

# The Sulphur Outlook

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**The Fertilizer Institute – Fertilizer Industry Round Table  
Outlook and Technology Conference**

**Tampa, Florida**

**November 19-21, 2013**



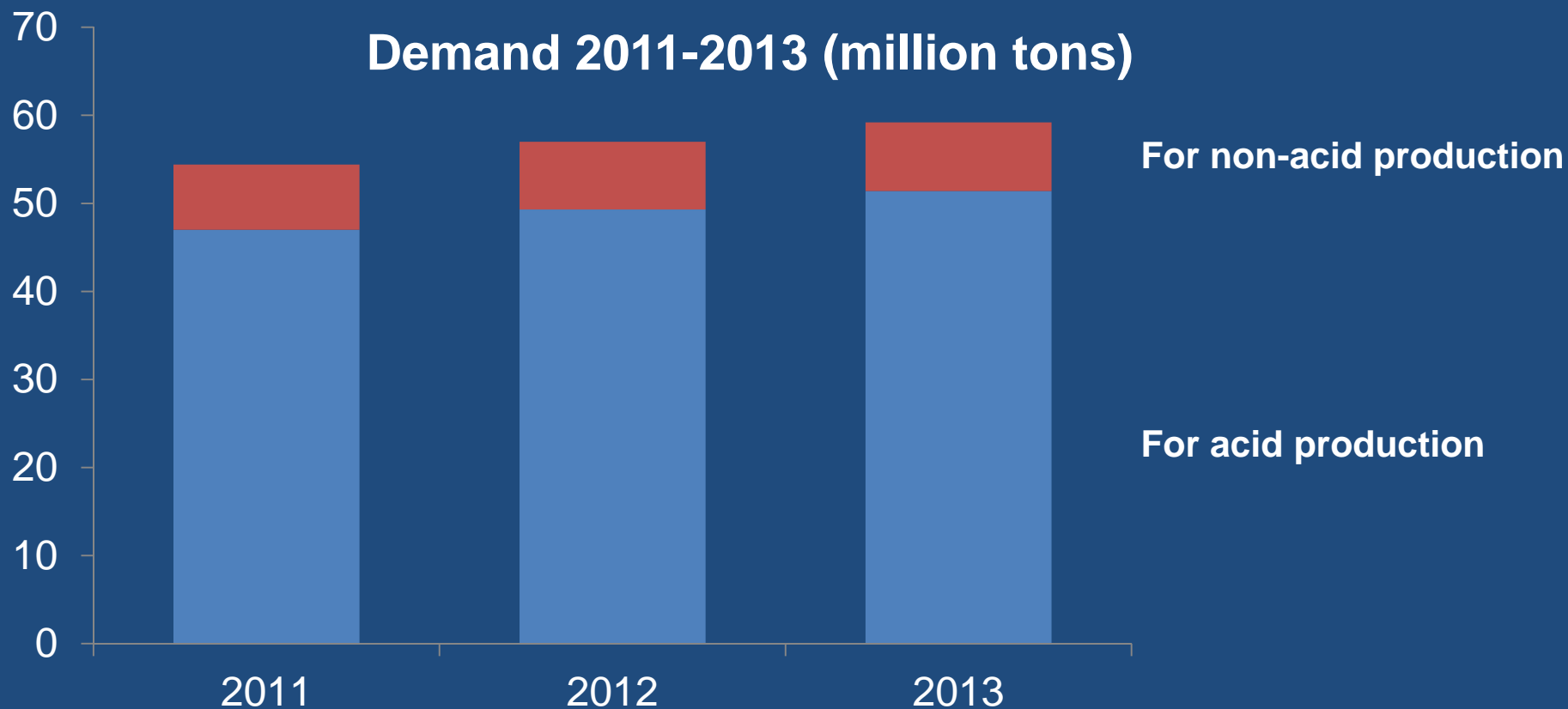
# Sulphur Consumption by End Use

- **Fertilizer (about 50%)**
  - **Phosphates**
    - Phosphoric Acid
    - SSP
  - **Non-Phosphates**
    - Ammonium Sulphate
    - Potassium Sulphate
    - Elemental Sulphur-based fertilizers

# Sulphur Consumption by End Use

- **Non-fertilizer (the balance)**
  - Metallurgical processing
  - Caprolactam
  - Feed and industrial phosphates
  - Titanium dioxide
  - Petroleum refining
  - Hydrofluoric acid
  - Pulp and paper industry
  - Other

