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# **N, P and K Capacity Developments in SSA - Update**

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**Argus Africa Fertilizer  
Addis Ababa, February 2018**

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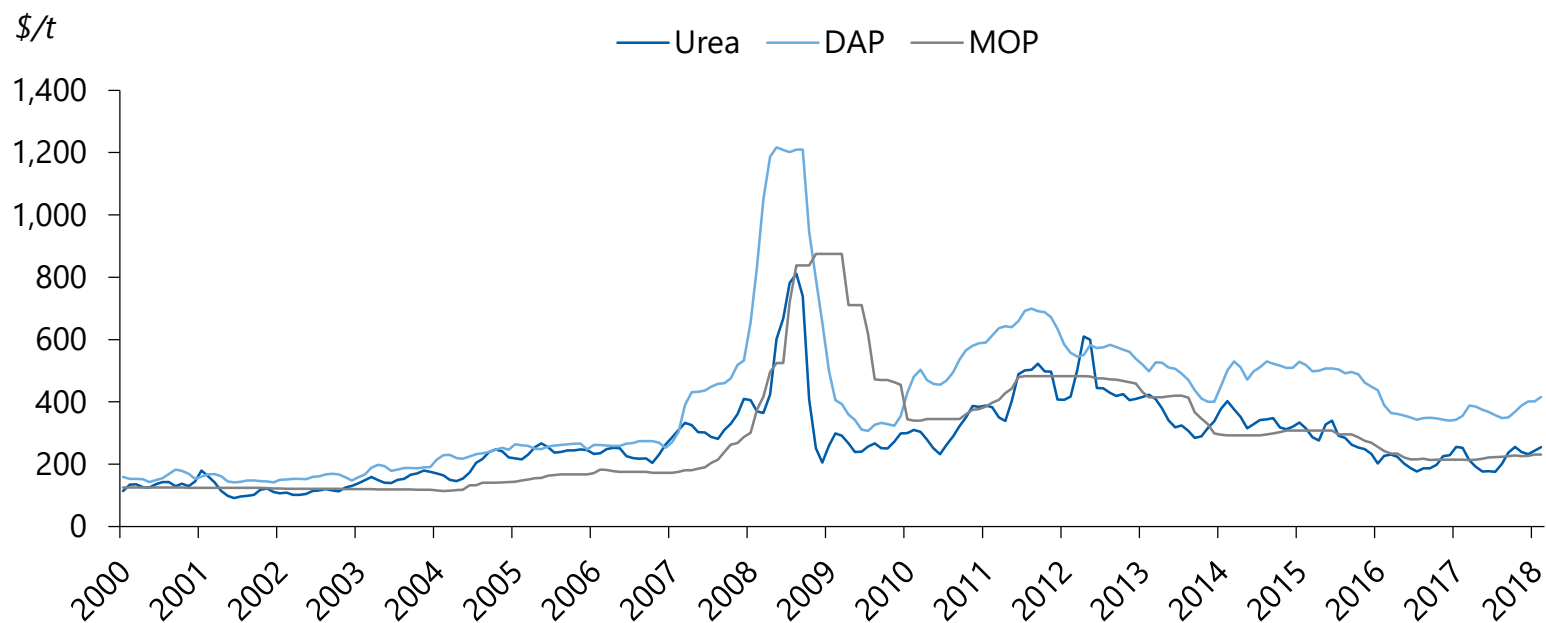
Events

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# Contents

- Resources – summary situation
- Market environment
- Project status
- Conclusions

# N, P and K price environment: current cycle



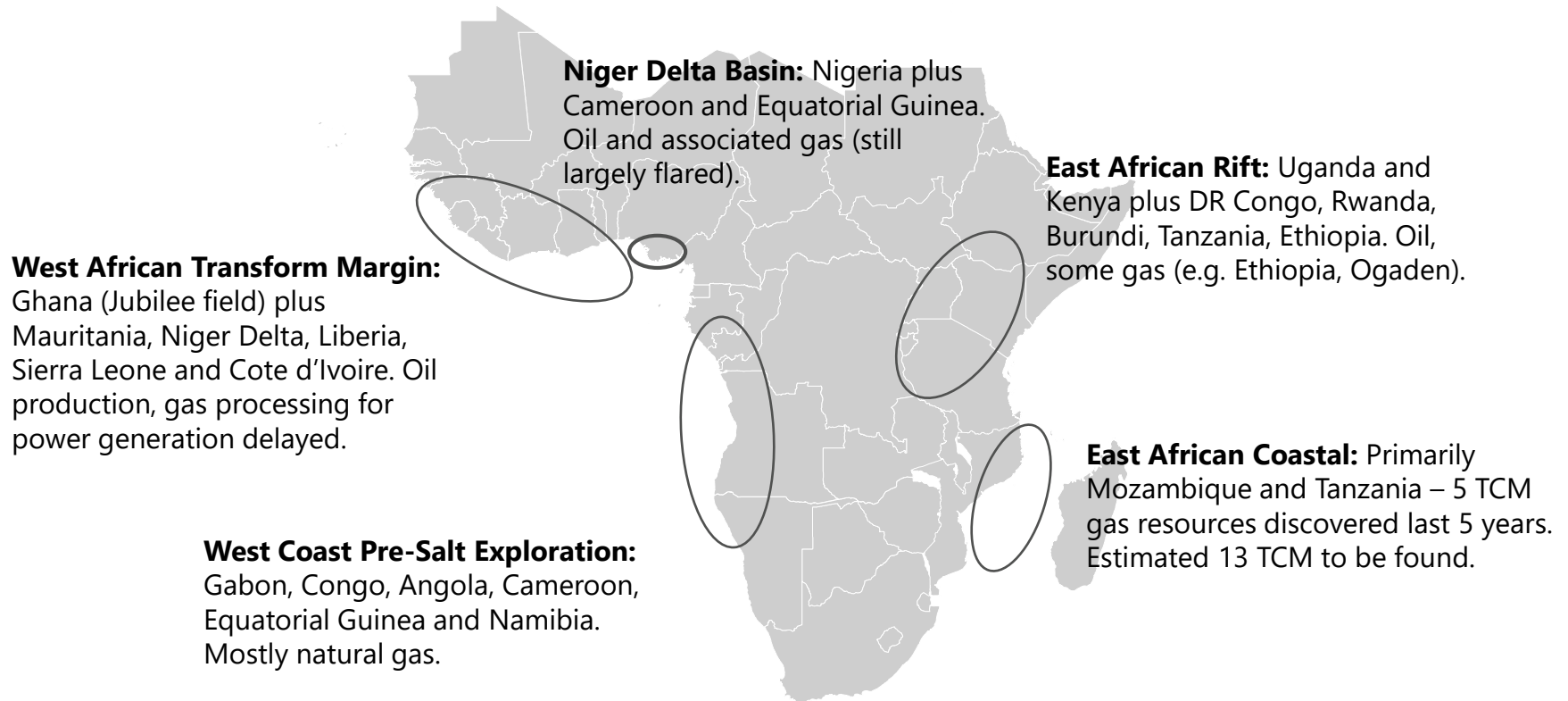
Notes: Granular Urea Middle East fob all netbacks; DAP fob Morocco; MOP Vancouver (standard)  
— Argus

# Nitrogen

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# Major oil & gas production/exploration areas- SSA

