IHS CHEMICAL

PROFITING FROM CHANGE – NEW INDUSTRY DYNAMICS

‘What a caterpillar calls the end, the rest of the world calls a butterfly’ – Lao Tzu

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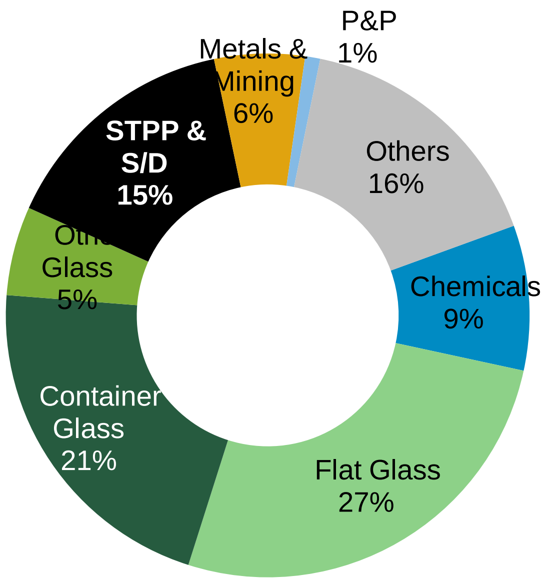
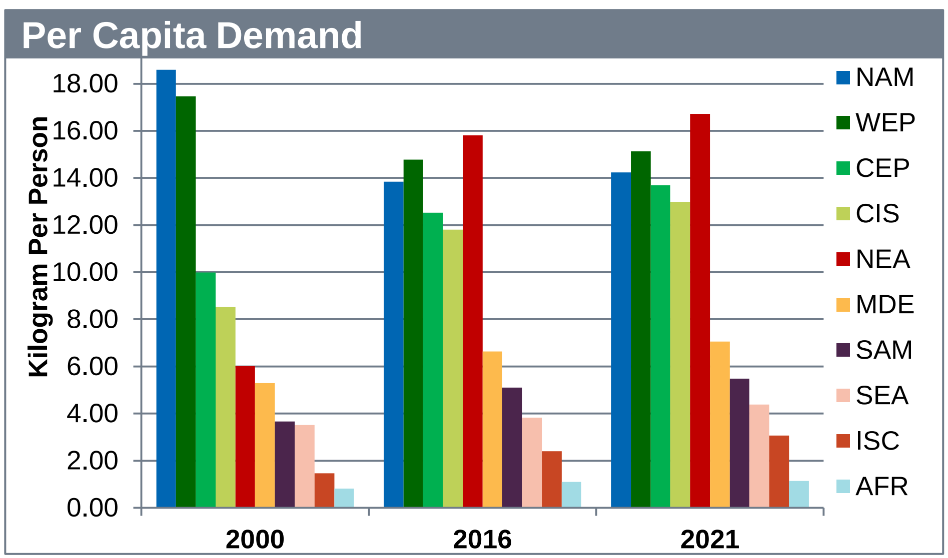
What Drives Soda Ash Demand?



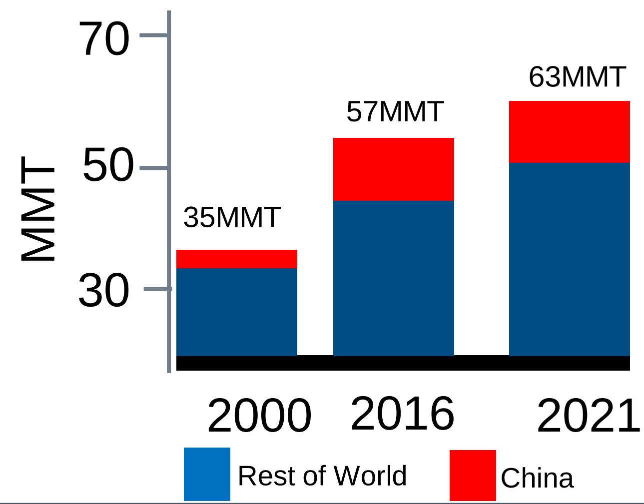
Total Demand = 57 MMT

World demand

- Growth averaged 3.2%/y since 2000
- Forecast, 2.1% AAGR, 2016-2021

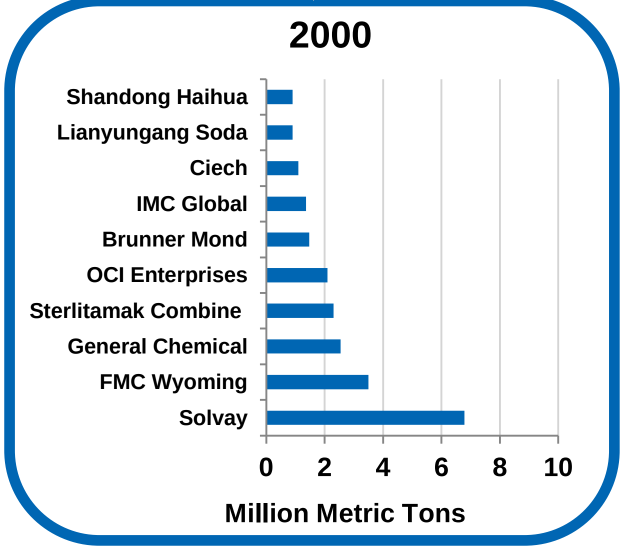


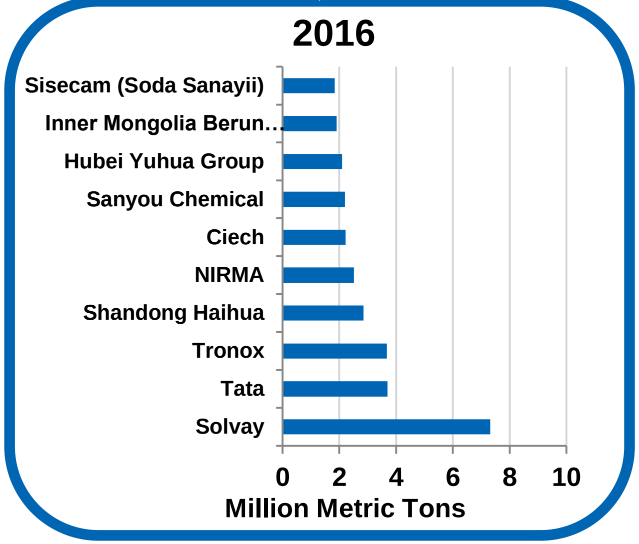
World Demand vs China

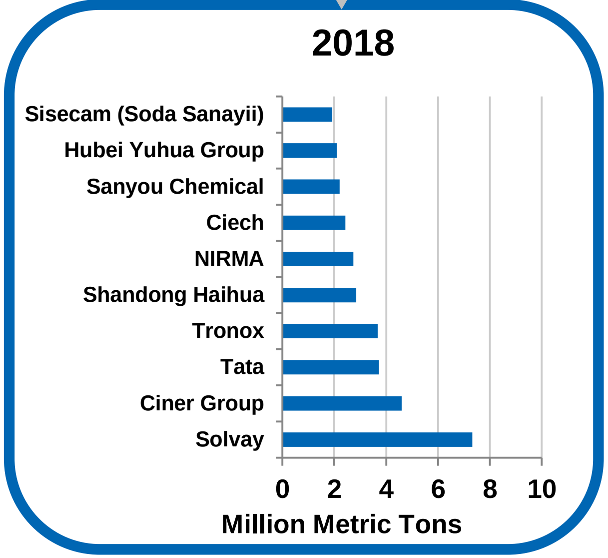


Changes in Soda Ash Producers

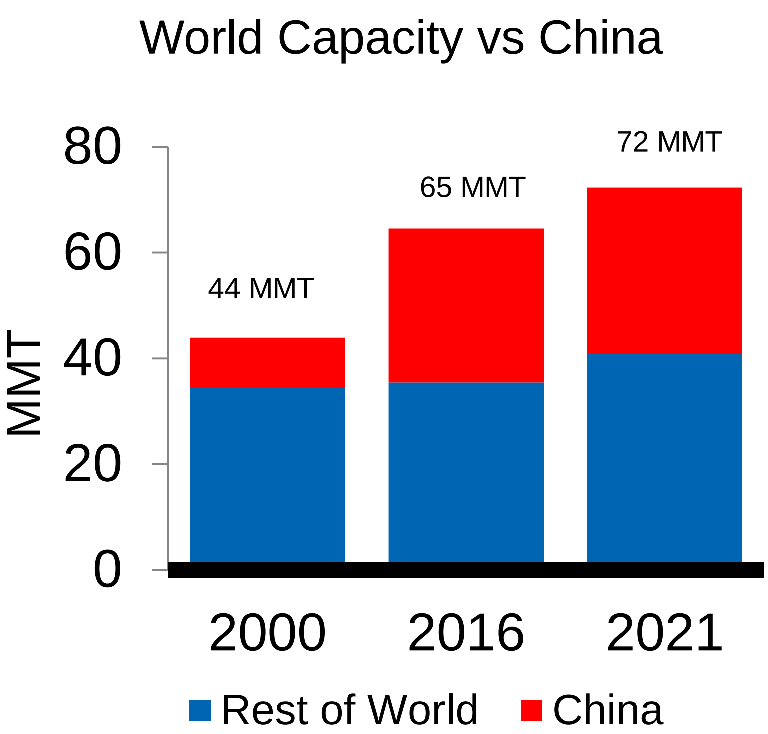
Ownership on a shareholder basis



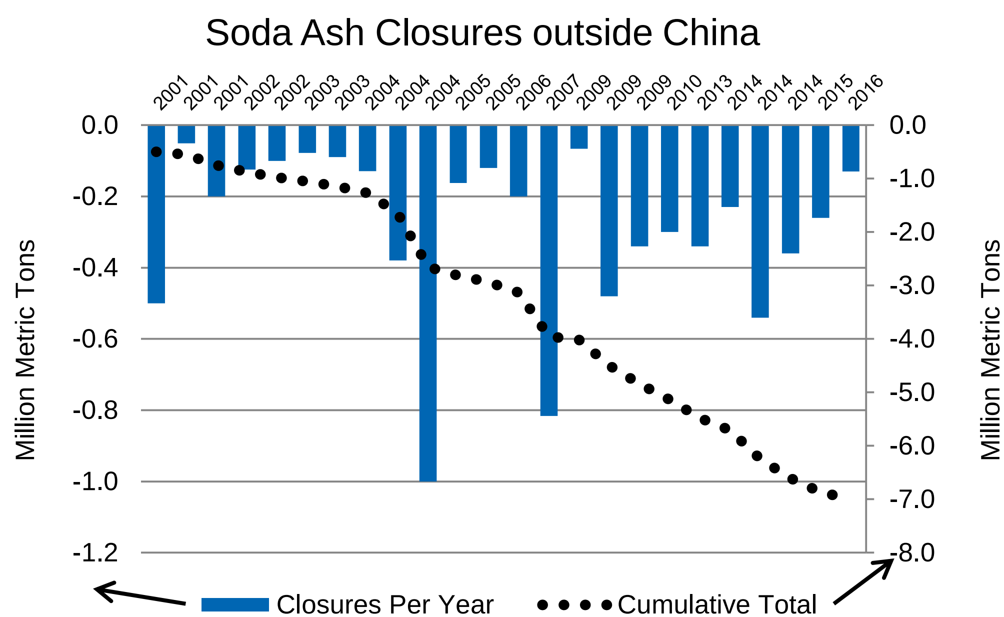




Capacity Changes

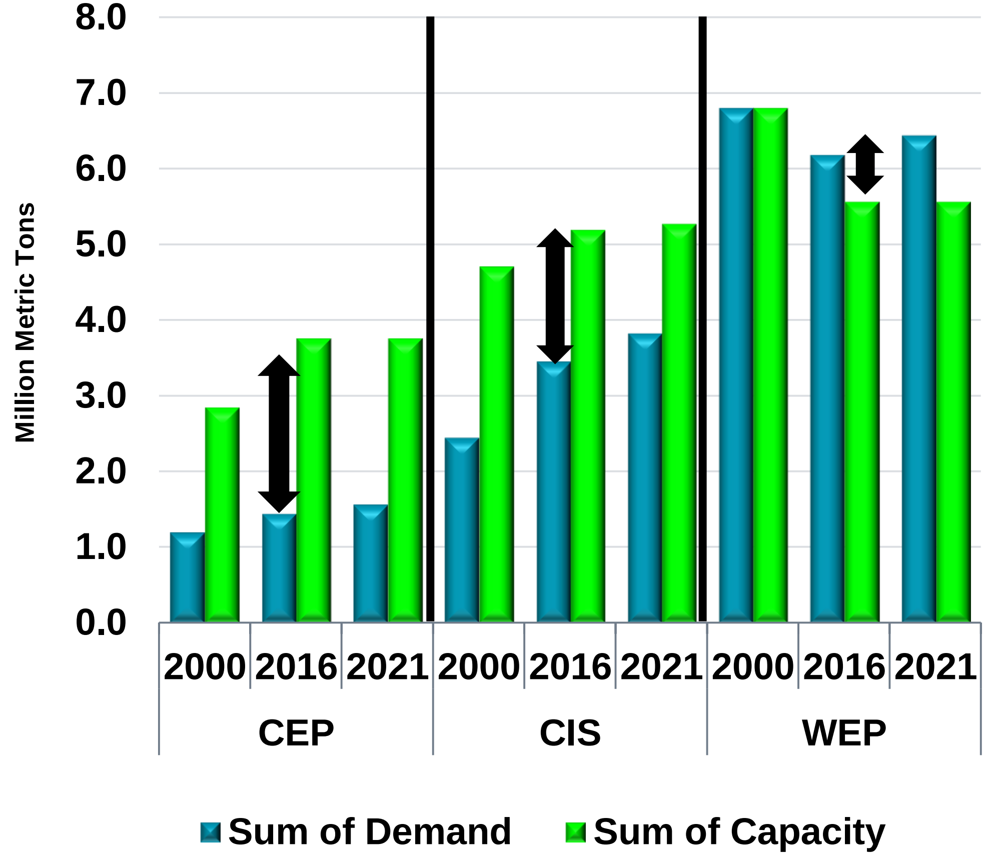


- China has dominated in adding capacity
- Capacity additions, economic problems, volatile energy prices have combined triggered closures
  - 7.0 MMT/Y capacity closed outside China
  - 2.4 MMT/Y capacity closed in Europe
- Chinese capacity additions have slowed
- Turkey set for single biggest expansion



