Nitrogen fertilizer industry in transformation

"Two decades in review and journey ahead"

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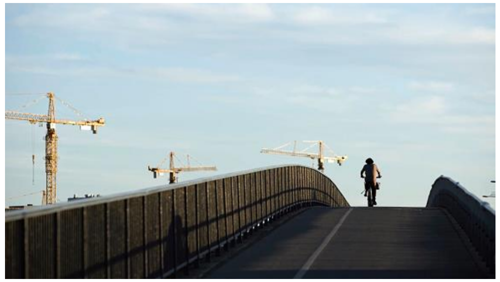
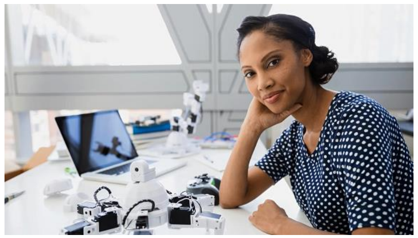
Megatrends and Fertilizers

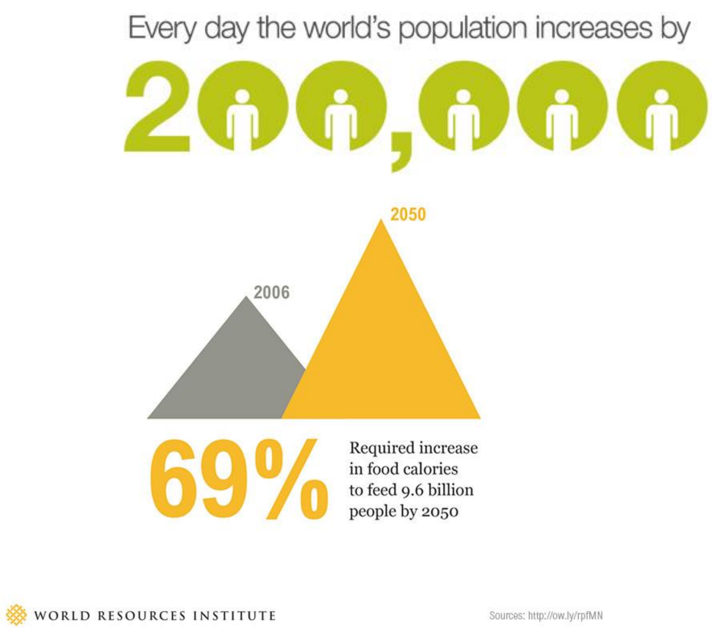
There are five major socio-economic driving forces

- Rapid urbanisation
- Climate change and resource scarcity
- Shift in global economic power
- Demographic and social change
- Technological breakthroughs





Combined population and GDP growth fertilizer consumption growing ~10 times since 1960's



FERTILIZERS

Implications for the fertilizer industry

Fertilizer industry:

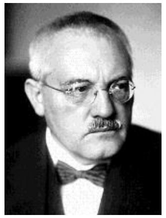
1. Urbanization results in less land available for agriculture.
2. Production of energy using hydrocarbons directly competes with producing hydrogen/nitrogen based fertilizers. A change in energy policy might free-up reserves for fertilizer production?
3. A growing population driven by birth rates and aging dramatically increases overall demand for food.
4. Demand for (higher quality) food increases dramatically with population rich countries (China and India) becoming more wealthy (increase in GDP per capita).
5. Digital technology solutions are appearing to help farmers increase efficiencies which may push down demand (e.g. digital soil mapping, precise agriculture, accurate weather forecast etc.)
6. Environmental implications of fertilizers production and use drive regulation and fertilizer production (eg. green ammonia) and crop technology (eg. nitrogen fixation)