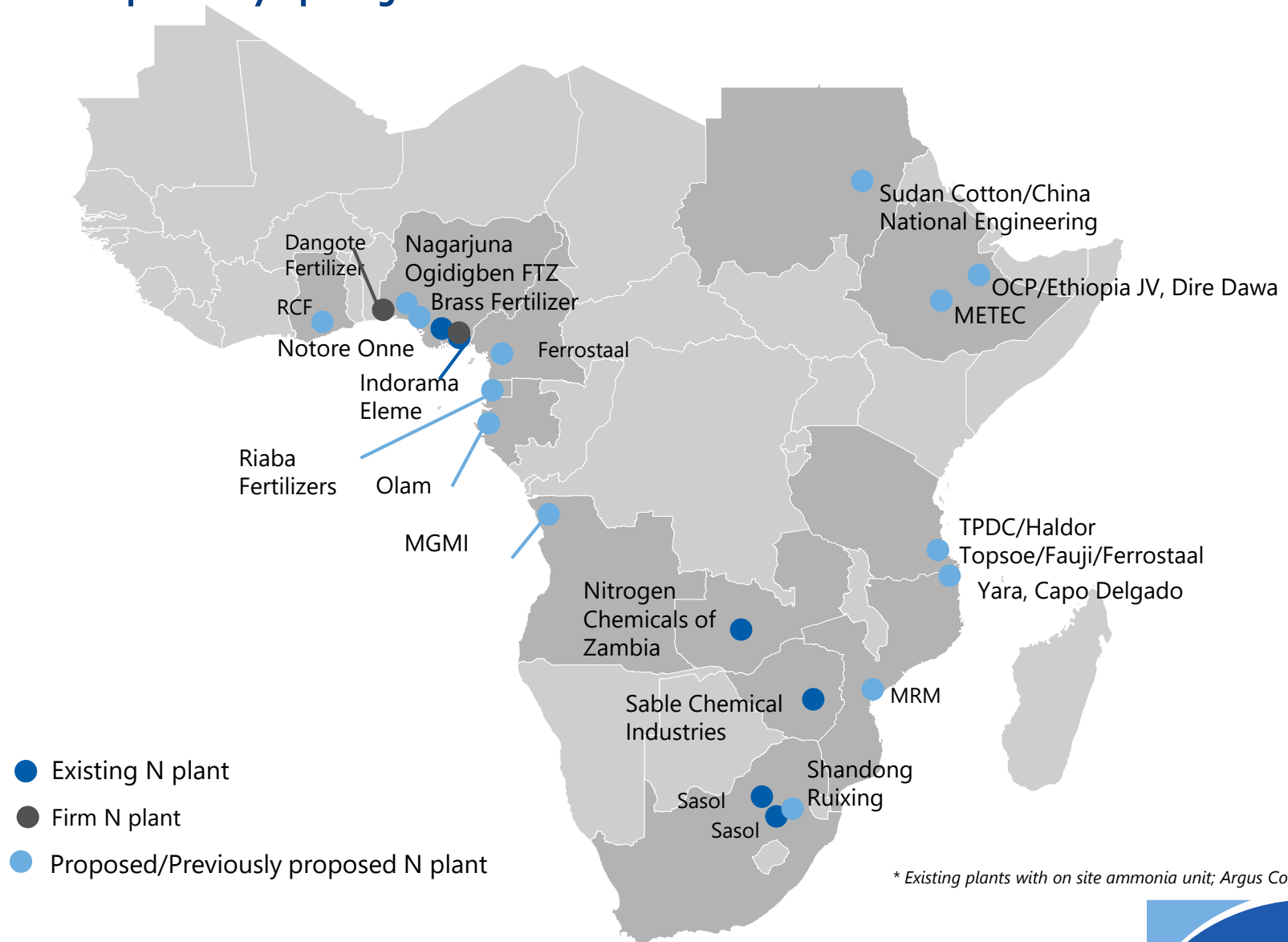


Source: Africa Energy Outlook, IEA, 2014

# Harnessing gas

- Requires significant infrastructural development e.g a master gas plan for distribution and incentives for down-stream investment and/or mega-projects to absorb large-scale production combining power generation/industrial usage/gas feedstock.
- LNG is often the first step to un-stranding gas: e.g. Nigeria. More recently Equatorial Guinea (2007) and Angola (2013).
- Nitrogen projects often tied to these....
- ...but not to Floating Liquefaction. FLNG concept gaining traction with lower capex conversion of LNG vessels - world first by Perenco ,Kribi, Cameroon (1.5 mn t/yr, early-2018), second Eni, Mozambique (2.5 mn t/yr, 2022).

# N capacity projects in sub-Saharan Africa

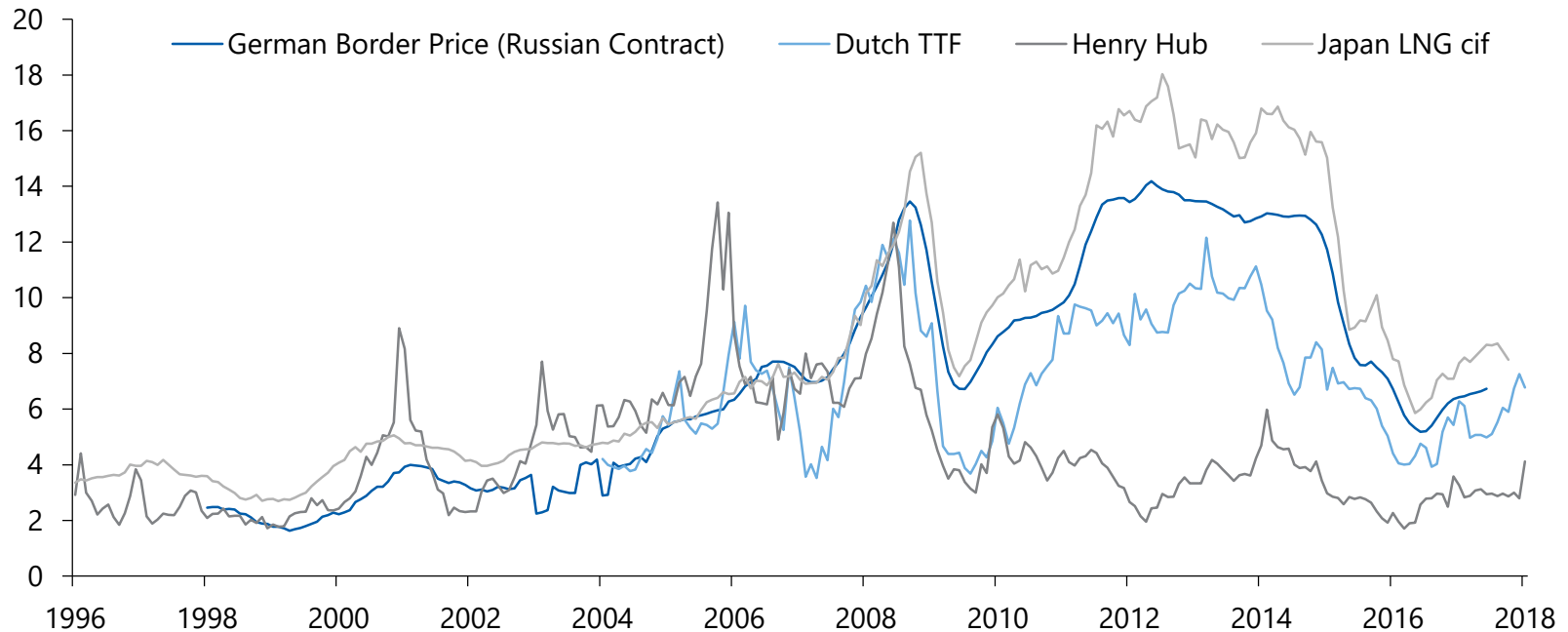


*\* Existing plants with on site ammonia unit; Argus Consulting*

# Natural Gas price convergence

- Oil price decline and the globalization of natural gas markets – *via* a flood of new LNG supply – have been key