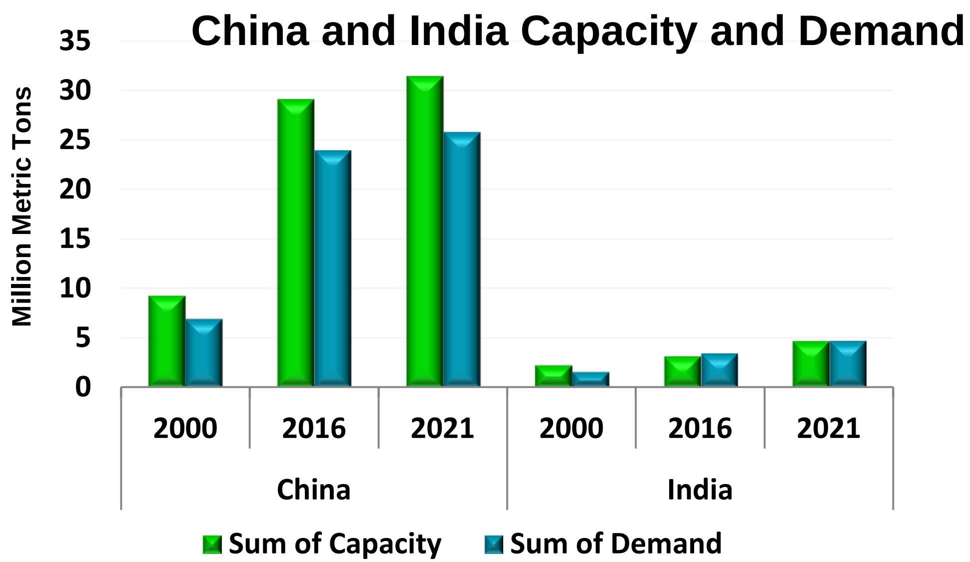
Changes in European Supply and Demand

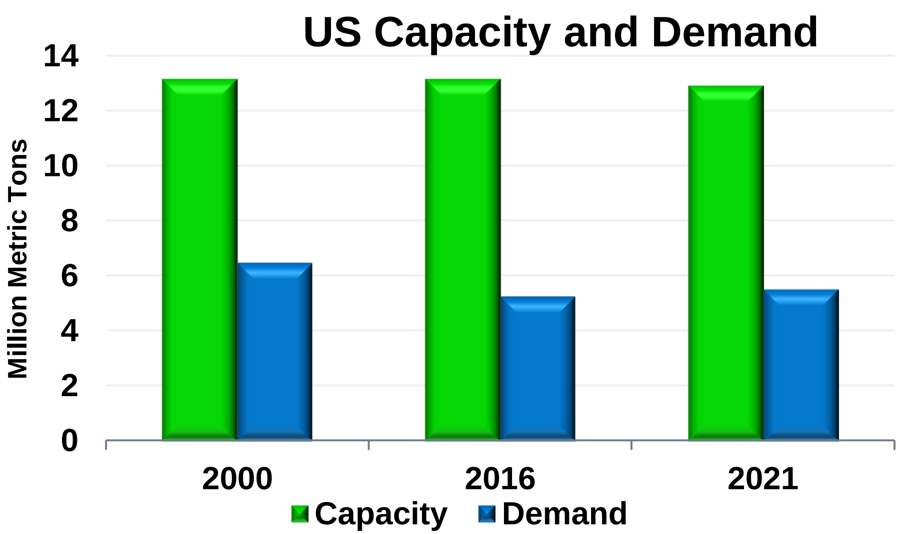
- Demand in both CEP and CIS has grown but both regions have surplus capacity
- CEP is a significant exporter of soda ash
- Demand in WEP has fallen since 2000 alongside a fall in capacity
  - WEP is structurally short of soda ash
- +700kt/y new demand in Europe since 2000
- While capacity in Europe has been forced to close, demand has not disappeared



West Europe (WEP), Central Europe (CEP), Commonwealth of Independent States (CIS)

Changes in Other Regions





- Growth in Chinese demand slowing as economy moves to more sustainable growth
- Significant demand potential in India
  - Who will supply this demand?
  - Will India copy China and meet its needs through local production?
  - Or will imports supply a certain portion of Indian demand?
- US demand has fallen since 2000 and doesn't look like it will grow much to 2021

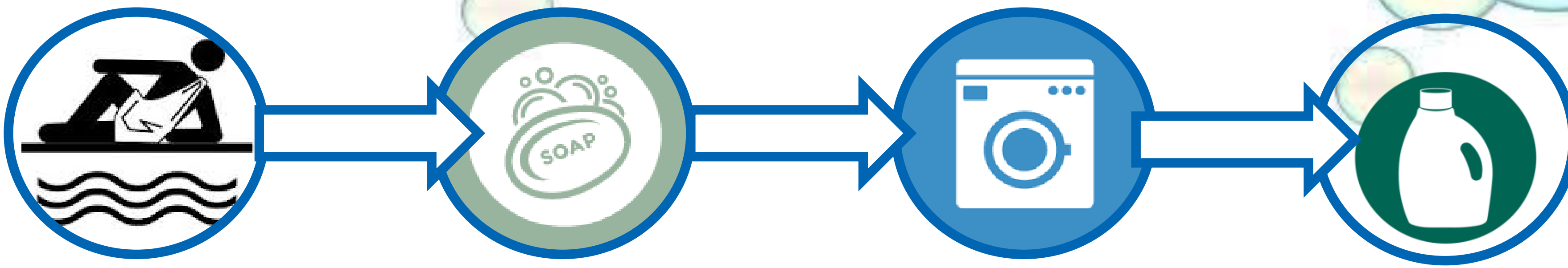
DETERGENTS

- 12% of World Soda Ash Demand
- Demand is Shrinking in Developed Markets
  - WHY?

Detergents & Soda Ash

- First of the great roman baths built about 312 B.C.
- By 200 A.D., the Greek physician, Galen, recommends soap for both medicinal and cleansing purposes.

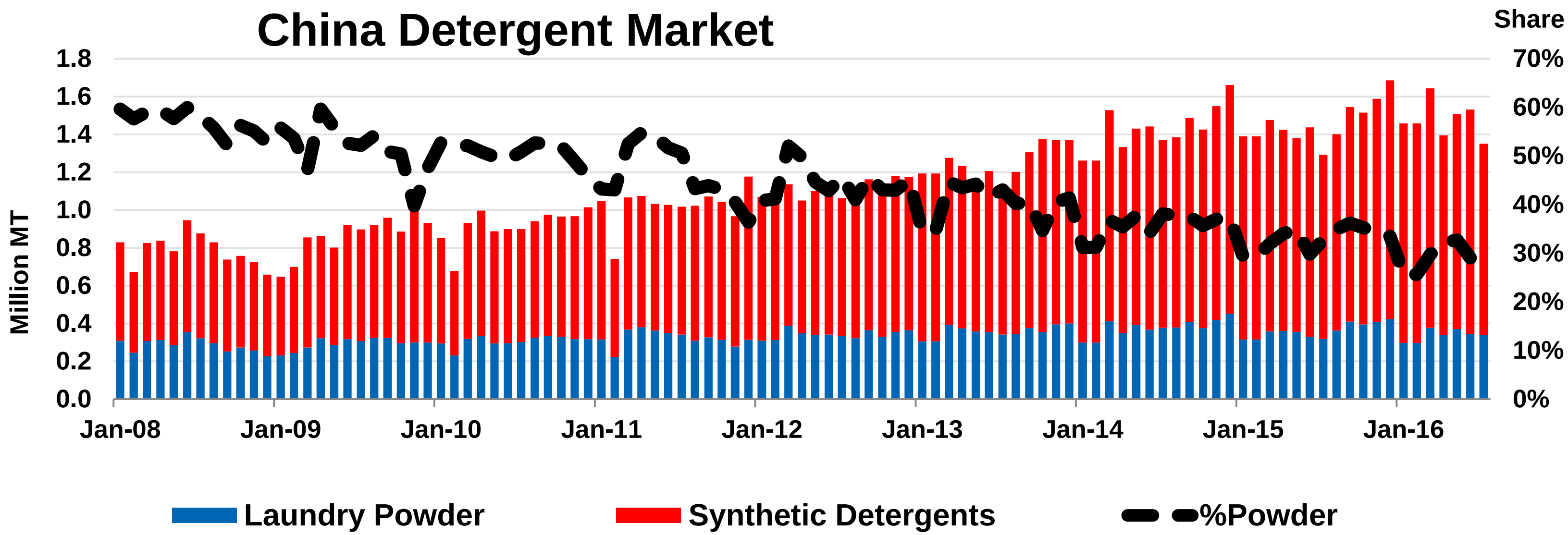
- In **1946**, when **the first "built" detergent** (containing a surfactant/builder combination) was introduced in the U.S.
- Phosphate compounds used as builders in making them suitable for cleaning heavily soiled laundry.

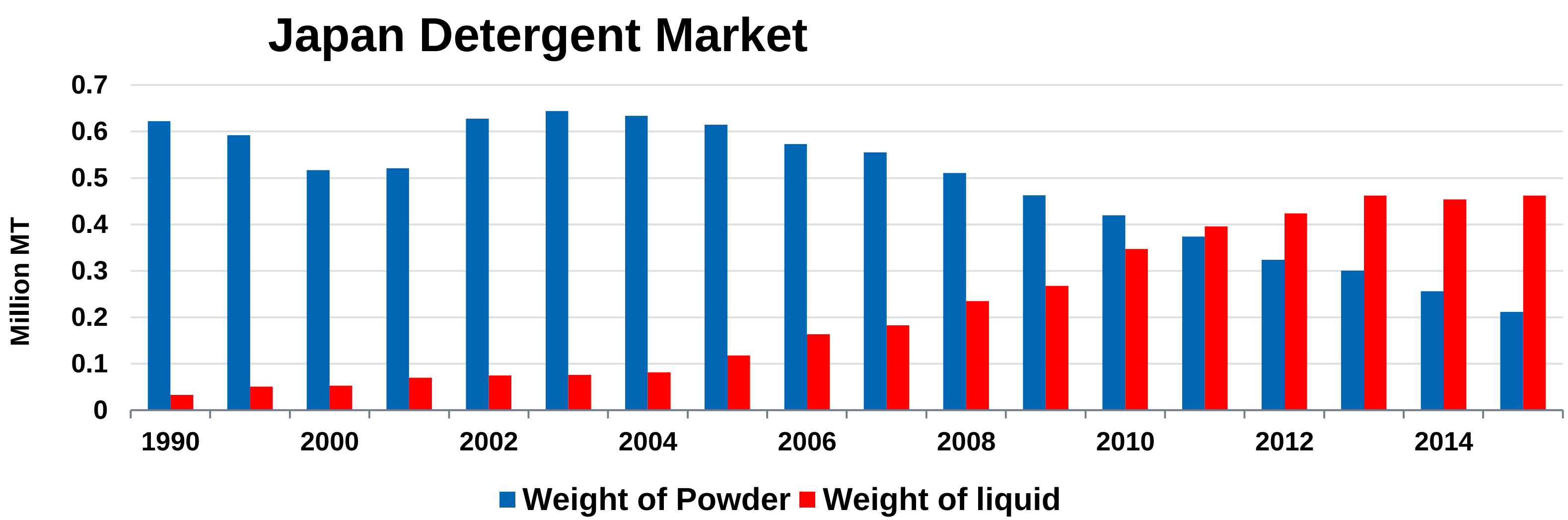


- In 1791 French chemist, Nicholas Leblanc, patented a process for making soda ash
- Soda ash was combined with fat to form soap.