The journey

Industrial nitrogen production has increased 85 times since WWII

Timeline of ammonia industry development

19th century — 1910-1913 — 1913-1934 — 1946-2018



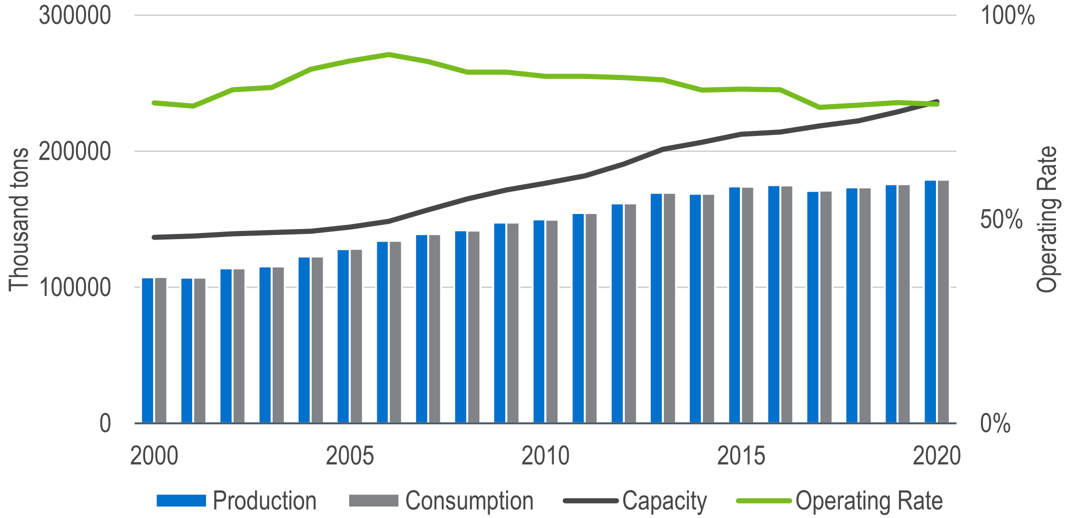
First ammonia synthesis commercial plant

From 1 plant in 1913 to >1000 ammonia and urea plants in 2018

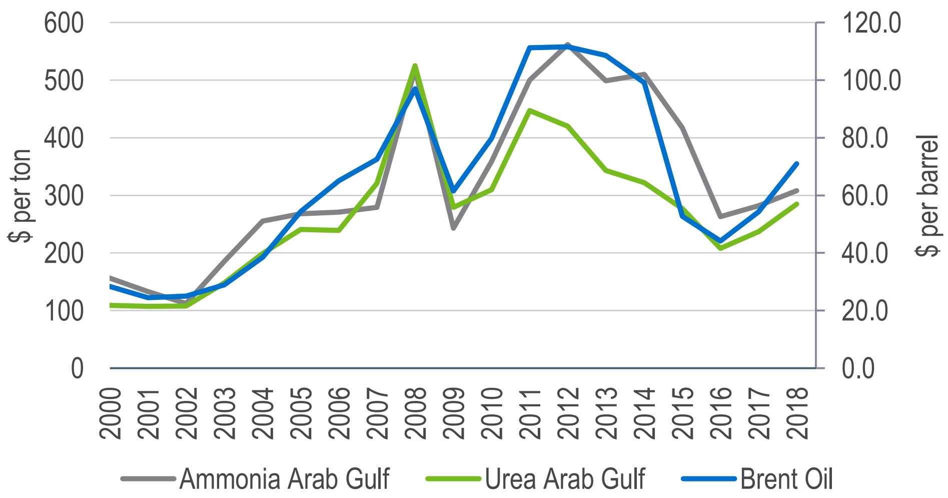
1910	1913	1934	1946	2010	2018
0.35 million tons	<1 million tons	2 million tons	3 million tons	165 million tons	251 million tons
	2% Haber Bosch	64% Haber Bosch		>99% Haber Bosch	

