that stocks have depleted.

## Middle East quarterly phosphate rock production/capacity:



## Middle East phosphate rock medium-term supply outlook:

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Operating	27.2	27.2	28.2	28.2	27.2	27.2	27.2	↔
Firm	0.0	0.0	0.0	1.3	5.0	5.0	5.0	
Probable	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Speculative	0.0	0.0	1.9	1.9	1.9	1.9	1.9	
<b>Base-case capacity</b>	<b>27.2</b>	<b>27.2</b>	<b>28.2</b>	<b>29.4</b>	<b>32.2</b>	<b>32.2</b>	<b>32.2</b>	↑
<b>Base-case production</b>	<b>15.2</b>	<b>15.1</b>	<b>16.3</b>	<b>17.3</b>	<b>19.7</b>	<b>20.9</b>	<b>21.7</b>	↑
<i>Operating rate</i>	<i>56%</i>	<i>56%</i>	<i>58%</i>	<i>59%</i>	<i>61%</i>	<i>65%</i>	<i>68%</i>	↑

Data: CRU, AFA, GTIS, IFA, JSA, LC, company reports



A restriction in phosphoric acid capacity in 2015, because of de-bottlenecking, has resulted in CRU estimating a 5% y/y decline in annual rock production at **Jordan Phosphate Mines Co. (JPMC)** to around 6.8 million tonnes. As a result, its share of regional rock production fell by an estimate two percentile points to 45% over the same period.

However, following the completion of this maintenance at JFIC – Aqaba and the ramping up of production at major buyers of its rock in Indonesia, we forecast rock production in **Jordan** to increase by around 23% y/y in 2016 to over 8.3 million tonnes. In the **medium-term**, we forecast a 5% CAGR growth in rock production at **JPMC**, to 8.5 million tonnes by the end of the decade.

In 2015, we estimate that the share of regional rock production from **Saudi Arabia** increased by two percentile points to 25% as captive demand at **Ma'aden Phosphate Co. (MPC)**, supported by the increase in DAP import demand in the Indian subcontinent, raised MPC's domestic production by 4% y/y to around 3.7 million tonnes.

Over the next year we expect rock production in **Saudi Arabia** to increase a further 3% y/y to around 3.8 million tonnes, though the commissioning of the **Wa'ad Al-Shamal Phosphate Co. JV (MWSPC)** projects in 2017Q4 are the main driver of our forecast 28% CAGR growth in domestic production over the **medium-term**. By the time the project is fully ramped-up and when downstream markets have adjusted to absorb the increased tonnage, we expect rock production to reach around 8.9 million tonnes.

The fire that eliminated SSP capacity at **Israel Chemicals Co. (ICL)** in June 2015 resulted in a strategic shift at the company. As a result, we understand that MGA and rock sales were prioritized, raising captive rock demand. Consequently, we estimate annual rock production in Israel to have increased by 17% y/y to over 3.7 million tonnes.

We forecast rock production in **Israel** to remain flat in 2016 at around 3.7 million tonnes, as **ICL** continues to raise exports. Likewise, over the **medium-term** we also expect relatively flat rock production, though as rock exports decline production is expected to be increasingly consumed for the captive production of MGA for export.

Elsewhere, we estimate that the sharp decline in rock exports from **Syria** over 2015Q4 indicates the exhaustion of stocks at the **General Co. for Phosphates and Mines (Gecopham)**. We estimate that annual rock production at Gecopham fell by 40% y/y to around 730,000 tonnes and that domestic production will decline by a further 80% y/y to around 140,000 tonnes over the short-term. In the **medium-term**, we expect production to reach a maximum of 0.5 million tonnes. It is worth considering that any positive changes in the civil war and the defeat of IS would result in the likely resumption of production at Gecopham, though reconstruction of infrastructure would also need addressing to raise production levels.

## 2.2.4 China

## China phosphate rock supply metrics

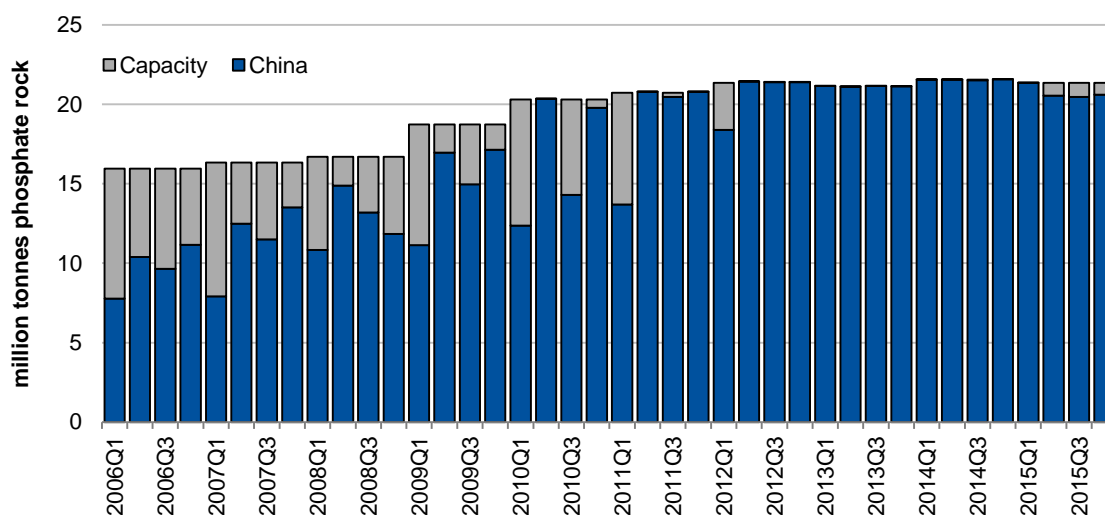
## Overview/short-term outlook:

Record-high annual exports of ammoniated phosphates from **China** in 2015, estimated by CRU to have totalled a combined 4.5 million P<sub>2</sub>O<sub>5</sub> tonnes, drove domestic rock demand higher and resulted in a 9% y/y increase in annual rock production at around 86.9 million tonnes. We do not forecast such high downstream production in 2016 and therefore estimate that rock production will decline by around 3% y/y to about 84.4 million tonnes, in accordance with lower domestic demand. This decline has been further fuelled by the delayed commissioning of projects, previously due for commissioning in the short-term, into the medium-term.

## Company tracker:

<b>YPC</b>	The YTH subsidiary mined a reported 14.5 million tonnes of ore in 2015, down by over 9% y/y compared with 2014. Over the same period, annual volume undergoing flotation increased by an estimated 74% at three of its largest plants – Kunyang, Anning and Haikou.
<b>Kailin</b>	As reflective of quarterly trends through the year, annual phosphate ore production, most of which is between 30-32% P <sub>2</sub> O <sub>5</sub> and doesn't require wet beneficiation, increased by an estimated 6% y/y to a record high of 7.8 million tonnes.
<b>Wengfu</b>	Annual ore production in 2015 fell by an estimated 6% y/y to a reported 6.1 million tonnes, whereas concentrate production increased by around 11% y/y at close to 4.5 million tonnes over the same period.
<b>Xingfa</b>	Whilst the company is yet to announce annual rock production figures, the targeted 5.0 million tonnes of ore production would represent a 31% y/y increase in output.

## China quarterly phosphate rock production/capacity:



## China phosphate rock medium-term supply outlook:

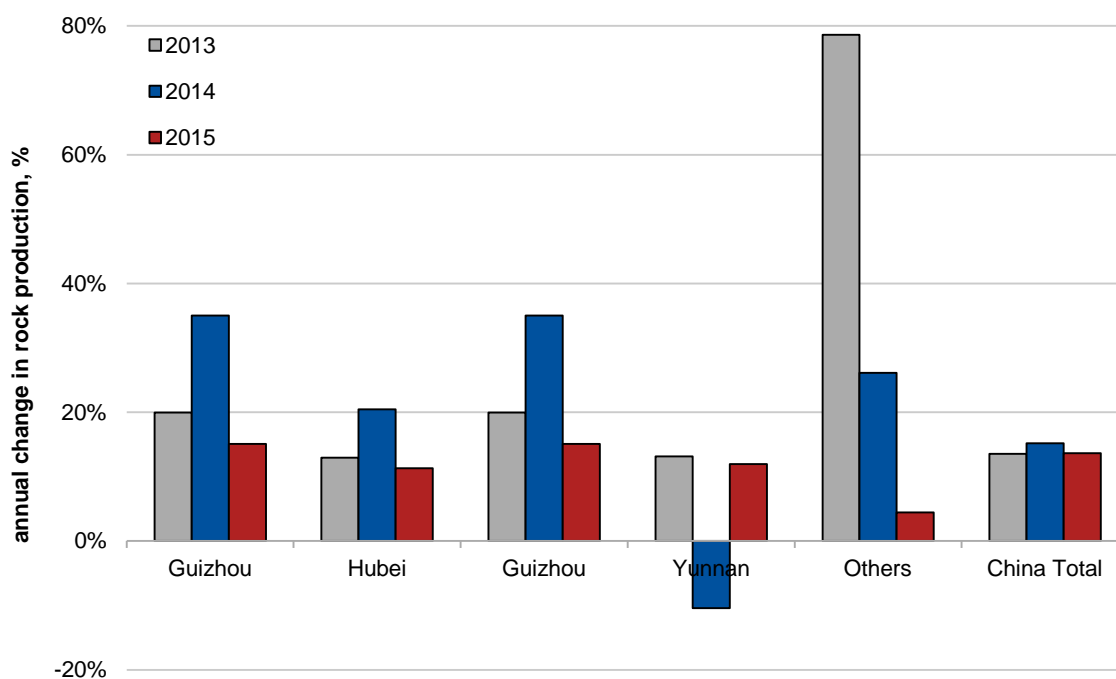
million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Operating	86.2	85.4	82.4	79.4	76.4	76.4	76.4	↓
Firm	0.0	0.0	0.5	2.8	3.5	3.5	3.5	
Probable	0.0	0.0	1.4	3.7	5.7	5.7	5.7	
Speculative	0.0	0.0	5.2	6.7	11.3	11.3	12.3	
<b>Base-case capacity</b>	<b>86.2</b>	<b>85.4</b>	<b>84.3</b>	<b>85.9</b>	<b>85.6</b>	<b>85.6</b>	<b>85.6</b>	↑
<b>Base-case production</b>	<b>80.0</b>	<b>86.9</b>	<b>84.4</b>	<b>83.5</b>	<b>82.8</b>	<b>82.4</b>	<b>82.6</b>	↓
<i>Operating rate</i>	<i>93%</i>	<i>102%</i>	<i>100%</i>	<i>97%</i>	<i>97%</i>	<i>96%</i>	<i>96%</i>	↓

Data: CRU, CPIA, CFMW, GTIS, IFA, company reports

The *NBS* reported that in 2015 annual rock production in **China** increased by 14% y/y to over 142.0 million tonnes though CRU does not believe this to be an accurate reflection of actual rock production. Rather we believe it is more reflective of phosphate ore production, though the y/y changes across the provinces are useful as estimates of regional variation in production. In the four-largest provinces by rock output, which continue to account for nearly 97% of domestic production, there was a combined 14% y/y increase in annual rock production through 2015 according to the *NBS*.

This *NBS* data suggest that in 2015 there were increments in annual rock production documented in all provinces, with the only notable decline being the 14% fall y/y in **Henan**, where most of the ore resource is below 28% P<sub>2</sub>O<sub>5</sub>. As a result of the depressed domestic rock prices last year, it is of no surprise that some mines will have closed or entered prolonged maintenance periods.

Annual phosphate rock production change by province in China



Data: CRU, NBS

Yuntianhua (YTH) subsidiary **Yunnan Phosphate Chemicals (YPC)** produced a reported 14.5 million tonnes of phosphate ore while over 8.0 million tonnes of ore underwent flotation in 2015. This reflects a 74% y/y increase in ore undergoing flotation, whilst overall ore decreased by 9%. Ore production fell as the company decided to reduce lower quality ore mining, with prices making it less profitable to do so. The company operates three beneficiation plants – Kunyang, An’ning and Haikou –, with the latter now split as an independent subsidiary. Plants were run at 94% average utilization rate in 2015.

**Kailin** reported record-high annual ore production in 2015 of 7.8 million tonnes, most of which is between 30-32%  $P_2O_5$  and is not beneficiated, reflecting a 6% y/y increase. The company also reported a 17% y/y increase in annual sales income for 2015 at a reported RMB36 billion.

More recently, in February 2016 it was announced by *CFMW* that a study completed by the *Guizhou Geology Prospecting Institute*, affiliate of the *China Chemical Geology & Mine Bureau*, had determined a high-grade (average of 33.83%  $P_2O_5$ ) phosphate rock reserve of 820.0 million tonnes in the eastern part of Kailin's **Yangshui Mine Section** in Kaiyang, **Guizhou** province. It is likely that Kailin will convert its exploration license to a mining license over the long-term. As the company is currently progressing with its low-CAPEX plans of expanding its current operation at this location, this does provide a long-term prospect, though CRU currently categorizes it as *speculative* in the base-case forecast.

Combined annual ore production at **Wengfu** in 2015 fell by nearly 6% y/y to a reported 6.1 million tonnes, whilst annual concentrate production increased by 11% y/y over the same period to close to 4.7 million tonnes. The fall in ore production was due to difficulties exploiting the lower quality Layer A at the company's biggest mine. Increases in concentrate shipments were maintained despite this fall as the company sold less un-processed rock to the market, and likely drew down on ore stocks. Over 2.0 million tonnes concentrate was consumed captively at the company's Zijin and Dazhou phosphoric acid plants. It also announced annual production targets for 2016 of 6.1 million tonnes of ore and 4.5 million tonnes of concentrate.

In the **short-term**, we expect annual rock production in **China** to fall by around 2% y/y to around 84.4 million tonnes in 2016 as the record-high production and export volumes of ammoniated phosphates seen in 2015 is unlikely to re-occur.

The depressed domestic rock market and the subsequent delays in the commissioning of rock projects included in our base-case forecast, results in the maintenance of high utilization rates, with an estimated 1% CAGR decline in annual production volumes across **China** in the **medium-term**. Three of the rock projects included in the base-case forecast were pushed back, from between six-to-eighteen months, whilst one has been removed altogether.

The **Dadi Yuantong – Hebei** project, which was previously expected to be commissioned in 2017 has now been downgraded to *speculative*. This is a result of the peculiar nature of the project, which is planned to produce around 1.0 million tonnes of phosphate concentrate as a by-product of the mining of magnetite ore. Since the iron ore markets have increasingly struggled over the last year, it is unlikely that the project will gain any financial backing over the next few years and the company may even scrap the project altogether, instead opting for an expansion of its currently very small co-production of phosphate concentrate from its current magnetite operations.

## 2.2.5 Central &amp; South America

## Central &amp; South America rock supply metrics

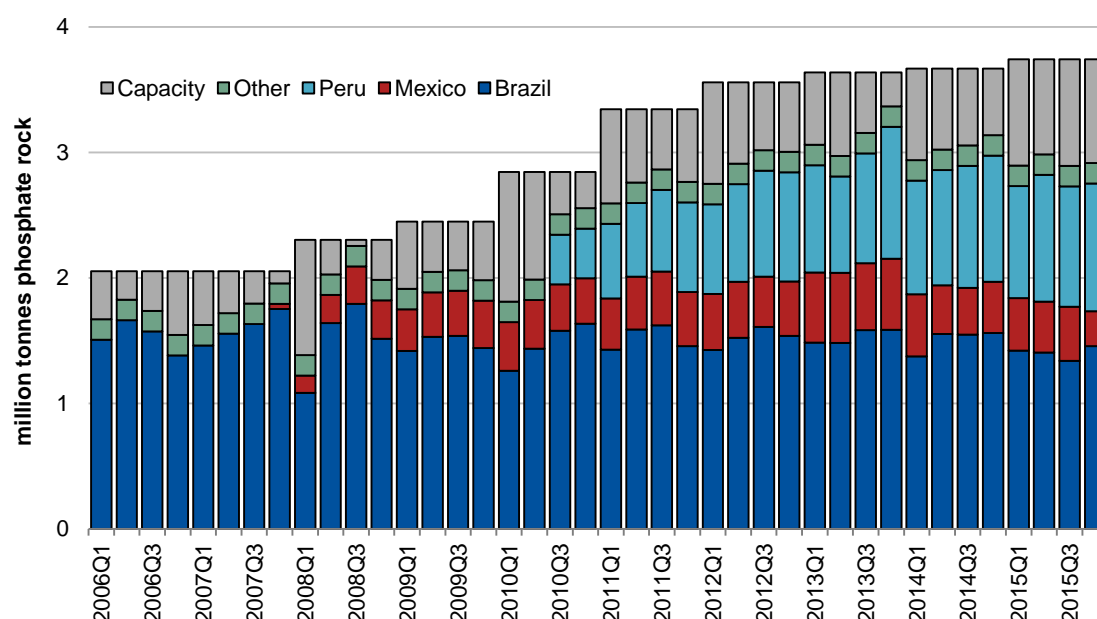
## Overview/outlook:

The recovery of SSP demand in Brazil through 2015Q4 and consistent output of rock in Peru and Mexico helped raise quarterly rock production levels but was not enough to prevent an estimated 7% y/y decline in annual rock production in Central & South America for the year at 11.1 million tonnes. In 2016 we forecast annual rock production to increase by nearly 8% y/y and reach 12.0 million tonnes – mostly driven by an expected return in downstream demand for rock in Brazil, in addition to forecast y/y increases in production from both Peru and Mexico.

## Company tracker:

<b>Vale</b>	Rock production in 2015 at its mines in <b>Brazil</b> fell by around 7% y/y to a reported 4.3 million tonnes, due to stoppages at its <b>Araxá</b> and <b>Patos de Minas</b> mines to balance supply-demand fundamentals.
<b>Miski Mayo</b>	With the elimination of shipping constraints in <b>Peru</b> , rock production at the <b>Vale-Mosaic JV</b> increased for a fifth consecutive year by 2% y/y at a reported 3.8 million tonnes.
<b>Rofomex</b>	Cumulative rock production in the first eleven months of 2015 at the <b>Fertinal</b> subsidiary fell by 1% y/y at a reported 1.5 million tonnes.
<b>AAF</b>	Rock production at the <b>Ouvidor</b> mine fell by 5% y/y at a reported 1.3 million tonnes.

## Central &amp; South America quarterly phosphate rock production/capacity:



## Central &amp; South America phosphate rock medium-term supply outlook:

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Operating	14.7	15.0	15.0	15.0	15.0	15.0	15.0	↔
Firm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Probable	0.0	0.0	0.0	0.0	1.2	1.2	1.2	
Speculative	0.0	0.0	0.4	3.4	7.0	8.3	10.8	
<b>Base-case capacity</b>	<b>14.7</b>	<b>15.0</b>	<b>15.0</b>	<b>15.0</b>	<b>16.2</b>	<b>16.2</b>	<b>16.2</b>	↑
<b>Base-case production</b>	<b>12.0</b>	<b>11.1</b>	<b>12.0</b>	<b>11.7</b>	<b>12.7</b>	<b>12.8</b>	<b>12.9</b>	↑
<i>Operating rate</i>	<i>82%</i>	<i>74%</i>	<i>80%</i>	<i>78%</i>	<i>78%</i>	<i>79%</i>	<i>80%</i>	↑

**Data:** CRU, ANDA, GTIS, IFA, INEGI, SERNAGEOMIN, company reports

In **Brazil**, we estimate annual rock production in 2015 to have declined by 6% y/y at around 5.5 million tonnes; driven mostly by three consecutive quarterly production declines over the first nine months of the year as **Vale** stopped production to balance its supply and demand.

Production at the **Anglo American Fosfatos (AAF)** mine of **Ouvidor** also declined marginally over the period, falling by 5% y/y at a reported 1.3 million tonnes. Concentrate production at AAF in 2015Q4 increased marginally y/y to a reported 355,700 tonnes. With the board considering offers for the sale of its phosphates assets, the brown-field expansion of both the rock and downstream projects have been downgraded to *speculative*.

Using data provided by *ANDA* we conclude that rock production in 2015 at two of the three **Yara-Galvani** mines, **Irecê** and **Angico dos Dias**, declined by 4% y/y down to 197,500 tonnes.

The rock curtailments at the **Vale** mines of **Araxá** and **Patos de Minas** resulted in a 7% y/y decline in annual rock production at a reported 4.3 million tonnes. With the exception of 2015Q1, quarterly production from all of Vale's rock mines in **Brazil** fell short of output reached in the equivalent quarter the previous year. Consequently, company-wide rock production in 2015 fell by over 3% y/y to a reported 8.2 million tonnes.

This occurred despite record annual production from the **Miski Mayo JV** in **Peru**, where production in 2015 increased by 2% y/y to a reported 3.8 million tonnes. The only other phosphate miner in Peru, **Fosyeiki**, is understood to have produced between 20-30,000 tonnes.

In the **short-term**, we forecast rock production in **Central & South America** to increase by nearly 8% y/y in 2016 to reach 12.0 million tonnes. This will be driven by an expected return in demand in **Brazil**, eliminating the requirement to curtail rock production; the 2016 total will also be helped by an forecast increase in rock output in Mexico and Peru. In **Mexico**, the expected capital investment resulting from the Pemex takeover of Fertinal should raise production efficiency at its subsidiary miner **Roca Fosfórica Mexicana (Rofomex)**, which we forecast to increase production by 7% y/y to 1.8 million tonnes in 2016. In **Peru**, the **Miski Mayo JV** is likely to increase production for a sixth consecutive year and exceed 3.9 million tonnes.

In the **medium-term**, rock production in **Central & South America** is forecast to increase by over 3% CAGR to 12.9 million tonnes by the end of the decade, spurred by the commissioning of the **Yara-Galvani – Serra do Salitre** project in late-2017 and its ramp-up. This will result in the share of Brazilian rock production in the region, which accounted for around 48% in 2015, to increase to around 53% over the same period. Likewise, we also forecast an increase in rock production at **Rofomex** in **Mexico** to around 2.0 million tonnes by 2017 and flat thereafter. With no current base-case capacity expansions in **Peru**, we expect production to remain flat around 4.0 million tonnes throughout the rest of the forecast period.

## 2.2.6 Europe &amp; the Commonwealth of Independent States (CIS)

## Europe &amp; CIS phosphate rock supply metrics

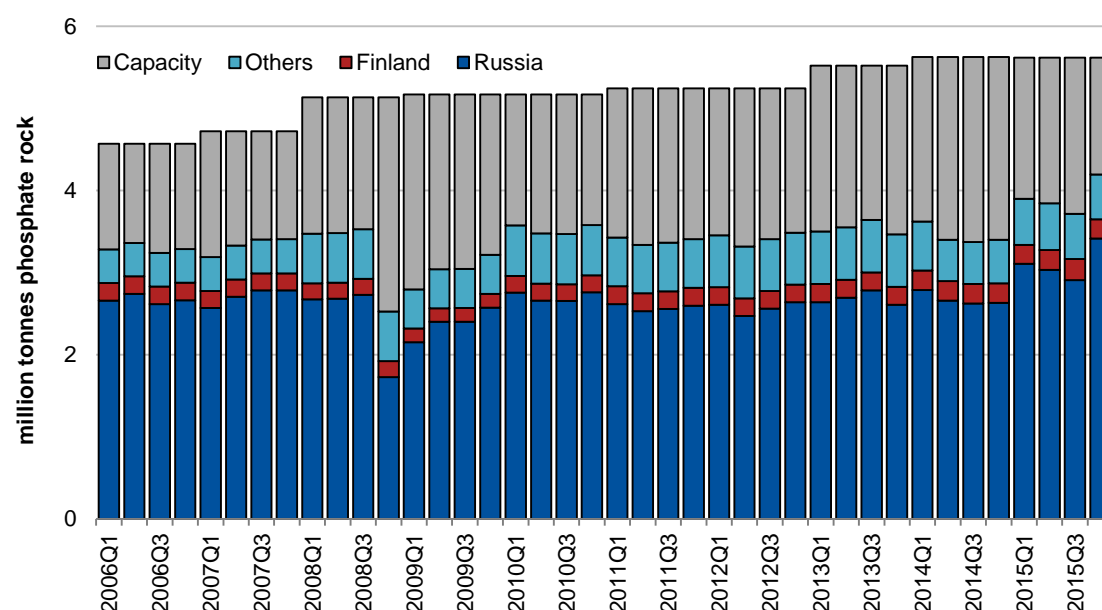
## Overview/outlook:

Rock production in Russia in 2015 increased by an estimated 16% y/y to around 12.4 million tonnes. Production in both Kazakhstan and Uzbekistan is also estimated to have increased by 3% and 14% to total 1.5 million tonnes and 690,000 tonnes respectively. In 2016, we forecast production in the CIS will increase by a further 3% y/y and total 15.2 million tonnes as PhosAgro ramps up production at the underground section of its Kirovsky mine in Russia and EuroChem ramps up production at its Taraz mine in Kazakhstan.

## Company tracker:

<b>PhosAgro</b>	Rock production in 2015 at subsidiary <b>Apatit</b> was reported at over 7.8 million tonnes, reflecting a 5% y/y increase in output at its <b>Kirovsky</b> mine.
<b>EuroChem</b>	Cumulative rock production in the first ten months of 2015 at its <b>Kovdor</b> mine is estimated to have increased by nearly 9% y/y to over 2.0 million tonnes.
<b>Acron</b>	Rock production at subsidiary <b>NWPC</b> in 2015 reflected a 27% y/y increase at a reported 1.1 million tonnes.
<b>Yara</b>	We estimate a marginal increase in rock production at the <b>Siilinjärvi</b> mine will have raised annual output last year to just below 1.0 million tonnes.

## CIS quarterly phosphate rock production/capacity:



## Europe &amp; CIS phosphate rock medium-term supply outlook:

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Operating	22.5	22.5	23.1	23.1	23.1	23.1	23.1	↑
Firm	0.0	0.0	0.0	0.3	1.0	1.0	1.1	
Probable	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Speculative	0.0	0.0	0.3	2.2	2.4	3.2	5.2	
<b>Base-case capacity</b>	<b>22.5</b>	<b>22.5</b>	<b>23.1</b>	<b>23.4</b>	<b>24.0</b>	<b>24.0</b>	<b>24.2</b>	↑
<b>Base-case production</b>	<b>13.8</b>	<b>15.7</b>	<b>16.2</b>	<b>16.3</b>	<b>16.5</b>	<b>16.2</b>	<b>17.1</b>	↑
<b>Operating rate</b>	<b>61%</b>	<b>70%</b>	<b>70%</b>	<b>70%</b>	<b>68%</b>	<b>67%</b>	<b>71%</b>	↑

Data: CRU, Azotecon, GTIS, IFA, company reports

According to *Azotecon* data, cumulative rock production in **Russia** for the first-ten-months of 2015 increased by 5% y/y to over 9.4 million tonnes, with increases across all three phosphate miners over the same period. Over this period, Acron contributed the greatest increase in contribution to domestic rock output, both in terms of production share and volume. Overall, CRU estimates that Russian rock production in 2015 increased by nearly 16% y/y to around 12.4 million tonnes. However, its share of rock production in the **CIS** region of around 84% only increased marginally over the same period, as production in both **Kazakhstan** and **Uzbekistan** is estimated to have also increased by 3% and 14% to a total of 1.5 million tonnes and 690,000 tonnes respectively.

We understand that production increased towards the end of the year at **PhosAgro** subsidiary **Apatit**, resulting from the ramp-up in output from the underground section of the **Kirovsky** mine. Indeed, rock production in 2015Q4 reached its highest figure since 2014Q1 and reflected a 21% y/y increase in quarterly production, at over 2.1 million tonnes. The production of phosphate rock in 2015 at **PhosAgro** totalled over 7.8 million tonnes, reflecting a 5% y/y increase in output over the comparative period.

Similarly, in 2015Q4 **Acron** subsidiary **North West Phosphorus Co. (NWPC)** produced a reported 304,300 tonnes of rock, reflecting a 17% y/y increase and record-high quarterly production figure since the mine was commissioned in 2012Q4. The ramping-up of production at its **Oleniy Ruchey** mine in 2015 resulted in a 27% y/y increase in rock production at a reported 1.1million tonnes.

At the time of writing, **EuroChem** had not published any annual results, though we estimate that production at its **Kovdor** mine in the first-ten-months of 2015 increased by 9% y/y to over 2.0 million tonnes.

CRU forecasts that rock production in 2016 throughout the **CIS** will increase by a further 3% y/y in 2016 to total 15.2 million tonnes; as PhosAgro ramps up production at the underground section of its Kirovsky mine in Russia and EuroChem ramps up production at its Taraz mine in Kazakhstan. The latter will have the greatest impact on regional production, raising Kazakhstan rock production by 39% y/y to an estimated 2.1 million tonnes.

In the **medium-term**, we forecast rock production in the CIS to increase by 2% CAGR and to total 16.1 million tonnes by the end of the decade. Whilst Acron has expansions included in our base-case forecast, rock production in Russia is expected to decline by 1% CAGR to below 11.9 million tonnes over the same period. It is in **Kazakhstan**, with the ramping up of production at **Kazphosphate** and the commissioning of more capacity at EuroChem, where the largest expansion will occur. Output in Kazakhstan is expected to rise by 27% CAGR over the next five years to 3.6 million tonnes by 2020.



2.2.7 Rest of the World (RoW)<sup>1</sup>

## RoW phosphate rock supply metrics

## Overview/outlook:

Combined rock production from South & South East Asia and Oceania in 2015 is estimated to have increased by nearly 3% y/y to around 7.4 million tonnes. This increase resulted from an estimated 16% y/y increase in production from Vinaapaco in Vietnam, as domestic demand increased significantly with the commissioning of two projects. Furthermore, increases in production at IPL in Australia and RSMM in India were enough to balance losses from PRL and Ronphos, located in Christmas Island and Nauru respectively. In 2016, we forecast rock production from South & South East Asia and Oceania to further increase to around 7.9 million tonnes, again, mostly due to a further increase in production at Vinaapaco. This should more than offset the expected decline in production from India over the same period.

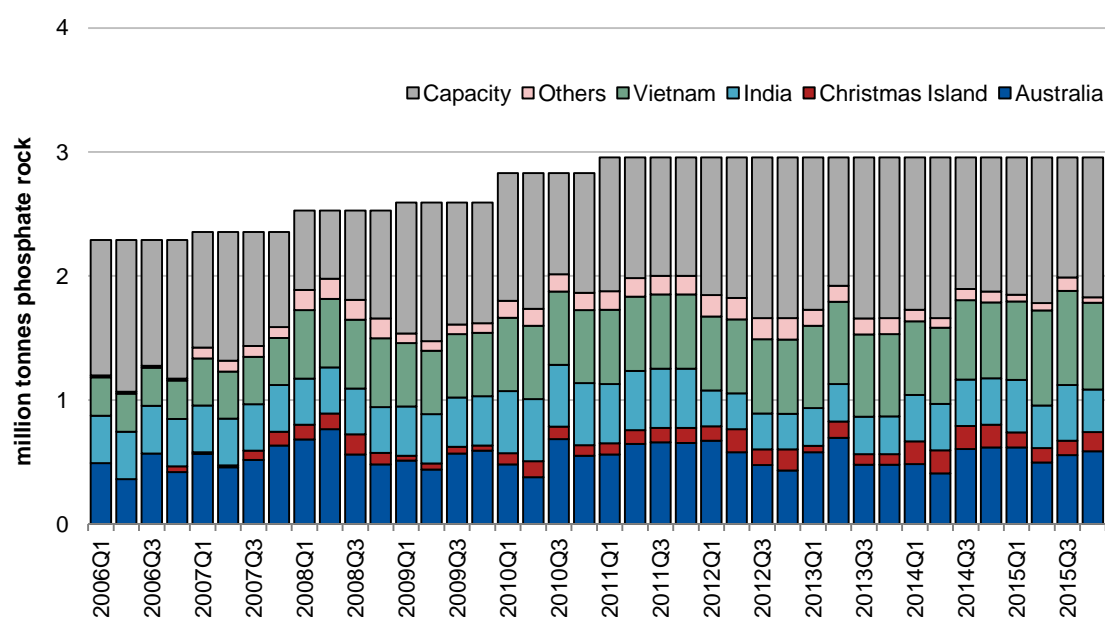
## Company tracker:

**Incitec Pivot** We estimate that rock production at the **Phosphate Hill** mine increased by around 7% y/y in 2015 to over 2.2 million tonnes.

**Vinaapaco** In 2015 we estimate that the **Vinachem** subsidiary increased rock production by around 16% y/y to over 2.8 million tonnes.

**RSMM** Annual rock production of the largest phosphate miner in India is estimated to have increased by 20% y/y to nearly 1.0 million tonnes.

## RoW quarterly phosphate rock production/capacity:



## RoW phosphate rock medium-term supply outlook:

million tonnes rock	2014	2015	2016	2017	2018	2019	2020	Δ 2015-2020
Operating	11.3	11.3	11.3	11.3	11.3	11.3	11.3	↔
Firm	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Probable	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Speculative	0.0	0.0	2.1	3.6	5.7	8.5	8.5	
<b>Base-case capacity</b>	11.3	11.3	11.3	11.3	11.3	11.3	11.3	↔
<b>Base-case production</b>	7.2	7.4	7.9	7.9	7.9	7.6	7.6	↑
<b>Operating rate</b>	64%	66%	70%	70%	70%	67%	67%	↑

**Data:** CRU, FAI, GTIS, IFA, company reports; **Note:** in this section, RoW refers to South & South East Asia, and Oceania (including the Pacific Islands).

In Southeast Asia, we estimate rock production in 2015 at **Vinachem** subsidiary Vinaapaco to have totalled over 2.8 million tonnes. The 16% y/y increase was driven by the growth in domestic demand following the commissioning of two new phosphoric acid plants, **DLC – Lao Cai** and Vinachem DAP II – Lao Cai.

In 2016, we estimate that production at Vinaapaco will increase by a further 13% y/y and reach a record-high of 3.2 million tonnes, as the aforementioned plants ramp-up production, thereafter remaining flat in the medium-term.

In Oceania, CRU estimates rock production at **Incitec Pivot Ltd. (IPL)** in Australia, increased by around 7% y/y in 2015 to over 2.2 million tonnes. We expect this to increase by around 3% y/y in 2016 to about 2.3 million tonnes.

Elsewhere in Oceania, export data from GTIS and IFA indicate that rock production in 2015 at both **Phosphate Resources Ltd. (PRL)** and **RonPhos** declined by 32% and 58% y/y respectively. Exports of around 500,000 tonnes from PRL in Christmas Island are understood to have suffered from the increased competition of imported rock into India, whilst exports of just 100,000 tonnes from Ronphos in Nauru were down because of maintenance work carried out in 2015Q1 to replace a kiln.

In the medium-term, we forecast that rock production in Oceania will decline marginally by the end of the decade. In between 2015 and 2018 we expect that the steady consecutive increase in annual output from **IPL** and a recovery in **Ronphos** production, will drive a regional increase of 3% CAGR by when Oceania rock production will peak at around 3.1 million tonnes.

In South Asia, rock production in 2015 is estimated to have increased by 3% y/y at 1.7 million tonnes. This resulted from the 20% y/y increase in output from **Rajasthan Mines and Minerals Ltd. (RSMM)** in India, where we understand rock production to have totalled nearly 1.0 million tonnes.