- **Phosphate use has been greatly reduced in many countries** as a reaction to it's link to eutrophication
- Current trends show a **move towards liquid detergents**

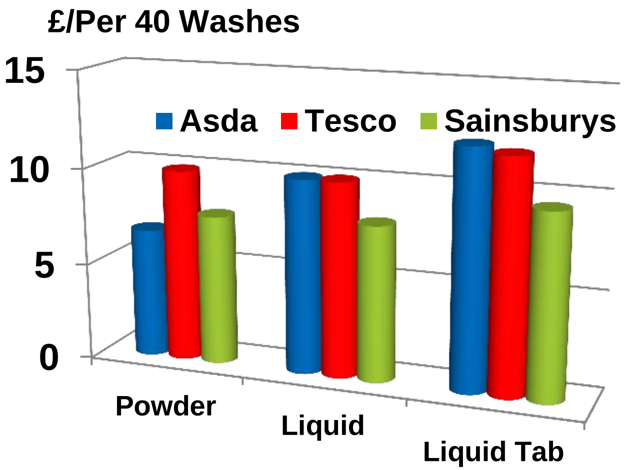
Changes in Detergent Market



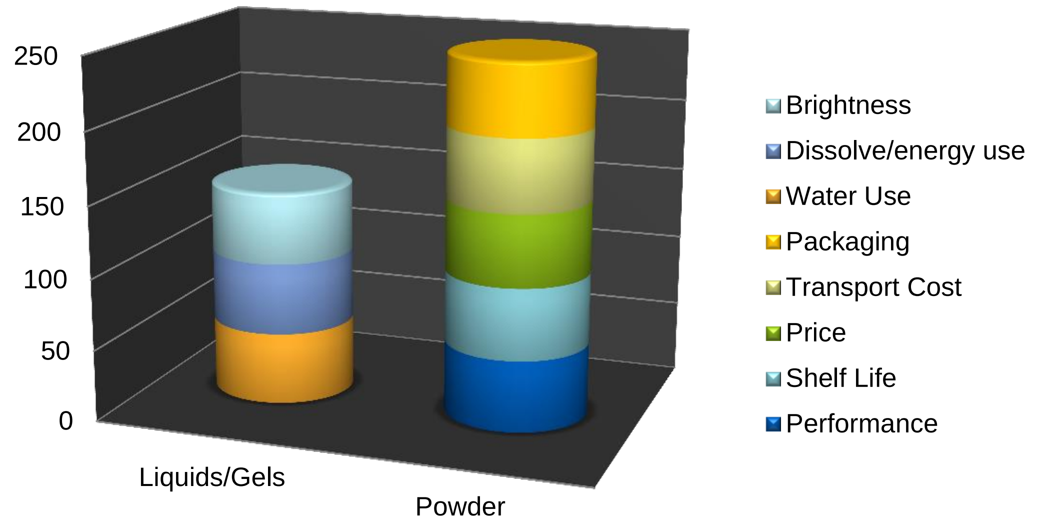


Why are Liquid Detergents taking Market Share?

Retail Prices



Ranking, Powder vs Liquid



Liquids

- Better at keeping colours bright
- **Lower temperature wash**, **less energy**
- Use less water in wash
- Tend to overdose on liquids
- 75% water, heavier, higher transport cost
- Packaged in plastic

Powder

- **Usually cheaper**
- **Better washing performance**
- More stable ingredients, longer shelf life
- Can buy in bulk, less packaging
- Packaged in biodegradable boxes

Why Liquid?

Wash at lower temperatures

Less shelf space, better for supermarkets

$

Command premium price, better margins for detergent producers

$

Why Powder?

Cheaper

Less packaging, Biodegradable box, Longer shelf life ,

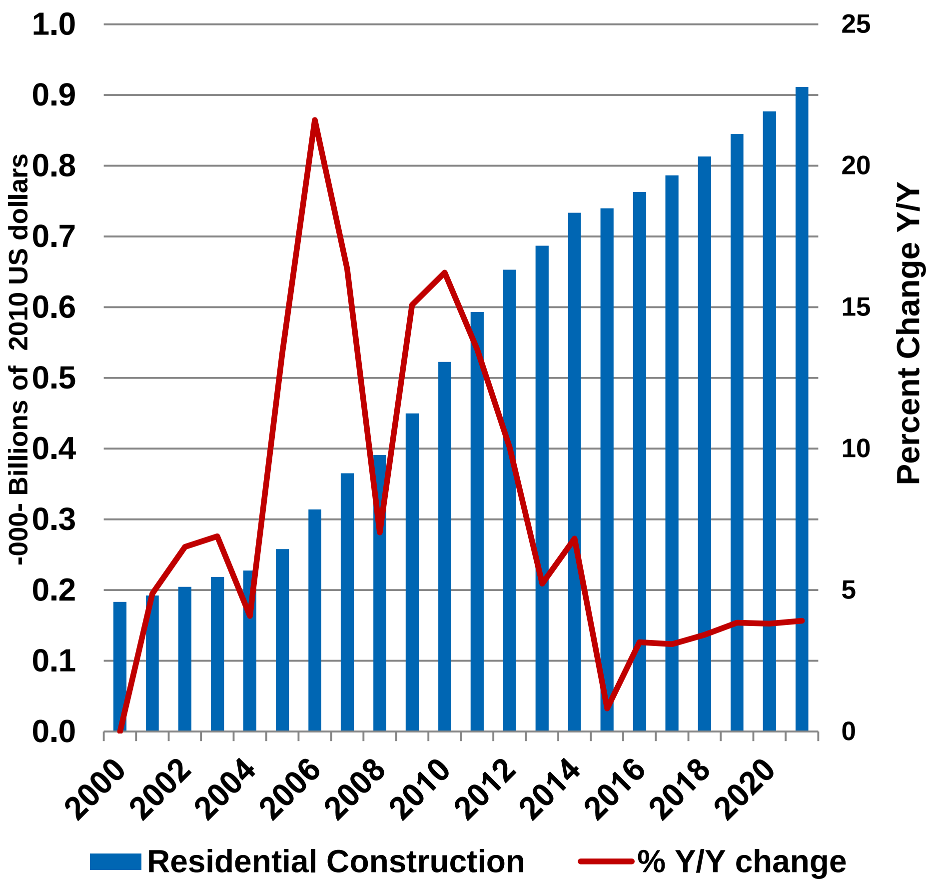
Use less, More economical to transport, Better at cleaning,

Are powder detergents in fact <u>kinder</u> to the <u>environment</u>?

FLAT GLASS

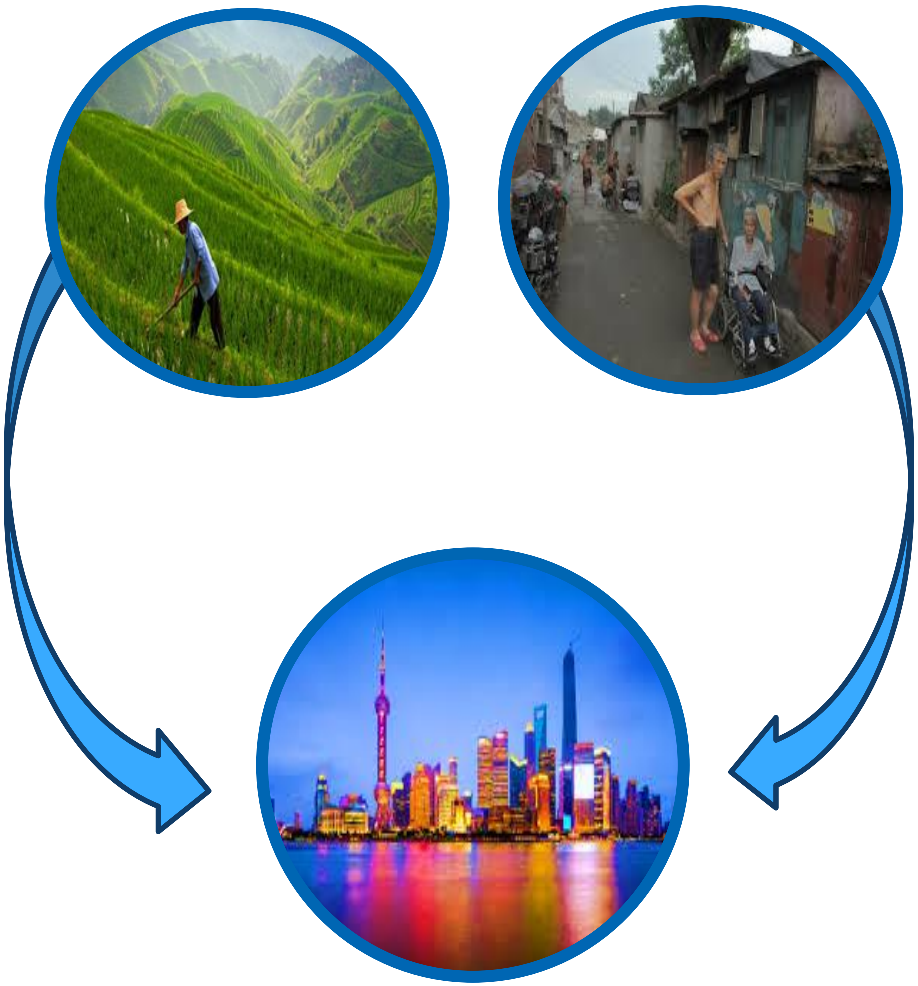
- The single biggest end use for soda ash
- Flat Glass has driven world soda ash demand over last 15 years
- China is the biggest flat glass producer in the world

China's Housing Market Story



- After decades of frantic growth the Chinese economy is shifting to what it calls the "new normal" – sustainable growth – as set out in the 13th 5 year plan
- Chinese growth in **housing construction** has **slowed dramatically**
- Pressure on growth coming from a **glut of housing inventory**

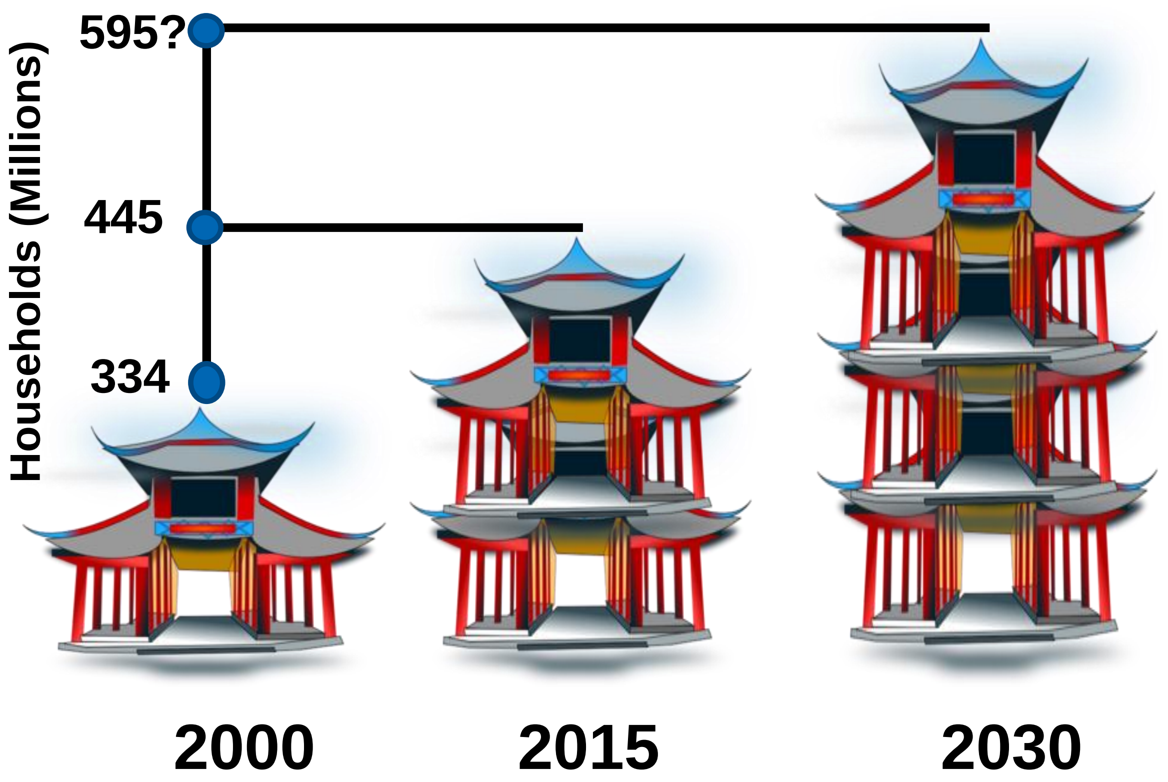
Future Chinese Construction



What is going to happen to Chinese Flat Glass demand?

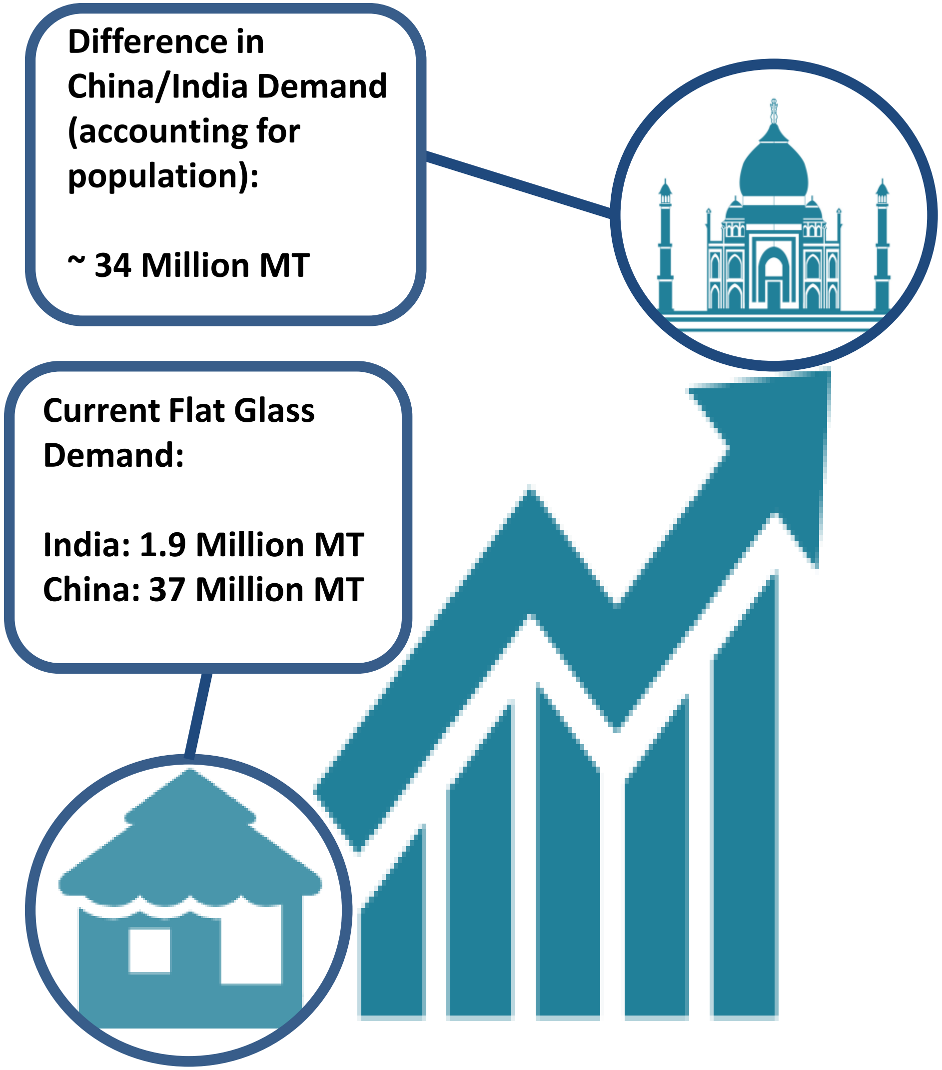
- The biggest driver of housing demand is urbanisation
- Government plans to increase urban population by 100 Million by 2020
- Rebuilding Shanty towns

Has Flat Glass Production Peaked in China?