Some key trends over past decades – Global

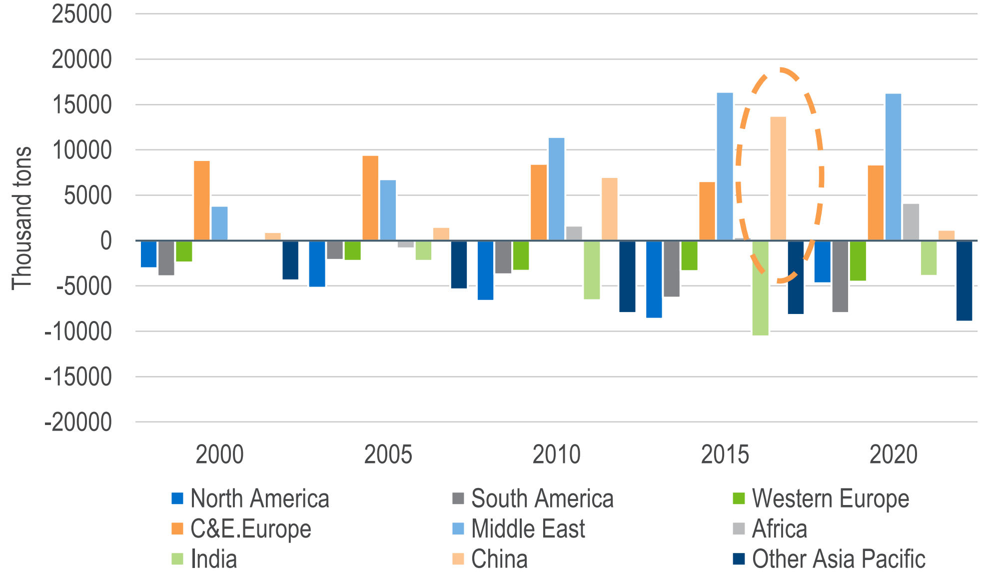
Supply, Demand and trade Urea



Historic Prices vs Oil

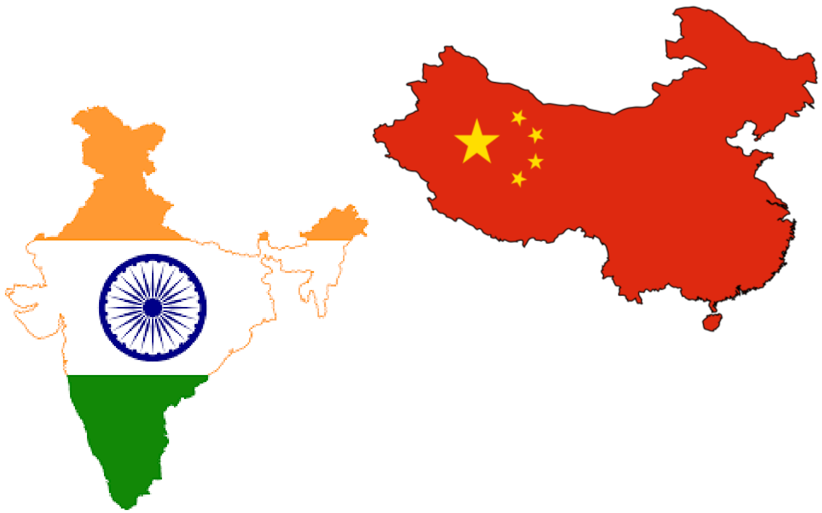


World Trade Urea

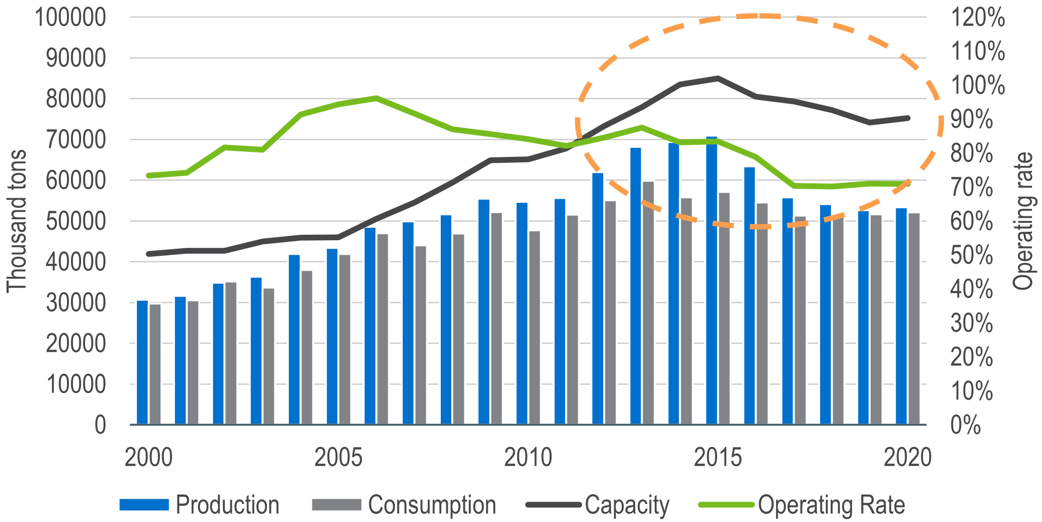