In 2016 we expect rock production throughout India to decline and annual domestic output to total around 1.4 million tonnes, thereby resulting in a y/y decline of 9% y/y in regional rock production to below 1.6 million tonnes.

Unless RSMM's plans to expand its mining area are approved by the state, a project that we categorize as speculative because of the limited interest in funding a such a development, considering the low limited resource and lower grade rock, we forecast rock production to remain flat around 1.4 million tonnes over the medium-term.



# Chapter 3

## Trade, Balance & Prices

### 3.1 Trade: Recent developments and forecasts

During H2 2015 an estimated 14.9 million tonnes of rock was traded, taking the annual total to 29.1 million tonnes. This figure is 700,000 tonnes above our forecast published in the *PRMO November 2015 Edition*, reflecting better than expected sales into forty countries since our last publication. In four of these – **USA, Indonesia, Lebanon** and **Lithuania** – our estimates were revised up by over 100,000 tonnes to account for the large volumes traded either in Q3 or in Q4.

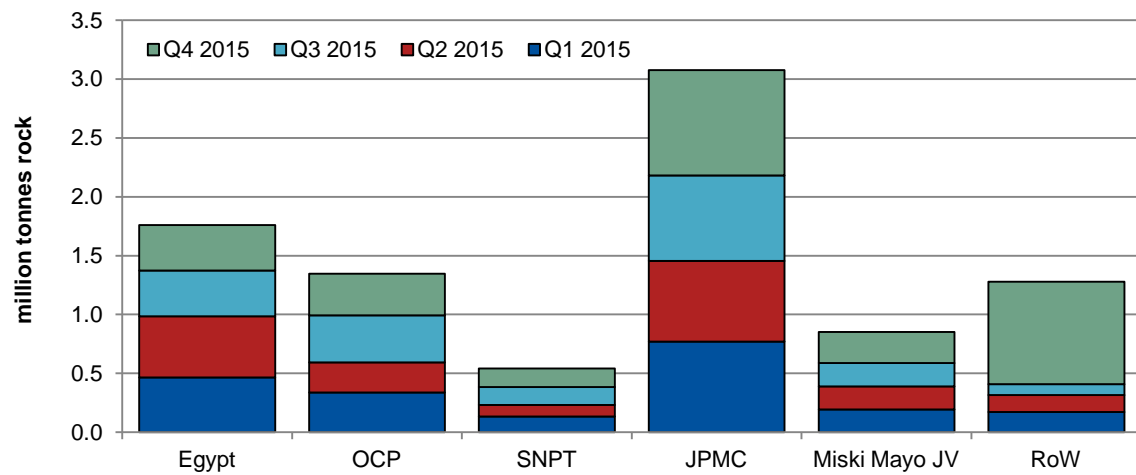
In the case of the **USA**, imports held up better than expected y/y during 2015, despite the **MissPhos – Pascagoula** closure. While it is true that the 2015 volume is well below the average of 3.3 million tonnes recorded annually between 2011 and 2013, it is still more than the 1.5 million we had forecast in the previous *Edition*. In **Indonesia**, the current total (2.2 million tonnes) is in line with expectations at the beginning of the year; however, we had revised this downwards in November (1.8 million tonnes) to account for technical difficulties reported at **Petro-Jordan Abadi – Gresik**. In **Lebanon**, **LCC** imported close to 700,000 tonnes of rock in 2015, with around a quarter being sourced from mines in **Senegal**. In **Lithuania**, **EuroChem** shifted more of its Russian rock to **Lifosa**, as part of its longer-term self sufficiency strategy.

Looking at the supply side, shipments from **Egypt, Morocco, China, Russia, Peru** and **Senegal** surprised on the upside during 2015. In **Egypt**, exporters were able to place 1.8 million tonnes into India through the year, compared to 1.5 million tonnes in 2014. Notably, more than expected was also sold into **Indonesia** and **Brazil**, the latter possibly representing a new opportunity. In the case of **Morocco**, **OCP** exports declined y/y, but our estimate of 8.5 million tonnes is above our corresponding forecast in the previous *Edition*, reflecting better than expected sales to the **USA, Belarus** and **Peru**. As previously mentioned, **Russian** exports enjoyed a late surge to **Lithuania**, while **Peruvian** sales were supported by the regular deliveries to **Brazil** and **India**, as well as better than expected sales to the **USA** and **Argentina**.

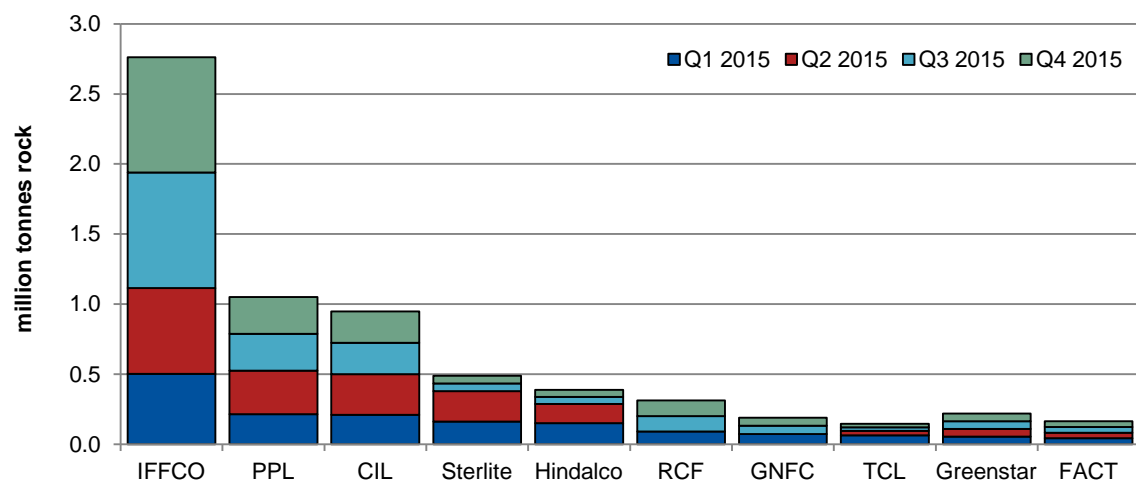
The medium-term forecast sees exports growing by CAGR of 1.7% between 2015 and 2020, totalling 31.7 million tonnes in 2020. This is around 2.0 million above our previous forecast, and is explained by a better outlook for the **USA, Indonesia, Lithuania** and **South Korea**. On the supply side, the market is set to become less concentrated as new projects ramp-up, causing **OCP** to lose further market share. That said, this is unlikely to affect its production negatively as it will be targeting to sell more fertilizer.

## India phosphate rock import profile

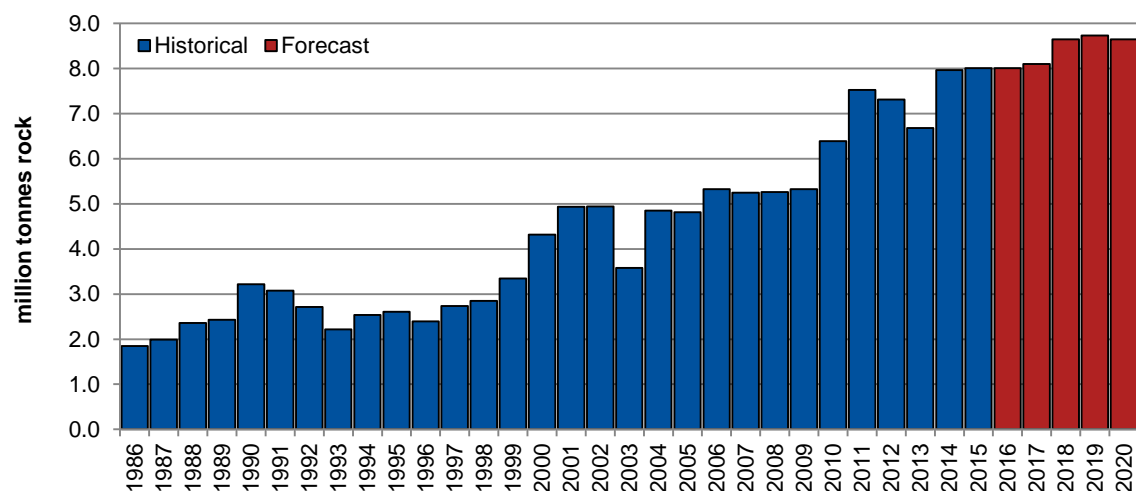
### Phosphate rock imports to India by major exporters, 2015



### Phosphate rock imports to India, 2015



### Phosphate rock imports to India, 1986-2020



Data: CRU, FAI, GTIS, IFA, Indian port arrivals

**Indian** rock imports in H2 2015 totalled 4 million tonnes, up only 31,000 tonnes y/y. This pushed 2015 total imports to 8 million tonnes, 100,000 tonnes above 2014 volumes due to a strong H1 2015. Indian port arrivals data shows that rock sourcing remained reasonably consistent overall y/y in 2015 – though volumes shifted. Imports from Togo fell to 542,000 tonnes from 953,000 tonnes in 2014, Israeli imports fell by 45% y/y to 108,000 tonnes, and falls were seen from Peru and Jordan. However, 245,000 tonnes was imported from Algeria against 28,000 tonnes in 2014 and 59,000 and 66,000 tonnes in 2012 and 2013 respectively. Rock was also imported from China for the first time in recent years in 2015 – one cargo of 43,000 tonnes. Imports from Morocco increased in 2015, by 15% y/y to 1.35 million tonnes.

Rock imports over the year were fairly consistent between quarters, with around 2 million tonnes imported each quarter. This most likely reflects consistent phosphoric acid production rates in the country – import volumes of DAP are required to meet demand and domestic production is supported by subsidy, meaning domestic producers can maintain production throughout the year.

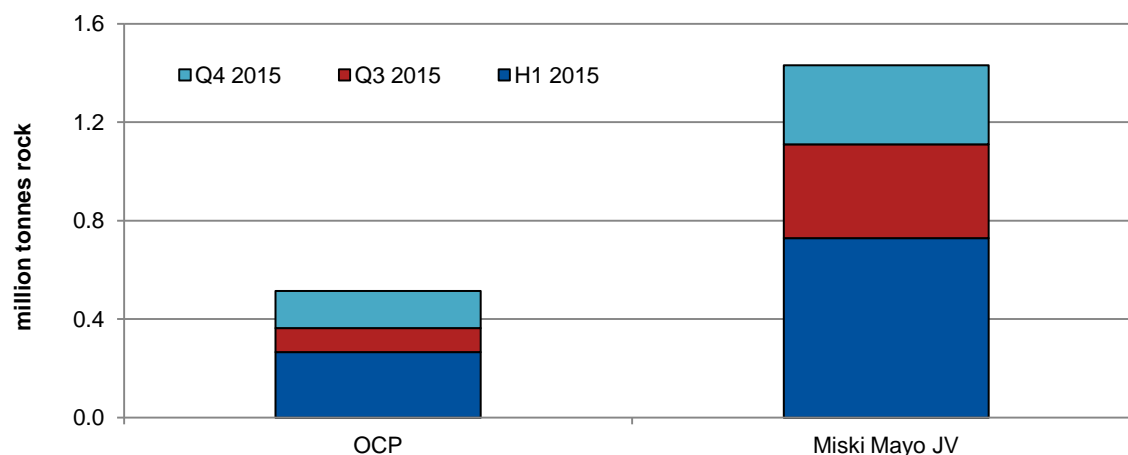
Port arrivals show that **IFFCO** was the biggest importer in 2015, predominantly sourcing product from JPMC. The company buys rock for its **Paradeep** plant, and imported a total of 1.5 million tonnes of rock from Jordan in 2015, up from 1.44 million tonnes in 2014. Interestingly, IFFCO deliveries went against the national trend as the company imported higher volumes in H2 2015 compared to H1 2015. In particular, deliveries were high in Q4 2015, with 824,000 tonnes delivered. Deliveries were 1.4 million tonnes in H2 2015, up 25% H/H and 17% y/y.

The second biggest importer **PPL**, which is also based in **Paradeep**, imported 1 million tonnes, all from OCP. This was significantly up from the 765,000 tonnes imported by the company in 2014, of which 621,000 tonnes was from OCP and 144,000 tonnes was from SNPT (Togo).

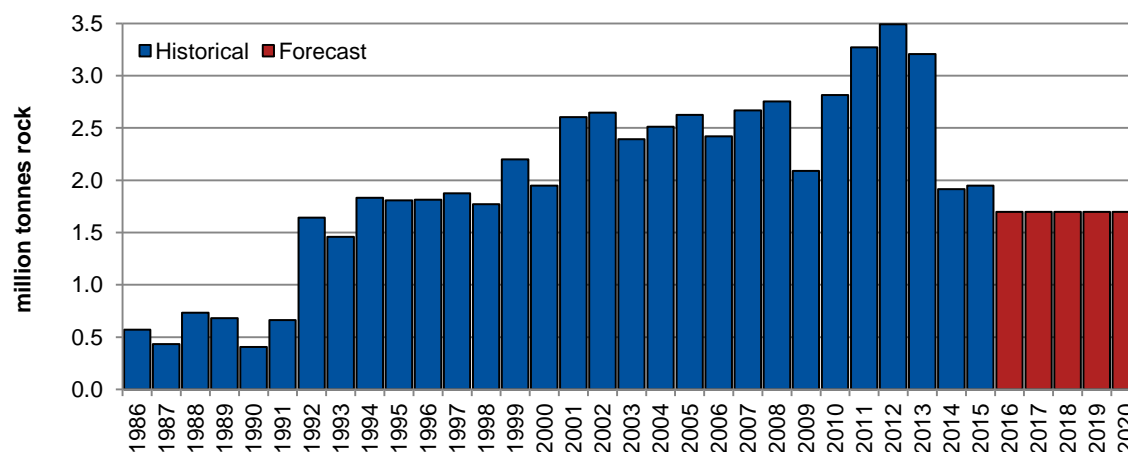
**Coromandel (CIL)** also imported large volumes for its **Visakhapatnam** plant, with a total of 846,000 tonnes imported in 2015, up by 114,000 tonnes y-o-y. Unlike PPL and IFFCO, however, CIL imports from a variety of sources. In 2015, their tonnes were sourced from Togo (356,000 tonnes, up from 309,000 tonnes in 2014), Egypt (162,000 tonnes, up from 69,000 tonnes in 2014), with smaller volumes in 2015 coming from Israel, Jordan, South Africa and Senegal. CIL is the major importer of Israeli rock in India, accounting for 83,000 of the 99,000 tonnes imported to the country in 2015. The company's imports from Israel also fell from 194,000 tonnes in 2014, meaning declining business between CIL and ICL is responsible for the fall in rock volumes being shipped from Israel overall. We expect Indian rock imports to increase by 1% to 8.1 million tonnes in 2016, reflecting steady demand and rock production y/y. Further out in our forecast we are expecting some increases in imports, to a high of 8.8 million tonnes in 2017 on the back of increases in phosphoric acid production and the fact that we do not expect domestic rock production to increase.

## United States phosphate rock import profile

### Phosphate rock imports to the US by exporter, H1 2015, Q3 and Q4 2015



### Phosphate rock imports to the US, 1986-2020



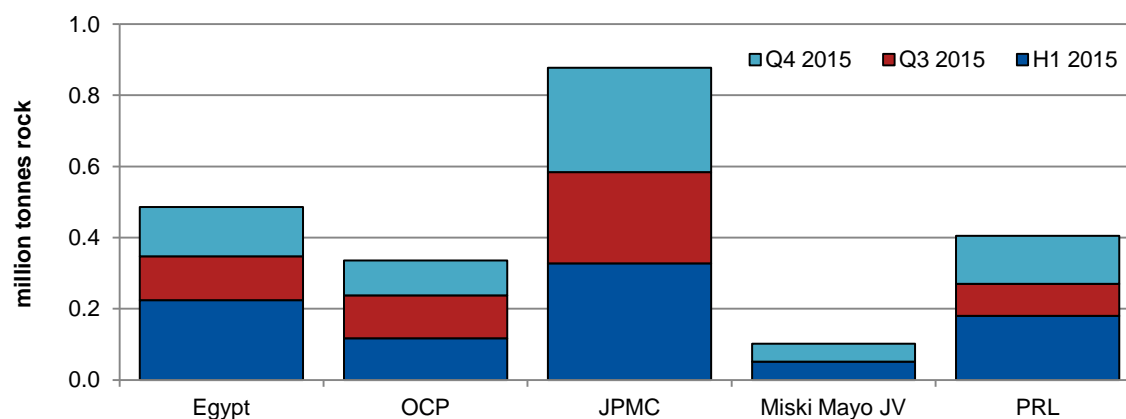
Data: CRU, GTIS, SUNAT, TFI, USGS

After a strong Q2 2015, US imports moderated through H2 to total 951,000 tonnes, as arrivals from both **OCP** and **Miski Mayo** slowed. The **Peruvian** product, averaging 66-68% BPL, is shipped into **Gramercy**, from where it is dispatched to Mosaic's **Faustina** acidulation complex. Based on available data, around 1.4 million tonnes was supplied from Peru in 2015, with volumes in Q2, Q3 and Q4 exceeding their corresponding totals in 2014. Much of the remaining product was shipped either from the **Bou Craa** (80% BPL) or **Khouribga** (up to 72% BPL) mines in Morocco for consumption at **PotashCorp** or **Mosaic's** acidulation units in Louisiana. While trade data does not break the volumes down by source, it is estimated that around 130,000 tonnes stemmed from Khouribga and 385,000 tonnes from Bou Craa.

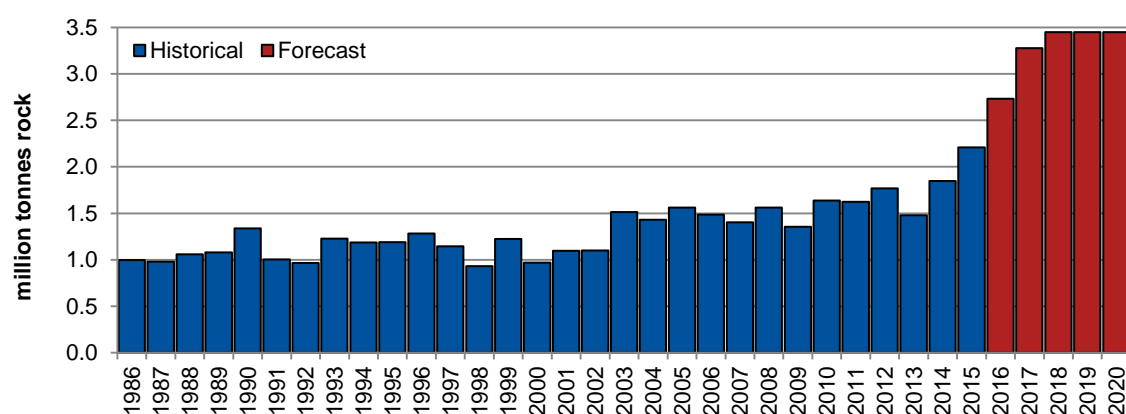
Through the forecast, we see US imports stabilizing at 1.8 million tonnes rock. This represents an upward revision to previous forecasts – in the previous *Edition* our estimate was closer to 1.3 million tonnes – and reflects the resilience of the non-integrated operations in the gulf.

## Indonesian phosphate rock import profile

### Phosphate rock imports to Indonesia by exporter, H1 2015, Q3 and Q4 2015



### Phosphate rock imports to Indonesia, 1986-2020



Data: CRU, GTIS, IFA, JSA

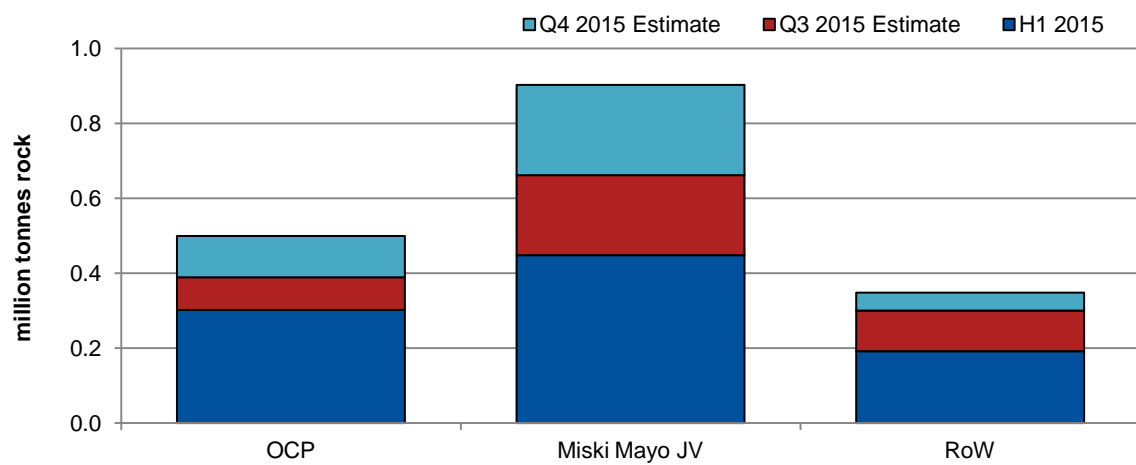
**Indonesian** import volumes rose by 14% y/y in 2015 to 2.2 million tonnes, a significant increase driven by the commissioning of rock-based acidulation capacity during the year. The **Petro-Jordan Abadi JV** between **Petrokimia Gresik** and **JPMC** was commissioned in Q4 2014 and has been ramping up through the year. **Petrokimia Gresik** also commissioned some wholly owned capacity in 2015. We expect volumes imported for these projects to increase again this year, pushing our forecast for Indonesian imports to 2.7 million tonnes. Furthermore, an additional JV based on imported rock – **Kaltim Jordan Abadi** – is expected in 2018 driving rock imports to 3.5 million tonnes.

**JPMC**'s share of rock imports in Indonesia increased as a result of the JV to 40% in 2015 from 37% in 2014. The ramping-up of **JPMC**'s **JV**, and its increasing share of exports to Indonesia, is also reflected in the greater imports into Indonesia in H2 versus H1 at 549,000 tonnes compared to 328,000 tonnes. The other suppliers to the market were Egypt, with 487,000 tonnes, **OCP**, with 336,000 tonnes, and **PRL** (Christmas Island), with 405,000 tonnes. Imports from PRL increased by 45% y/y, while Moroccan and Egyptian volumes were level y/y.

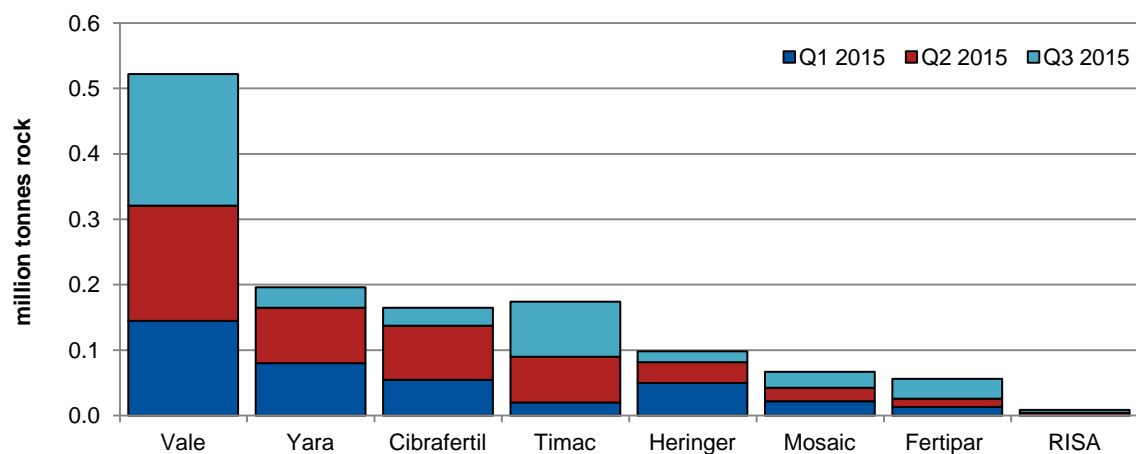


## Brazil phosphate rock import profile

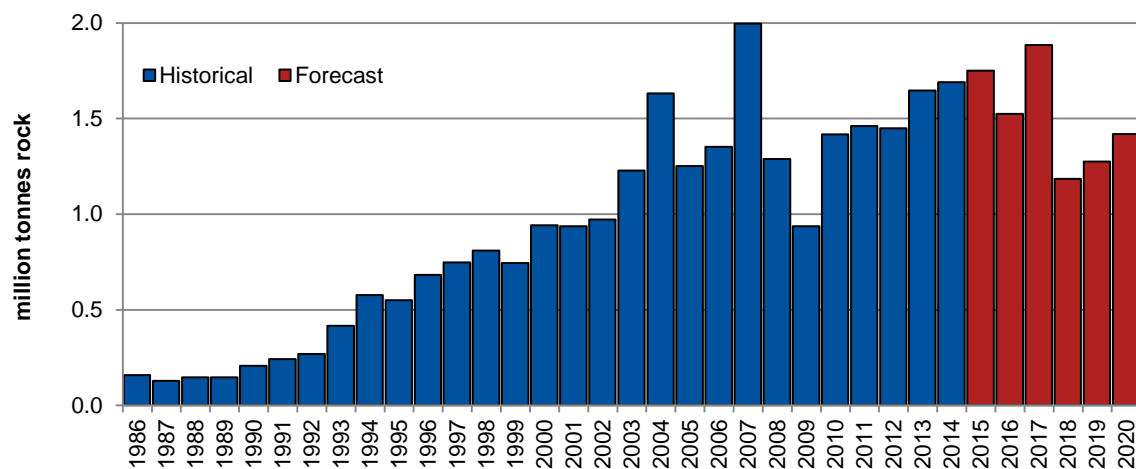
Phosphate rock imports to Brazil by exporter, H1 2015, Q3 and Q4 2015 forecast



Phosphate rock imports to Brazilian imports by major buyer, Jan-Oct 2015



Phosphate rock imports to Brazil, 1986-2020



Data: CRU, ANDA, Brazilian port arrivals, GTIS, IFA

**Brazilian** rock imports are estimated to have totalled 808,000 tonnes during H2 2015, which compares to 942,000 tonnes in H1 2015. **Vale's Peruvian JV, Miski Mayo** is estimated to have shipped just short of 1.8 million tonnes during 2015, registering a y/y increase of 2.5%.

Meanwhile, **Moroccan** deliveries to **Brazil** from **OCP** fell to below 200,000 tonnes during H2, as volumes in both Q3 and Q4 fell below expectations. Brazilian port arrivals show that the last significant volumes (60,000 tonnes) were imported by **Fertipar, Mosaic** and **Yara** during October, with arrivals falling sharply in November and December. This year the Peru exported shipped more to **Cibrafertil** and **Vale**, at the expense of **OCP** product. Less was also shipped from **OCP** to **Mosaic** and **Fertipar** y/y, although this was the result lower consumption in 2015, as opposed to a loss of market share. Sales to **Yara** during 2015 were flat y/y.

Looking at the other suppliers to the Brazilian market, **Egypt** traders exported an estimated 79,000 tonnes during the last nine months of the year for delivery to consumers that included **Cibrafertil** and **Rouiller**. This is a new market for the Egyptians, and given the success that they've already had, they could start targeting this market in the future. **Somiphos** in **Algeria** is understood to have shipped 48,000 tonnes less rock to Brazil in 2015 as **Fertipar** and **Risa** cut back on their volumes through H2.

On a positive note, **Somiphos** was able to sell two cargos totalling 45,000 tonnes to **Rouiller** last year, having not sold to that company in 2014. **ICL's** sales to Brazil are estimated to have surpassed 165,000 tonnes in 2015, compared to just 18,000 tonnes in 2014, as deliveries were made to **Fertilizantes Tocantins, Fertipar, Josapar, Mosaic, Ourofertil, Risa** and **Rouiller**. Exports from Senegal were absent in Q4 and annual exports fell by 50% y/y to 17,000 tonnes.

The full year Brazil import estimate for 2015 stands at 1.75 million tonnes rock, in line with our forecast in the previous *Edition*. The medium-term outlook is mixed. Rock imports are expected to moderate in 2016 as domestic production picks up. Although a slight improvement is expected in 2017, further moderation is expected in 2018 and 2019 as Galvani ramps up its domestic rock production. The 2020 forecast stands at 1.4 million tonnes, which is lower than the corresponding value in 2015, but higher than previous forecasts as we have downgraded the Anglo American Fosfatos expansion.

There was little change in imports into **Western Europe** in 2015, with volumes unchanged y/y at 3.1 million tonnes, while **Eastern European** imports were 4.1 million tonnes in 2015 compared to 3.8 million tonnes in 2014. This increase was mostly driven by an increase in imports to **Lithuania** for use in **EuroChem's** Lifosa plant. Lithuanian imports increased from 1.2 million tonnes in 2014 to 1.7 million tonnes in 2015, reflecting increased production of animal feed products, which increased by 12% y/y. The Lifosa plant's technical set-up is for the use of igneous rock, which is normally supplemented with purchases of high-grade sedimentary rock from **OCP's** Bou Craa mine.

In 2015, the plant imported South African igneous rock alongside volumes usually imported from Russia, as Foskor struggled with phosphoric acid production and looked to increase rock export volumes. Deliveries from South Africa spread throughout the year, with 66,000 tonnes the lowest quarterly delivery volume in Q4 2015 and 120,000 tonnes the highest in Q1 2015. In total, 369,000 tonnes were imported from South Africa, compared to 35,000 tonnes in 2014. Russian volumes to Lithuania increased by 43% y/y to 966,000 tonnes while imports from OCP fell by 35% to 323,000 tonnes. The fall in imports from OCP is likely part of EuroChem's move away from buying Bou Craa rock due to the political sensitivities of buying from the Western Sahara region. The company announced in February 2016, that it will cease imports from Bou Craa from this year.

Quarterly trends in Lithuania saw particularly high import volumes in Q4 2015 at 624,000 tonnes against a total of a little over 1.0 million tonnes for the rest of the year, with 504,000 tonnes imported from Russia. We believe that these increased volumes must be partially to build stocks at the site – given how dramatic the increase. We also understand that Lifosa's phosphoric acid capacity utilisation was relatively high, around 80% for 9m 2015, meaning that there would not have been scope for such an increased usage of phosphate rock in Q4 2015.

Increases in Lithuanian imports in 2015 were sufficient to outweigh falls in imports into Bulgaria, which fell 16% y/y to 488,000 tonnes in 2015 due to lower phosphoric acid production at Agropolychim's Devnya plant. Imports into **Poland** also decreased by 14% y/y to 1.1 million tonnes in 2015, though decreases were more substantial in H1 2015, with H2 2015 volumes down only 5% y/y to 593,000 tonnes. Grupa Azoty has continued to import volumes from its part-owned mine in Senegal, with 181,000 tonnes arriving from there in H2 2015, up y/y from 173,000 tonnes. Q4 2015 volumes from Senegal were the largest since the mine's commissioning, at 103,000 tonnes, up 32% y/y. Moroccan volumes in particular increased to Poland, reaching 310,000 tonnes in 2015, more than double what they were in 2014. With imports decreasing overall, the main reduction amongst major exporters was in Algeria's share of imports in Poland. Algerian imports were 359,000 tonnes in 2015, down from 587,000 tonnes in 2014.

Shifting over to the supply side of the market, **OCP** is understood to have exported just short of 8.5 million tonnes of rock during the 2015 calendar year, compared to 8.7 million tonnes in 2014. While the company remains the largest merchant rock supplier, accounting for 30% of global shipments, this is the lowest recorded volume since 2009 and reflects a steady reduction since 2007. Looking at the pattern of trade during the year, after a slow start, shipments peaked in Q2 at 2.5 million tonnes, slowing to 2.3 million tonnes in Q3 and then again to 2.1 million tonnes in Q4. The H2 slowdown reflects lower sales into parts of **Europe**, the **Americas** (excluding Peru and Venezuela) and **Australia**.

In **Europe**, the downward trend was a function of both demand and competition intensity. In the case of **Austria**, the reduction is explained by the former. Although OCP grew its market share into Austria y/y in 2015, its sales fell by 6% y/y as the country's total imports fell by 15% y/y. By contrast, in **Belgium** and **Spain**, OCP's sales were eroded by other suppliers including the **Russians (PhosAgro and Acron)**, **Senegalese (Sephos and SSPT)** and **Algerians (Somiphos)**. The company's largest reductions into Europe were, however, recorded into **Lithuania** where its sales fell to 323,000 tonnes in 2015, compared to 494,000 tonnes in 2014, as **Lifosa** purchased significantly more from **Russia** y/y.

While the prevailing trend in Europe was downwards, there were also a number of growth markets for OCP. In **Greece**, OCP was able to capture close to 50% of the market in 2015, as it replaced supplies from **Syria (Gecopham)**. In Eastern Europe, OCP captured 80% of **Bulgaria's** requirements (**Agropolychim** and **Decaphos**) at the expense of sales from **Jordan (JPMC)** and **Syria (Gecopham)**. Similarly sales to Poland doubled to 310,000 tonnes, eating into **Algerian (Somiphos)**, **Togolese (SNPT)** and **Tunisian (CPG)** shares. Finally, in **Romania**, growth was recorded at the expense of **Syria (Gecopham)** and **Russia**.

In the **Americas**, OCP sold less into the **USA, Canada, Brazil** and **Mexico**. **US** volumes for 2015 are estimated down by around 0.5 million tonnes y/y, which is due to the closure of **MissPhos** at the end of 2014. Sales to **Canada** fell sharply in H2 y/y, as **Agrium** supplemented some of its requirement with product from **Togo (SNPT)** and **Senegal**. After a weak Q3 sales to Brazil improved in Q4, but remained well short of volumes shipped during the corresponding period in 2014, as market share was lost to **Egypt (various)** and **Israel (ICL)**. In **Mexico**, OCP lost out at the expense of the **Miski Mayo JV**, selling 65,000 tonnes less y/y.

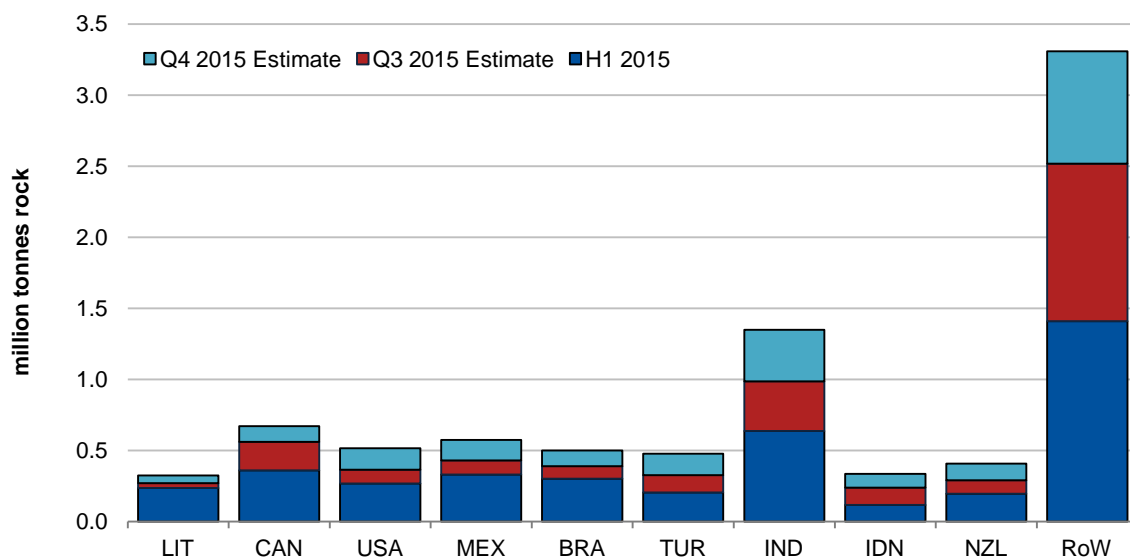
The exception in South America is **Peru**, which continued to ramp up its imports of Moroccan product through H2. This is most likely explained by the commissioning of **Quimpac's** new 70,000 tonne/year DCP/MCP unit in Callao. Full year sales are roughly a third more than we had previously expected, given that it was understood that there were some bottlenecks in ramping-up of the new plant.