# Elemental sulphur demand 2011-2013



Source: IFA

# Variables - Demand

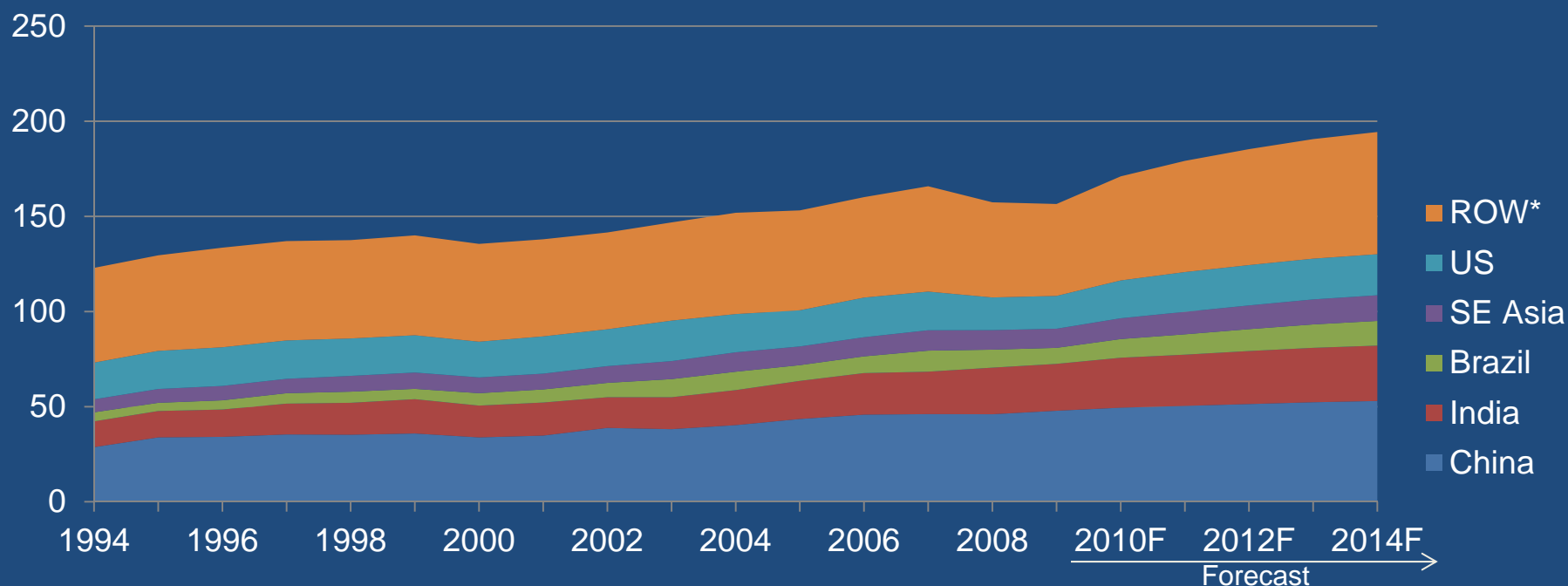


- China
- Saudi Arabia
- Industrial activity

# Fertilizer consumption by major markets

## Asia and Latin America Are the Key Fertilizer Growth Markets

Million Nutrient Tons



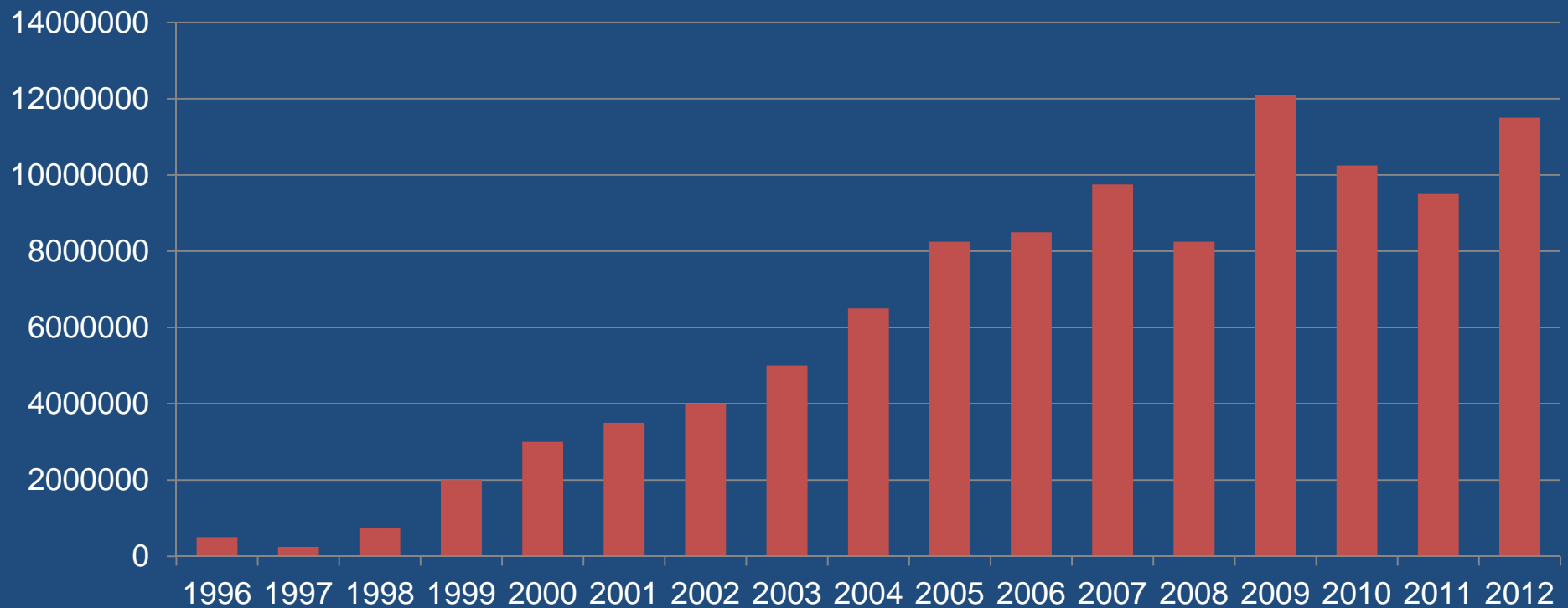
Data reported by individual countries in a combination of fertilizer and calendar years. For example, 2010F is based on 2010 calendar year and 2010/11 fertilizer year data.

\* Rest of world

Source: Argus, IFA, Fertecon

# Chinese Sulphur Imports

## Chinese Sulphur Imports in 1996 – 2012, tons



Source: BAIINFO

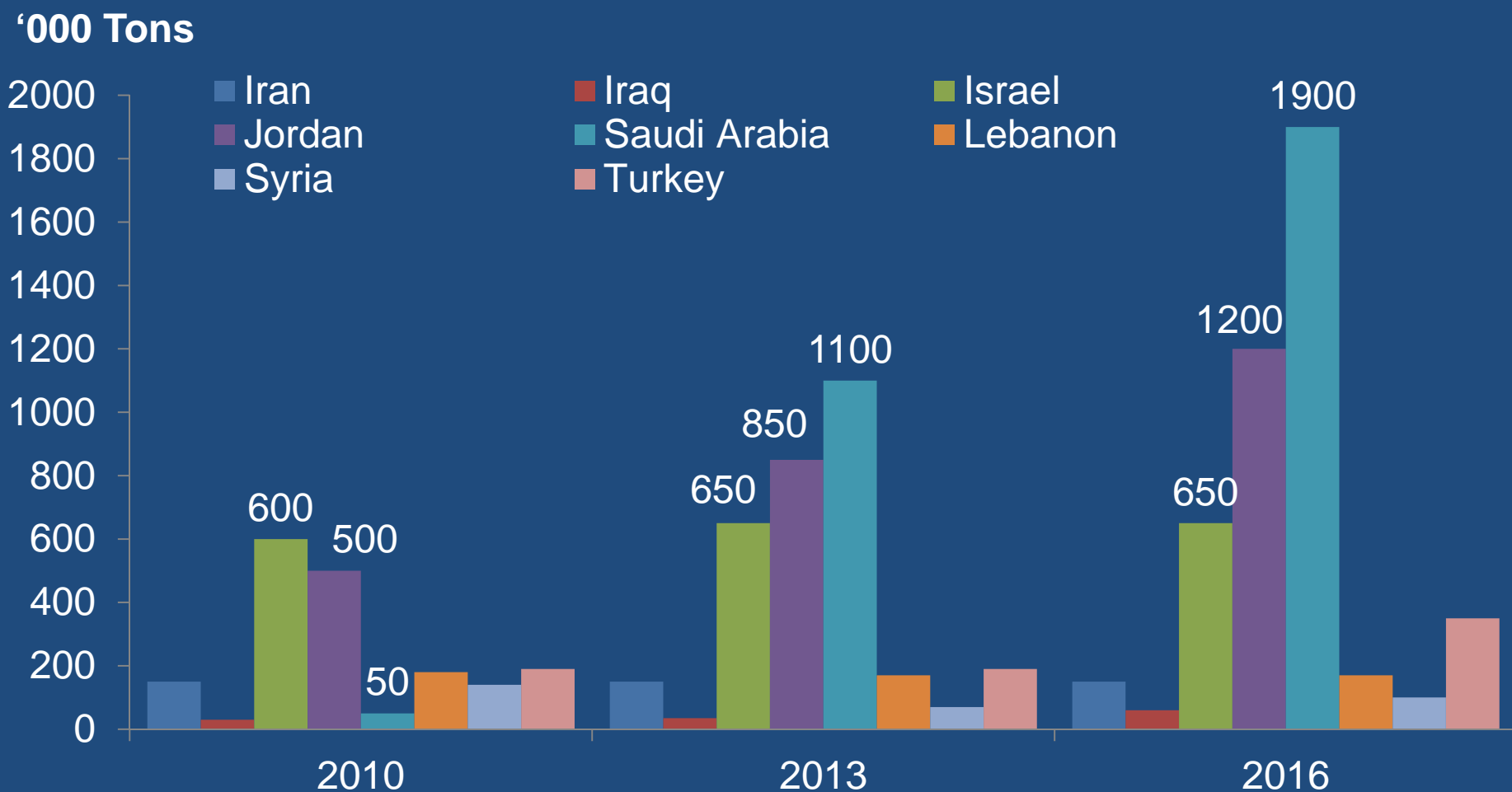
# China – world's largest importer

- 2012 imports were 11 million tons
- One-third of world trade
- Fertilizer industry consumes bulk
- Nearly 16 million tons was used to produce phosphoric acid
- Trend is for phosphoric acid production to increase and SSP continue to reduce
- ...domestic sulphur production will rise