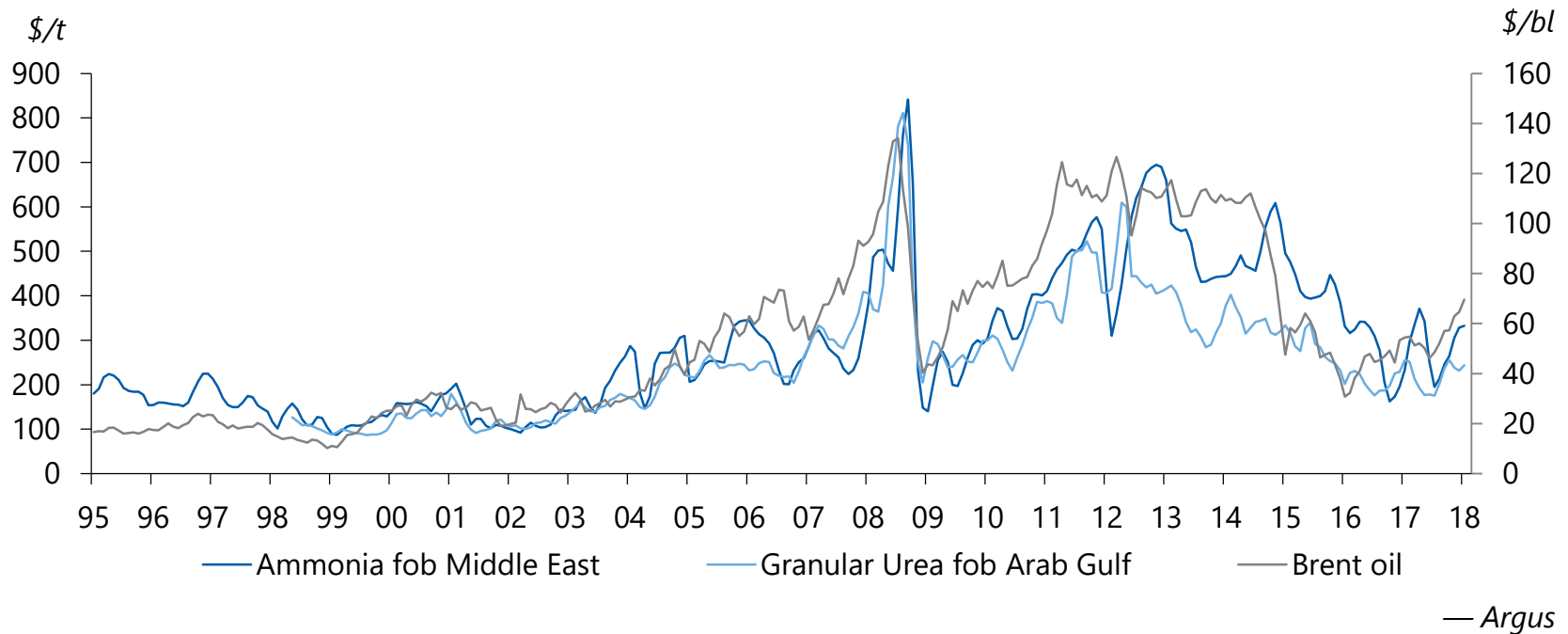
\$/mn Btu



—Argus



# Ammonia & urea v oil prices

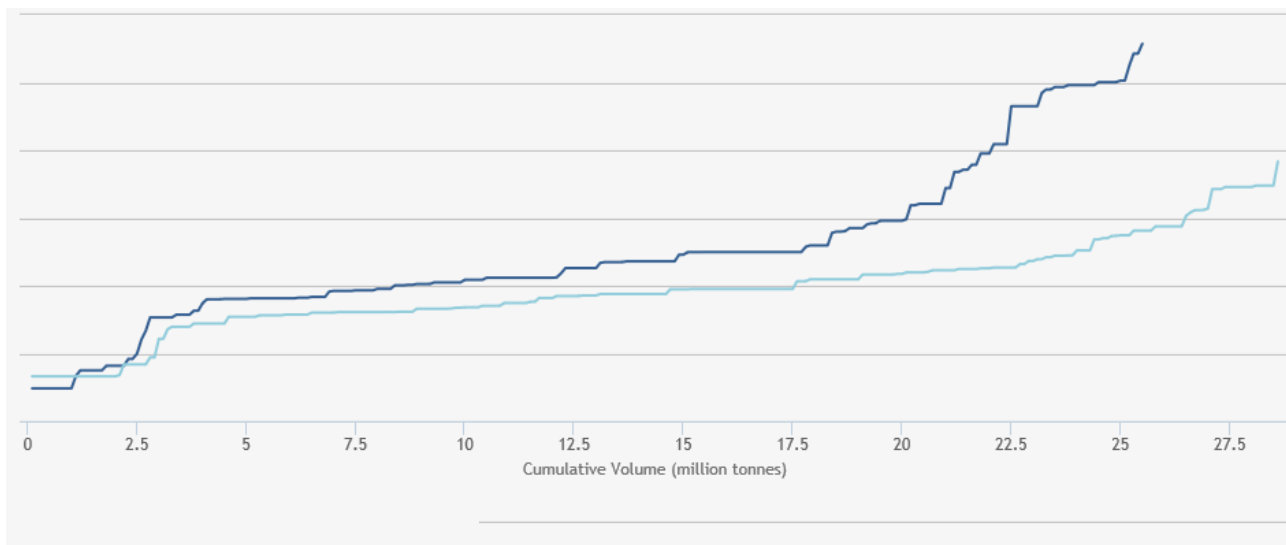


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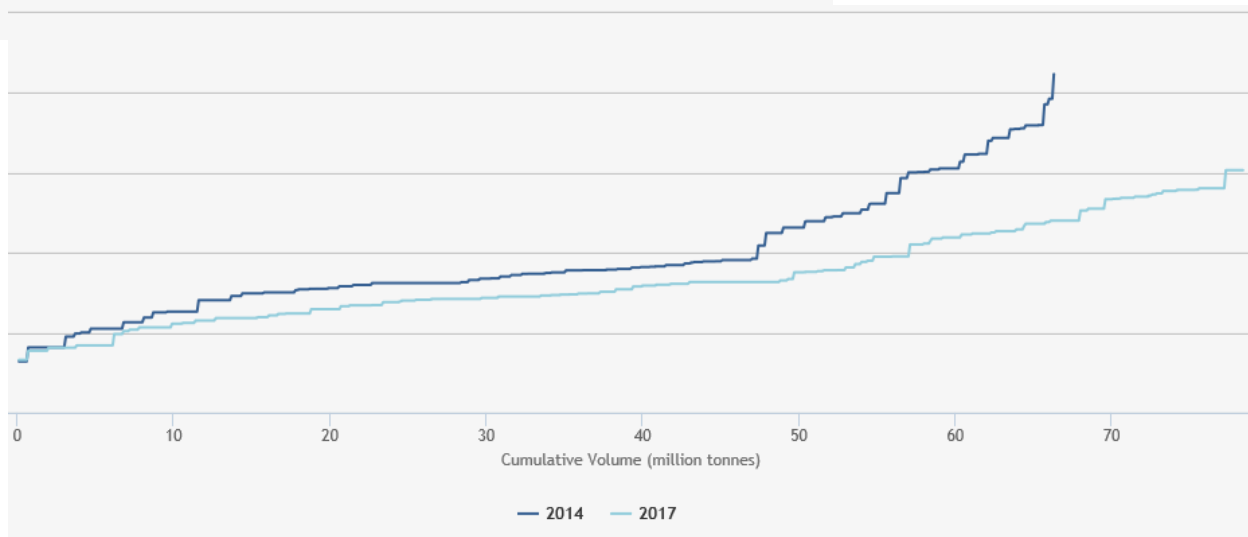
- Long-term structural shifts in oil prices → long-term structural shifts ammonia and urea pricing.
- Short-term oil and nitrogen prices can and do diverge but direct/indirect impact on industry cost curve.
- Long-term trend oil price view c. \$65/bbl (constant 2017 dollars) only slowly returning to this level as current supply glut erodes.

# Merchant Ammonia & urea cost curve, 2014 v 2017 – downward shift and flat-lining – cost to fob basis. Capex defining LRMC *ceteris paribus*

## Ammonia



## Urea



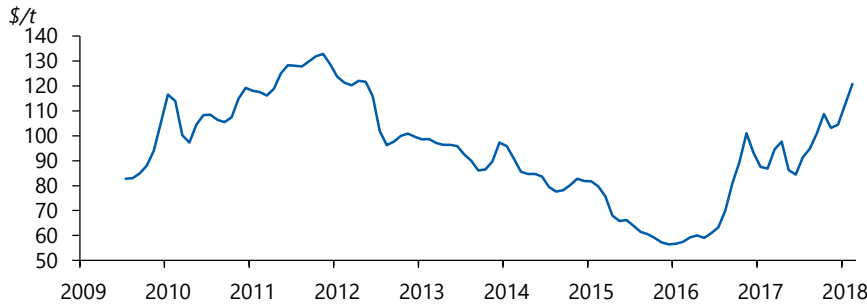
Notes: Based on potential exports  
— Argus Consulting Ammonia & Urea  
Cost & Margin Service

# Large-Scale Urea Projects/Closures (excl China) to 2023

Total 2016-19=13.2 mn t/yr; 2020-2023=6.8 mn t/yr (so far)					
2016		6.7	2018		1.3
Algeria	AOA II, Arzew	1.2	Azerbaijan	Socar, Sumgait City	0.7
Egypt	Egyptian Nitrogen II, Damietta	0.7	Indonesia	Petrokimia Gresik II	0.6
US	CF Industries, Port Neal IA (+ D'ville, LA urea expansion in 2015)	1.2	Turkmenistan	Turkmen Chemical Co, Garabogaz	1.2
Iran	Shiraz Petrochemical Co, Shiraz	1.1	PIC	Kuwait	-1.2
Malaysia	Petronas, Sipitang, Sabah	1.2	<b>2019</b>		<b>4.3</b>
Nigeria	Indorama Eleme, Nigeria	1.3	Uzbekistan	NavoiAzot	0.6
<b>2017</b>		<b>5.4</b>	Iran	Lordegan Urea Fertilizer	1.1
Iran	Pardis Petrochemcial Co, Pardis 3	1.1	India	Chambal Gadepan III, Rajasthan	1.3
Bolivia	YPFB, Cochabamba	0.7	India	Ramagundam AP	1.3
US	Koch, Enid, OK	0.9	<b>2020-2023</b>		<b>6.8</b>
US	IFCo (OCI), Wever, Lee County IA (net urea after UAN)	0.4	Nigeria	Indorama Eleme II	1.1
US	Agrium, Borger Tx	0.6	Russia	ToAz	0.8
US	Dakota Gasification, Beulah, ND	0.3	Brazil	Former Petrobras, Tres Lagoas (?)	1.2
Russian	PhosAgro, Cherepovets	0.5	Nigeria	Dangote I/II	2x1.3
Indonesia	Pusri IIB, Palembang	0.9	Brunei	BFI, Sungai Liang	1.1
<i>2021/2022 Nakhodka, Russian Far East ?                      OCP Dire Dawa; Other/uncertain: Matix India, Other Iranian projects                      — Argus</i>					