Elsewhere, gains were also made into the **Indian sub-continent** and **Belarus** during 2015. In the case of the former, sales of 1.0 million tonnes to PPL, helped to push OCP's total shipments to India to 1.3 million tonnes. Encouragingly, it's sales into Pakistan rose to 462,000 tonne in 2015, compared to 232,000 tonnes in 2014, as Pakistan imported 214,000 tonnes more rock in 2015. In Belarus, a limited availability of Russian rock has prompted a switch towards other sources, including rock from Morocco. Having not sold anything to Belarus in 2014, OCP shipped 276,000 tonnes during 2015, mostly during the second half of the year.

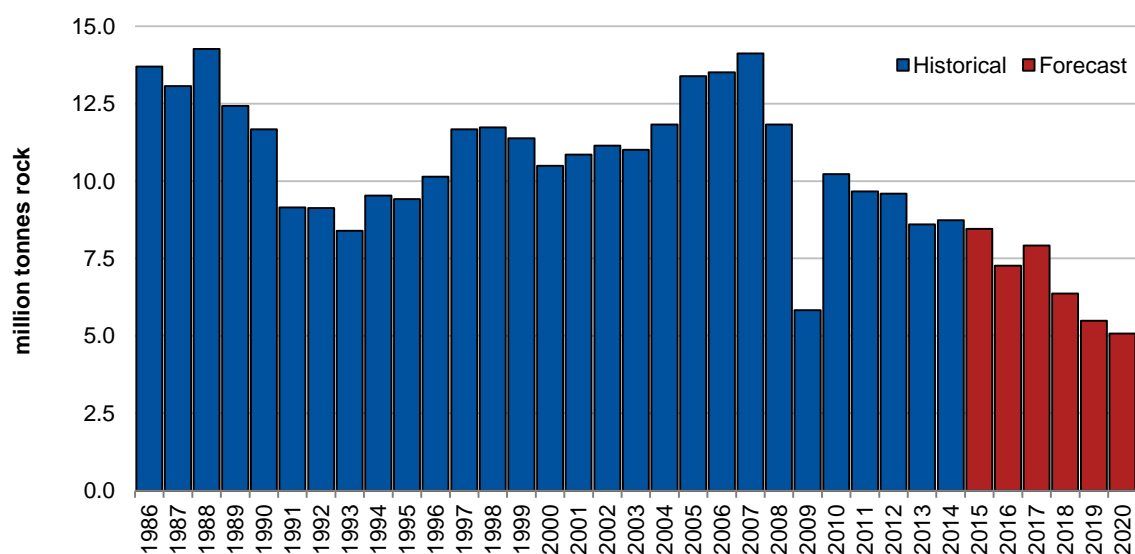
Finally, OCP's sales to **Australia** fell by 50% y/y as it lost market share to **Togo (SNPT)**, **Nauru (RonPhos)**, **Peru (Miski Mayo JV)** and **Vietnam (VinaChem)**.

## Morocco phosphate rock export profile

### OCP phosphate rock exports, H1 2015, Q3 and Q4 2015 forecast



### OCP phosphate rock exports, 1986-2020

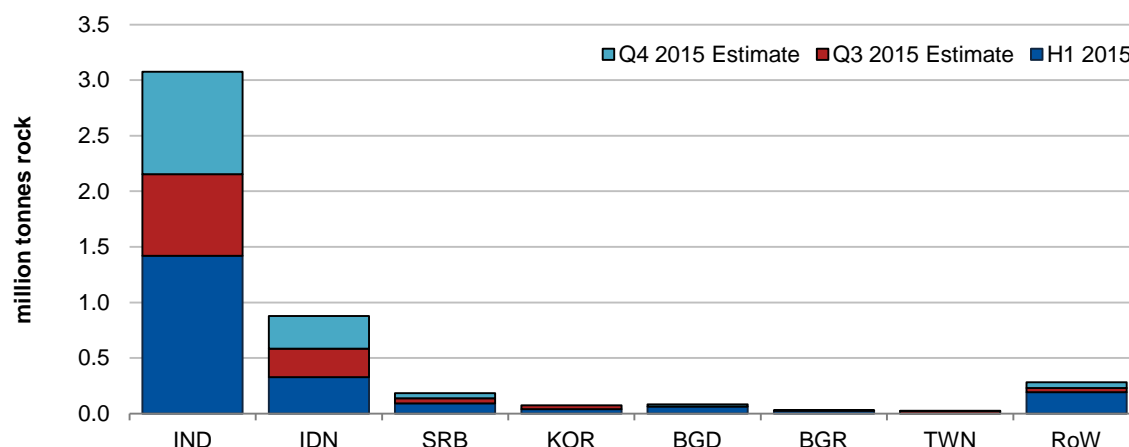


Data: CRU, ANDA, ANP, Brazilian port arrivals, GTIS, IFA, Indian port arrivals, TFI

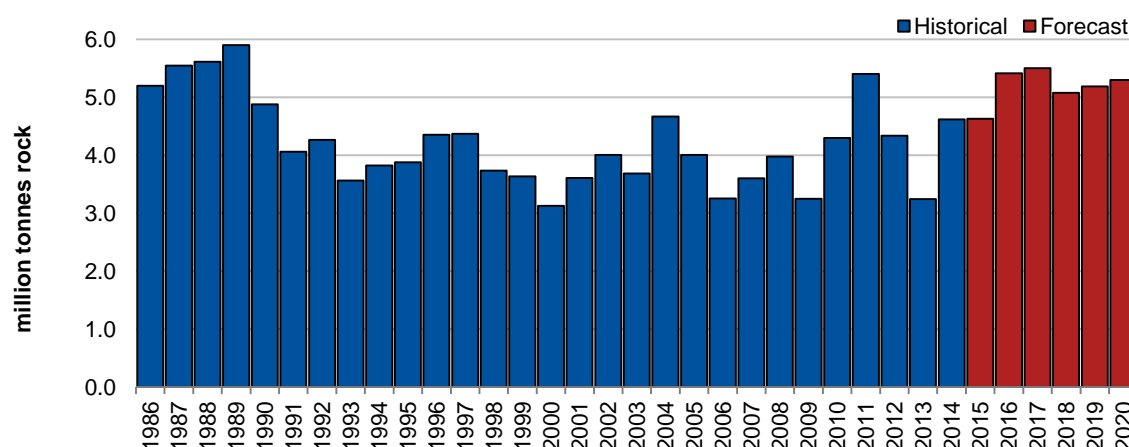
Over the past few outlooks, we have become increasingly conservative in our view of merchant sales from Morocco. While global rock trade is expected to continue growing y/y during 2016-2017, competition is set to intensify across the value chain. At current exchange rates, for example, **Russian exporters** should be able to keep their foreign sales above 2.4 million tonnes per year. Meanwhile, **OCP** itself will be looking to place additional granular fertilizer into countries, as it looks to ramp-up its four new integrated acidulation/granulation lines. In our view this will affect OCP's ability to place rock into the international market.

## Jordan phosphate rock export profile

### JPMC phosphate rock exports, H1 2015, Q3 and Q4 2015 forecast



### JPMC phosphate rock exports, 1986-2020



Data: CRU, GTIS, IFA, Indian port arrivals, JSA

Moreover, while our forecast has turned bearish, the risk remains on the downside through 2020. Implicit in our base case assumptions is that OCP will continue to benefit from weak production fundamentals in **Syria** and **Tunisia**. In recent forecasts, we've removed export focused projects from our base case project line up, including FOSPAC and Mine Arnaud, which should provide more breathing room for OCP. However, should such projects succeed, OCP will be even more squeezed on the traded market beyond our current forecast of 5.4 million tonnes by the close of the medium-term forecast.

**Jordanian** exports of phosphate rock are expected to have been 3% higher in 2015 than in 2014. Of the 4.7 million tonnes of rock that **JPMC** is expected to have exported in 2015, 70% (3.3 million tonnes) is expected to have gone to India, with Indonesia taking a further 14% (0.6 million tonnes).

Of the remaining 0.7 million tonnes which we forecast **JPMC** exported to other countries in 2015, 0.32 million tonnes is expected to have gone to Eastern Europe, divided roughly equally between Bulgaria and Serbia. In 2015, we predict that **JPMC** will have produced 6.56 million tonnes of rock, implying it will have produced 1.90 million tonnes of rock over and above its export requirement.

Over Q1-Q3 2015, JPMC delivered 2.18 million tonnes rock to India, with 42% of the material going to the eastern port of **Paradeep**, primarily to service downstream producer **IFFCO Paradeep**. According to Indian port arrivals data, the western ports (**Hazira**, **Haybunder**, **Dahej** and **Mumbai**) took 36% of the JPMC material. The southern ports (of **Kakinada**, **Vizag**, **Tuticorin**, and **Chennai**) took 21% of JPMC exports to India over the period.

We anticipate that **JPMC**'s rock exports will reach 5.4 million tonnes in 2016, the highest level since 2011, as new mining capacity comes on stream. This year will see **Jordanian** rock capacity reach 12.05 million tonnes/y, up from 11.06 million tonnes in 2015. Thereafter, we expect **JPMC**'s exports to gradually decline, dropping to 4.18 million tonnes by 2020. That year, the country's production capacity will have dropped to 11.07 million tonnes/y rock.

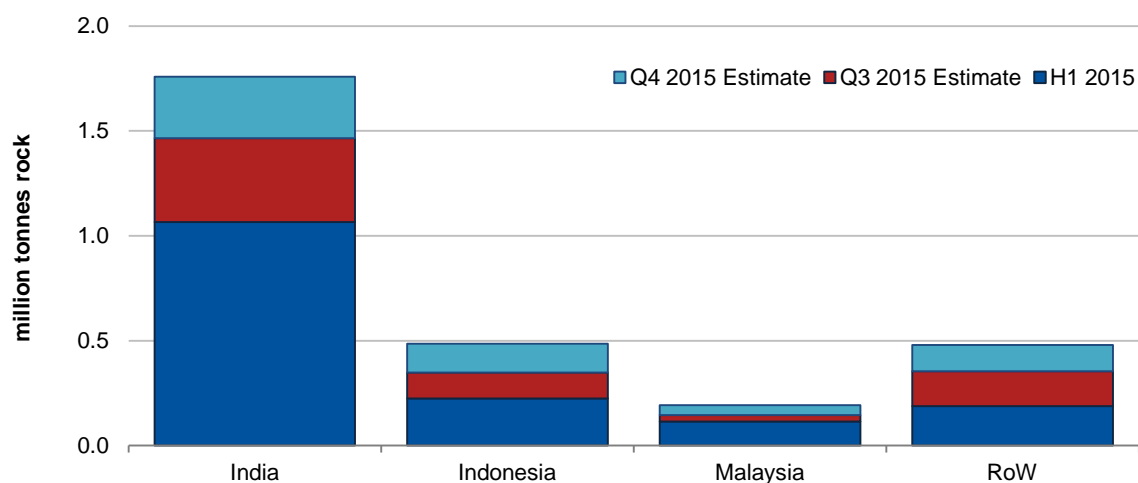
**Egyptian** rock exports slowed to 604,000 tonnes in Q4 2015, down from 720,000 tonnes in Q3. That said, the Q4 2015 total was above the 539,000 tonnes recorded in the same quarter one year earlier. Growth in exports to India over Q4 y/y meant that Egypt's total export performance over H2 2015 (1.3 million tonnes in total) was an improvement on total exports seen in H2 2015 (1.1 million tonnes). This y/y improvement was largely due an 82% increase in sales to **Indonesia** (Egypt's second largest phosphate rock trading partner) y/y in H2 2015. Sales to India remained essentially flat y/y in H2, despite y/y declines in the final quarter of the year.

**India** is **Egypt**'s biggest rock trading partner and Q4 2015 exports to the country were down 21% the same period in 2014. Weak demand from this key trading partner over the final quarter was driven by high stockpiles of phosphate fertilizer, declining crop prices and weather concerns.

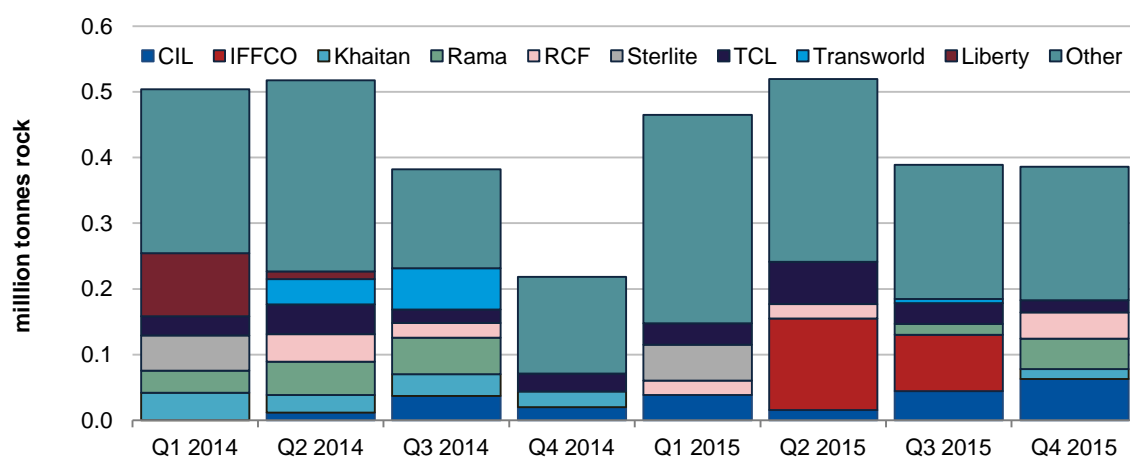
According to port statistics, 43 Indian companies imported rock from Egypt over H2 2015. Around 86,000 tonnes was sourced by **IFFCO** for delivery to into **Paradeep port** (down from 140,000 tonnes in H1) for the production of phosphoric acid and DAP. Here the rock is blended with **Moroccan** and **Jordanian** rock before being fed into the company's on-site phosphoric acid unit. A further 108,000 tonnes of Egyptian rock was sourced by **CIL** during H2, an increase on its H1 purchases of 54,000.

## Egypt phosphate rock export profile

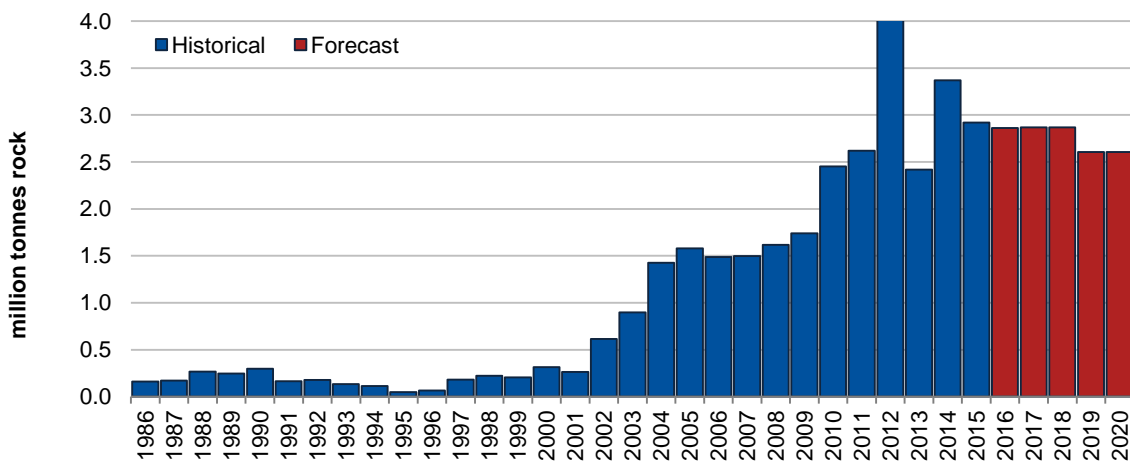
### Egypt phosphate rock exports, H1 2015, Q3 and Q4 2015 forecast



### Egypt phosphate rock sales to India by major importer, Q1 2014 – Q4 2015



### Egypt phosphate rock exports, 1986-2020



Data: CRU, GTIS, IFA, Indian Port Arrivals



Of the tonnage which CIL took in H2, 63,000 tonnes went to **Hazira port** for SSP production. Some 12,000 tonnes went to **Chennai port**, where **CIL** operates an acidulation unit. Indian port arrivals data over H2 show that **Egyptian exporters** have gained tonnage into CIL's operations at the expense of arrivals from **Israel (ICL)**.

In H1 2015, ICL sales to CIL stood at 73,000 tonnes – exceeding Egyptian sales of 54,000 tonnes. The situation switched completely in H2 as **ICL** sales fell to 10,000 tonnes but Egyptian sales rose to 108,000 tonnes.

While most the other trades are comparatively small, the Egyptian exporters were able to sell larger H2 tonnages to **Rama Phosphates** (63,000 tonnes) and **Sun Fertilizers** (57,000 tonnes). Sales to Rama, for the production of SSP, were slightly weaker in H2 than H1, as 15,000 tonnes were sent to **Dharamtar port** in H1 but not in H2. In the second half of the year, Egypt's sales to Rama went to **Jaigarh** and **Hariza** ports. Sun fertilizers mainly took Egyptian rock at **Hazira** and **Kandla ports**, with a minority of tonnage going to **Kakindada**.

Outside of **India** and **Indonesia**, **Egypt** also made gains y/y gains in H2 2015. The main success stories were:

- **China**, where 63,000 tonnes was sold in H2 2015, versus no sales in the same period of 2014.
- **Brazil**, where 52,000 tonnes was sold in H2 2015, versus no sales in H2 2014.
- **Eastern Europe**, where 108,000 tonnes was sold in H2 2015, versus 39,000 tonnes in the same period of 2014. Sales to **Poland** stood at 44,000 tonnes in H2, around double the H1 figure and over five times as much as in H2 2014. Sales to **Romania** also rose to 55,000 tonnes in H2 2015 – about 70% higher than H1.

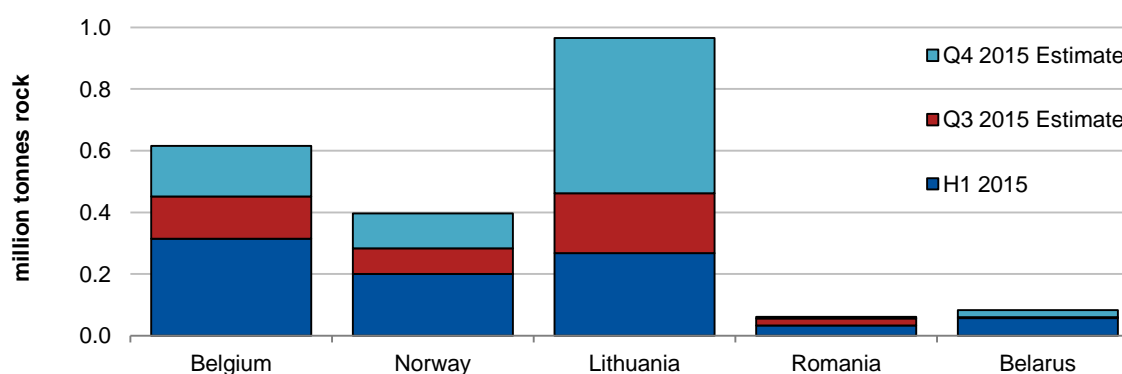
Gains in Eastern Europe in H2 (versus H1) were partially offset by declining sales into **Western Europe**, particularly **Spain** and **Italy**. Compounding this, there are downside risks to Egypt's performance in Eastern Europe – the country faces increasing competition from **OCP** and **ICL**, and **Grupa Azoty's Afrig** mine is likely to lower import requirements. Finally, sales into **Malaysia** also proved a blow, falling to 79,000 in H2 from 116,000 in H1 2015.

Going forward, we expect increasing competition to squeeze Egyptian exporters. Competition into the Indian and South East Asian rock markets is a particular worry. Exports are forecast to tread water until 2018 before coming down over 2019-20.

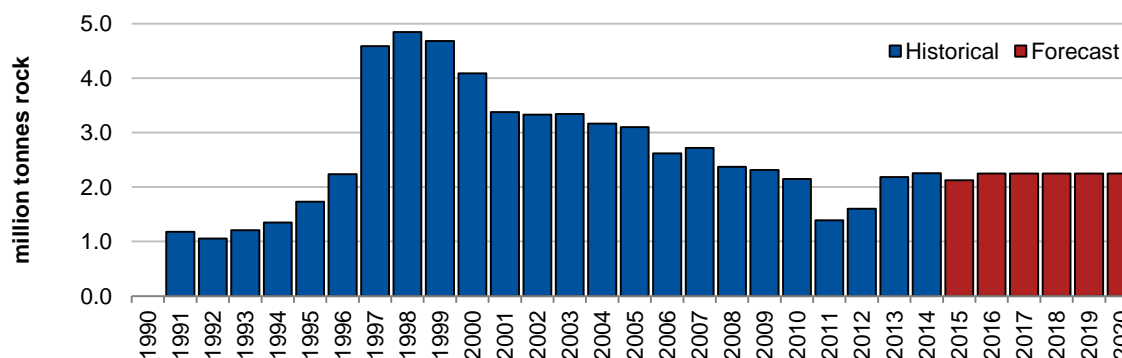
**Russian** phosphate rock miners continued to export to five destinations in 2015: **Belgium, Norway, Lithuania, Romania, and Belarus**. Despite the estimated 52% y/y increase in exports in Q4 2015 of nearly 810,000 tonnes, annual exports in 2015 fell in each of the first three quarters of the year when compared to the previous. Consequently, rock exports declined 6% y/y down to 2.1 million tonnes – as the favourable cost position of downstream producers in Russia encouraged greater captive consumption of rock for the export of ammoniated phosphates, NPK and NP+S.

### Russia phosphate rock export profile

#### Russia phosphate rock exports, H1 2015, Q3 and Q4 2015 forecast



#### Russia phosphate rock exports, 1990-2020



Data: CRU, Azotecon, GTIS, IFA

Considering this, we understand that Russian rock exporters strategically lowered sales into Romania and Belarus; where annual exports fell by an estimated 38% and 80% y/y down to around 60,000 and 85,000 tonnes respectively in 2015. Combined sales to major customers in Belgium and Norway remained more stable, reflecting a 4% y/y increase; exports to Belgium increased by an estimated 12% y/y to 615,000 tonnes and exports to Norway declined by an estimated 6% y/y to below 400,000 tonnes.

Rock exports from EuroChem to its wholly-owned subsidiary AB Lifosa are estimated to have increased by 43% y/y up to nearly 1.0 million tonnes in 2015. This resulted mostly from an increase in exports over H2 2015, particularly Q4 2015 where exports reached 500,000 tonnes in 2015 compared to around 175,000 tonnes the same quarter of the previous year. We understand the primary reason for this to have been the company's decision to stop importing rock from OCP subsidiary Phosboucraa in 2016 and consequently build stocks to blend with whatever rock it might continue to import in the next year.

In 2016 and throughout the medium-term, we forecast Russian rock exports to increase marginally at a total of around 2.2-2.3 million tonnes as more product will be available for export as **Acron** ramps-up and doubles capacity by 2020 and as **EuroChem** switches to using **Taraz** (Kazakh) rock at its **BMU** plant.

We estimate that rock exports from **Senegal** in 2015 increased by 58% y/y to around 845,000 tonnes – with a 47% and 87% y/y increase in exported rock in each respective half of the year. There were notable increases in exports of 19% and 11% to Spain and Poland, where exports from **Sephos** to the former and **Afrig** to the latter totalled an estimated 100,000 and 300,000 tonnes respectively.

However, Senegalese sales to major buyers in Spain and Poland, which accounted for 18% and 54% of exports in 2014, fell to 13% and 36% in 2015. This resulted for two reasons; (i) the 122% increase in exports to CIL in India that totalled nearly 68,000 in 2015 and (ii) the appearance of over 40,000 tonnes and 190,000 tonnes of exports to Agrium in Canada and LCC in Lebanon during 2015 that were absent the previous year.

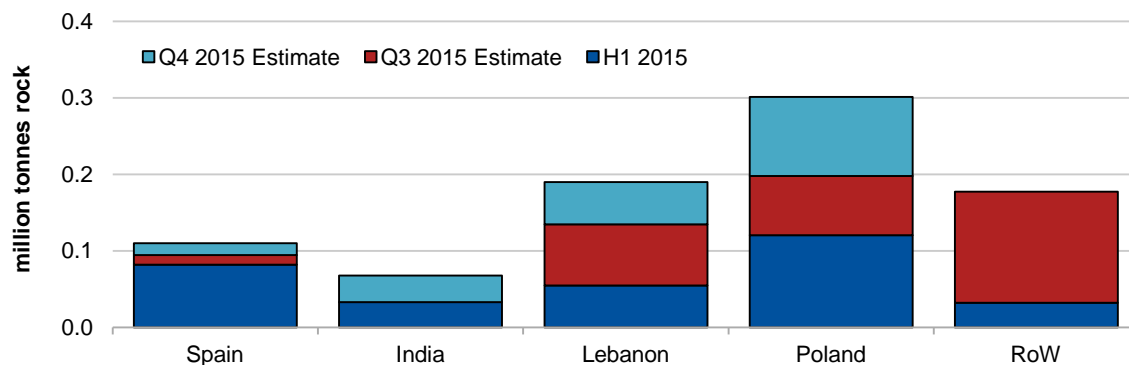
With the commissioning of the export-oriented **Avenira – Baobab** phosphate rock project of 0.5 million tonnes/year capacity in H2 2016, we forecast a 37% y/y increase in annual exports, which we estimate will total over 1.1 million tonnes this year.

Conversely, rock exports from **SNPT** in **Togo** declined by an estimated 13% y/y to around 920,000 tonnes in 2015. The 525,000 tonnes of exports in H1 2015, of which 28% was sold to Canada and 45% went to India, represented a 4% y/y decline. The appearance of rock exports to Canada, which was previously absent as a market, disappeared altogether in H2 2015 as exports over the half fell by an estimated 23% y/y at below 400,000 tonnes. Besides some sales into East Asia and Australia, India continued as the largest buyer of SNPT rock, but here sales in 2015 fell by around 37% y/y to an estimated 305,000 tonnes in 2015H2.

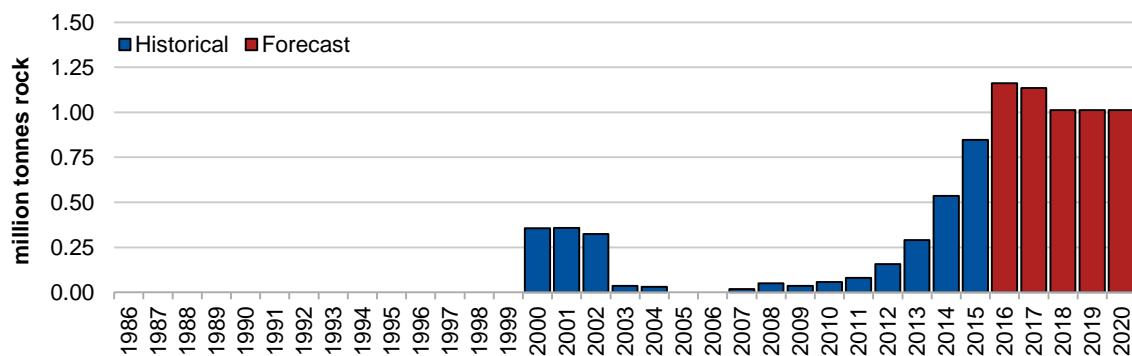
The largest buyer of **SNPT** rock in India over 2015 was CIL, which imported monthly volumes from April-onwards to a total of 356,000 tonnes. The remaining 35% of exports from SNPT to India were to Hindalco (c. 150,000 tonnes) and RCF (c. 30,000 tonnes).

## West Africa phosphate rock export profile

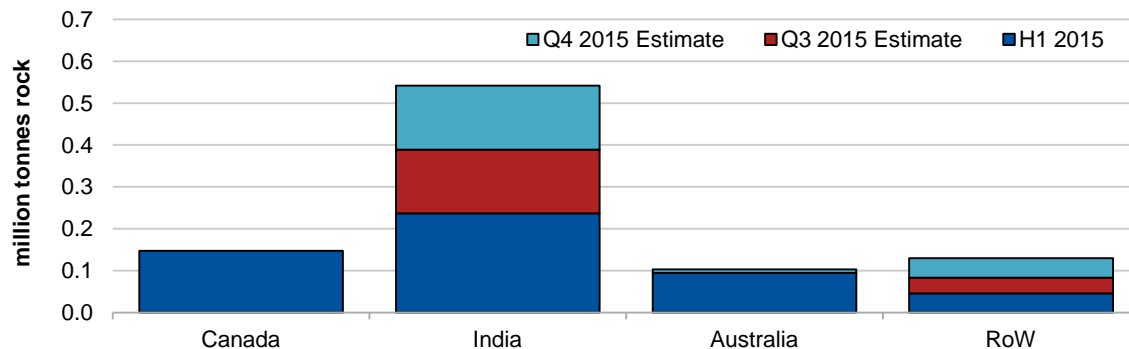
### Senegal phosphate rock exports, H1 2015, Q3 and Q4 2015 forecast



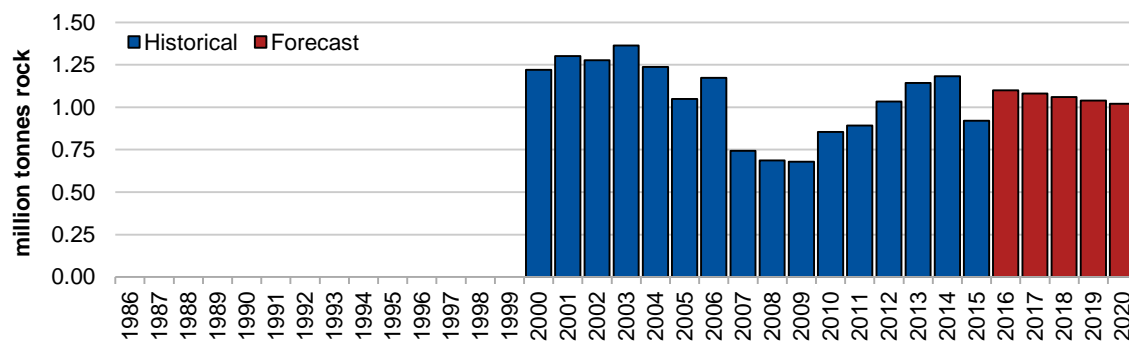
### Senegal phosphate rock exports, 2000-2020



### Togo phosphate rock exports, H1 2015, Q3 and Q4 2015 forecast



### Togo phosphate rock exports, 2000-2020

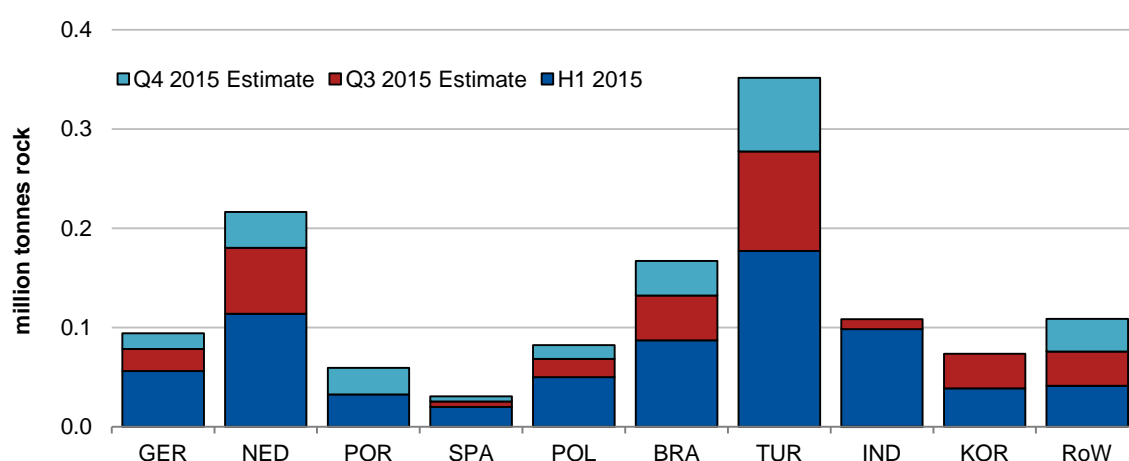


Data: CRU, ANSD, GTIS, IFA

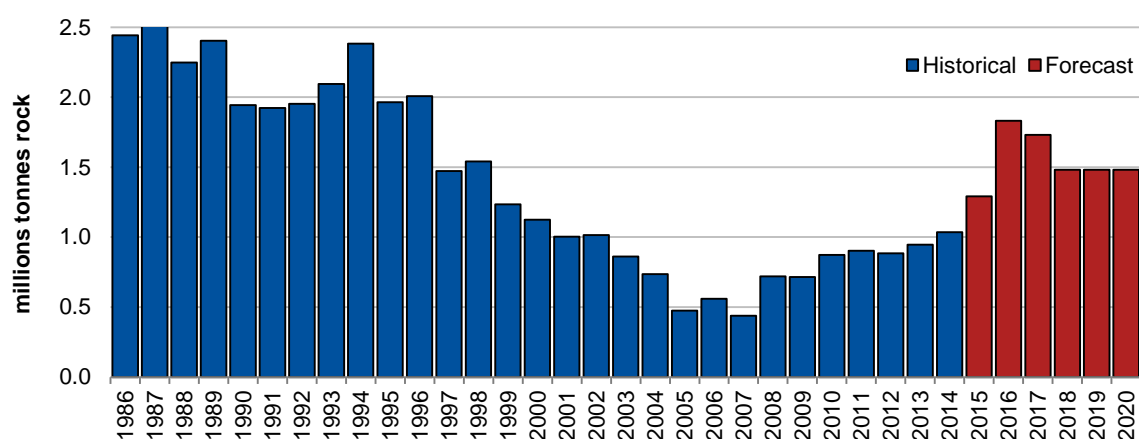
**Israel** exported an estimated 1.3 million tonnes in 2015 as **ICL** was forced to sell more rock following the fire at its SSP unit, but also because of increased demand from Brazil and Turkey. This resulted in a 25% y/y increase in ICL's exports. Shipments to Brazil increased from just below 20,000 tonnes in 2014, to over 165,000 tonnes in 2015. Most of this understood to have been to its subsidiary **Fosbrasil**, which it acquired in December 2014. Likewise, sales to Turkey, where ICL's Rotem-Turkey produces MCP and DCP, increased by 79% y/y up to over 350,000 tonnes. This resulted in Turkey becoming the largest destination of Israeli rock, exceeding the Netherlands, where ICL rock exports to its wholly-owned subsidiary ICL Fertilizers Europe remained flat y/y around 215,000 tonnes in 2015. Conversely, ICL rock sales into India, which totalled nearly 195,000 tonnes in 2014 and accounted for 20% of all exports, fell to just 8% of total exports at below 110,000 tonnes in 2015.