- 110 million (M) new households between 2000 and 2015
- 110-150M new households by 2030
- Average glass demand of 26-36 MMT/Y by 2030
  - But, glass production reached 39MMT in 2014

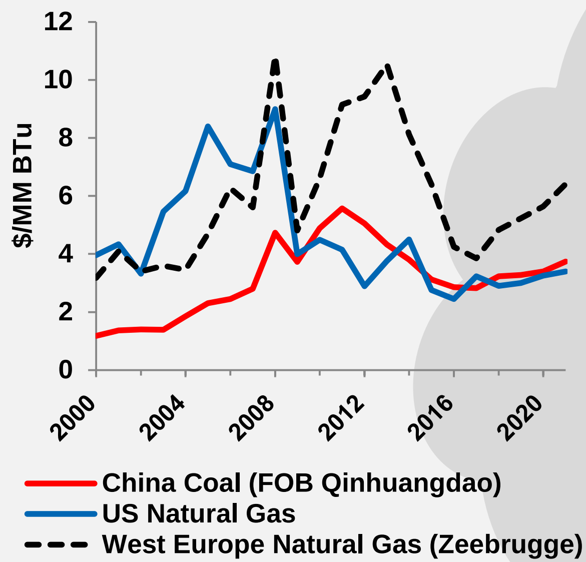
Flat Glass Potential in ROW

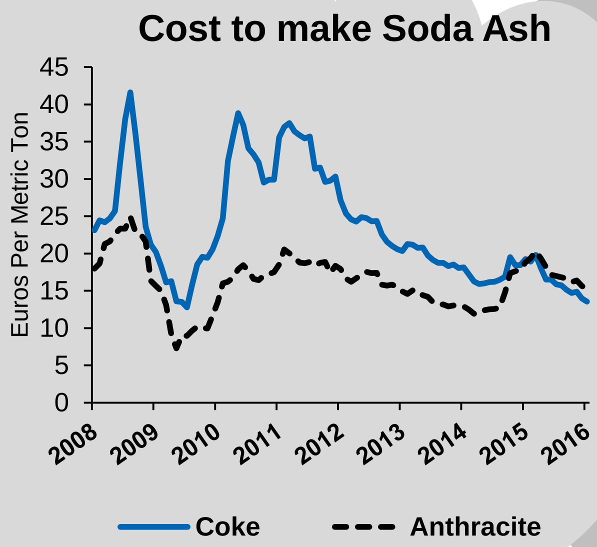


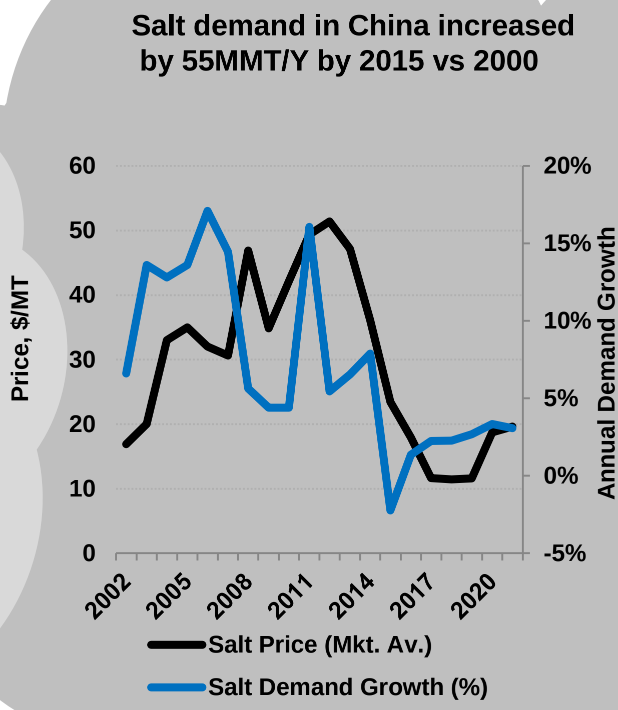
- Chinese story in terms of exponential flat glass growth is over
- But other stories have yet to begin
- India, South America, other developing regions also have to realize their potential
- Also, flat glass is not just for new buildings
  - Automobile, solar glass, double glazing etc

Cost Changes

Variable Cost Overview







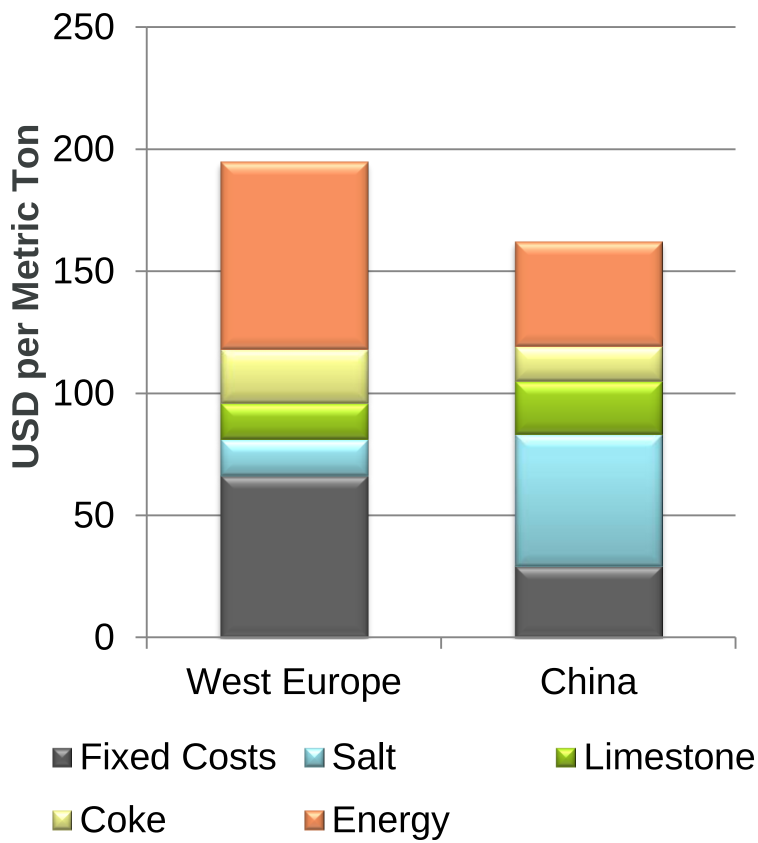
NATURAL GAS/COAL

COKE/ANTHRACITE COST

SALT COST

Solvay Synthetic Costs – Regional Differences

Soda Ash Cash Cost 2014



Source: IHS

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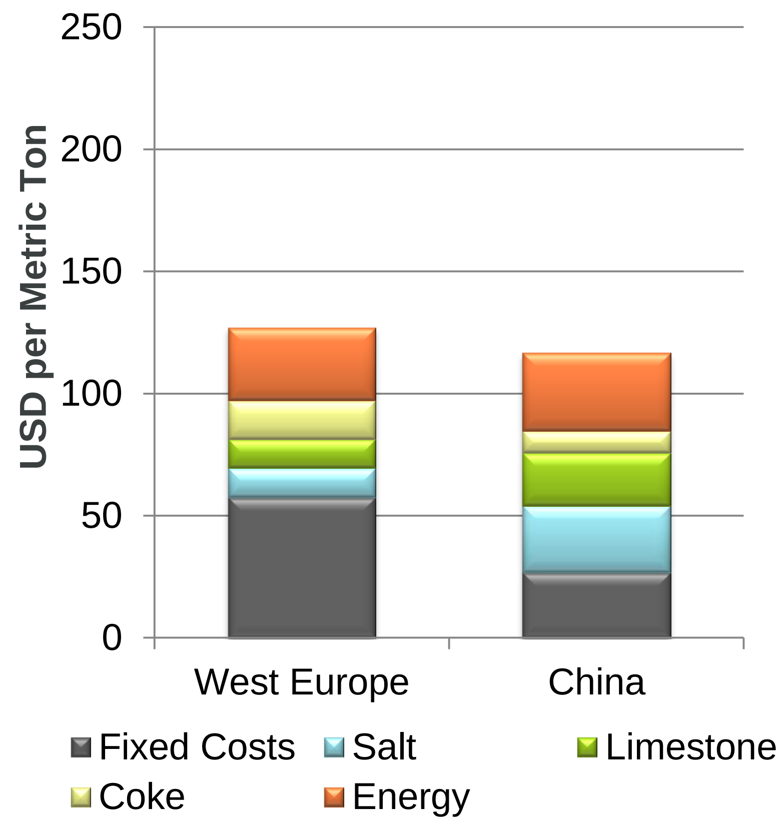
Soda Ash Cash Cost 2016



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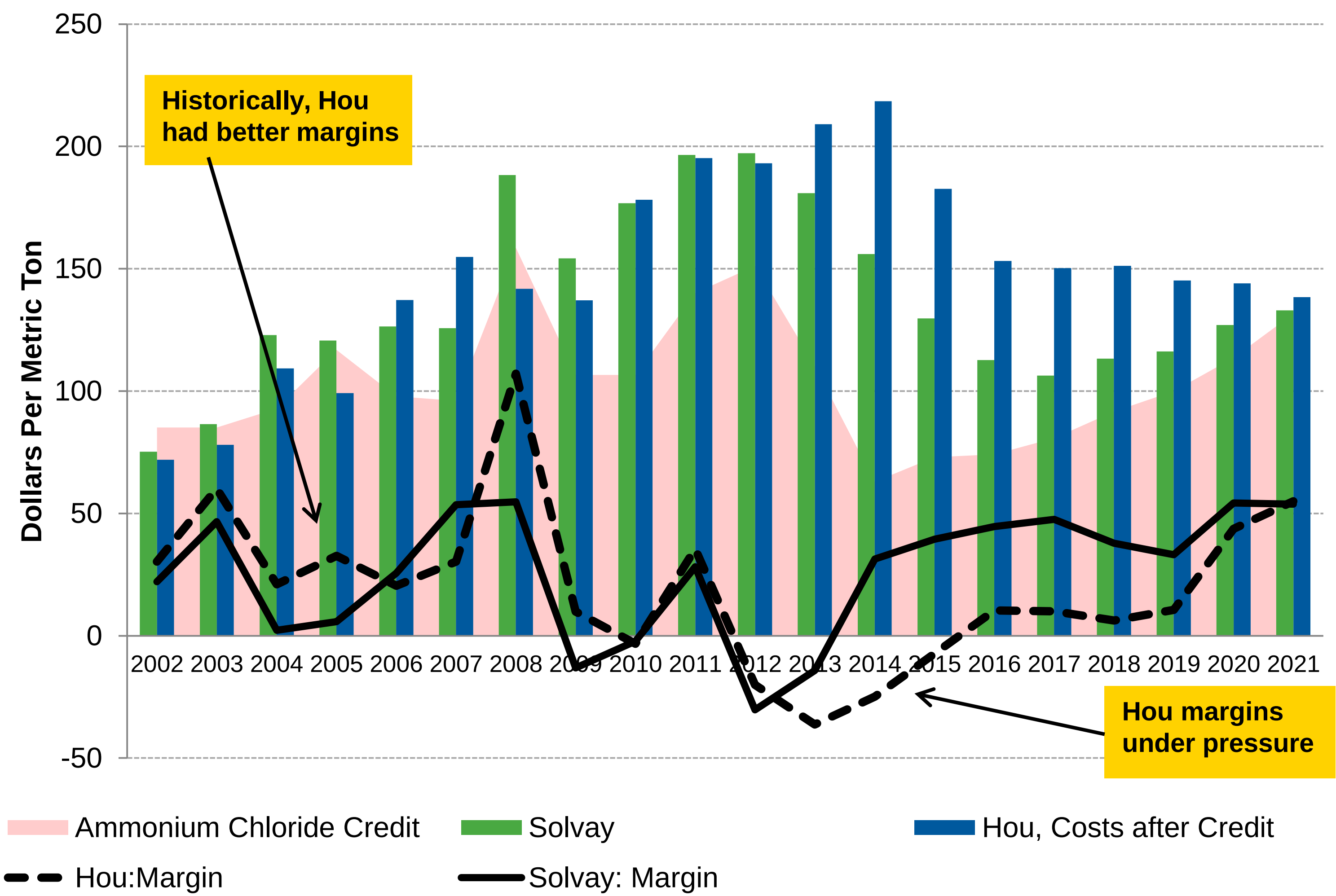
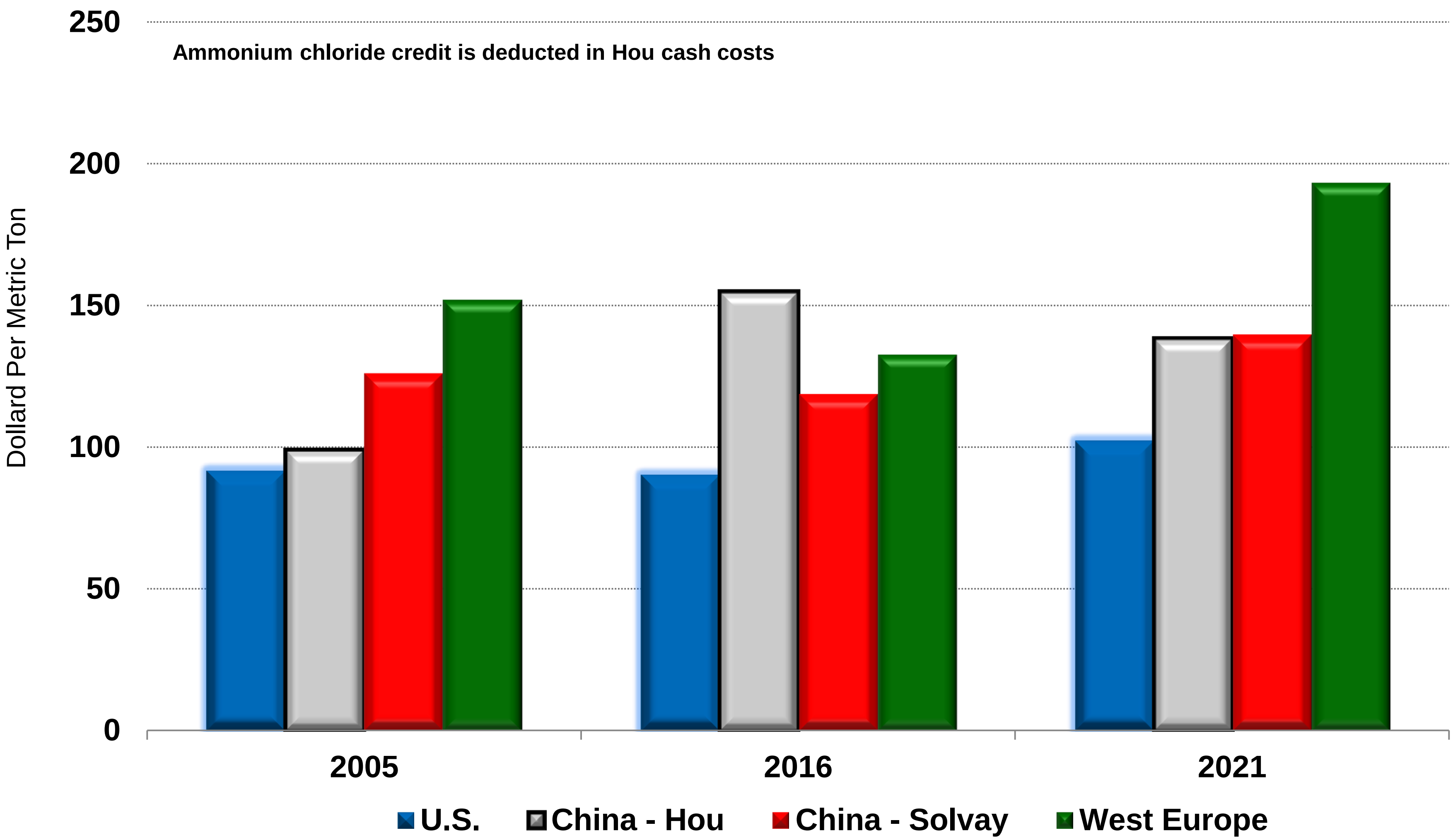
China Cash Costs and Margins