# The changing role of China

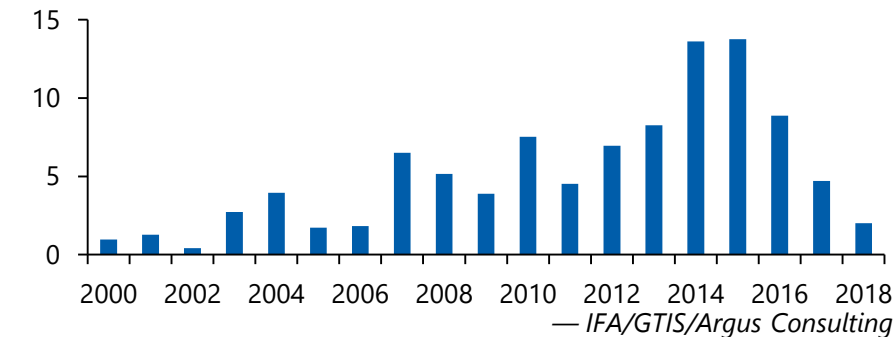
Chinese coal prices



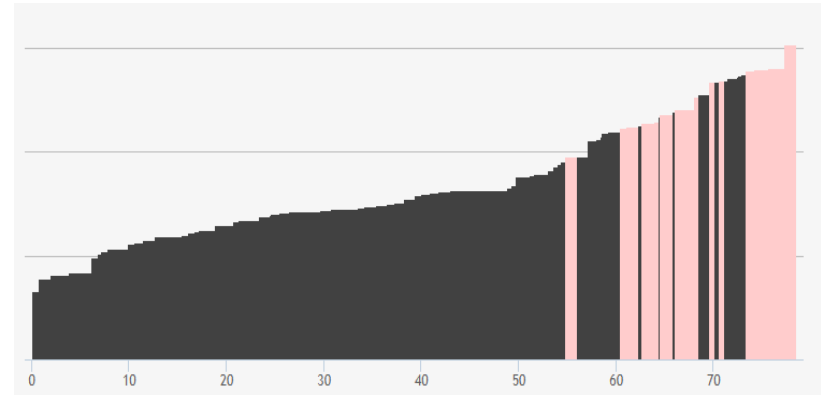
Notes: 5500 fob: Qinghuangdao – China domestic within 90 days prompt, London close mid-

c. 30% world trade

Chinese urea exports



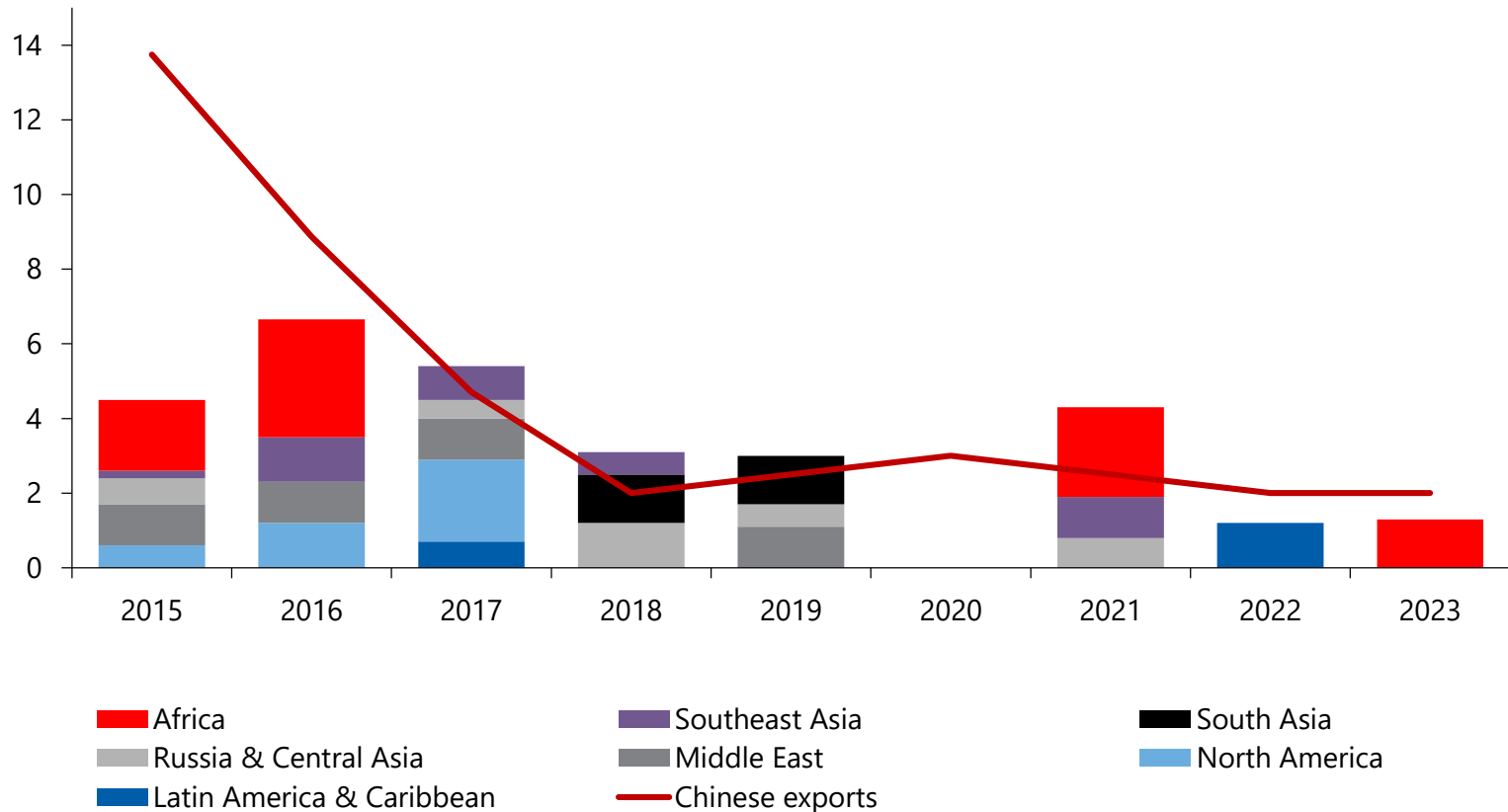
The (export) cost curve: China



- Government focus on environment
- >3,000 small coal mines have closed driving up coal prices/feedstock cost
- Urea operating rates currently 50pc
- Gas diverted to power gen (winter months); gas-based urea operating at <20pc (25-30pc total capacity)
- c. 10 mn t/yr permanent urea closures (CNFIA), 2015-2017

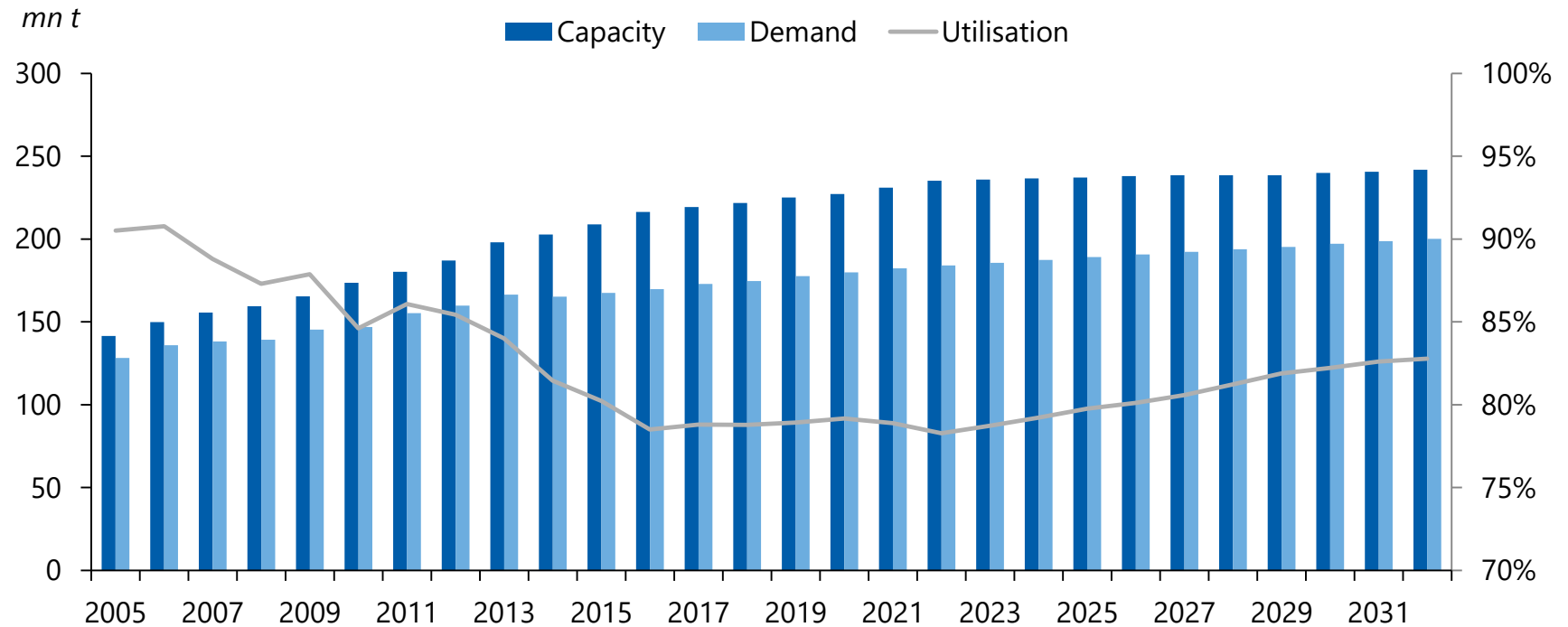
# Incremental urea capacity change vs Chinese exports