### Israel phosphate rock export profile

#### ICL phosphate rock exports, H1 2015, Q3 and Q4 2015 forecast



#### ICL phosphate rock exports, 1986-2020

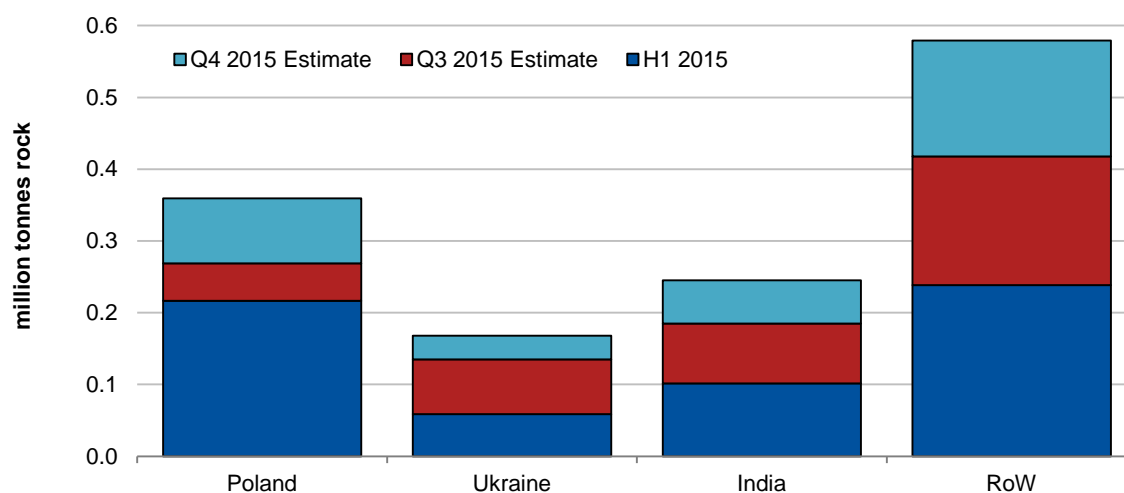


Data: CRU, GTIS, IFA

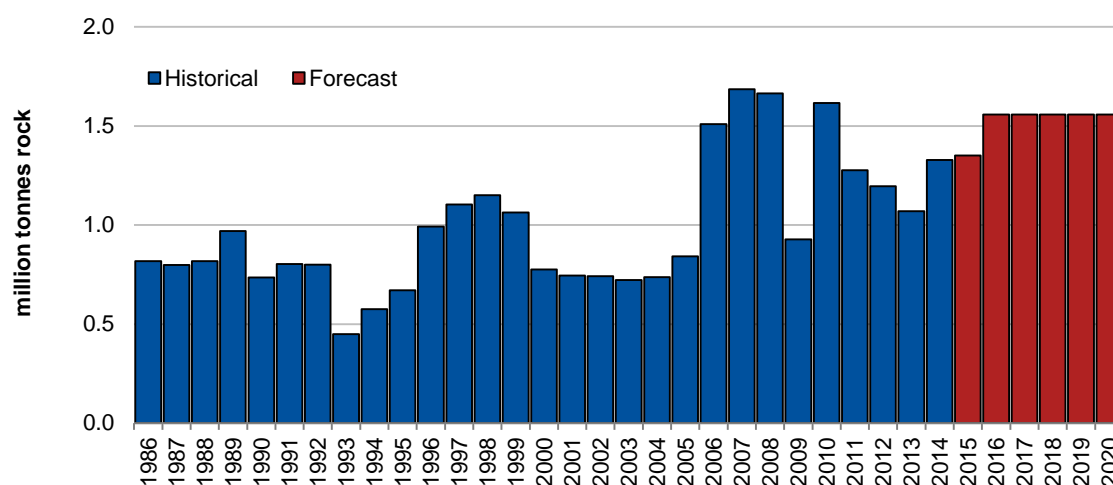
After a 53% y/y increase in rock exports from **Syria (Gecopham)** over Q1 2015, trade fell consistently y/y in the remaining three quarters. Combined exports in the last nine months of the year fell by 48% y/y. Sales to major buyers in 2014 fell back in 2015: exports to Lebanon (LCC) fell by 7% y/y, sales to Bulgaria (Agropolychim) contracted by 53% y/y, exports to Greece (ELFE) fell by 75%, and exports to Romania and Ukraine fell by 77% and 37% y/y. These five destination combined represented 83% of total rock exports in 2014, but are estimated to have fallen to around 70% in 2015 as exports to other destinations ramped up. In particular, sales to Belarus (Gomel) increased from below 10,000 tonnes 2014 to 145,000 tonnes in 2015. The expectation is that **Gecopham** will continue to operate, but struggle to export much more than 300,000 tonnes/year through to the close of the forecast.

### Algeria phosphate rock export profile

#### Somiphos phosphate rock exports, H1 2015, Q3 and Q4 2015 forecast



#### Somiphos phosphate rock exports, 1986-2020



Data: CRU, GTIS, IFA

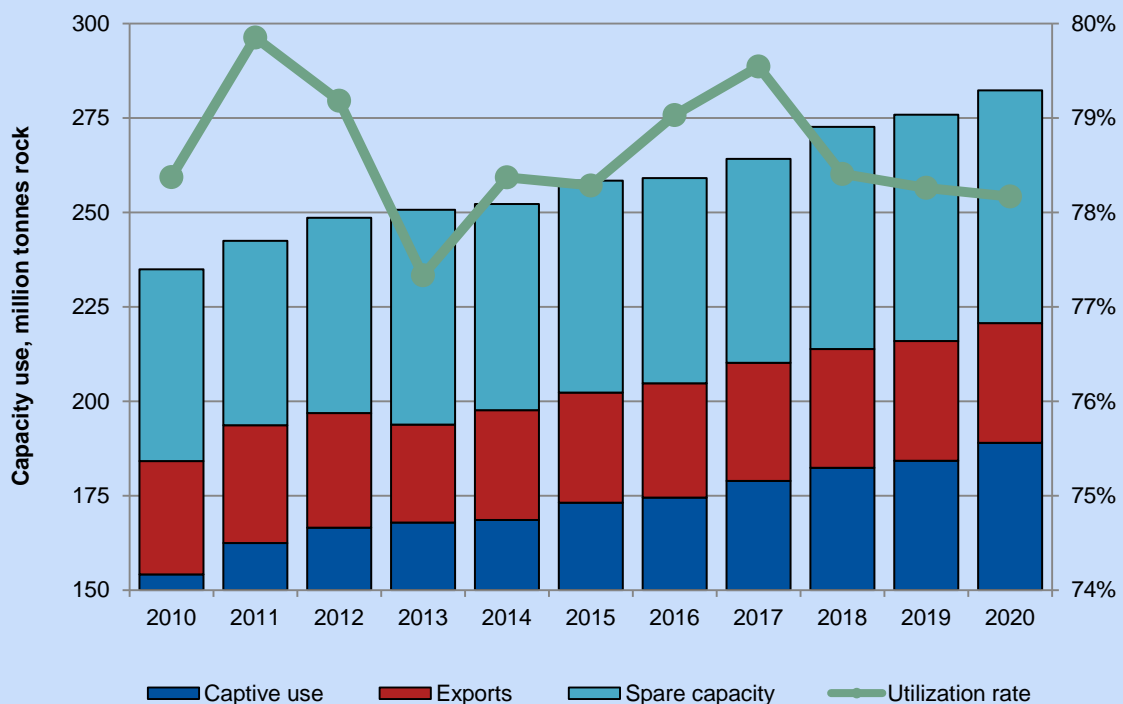
In **Algeria**, **Somiphos** is estimated to have exported 1.3 million tonnes during 2015, with shipments picking up in H2 after an unusually slow Q2. Gains were made y/y into **Belgium, France, Spain and Croatia**, although **Polish** volumes fell well short of expectations (and also previous totals), as market share was lost to **Senegalese exporters** (mainly **AFRIG** – which is **Grupa Azoty's JV** in Senegal). Outside of **Europe**, sales suffered into **Brazil**, falling by a third y/y to 85,000 tonnes, as **Fertipar** and **RISA** both consumed less rock in 2015. Similarly, weaker demand from the **Ukraine** saw Somiphos' exports fall by around 30,000 tonnes y/y. One positive was the growth achieved into **India**. Last year, Somiphos was able to ship 245,000 tonnes of rock into **India**, which represented a y/y growth of 216,000 tonnes. In addition the company was also able to double its sales to **Belarus** in 2015. While this remains a small market for them (50,000 tonnes), there does appear to be a longer term opportunity here, given the latter's switch away from **Russian** product.

## Phosphate rock supply/demand position

Global phosphate rock capacity is estimated to have reached 258.4 million tonnes in 2015 – an upward revision from our earlier estimate of 257.7 million tonnes. The revised 2015 estimate reflects a y/y increase of 6.2 million tonnes versus actual 2014 capacity. Global production in 2015 is estimated to reach 202.3 – an upward revision from our earlier estimate of 195.6 million tonnes. The revised 2015 figure is a 2.4% increase on 2014 production of 197.6 million tonnes.

The significant upward revision in production, combined with smaller upward revisions in capacity, imply an upward revision to 2015 operating rates. We expect global operating rates to climb gradually to 80% in 2017, before new capacity in Saudi Arabia and Congo causes them to fall back.

## Global Phosphate Rock supply/demand position



Data: CRU

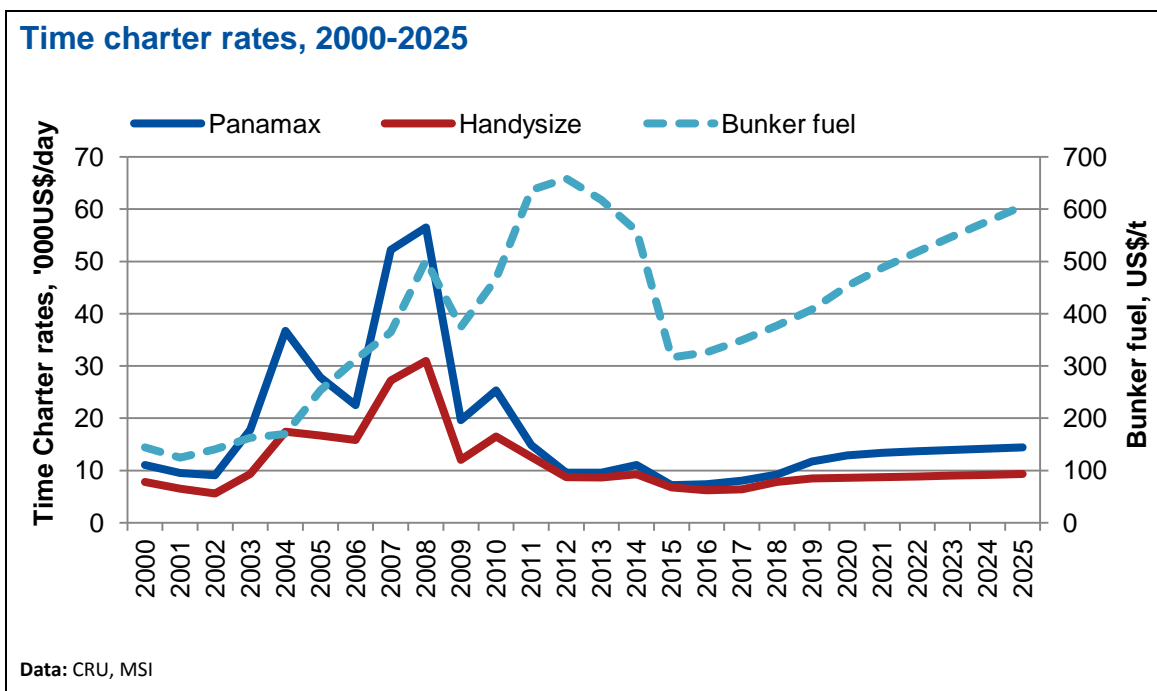
Global phosphate rock demand in 2015 is forecast up nearly 4% y/y to nearly 201.8 million tonnes. Greater ammoniated phosphate production in China was the main driver, raising annual rock demand by nearly 8% y/y to over 86.6 million tonnes. There were also increases in Russia and the Middle East that offset losses in Africa and Central & South America. Global phosphate rock demand is forecast to increase 1% y/y in 2016 to reach 204.7 million tonnes, as demand lost in East Asia is replaced by growth in North Africa, where OCP is set to commission the rest of its JPH-II-IV hubs over the year. This growth in annual rock demand is forecast to continue at around 2% CAGR to 220.7 million tonnes in 2020, with rapid growth in Africa and the Middle East, following the commissioning of large downstream projects in by OCP and MPC.



## 3.2 Medium-term outlook for prices

### 3.2.1 The outlook for freight rates

After trending down from early August 2015, the **Baltic Dry Index** (a composite measure of freight rates for dry bulk commodities) set a new record low in mid-February 2016. It has since risen modestly. This has been driven by lower oil prices compounding a glut of vessels built following the commodity price boom of the late 2000s.



Time charter rates (TCRs) for **Panamax** vessels are expected to have bottomed out in 2015 at US\$7200/day. By contrast, **Handysize** rates are expected to reach a trough in 2016, reaching US\$6200/day. This is because the two vessel types generally serve different commodity groups (e.g. coal in Panamax and potash Handysize). Phosphate rock is transported in both vessel types and the opening of a wedge between the two vessel types' TCRs could incentivise producers to substitute to Handysize vessels going forward. Over 2016-2020 Handysize TCRs are forecast to rise by 40% - with growth rates kept low by oversupply and weak demand - as Panamax rates increase by 75%.

### 3.2.2 The outlook for exchange rates

**US dollar posted January gains** as the Fed raised its benchmark rate by 25 basis points (to 0.50%) in mid-December; additional rate rises are likely to be implemented gradually. After appreciating by 12.8% on average in 2015, the trade-weighted US dollar gained another 2.1% over January. Given low US inflation, instability in financial markets, plunging oil prices and ongoing economic weakness in China, we believe a further rate rise before June is unlikely. Given the poor prognosis in emerging markets and the Eurozone, we expect the USD to

appreciate further over the medium-term, by 9% y/y in 2016. However, as emerging markets recover going forward, we expect the USD to depreciate, by 4% over 2016-20.

We expect the **Canadian Dollar (CAD)** will remain stable over 2016 at about 1.3 CAD:USD, before appreciating over the longer term, driven by a gradual recovery in oil and lumber prices.

**RMB policy change unsettled markets** as the People's Bank introduced a trade-weighted **Chinese yuan** index in December, replacing the USD as its FX reference. Having been surprised by the 'one-off' RMB/\$ devaluation in August, markets received the announcement poorly. Since its introduction, the index has fallen by 0.7%, due to a sentiment-driven 1.9% decline against the USD. Our expectation of slowing Chinese economic growth means we expect the RMB to depreciate in 2016: we forecast the RMB/\$ to trade at around 6.8 by the end of the year compared to 6.4 in 2015Q4. Going out to 2020 we expect the yuan to appreciate as Chinese economic growth rates remain robust versus more developed economies, attracting international investors.

**Things will get worse before they get better for the Aussie dollar.** The AUD held up better than expected in 2015Q4. However, the interest rate rise in the US, falling commodity prices and a substantial contraction in mining investment – which is impacting the domestic economy – are all negatives for the AUD. The commodity outlook remains tough in 2016 and CRU continues to expect that this will drive a further weakening of A\$. We expect a gradual recovery from 2017 as Australia's commodity exports in US\$ value terms begin to pick-up.

**Rouble declines continue** as the RUB has been hit hard by further falls in the price of oil. The importance of movements in the price of crude oil for the rouble is unlikely to fade and CRU has recently downgraded our oil price forecast, prompting downward revisions to our rouble forecast. We now expect the rouble to average 67 (roubles per US\$) in 2016 – it was 38 in 2014. Nonetheless, a gradual but sustained recovery in oil prices over the medium-term is expected to prompt an appreciation of the rouble after 2017.

**Latin American currencies remain in a funk** as the **Mexican peso** finished 2015 lower than its end-2014 value by 16.7%. Following the Fed, the Bank of Mexico moved to support the peso and raised interest rates for the first time since 2008. This, combined with low inflation, means the peso should not lose significant ground in 2016. We expect the peso to remain broadly stable over 2016-20. By the end of 2015, the **Brazilian real** had depreciated by 49% since the previous year-end and it fell by another 3.7% in January 2016. The central bank is trapped, since if it raises interest rates to curb inflation, it could jeopardize government's finances. We are likely to see inflation remain well above the central bank's target which means the real will get weaker before it strengthens.

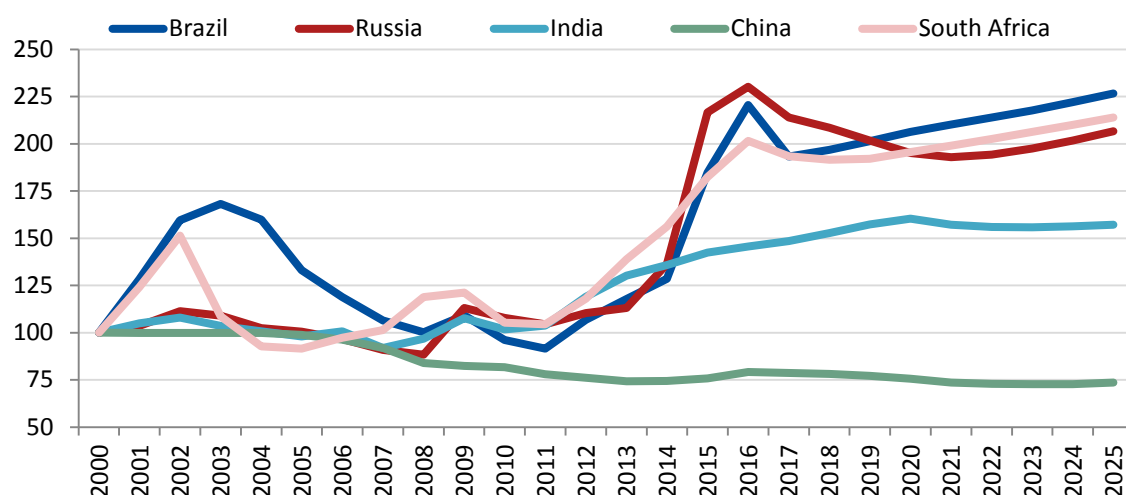
The **Argentine peso** depreciated unexpectedly following the decision to remove capital controls on December 17. Over the second half of December and January, the currency lost 41% of its value. Even relative to other currencies in the region, there is considerable volatility expected in the currency's future path as the government works to enact economic reforms. The collapse in the **Venezuelan bolivar** has been so significant as to materially affect the appreciation in the USD, as it is one of the currencies against which the UDS's trade-weighted exchange rate is constructed.

**Euro set to weaken, driven down by US policy.** The euro had a turbulent end to 2015 as ECB action undershot market expectations and the Federal Reserve raised interest rates in the US – thus, the long-heralded Fed-ECB policy divergence is finally underway. While significant risks remain around the timing and magnitude of US rate rises, CRU believes there will be sufficient divergence to push the euro to a low of US\$1.05/ € later this year, from late January levels of close to US\$1.09/€. Recent announcements suggest that the ECB is poised to step in should the Fed raise interest rates more slowly than expected. We expect the euro to depreciate by 4% over 2015-16 but to recover modestly after 2018 as the ECB starts raising rates itself.

**Rand dragged down by commodity weakness** as poor emerging market sentiment and fiscal and current account deficits compound the current weakness. However, estimates of the rand's fair value indicate the currency may be undervalued and we do not believe the current negative sentiment pertaining to emerging economies. Moreover, CRU commodity price forecasts suggest that there will be an improvement in several of South Africa's key export commodities, which should support the rand in the medium-term. There is potential for some moderate rand appreciation in the medium-term. We expect 14.0 ZAR:USD over 2016, appreciating to 13.3 by 2018.

**Moroccan dinar depreciates, driven by the euro.** The MAD depreciated over 2014-15 from 8.4 to 9.8 MAD:USD – driven lower by euro depreciation. (The currency is 60:40 EUR:USD weighted.) We expect a marginal further weakening over 2016-18, before a modest recovery driven by euro and USD FX movements.

## BRICS exchange rate forecast index, 2000=100



Data: CRU, Oxford Economics

OCP succeeded in raising the **FOB MOROCCO 68-72% BPL** price in September 2015 from US\$115/tonne to US\$123/tonne and prices for the benchmark remained steady over Q4. In Q1 2016 they have started to weaken, reaching US\$115/t in February. Yara and OCP settled Q1 2016 rock prices at the end of December, marking an undisclosed decline in prices across all grades.

### 3.2.3 The outlook for prices through to 2020

The benchmark is expected to come down over Q2-Q4 2016, weighed down by low end-use demand.

Other producers had seen their rock prices hold steady at the end of 2015 and into early Q1 2016, but have since seen slides. **FOB Jordan 66-72% BPL** maintained US\$115/tonne over H2 2015 and January, but this fell to US\$106/tonne in February. **FOB Jordan 73-75% BPL** behaved similarly, falling from US\$134/tonne to US\$123/tonne over the same period – this represents a US\$2/tonne erosion of its grade premium. By early February, JPMC had settled most of its phosphate rock contracts with customers for Q1 at a US\$10-13/tonne decrease from prices in H2 2015.

Egyptian producer Misr Phosphates has reduced its phosphate rock prices from the Red Sea. The company is charging US\$34-70/mt FOB for rock sales in the 24-30% P<sub>2</sub>O<sub>5</sub> range, a reduction from previous levels of around US\$6-7/tonne. The **FOB Egypt 60-68% BPL** benchmark stood at US\$69/tonne (ranging from US\$59-79/tonne) in February 2016, US\$3/tonne lower than in December. These three MENA benchmarks are also expected to decline over the course of 2016, driven lower by slackening demand from importers. The FOB Egypt price is expected to fall by 12% over Q1-Q4.

Table 3.1: Quarterly phosphate rock price forecast, US\$/tonne

	2015				2016				2017	
Price point:	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
fob Morocco, 68-72%BPL	115	115	117	123	115	107	105	101	107	104
fob Morocco, 80%BPL	132	138	145	150	135	124	120	114	123	119
cfr India, 71-75%BPL	143	143	143	146	137	127	123	118	123	121
fob Jordan, 68-72%BPL	112	113	115	115	107	99	96	92	97	95
fob Jordan, 73-75%BPL	133	133	134	134	126	117	114	109	114	111
fob Russia, 78-87%BPL	161	171	172	171	157	144	140	134	145	143
fob Syria, 60-73%BPL	85	85	87	91	86	80	78	76	80	78
fob Peru, 63-68%BPL	94	94	94	94	90	83	81	77	81	79
exw China, 61-65%BPL	62	61	60	59	66	63	62	60	64	62
fob Egypt, 60-68%BPL	69	68	68	71	69	64	63	61	64	62

Data: CRU, Fertilizer Week

After spiking in December and January to US\$100/tonne, the **FOB Peru 63-68% BPL** benchmark fell back to US\$95/tonne in February 2016. Vale is negotiating contracts with its regular buyers, including those in India who are pushing for lower prices.

Most producers were impacted by declining CFR India rock prices in Q1 2016. Negotiations dragged on into Q1 but the key benchmarks had trended lower: The **CFR India 65-70% BPL** benchmark stood at US\$105/tonne in February 2016, US\$113/tonne lower than in December 2015 – a 6.7% decline.

The higher grade Indian benchmark, CFR India 71-75% BPL, also declined but fared better – experiencing a 4.5% decline. This actually marginally increased the US\$/tonne premium of the high BPL benchmark. IFFCO settled its phosphate rock contract with JPMC for deliveries in H1 2016. The new price for 66-68% BPL is around US\$100/tonne CFR, according to sources in India. JPMC was not immediately available to confirm this information. The CFR India benchmark is expected to come down over Q1-Q4 2016, but is then expected to rise over H1 2017 as local demand picks up following the depletion of current high DAP inventories.

We generally expect rock prices to hold steady over 2016-18, with better quality benchmarks doing better than lower quality ones. Stability will be driven by OCP which will look to protect rock prices and will scale back export volumes if they are threatened, instead focusing on establishing market share in downstream fertilizer markets. The notable exceptions to the general trend are Russian rock, the price of which is forecast to come down significantly, and Chinese rock, the prices of which are expected to rise. Over 2019-20, most prices are expected to lift, supported by a broad-based uptick in demand.

Table 3.2: Annual phosphate rock price forecast, US\$/tonne

Price point	2015	2016	2017	2018	2019	2020	Δ '15-20
fob Morocco, 68-72% BPL	117	107	106	107	111	114	-3
fob Morocco, 80% BPL	139	124	126	127	132	135	-4
cfr India, 71-75% BPL	143	126	121	119	115	117	-26
fob Jordan, 68-72% BPL	113	103	98	99	103	105	-8
fob Jordan, 73-75% BPL	133	118	116	112	110	113	-20
fob Russia, 78-87% BPL	167	153	143	135	141	143	-24
fob Syria, 60-73% BPL	87	80	79	80	83	85	-2
fob Peru, 63-68% BPL	94	85	82	83	86	89	-5
exw China, 61-65% BPL	61	63	67	69	73	74	+13
fob Egypt, 60-68% BPL	69	64	63	64	67	68	-1

Data: CRU, Fertilizer Week

#### With respect to selected different benchmarks:

- We believe that OCP strategy will maintain **Moroccan benchmark** prices over 2016-18. The company's shift to downstream phosphate fertilizers and our belief that it will curtail rock exports in order to preserve rock sale margins should keep prices stable. After 2018, the benchmark prices are expected to rise in line with increasing downstream demand. Two additional drivers could support the benchmarks: we no longer believe mine Arnaud will come on line and secondly, OCP is building downstream capacity at Bou Craa – this could grow the differential between the two grade benchmarks.
- The **FOB Egypt** benchmark is generally the lowest price owing to its variable quality. After 2018, rising global demand and the possibility of increased producer co-ordination in Egypt (which would make it harder for traders to drive down prices) are expected to lift the benchmark.
- The **FOB Russian 78-87% BPL** benchmark is forecast to suffer erosion over 2015-18, driven by weakening demand for this high grade rock. This will see its premium over FOB Morocco 68-72% BPL fall from US\$50/tonne to US\$28/tonne. Despite these declines, the Russian product premium will be supported as the product is igneous. Additionally, export availability is declining – in 2012 EuroChem bought the Murmansk Port, which has limited PhosAgro's access to exports. After 2018, rising demand for downstream fertilizers will lift this benchmark, but rouble appreciation will squeeze producer margins.
- **Ex-works China** rock prices will increase throughout the forecast period as rock production costs rise on the back of increasing labour and energy costs. The Chinese rock market is relatively insulated from developments elsewhere, allowing this benchmark to buck the global trend.

- Peru has key export destinations in slim margin Indian producers, we expect the **FOB Peru** benchmark to be just low enough to keep these producers in business and purchasing Peruvian rock. This explains why the rock is at a significant discount to most other international benchmarks. As Indian demand picks up after 2018, the Peruvian benchmark should rise. OCP's focus on the development of downstream markets could tighten rock supply around this time, providing further scope for price rises in the Peruvian benchmark. Our recent decision to remove the FOSPAC mine project in Peru from our base case forecast will exert downward pressure on the benchmark, due to the relatively higher quality of the rock which the mine would have produced.

### Bearish and bullish factors that could impact prices

#### Bearish drivers

**OCP chooses to maximise rock export volumes** as DAP prices fall in 2019 and 2020

**Currently curtailed production in Syria, Togo and Tunisia** resumes production quicker than expected, making more rock available for export.

**State-driven investments push uneconomical projects**, resulting in unnecessary rock tonnage.

**Long-term contracts return as the preferred pricing tool**, resulting in average lower prices and more stable volumes.

**A dramatic reduction in phosphoric acid prices** would have a knock-on effect on phosphate rock prices. Indian buyers are reportedly demanding significant reductions for H1 2016. We are forecasting a smaller fall to US\$704/tonne in H1, down from US\$810/t in H2 2015.

**China imposes VAT on fertilizer sales**, if fertilizer producer margins are squeezed, affordability of rock for non-integrated producers will decline.

#### Bullish drivers

**Higher interest rates restrict credit for equity markets**, tightening supply prospects.

**Delay/cancellation of mine expansions** in Brazil and other import-orientated regions.

**Chinese market consolidates faster than expected**, tightening fundamentals & lifting prices.

**Tunisian production faces renewed disruption** from civil unrest and strikes.

**OCP decides to postpone or cancel further rock capacity expansions** to help balance the market.

**Foskor resolves acidulation problems** and rock exports fall from forecast levels.

## About CRU

CRU's reputation with customers across mining, metals and fertilizers is for integrity, reliability, independence and authority.

CRU's insights are built on a twin commitment to quality primary research and robust, transparent methodologies. You can rely on our work - our data, our views, our models - because we have built them ourselves, from the ground up, since our foundation in 1969.

The requirement for exclusive, first-hand knowledge has driven us to invest in a global team of analysts, the key to gaining a real understanding of critical, hard-to-reach markets such as China. CRU's people - whether delivering market outlooks, price assessments, cost analysis or consulting - focus on helping customers to make important business decisions.

Across a comprehensive range of commodities, we strive to provide customers with the best service and the closest contact - flexible, personal and responsive.

CRU - big enough to deliver a high quality service, small enough to care about all of our customers.



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# Appendix A

## The Long Term Outlook for the phosphate rock market

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### A.1 Introduction

The aim of this Appendix is to provide a long term trend price forecast for phosphate rock. The forecast takes into consideration the period between 2018 and 2038. In addition to providing a trend price, it includes an outlook for long term demand and supply.

There is a greater degree of uncertainty associated with the long term outlook; over time it becomes increasingly difficult to forecast the highs and lows of the economic cycle, whilst details about future supply and consuming projects become increasingly more uncertain. CRU utilises alternative methodologies in order to forecast long term market dynamics, shifting from a cyclically driven forecast (through to 2020) to focus on the structural elements that determine trend levels and rates of growth through time.

The most important concept of CRU's long term forecasting methodology is the Long Run Marginal Cost (LRMC) which reflects the cost of production (including a reasonable rate of return on capital expenditure) of the last plant required to meet forecast demand or the "marginal producer". The long run marginal cost methodology results in a price guide, around which the actual prices will oscillate.

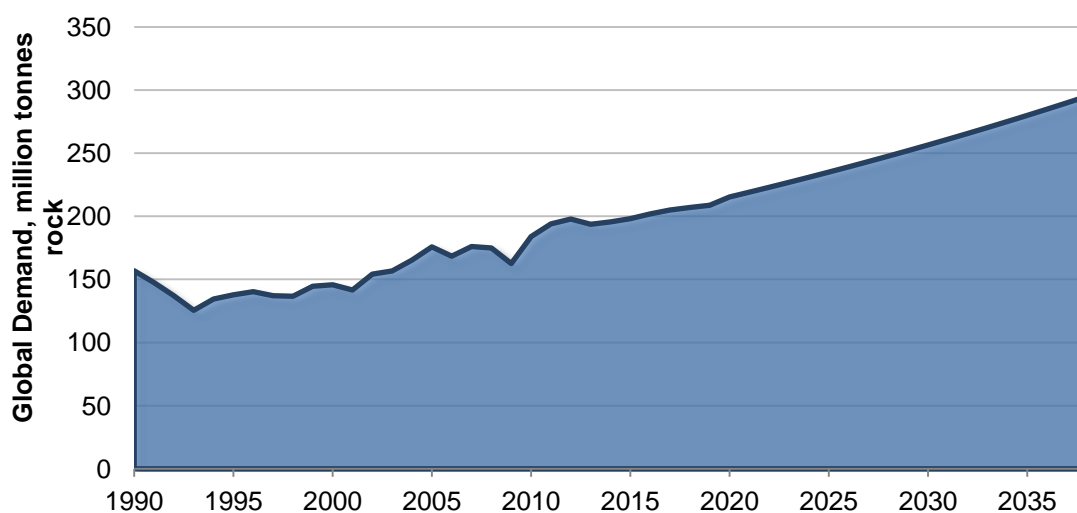
CRU recognises that actual prices will continue to be determined by a complex market environment where buyers and sellers are considering a number of different factors before agreeing to a price. Marketers are mainly short term price oriented where the next sale or the one after are their primary focus. The long term focus and market outlook are more useful tools for long term planning for senior management or strategy teams or for investors.

## A.2 The long term outlook for phosphate rock demand

Forecasting twenty five years into the future is a daunting task in any market, including the phosphate industry. This, however, is made easier by the assumption that virtually all phosphate will originate from its mineral rock form. While it is true that strides have been made in reducing run-offs and recycling in general, for the purposes of this analysis, future demand for phosphate rock will be driven by trend growth rates in population, food demand, livestock production, as well as relevant forecast indices or macroeconomic indicators.

CRU's medium term outlooks estimate phosphate demand on a country-by-country basis, which is then integrated into the value chain in order to determine a requirement for phosphate rock. In the case of demand from the agricultural sector, we forecast crop areas, disaggregated by country and crop, factoring in historical trends in crop prices, production, trade and the propensity of individual countries to switch between crops. Our methodology then switches to a high level assessment for global demand over the long run (2018-2038) that is based on extensive research that has been conducted into the fertilizer, animal feed and industrial/food phosphate industries. Our starting point for the long run analysis is to estimate total  $P_2O_5$  demand/supply, which will then determine the need for phosphate rock. Over the past two decades, the  $P_2O_5$  to phosphate rock consumption has ranged between 22-27%. In general, the ratio has trended upwards since the early 1990s, though fell back between 2010 and 2012. We believe the ratio will stabilize in over the medium term, thereafter recovering to 25.0% in 2038. Although rock grades are expected to continue to decline, there is still room for improvement on the recovery side, as more and more operations move over to using floatation cells.

Global phosphate rock demand, million tonnes rock



Data: CRU

Global rock consumption is forecast to grow from 202.8 million tonnes in 2014 to 295.0 million tonnes in 2038, equivalent to a 1.6% CAGR or an absolute growth of 92.2 million tonnes over the outlook period. This is based on the assumption that additional downstream phosphate application, whether it be for plant or feed rations, will have a beneficial impact on crop and/or livestock production.

Fertilizer feedstock will experience the bulk of the forecast growth (85-90%). As such, the balance between the fertilizer and non-fertilizer sectors will remain fairly constant between 2010 and 2038, with any losses on the industrial/food side likely to be offset by growth in feed consumption. Central to this scenario is that farmers will not only need more fertilizer, but that they will be moving towards achieving a better balance between nutrients. Hence P application will be favoured at the expense of N.

We also acknowledge that prevailing weather conditions will play a role in the scenario actually materializing. Weather patterns will become increasingly unpredictable and result in a substantial depletion of corn and wheat stocks. This has tightened the balance for both products, and in turn pushed their prices up over the past decade. Whilst our scenario assumes that weather patterns will become increasingly volatile, it also sees a gradual improvement of crop growing conditions in the world's main agricultural markets. This will favour crop production, and in turn encourage fertilizer application.