Some outcomes of overuse

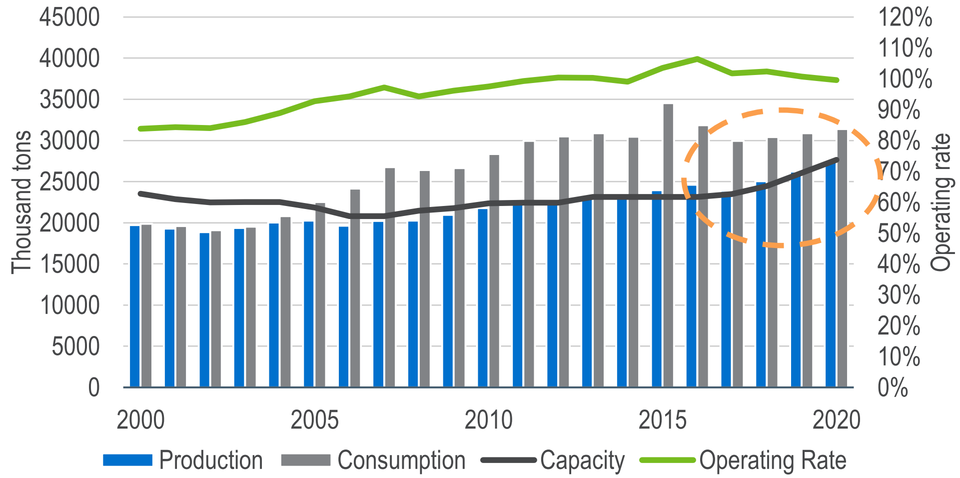
Some key trends in China



Supply, Demand and Trade Urea, China



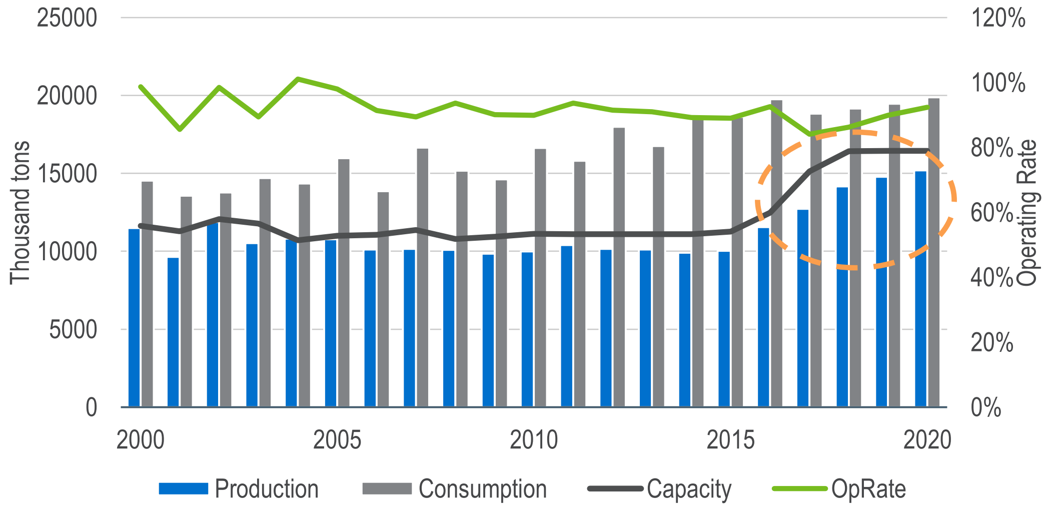
Supply, Demand and Trade Urea, India