Source: CSAIA, IFA



# Consumption in the Middle East could reach 4.5 million tons in 2016



Source: Integer, IFA

# Incredible India



Photo credit: Vivek Chugh

# Variables - Supply



- Middle East
- Caspian Sea

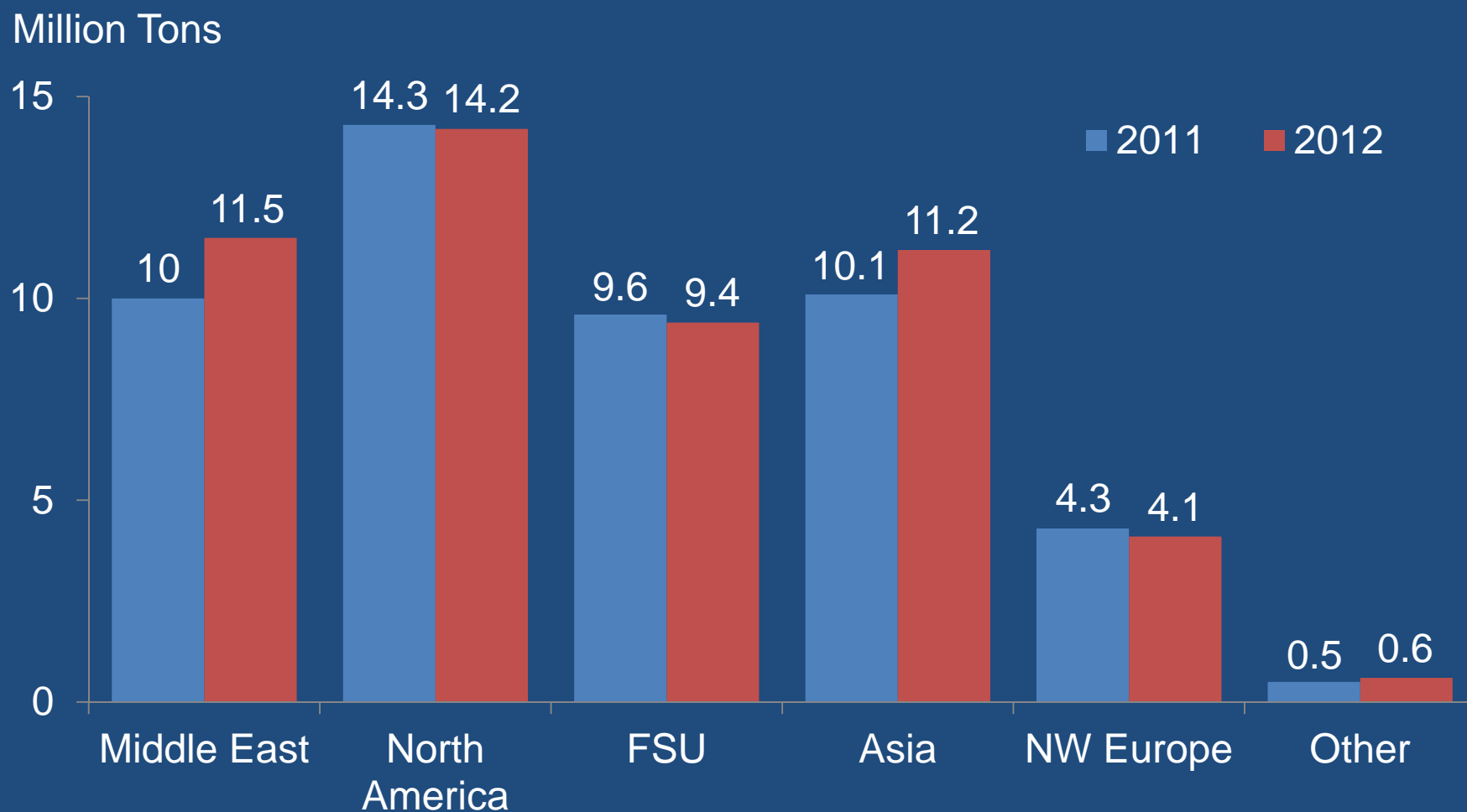


# Majority of supply growth to come from gas processing

- **Sour Gas Processing**
  - To reach 36.9 million tons in 2017
  - Regional output from Middle East, FSU, China
- **Oil Refining**
  - To reach 30.3 million tons in 2017
  - Oil sands in Canada
  - Crude oil in the US

Source: Integer

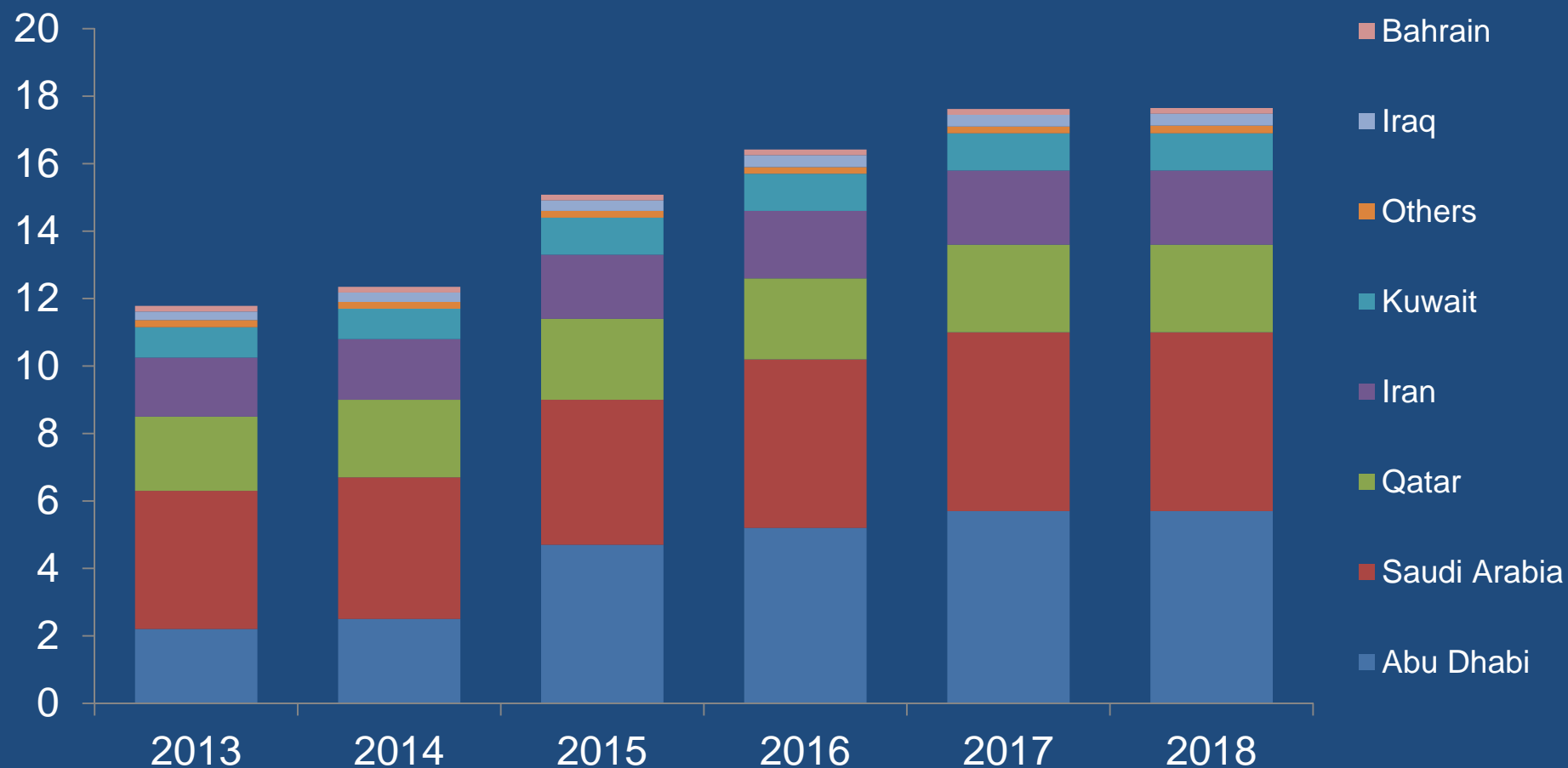
# Middle East production shows significant growth



Source: IFA

# Middle East sulphur production to grow by 6 million tons in 2013-2018

Million Tons



Source: Integer, IFA

# Abu Dhabi to become a top global sulphur exporter

- **Annual production to rise to 7 million tons**
  - Gas production at Shah scheduled to start end 2014
  - Impact on sulphur supply from 2015
  - 120 km rail infrastructure between Shah and Ruwais under construction for sulphur transportation
  - ADNOC's granular sulphur storage close to 290,000 tons at port, further 290,000 ton storage facility to be added at plant

Source: Integer

# Expansion at Habshan to increase export potential

- Habshan gas processing plant built in 1984
- Habshan-5, an Abu Dhabi Gas Industries (GASCO) facility to add 5,200 tons/day sulphur production
- October 2013: rail transport between Habshan and Ruwais undergoing testing
- Habshan Sulphur Granulation Plant (HSGP): liquid sulphur to be transported from Habshan 1-4 via heated pipelines
- Discussion over stockpiling options

Source: Integer



# Over 3 million tons production to be added by other Middle East producers

- **Kuwait**
  - Clean fuels project to push production over one million tons, from 2015
- **Iran**
  - Increases to come from South Pars gas expansions, potential to reach two million ton mark in 2016
- **Iraq**
  - Sour gas processing plant at Kirkuk; volume uncertain
  - Badra oil field development, second half 2015: 100,000 tons/year sulphur
- **Qatar**
  - Barzan gas developments scheduled
  - Potential to reach 2.6 million tons in 2017

Source: Integer

# Another Supply Variable - China

- Puguang is operational
- Now extracting about 2 million tons
- Expected to grow an additional 1 million tons