mn t & mn t/yr



— Argus Consulting, GTIS

# Urea S/D Balance



— Argus Urea Analytics to 2032

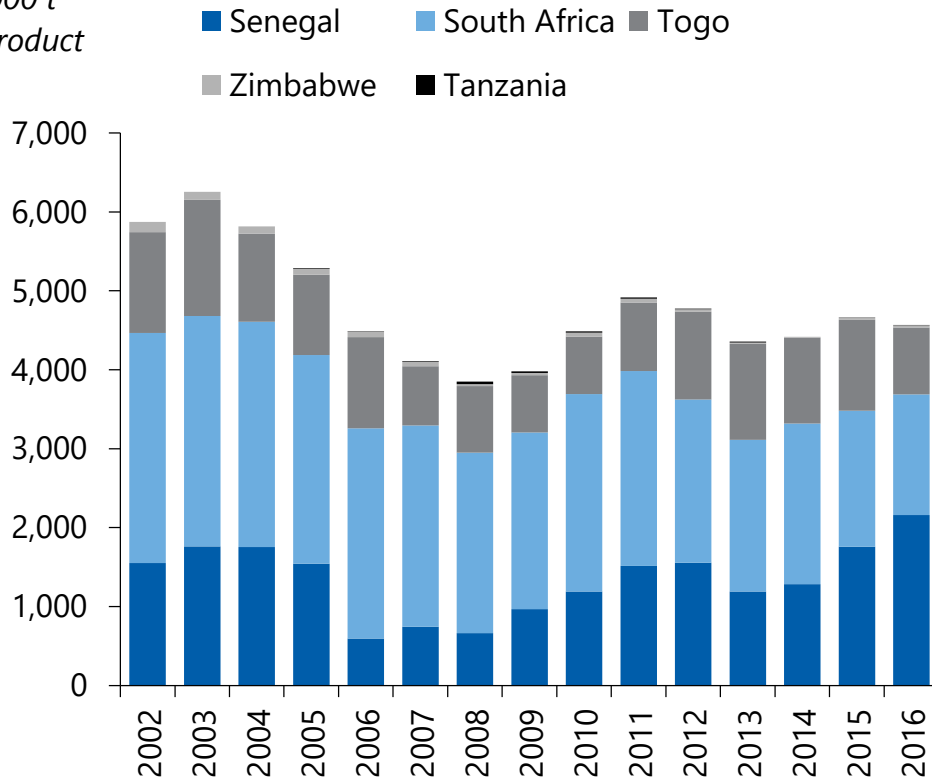
# Phosphates

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# SSA Phosphate Rock Production: current situation

'000 t  
product

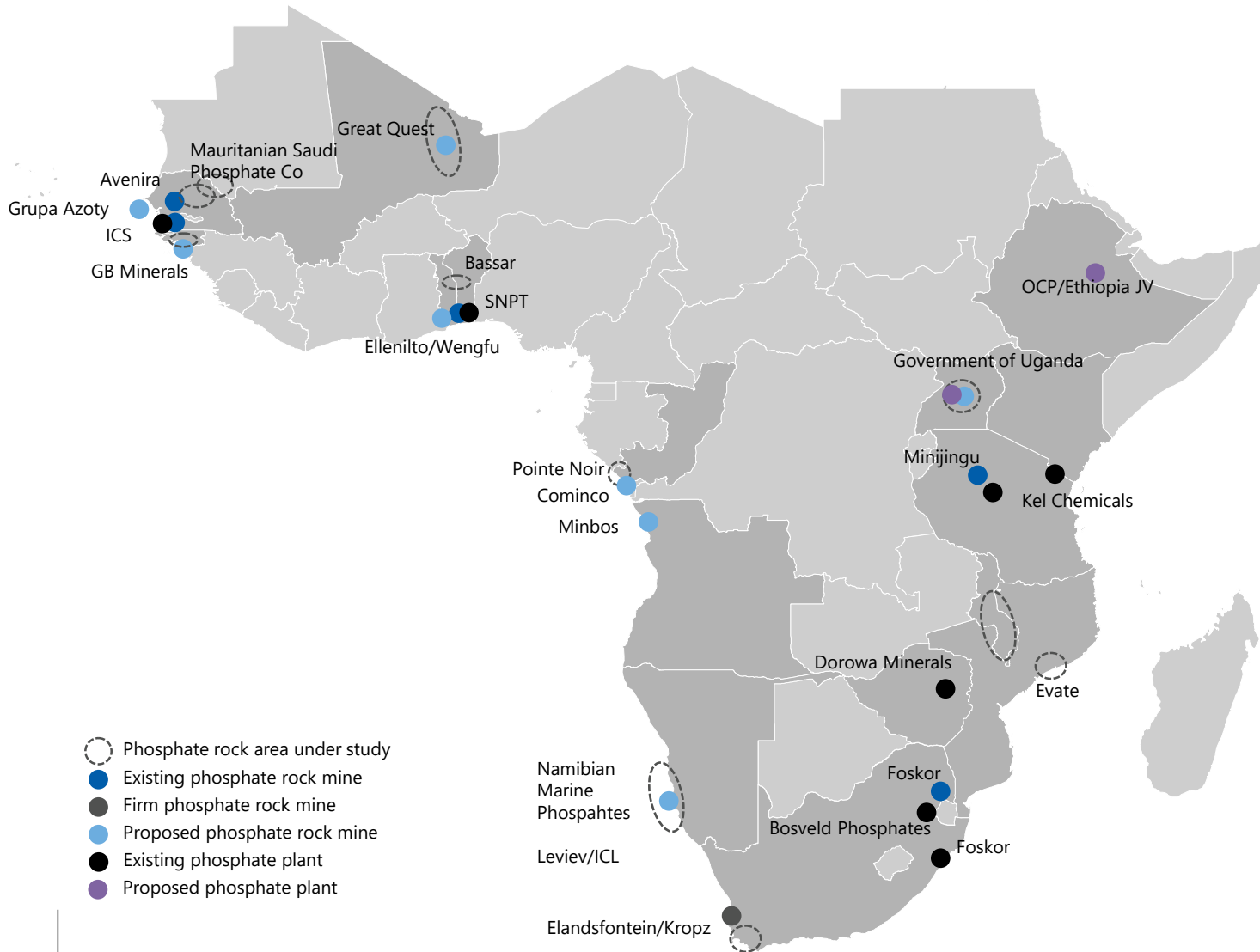


— IFA

- Senegalese production almost doubled between 2013 and 2016, as operations improved at ICS after investments made by Indorama.
- South African production decline to 1.5 mn t 2016 – technical issues at Richards Bay phosacid facility.