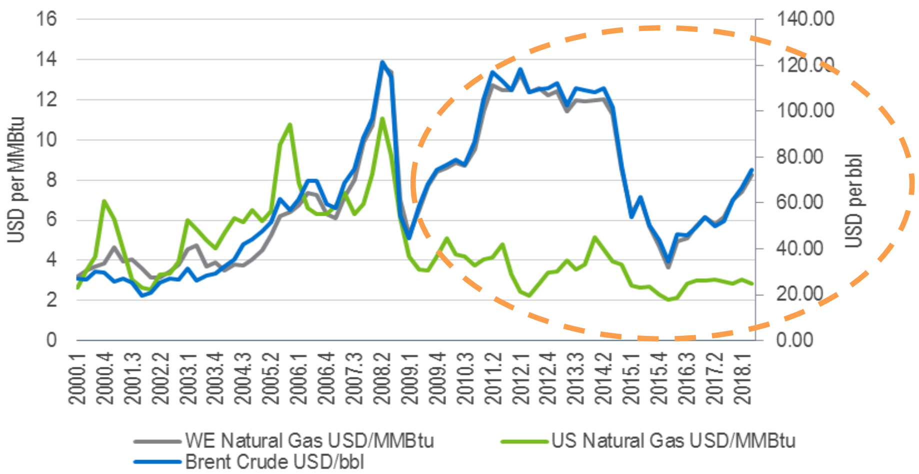
Some key trends in North America

PacWest Consulting Partners

Supply, Demand and Trade Urea

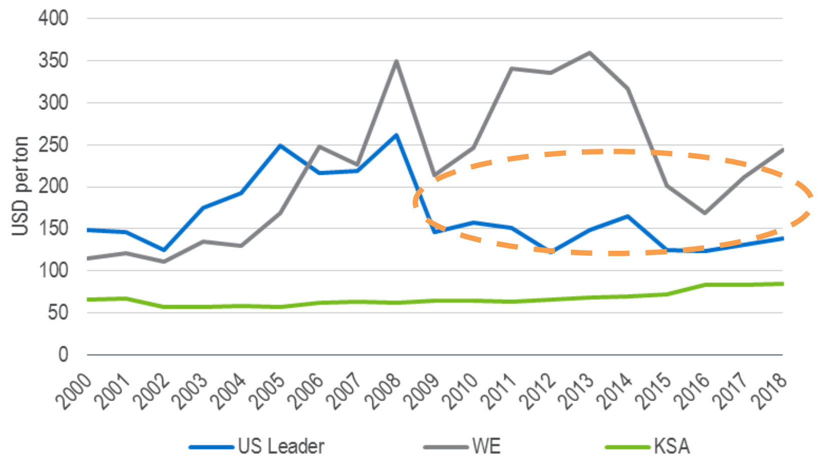


Natural Gas prices vs Oil



Nexant