Source: Devco

# Puguang Summary

- Gas - Design Capacity: 36 MMCM/d
- Gas – Design Composition: 15-17% H<sub>2</sub>S
- **Sulphur – Design Production Capacity:  
8,640 metric t/d, or 3 million t/y**
- Molten sulphur storage: 100,000 tons in 10 tanks
- Formed sulphur storage, bulk: 230,000 tons in 2 silos
- Bagged sulphur storage: 9,000 tons
- Sulphur shipment: bag and bulk by rail and truck

Source: Devco

# Other Chinese projects

- Chuandongbei - 2013
  - 1.5 million tons per year capacity
- Yuanba – 2015
  - Smaller than Puguang or Chuandongbei
- Smelter acid increases also expected

Source: CSAIA, IFA

# China Top 10 Sulphur Producers 2012

Enterprise	2012	2011	Change(YoY)
Puguang Gasfield	1,983,710	1,573,416	26.08%
Zhenhai Oil Refining & Chemical	210,300	211,800	-0.71%
Qingdao Oil Refining & Chemical	18,307	162,700	12.79%
Fujian Oil Refining & Chemical	169,000	131,000	29.01%
Jinling Petrochemical	161,400	176,100	-8.35%
Tianjin Petrochemical	160,600	193,400	-16.96%
Maoming Petrochemical	148,200	151,400	-2.11%
Dalian Petrochemical	140,000	101,700	37.66%
Qilu Petrochemical	138,700	146,100	-5.07%
Guangzhou Petrochemical	132,200	126,900	4.18%

Source: BAIINFO

# Chinese import outlook

- With increasing domestic production will come, decreasing imports.
- Import levels have been averaging about 10 million tons per year recently.
- New projects...and some new demand... will have number at about 7 million tons per year.

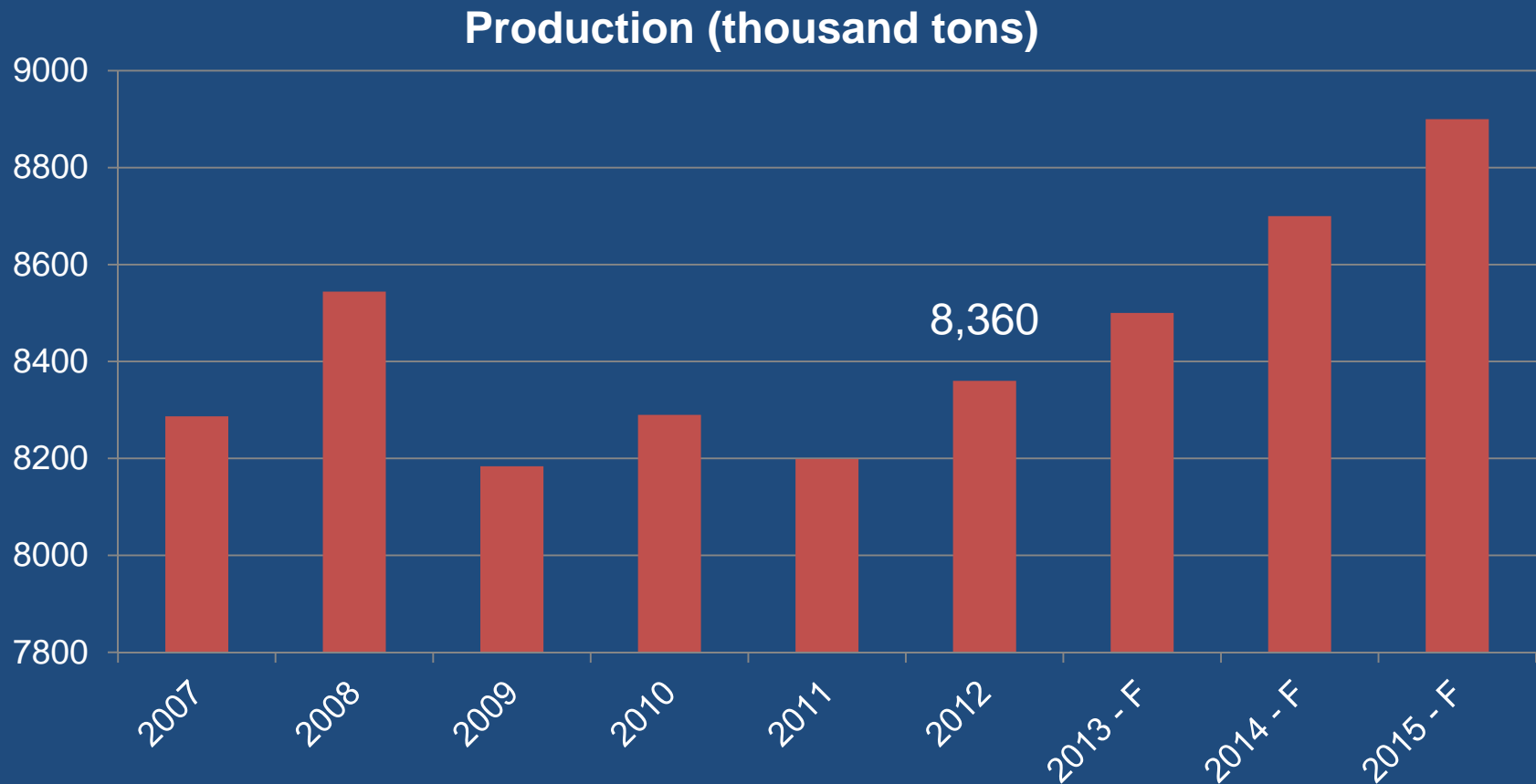
Source: BAIINFO, CSAIA

# Canadian inventory augments supply

- Inventory at gas plants depleted
  - 9.1 million tons end of 2002
  - 1.4 million tons end of 2012
- Inventory at oil sands grows
  - 9.5 million tons end of 2012