### The long-term outlook for food and agricultural markets

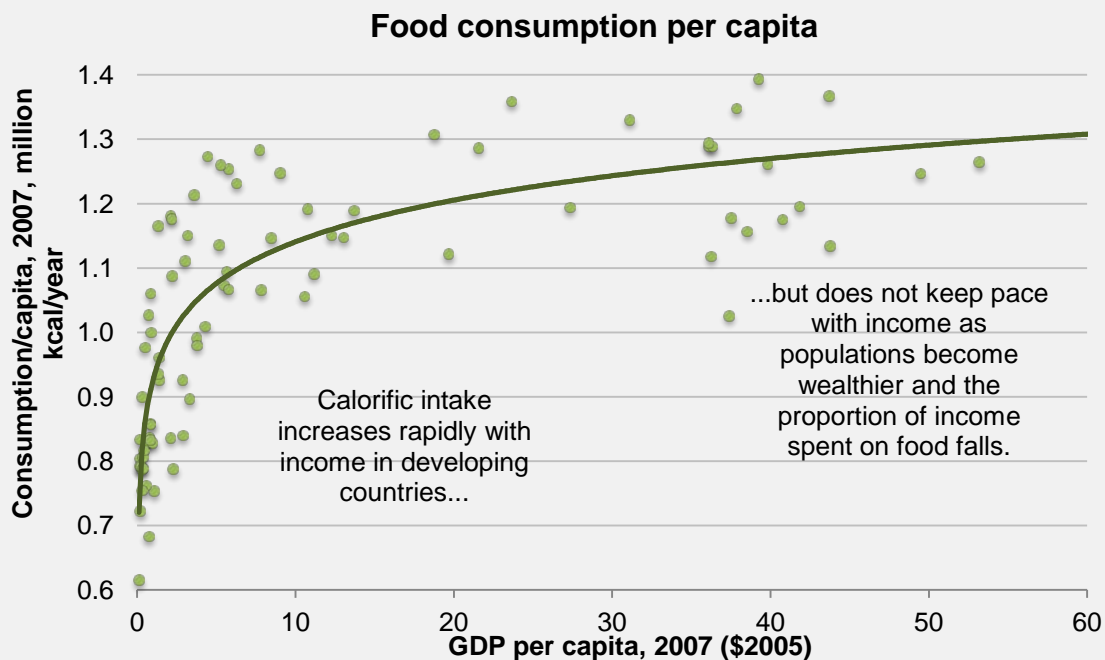
Demand for fertilizers is determined by the outlook for crop production, which is related to food consumption, as well as the need for animal feed, natural fibres and biofuels. Taking into account these, in order to forecast **medium term** fertilizer consumption, CRU uses a bottom-up forecast of nutrient demand, based food demand and crop plantings forecasts. These take into account factors such as planted area, applications rates (which are affected by fertilizer prices and crop prices) and economic cycles and population growth (and in turn changes in income and diet).

Over the **long term** it becomes more difficult to predict the development of many of these variables, especially the timing or duration of economic cycles driving income changes. Instead, the focus is on the structural elements that determine trend levels and rates of growth through time. The drivers of fertilizer demand that will persist over the long term will be food consumption (driven by population growth and changes in income) and changes in productivity. There are also issues that deserve consideration as risks to these drivers, such as resource availability, technological advances, and climate change. This section provides an overview for agricultural markets and fertilizer demand over the long term (2018-2038)

#### Food consumption

Over the long run, population and income determine food consumption. CRU has examined food demand measured by calorific intake as a function of per capita GDP. A 2007 study from the Food and Agricultural Organization of the United Nations (FAO) demonstrated that as income per capita rises in

developing countries, their calorific intake also increases rapidly, but over time growth in calorific intake does not keep pace with growth in income.

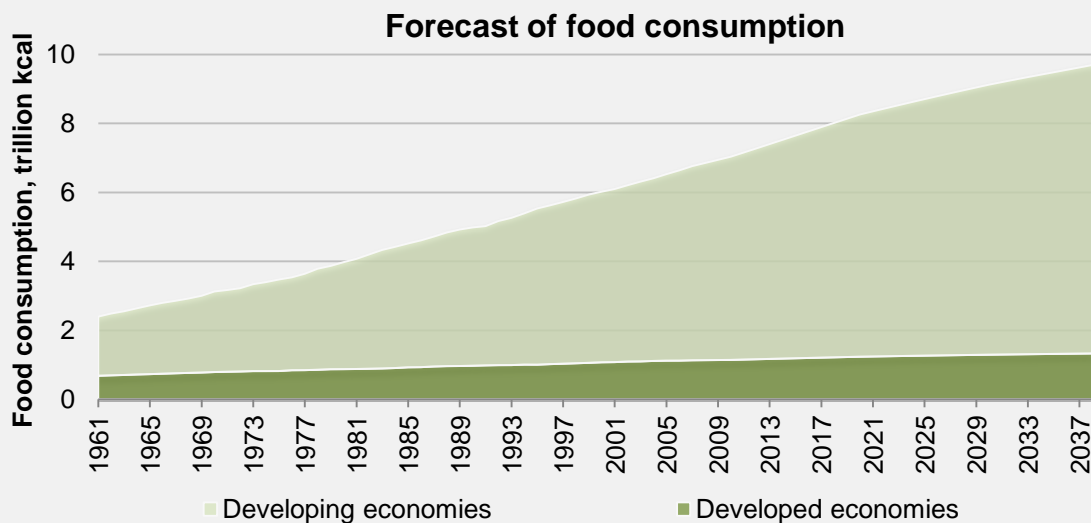


**Data:** FAO; CRU

Changes in income lead to shifts in diet. As income rises, people move away from staple foods, such as cereals, in favour of higher-value products including meat, edible oils and dairy. For example, according to the FAO, from 1990-2007 incomes in East Asia rose by 6.0% per annum.

During this time consumption of meat and fish rose by 3.6% per year and consumption of eggs and dairy products rose by 5.9% per year while consumption of cereals and root vegetables actually fell. In particular the shift in favour of meat consumption requires higher levels of agricultural production and resource use (animal feed requires significant quantities of grain).

CRU has made forecasts of food consumption, measured by calorific intake based on the position of key regions on the curve, and projections for population and GDP. This means that regions with lower incomes are assumed to experience faster food consumption growth in than those with higher incomes per capita.



**Data:** FAO; CRU

The forecast for food consumption assumes that the world population will grow from 7.2 billion in 2014 to 8.8 billion by 2038, equivalent to CAGR (2014-2038) of 0.8%. Growth will increasingly be driven by the developing economies, which can still support relatively rapid labour productivity growth, and therefore GDP growth. The trend rate of world GDP growth is projected to be close to 3.0% per annum to 2038. Based on population and income growth projections, CRU forecasts world food consumption (measured by calorific intake) to reach 9,700 trillion kcal/year by 2038. This is in comparison to 7,700 trillion kcal/year in 2014.

## Agricultural production

Whilst crop production is subject to seasonal and cyclical variations, such as unpredictable weather conditions and changes in crop prices, over the long-term, agricultural production growth tracks demand. However, the ability of agriculture to feed 8.8 billion people the 9,700 trillion kilocalories we forecast to be needed by 2038, will be governed by resource constraints and agricultural productivity. These issues are considered below.

### (i) Resource constraints

The **availability of land and water** are the most notable resource constraints to future agricultural production. Although producers will need to increase agricultural land area and/or increase yields, there are concerns that the availability of arable land may become a limiting factor.

The FAO estimates that around one third of the world's land surface is prime land (capable of yields of more than 80% of the "potentially attainable" maximum) and good land (capable of 40-80% of potentially

Whilst this seems ample for agricultural expansion, in reality much of this land is, in practice, unsuitable for crop production for the following reasons:

- 1) it is under an alternative competing use, such as woodland, urban areas, infrastructure;
- 2) available land is unevenly distributed, with the majority in sub-Saharan Africa and Latin America;
- 3) it may be unsuitable for most demanded crops (FAO does not distinguish suitability by crop type);
- 4) the infrastructure necessary to support large-scale farming may be inadequate or absent.

CRU believes in addition to any physical restriction on crop area expansion, there is an economic constraint that will be reached earlier (i.e. there could be land available but it might be uneconomic to farm, subject investment costs, land quality and prevailing crop prices). As this economic limit is approached it will become increasingly slow and costly to bring additional land into production, placing pressure on producers to achieve higher crop yields to compensate.

Based on current literature, CRU is of the opinion that overall the world will not reach the physical and economic bottleneck in land availability within the forecast period, but shortages of arable land will pose problems in some areas, notably North Africa and parts of Asia. Moreover, there will need to be the incentives in place, including higher crop prices and public investment, in order to enable the investment needed to create roads, silos, ports and other requirements, as well as for farm machinery, agronomy, herbicides, pesticides and significant nutrient applications to make available land productive.

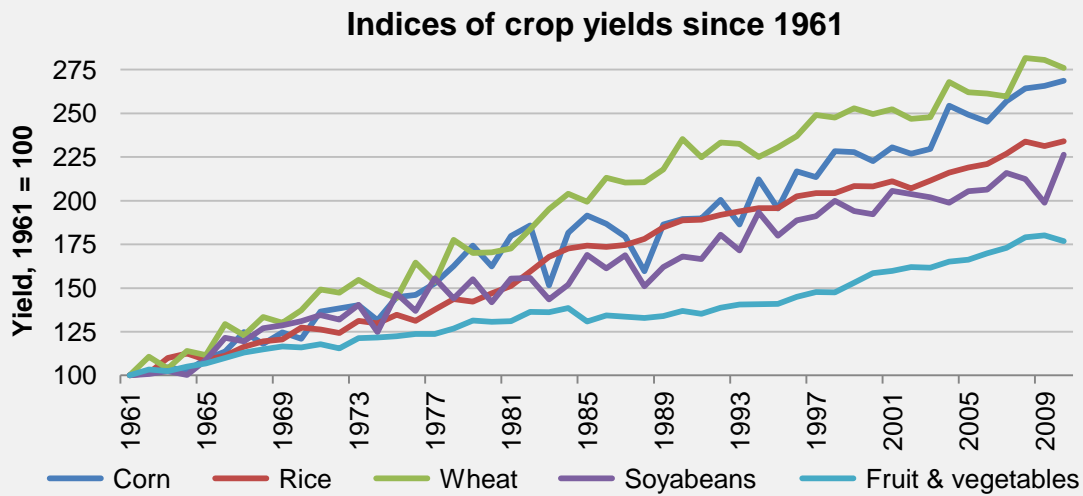
Water scarcity is a complex issue, on account of the many competing demand sectors, such as residential, agricultural and industrial. The agricultural sector is by far the biggest consumer of water, but its share of global freshwater withdrawals has trended downwards since the late 1980s. Nonetheless, according to the FAO, there are still ample opportunities to increase water use efficiency, through better water resource management, provided the necessary incentives are in place.

On balance, given the high productivity of irrigated land, CRU believes that constraints on water resources represent a significant risk to demand growth for food and fertilizers over the forecast period. Despite there being sufficient water resources at a global level, the FAO and other bodies stress that these are unequally distributed, and that an increasing number of countries face water scarcity, most notably in North Africa, South Asia and parts of China. Moreover, climate change provides a greater degree of uncertainty, meaning increased risk of severe water shortages or flooding.

## **(ii) Agricultural Productivity**

Facing resource constraint, the main means by which agricultural producers can meet future demand is by increasing productivity. According to the FAO, over 1961 to 2009, more than three quarters of the world's growth in crop production can be attributed to improvements in

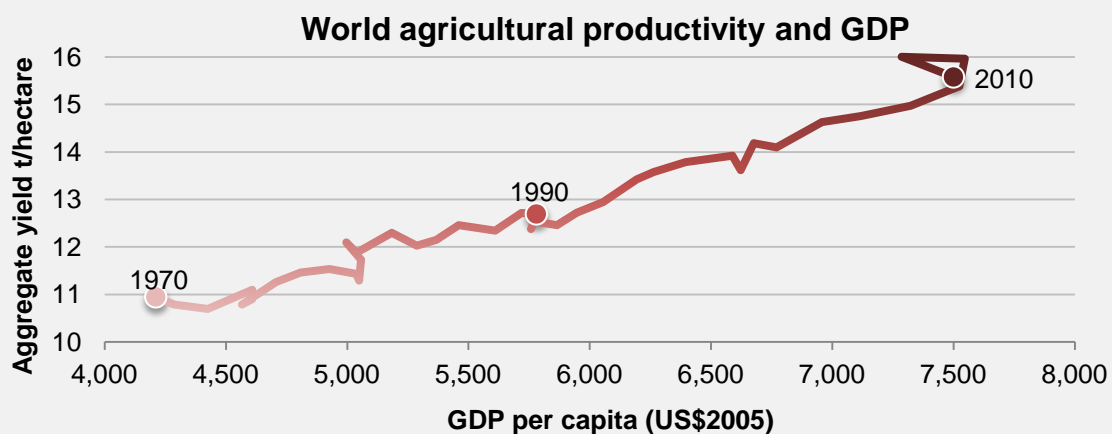
yields, as opposed to land expansion and increased cropping intensity. However, what is of most concern is **whether further improvements can be made in agricultural productivity to enable continued yield gains over the long term.**



Data: FAO

There has historically been a clear correlation between GDP per capita and crop yields, implying that further improvements can be expected based on our forecasts for income growth. Many countries still have scope to bridge the gap between attainable and actual yields through improvements in technology, crop husbandry, fertilization and irrigation.

Although there are concerns that further gains in productivity might not be possible from a technical perspective or that resource constraints may counter productivity gains, current literature suggests that further yield improvements over the forecast period are possible. However, the pace of change will certainly be dependent on public policy and investment measures to incentivise the necessary development. Although some efforts to improve productivity may have negative implications for fertilizer consumption (such as precision application techniques) fertilizer use will continue to play an important role in productivity gains in many countries.



Data: FAO; CRU



CRU has made a high-level forecast of future agricultural production based on food consumption and the assumptions discussed above. By taking into account changes in income, we account for dietary changes over the long term, but do not forecast any unforeseen step change linked to wealth effects. **CRU forecasts agricultural production to grow by 1.4% per annum to 2038, rising from 8.6 billion tonnes in 2014 to 12.1 billion tonnes in 2038.**

CRU's forecasts allow for some agricultural production being driven by non-food uses, most notably biofuel production. World biofuel output experienced exceptional growth of 22% per annum between 2000 and 2011, though this rate is slowing as governments exercise more caution in their policy support for biofuels compared to in the early 2000s. It is worth remembering that biofuel crops often yield other products (such as soyabean meal or distiller's dried grains), which are used in the food chain.

### **Risks to the Outlook**

The outlook presented above represents CRU's base case scenario for long term food demand, which is used to drive our long term forecasts for fertilizer demand. However, CRU recognises that forecasting over such a long period of time is fraught with risks and uncertainties, which could result in significantly different scenarios.

- Stronger than expected energy prices, or renewed policy support for biofuel initiatives could increase the share of industrial demand in future agricultural production. This would accelerate the period in which we reach the economic and physical land constraints.
- The long term impact of climate change is uncertain and we assume the net effect of climate changes and measures to tackle it are neutral. However, we expect greater unpredictability and extremity in weather events, and as such crop production.

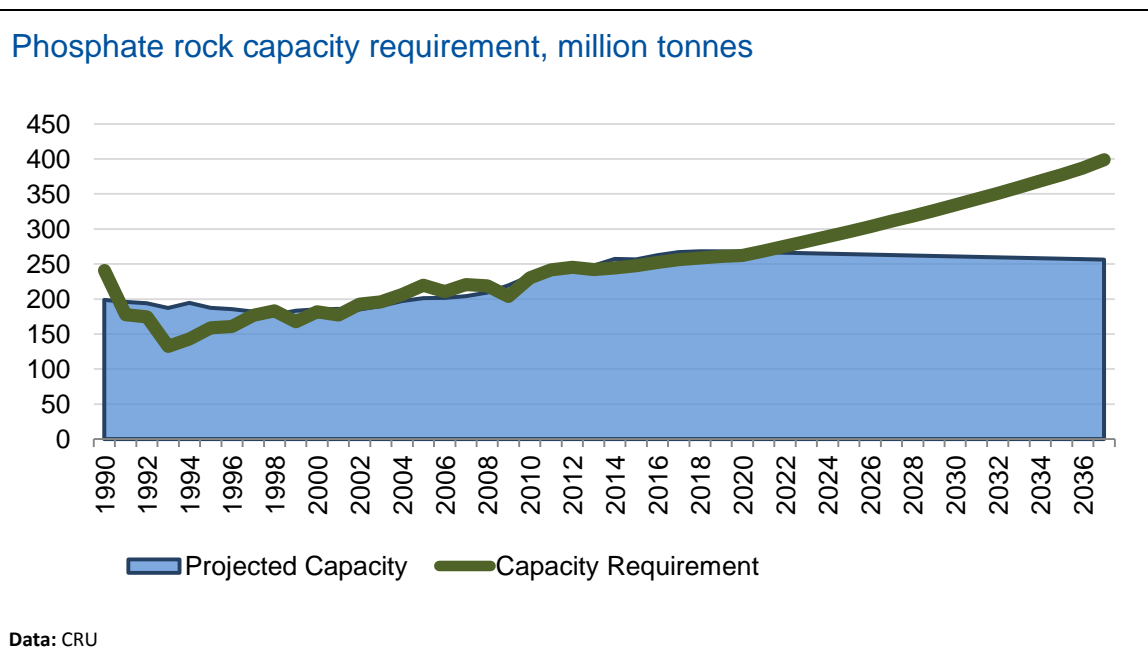
There are upside and downside risks associated with biotechnology and the introduction of new farming methods and technologies. An increase in yields resulting from such technologies would be associated with increased fertilizer demand. Conversely, many technologies aim at using bespoke formulations and targeted nutrient application to maximize the effect of fertilizers and minimize physical wastage, resulting in lower fertilizer unit consumption.

## A.3 The long term outlook for phosphate rock supply

The assumption is that future supply will need to increase in order to meet the future demand forecast. To demonstrate the magnitude of the investment needed, CRU first considers how much capacity will be required to meet long term demand. To do this, we have projected existing capacity forward, taking into account the potential for creep (i.e. increased production owing to productivity gains) and for closures (owing to the mothballing of inefficient capacity). This is based on the following calculation:

$$\text{Projected Capacity} = \text{Prior Year Existing Capacity (Including Firm/Probable Expansions Over Medium Term Forecast)} + \text{Capacity Creep} - \text{Closures}$$

CRU assumes that world production capacity will be unconstrained over the considered time period, with sufficient global phosphate rock reserves available. As such, it is believed that phosphate rock production will be able to meet total demand (fertilizer and non-fertilizer), which is therefore equal to the demand estimate (294.5 million tonnes rock in 2038). Implicit in this outlook is the assumption that the bulk of future demand will be for the acidulation of rock based on wet-process acid derivatives. Notably, we have also taken the view that closures (-1.0% per annum) will outweigh creep (+0.25% per annum) between 2017 and 2038. This opinion has been derived by the large volume of capacity that is expected on-stream in the latter part of the medium term forecast. Much of this capacity will be lower cost and more efficient than what is currently in operation, and therefore we are likely to see some closures of older mines, particularly in China.



The chart above shows the difference between projected capacity and requirement. Even if only the firm and probable capacity expansions are completed in the medium term, at an average

operating rate of 81% (which has been the average over the past decade), a need for new capacity will not arise until 2021. If this rate were to be dropped to 77%, the need for new capacity will be brought forward to 2019.

## A.4 Determining a long term trend price for phosphate

### A.4.1 Introduction to Marginal Cost theory

According to economic theory, competition among producers should set the price of a good at the Marginal Cost (MC), which is equivalent to the cost of producing the last unit of output required to meet demand. There are two marginal cost concepts used to forecast prices, namely: Short Run Marginal Costs (**SRMC**), and Long Run Marginal Costs (**LRMC**). These are applicable on different timescales.

The **short run** is defined as a period of time where capacity remains relatively fixed. CRU defines model, the short run as five years or less. Short run capacity can change with a closure or bottleneck of an existing mine or plant or capacity that is currently under development. More specifically, in the short term a producer only has the ability to respond to changes in demand and prices by controlling its variable costs which are dependent on its level of output. At least one, but in reality more likely several, of its input costs are fixed in the very short term (less than one year) and not dependent on the level of output (e.g. interest on debt, central overheads, etc.). Hence, operating decisions at existing producers are based on the relationship between market prices and operating costs. In the short run, the marginal producers are those producers who are at the top of the industry cost curve. For the phosphate industry, these are producers feeding on imported phosphate rock (or phosphoric acid).

Table A.1: Difference between short and long run marginal costs

Variable	Short Run Marginal Costs	Long Run Marginal Costs
Time period	Generally five years or less	Generally over five years
Fixed vs. variable	Capacity remains fixed. At least one operating variable remains fixed	Capacity can change. All costs become variable. There are no fixed costs
Marginal producers	Production costs at the top of the industry cost curve	Highest industry production costs including costs of new capacity
Calculations	Operating cost for marginal producer.	Operating costs for marginal producer including capital
Use of concept	Calculation will set the floor price of the short-term price cycle.	Calculation of the trend price for long term cycle.
Decisions	Price < SRMC, leads to a cut in production	Price < LRMC, no investment in new capacity
	Price > SRMC, leads to an increase of production	Price > LRMC investment in new capacity

Source: CRU

As the time horizon increases over the **long run** (more than five years), all costs become variable. Hence, this can include changes in production capacity whereby an investment in additional capacity is made. Operating decisions for long run marginal producers (producers building and operating profitable capacity sufficient to meet future expected demand), are based on the relationship between market prices and operating and capital costs. The concept of marginal cost is also useful in order to calculate the floor price, i.e. how low could prices go. The above assumes an ideal market, but in reality commodity markets are not entirely perfect and other factors could interfere with the role of prices as a signal for investment, such as speculative investment. However, we believe these concepts offer a reasonable basis to provide an insightful long term view.

#### A.4.2 Selection of the long run marginal producers

CRU believes much of the industry's new acidulation/granulation capacity will originate in regions that have access to an integrated source of phosphate rock<sup>1</sup>. Africa, Middle East, South America and East Asia are jointly expected to enjoy between 80-90% of all expansions over the medium term, and although there is less certainty over the longer term, given the distribution of high quality reserves, these areas will undoubtedly continue to drive supply/capacity beyond 2020.

For the purposes of determining long run marginal producers, CRU has identified nine areas where phosphate mining is either likely to or could expand between 2017 and 2038: Brazil, Morocco, Saudi Arabia, Peru, Canada, West Africa, Jordan, Tunisia and Australia. The decision on their location/size is based on an assessment of the above criteria, focusing specifically on their access a target market. Each location has its own strengths and weaknesses:

- **Brazil:** While the country is thought to hold less than 2% of global phosphate rock resources, its agricultural demand has grown by such an extent that it is now one of the world's largest consumers of high analysis phosphate fertilizer (in particular MAP). Much of this is imported. In 2013, for example, domestic operations supplied 1.4 million tonnes of MAP, which was slightly less than 50% of the country's overall requirement. As such, there is potential for further expansion over the medium/long term, particularly as the national government has laid out plans to become self sufficient by 2020. Domestic projects will potentially benefit from both a sea and an inland freight advantage. Although we acknowledge that this advantage could be reduced by improving domestic transport

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<sup>1</sup> This is not to say that we won't see stand alone rock mines developed in the future. In fact there are a number of interesting options, from Brazil through to French Polynesia, that are currently being explored (discussed in greater detail in the **Phosphate Rock Market Outlook**).

links, given the size and layout of the country, this will be a considerable undertaking, both in terms of time and cost. Therefore, most new projects in Brazil should have a healthy competitive advantage.

- **Morocco:** Morocco holds approximately half of all known rock resources, and currently ranks as the world's second largest phosphate rock producer. At the same time, it consumes a comparatively small amount of fertilizer. Therefore any new capacity will need to be export-focused. Presently this approach is viable as a result of the wide spread that exists between phosphate rock costs and prices. Geographically the country is well placed to serve Europe, Africa, the Americas and the Indian sub-continent. Although competition into these markets has intensified, it should still be well placed to expand production into the long run.
- **Saudi Arabia:** Saudi Arabia is a relative newcomer to the phosphates market, having ramped-up its first fully integrated operation in 2011. The country however does have a number of advantages which should allow further expansions (beyond those outlined in the medium term). Firstly, its geographical position is key. Ras Al-Khair is less than 1,200 nautical miles away from the west coast of India, which is the world's largest importer of DAP. Secondly, an abundance of hydrocarbons in the country means that Ma'aden is one of the few phosphate producers which is fully integrated (i.e. with rock and also ammonia).
- **Peru:** the west coast of South America has, until recently, not produced phosphate rock. This all changed with the ramping-up of the Bayovar project in 2010. Between 2010 and 2013 some 10.1 million tonnes of rock was produced, which has been sold in North and South America, the Indian sub-continent and South East Asia. While rock from this area typically contains fairly elevated levels of chlorine, causing it to trade at a discount to the Moroccan benchmark, five new projects have since emerged which could well be developed over the next decade. The likelihood is that these will be rock only operations, shipping product either to the USA, South America, or to the Indian sub-continent.
- **Western Africa:** Rock projects in West Africa also have a potential for success in the long term. Projects in Angola, Guinea-Bissau, the Republic of Congo and Senegal benefit from having sedimentary deposits which are located fairly close to port terminals, and are on the doorstep of Brazil, one of the largest end-use markets around the world.
- **Australia:** Despite being resource rich, the country only has one high analysis phosphate fertilizer producer (Incitec Pivot) and imports significant tonnages on an annual basis. The main challenge facing new players is logistics. Most phosphate deposits are a long way away from an FOB point, and then still face a fairly length ocean voyage to a target market. There are, however, a number of projects, which could be developed in the next few decades.
- **Tunisia:** Recent government announcements to increase phosphate rock capacity in Tunisia to 19 million tonnes by 2021 should be viewed with caution. Indeed, the 4.5-5.0

million tonnes/year Sra Ouertane project in the northern phosphate basin has been continuously quoted as soon to be commissioned since the 1980s. Likewise in the Kef Governate, the Sakiet Sidi Youssef project was recently mentioned as a potential project, with interest shown by the Algerian Ministry of Industry, Energy & Mines on the sidelines of a state visit. There are also investigations into projects at Om Lakhchab and Tozeur-Nefta, which remain in the pre-development stage. The only project that has made some viable progress is the Chaketma Phosphate project, for the annual production of up to 1.5 million tonnes concentrate. However, a financial disagreement between joint-venture partners, Celamin Holdings and the TNS (Tunisian Mining Service) has halted progress. Considering the lack of progress on all fronts and the low confidence in uninterrupted rock supply, following the constant rock curtailments since the Arab Spring in 2011, all of the above-mentioned projects remain in the speculative category of the CRU PGS rating.

- **Jordan:** Jordan's JPMC is an established phosphate rock miner and exporter, with mining operations since the 1950's. Recent years have seen it establish two new mining areas at its Eshidiya mine, the North-West and Eastern Mines. These operations have been relatively easy and low cost to establish, with most product not requiring treatment beyond screening. Phosphate deposits in the country are extensive and we therefore believe that the company could establish further mining areas in the future.

#### A.4.3 Phosphate rock LRMC in 2015

In order to estimate the future dynamics of the LRMC for phosphate rock, we have assessed costs at each of the locations described above. The components that will affect the LRMC estimation in the base year (2015) for each project are the following:

- Production costs at the mine gate;
- Capital costs incurred when financing a project;
- Freight costs to a target plant; and
- The netback to the benchmark fob point (Morocco).

Operational costs are computed using CRU's Phosphate Rock Cost Model, and take into account royalties, labour, fuel, electricity and maintenance costs, as well as macroeconomic dynamics. A more detailed analysis of the costing methodology is provided in CRU's *Phosphate Rock Cost Report*.

The mining operation's size has been determined by matching their norm (for that particular area), or in the case when future expansion plans have been outlined, the size of the known projects. It should be noted, however, that companies rarely reveal long-term (>5 years) growth plans. Hence the analyst is usually forced to make his/her own judgement on these factors.

Where specific details about projects' capital costs are known, they have been incorporated into our research. However, as many projects are integrated, and/or state-sponsored (thus not needing much outside investment), few details may be disclosed. In this case, CRU's estimates for capital expenditure are listed below, and are based on information available from published reports. The current capital cost of building a 1.8 million tonne/year greenfield surface phosphate rock mine is estimated around US\$350 million.

For the purposes of the long run analysis, capex has been computed assuming a 10-year loan at a fixed interest rate, which is determined summing the Weighted Average Cost of Capital (WACC) of the fertilizer industry to a country-risk premium. Our current estimate for the long-run guidance for the WACC in the fertilizer industry stands at 8.8%, and is adjusted for different projects with a suitable country risk premium. This covers additional political risks in respect to countries in which they are prepared to invest. It is however important to note that this has been taken from a US investor's point of view, and thus if projects are predominantly funded by domestic funds, for example in Morocco, they may not incur such a risk premium.

We have used CRU's concept of Business Costs to select the long run marginal project location. Business Costs use site costs and incorporate the impact of quality differences and location on expected mine netbacks in order to benchmark the competitiveness of operations. While the Business Cost level does not correspond to an actual cost level, as it incorporates revenue-related factors, it is superior to Site Costs in determining the most competitive operation, as rock values vary significantly with location and quality.

When calculating the LRMC we then take the most competitive operation (defined by business cost + capital cost) and calculate the FOB Morocco price required to incentivise this project. We take operating and capital costs, a quality adjustment factor, and calculate the FOB Morocco price required for EXW netbacks at that operation to satisfy this level.

The table below shows speculative mines selected by CRU to determine the phosphate rock LRMC.

Table A.2: Base-year (2015) phosphate rock LRMC estimate

	Plant 1	Plant 2	Plant 3	Plant 5	Plant 4	Plant 6	Plant 7	Plant 8	Plant 9	Plant 10	Plant 11
Country	Morocco	Tunisia	W Africa 1	W Africa 2	Rep.of Congo	Jordan	Saudi Arabia	Peru	Brazil	Canada	Australia
Rock capacity ('000 t/y)	3.0	1.5	1.3	0.5	4.1	1.5	5.0	1.3	1.2	3.0	2.0
Capex total (mil US\$)	528	364	149	25	601	125	750	530	486	1,215	560
WACC (%)	11.3%	12.6%	14.3%	12.6%	13.8%	11.8%	10.8%	11.8%	11.1%	8.3%	8.6%
Capex total (US\$/t)	15	51	29	11	31	16	26	87	83	56	43
Opex total (US\$/t)	31	38	48	23	38	50	36	38	47	68	49
Quality adjustment (US\$/t)	12	0	-29	23	-2	-10	3	40	-20	-35	-18
Business & capex cost (US\$/t)	<b>65</b>	115	86	123	107	94	88	189	82	127	84
LRMC project	<b>Yes</b>										
Operating & economic cost	<b>46</b>										
Rock LRMC 32% EXW (quality adjusted)	<b>57</b>										
Freight adjustment to FOB Morocco	<b>28</b>										
<b>Rock LRMC 32% P2O5 FOB Morocco, 2015 (US\$/t)</b>	<b>85</b>										

**Note:** 1. Adjusted for value-in-use components

**Data:** CRU

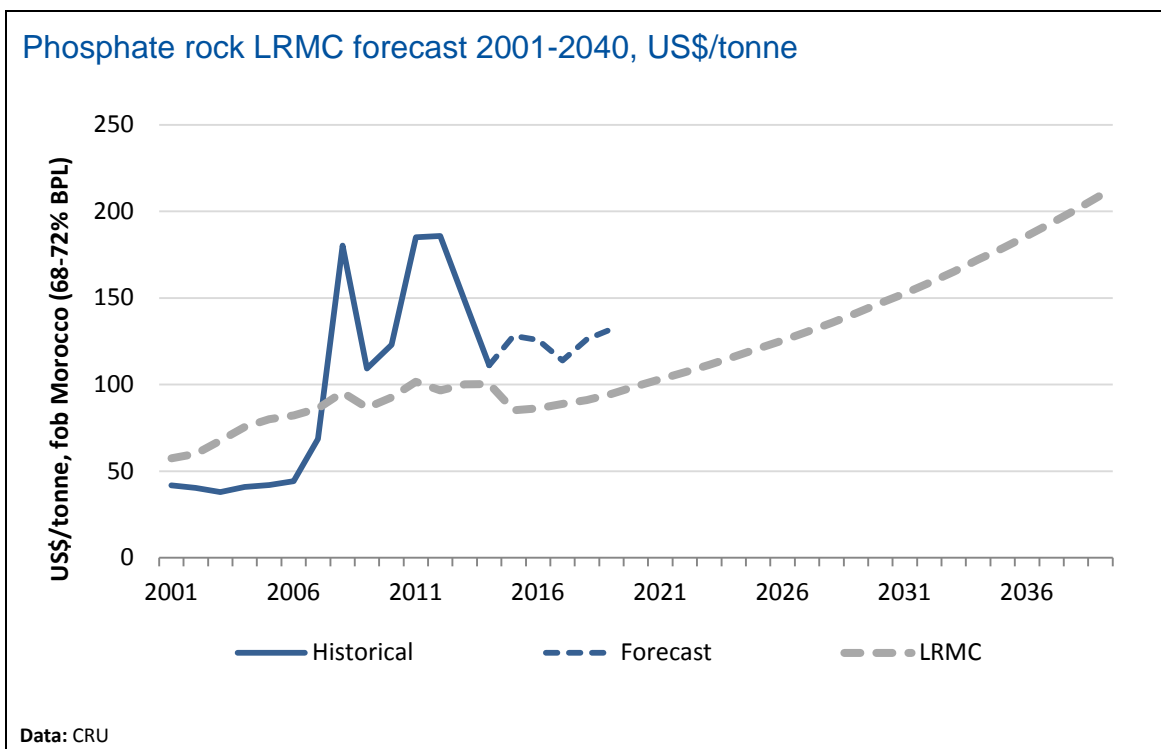


### A.4.5 Escalation of the long run marginal cost

In order to escalate the base year LMRC estimate over time, two additional parameters need to be taken into account:

- An estimate of productivity growth, to obtain real LRMC projections;
- An LRMC inflation index, to obtain nominal projections to form the base-case long-run price.

The LRMC inflation index is constructed starting from CRU's in-house macroeconomic forecasts, involving a specific mix of labour and capital costs, engineering supply costs, freights costs and, most importantly, feedstock prices. Such a procedure ensures that each product across the CRU portfolio of market outlooks is escalated using a dedicated inflation index, hence representing a robust methodology for understanding future market developments.



Although rock grades are on the decline, the growing uptake of flotation cells, indicate that there are decent prospects for further technological improvements/efficiencies on the mining side. As such CRU believes that the real LRMC for phosphate rock production will decrease by an average of 0.18% per annum between 2017 and 2039. This represents a 6% increase in the  $P_2O_5$  recovery rate.