Cash Cost Margins Development



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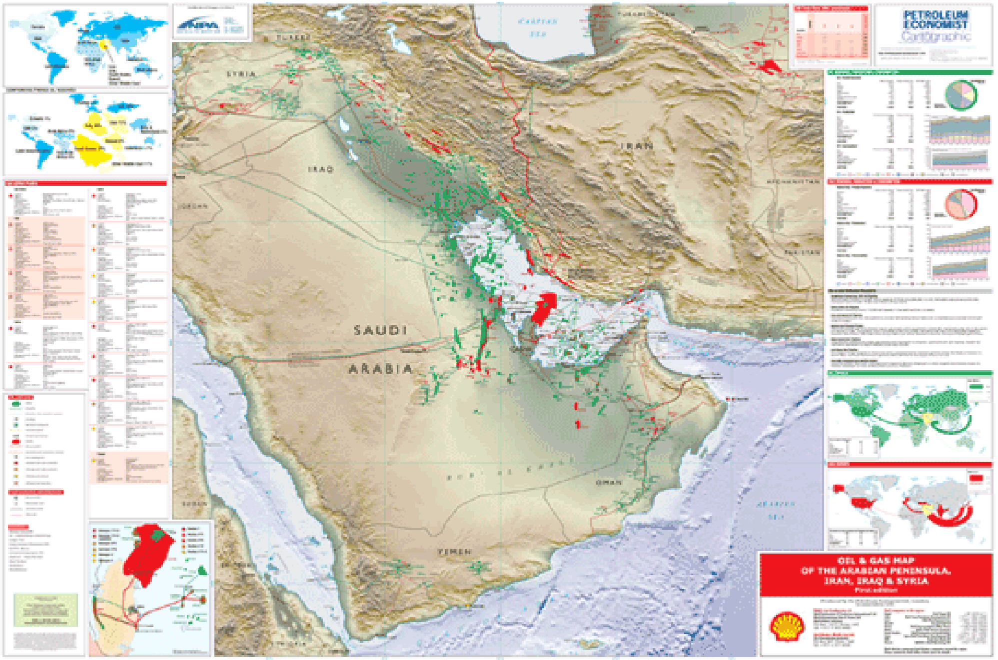
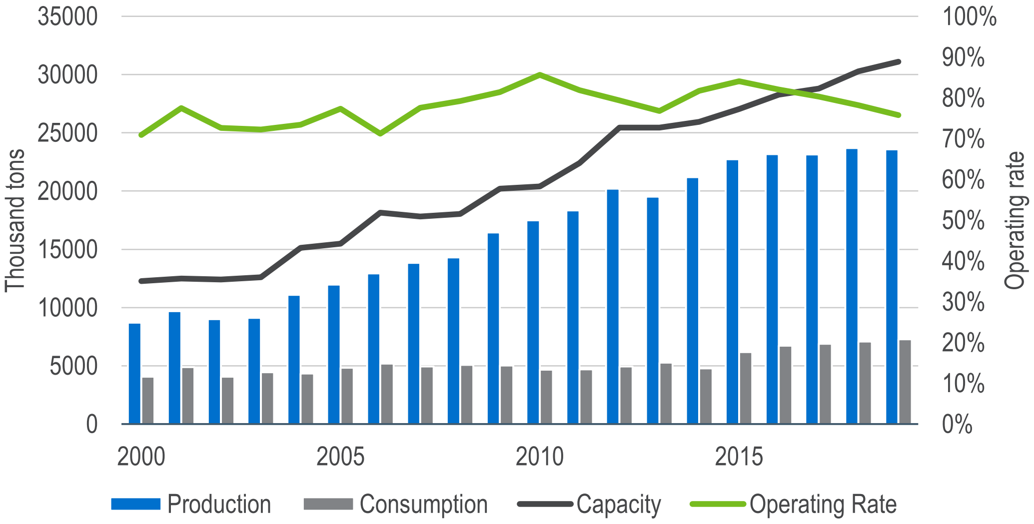
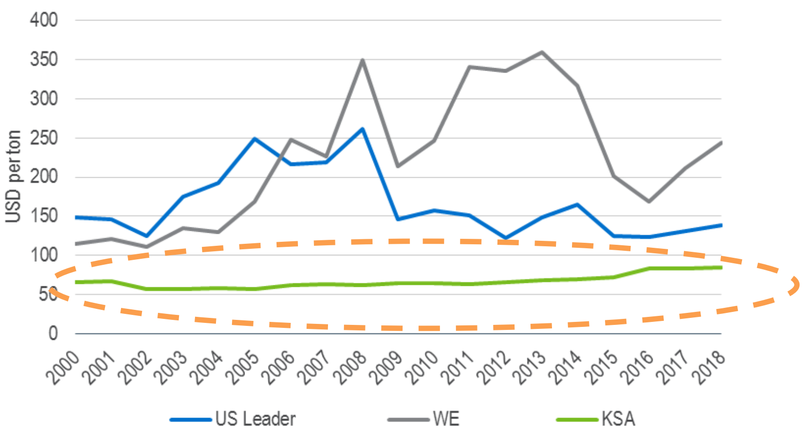
Some key trends in the Middle East