Source: ERCB, Argus

# US sulphur production

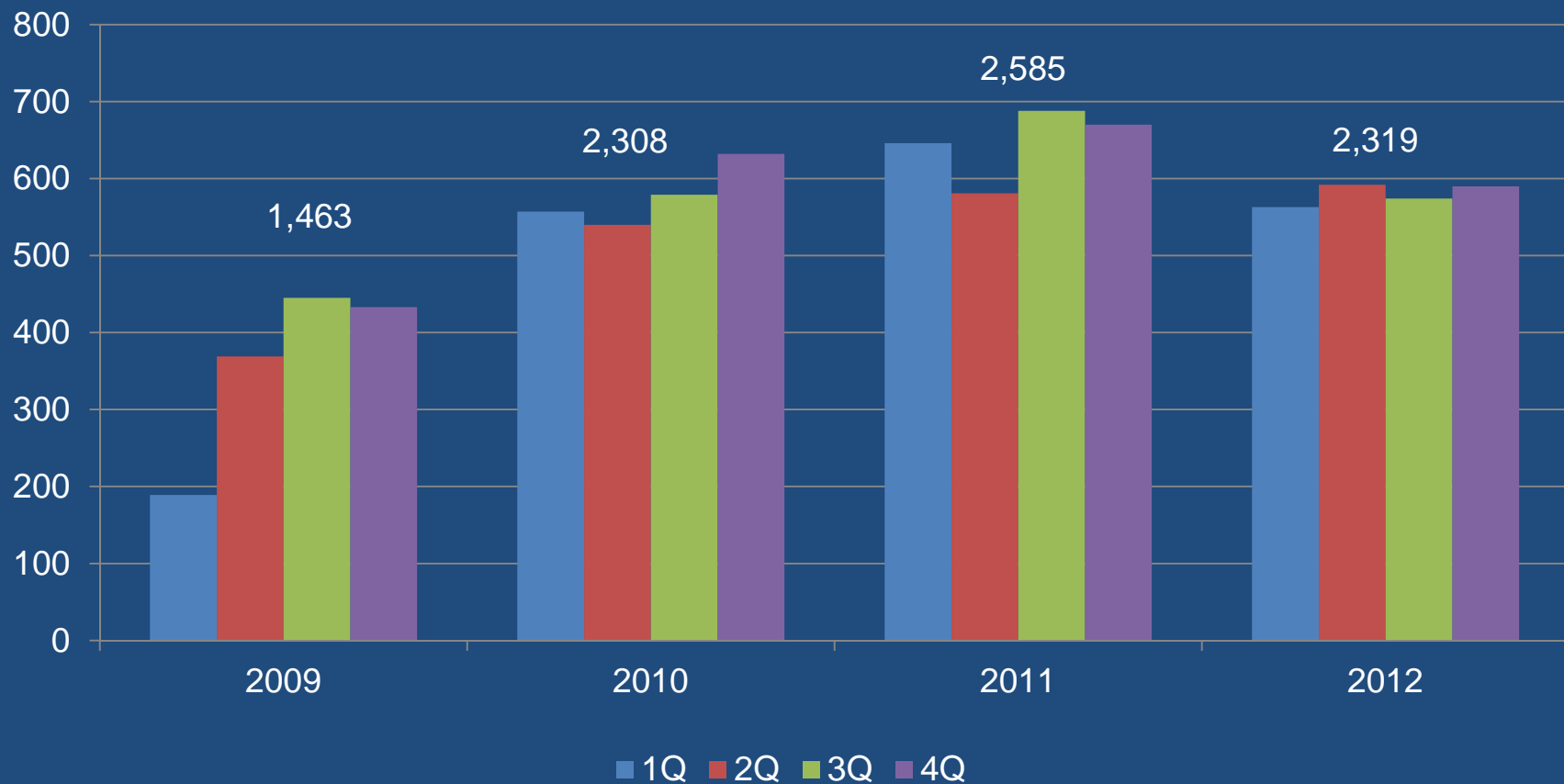


Source: USGS



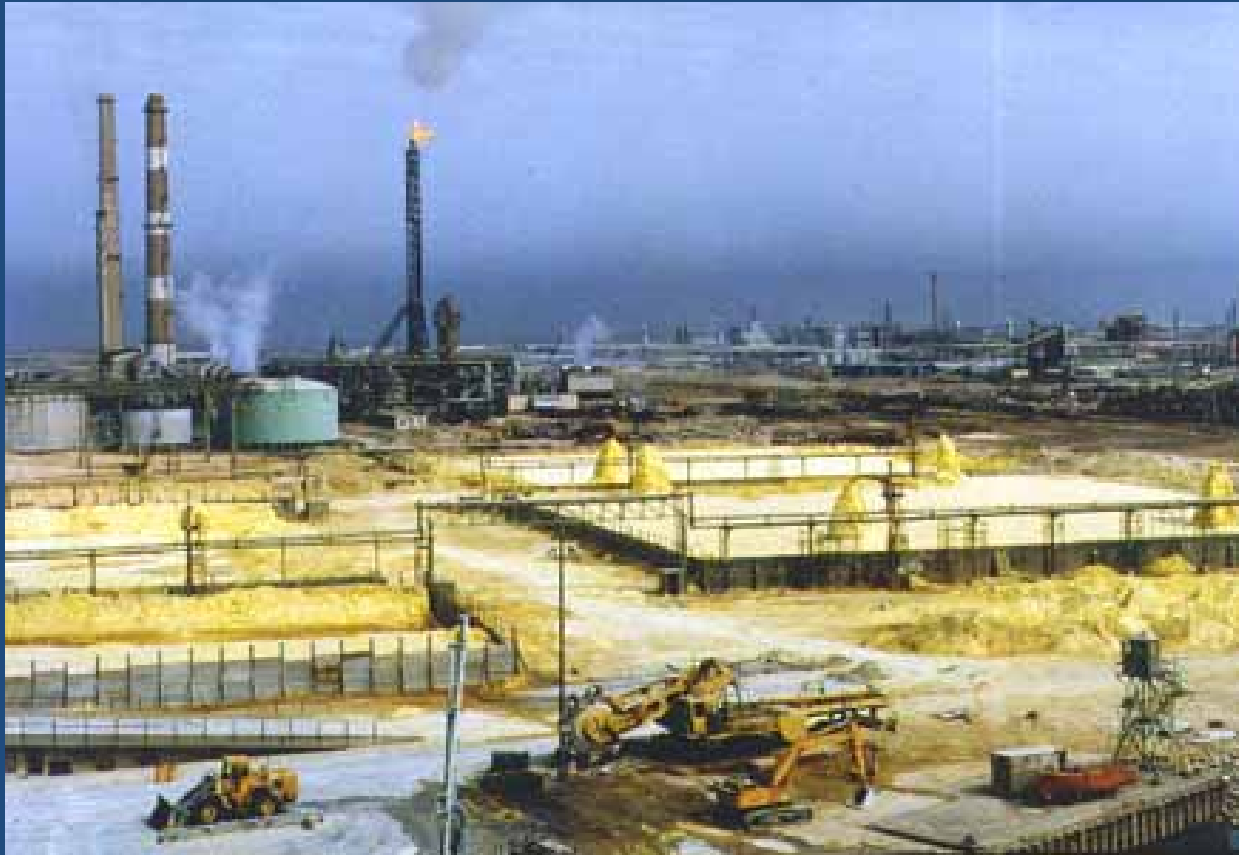
# US takes large volume of Canadian production

Imports (thousand tons)