- Hou has dominated capacity additions
  - Historically, had better margins
- Hou margins under pressure
  - Poor credit from NH_4Cl
- Outlook remains better for Solvay margins

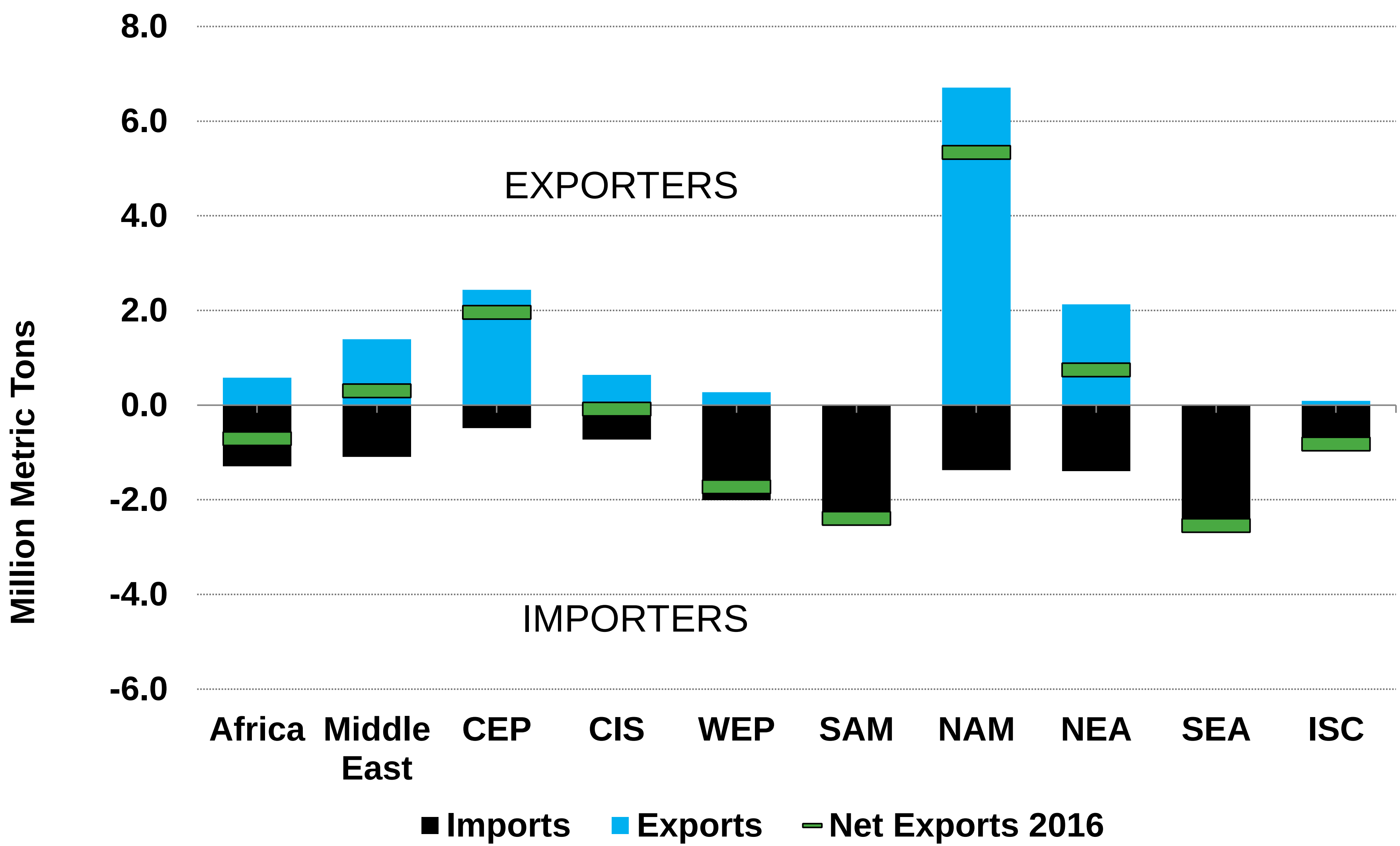
Cash Costs Comparison



TRADE

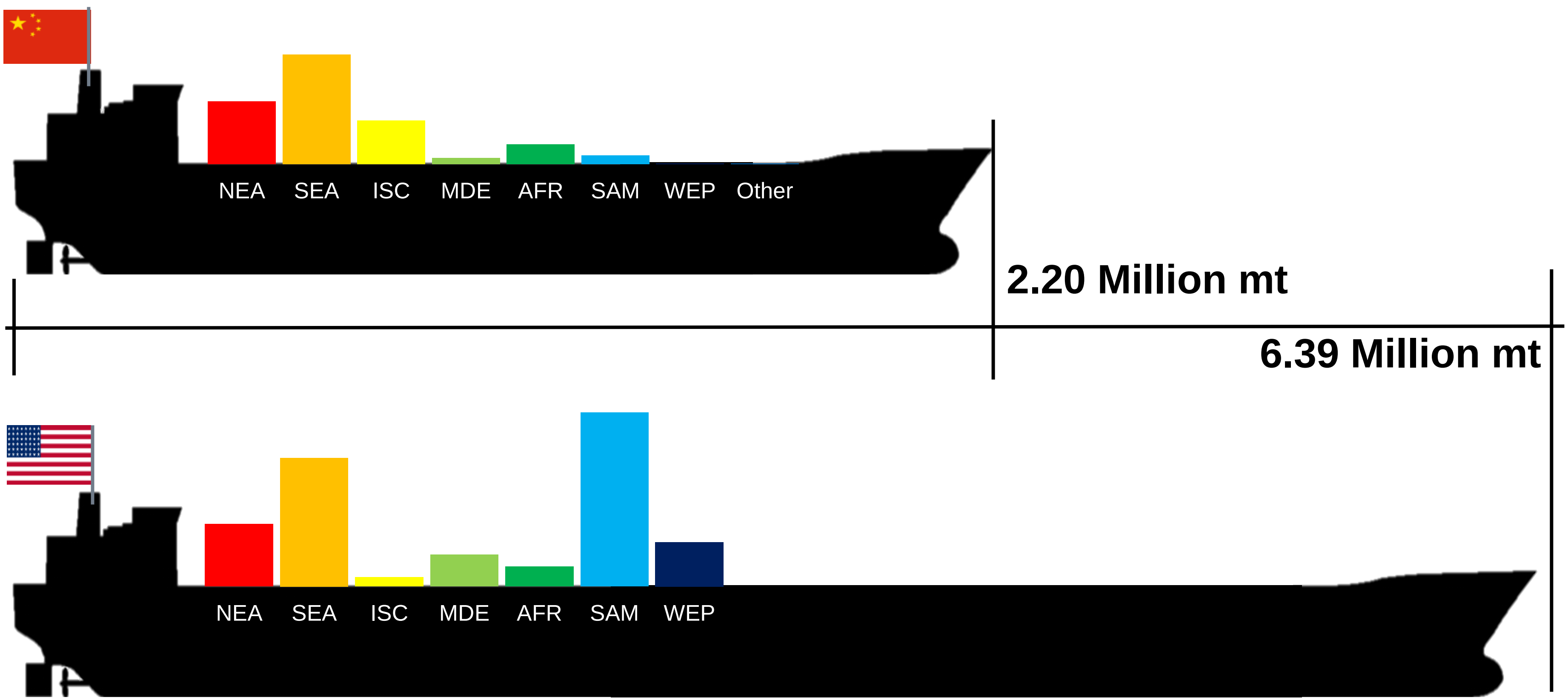
- 25% of soda ash production is shipped between key regions
- World trade has grown from 8.5 MMT/Y in 2000 to 14.2 MMT/Y in 2016
  - A net increase of 5.7 MMT
  - Growth in global trade has averaged 4%/y