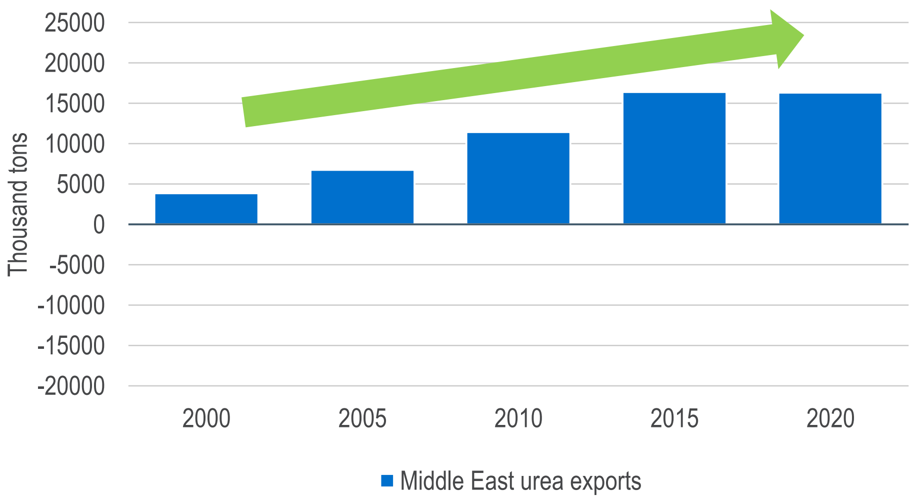
Supply, Demand and Trade Urea



Cash Cost Margins Development

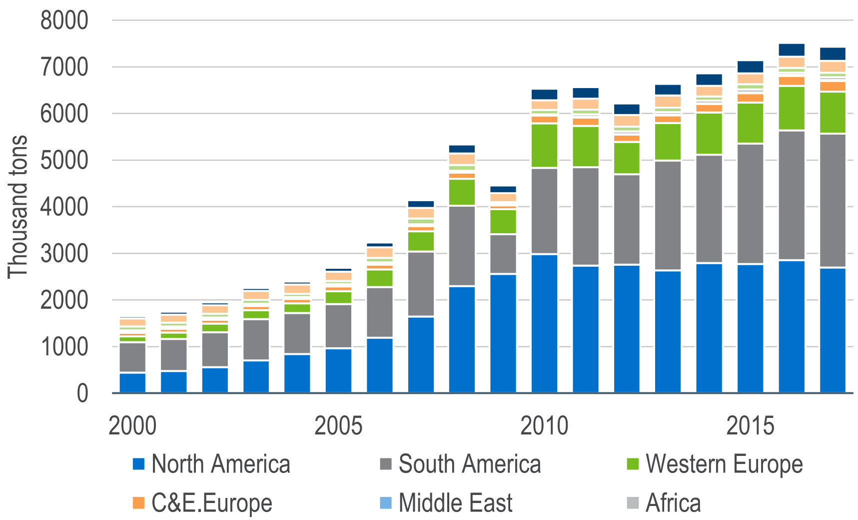


Urea Trade from Middle East

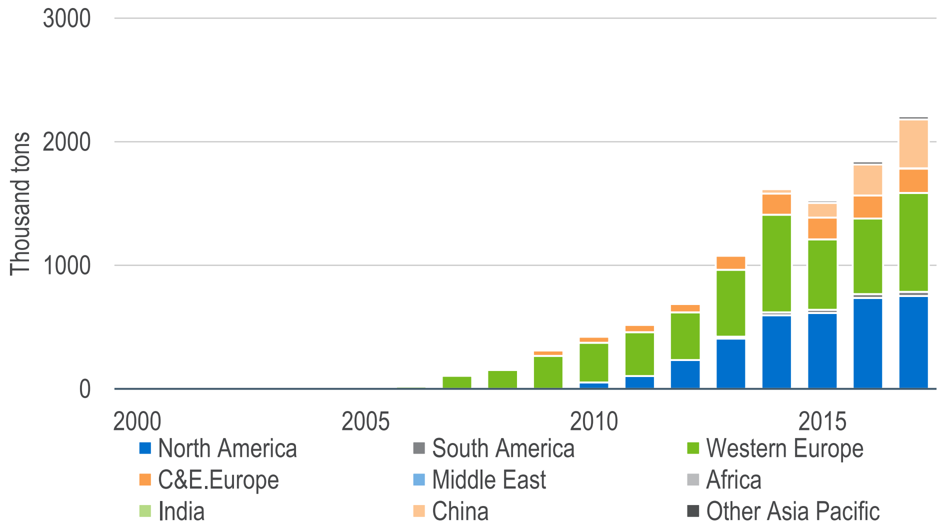


Some key trends over past decades –New applications

Biodiesel Demand by region



DEF Demand by region



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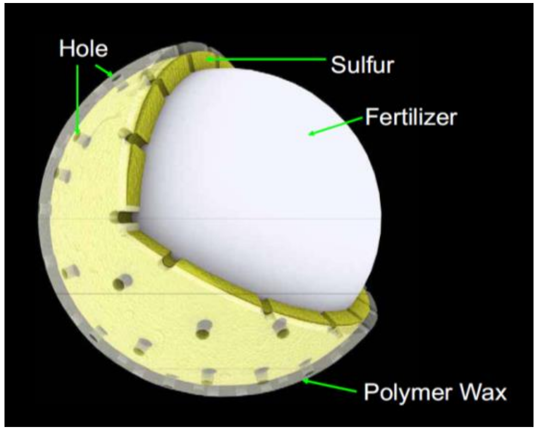
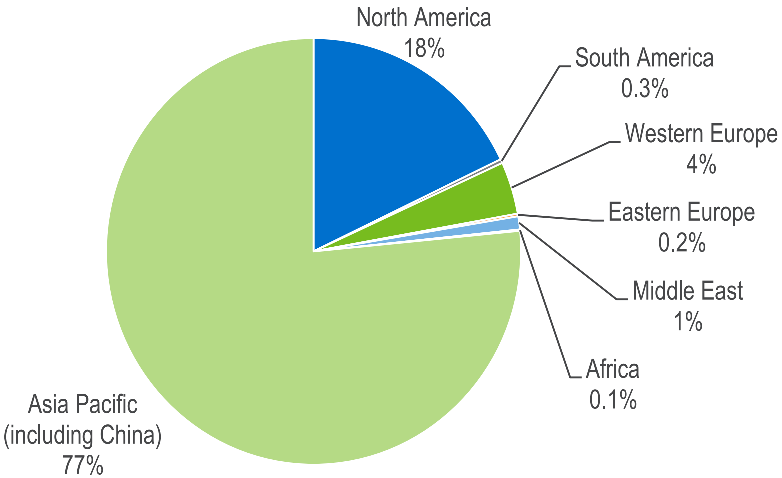
Some key trends over past decades –New products



ESN
SmartNitrogen

ENTEC



4 million tons in 2017
(growing at >5% CAGR)

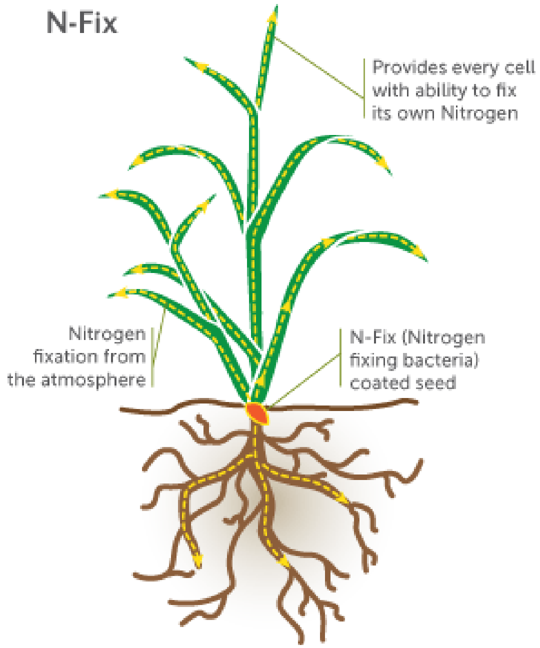
Nexant views - past

- Fertilizer overuse and environmental impact!
- Shale gas development and significant decoupling of natural gas prices in the US from crude oil
- Competitiveness position of US producers improved significantly
- Producers in KSA enjoy a strong advantage on a cash cost basis due to low gas cost, but limited gas resource for new projects and threat from other exporters rising
- China become a large net exporter of urea threating global market – net exports recently declined; supply and demand side reforms.
- India and SEA main importing markets
- Africa in focus: under application, large resources and population growth
- From a buoyant market in until mid 2010's to an oversupplied market today

The road ahead?

Some key trends to follow?

nutrient stewardship



Nexant views - future

- Consistent long term growth due to rising population but at lower rates due to fertilizer over-application, regulation and nutrient stewardship in major consuming markets
- New products/new markets and new strategies for players in effort to create and capture value
- Digitalisation impacting demand and supply?
- India emerging as a key producer?
- China further capacity rationalisation, growing environmental drive and lower exports;
- Middle East continued position as low cost, volume exporter but competitive threat rising; need for new business strategies!
- Protectionism impacting market - Government changes can lead to trade tensions
- Policy developments are a major driver of future fertilizer supply and demand
  - China, fertilizer consumption growth has been capped and supply decreasing
  - India, the government is considering options to improve the effectiveness of its fertilizer subsidy scheme and become self sufficient
- Africa emerging a major consuming and producing centre?

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