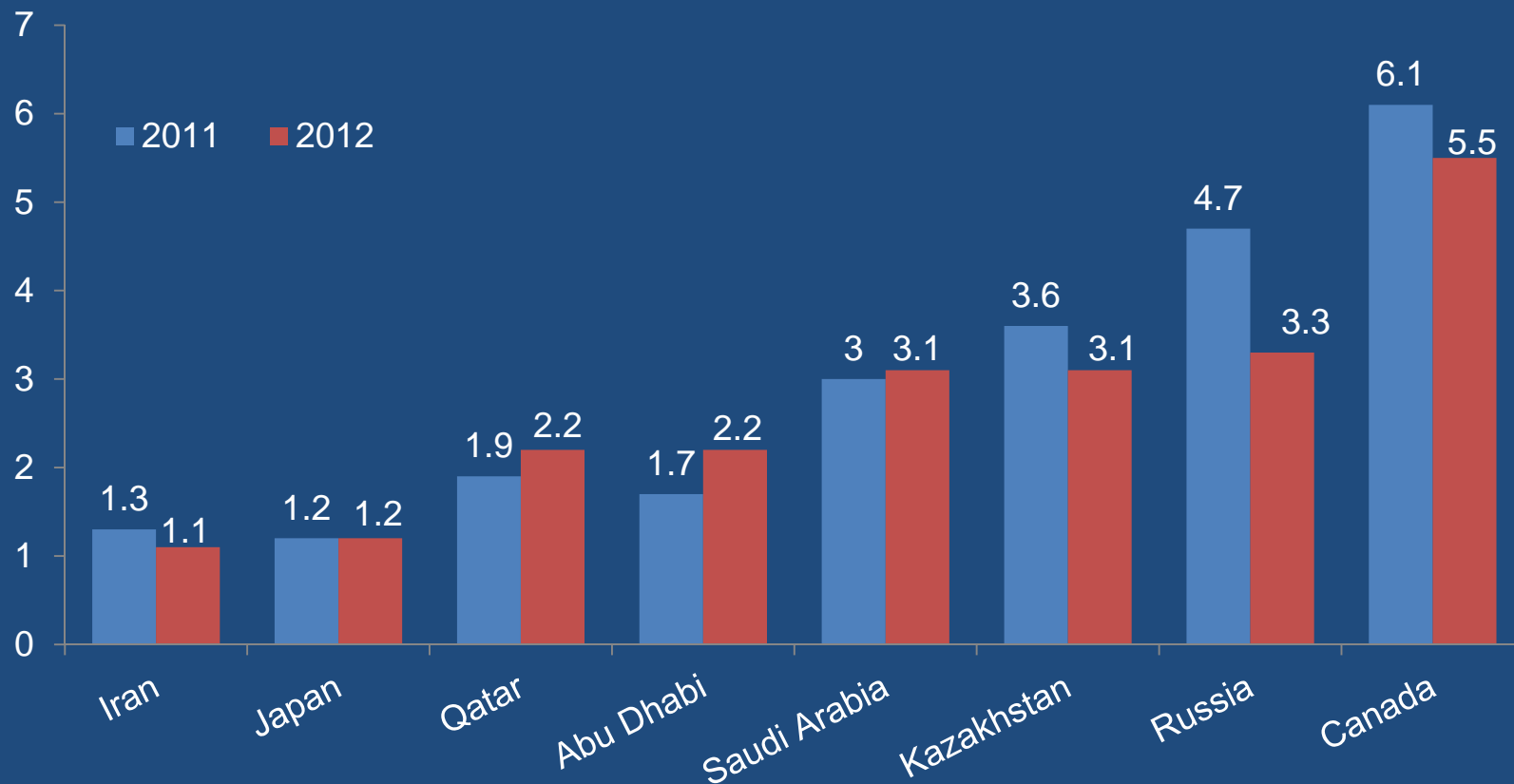
Source: CN Rail, CP Rail

# Gas Recovered Sulphur Storage Tengiz, Kazakhstan



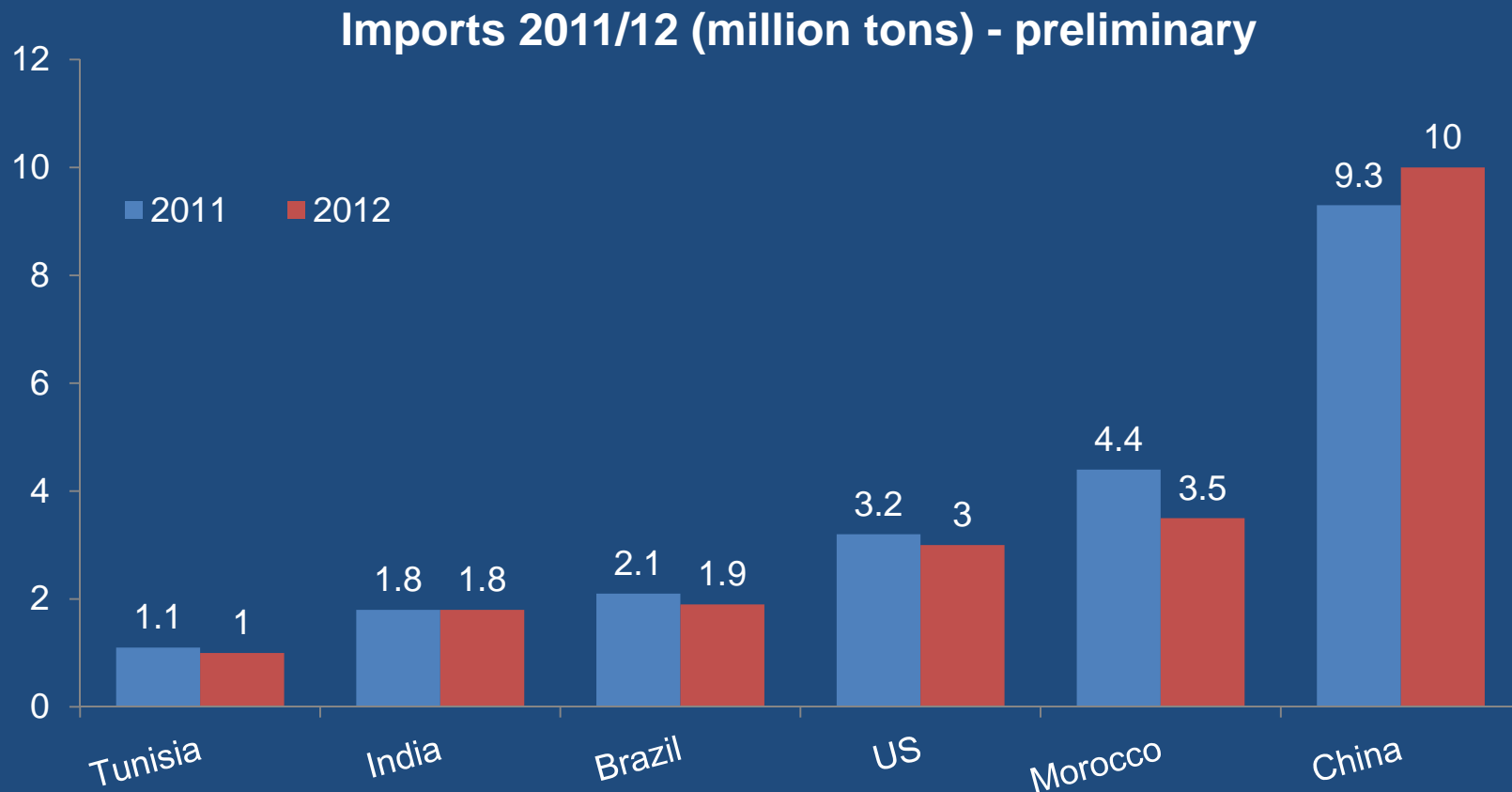
# Sulphur exports - 2012

Exports 2011/12 (million tons) - preliminary



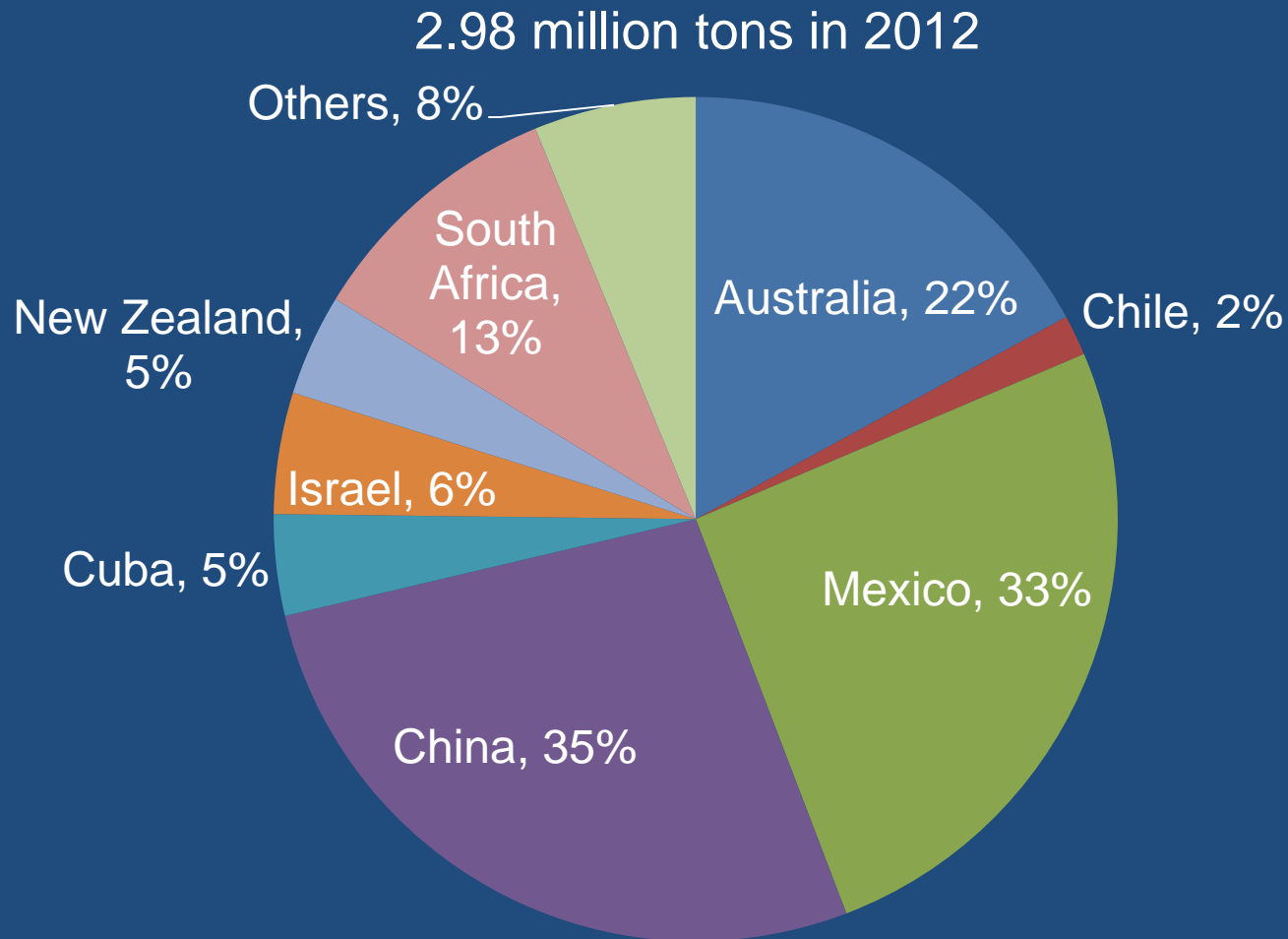
Source: IFA