Table A.3: Phosphate rock LRMC forecast, US\$/tonne

Year	LRMC, nominal US\$/tonne	Year	LRMC, nominal US\$/tonne
<b>2015 (Base year)</b>	85	<b>2030</b>	146
<b>2020</b>	99	<b>2031</b>	152
<b>2021</b>	103	<b>2032</b>	158
<b>2022</b>	107	<b>2033</b>	164
<b>2023</b>	111	<b>2034</b>	171
<b>2024</b>	116	<b>2035</b>	178
<b>2025</b>	120	<b>2036</b>	185
<b>2026</b>	125	<b>2037</b>	192
<b>2027</b>	130	<b>2038</b>	200
<b>2028</b>	135	<b>2039</b>	208
<b>2029</b>	141	<b>2040</b>	216

Data: CRU

## A.5 Risks to the outlook

Long term forecasting is fraught with uncertainties, given the variety of events and scenarios that could develop over the forecast period that could change the long term outlook from the base case scenario. Below is a selection of risks that could result in higher or lower phosphate prices over the long term. For those related to agricultural markets, please see the Focus on Agricultural Markets throughout this report.

- Operating costs are an important part of our LRMC calculations and these are based on a number of assumptions. Although the LRMC estimate will be regularly updated with CRU's latest forecasts, the accuracy of the LRMC forecast is clearly reliant on the accuracy of these underlying forecasts. The LRMC forecasts do not account for any breakthrough in mining or processing technology, or step-change in mine productivity that could affect operating costs. Capital cost inflation, including the country-specific risk premiums, may also differ from our forecasts.
- Our demand outlook is primarily based on a forecast of agricultural production and its relationship with nutrient consumption. Demand projections will be impacted if:
  - Agricultural production does not grow as predicted and/or the historical correlation between agricultural production and breaks down;
  - If phosphate fertilizer consumption grows faster or slower than forecast – as discussed in the demand section, we believe that a reduction in the world N:P<sub>2</sub>O<sub>5</sub> ratio in the long term represents the more likely risk.

- The relatively small size of the international market for the phosphate rock industry increases the impact of new mines or plants on global supply. This means that the timing of individual projects could have a significant impact on the LRMC.
- As noted earlier, there is also a risk that favourable investment conditions in the medium term create a prolonged excess capacity, with the effect of depressing prices below the projected LRMC. On the other hand, until such new capacity materialises, the existing producers can be expected to pursue the established strategy of managed supply with the intention of maintaining prices above the LRMC level.

Table B.1: Phosphate Rock Capacity, '000t, 2012-2020

	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>World Total</b>	<b>248,572</b>	<b>250,653</b>	<b>252,202</b>	<b>258,364</b>	<b>259,054</b>	<b>264,204</b>	<b>272,678</b>	<b>275,878</b>	<b>282,328</b>
<b>Europe &amp; CIS Total</b>	<b>20,980</b>	<b>22,080</b>	<b>22,500</b>	<b>22,470</b>	<b>23,070</b>	<b>23,370</b>	<b>24,030</b>	<b>24,030</b>	<b>24,180</b>
<b>West Europe Total</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>	<b>1,000</b>
Finland	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
<b>CIS Total</b>	<b>19,980</b>	<b>21,080</b>	<b>21,500</b>	<b>21,470</b>	<b>22,070</b>	<b>22,370</b>	<b>23,030</b>	<b>23,030</b>	<b>23,180</b>
Kazakhstan	5,350	5,350	5,670	5,640	5,640	5,640	6,000	6,000	6,000
Russia	13,930	15,030	15,030	15,030	15,630	15,930	16,230	16,230	16,380
Uzbekistan	700	700	800	800	800	800	800	800	800
<b>Africa Total</b>	<b>54,091</b>	<b>54,391</b>	<b>54,691</b>	<b>61,891</b>	<b>62,141</b>	<b>64,141</b>	<b>69,241</b>	<b>73,741</b>	<b>80,041</b>
<b>North Africa Total</b>	<b>46,400</b>	<b>46,400</b>	<b>46,400</b>	<b>53,600</b>	<b>53,600</b>	<b>52,600</b>	<b>54,100</b>	<b>58,600</b>	<b>64,900</b>
Algeria	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300
Egypt	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300	5,300
Morocco	29,000	29,000	29,000	36,200	36,200	35,200	36,700	41,200	47,500
Tunisia	9,800	9,800	9,800	9,800	9,800	9,800	9,800	9,800	9,800
<b>East Africa Total</b>	<b>101</b>	<b>101</b>	<b>101</b>	<b>101</b>	<b>101</b>	<b>601</b>	<b>1,101</b>	<b>1,101</b>	<b>1,101</b>
Uganda	0	0	0	0	0	500	1,000	1,000	1,000
Other East Africa	101	101	101	101	101	101	101	101	101
<b>West Africa Total</b>	<b>4,940</b>	<b>5,240</b>	<b>5,540</b>	<b>5,540</b>	<b>5,790</b>	<b>6,040</b>	<b>6,040</b>	<b>6,040</b>	<b>6,040</b>
Senegal	2,920	3,220	3,520	3,520	3,770	4,020	4,020	4,020	4,020
Togo	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
Other West Africa	20	20	20	20	20	20	20	20	20
<b>Central Africa Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1,000</b>	<b>4,100</b>	<b>4,100</b>	<b>4,100</b>
Congo	0	0	0	0	0	1,000	4,100	4,100	4,100
<b>Southern Africa Total</b>	<b>2,650</b>	<b>2,650</b>	<b>2,650</b>	<b>2,650</b>	<b>2,650</b>	<b>3,900</b>	<b>3,900</b>	<b>3,900</b>	<b>3,900</b>
South Africa	2,650	2,650	2,650	2,650	2,650	3,900	3,900	3,900	3,900
<b>North America Total</b>	<b>36,910</b>	<b>36,210</b>	<b>35,165</b>	<b>34,620</b>	<b>34,620</b>	<b>34,620</b>	<b>33,620</b>	<b>32,320</b>	<b>32,320</b>
<b>North America Total</b>	<b>36,910</b>	<b>36,210</b>	<b>35,165</b>	<b>34,620</b>	<b>34,620</b>	<b>34,620</b>	<b>33,620</b>	<b>32,320</b>	<b>32,320</b>
Canada	1,200	0	0	0	0	0	0	0	0
United States	35,710	36,210	35,165	34,620	34,620	34,620	33,620	32,320	32,320
<b>Central &amp; South America Tot:</b>	<b>14,233</b>	<b>14,551</b>	<b>14,677</b>	<b>14,967</b>	<b>14,967</b>	<b>14,967</b>	<b>16,167</b>	<b>16,167</b>	<b>16,167</b>
<b>Central America Total</b>	<b>2,000</b>	<b>2,000</b>	<b>2,000</b>	<b>2,000</b>	<b>2,000</b>	<b>2,000</b>	<b>2,000</b>	<b>2,000</b>	<b>2,000</b>
Mexico	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
<b>South America Total</b>	<b>12,233</b>	<b>12,551</b>	<b>12,677</b>	<b>12,967</b>	<b>12,967</b>	<b>12,967</b>	<b>14,167</b>	<b>14,167</b>	<b>14,167</b>
Brazil	7,485	7,803	7,929	8,219	8,219	8,219	9,419	9,419	9,419
Colombia	148	148	148	148	148	148	148	148	148
Peru	4,020	4,020	4,020	4,020	4,020	4,020	4,020	4,020	4,020
Venezuela	500	500	500	500	500	500	500	500	500
Other South America	80	80	80	80	80	80	80	80	80
<b>Asia Total</b>	<b>118,143</b>	<b>119,206</b>	<b>120,954</b>	<b>120,201</b>	<b>120,041</b>	<b>122,891</b>	<b>125,405</b>	<b>125,405</b>	<b>125,405</b>
<b>Middle East Total</b>	<b>25,103</b>	<b>27,166</b>	<b>27,164</b>	<b>27,161</b>	<b>28,151</b>	<b>29,401</b>	<b>32,165</b>	<b>32,165</b>	<b>32,165</b>
Iran	200	200	200	200	200	200	200	200	200
Iraq	500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Israel	4,750	4,750	4,750	4,750	4,750	4,750	4,750	4,750	4,750
Jordan	10,003	11,066	11,064	11,061	12,051	12,051	11,065	11,065	11,065
Saudi Arabia	5,300	5,300	5,300	5,300	5,300	6,550	10,300	10,300	10,300
Syria	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850	3,850
Turkey	500	500	500	500	500	500	500	500	500
<b>South Asia Total</b>	<b>3,290</b>	<b>3,290</b>	<b>3,290</b>	<b>3,290</b>	<b>3,290</b>	<b>3,290</b>	<b>3,290</b>	<b>3,290</b>	<b>3,290</b>
India	3,110	3,110	3,110	3,110	3,110	3,110	3,110	3,110	3,110
Pakistan	120	120	120	120	120	120	120	120	120
Other South Asia	60	60	60	60	60	60	60	60	60
<b>South-East Asia Total</b>	<b>3,820</b>	<b>3,820</b>	<b>3,820</b>	<b>3,820</b>	<b>3,820</b>	<b>3,820</b>	<b>3,820</b>	<b>3,820</b>	<b>3,820</b>
Indonesia	300	300	300	300	300	300	300	300	300
Vietnam	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Other South-East Asia	20	20	20	20	20	20	20	20	20

Table B.1: Phosphate Rock Capacity, '000t, 2012-2020 - *Concluded*.

	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>East Asia Total</b>	<b>85,930</b>	<b>84,930</b>	<b>86,680</b>	<b>85,930</b>	<b>84,780</b>	<b>86,380</b>	<b>86,130</b>	<b>86,130</b>	<b>86,130</b>
China	85,430	84,430	86,180	85,430	84,280	85,880	85,630	85,630	85,630
North Korea	500	500	500	500	500	500	500	500	500
<b>Oceania Total</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>
<b>Oceania Total</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>	<b>4,215</b>
Australia	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015	3,015
Christmas Island	700	700	700	700	700	700	700	700	700
Nauru	500	500	500	500	500	500	500	500	500

Table C.1: Phosphate Rock Production, '000t, 2012-2020

	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>World Total</b>	<b>196,828</b>	<b>193,842</b>	<b>197,656</b>	<b>202,261</b>	<b>204,734</b>	<b>210,164</b>	<b>213,800</b>	<b>215,905</b>	<b>220,694</b>
<b>Europe &amp; CIS Total</b>	<b>13,673</b>	<b>14,176</b>	<b>13,818</b>	<b>15,653</b>	<b>16,180</b>	<b>16,254</b>	<b>16,455</b>	<b>16,219</b>	<b>17,098</b>
<b>West Europe Total</b>	<b>858</b>	<b>877</b>	<b>946</b>	<b>961</b>	<b>980</b>	<b>971</b>	<b>971</b>	<b>971</b>	<b>971</b>
Finland	858	877	946	961	980	971	971	971	971
<b>CIS Total</b>	<b>12,815</b>	<b>13,299</b>	<b>12,872</b>	<b>14,693</b>	<b>15,200</b>	<b>15,283</b>	<b>15,485</b>	<b>15,249</b>	<b>16,127</b>
Kazakhstan	1,868	1,832	1,494	1,538	2,141	2,224	2,422	2,489	3,600
Russia	10,282	10,743	10,778	12,465	12,366	12,365	12,363	12,060	11,861
Uzbekistan	664	724	600	689	693	694	700	700	666
<b>Africa Total</b>	<b>41,234</b>	<b>39,614</b>	<b>42,417</b>	<b>38,587</b>	<b>39,801</b>	<b>44,948</b>	<b>45,805</b>	<b>47,613</b>	<b>49,618</b>
<b>North Africa Total</b>	<b>36,438</b>	<b>35,238</b>	<b>37,980</b>	<b>34,676</b>	<b>34,944</b>	<b>38,979</b>	<b>37,800</b>	<b>38,511</b>	<b>40,214</b>
Algeria	1,250	1,151	1,418	1,311	1,515	1,516	1,516	1,516	1,516
Egypt	5,738	5,315	5,378	4,142	4,134	4,134	4,134	3,869	3,869
Morocco	26,844	25,489	27,391	25,672	25,838	29,179	27,421	28,027	29,703
Tunisia	2,607	3,284	3,793	3,552	3,457	4,150	4,729	5,100	5,126
<b>East Africa Total</b>	<b>43</b>	<b>28</b>	<b>11</b>	<b>23</b>	<b>24</b>	<b>92</b>	<b>160</b>	<b>160</b>	<b>160</b>
Uganda	0	0	0	0	0	0	136	136	136
Other East Africa	43	28	11	23	24	92	24	24	24
<b>West Africa Total</b>	<b>2,687</b>	<b>2,423</b>	<b>2,390</b>	<b>2,756</b>	<b>3,265</b>	<b>3,592</b>	<b>3,755</b>	<b>3,654</b>	<b>3,634</b>
Senegal	1,556	1,189	1,285	1,814	2,145	2,492	2,675	2,594	2,594
Togo	1,110	1,214	1,086	922	1,100	1,080	1,060	1,040	1,020
Other West Africa	20	20	20	20	20	20	20	20	20
<b>Central Africa Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>450</b>	<b>1,750</b>	<b>2,870</b>	<b>3,075</b>
Congo	0	0	0	0	0	450	1,750	2,870	3,075
<b>Southern Africa Total</b>	<b>2,065</b>	<b>1,925</b>	<b>2,035</b>	<b>1,132</b>	<b>1,568</b>	<b>1,835</b>	<b>2,340</b>	<b>2,418</b>	<b>2,535</b>
South Africa	2,065	1,925	2,035	1,132	1,568	1,835	2,340	2,418	2,535
<b>North America Total</b>	<b>30,115</b>	<b>30,864</b>	<b>26,944</b>	<b>27,216</b>	<b>28,164</b>	<b>28,506</b>	<b>28,478</b>	<b>28,233</b>	<b>29,127</b>
<b>North America Total</b>	<b>30,115</b>	<b>30,864</b>	<b>26,944</b>	<b>27,216</b>	<b>28,164</b>	<b>28,506</b>	<b>28,478</b>	<b>28,233</b>	<b>29,127</b>
Canada	643	316	0	0	0	0	0	0	0
USA	29,472	30,548	26,944	27,216	28,164	28,506	28,478	28,233	29,127
<b>Central &amp; South America Tot</b>	<b>11,452</b>	<b>11,874</b>	<b>11,985</b>	<b>11,300</b>	<b>12,014</b>	<b>11,679</b>	<b>12,684</b>	<b>12,778</b>	<b>12,866</b>
<b>Central America Total</b>	<b>1,920</b>	<b>2,217</b>	<b>2,218</b>	<b>1,723</b>	<b>1,800</b>	<b>1,960</b>	<b>1,960</b>	<b>1,960</b>	<b>1,960</b>
Mexico	1,920	2,217	2,218	1,723	1,800	1,960	1,960	1,960	1,960
<b>South America Total</b>	<b>9,532</b>	<b>9,657</b>	<b>9,767</b>	<b>9,577</b>	<b>10,214</b>	<b>9,719</b>	<b>10,724</b>	<b>10,818</b>	<b>10,906</b>
Brazil	6,094	5,939	5,793	5,438	6,082	5,589	6,593	6,687	6,782
Peru	3,209	3,547	3,801	3,969	3,967	3,967	3,967	3,967	3,967
Venezuela	159	106	100	96	84	82	83	83	0
Other South America	70	64	73	74	81	81	81	81	157
<b>Asia Total</b>	<b>96,982</b>	<b>94,485</b>	<b>99,393</b>	<b>106,640</b>	<b>105,479</b>	<b>105,666</b>	<b>107,246</b>	<b>108,195</b>	<b>109,139</b>
<b>Middle East Total</b>	<b>14,669</b>	<b>13,348</b>	<b>15,156</b>	<b>15,132</b>	<b>16,268</b>	<b>17,292</b>	<b>19,657</b>	<b>20,943</b>	<b>21,733</b>
Iran	180	200	0	0	106	122	122	117	117
Iraq	358	360	0	0	0	0	0	0	0
Israel	2,871	3,437	3,222	3,785	3,789	3,883	3,718	3,722	3,726
Jordan	6,382	5,399	7,125	6,804	8,376	8,724	8,299	8,409	8,520
Saudi Arabia	3,097	3,055	3,585	3,727	3,854	4,421	7,074	8,249	8,924
Syria	1,780	898	1,225	731	143	143	444	445	446
Other Middle East	0	0	0	85	0	0	0	0	0
<b>South Asia Total</b>	<b>1,303</b>	<b>1,363</b>	<b>1,647</b>	<b>1,705</b>	<b>1,550</b>	<b>1,550</b>	<b>1,550</b>	<b>1,550</b>	<b>1,550</b>
India	1,155	1,214	1,497	1,558	1,400	1,400	1,400	1,400	1,400
Pakistan	100	100	100	96	100	100	100	100	100
Other South Asia	48	49	50	50	50	50	50	50	50
<b>South-East Asia Total</b>	<b>2,410</b>	<b>2,675</b>	<b>2,490</b>	<b>2,877</b>	<b>3,236</b>	<b>3,236</b>	<b>3,236</b>	<b>3,219</b>	<b>3,201</b>
Vietnam	2,392	2,656	2,471	2,858	3,220	3,220	3,220	3,203	3,185
Other South-East Asia	19	19	20	19	16	16	16	16	16
<b>East Asia Total</b>	<b>78,600</b>	<b>77,100</b>	<b>80,100</b>	<b>86,927</b>	<b>84,424</b>	<b>83,588</b>	<b>82,803</b>	<b>82,484</b>	<b>82,655</b>
China	78,500	77,000	80,000	86,852	84,350	83,513	82,729	82,409	82,580
North Korea	100	100	100	0	0	0	0	0	0
Other East Asia	0	0	0	75	75	75	75	75	75

Table C.1: Phosphate Rock Production, '000t, 2012-2020 - *Concluded*.

	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Oceania Total</b>	<b>3,373</b>	<b>2,829</b>	<b>3,098</b>	<b>2,864</b>	<b>3,097</b>	<b>3,112</b>	<b>3,132</b>	<b>2,867</b>	<b>2,843</b>
<b>Oceania Total</b>	<b>3,373</b>	<b>2,829</b>	<b>3,098</b>	<b>2,864</b>	<b>3,097</b>	<b>3,112</b>	<b>3,132</b>	<b>2,867</b>	<b>2,843</b>
Australia	2,090	1,919	2,118	2,258	2,322	2,337	2,382	2,337	2,313
Christmas Island	760	562	740	506	500	500	500	280	280
Nauru	523	347	241	101	275	275	250	250	250
<b>Unidentified Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Unidentified Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>

Table D.1: Phosphate Rock Apparent Demand, '000t, 2012-2020

	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>World Total</b>	<b>196,671</b>	<b>193,766</b>	<b>195,884</b>	<b>201,788</b>	<b>204,734</b>	<b>210,164</b>	<b>213,800</b>	<b>215,905</b>	<b>220,694</b>
<b>Europe &amp; CIS Total</b>	<b>20,142</b>	<b>18,714</b>	<b>19,418</b>	<b>21,218</b>	<b>22,146</b>	<b>22,232</b>	<b>22,278</b>	<b>22,083</b>	<b>22,956</b>
<b>West Europe Total</b>	<b>4,578</b>	<b>3,738</b>	<b>4,087</b>	<b>3,944</b>	<b>4,123</b>	<b>4,001</b>	<b>4,001</b>	<b>4,001</b>	<b>4,001</b>
Austria	225	129	220	171	171	171	171	171	171
Belgium	1,254	974	833	809	904	798	798	798	798
Finland	814	905	919	813	858	841	841	841	841
France	291	216	241	209	245	246	245	246	246
Germany	0	0	106	95	95	95	95	95	95
Greece	129	105	199	150	147	147	147	147	147
Italy	214	151	205	154	154	154	154	154	154
Netherlands	572	229	180	246	239	239	239	239	239
Norway	675	680	704	784	799	799	799	799	799
Portugal	105	73	108	80	80	80	80	80	80
Spain	280	242	366	423	423	423	423	423	423
Other West Europe	19	35	6	9	9	9	9	9	9
<b>East Europe Total</b>	<b>3,749</b>	<b>3,312</b>	<b>4,246</b>	<b>4,145</b>	<b>4,467</b>	<b>4,533</b>	<b>4,468</b>	<b>4,449</b>	<b>4,436</b>
Bulgaria	483	368	578	488	615	620	625	625	625
Croatia	46	41	0	73	73	73	73	73	73
Lithuania	1,013	1,342	1,671	1,658	1,629	1,669	1,607	1,607	1,607
Poland	1,271	923	1,267	1,132	1,176	1,181	1,140	1,120	1,107
Romania	359	318	356	360	360	360	360	360	360
Serbia	0	33	73	192	243	260	260	260	260
Ukraine	578	288	277	242	369	369	403	403	403
Other East Europe	0	0	25	0	0	0	0	0	1
<b>CIS Total</b>	<b>11,815</b>	<b>11,664</b>	<b>11,085</b>	<b>13,129</b>	<b>13,556</b>	<b>13,698</b>	<b>13,809</b>	<b>13,633</b>	<b>14,519</b>
Belarus	493	469	443	553	524	534	543	553	553
Kazakhstan	1,363	1,586	1,410	1,422	1,541	1,574	1,572	1,589	2,657
Russia	9,180	8,832	8,555	10,349	10,666	10,765	10,863	10,660	10,511
Tajikistan	115	0	0	0	0	0	0	0	0
Turkmenistan	0	53	46	117	117	117	117	117	117
Uzbekistan	664	724	631	689	708	709	715	715	681
<b>Africa Total</b>	<b>24,686</b>	<b>25,923</b>	<b>25,188</b>	<b>22,847</b>	<b>25,123</b>	<b>29,211</b>	<b>29,778</b>	<b>31,304</b>	<b>33,343</b>
<b>North Africa Total</b>	<b>21,491</b>	<b>23,137</b>	<b>22,557</b>	<b>21,274</b>	<b>23,158</b>	<b>26,537</b>	<b>26,851</b>	<b>28,508</b>	<b>30,624</b>
Algeria	54	81	89	0	0	0	0	0	0
Egypt	1,665	2,898	2,008	1,223	1,273	1,264	1,264	1,264	1,264
Morocco	17,251	16,905	16,750	17,212	18,571	21,265	21,049	22,536	24,625
Tunisia	2,522	3,253	3,709	2,878	3,357	4,050	4,579	4,750	4,776
Other North Africa	0	0	0	-40	-43	-42	-42	-42	-42
<b>East Africa Total</b>	<b>39</b>	<b>17</b>	<b>12</b>	<b>24</b>	<b>24</b>	<b>92</b>	<b>160</b>	<b>160</b>	<b>160</b>
Uganda	0	0	0	0	0	68	136	136	136
Other East Africa	39	17	12	24	24	24	24	24	24
<b>West Africa Total</b>	<b>1,501</b>	<b>1,017</b>	<b>789</b>	<b>1,004</b>	<b>1,019</b>	<b>1,393</b>	<b>1,699</b>	<b>1,618</b>	<b>1,618</b>
Senegal	1,400	899	749	968	983	1,357	1,663	1,582	1,582
Togo	78	71	0	0	0	0	0	0	0
Other West Africa	23	47	40	36	36	36	36	36	36
<b>Central Africa Total</b>	<b>0</b>	<b>3</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>
Other Central Africa	0	3	4	4	4	4	4	4	4
<b>Southern Africa Total</b>	<b>1,655</b>	<b>1,749</b>	<b>1,827</b>	<b>542</b>	<b>918</b>	<b>1,185</b>	<b>1,065</b>	<b>1,014</b>	<b>937</b>
South Africa	1,655	1,749	1,827	542	918	1,185	1,065	1,014	937
<b>North America Total</b>	<b>33,668</b>	<b>34,389</b>	<b>29,764</b>	<b>30,026</b>	<b>30,791</b>	<b>31,133</b>	<b>31,106</b>	<b>30,861</b>	<b>31,755</b>
<b>North America Total</b>	<b>33,668</b>	<b>34,389</b>	<b>29,764</b>	<b>30,026</b>	<b>30,791</b>	<b>31,133</b>	<b>31,106</b>	<b>30,861</b>	<b>31,755</b>
Canada	703	635	905	861	828	828	828	828	828
USA	32,965	33,755	28,860	29,165	29,964	30,306	30,278	30,033	30,927
<b>Central &amp; South America Tot</b>	<b>11,287</b>	<b>11,377</b>	<b>11,775</b>	<b>10,768</b>	<b>11,224</b>	<b>11,232</b>	<b>11,605</b>	<b>11,802</b>	<b>12,046</b>
<b>Caribbean Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Other Caribbean Africa	0	0	0	0	0	0	0	0	0
<b>Central America Total</b>	<b>2,772</b>	<b>3,017</b>	<b>2,982</b>	<b>2,599</b>	<b>2,625</b>	<b>2,770</b>	<b>2,838</b>	<b>2,850</b>	<b>2,862</b>
Mexico	2,755	3,017	2,982	2,599	2,625	2,770	2,838	2,850	2,862
Other Central America	16	0	0	0	0	0	0	0	0



Table D.1: Phosphate Rock Apparent Demand, '000t, 2012-2020 - *Concluded*.

	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>South America Total</b>	<b>8,516</b>	<b>8,360</b>	<b>8,792</b>	<b>8,169</b>	<b>8,599</b>	<b>8,462</b>	<b>8,767</b>	<b>8,952</b>	<b>9,184</b>
Argentina	279	132	223	276	276	276	276	276	276
Brazil	7,542	7,585	7,482	7,188	7,606	7,473	7,777	7,962	8,199
Chile	0	0	0	30	30	30	30	30	30
Colombia	123	118	120	165	164	164	164	164	164
Peru	123	218	696	262	287	287	287	287	287
Uruguay	142	100	69	89	89	89	89	89	89
Venezuela	270	180	165	158	144	142	143	143	138
Other South America	37	27	38	1	1	1	1	1	1
<b>Asia Total</b>	<b>102,869</b>	<b>100,416</b>	<b>105,738</b>	<b>113,584</b>	<b>112,030</b>	<b>112,900</b>	<b>115,533</b>	<b>116,405</b>	<b>117,155</b>
<b>Middle East Total</b>	<b>9,305</b>	<b>9,408</b>	<b>10,044</b>	<b>10,439</b>	<b>10,726</b>	<b>11,738</b>	<b>14,498</b>	<b>15,644</b>	<b>16,324</b>
Iran	199	219	65	293	301	312	312	312	312
Iraq	358	360	0	0	0	0	0	0	0
Israel	1,986	2,491	2,187	2,536	1,974	2,167	2,253	2,256	2,260
Jordan	2,046	2,157	2,509	2,174	2,962	3,224	3,224	3,224	3,224
Lebanon	447	404	552	698	676	656	676	642	642
Saudi Arabia	3,097	3,055	3,586	3,727	3,854	4,421	7,074	8,249	8,924
Syria	535	119	205	148	143	143	144	145	146
Turkey	637	600	904	863	816	816	816	816	816
United Arab Emirates	0	0	36	0	0	0	0	0	0
Other Middle East	0	3	0	0	0	0	0	0	0
<b>South Asia Total</b>	<b>9,044</b>	<b>8,330</b>	<b>10,372</b>	<b>10,251</b>	<b>10,114</b>	<b>10,226</b>	<b>10,776</b>	<b>10,861</b>	<b>10,776</b>
Bangladesh	53	115	111	83	40	65	65	65	65
India	8,471	7,774	9,850	9,559	9,465	9,553	10,102	10,187	10,102
Pakistan	472	392	362	559	559	559	559	559	559
Sri Lanka	48	49	50	50	50	50	50	50	50
Other South Asia	0	0	0	0	0	0	0	0	0
<b>South-East Asia Total</b>	<b>5,336</b>	<b>5,005</b>	<b>4,520</b>	<b>5,277</b>	<b>6,188</b>	<b>6,770</b>	<b>6,910</b>	<b>6,894</b>	<b>6,878</b>
Indonesia	1,768	1,479	1,846	2,207	2,731	3,276	3,447	3,447	3,447
Malaysia	837	575	312	322	322	322	322	322	322
Philippines	467	390	0	0	0	0	0	0	0
Vietnam	2,229	2,546	2,343	2,722	3,109	3,145	3,114	3,098	3,082
Other South-East Asia	35	15	20	26	26	27	27	27	27
<b>East Asia Total</b>	<b>79,184</b>	<b>77,673</b>	<b>80,802</b>	<b>87,617</b>	<b>85,002</b>	<b>84,165</b>	<b>83,349</b>	<b>83,005</b>	<b>83,177</b>
China	78,014	76,642	79,665	86,596	83,850	83,013	82,229	81,909	82,081
Japan	308	375	326	372	383	382	382	382	382
North Korea	100	100	100	75	75	75	75	75	75
South Korea	567	430	557	511	633	633	601	577	577
Taiwan	195	125	155	62	62	62	62	62	62
<b>Oceania Total</b>	<b>3,105</b>	<b>2,878</b>	<b>3,385</b>	<b>3,345</b>	<b>3,420</b>	<b>3,456</b>	<b>3,500</b>	<b>3,451</b>	<b>3,435</b>
<b>Oceania Total</b>	<b>3,105</b>	<b>2,878</b>	<b>3,385</b>	<b>3,345</b>	<b>3,420</b>	<b>3,456</b>	<b>3,500</b>	<b>3,451</b>	<b>3,435</b>
Australia	2,479	2,271	2,536	2,719	2,774	2,789	2,833	2,784	2,768
Nauru	0	0	96	0	0	0	0	0	0
New Zealand	619	602	735	597	617	638	638	638	638
Other Oceania	6	6	18	29	29	29	29	29	29
<b>Unidentified Total</b>	<b>915</b>	<b>68</b>	<b>617</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Unidentified Total</b>	<b>915</b>	<b>68</b>	<b>617</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>Unidentified</b>	<b>915</b>	<b>68</b>	<b>617</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Unidentified Total</b>	<b>915</b>	<b>68</b>	<b>617</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Table E.1: Phosphate Rock Imports, '000t, 2012-2020

	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>World Total</b>	<b>30,181</b>	<b>25,906</b>	<b>29,092</b>	<b>29,133</b>	<b>30,229</b>	<b>31,301</b>	<b>31,421</b>	<b>31,637</b>	<b>31,756</b>
<b>Europe &amp; CIS Total</b>	<b>8,620</b>	<b>6,970</b>	<b>7,968</b>	<b>7,951</b>	<b>8,958</b>	<b>9,029</b>	<b>9,073</b>	<b>9,164</b>	<b>9,201</b>
<b>West Europe Total</b>	<b>3,764</b>	<b>2,861</b>	<b>3,168</b>	<b>3,130</b>	<b>3,285</b>	<b>3,180</b>	<b>3,180</b>	<b>3,180</b>	<b>3,180</b>
Austria	225	129	220	171	171	171	171	171	171
Belgium	1,254	974	833	809	904	798	798	798	798
France	291	216	241	209	245	246	245	246	246
Germany	0	0	106	95	95	95	95	95	95
Greece	129	105	199	150	147	147	147	147	147
Italy	214	151	205	154	154	154	154	154	154
Netherlands	572	229	180	246	239	239	239	239	239
Norway	675	680	704	784	799	799	799	799	799
Portugal	105	73	108	80	80	80	80	80	80
Spain	280	242	366	423	423	423	423	423	423
Other West Europe	19	63	6	9	29	29	29	29	29
<b>East Europe Total</b>	<b>3,749</b>	<b>3,312</b>	<b>4,246</b>	<b>4,145</b>	<b>4,467</b>	<b>4,533</b>	<b>4,468</b>	<b>4,449</b>	<b>4,436</b>
Bulgaria	483	368	578	488	615	620	625	625	625
Croatia	46	41	0	73	73	73	73	73	73
Lithuania	1,013	1,342	1,671	1,658	1,629	1,669	1,607	1,607	1,607
Poland	1,271	923	1,267	1,132	1,176	1,181	1,140	1,120	1,107
Romania	359	318	356	360	360	360	360	360	360
Serbia	0	33	73	192	243	260	260	260	260
Ukraine	578	288	277	242	369	369	403	403	403
Other East Europe	0	0	25	0	0	0	0	0	1
<b>CIS Total</b>	<b>1,107</b>	<b>797</b>	<b>554</b>	<b>676</b>	<b>1,206</b>	<b>1,315</b>	<b>1,425</b>	<b>1,535</b>	<b>1,585</b>
Belarus	493	469	443	553	524	534	543	553	553
Russia	499	274	35	0	550	650	750	850	900
Tajikistan	115	0	0	0	0	0	0	0	0
Turkmenistan	0	53	46	117	117	117	117	117	117
Uzbekistan	0	0	31	0	0	0	0	0	0
Other CIS	0	0	0	7	15	15	15	15	15
<b>Africa Total</b>	<b>8</b>	<b>61</b>	<b>43</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>21</b>
<b>North Africa Total</b>	<b>0</b>	<b>19</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Other North Africa	0	19	0	0	0	0	0	0	0
<b>East Africa Total</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Other East Africa	0	0	1	0	0	0	0	0	0
<b>West Africa Total</b>	<b>3</b>	<b>28</b>	<b>20</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>16</b>	<b>17</b>
Other West Africa	3	28	20	16	16	16	16	16	17
<b>Central Africa Total</b>	<b>0</b>	<b>3</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>	<b>4</b>
Other Central Africa	0	3	4	4	4	4	4	4	4
<b>Southern Africa Total</b>	<b>5</b>	<b>12</b>	<b>19</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Other Southern Africa	5	12	19	0	0	0	0	0	0
<b>North America Total</b>	<b>3,553</b>	<b>3,525</b>	<b>2,820</b>	<b>2,811</b>	<b>2,628</b>	<b>2,628</b>	<b>2,628</b>	<b>2,628</b>	<b>2,628</b>
<b>North America Total</b>	<b>3,553</b>	<b>3,525</b>	<b>2,820</b>	<b>2,811</b>	<b>2,628</b>	<b>2,628</b>	<b>2,628</b>	<b>2,628</b>	<b>2,628</b>
Canada	61	318	905	861	828	828	828	828	828
USA	3,493	3,207	1,915	1,949	1,800	1,800	1,800	1,800	1,800
<b>Central &amp; South America Tot</b>	<b>3,054</b>	<b>2,948</b>	<b>3,010</b>	<b>3,381</b>	<b>3,139</b>	<b>3,483</b>	<b>2,851</b>	<b>2,954</b>	<b>3,110</b>
<b>Caribbean Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Other Caribbean Africa	0	0	0	0	0	0	0	0	0
<b>Central America Total</b>	<b>852</b>	<b>800</b>	<b>764</b>	<b>876</b>	<b>825</b>	<b>810</b>	<b>878</b>	<b>890</b>	<b>902</b>
Mexico	836	800	764	876	825	810	878	890	902
Other Central America	16	0	0	0	0	0	0	0	0
<b>South America Total</b>	<b>2,202</b>	<b>2,149</b>	<b>2,246</b>	<b>2,506</b>	<b>2,314</b>	<b>2,673</b>	<b>1,973</b>	<b>2,064</b>	<b>2,208</b>
Argentina	279	132	223	276	276	276	276	276	276
Brazil	1,448	1,646	1,689	1,750	1,524	1,884	1,184	1,274	1,418
Colombia	69	68	70	107	100	100	100	100	100
Peru	132	117	116	207	250	250	250	250	250
Uruguay	142	100	69	89	89	89	89	89	89
Venezuela	111	74	65	62	60	60	60	60	60
Other South America	22	12	15	16	15	15	15	15	16

Table E.1: Phosphate Rock Imports, '000t, 2012-2020 - *Concluded*.