Soda Ash Trade 2016

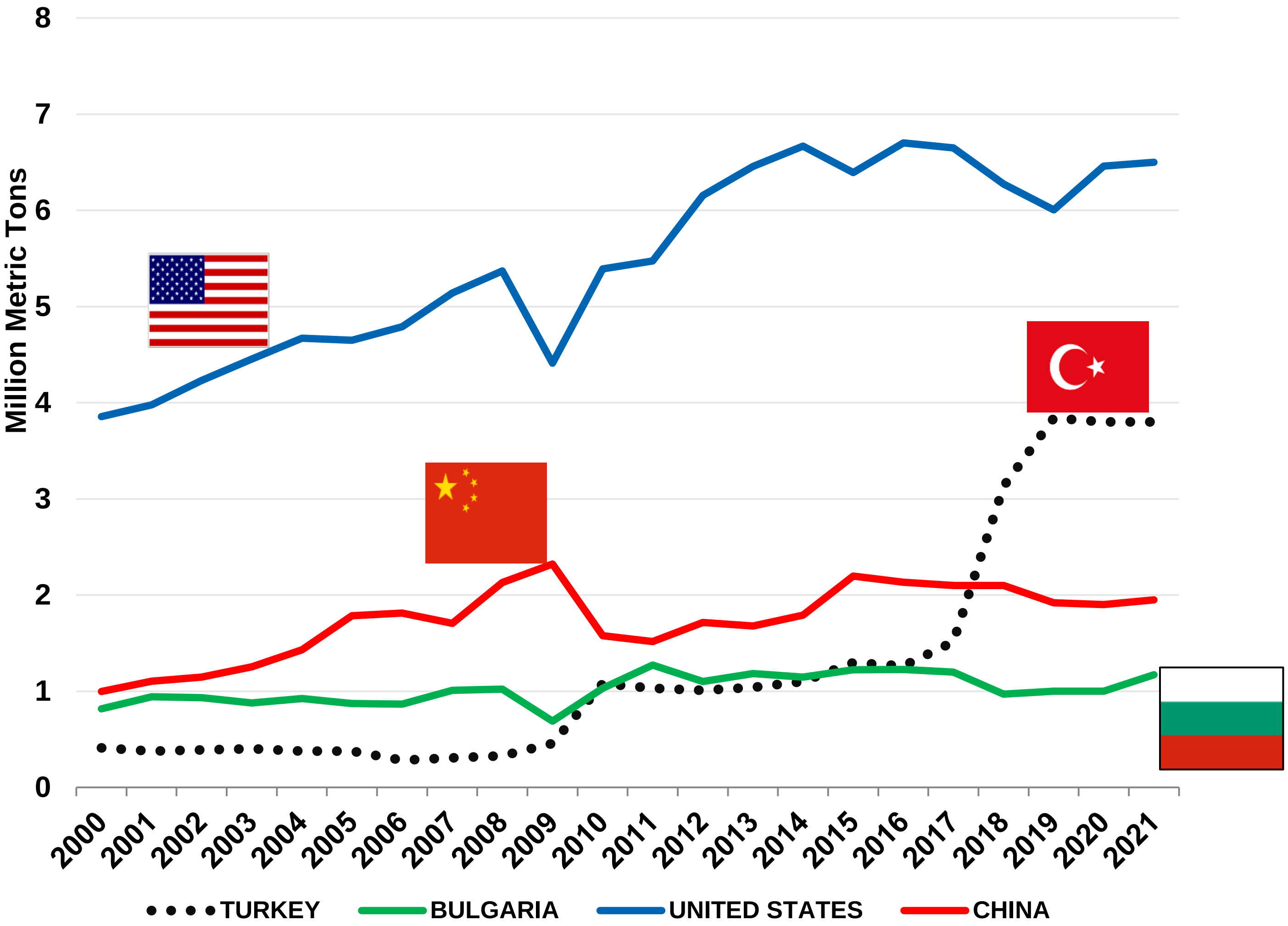


EXPORTERS

Global Trade: Main Players

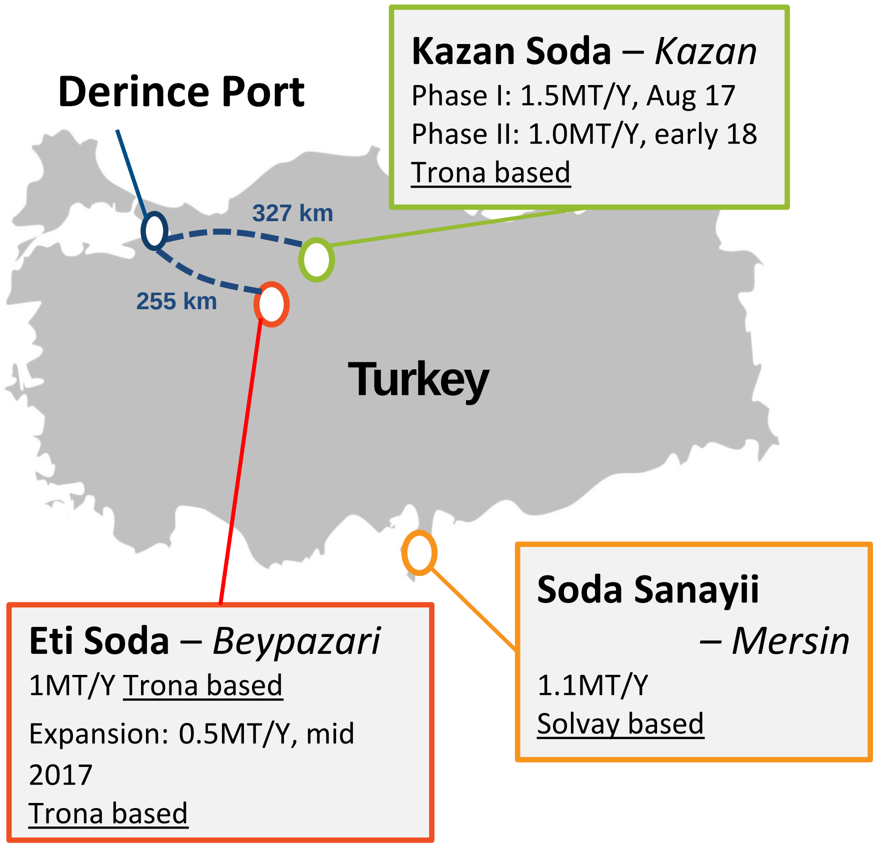


Transportation & Soda Ash



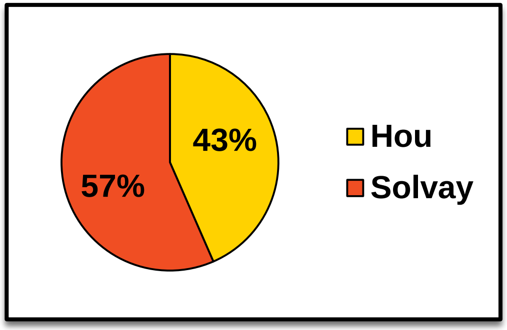
- 25% of soda ash is shipped between key regions
- US by far the biggest exporter
- China is opportunistic
- Turkey will take a bigger share of global trade

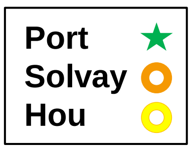
Distance from Ports



In 2015, a longstanding contract between producers and the rail companies expired – bringing about the end of favourable rates

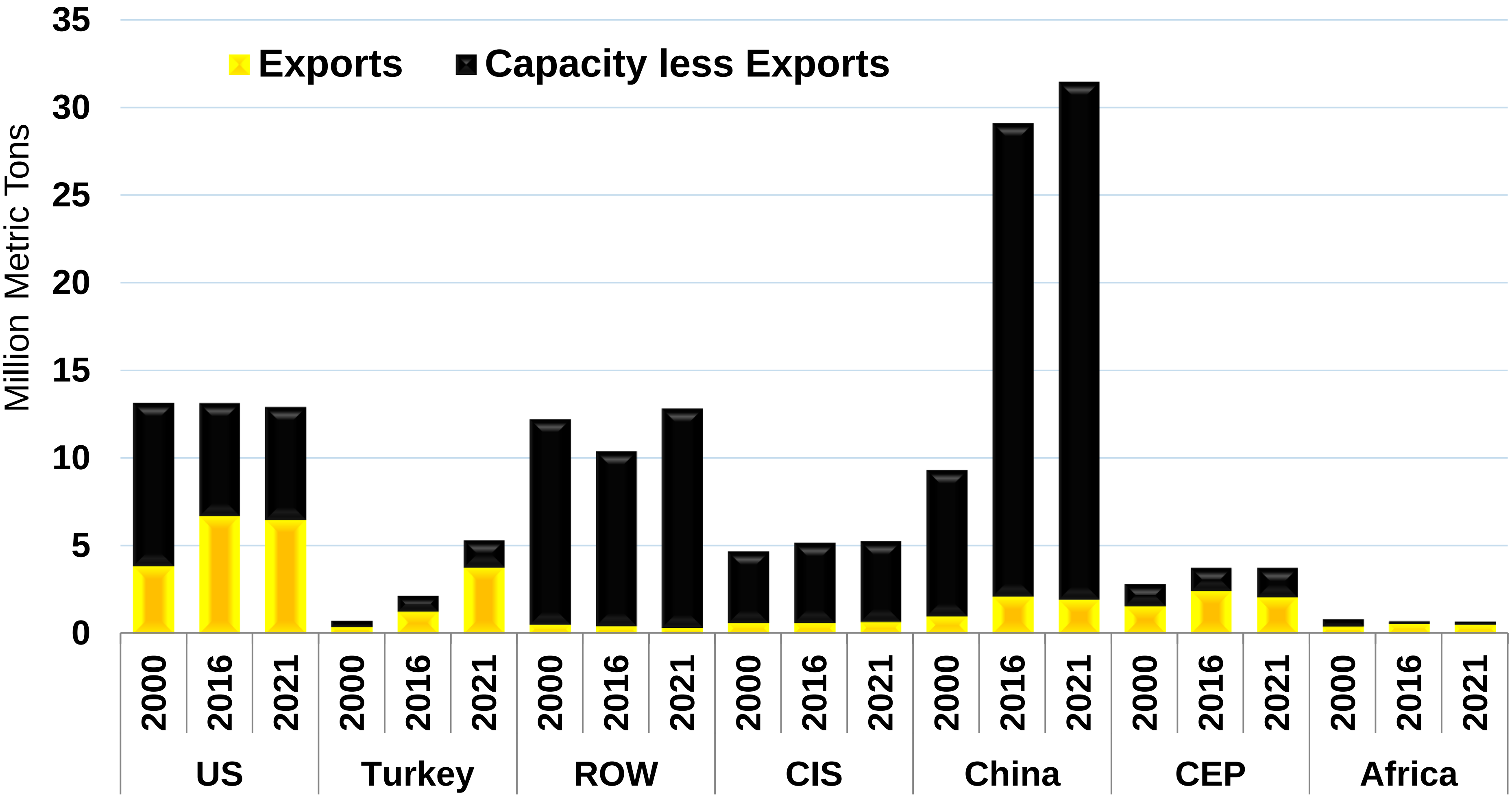
Chinese Soda Ash Exporters



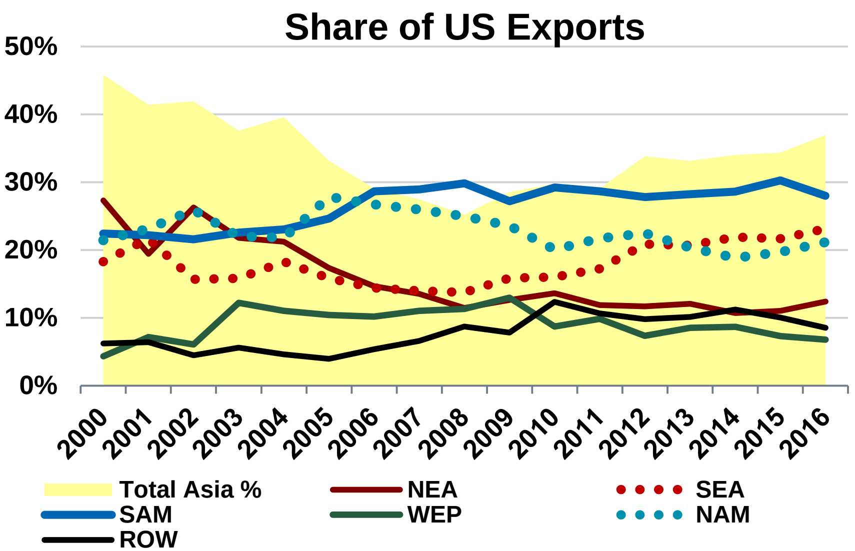


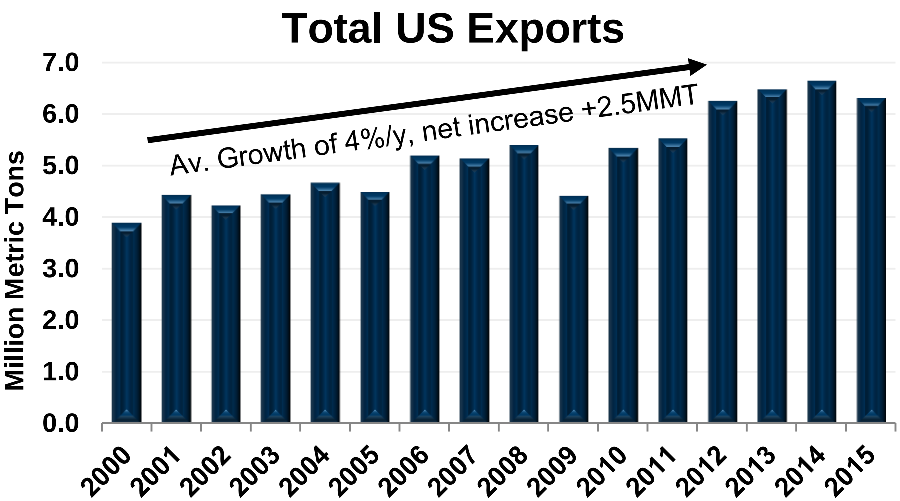
Company	Location	Tech.	Cap.	Exp. Vol.	Port	Transportation	Cost to Port ($/MT)
Haitian BioChem	Shandong	Solvay	1,100	300	Qingdao	Truck	9
Lianyungang Soda	Jiangsu	Solvay	1,300	324	Nanjing	Truck	12
Sanyou Checal	Hebei	Solvay	2,300	370	Tianjin	Truck	7
Shandong Haihua	Shandong	Solvay	2,850	358	Qingdao	Truck	9
Hubei Shuanghuan	Hubei	Hou	1,100	126	Wuhan	Truck	7
Chongqing Yihua	Sichuan	Hou	1,000	144	Nanjing	Barge/Boat	8
Tianjin Bohua Yongli	Tianjin	Hou	800	65	Tianjin	Truck	4
Dahua Checal	Liaoning	Hou	600	36	Dalian	Truck	8
Jiangsu Debang	Anhui	Hou	450	} 90	Nanjing	Truck	12
Jiangsu Debang	Jiangsu	Hou	300	}			