# Sulphur imports - 2012



Source: IFA

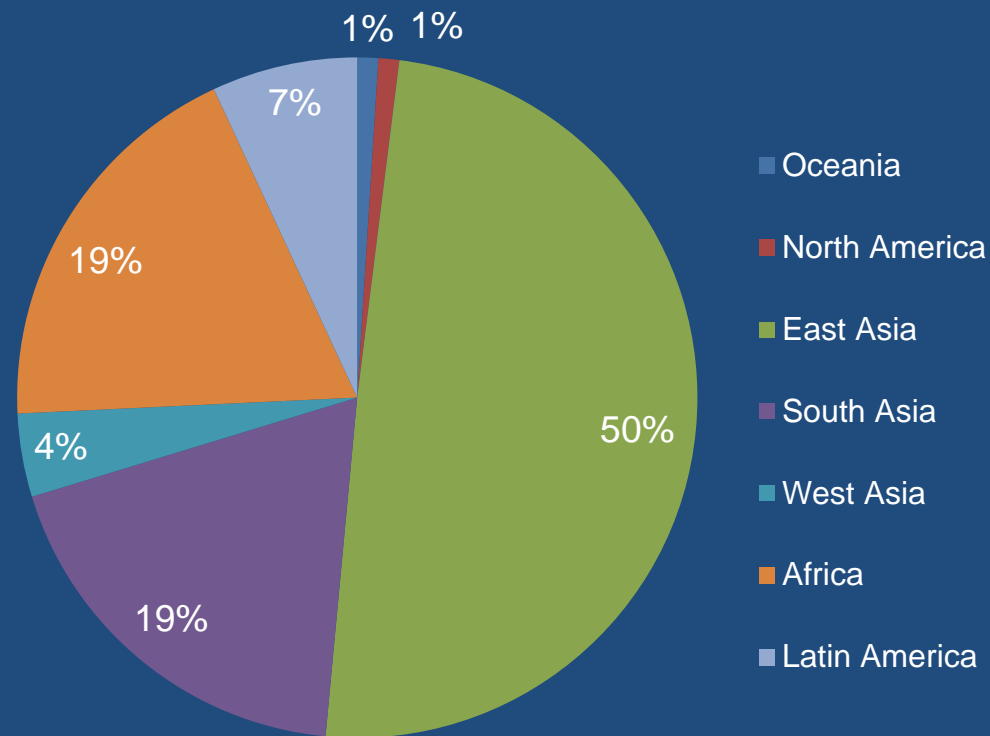
# Canadian offshore exports



Source: Argus

# Middle East sulphur producers reliant on Asian import markets

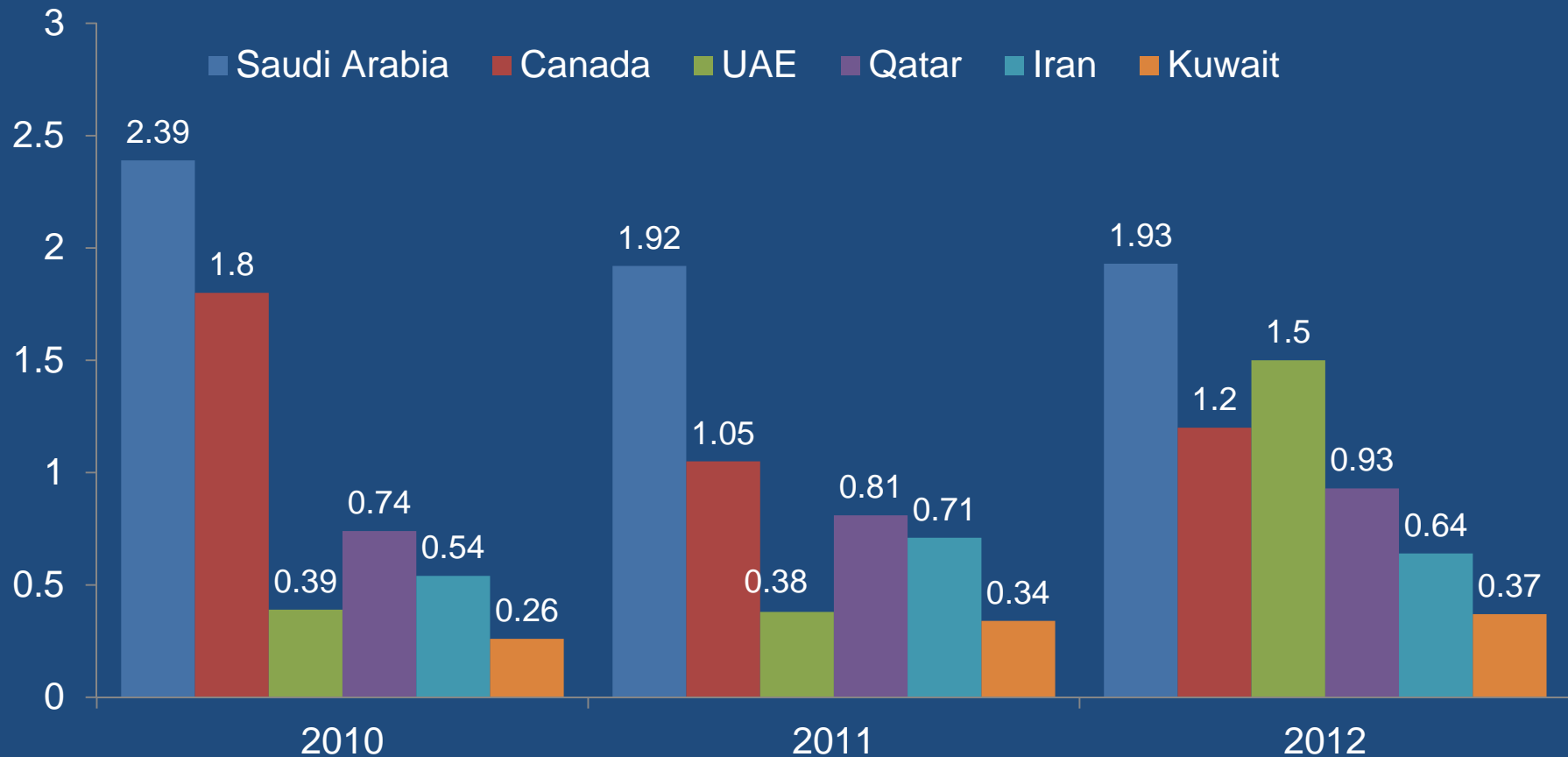
2011  
Middle East sulphur export destinations