	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Asia Total</b>	<b>13,023</b>	<b>11,381</b>	<b>13,482</b>	<b>13,911</b>	<b>14,414</b>	<b>15,051</b>	<b>15,759</b>	<b>15,786</b>	<b>15,702</b>
<b>Middle East Total</b>	<b>1,114</b>	<b>1,038</b>	<b>1,560</b>	<b>1,812</b>	<b>1,708</b>	<b>1,687</b>	<b>1,707</b>	<b>1,673</b>	<b>1,673</b>
Iran	0	31	65	216	200	200	200	200	200
Israel	0	0	0	42	0	0	0	0	0
Lebanon	447	404	552	698	676	656	676	642	642
Turkey	637	600	904	855	816	816	816	816	816
United Arab Emirates	0	0	36	0	0	0	0	0	0
Other Middle East	30	3	3	1	15	15	15	15	15
<b>South Asia Total</b>	<b>7,742</b>	<b>6,968</b>	<b>8,725</b>	<b>8,547</b>	<b>8,564</b>	<b>8,676</b>	<b>9,226</b>	<b>9,311</b>	<b>9,226</b>
Bangladesh	53	115	111	83	40	65	65	65	65
India	7,316	6,561	8,353	8,001	8,065	8,153	8,702	8,787	8,702
Pakistan	372	292	262	463	459	459	459	459	459
Other South Asia	0	0	0	0	0	0	0	0	0
<b>South-East Asia Total</b>	<b>3,094</b>	<b>2,444</b>	<b>2,159</b>	<b>2,537</b>	<b>3,064</b>	<b>3,610</b>	<b>3,781</b>	<b>3,781</b>	<b>3,781</b>
Indonesia	1,767	1,479	1,845	2,207	2,731	3,276	3,447	3,447	3,447
Malaysia	837	575	312	322	322	322	322	322	322
Philippines	464	387	0	0	0	0	0	0	0
Other South-East Asia	25	4	3	8	11	12	12	12	12
<b>East Asia Total</b>	<b>1,073</b>	<b>931</b>	<b>1,037</b>	<b>1,016</b>	<b>1,078</b>	<b>1,077</b>	<b>1,045</b>	<b>1,021</b>	<b>1,022</b>
China	0	0	0	70	0	0	0	0	0
Japan	308	375	326	372	383	382	382	382	382
South Korea	567	430	557	511	633	633	601	577	577
Taiwan	195	125	155	62	62	62	62	62	62
Other East Asia	3	0	0	0	0	0	0	0	1
<b>Oceania Total</b>	<b>1,009</b>	<b>953</b>	<b>1,153</b>	<b>1,058</b>	<b>1,070</b>	<b>1,091</b>	<b>1,089</b>	<b>1,085</b>	<b>1,094</b>
<b>Oceania Total</b>	<b>1,009</b>	<b>953</b>	<b>1,153</b>	<b>1,058</b>	<b>1,070</b>	<b>1,091</b>	<b>1,089</b>	<b>1,085</b>	<b>1,094</b>
Australia	389	352	418	461	452	452	451	447	456
New Zealand	619	602	735	597	617	638	638	638	638
<b>Unidentified Total</b>	<b>915</b>	<b>68</b>	<b>617</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Unidentified Total</b>	<b>915</b>	<b>68</b>	<b>617</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Table F.1: Phosphate Rock exports, '000t, 2012-2020

	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>World Total</b>	<b>30,337</b>	<b>25,982</b>	<b>29,089</b>	<b>29,133</b>	<b>30,229</b>	<b>31,301</b>	<b>31,421</b>	<b>31,637</b>	<b>31,756</b>
<b>Europe &amp; CIS Total</b>	<b>2,151</b>	<b>2,432</b>	<b>2,368</b>	<b>2,387</b>	<b>2,992</b>	<b>3,050</b>	<b>3,250</b>	<b>3,300</b>	<b>3,343</b>
<b>West Europe Total</b>	<b>44</b>	<b>0</b>	<b>27</b>	<b>148</b>	<b>142</b>	<b>150</b>	<b>150</b>	<b>150</b>	<b>150</b>
Finland	0	0	0	148	142	150	150	150	150
Other West Europe	44	0	27	0	0	0	0	0	0
<b>CIS Total</b>	<b>2,107</b>	<b>2,432</b>	<b>2,341</b>	<b>2,240</b>	<b>2,850</b>	<b>2,900</b>	<b>3,100</b>	<b>3,150</b>	<b>3,193</b>
Kazakhstan	505	246	84	117	600	650	850	900	943
Russia	1,602	2,186	2,257	2,123	2,250	2,250	2,250	2,250	2,250
<b>Africa Total</b>	<b>16,556</b>	<b>13,751</b>	<b>15,463</b>	<b>15,110</b>	<b>14,698</b>	<b>15,758</b>	<b>16,047</b>	<b>16,329</b>	<b>16,296</b>
<b>North Africa Total</b>	<b>14,947</b>	<b>12,120</b>	<b>13,518</b>	<b>12,752</b>	<b>11,786</b>	<b>12,442</b>	<b>10,950</b>	<b>10,003</b>	<b>9,590</b>
Algeria	1,197	1,070	1,329	1,351	1,558	1,558	1,558	1,558	1,558
Egypt	4,073	2,417	3,370	2,919	2,861	2,870	2,870	2,605	2,605
Morocco	9,593	8,602	8,735	8,459	7,267	7,914	6,372	5,490	5,077
Tunisia	85	0	84	0	100	100	150	350	350
Other North Africa	0	31	0	23	0	0	0	0	0
<b>East Africa Total</b>	<b>5</b>	<b>11</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Other East Africa	5	11	0	0	0	0	0	0	0
<b>West Africa Total</b>	<b>1,189</b>	<b>1,433</b>	<b>1,718</b>	<b>1,768</b>	<b>2,262</b>	<b>2,216</b>	<b>2,072</b>	<b>2,052</b>	<b>2,033</b>
Senegal	156	290	536	847	1,162	1,136	1,012	1,012	1,012
Togo	1,033	1,143	1,182	922	1,100	1,080	1,060	1,040	1,020
Other West Africa	0	0	0	0	0	0	0	0	1
<b>Central Africa Total</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>450</b>	<b>1,750</b>	<b>2,870</b>	<b>3,075</b>
Congo	0	0	0	0	0	450	1,750	2,870	3,075
<b>Southern Africa Total</b>	<b>415</b>	<b>187</b>	<b>227</b>	<b>590</b>	<b>650</b>	<b>650</b>	<b>1,275</b>	<b>1,404</b>	<b>1,598</b>
South Africa	415	187	227	590	650	650	1,275	1,404	1,598
<b>Central &amp; South America Total</b>	<b>3,218</b>	<b>3,445</b>	<b>3,220</b>	<b>3,914</b>	<b>3,930</b>	<b>3,930</b>	<b>3,930</b>	<b>3,930</b>	<b>3,930</b>
<b>South America Total</b>	<b>3,218</b>	<b>3,445</b>	<b>3,220</b>	<b>3,914</b>	<b>3,930</b>	<b>3,930</b>	<b>3,930</b>	<b>3,930</b>	<b>3,930</b>
Peru	3,218	3,445	3,220	3,914	3,930	3,930	3,930	3,930	3,930
<b>Asia Total</b>	<b>7,135</b>	<b>5,450</b>	<b>7,137</b>	<b>7,116</b>	<b>7,862</b>	<b>7,817</b>	<b>7,473</b>	<b>7,577</b>	<b>7,686</b>
<b>Middle East Total</b>	<b>6,478</b>	<b>4,978</b>	<b>6,672</b>	<b>6,653</b>	<b>7,250</b>	<b>7,241</b>	<b>6,866</b>	<b>6,971</b>	<b>7,082</b>
Israel	885	946	1,035	1,291	1,831	1,731	1,481	1,481	1,481
Jordan	4,336	3,241	4,616	4,631	5,414	5,500	5,075	5,186	5,296
Syria	1,245	779	1,021	731	0	0	300	300	300
Other Middle East	11	12	0	0	5	10	10	5	5
<b>South-East Asia Total</b>	<b>168</b>	<b>114</b>	<b>130</b>	<b>137</b>	<b>112</b>	<b>76</b>	<b>107</b>	<b>105</b>	<b>104</b>
Vietnam	168	114	130	137	112	76	107	105	104
<b>East Asia Total</b>	<b>489</b>	<b>358</b>	<b>335</b>	<b>326</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>	<b>500</b>
China	489	358	335	326	500	500	500	500	500
<b>Oceania Total</b>	<b>1,277</b>	<b>904</b>	<b>901</b>	<b>607</b>	<b>746</b>	<b>746</b>	<b>721</b>	<b>501</b>	<b>501</b>
<b>Oceania Total</b>	<b>1,277</b>	<b>904</b>	<b>901</b>	<b>607</b>	<b>746</b>	<b>746</b>	<b>721</b>	<b>501</b>	<b>501</b>
Christmas Island	754	556	722	506	500	500	500	280	280
Nauru	523	347	180	101	246	246	221	221	221

# Appendix G:

## Industrial and economic outlook, 2016 – 2020

- **Global economy in transition - uncertainty abounds**
- **Stronger US dollar will continue to pressure commodity prices – all eyes on the ECB**
- **FEATURE: Oil – Lower for longer or bound to rebound?**

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### 1. Overview

Transition in the global economy will continue to dominate the economic outlook. With transition comes uncertainty for the past is largely a known quantity (if not necessarily well understood) while the future is full of options, unknowns and “what ifs”. We know that the US has taken the first step towards normalizing monetary policy. The US dollar strengthened significantly prior to the rate increase and, combined with a more negative outlook for China, emerging market currencies shifted much lower. The pace and timing of future rate rises by the Fed, along with the actions of the European Central Bank, have significant implications for both currency movements and the direction of commodity prices.

Export-oriented emerging economies will continue to struggle since their previous engine of growth, China, remains focused on rebalancing towards more private consumption and less investment spending. We are already seeing some positive effects in China’s consumer sector in the form of stronger vehicle sales and, over the medium term, as overcapacity in the real estate sector is reduced and China moves up the value chain, new opportunities for industry will arise.

The collapse in oil prices is at the crux of the negative investor sentiment dominating commodity markets. We offer our view on the prospects for the oil market on **page 5**.

Commodities production costs, and therefore price support, will experience downward pressure from the renewed slide in oil prices, which, in January 2016, fell to lows not seen since September 2003. From the macroeconomic perspective, sustained oil prices at a relatively low level are a net positive for the developed economies and for China and India. Our base case forecasts are for reasonable, if unspectacular, growth in the developed economies. In our upside scenario we present the potential for a stronger rebound in the developed world.

Downside risks dominate in the emerging markets. China remains the major downside risk to the outlook, with metals-intensive sectors most at risk from past debt excesses and the rebalancing of the economy towards consumption and services. Many other emerging markets are exposed to weaker commodity prices, including oil prices, and to capital flight as financial markets adjust to rising US interest rates. In our downside scenario we explore the effects on growth of significant capital flight from emerging markets.

## Upside risks

- **OECD recovery takes-off:** The OECD could take-off, bringing a stronger economic rebound as pent up demand is released. Stronger world trade would benefit all, especially export-dependent emerging economies.
- **Indian renaissance:** If economic reforms are implemented more quickly than expected, India could return to 8%+ GDP growth.
- **Oil prices permanently lower:** Still lower prices would boost global GDP growth by 20bp pa over 2016-18.

## Downside risks

- **China crash:** A massive increase in debt and a bold program of structural reforms mean that risks are increasingly skewed to the downside as we go forward, especially for investment and construction. A large negative risk for commodity markets.
- **Emerging economy capital outflows:** Global capital is retreating from riskier emerging economies and finding a safer home in the developed world. Without foreign capital, emerging economy growth will slow and currencies weaken further.
- **Chaotic Grexit:** Concerns over Greece exiting the Eurozone have receded, but not gone away. Exit could shake confidence in the euro's future, sending the region into recession and denting world growth.

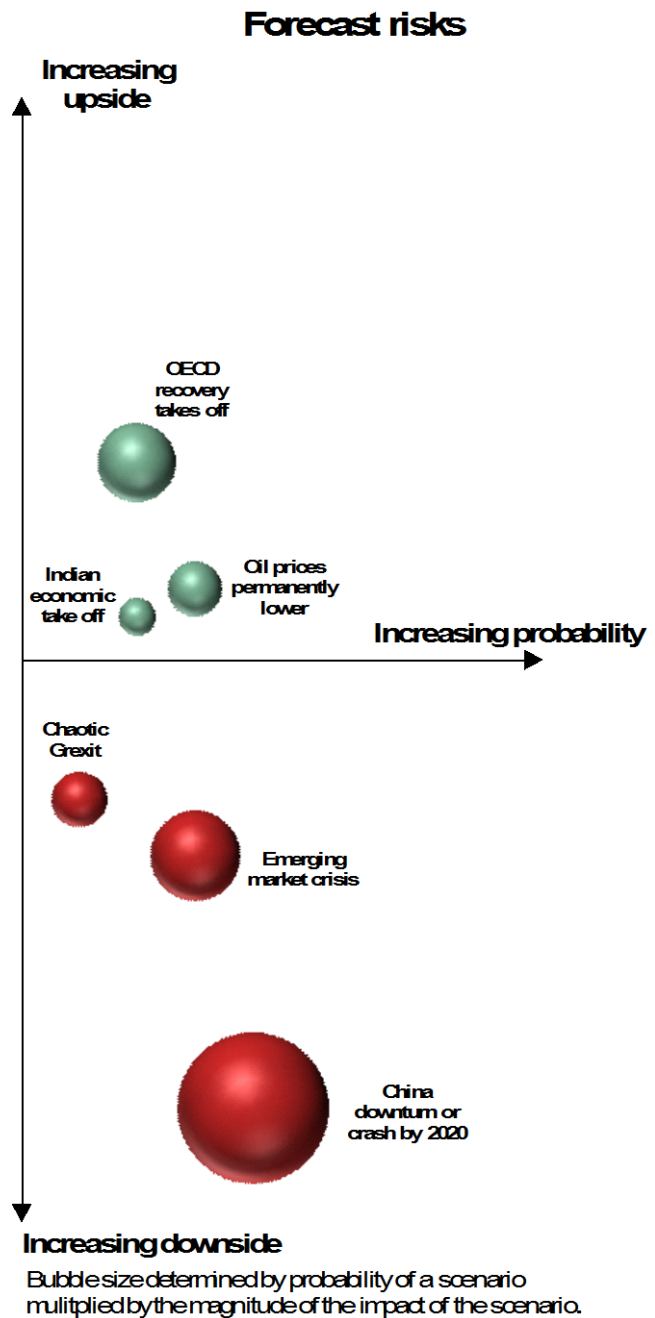


Table G.1: World food, agricultural and fertilizer prices  
(percentage change year-on-year)

	World agricultural raw materials price	World fertilisers price	World food price
2015 Q1	-8.3	-3.1	-15.7
2015 Q2	-11.2	-0.2	-21.0
2015 Q3	-17.2	-7.0	-15.4
2015 Q4	-14.9	-8.0	-9.3
2016 Q1	-11.9	-6.0	-3.5
2016 Q2	-10.0	0.0	-0.6
2016 Q3	-0.7	2.9	1.7
2016 Q4	-0.5	6.3	1.1
2017 Q1	-0.5	7.9	1.8
2017 Q2	0.2	6.3	3.4
2017 Q3	0.5	4.7	3.4
2017 Q4	0.1	2.4	2.7

Data : OE, CRU

Table G.2: Industrial production in selected major economies  
(percentage change year-on-year)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>North America</b>	<b>3.2</b>	<b>2.5</b>	<b>1.7</b>	<b>3.6</b>	<b>0.9</b>	<b>0.4</b>	<b>3.1</b>	<b>2.4</b>	<b>2.0</b>	<b>2.1</b>
Canada	4.8	0.0	2.2	4.0	-2.1	-0.5	2.4	1.9	1.9	1.9
Mexico	3.5	2.8	-0.5	2.5	1.3	1.7	3.1	3.5	2.8	2.7
USA	3.0	2.8	1.9	3.7	1.3	0.4	3.2	2.4	2.0	2.1
<b>Central &amp; South America</b>	<b>2.2</b>	<b>-1.1</b>	<b>1.6</b>	<b>-2.1</b>	<b>-4.8</b>	<b>-2.0</b>	<b>1.9</b>	<b>2.9</b>	<b>3.2</b>	<b>3.1</b>
Argentina	6.6	-1.2	-0.2	-3.1	0.1	0.8	2.6	3.1	3.5	3.5
Brazil	0.5	-2.7	2.2	-2.9	-7.8	-4.4	1.0	1.9	2.5	2.5
Chile	3.6	2.9	3.9	0.4	-0.1	1.5	2.4	2.7	2.8	2.7
<b>Europe</b>	<b>3.3</b>	<b>-1.2</b>	<b>-0.6</b>	<b>1.2</b>	<b>0.8</b>	<b>1.1</b>	<b>1.9</b>	<b>1.6</b>	<b>1.6</b>	<b>1.7</b>
Eurozone	3.5	-2.4	-0.7	0.8	1.3	1.2	1.9	1.3	1.3	1.3
France	2.4	-2.5	-0.5	-1.0	1.4	1.4	1.3	0.7	0.9	1.0
Germany	7.3	-0.3	0.1	1.3	0.9	0.4	1.8	1.2	1.0	0.9
Italy	1.3	-6.2	-3.1	-0.5	1.1	1.8	1.5	0.9	0.8	0.8
Spain	-1.5	-6.6	-1.6	1.2	3.2	2.6	2.7	2.4	2.6	2.5
Poland	7.0	1.5	2.4	3.2	4.4	5.8	4.9	4.3	4.2	3.7
Russia	5.0	3.3	0.5	1.5	-3.0	-2.4	1.5	1.9	2.2	2.6
UK	-0.6	-2.8	-0.8	1.3	1.4	1.7	1.3	0.7	0.8	1.4
<b>Asia &amp; Australasia</b>	<b>7.1</b>	<b>5.6</b>	<b>5.0</b>	<b>5.1</b>	<b>3.4</b>	<b>4.2</b>	<b>4.3</b>	<b>4.0</b>	<b>4.2</b>	<b>4.3</b>
Australia	1.2	3.3	2.1	4.6	2.1	3.9	2.2	1.8	2.1	2.4
China	13.7	10.0	9.7	8.3	6.1	5.8	5.6	5.5	5.7	5.9
India	4.8	0.7	0.6	1.8	3.8	5.5	6.8	7.0	7.0	6.9
Indonesia	4.1	4.1	6.0	4.8	4.7	4.5	5.3	5.1	5.4	5.4
Japan	-2.6	0.2	-0.6	2.1	-0.8	1.6	1.7	0.6	0.9	0.6
Malaysia	2.4	4.2	3.4	5.1	4.4	2.8	3.2	3.0	3.1	3.0
Philippines	4.7	5.4	10.3	8.3	5.9	9.0	5.3	4.7	5.2	5.3
South Korea	6.0	1.7	0.4	0.5	-0.8	1.8	3.6	2.9	2.1	1.9

Table G.2: Industrial production in selected major economies (percentage change year-on-year) – *Concluded*.

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Taiwan	4.4	-0.2	0.7	6.4	-1.4	3.3	4.1	3.1	2.3	2.3
Thailand	-5.2	11.0	2.3	-5.1	-0.1	3.0	4.3	4.1	3.7	3.4
Vietnam	6.7	5.8	5.4	7.1	7.6	6.5	6.5	6.5	6.4	6.3
<b>Africa</b>	<b>-1.2</b>	<b>3.2</b>	<b>-2.0</b>	<b>3.2</b>	<b>-0.3</b>	<b>2.3</b>	<b>3.0</b>	<b>3.1</b>	<b>3.2</b>	<b>3.7</b>
Egypt	-6.9	5.1	-7.1	8.3	-0.7	4.0	4.1	4.0	4.0	4.0
South Africa	3.0	2.0	1.5	0.1	-0.1	1.1	2.2	2.5	2.7	3.4
<b>Middle East</b>	<b>10.2</b>	<b>4.9</b>	<b>1.5</b>	<b>2.4</b>	<b>1.6</b>	<b>1.8</b>	<b>1.8</b>	<b>1.8</b>	<b>1.8</b>	<b>1.8</b>
Turkey	10.1	2.5	3.0	3.6	3.0	2.8	2.8	3.3	3.6	3.6
Saudi Arabia	12.0	4.9	0.2	2.7	0.8	0.6	0.8	1.1	0.9	0.6
UAE	5.6	7.0	2.8	4.5	2.2	2.6	2.3	0.9	0.7	1.2
<b>World</b>	<b>4.9</b>	<b>2.7</b>	<b>2.6</b>	<b>3.4</b>	<b>1.8</b>	<b>2.3</b>	<b>3.4</b>	<b>3.0</b>	<b>3.1</b>	<b>3.2</b>
Developed economies	2.2	0.4	0.4	2.4	0.7	1.1	2.4	1.7	1.6	1.6
Emerging economies	8.3	5.6	5.2	4.5	3.0	3.6	4.3	4.4	4.6	4.7

Data : OE, CRU

Notes: Except for 'Africa', regional totals include countries not shown in the table. Weighted by industrial aggregate value added at year 2010 prices and market exchange rates

Table G.3: Real GDP Agriculture

(percentage change in real GDP/GNP year-on-year)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
India	8.8	2.7	2.9	1.7	1.8	5.5	4.6	5.0	4.9	4.8
China	4.2	4.5	3.8	4.1	3.8	3.3	2.7	2.3	2.0	1.9
USA	-4.4	-8.3	18.5	2.6	5.7	2.6	2.3	2.1	2.1	2.1
Brazil	5.6	-3.1	8.4	2.1	1.3	1.3	2.2	2.5	2.4	2.4
Indonesia	3.9	4.6	4.2	4.2	4.7	4.3	4.7	4.4	4.0	3.6
Malaysia	6.7	0.9	2.0	2.2	0.6	1.6	1.9	1.2	1.3	1.4
Korea	-2.0	-0.9	3.1	2.6	-0.6	1.8	2.2	2.3	1.0	0.5
Thailand	5.7	3.4	0.0	0.7	-4.9	1.2	0.4	0.1	0.3	0.4
Philippines	2.6	2.8	1.1	1.6	1.8	7.5	4.0	3.5	3.6	3.9
Singapore	3.8	1.2	-2.3	1.9	2.9	3.1	2.5	1.7	2.7	3.0
Russia	8.3	-1.3	3.5	0.7	4.6	16.2	2.7	-4.5	-2.0	1.0
Denmark	-10.3	11.7	-18.7	17.6	4.1	2.3	0.8	0.3	0.2	0.6
Turkey	4.7	4.2	3.3	0.0	5.3	2.4	2.3	1.9	1.9	2.0
France	3.9	-8.6	-1.9	8.5	-0.9	0.6	1.5	0.8	0.8	1.0
Germany	-10.4	6.0	4.3	7.4	-2.1	1.8	1.1	0.5	0.1	0.2
Spain	4.4	-11.0	16.5	-3.7	1.3	2.5	1.9	1.6	1.6	1.8
Poland	0.0	-2.6	5.2	3.2	-0.6	1.9	1.6	1.1	1.3	1.5
Romania	12.9	-22.6	25.1	-0.4	0.5	2.0	0.5	-1.4	-0.9	0.2
Italy	1.9	-2.6	1.8	-2.2	3.7	0.9	1.0	0.9	0.7	0.8
UK	11.0	-7.3	0.7	14.3	0.6	1.3	1.4	0.9	0.8	1.1



Table G.3: Real GDP Agriculture (percentage change in real GDP/GNP year-on-year) – *Concluded*.

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Argentina	-3.8	-8.6	9.9	5.5	3.4	1.5	1.6	1.7	1.8	1.9
Mexico	-2.3	7.4	0.9	4.3	-2.8	1.4	1.2	1.2	1.2	1.1
Chile	8.7	-3.9	2.1	-0.4	3.1	2.3	3.6	1.8	1.4	1.3
Australia	5.1	-1.4	4.9	-0.1	0.2	2.1	2.5	2.0	1.9	1.8
Canada	2.3	2.0	12.6	-6.4	0.7	0.4	0.5	0.5	0.5	0.5

Data : OE, CRU

Table G.4: Population Growth  
(percentage change in population year-on-year)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
China	0.54	0.54	0.53	0.50	0.47	0.44	0.42	0.39	0.35	0.30
India	1.33	1.29	1.26	1.23	1.22	1.20	1.18	1.16	1.13	1.10
USA	0.73	0.74	0.72	0.83	0.82	0.82	0.81	0.81	0.80	0.79
Indonesia	1.32	1.32	1.30	1.26	1.21	1.16	1.12	1.08	1.04	1.01
Brazil	0.96	0.94	0.91	0.88	0.85	0.82	0.80	0.77	0.74	0.71
Russia	0.02	0.06	0.07	0.05	0.01	-0.03	-0.05	-0.08	-0.11	-0.14
Japan	-0.06	-0.09	-0.13	-0.15	-0.17	-0.20	-0.22	-0.25	-0.27	-0.29
Mexico	1.45	1.41	1.37	1.34	1.30	1.27	1.23	1.20	1.16	1.13
Philippines	1.60	1.61	1.61	1.59	1.56	1.53	1.51	1.49	1.47	1.45
Germany	-0.13	0.13	0.28	0.45	0.79	0.69	0.46	0.25	0.07	-0.05
Turkey	1.68	1.83	1.83	1.68	1.41	1.13	0.95	0.83	0.77	0.74
Thailand	0.36	0.41	0.41	0.38	0.31	0.25	0.21	0.18	0.14	0.11
France	0.47	0.44	0.43	0.46	0.47	0.45	0.44	0.42	0.40	0.39
UK	0.80	0.67	0.66	0.76	0.77	0.75	0.70	0.69	0.67	0.64
Italy	0.14	0.32	1.33	0.87	0.27	0.24	0.21	0.17	0.15	0.12
South Africa	1.18	1.14	1.09	1.03	0.96	0.88	0.82	0.77	0.73	0.70
South Korea	0.53	0.50	0.48	0.46	0.44	0.42	0.40	0.37	0.36	0.34
Spain	0.35	0.00	-0.36	-0.27	-0.17	-0.20	-0.24	-0.27	-0.30	-0.31
Argentina	1.05	1.06	1.05	1.03	1.01	0.98	0.97	0.95	0.93	0.91
Poland	0.04	0.00	-0.07	-0.01	0.04	0.02	-0.01	-0.03	-0.05	-0.08
Canada	1.01	1.15	1.16	1.12	0.93	1.07	0.99	0.97	0.96	0.95
Malaysia	1.60	1.56	1.52	1.48	1.43	1.38	1.34	1.30	1.27	1.25
Taiwan	0.24	0.35	0.30	0.21	0.18	0.15	0.12	0.09	0.07	0.04
Australia	1.51	1.70	1.74	1.76	1.81	1.78	1.82	1.74	1.75	1.74
Romania	-0.50	-0.43	-0.37	-0.25	-0.19	-0.19	-0.19	-0.19	-0.20	-0.20
Chile	1.09	1.09	1.08	1.06	1.04	1.02	1.00	0.98	0.95	0.92
Netherlands	0.46	0.35	0.30	0.32	0.33	0.32	0.32	0.32	0.31	0.30
World	1.20	1.20	0.82	1.17	1.13	1.12	1.10	1.07	1.04	1.01

Data : OE, CRU

## 2. Exchange rates

### US dollar notches additional gains in January

The Fed raised its benchmark Federal Funds rate by 25 basis points (to 0.50%) at its meeting on December 16<sup>th</sup> and at that time, Federal Reserve Chair Janet Yellen stated that the Fed would implement additional rate increases very gradually in order to gauge their effects on the US economy and, by extension, the US dollar. In its statement following the most recent policy meeting ended 27<sup>th</sup> January, the Fed remained cautiously optimistic regarding the US domestic economy but its concern over global developments had risen. After appreciating by 12.8% on average in 2015, the trade-weighted US dollar has gained another 2.1% since 31<sup>st</sup> December. Given continued low US inflation, the increased instability in financial markets and in oil exporting economies as a result of plunging oil prices, as well as the ongoing economic weakness in China and other key emerging markets, we do not anticipate another rate increase until June 2016, at the earliest.

### Monetary policy divergence underway

The euro had a turbulent end to 2015 as ECB action undershot financial market expectations and the Federal Reserve finally raised interest rates in the US – thus, the long-heralded monetary policy divergence is finally underway. While significant risks remain around the timing and number of interest rate increases in the US, CRU believes that there will be sufficient divergence to push the euro to a low of \$1.05/ € later this year, from current levels of close to \$1.09/€. Moreover, despite disappointing the markets in December, recent announcements suggest that the ECB is poised to step in should the Fed raise interest rates more slowly than expected.

### Change in RMB policy unsettles market

The People's Bank introduced a trade-weighted RMB index on 11th December which it now uses in place of the \$ as its reference rate for exchange rate policy. Having been surprised by the 'one-off' RMB/\$ devaluation in August, the markets did not receive the announcement of the change in exchange rate policy well. Since its introduction the index has fallen by 0.7%, almost all due to a 1.9% decline against the \$, with the downward pressure largely driven by negative sentiment. Looking ahead, given our expectation of slowing Chinese economic growth but no hard landing this year, we expect the RMB to trend weaker in 2016. The decline will predominantly be against the generally strong \$ and we forecast the RMB/\$ to trade at around 6.8 by the end of the year compared to 6.39 in 2015Q4.

## Safe haven status can preserve Yen strength

The Japanese yen appreciated to below 120/\$ in January as investors' concerns over China flared. Such strength could pose problems for the Bank of Japan (BoJ) since a stronger yen dampens inflation, which the BoJ is currently trying to push up toward 2% against a backdrop of already lower import prices, due, in part, to cheaper oil. As we prepare to enter a period of relatively infrequent economic data releases for China, investors will likely remain cautious, preserving the yen near 120/\$ through 2016Q1. The near term risks to the yen relate to the BoJ. If the central bank is concerned with the strong currency weakening inflation prospects and eroding exporters' competitiveness, it may look for more monetary easing which would likely see the yen weaken to north of 120.

## Rand hit hard by weak emerging market sentiment

Low commodity prices, combined fiscal and current account deficits, and generally negative sentiment towards emerging markets are all contributing to the rand's current weakness. Not only do estimates of the rand's fair value indicate that the currency may be notably undervalued, but CRU do not believe that the current negative sentiment in emerging economies, centred on fears of a China "hard landing", is justified. Moreover, CRU commodity price forecasts suggest that there will be an improvement in several of South Africa's key export commodities, which should support the rand in the medium term. Therefore, as better data emerge from China, allaying fears of a "hard landing", there is potential for some moderate rand appreciation in the medium term.

## Latin America's currencies unlikely to rebound

The **Mexican peso** finished 2015 lower than its end-2014 value by 16.7%. Following the Fed's interest rate increase on December 16<sup>th</sup>, the Bank of Mexico moved to support the peso and raised interest rates for the first time since 2008. Given low inflation and the central bank's willingness to match the Fed's decisions, the peso should not lose significant ground in 2016, but it will remain weaker than last year. By the end of 2015, the **Brazilian real** had depreciated by 49% since the previous year-end and it has fallen by another 3.7% already in 2016. The central bank has a definite problem in that, if it raises interest rates to curb very high inflation, it risks jeopardizing the government's finances. We are likely to see inflation remain well above the central bank's target which means the real will get weaker before it strengthens. The **Argentine peso** depreciated beyond our expectations following the Macri government's decision to remove capital controls on December 17<sup>th</sup>. As of this writing, it is trading around 13.8/\$, which is 41% below its value prior to that announcement. There has been more volatility in the peso than in the other major currencies in the region and we anticipate that will continue as the new Macri government begins to make strides in restructuring the economy.

Table G.5: Exchange rates, inflation rates and short-term interest rates (Exchange rate shown as local currency/US\$, yearly averages)

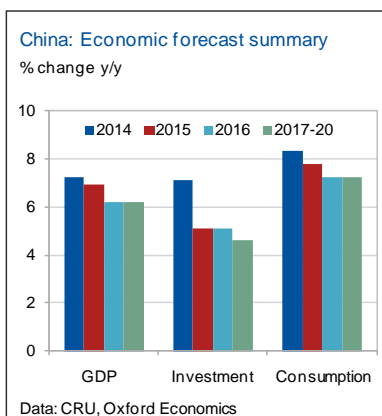
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Exchange rates</b>										
China	6.46	6.31	6.15	6.16	6.28	6.76	6.76	6.62	6.48	6.33
Euro	0.72	0.78	0.75	0.75	0.90	0.94	0.94	0.92	0.90	0.88
India	46.7	53.5	58.6	61.0	64.1	66.6	66.8	68.2	70.1	71.1
Japan	80	80	98	106	121	123	126	127	127	125
UK	0.62	0.63	0.64	0.61	0.65	0.69	0.66	0.66	0.65	0.65
Australia	0.97	0.97	1.04	1.11	1.33	1.46	1.40	1.34	1.32	1.31
Brazil	1.67	1.95	2.16	2.35	3.33	4.08	3.90	3.79	3.72	3.78
Canada	0.99	1.00	1.03	1.10	1.28	1.42	1.32	1.28	1.26	1.26
Chile	484	486	495	570	654	715	675	636	593	550
Russia	29.4	31.1	31.8	38.4	61.1	74.7	64.3	60.2	58.0	57.0
South Africa	7.26	8.20	9.64	10.8	12.76	16.3	15.7	15.2	15.2	15.5
				5		4	0	3	5	0
<b>Inflation rates</b>										
USA										
Consumer prices	3.1	2.1	1.5	1.6	0.1	1.1	2.6	2.4	2.2	2.3
GDP deflator	2.1	1.8	1.6	1.6	1.0	1.9	2.0	2.3	2.5	2.3
Consumer Prices										
China	5.4	2.6	2.6	2.0	1.5	1.6	2.6	2.8	3.0	3.0
Eurozone	2.7	2.5	1.3	0.4	0.0	0.4	2.0	2.1	1.7	1.6
India	8.3	9.4	9.9	6.6	4.9	5.2	5.9	5.8	5.3	5.0
Japan	-0.3	0.0	0.4	2.7	0.7	-0.1	2.5	1.5	0.8	0.8
UK	4.5	2.8	2.6	1.5	0.1	0.3	2.2	2.1	1.3	1.8
Australia	3.3	1.8	2.4	2.5	1.5	1.9	2.5	2.7	2.6	2.5
Brazil	6.6	5.4	6.2	6.3	9.0	7.9	6.5	5.4	4.4	4.0
Canada	2.9	1.5	1.0	1.9	1.0	1.1	2.3	2.3	2.1	2.0
Chile	3.3	3.0	1.9	4.4	4.3	3.5	3.5	3.0	2.6	2.6
Russia	8.4	5.1	6.8	7.8	15.5	8.5	6.0	5.1	4.3	3.9
South Africa	5.0	5.7	5.8	6.1	4.9	6.3	5.9	5.7	5.5	5.3
<b>Brent Crude (US\$/bbl)</b>	111	112	109	99	52	36	50	62	70	76
<b>Short-term interest rates</b>										
Australia	4.8	3.9	2.8	2.7	2.5	2.4	3.4	4.8	5.3	5.4
Canada	0.9	1.0	1.0	0.9	0.5	0.4	1.0	1.5	1.7	2.0
China	5.3	4.2	4.9	4.8	3.8	3.0	3.5	3.9	4.3	4.9
Eurozone	1.4	0.6	0.2	0.2	0.0	-0.3	-0.3	0.2	0.4	0.5
Japan	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
UK	0.9	0.8	0.5	0.5	0.6	0.6	1.1	1.6	1.9	2.4
USA	0.3	0.4	0.3	0.2	0.3	0.8	1.5	2.6	3.2	3.5

Data : OE, CRU

### 3. Macroeconomic outlook

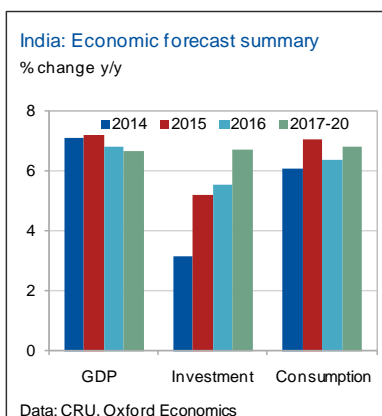
Each month CRU fully reviews its economic forecasts. This section sets out the macroeconomic story which underpins the forecasts in the preceding section. The written analysis which follows is amended when there are material changes to the outlook. The date of the latest update is listed below.