# Phosphate Rock/Processed Phosphate Capacity and Projects



# Net Incremental Phosacid capacity 6.0 mn t/yr P<sub>2</sub>O<sub>5</sub> 2017-2031

## OCP, Morocco

TSP - Safi Phosphate Hub, Safi (+230,000 t/yr P<sub>2</sub>O<sub>5</sub>, 2021)  
 DAP/MAP - Safi Phosphate Hub, Safi (200,000 t/yr P<sub>2</sub>O<sub>5</sub>, 2022)  
 DAP/MAP - Phosboucraa, Boucraa-Laayoune (470,000 t/yr P<sub>2</sub>O<sub>5</sub>, 2H 2021)  
 DAP/MAP/TSP - Jorf Lasfar Phosphate Hub IV-X plus line F (+4mn t/yr P<sub>2</sub>O<sub>5</sub>, 2018→2027)

**Kazphosphate, Kazakhstan**  
 MAP - Taraz (+160,000 t/yr P<sub>2</sub>O<sub>5</sub>, 2018)

## Ma'aden, Saudi Arabia

DAP/MAP/NPS - Ma'aden 3  
 (+1.7 mn t/yr P<sub>2</sub>O<sub>5</sub>, 2021→2024); Plus 2018  
 ramp-up MWSPC

## China – Industry restructuring

Argus assumed the closure of  
 small inefficient plants  
 Equivalent to **-0.7mn t P2O5**

## China Molybdenum, Brazil

MAP/TSP - Catalao (+440,000 t/yr P<sub>2</sub>O<sub>5</sub>, 2H 2020)

## JPMC, Indonesia

Pupuk Kaltim, Bontang (200,000 t/yr P<sub>2</sub>O<sub>5</sub>, 2019)  
 Pupuk Sriwijaya (Pusri), Palembang (200,000 t/yr P<sub>2</sub>O<sub>5</sub>, 2020)

## Yara, Brazil

MAP/TSP - Galvani, Serra do Salitre (+155,000 t/yr P<sub>2</sub>O<sub>5</sub>, 2020)

## Mosaic, US – Plant City closure

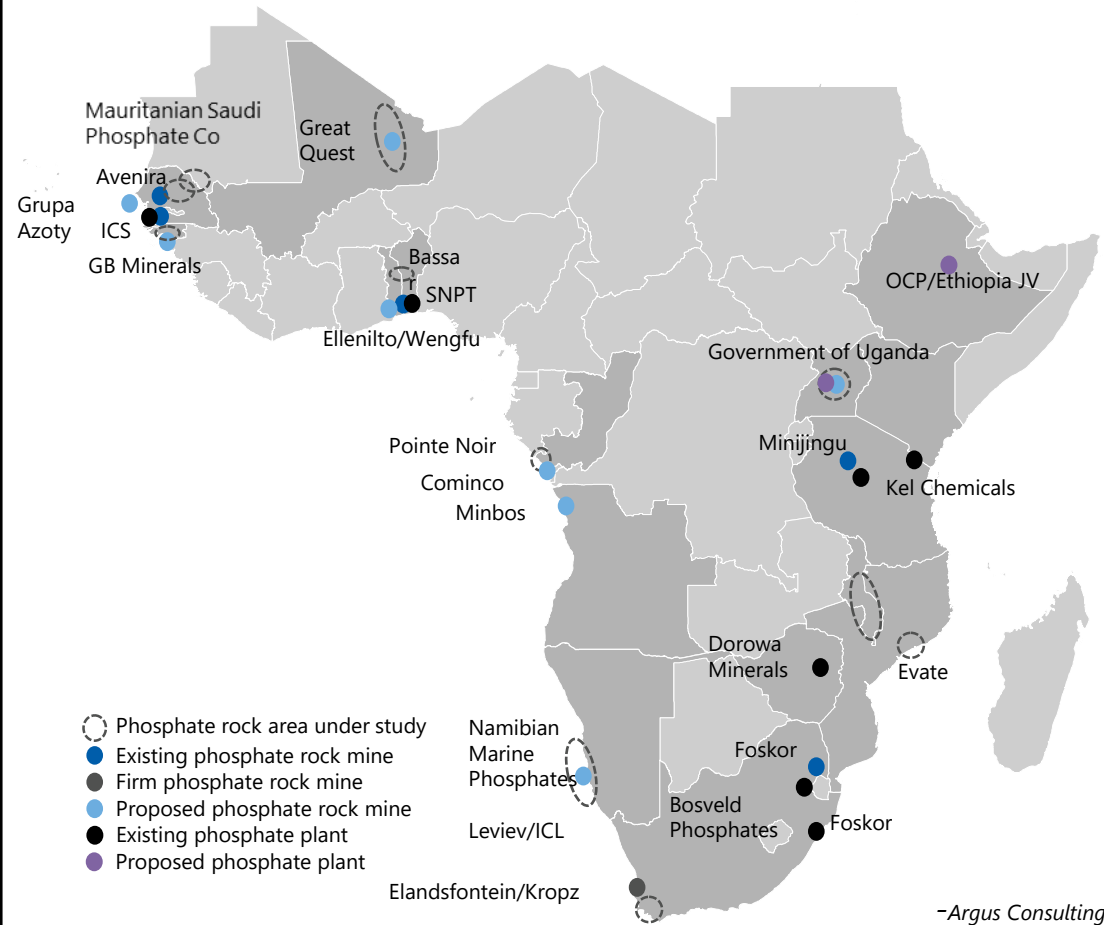
**-1mn t Phosacid** as Mosaic Idles Plant City for  
 at least 1 year :

- Serve own distribution business and other  
 India customers with low-cost MWSPC JV

■ Planned projects

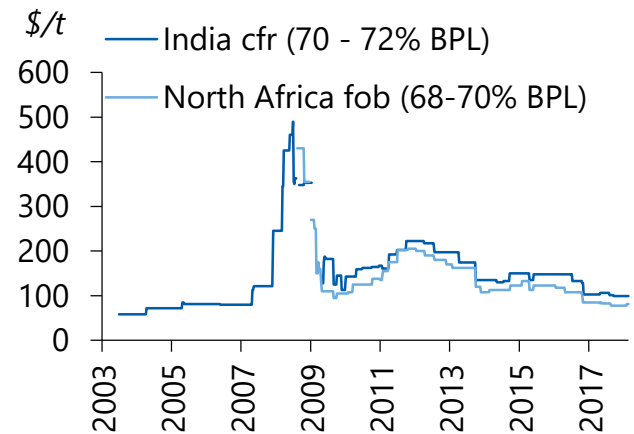
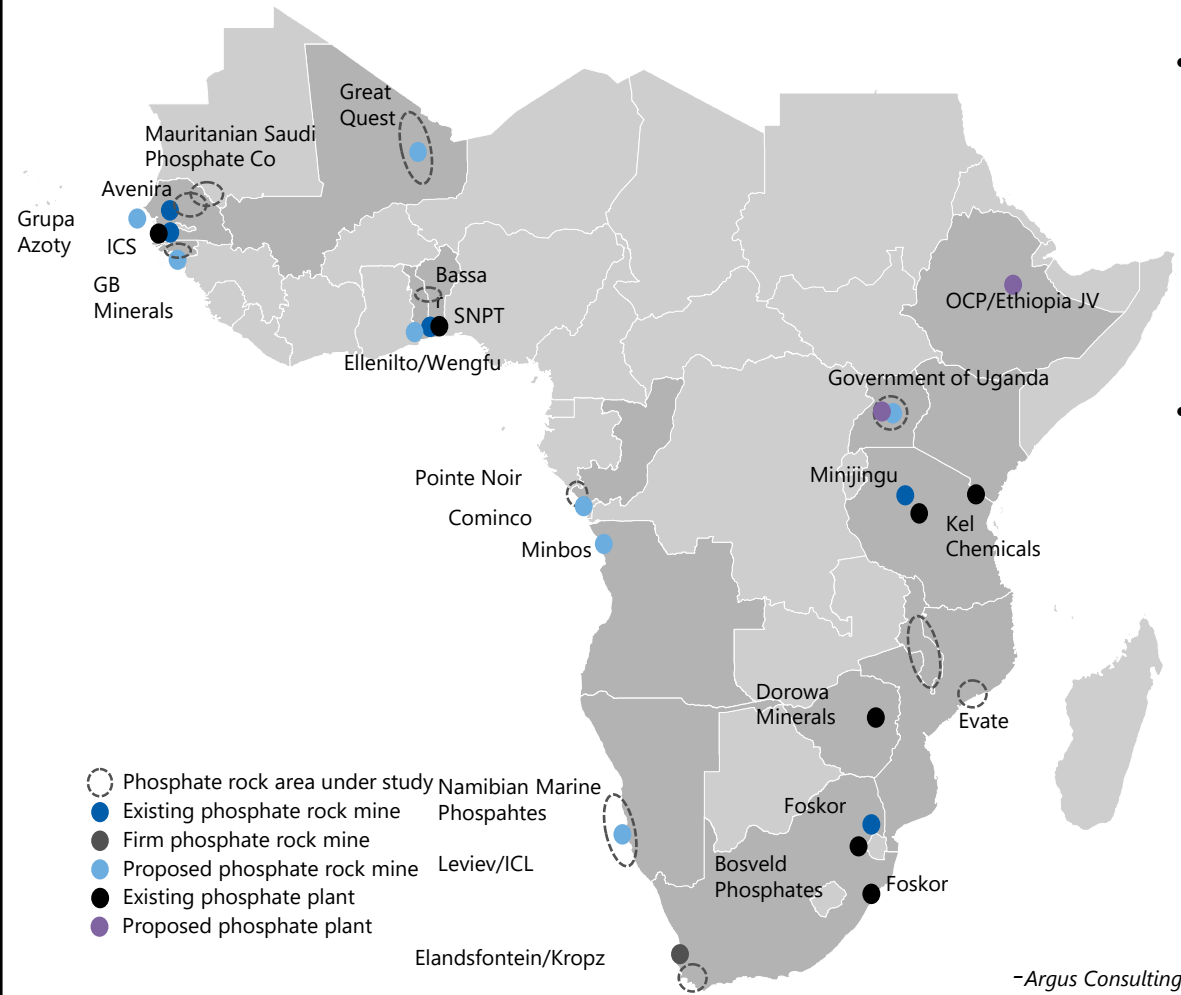
# Challenges