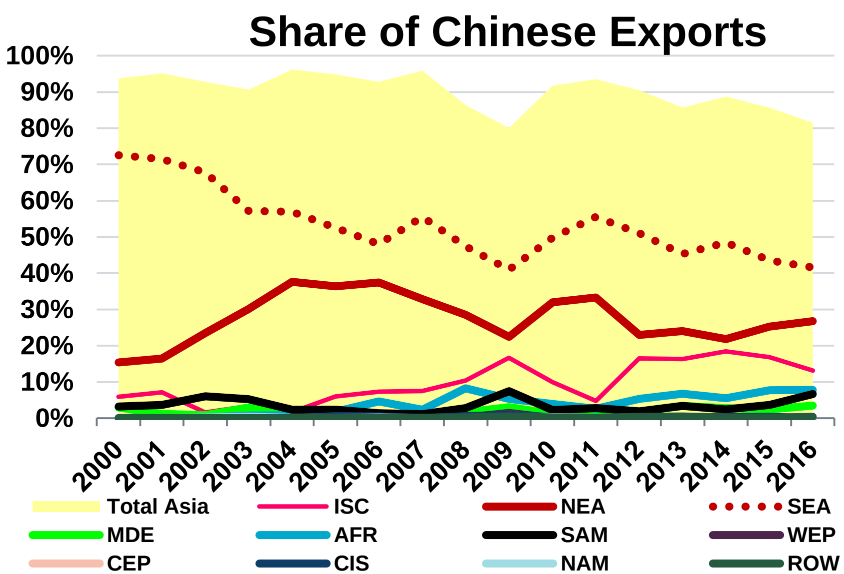
Changes in Global Exports

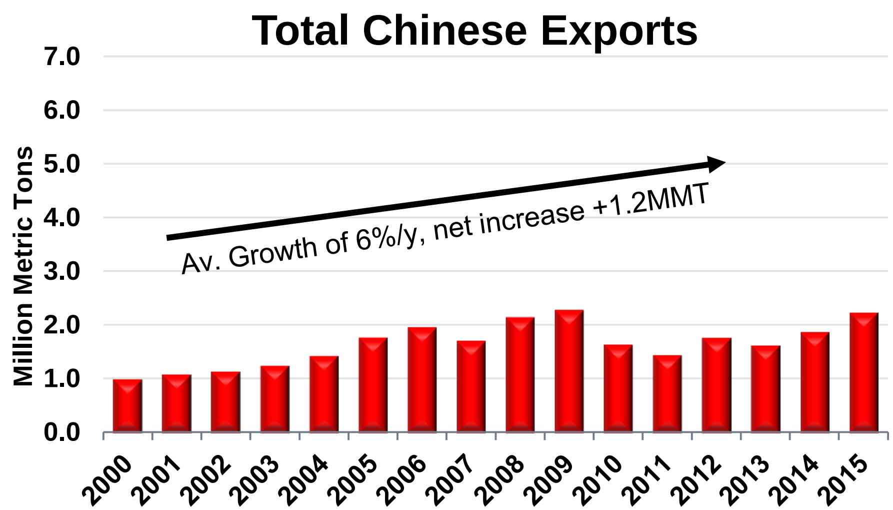


Major Exporters

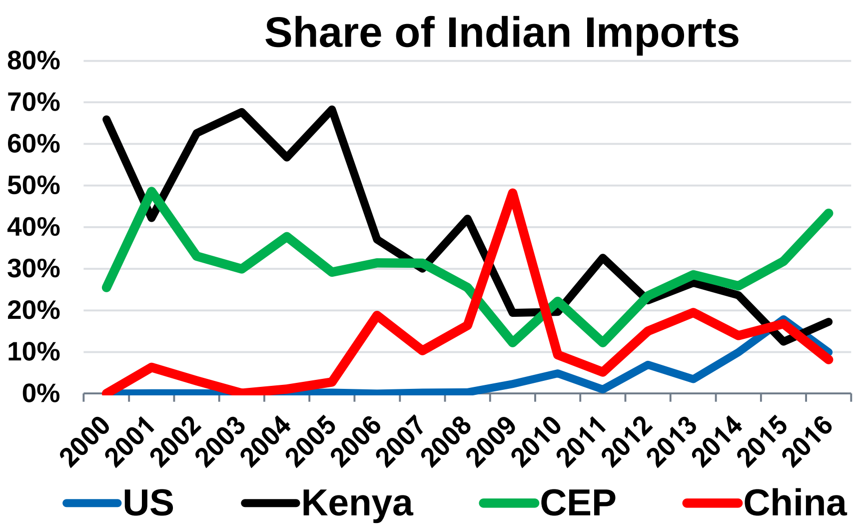


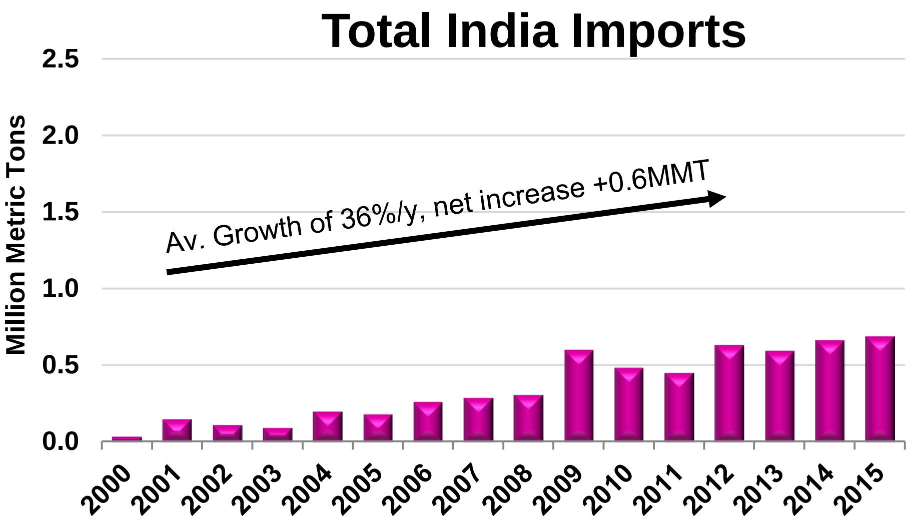


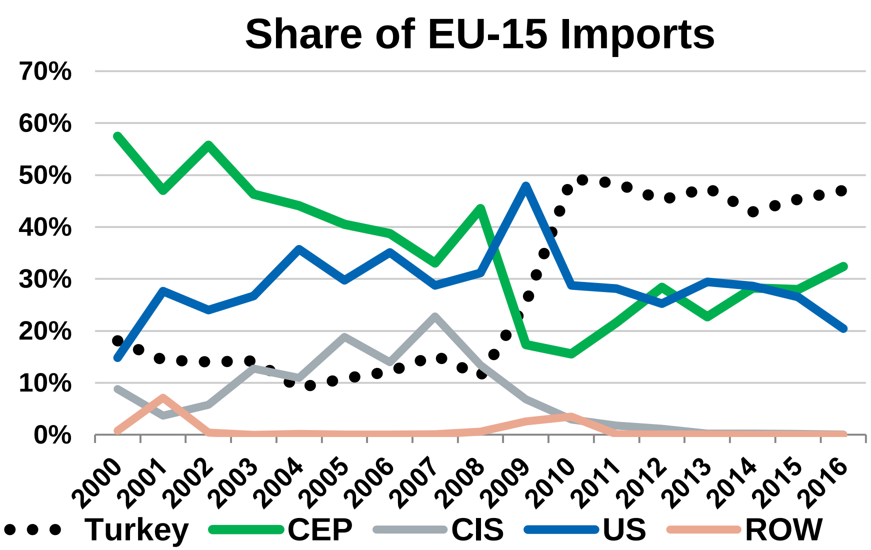


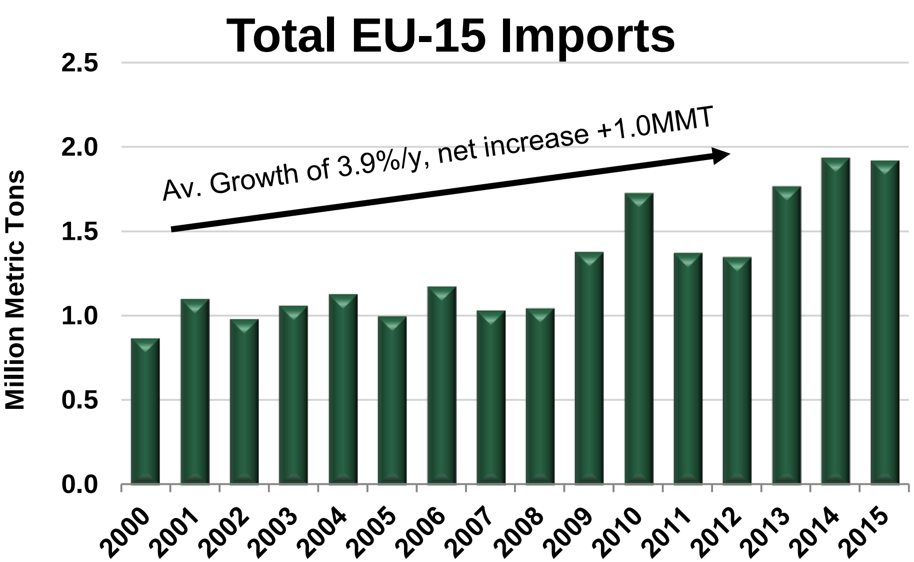


Major Importers

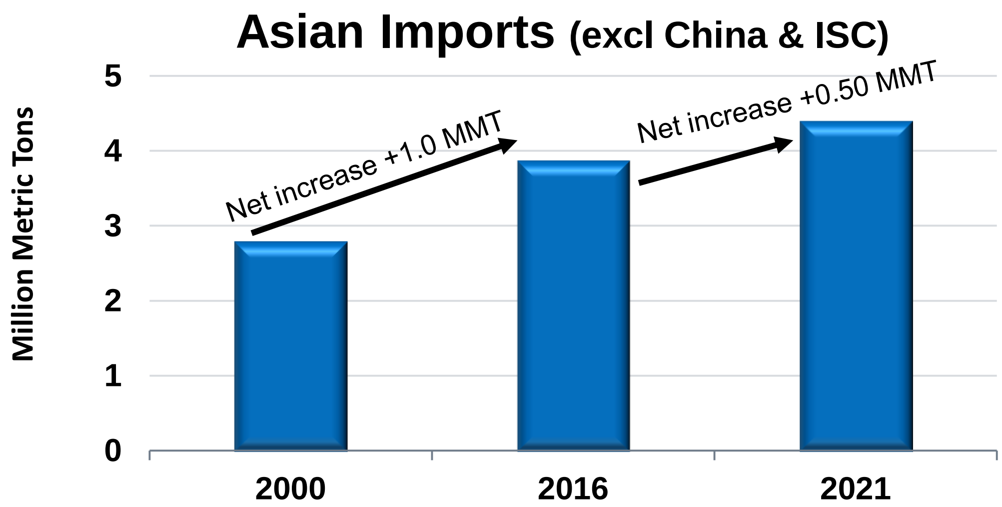


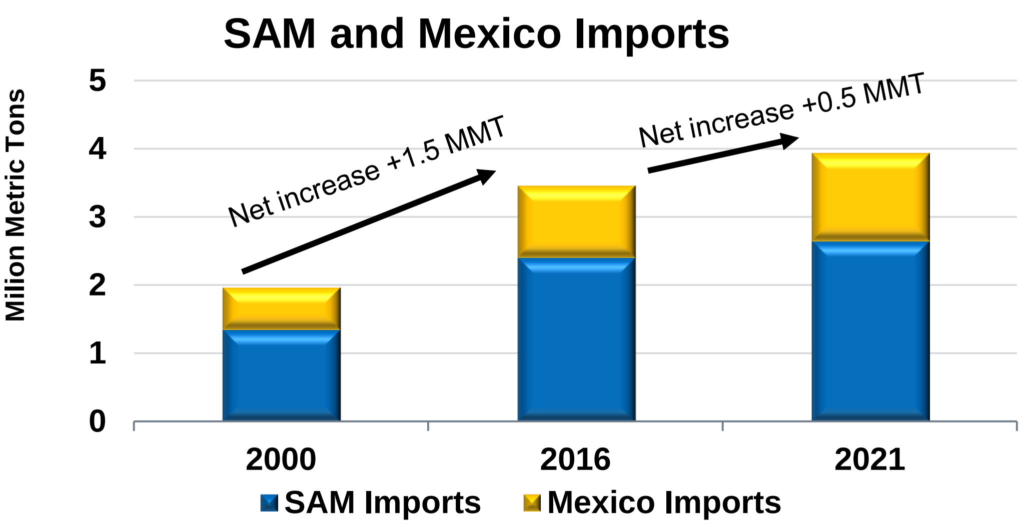






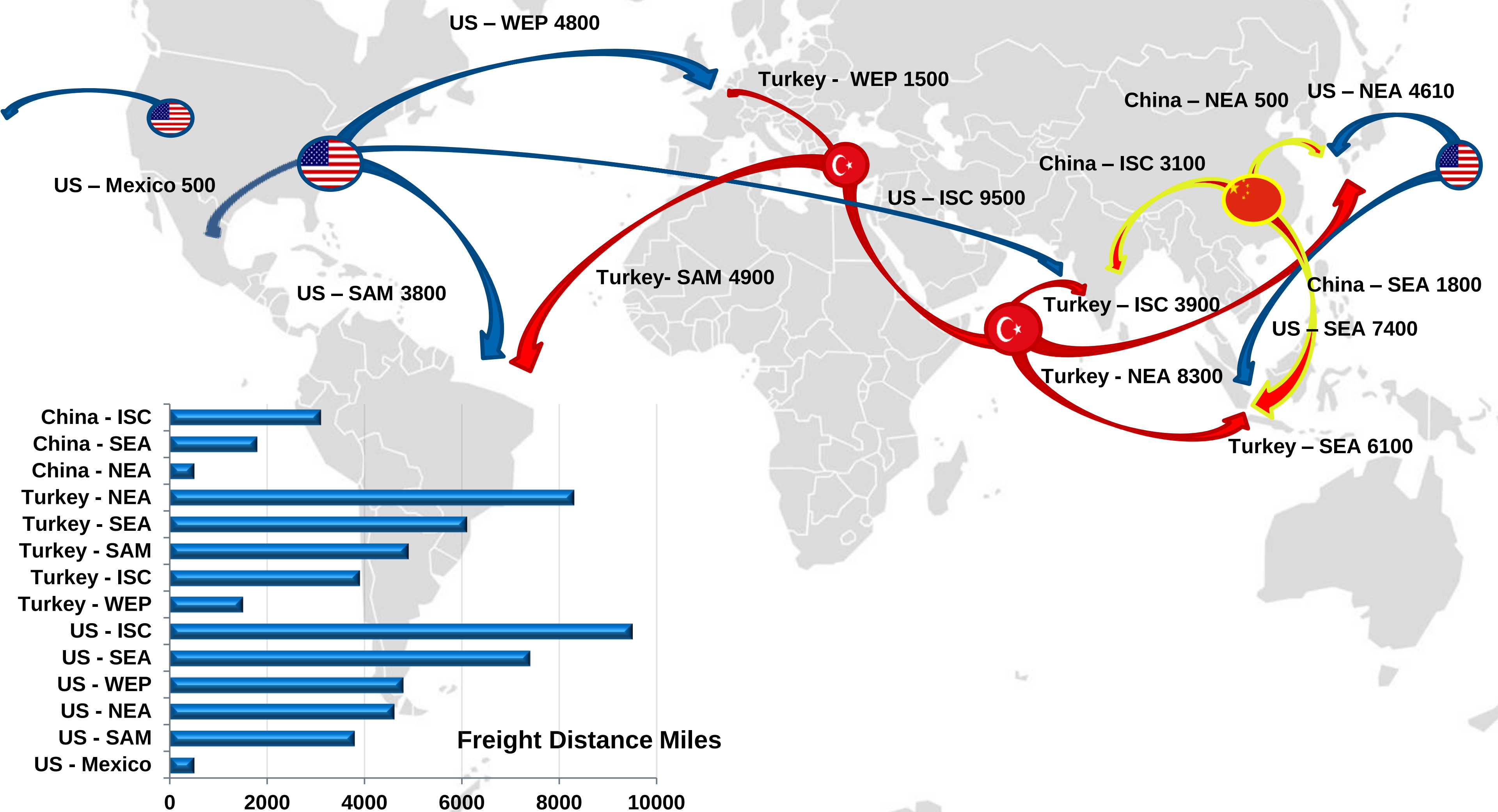
Import Potential





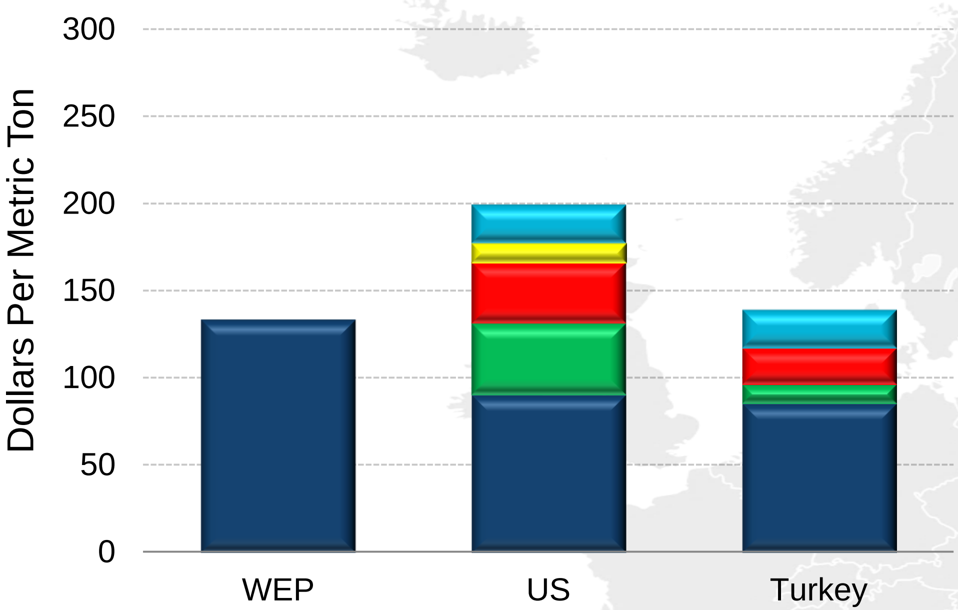
- South America (SAM) and Asia, two biggest import markets
- Capacity in Asia (excl. China & ISC) is confined to small plants in Vietnam and Japan
- Capacity in Mexico/SAM confined to 300kt/y plant in Mexico, 200kt/y plant in Argentina

Comparison of Freight Distances

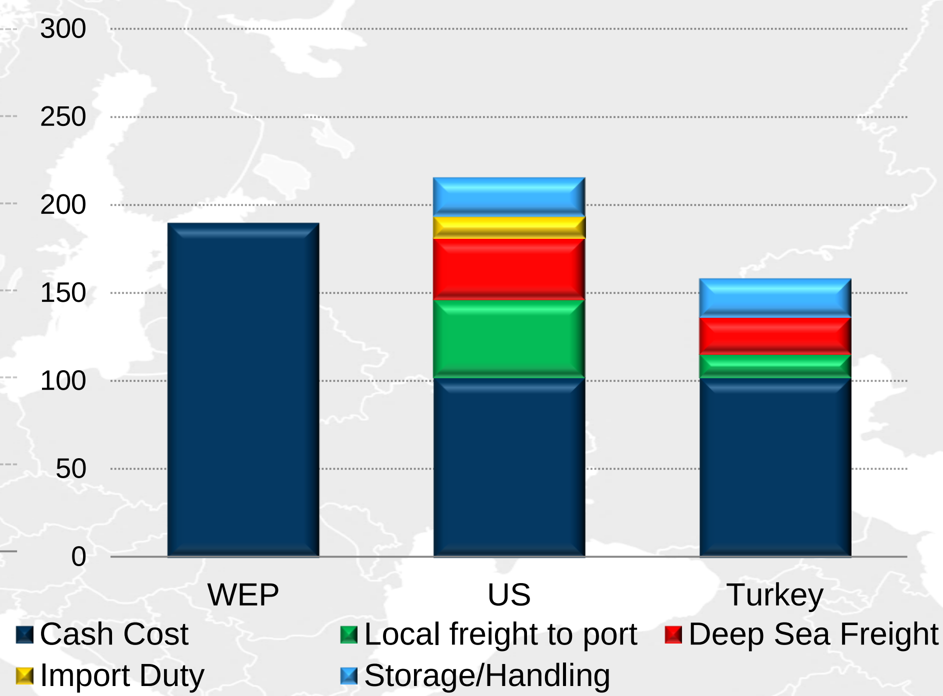


Competition in Europe

Soda Ash Cost to Med. 2016



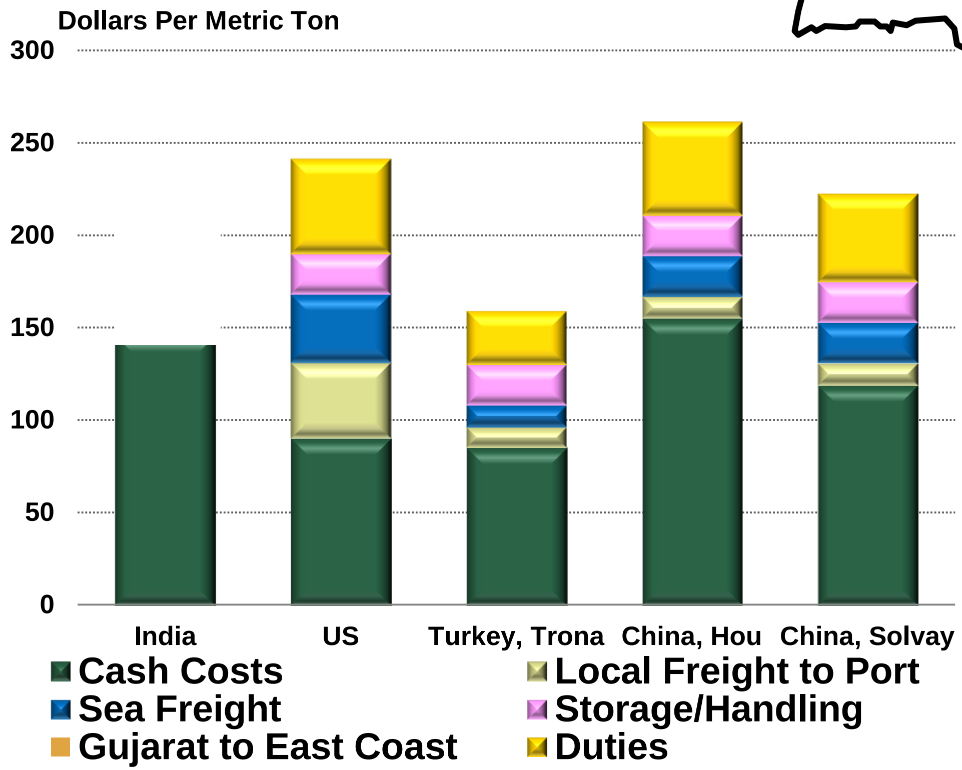
Soda Ash Cost to Med. 2021