Country/region	Updated
<b>Asia</b>	
<b>China:</b> Twin track economy	<b>New this month</b>
<b>India:</b> Supportive macro policy and reforms drive growth	<b>New this month</b>
<b>Indonesia:</b> Mixed macro policy limits economy	<b>New this month</b>
<b>Japan:</b> BoJ steps up support for economy	<b>December</b>
<b>Korea:</b> Domestic demand pushing up growth	<b>New this month</b>
<b>Malaysia:</b> Consumer demand hit by GST	<b>October</b>
<b>Thailand:</b> Uncertain politics plague outlook	<b>New this month</b>
<b>Vietnam:</b> Export and investment led growth	<b>October</b>
<b>Americas</b>	
<b>USA:</b> Domestic strength will outweigh external weakness	<b>December</b>
<b>Brazil:</b> Still seeking a trough	<b>December</b>
<b>Mexico:</b> Solid domestic economy & stronger US will drive growth	<b>December</b>
<b>Europe, Middle-East and Africa</b>	
<b>Eurozone:</b> Slow but steady progress	<b>December</b>
<b>Germany:</b> Investment to take the reins	<b>November</b>
<b>Italy:</b> Seeing a cyclical upturn	<b>November</b>
<b>Central &amp; Eastern Europe:</b> Slowing but solid growth	<b>New this month</b>
<b>Russia:</b> Recovery to be limited by low oil prices	<b>November</b>
<b>Turkey:</b> Election leaves much unresolved	<b>November</b>
<b>Mid-East Gulf:</b> Iran to avoid 2016 slump	<b>November</b>
<b>N.Africa:</b> Solid prospects despite turmoil	<b>New this month</b>
<b>Other Africa:</b> Key themes of 2015 to persist	<b>November</b>



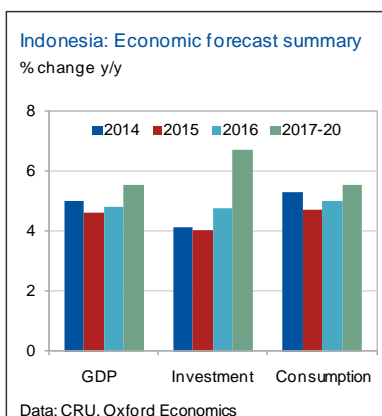
## China: Twin track economy

- China's economy is divided. One track shows still strong growth in consumer spending and services sector output, backed by a firm labour market and solid real income growth. The other track shows struggling real estate investment, which is weighing on heavy industry and exacerbating the issue of overcapacity. We expect GDP growth to slow to less than 6.5% in 2016 from 6.9% in 2015.
- We expect a managed deceleration in GDP growth into the medium term of around 6.0-6.5%, but investment and construction will slow more sharply as the economy rebalances. Risks are skewed to the downside due to China's debt overhang. The government's reforms to rebalance the economy away from investment and industry are vital, but also entail significant implementation risks.



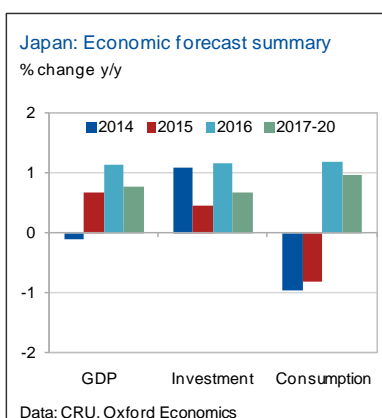
## India: Supportive macro policy and reforms drive growth

- Industrial production has been trending higher with more metals-intensive manufacturing contributing notably. Although floods will suppress growth over the turn of the year, leading indicators suggest IP will continue rising in to 2016.
- The central bank has brought interest rates down on the back of softer price pressures in recent quarters and the effects of the stimulus should offer support to growth in the coming quarters.
- We expect GDP growth will slow from the sharp, upwardly revised outturn in the recent past, but remain robust and average 6.6% pa over the next few years. Reform progress has been made but faster economic growth is conditional on further structural change.



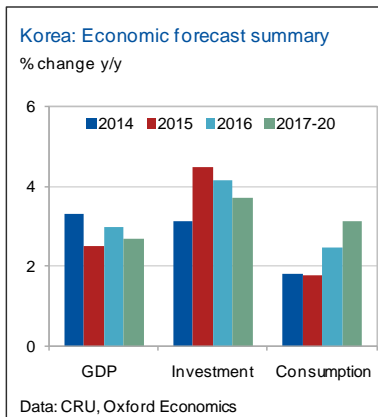
## Indonesia: Mixed policy limits economy

- All GDP components contributed to slow economic growth to 5.0% in 2014 and lower domestic demand has weakened 2015 GDP growth but reduced imports (which detract from GDP) have partially offset this.
- Growth will be constrained by weaker export revenue from commodity price falls but base effects mean inflation should fall and this will allow interest rates to come down in 2016, aiding domestic demand.
- The government talks of cutting red tape and making the country more open to foreign money. Although politics has frustrated, a cabinet reshuffle in 2015Q3 offers hope that politicians can affect positive change in the economy in the years ahead. Addressing structural problems would raise productivity and push GDP growth beyond the range of 5-5.5% we currently see as trend pace.



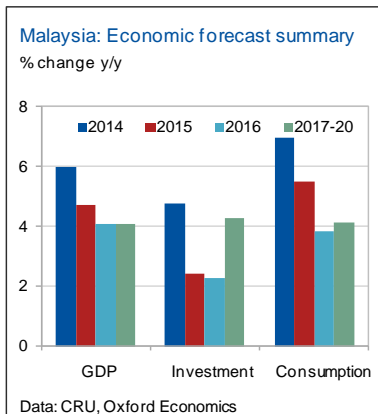
## Japan: BOJ steps up support for economy

- Lower demand from China and other parts of Asia is hurting exports but higher wages should offer a lift to consumer activity in the near term. Frontloading of purchases ahead of the next rise in the sales tax in 2017 should see consumption increase further in 2016 and 2017Q1.
- The central bank (BOJ) stepped up its asset program modestly in December and more fiscal stimulus seems likely. Despite the extraordinary level of stimulus in the country, the economy is set to continue eking out moderate growth in the coming years as demographics and low productivity growth hinder performance.



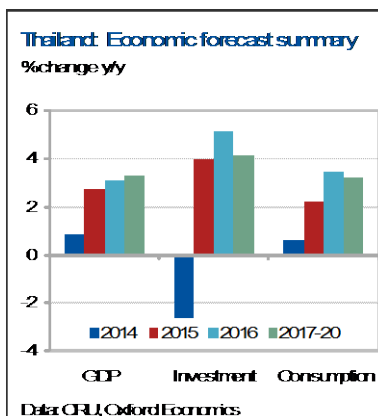
## Korea: Domestic demand pushing up growth

- GDP growth will have been slightly softer in 2015 as the typically export-dependent economy has seen domestic demand growth outstrip export growth. Consumer spending is seeing some support from monetary easing since the middle of last year, rising wages and job growth. Meanwhile, investment should see support from expansionary fiscal policy.
- The strength of the trade-weighted won has weighed on export growth over the past few years and we continue to expect a gradual appreciation of the currency into the medium term, which will weigh on GDP growth. However, strong fundamentals including a large fiscal surplus, and also the US recovery, which should give some support to exports, mean that risks are somewhat balanced.



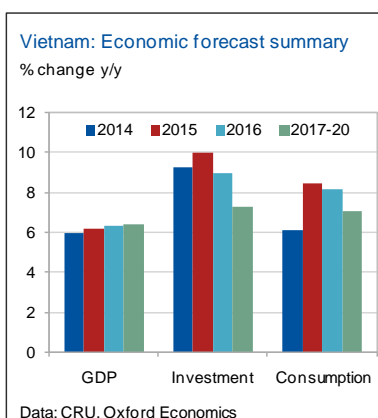
## Malaysia: Consumer demand hit by GST

- GDP and IP grew sharply in 2015Q1 as households and businesses front-loaded expenditure to avoid the introduction of the new goods and services tax (GST) this past April. Domestic demand growth has since slowed and will slow further in 2016. The GST has caused inflation to rise, which we think will eat into consumer spending, while a sharp decline in capital goods imports suggest that business investment will slow.
- CRU expects economic growth to moderate into 2016 on weaker consumer spending, fiscal consolidation and political problems which are acting as a deterrent for foreign investment. However, the government's plans to support infrastructure investment do provide upside risk to medium-term economic growth.



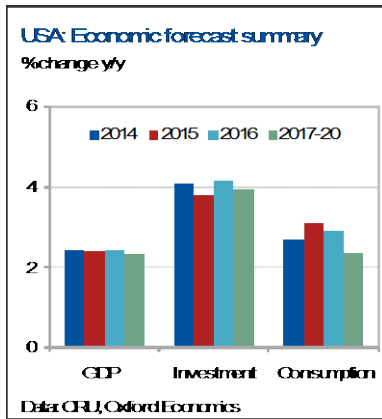
## Thailand: Uncertain politics plague outlook

- GDP growth has been improving of late due to a rebound in domestic demand. Meanwhile, lower raw materials prices mean inflation has become more benign. This has offered a boost to consumer spending and allowing monetary policy to remain accommodative. On the fiscal front, the military government appears to be implementing its spending plans, which are expanding public investment.
- The economy continues to face several headwinds including high levels of household debt and slower export demand from China – both of which are risks to our outlook. Thailand's political disruptions may have eased since 2014 but politics will become more prominent as we head towards 2017 elections and – at a time of already elevated concern for emerging markets – could deter capital inflows.



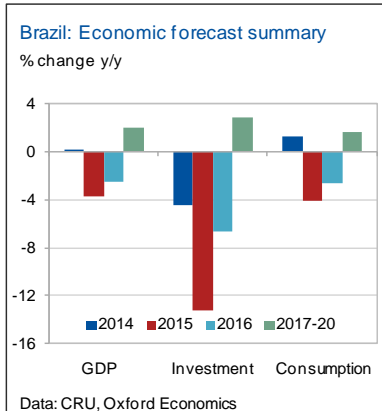
## Vietnam: Export and investment led growth

- We expect the economy to continue growing strongly and anticipate further acceleration into the medium term. Exports should continue to grow robustly, as manufacturing is supported by a currency on trend depreciation against the US\$, though softer demand from China will limit growth. Inflows of foreign direct investment, benign inflation and low interest rates have made room for the central bank to cut rates to support domestic demand and allow for more sustainable growth.
- CRU forecasts GDP growth to accelerate to around 6.5%pa into the medium term, with notable contributions from exports and investment. If implemented, the Trans-Pacific Partnership could benefit industry and agriculture. Downside risks include slower growth in China and a more gradual than expected pace of economic liberalisation.



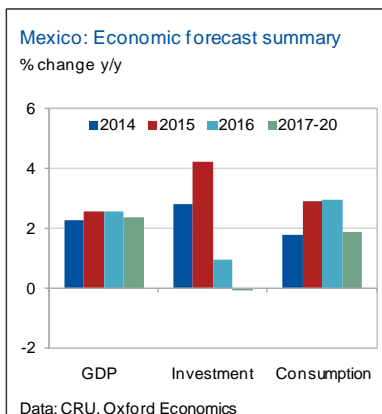
## USA: Domestic strength will outweigh external weakness

- Though US interest rates are set to move higher, the Fed has pledged that increases will be gradual and designed to minimize negative effects on economic growth.
- Our forecast for US GDP growth assumes an acceleration in investment spending. This implies continued expansion in the housing and nonresidential construction markets, along with outlays aimed at raising productivity gains throughout the economy.
- Stronger wage gains and lower fuel prices will support higher levels of consumer spending during our forecast horizon.



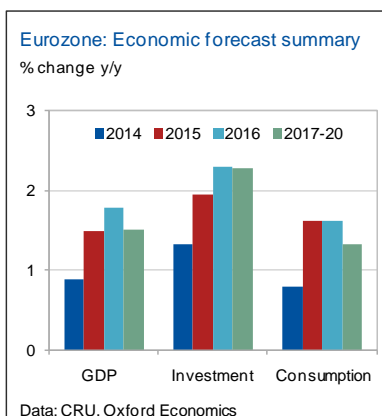
## Brazil: Still seeking a trough

- In December, Fitch downgraded Brazilian sovereign debt to junk status and maintained a negative outlook. This followed S&P's downgrade to junk status in September.
- President Dilma Rousseff is facing impeachment proceedings so she will struggle to make any additional headway on Brazil's problems. It does not help that 90% of the 2016 budget cannot be decreased without a change in the constitution.
- The sharp drop in the real has set the stage for Brazil to become more competitive in terms of its exports and to seek new markets. However, in order to lay strong foundations for growth in the future, structural reforms are needed which will strengthen policymaking institutions, boost productivity and spur infrastructure upgrades.



## Mexico: Solid domestic economy and strong US will drive growth

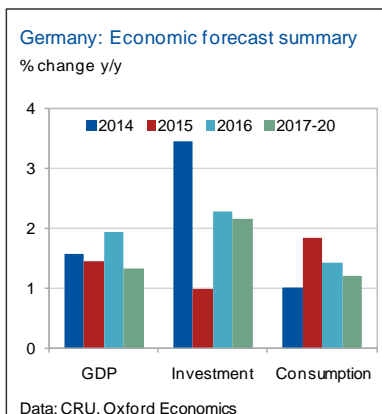
- Consumers will be the driving force behind Mexican economic growth. As the US economy improves and Mexico's exporters gain market share, manufacturing will also remain on solid footing.
- The central bank appears ready to match the Fed's rate moves in order to support the peso and keep inflation under control. Given that US rate increases are likely to be very small and gradually implemented, this policy stance will help support domestic spending.
- The energy sector is the main constraint on growth in 2016. Until the global oil market comes back into balance in 2017, this remains a downside risk to Mexican industrial activity.



## Eurozone: Slow but steady progress

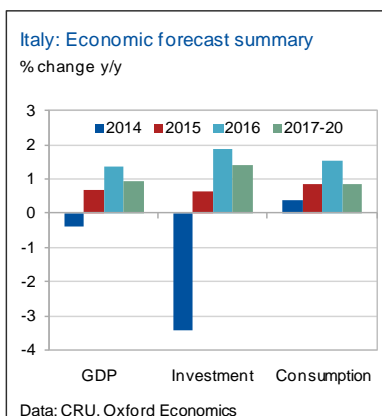
- CRU expects that consumption growth will moderate in the next few years as the tailwind from lower oil prices fades. However, investment is well positioned to take the growth mantle in coming years as capacity utilisation is currently at its highest level since 2011.
- In aggregate, slowing consumption and accelerating investment are likely to offset each other, leaving GDP growth close to current levels. Key structural factors, such as an ageing population, a prolonged period of high unemployment and a weak banking sector in many countries are likely to weigh on potential growth into the medium term. Labour market reforms in some countries offer signs of hope but the political backlash against immigration and austerity is a risk to future economic management and consequently, growth.





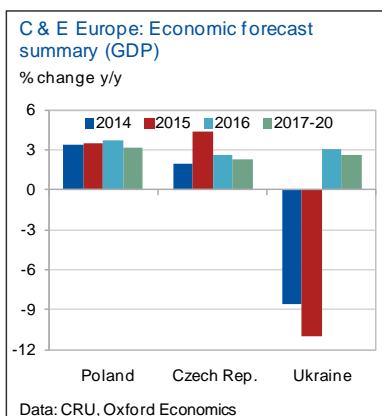
## Germany: Investment to take the reins

- High capacity utilisation and strong industry sentiment point towards solid investment in Germany. CRU expects investment to become an increasingly important driver of growth through the forecast period, as the tailwind from lower oil prices fades.
- Risks to the forecast are centred on politics. The political risks to the wider Eurozone, in the form of anti-austerity parties, represent the main risk to Germany, through the impact on confidence and export demand.
- Further out in the forecast period demographic concerns remain key. The surge of refugees recently arriving in Germany has prompted some optimism but CRU does not expect inflows to be sufficient to offset slowing growth in the domestic population.



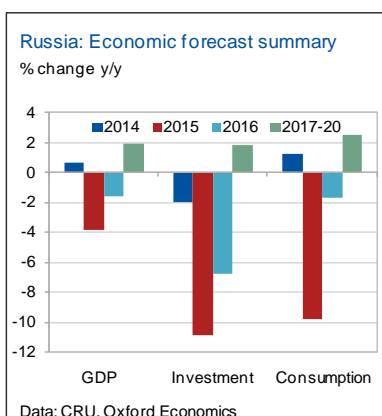
## Italy: Seeing a cyclical upturn but growth prospects are limited

- Optimism surrounding the recovery in Italy has been rising steadily. Low oil prices, falling unemployment and a weaker euro are combining to produce broad based growth, albeit at a slow pace. CRU expects growth to remain relatively muted but with a cyclical boost, as Italy recovers from a three year recession.
- Further out, stubbornly high unemployment will be a drag on growth. Reform efforts have been made, with encouraging evidence of progress, but they are unlikely to solve the problem. Similarly, slow population growth will further limit potential growth, whilst productivity is likely to remain subdued without significant reform efforts.



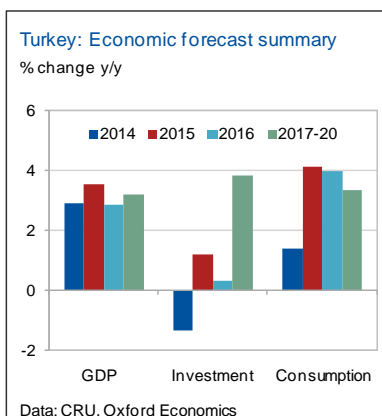
## C. & E. Europe: Slowing but solid growth

- There are signs that a recovery may be beginning in the Ukrainian economy, after 2015Q3 registering q/q growth. Nonetheless, political tension, high inflation and the lack of a resolution to the conflict are structural factors that will limit the extent of any recovery.
- The undermining of democratic institutions currently occurring in Poland could undermine an otherwise strong platform for growth. CRU now expects medium term growth to be closer to 3%.
- Growth momentum remains strong in the Czech Republic, due to low inflation and an easing of fiscal policy. However, a reduction in EU funding this year is likely to slow growth. Looking beyond 2016, growth will remain solid at close to 2.5%, with a declining labour supply preventing more rapid growth.



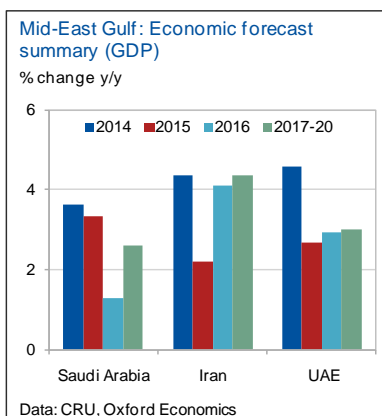
## Russia: Recovery to be limited by low oil prices

- Early indications that Russia has reached a turning point have started to emerge. However, the major driver of the recession in Russia, low oil prices, is unlikely to be reversed quickly, leading us to expect a very gradual recovery, with growth likely to be close to zero or negative in 2016. In particular, the impact of lower oil prices on investment will be felt for some time.
- Looking beyond next year, a declining working age population will weigh on potential growth, whilst the low oil price will slow the pace of investment. Moreover, an over-reliance on commodities and poor economic institutions will hamper productivity growth.



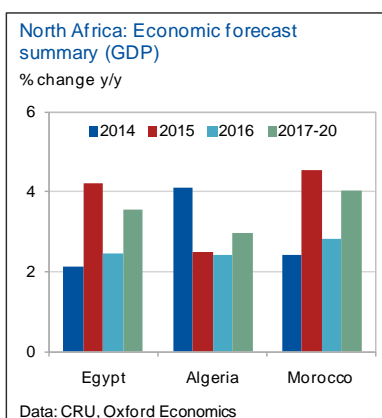
## Turkey: Election leaves much unresolved

- A surprise majority victory for the AKP in the November 1<sup>st</sup> election broke the political stalemate that had hung over Turkey in the summer. The result offers some hope of short term stability but recent developments in the region may undermine even this.
- In the medium term, CRU has not yet seen sufficient evidence of a strong reform agenda to be encouraged by the election result. Indeed, the president's attempts to cement his own powers using increasingly nationalistic language could create more political uncertainty than a coalition. As will the breakdown in the ceasefire with Kurdish militants. On the positive side, Turkey's robust labour market presents a strong platform for growth, should the government pursue a more reformist agenda than anticipated.



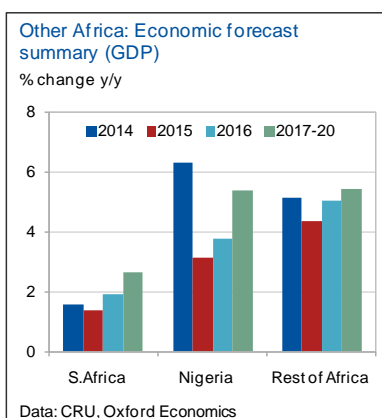
## Mid-East Gulf: Iran to avoid 2016 slump

- Saudi Arabia is continuing its strategy of extracting oil at record volumes to drive marginal producers out of the market. However, achieving their aim is taking longer than they envisaged and putting pressure on the government's finances. Growth is likely to slow in 2016 as a result.
- Unlike Saudi Arabia, the UAE has not been able to ramp oil production and mitigate falling oil prices. As a result, GDP growth is expected to slump in 2015 and 2016. However, preparation for the World Expo in Dubai should help growth towards the end of our forecast period.
- In Iran, the lifting of sanctions in 2016 is increasingly likely. CRU expects easing sanctions to result in increased oil exports and larger inflows of FDI, which should boost growth to close to 4%.



## N.Africa: Solid prospects despite turmoil

- In Egypt, growth is likely to be held back by several factors but remain robust. High levels of political risk, chronic foreign exchange shortages and the crowding out of the private sector will all act as limiting factors. Nonetheless, catch up potential and population growth should allow GDP growth of 3.7% in the medium term.
- Regional turmoil has prevented Morocco's tourism industry benefitting fully from the improved growth in the Eurozone. However, successful fiscal consolidation and control of inflation are a solid platform, while exports are growing solidly. We expect growth of 4% p.a.
- Low oil prices, factional fighting in the ruling political and military elite and large fiscal deficits all suggest growth in the Algeria will remain muted in the medium term, between 2.5%-3%.



## Other Africa: Key themes of 2015 to persist

- In Nigeria, slow progress in forming a cabinet has undermined optimism that followed the March election. The country faces several issues, including low oil prices and conflict with Boko Haram. Nonetheless, with reforms, Nigeria's prospects are good and growth should improve.
- Low commodity prices and weaker growth in China are undermining South African growth. A growing labour force is an encouraging sign for medium term growth but will be mitigated by high unemployment.
- For the region as a whole, CRU expects a slight improvement in growth but key issues from 2015 will persist into 2016, including low energy prices and US monetary policy tightening. Moreover, with elections scheduled in 14 countries, political risk will be elevated.

Table G.6: World economic growth

(percentage change in real GDP/GNP year-on-year)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>North America</b>	<b>1.9</b>	<b>2.3</b>	<b>1.6</b>	<b>2.4</b>	<b>2.3</b>	<b>2.4</b>	<b>2.5</b>	<b>2.4</b>	<b>2.3</b>	<b>2.2</b>
Canada	3.1	1.7	2.2	2.5	1.2	1.6	2.4	2.4	2.4	2.3
Mexico	4.0	3.8	1.6	2.3	2.5	2.6	2.4	2.4	2.3	2.3
USA	1.6	2.2	1.5	2.4	2.4	2.4	2.5	2.4	2.3	2.2
<b>Central &amp; South America</b>	<b>4.7</b>	<b>2.7</b>	<b>3.1</b>	<b>0.6</b>	<b>-1.7</b>	<b>-0.7</b>	<b>1.9</b>	<b>2.7</b>	<b>3.1</b>	<b>3.2</b>
Argentina	8.4	0.8	2.9	0.5	1.3	0.6	2.1	2.5	2.8	2.8
Brazil	3.9	1.9	3.0	0.1	-3.7	-2.5	0.9	2.1	2.5	2.5
Chile	5.8	5.5	4.3	1.8	2.1	1.9	2.6	2.8	2.8	2.8
Colombia	6.6	4.0	4.3	4.6	3.0	2.8	3.7	3.3	3.6	4.1
Venezuela	4.2	5.6	1.3	-3.7	-7.3	-4.9	2.1	5.3	5.7	5.7
<b>Europe</b>	<b>2.0</b>	<b>0.0</b>	<b>0.4</b>	<b>1.2</b>	<b>1.2</b>	<b>1.7</b>	<b>2.0</b>	<b>1.6</b>	<b>1.7</b>	<b>1.8</b>
Eurozone	1.6	-0.8	-0.3	0.9	1.5	1.8	1.8	1.4	1.4	1.5
France	2.1	0.2	0.7	0.2	1.1	1.5	1.6	1.3	1.4	1.6
Germany	3.7	0.6	0.4	1.6	1.4	1.9	1.9	1.4	1.0	1.1
Italy	0.7	-2.9	-1.8	-0.4	0.7	1.4	1.3	0.9	0.7	0.8
Spain	-1.0	-2.6	-1.7	1.4	3.1	2.8	2.4	2.0	2.1	2.1
Poland	5.0	1.7	1.3	3.4	3.5	3.8	3.3	2.9	3.2	3.3
Russia	4.3	3.4	1.3	0.6	-3.8	-1.6	2.0	1.6	1.9	2.1
UK	2.0	1.2	2.2	2.9	2.2	2.5	2.5	2.0	2.1	2.7
<b>Asia &amp; Australasia</b>	<b>5.1</b>	<b>4.6</b>	<b>4.4</b>	<b>4.1</b>	<b>4.1</b>	<b>4.1</b>	<b>4.2</b>	<b>4.2</b>	<b>4.3</b>	<b>4.2</b>
Australia	2.7	3.5	2.0	2.6	2.4	2.8	2.9	2.9	2.6	2.5
China	9.5	7.7	7.7	7.2	6.9	6.2	6.1	6.2	6.3	6.2
India	7.9	5.3	6.4	7.1	7.2	6.8	6.7	6.6	6.7	6.6
Indonesia	6.2	6.0	5.6	5.0	4.6	4.8	5.4	5.8	5.6	5.3
Japan	-0.4	1.7	1.4	-0.1	0.7	1.1	0.9	0.8	0.8	0.6
Malaysia	5.3	5.5	4.7	6.0	4.7	4.1	4.5	4.0	3.9	3.9
Philippines	3.7	6.7	7.1	6.1	5.6	6.5	5.5	4.6	4.8	5.0
South Korea	3.7	2.3	2.9	3.3	2.5	3.0	3.3	3.1	2.3	2.0
Taiwan	3.8	2.1	2.2	3.9	0.9	2.3	3.1	3.0	2.7	2.6
Thailand	0.8	7.3	2.8	0.9	2.7	3.1	3.5	3.4	3.2	3.0
Vietnam	6.2	5.2	5.4	6.0	6.2	6.3	7.0	6.0	6.1	6.4
<b>Africa</b>	<b>1.2</b>	<b>5.0</b>	<b>3.2</b>	<b>3.8</b>	<b>3.1</b>	<b>3.5</b>	<b>4.1</b>	<b>4.4</b>	<b>4.7</b>	<b>4.8</b>
South Africa	3.2	2.2	2.2	1.5	1.4	1.9	2.4	2.7	2.7	2.8
<b>Middle East</b>	<b>7.2</b>	<b>3.7</b>	<b>2.0</b>	<b>2.7</b>	<b>2.7</b>	<b>2.6</b>	<b>3.2</b>	<b>3.1</b>	<b>3.0</b>	<b>3.2</b>
Gulf Cooperation Council	8.5	5.4	3.6	3.3	3.0	1.9	2.8	2.7	2.4	2.5
Turkey	8.8	2.1	4.2	2.9	3.5	2.9	2.9	2.9	3.3	3.6
Saudi Arabia	10.0	5.4	2.7	3.6	3.4	1.3	2.8	2.6	1.7	2.0
UAE	5.2	6.9	4.3	4.6	2.7	2.2	3.0	3.0	3.1	2.7

Table G.6: World economic growth (percentage change in real GDP/GNP year-on-year) – *Concluded*.

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>World</b>	<b>3.1</b>	<b>2.4</b>	<b>2.3</b>	<b>2.6</b>	<b>2.4</b>	<b>2.6</b>	<b>3.0</b>	<b>2.9</b>	<b>3.0</b>	<b>3.0</b>
Developed economies	1.6	1.2	1.1	1.7	1.8	2.1	2.1	1.9	1.9	1.9
Emerging economies	6.3	5.0	4.7	4.2	3.4	3.6	4.5	4.7	4.8	4.9

Data: OE, CRU

Notes: Regional totals include countries not shown in the table; Gulf Cooperation Council (GCC) is defined as the union of the Arab states Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE. Weighted by gross value added at 2010 prices and market exchange rates

## 4. Scenario

### Upside: Low oil prices stimulate demand

Since 2014, when oil prices started falling, US shale oil producers have achieved significant cost reductions. At the same time OPEC has pursued a strategy of keeping market share, no longer supporting prices. In this scenario, we assume that US shale achieves further cost reductions, which allows them sustain production at lower prices, while OPEC responds by further increasing production. Over supply sees Brent crude average \$20/bbl this year and \$30/bbl in 2017 before rising to \$50/bbl in 2020.

Lower oil prices are a net positive for the global economy. The redistribution of incomes, resulting from lower oil prices, boosts consumption in major oil importers, such as the Eurozone, Japan, the USA, China and India, as consumers purchasing power is increased, while large financial reserves in many oil exporters cushion the fall in spending that would otherwise take place. There is likely to be a timing issue, as we saw in 2015; producers are hit immediately but it takes time for lower prices to filter through to producer prices and eventually consumer prices, as well as at the pump. However, the net effect is stronger global growth.

Table G.7: Alternative Scenario – Oil price lower for longer (percentage change in real GDP/GNP year-on-year)

		2015	2016	2017	2018	2019	2020
USA:	Base case	2.4	2.4	2.5	2.4	2.3	2.2
	Scenario	2.4	2.6	2.9	2.5	2.3	2.3
Eurozone:	Base case	1.5	1.8	1.8	1.4	1.4	1.5
	Scenario	1.5	2.1	2.3	1.6	1.5	1.5
Japan:	Base case	0.7	1.1	0.9	0.8	0.8	0.6
	Scenario	0.7	1.4	1.4	0.9	0.9	0.6
China:	Base case	6.9	6.2	6.1	6.2	6.3	6.2
	Scenario	6.9	6.7	6.6	6.3	6.3	6.3

Table G.7: Alternative Scenario – Oil price lower for longer (percentage change in real GDP/GNP year-on-year) – *Concluded*.

		2015	2016	2017	2018	2019	2020
Brazil:	Base case	-3.7	-2.5	0.9	2.1	2.5	2.5
	Scenario	-3.7	-2.7	1.1	2.2	2.7	2.7
Russia:	Base case	-3.8	-1.6	2.0	1.6	1.9	2.1
	Scenario	-3.8	-5.0	1.6	2.5	2.1	2.0
India:	Base case	7.2	6.8	6.7	6.6	6.7	6.6
	Scenario	7.2	7.6	7.7	7.1	7.2	6.9
World:	Base case	2.4	2.6	3.0	2.9	3.0	3.0
	Scenario	2.4	2.8	3.4	3.1	3.1	3.1

Data: CRU

## Downside: Emerging market crisis

Investors are withdrawing capital from emerging markets and currencies are depreciating from Kazakhstan to Chile. Economic weakness, such as in Brazil and Russia, political uncertainty in Turkey and Malaysia, for example, and a general reliance on commodity exports are all contributing to negative investor sentiment. At the same time, US investments are becoming more attractive as interest rates rise. In this scenario, the exit of capital from emerging markets prompts collapses in exchange rates and soaring inflation and interest rates. Debts denominated in foreign currency become unserviceable and are defaulted upon. Financial market contagion sees even relatively sound emerging markets hard hit, spreading the crisis wider than the initial at risk countries. Business, household and market confidence around the world suffers, exacerbating the impact on the real economy of weaker world trade growth.

The emerging market economies see the greatest deceleration in growth relative to the base case. The developed economies, especially Europe and Japan due to their greater reliance on export markets, also see growth reduced and policymakers have only limited scope to respond via fiscal and monetary policy. Commodities fare particularly badly due to their reliance on emerging markets as drivers of demand growth. Moreover, plummeting currencies versus the US\$ drive down cost curves and prices with them. The world economy begins to recover in 2017 but the level of GDP remains below the base case throughout the forecast period.

Table G.8: Alternative Scenario – Emerging market crisis  
(percentage change in real GDP/GNP year-on-year)

		<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
USA:	Base case	2.4	2.4	2.5	2.4	2.3	2.2
	Scenario	2.4	2.0	2.4	2.5	2.4	2.2
Eurozone:	Base case	1.5	1.8	1.8	1.4	1.4	1.5
	Scenario	1.5	1.1	1.3	1.6	1.7	1.5
Japan:	Base case	0.7	1.1	0.9	0.8	0.8	0.6
	Scenario	0.7	-0.4	0.5	1.3	1.5	0.6
China:	Base case	6.9	6.2	6.1	6.2	6.3	6.2
	Scenario	6.9	4.6	5.2	6.1	6.7	6.2
Brazil:	Base case	-3.7	-2.5	0.9	2.1	2.5	2.5
	Scenario	-3.7	-4.6	-1.2	0.3	1.4	2.5
Russia:	Base case	-3.8	-1.6	2.0	1.6	1.9	2.1
	Scenario	-3.8	-3.2	-0.2	0.3	1.4	2.1
India:	Base case	7.2	6.8	6.7	6.6	6.7	6.6
	Scenario	7.2	5.7	6.1	6.4	7.0	6.6
World:	Base case	2.4	2.6	3.0	2.9	3.0	3.0
	Scenario	2.4	1.7	2.3	2.7	3.2	3.0

Data: CRU