- Finding rock oftakers difficult given new processed phosphates capacity from Morocco and Saudi Arabia .
- SSA key target for both players; OCP African footprint >1.3 mn t NPK/NP/NPS already into SSA 2017 + Dire Dawa



# Challenges

- As always, rock quality/spec, logistics and politics are key
- Smaller-scale projects will look to supply rock for direct application in local markets (e.g. Tanzania; Mali and Malawi)
- Production at Elandsfontein on hold due to falling rock prices



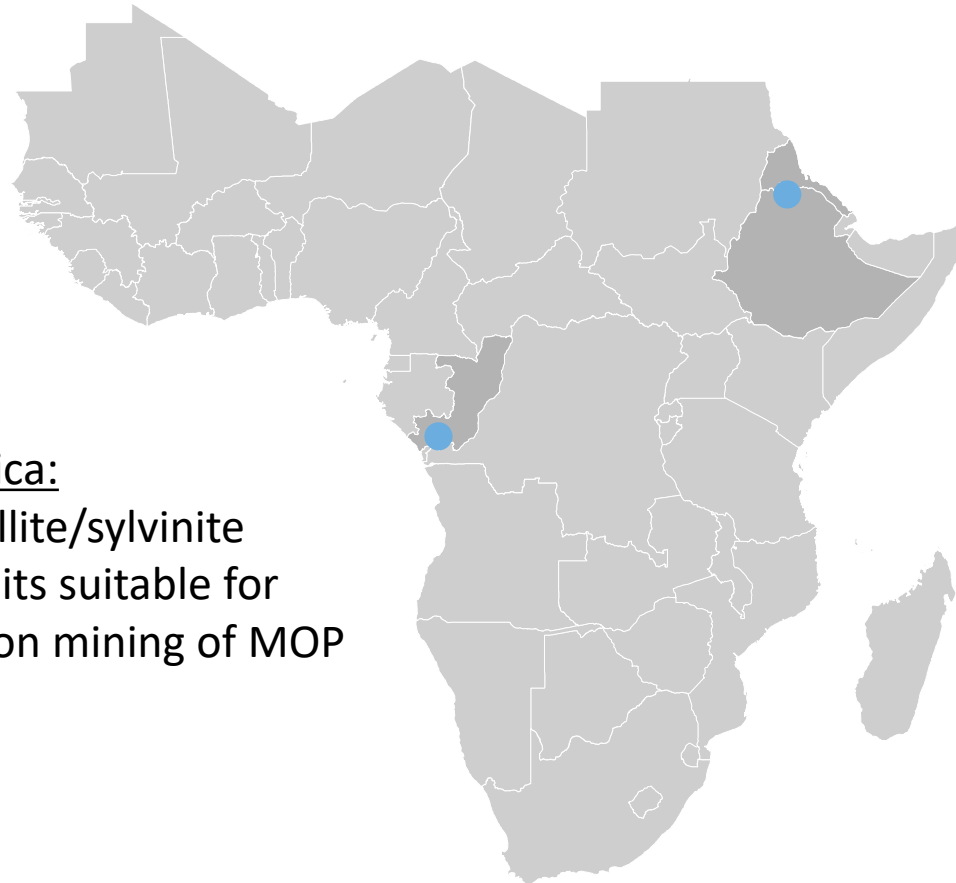
— Argus FMB

# Potash

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# SSA potash resources



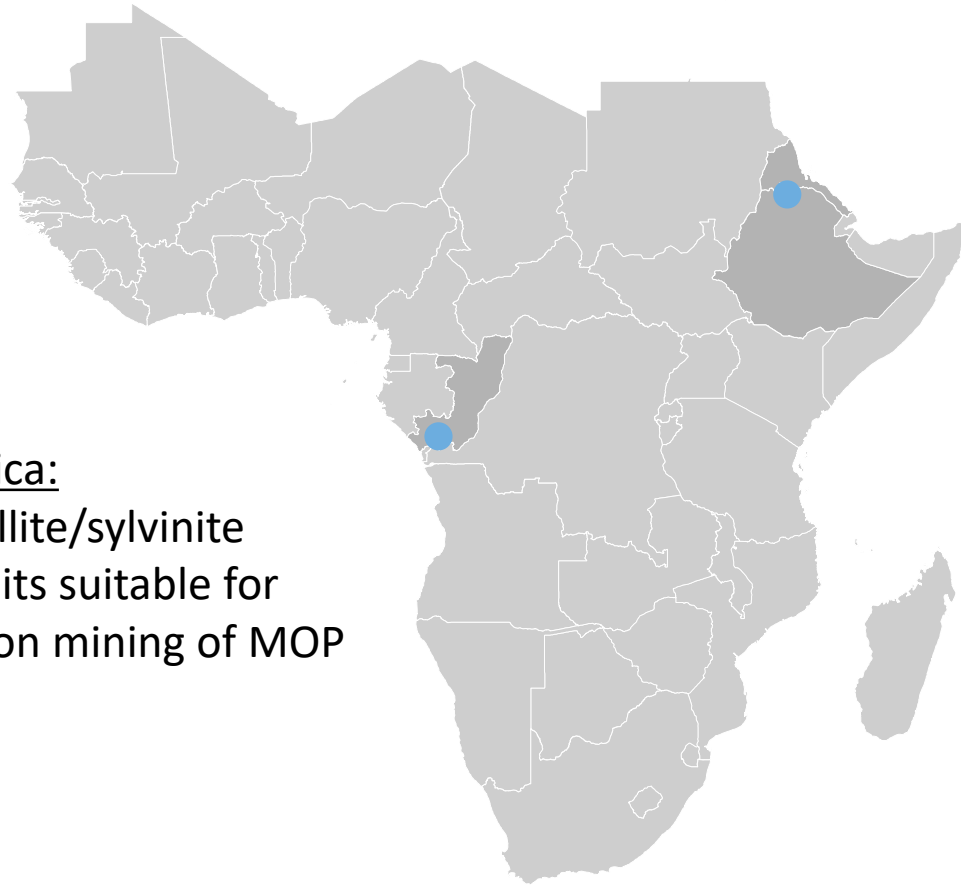
## East Africa:

- Carnallite/sylvinite/kainite
- Suitable for MOP/SOP production

## West Africa:

- Carnallite/sylvinite deposits suitable for solution mining of MOP

# SSA potash resources

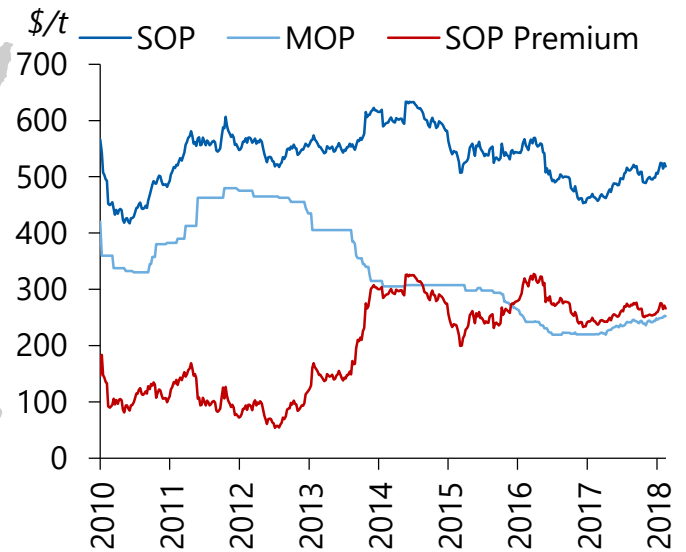


## West Africa:

- Carnallite/sylvinite deposits suitable for solution mining of MOP

## East Africa:

- Carnallite/sylvinite/kainite
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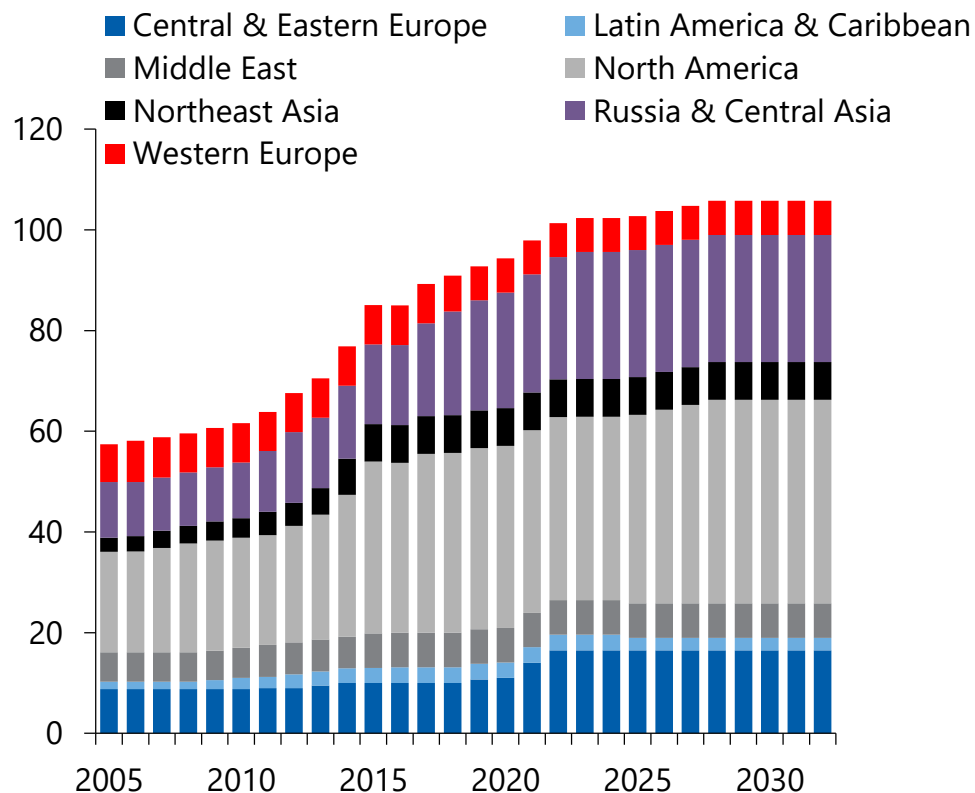
Notes: NWE Standard fob bulk  
— Argus

- c. \$6 per 10kg K<sub>2</sub>O premium for SOP

# Challenges/opportunities

MOP  
Capacity mn  
tpy

Company/project	Commissioning	Capacity '000 t/yr MOP
Turkmenhimiya - Turkmenistan	1Q17	1,400,000
K+S Kali, Bethune - Canada	2Q17	2,860,000
Eurochem, Usolsky - Russia	Late 2017	3,700,000
Mosaic, K3 - Canada	2017	900,000
Eurochem, VolgaKali - Russia	2018	4,600,000
Belaruskali - Belarus	2019	3,000,000
Uralkali - Russia	2020	2,800,000
Uralkali - Russia	2020	2,300,000
Acron – VPC - Russia	2021	2,000,000
Slavkali - Belarus	2022	2,000,000



— Argus Potash Analytics

- SOP firm projects: Eurochem 2x250kt/yr (Mannheim)
- Robust global demand growth c. 1.0 mn t/yr K<sub>2</sub>O next 10 years
- Low price outlook for MOP/SOP to mid-2020s

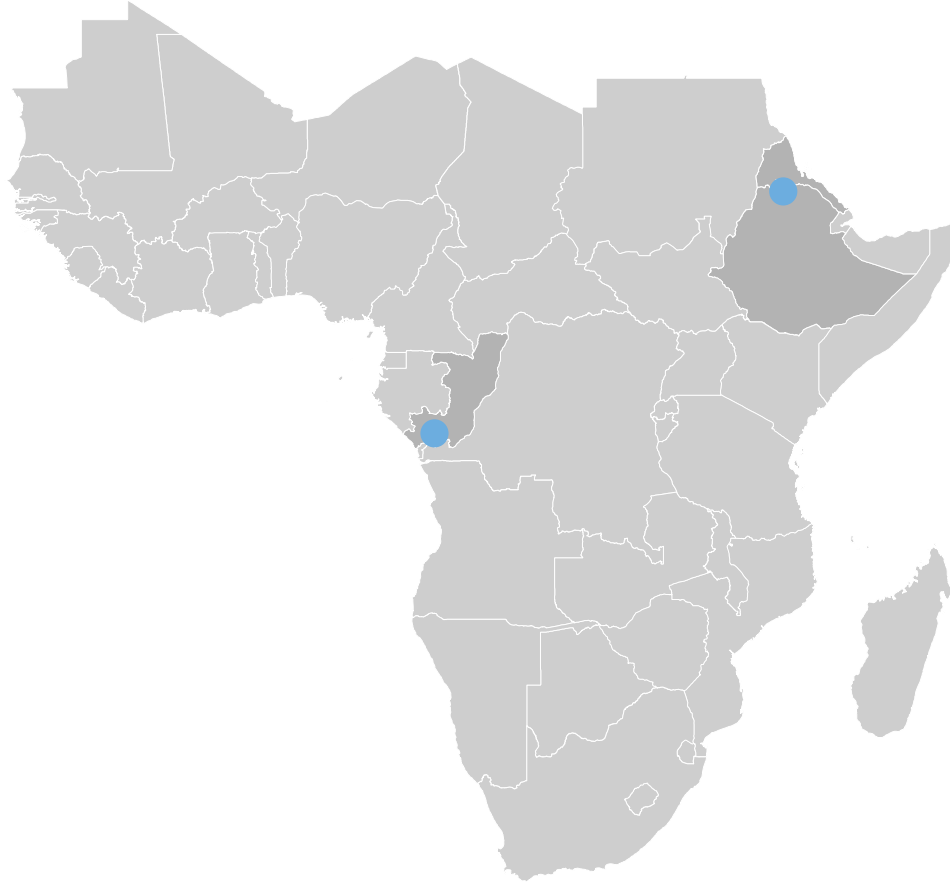
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# SSA: potash challenges



- Fertilizer majors developing distribution channels to capture growth in Africa e.g. K+S, Uganda
- NPK as growth driver for K demand in Africa
- Potential for polyhalite to disrupt potash markets

## Potash in SSA – Project status (mixed)

Project	Volume (mn t/yr)	Notes
Mengo Congo	1.2 mn t/yr MOP	Finance/legal issues, possible relaunch, solution mining of carnallite (cf sylvinite)
Kore Potash (Kola, Dougou) Congo	2.0 + 0.4 mn t/yr MOP	Main deposit conventional, shallow mining, high grade - \$1.6 bn. OPEX <\$100/t. Solution mining \$430mn SQM/SGRF participation; 35km to port. DFS completion due Q2 2018
Yara Dallol, Ethiopia	0.6 mn t/yr SOP	Agreement with govt to progress Yara board to decide by end 2018 (\$740mn)
Colluli Mining (Danakali/ENAMCO), Eritrea	2x472,000 t/yr SOP	FEED complete, Jan 2019 commence construction. Open-pit mining, 180km from Massawa port (\$332mn)
ICL (Allana), Ethiopia	1mn t/yr MOP and SOP	Project terminated October 2016
Circum, Ethiopia	2.0 mn t/yr MOP, 0.75 mn t/yr SOP	Mining licence approved March 2017. Estimated CAPEX \$2.6 bn

—Argus Sub-Saharan Africa Strategy Report

# Conclusions

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## Conclusions

- SSA has significant resources for developing N, P and K capacity.
- Prolonged down-cycle and below trend oil/energy prices has discouraged some new investment for nitrogen in SSA....but opportunity from China's withdrawal from international urea market for fast-track projects (e.g. Indorama Eleme II).
- Potash also facing extended down-cycle and difficult project environment in the medium-term, although opportunity for smaller scale SOP projects.
- Phosphates – small rock projects have moved forward but pricing environment difficult. Medium-term constraint will come from the targeting of major new processed phosphate capacity into the region but this offers the chance to develop a local industry.

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Sources: Argus Analytics (Ammonia, Urea, Processed Phosphates, Phosphate Rock, Potash); Argus Sub-Saharan Africa Strategy Report; Argus Consulting Ammonia/Urea Cost & Margin Service; Argus Weekly Reports; IFA; GTIS.

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