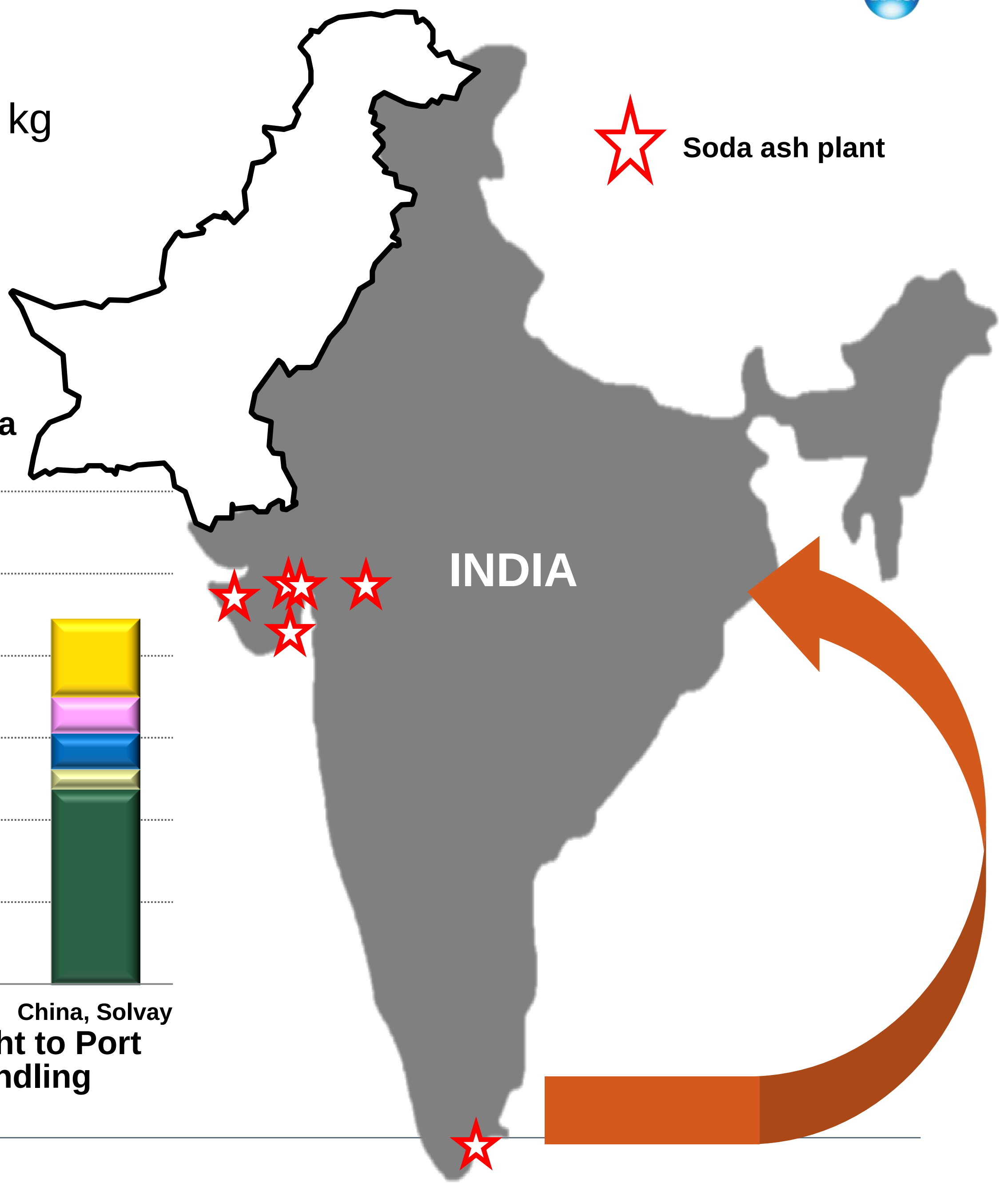


India, Potential Value?

- Per Capita Consumption just 2.7 kg
- Imports meet 25% of supply
- Market protected by duties

Delivered Cost Comparison to India





Conclusions

- Changes will bring opportunities
  - But not everybody will profit.
- Rapid growth in Chinese soda ash and CA production is over. Less pressure on raw materials.
- Flat glass story in China may be over, flat glass story in other developing markets has not even begun.
- India, potential to be a butterfly, today is a ‘cocoon’. Opportunities to profit from this growth story.
- The change in detergents to liquids does not ‘profit’ soda ash. But maybe, an opportunity to influence a change back to powders!!
- Turkish soda ash expansion will influence a change in trade patterns, it may trigger capacity to close but demand will not disappear.

‘What a caterpillar calls the end, the rest of the world calls a butterfly’ Lao Tzu.