Source: IFA

# Canadian exports to China decline as Middle East exports increase

Million Tons



Source: Integer, GTIS

# Ras Laffan, Qatar

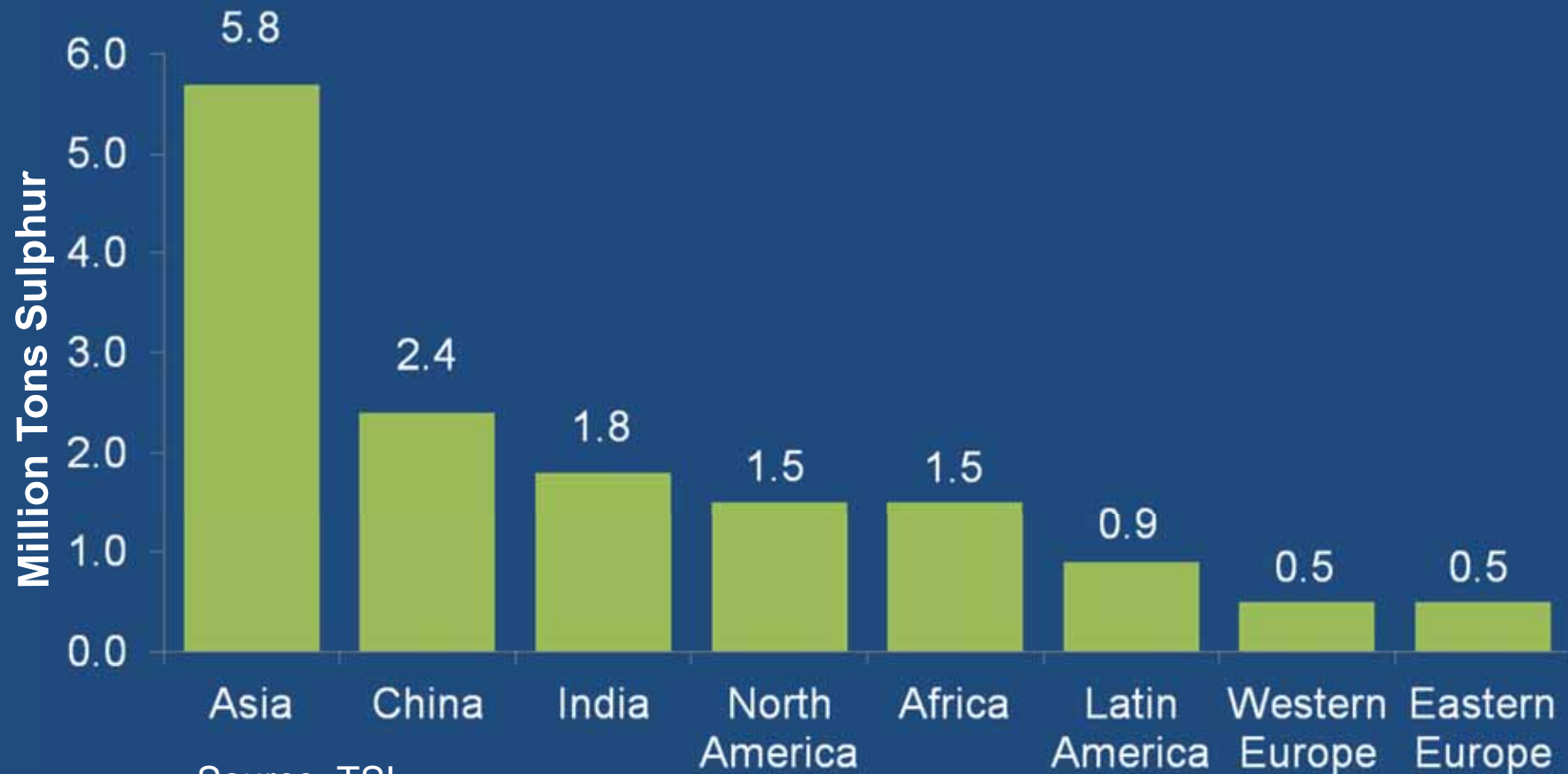




# Trade patterns to shift as Middle East production increases

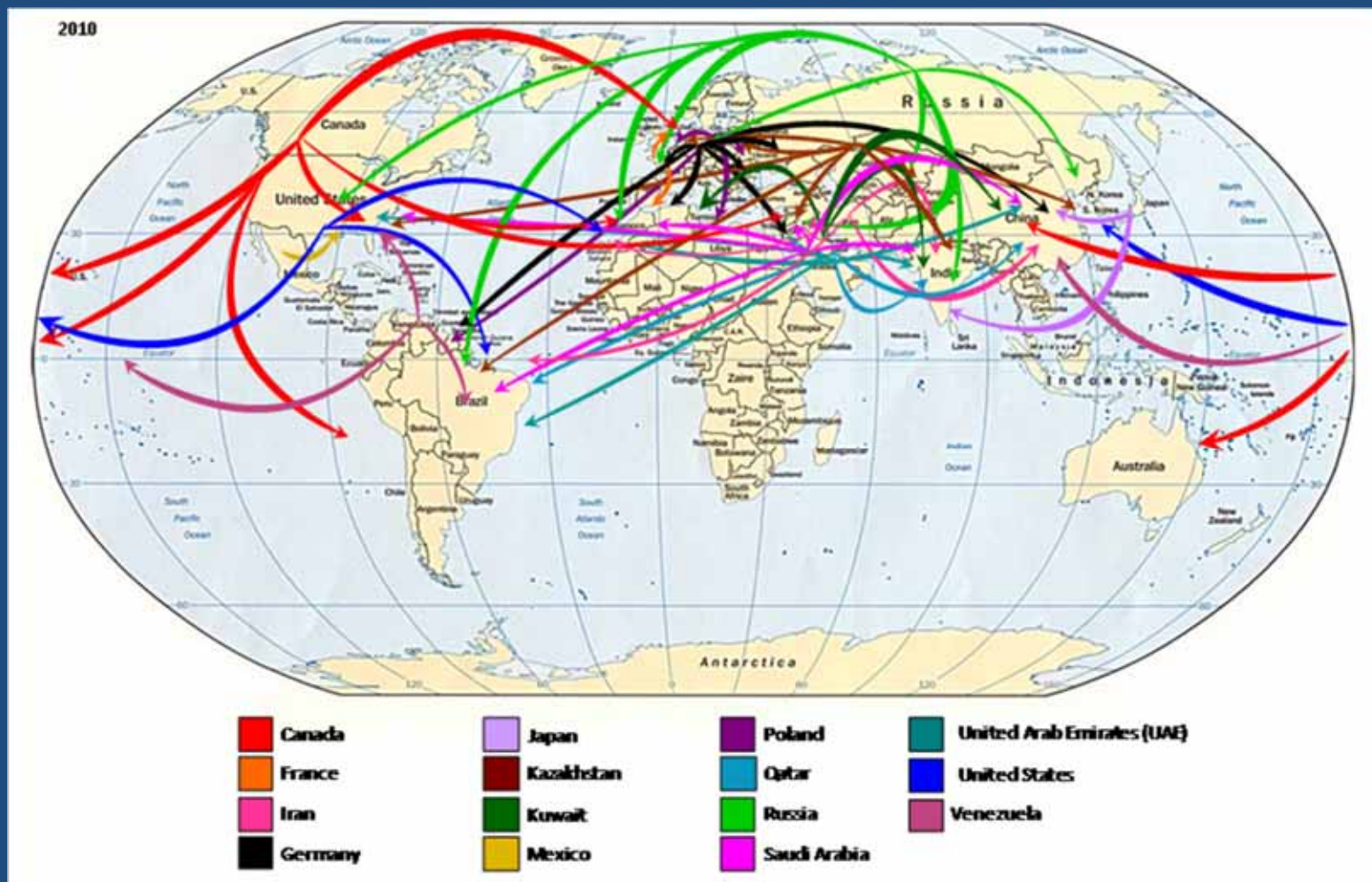
- Block storage options limited
- Additional surplus production to go to export market?
- Production close to ports – further competition for other exporters
- Different end-user markets being researched for sulphur
- Metals leach projects gain interest

# Plant Nutrient Sulphur Deficit in 2010



Source: TSI

# Global Elemental Sulphur Trade – 2010



# Demand Versus Production

- Demand – Increasing...
- Deficit supply – End near?
- Sulphur stockpiles – Reversing trend?

# All forms of sulphur potential balance

Sulphur in All Forms Potential Supply / Demand Balance  
(‘000 tons S)

	2013	2014	2015	2016	2017
<b>Demand</b>	86,925	89,381	91,598	93,514	95,655
<b>Supply</b>	87,735	92,659	96,970	100,591	103,421
<b>Potential Balance</b>	810	3,278	5,372	7,077	7,767
<i>Share of total supply</i>	1%	4%	6%	7%	8%

Source: IFA

# Elemental sulphur potential balance

Elemental Sulphur Potential Supply / Demand Balance  
(‘000 tons S)

	2013	2014	2015	2016	2017
<b>Demand</b>					
Sulphuric acid	49,423	50,875	52,126	53,846	55,941
Non-sulphuric acid	7,902	8,017	8,132	8,202	8,272
<b>Total Demand</b>	<b>57,325</b>	<b>58,892</b>	<b>60,258</b>	<b>62,048</b>	<b>64,213</b>
<b>Supply</b>					
Oil	26,255	27,620	28,700	29,600	30,300
Gas	28,165	30,760	33,060	35,310	36,885
Other	3,715	3,790	3,870	4,215	4,795
<b>Total</b>	<b>58,135</b>	<b>62,170</b>	<b>65,630</b>	<b>69,125</b>	<b>71,980</b>
<b>Potential Balance</b>	810	3,278	5,372	7,077	7,767
<i>Share of total supply</i>	1%	5%	8%	10%	11%

Source: IFA, May 2013

# Elemental sulphur potential balance

	2012	2013	2014	2015	2016
<b>Demand</b>					
Sulphuric acid	50.7	53.1	54.9	56.5	57.6
Non-sulphuric acid	7.7	7.8	8.0	8.1	8.2
<b>Total Demand</b>	<b>58.4</b>	<b>60.9</b>	<b>62.8</b>	<b>64.6</b>	<b>65.9</b>
<b>Supply</b>					
Oil	25.1	26.2	27.2	28.1	28.6
Gas	27.5	28.7	32.4	35.9	36.2
Other	3.5	3.7	4.0	4.3	4.8
<b>Total</b>	<b>56.1</b>	<b>58.6</b>	<b>63.6</b>	<b>68.2</b>	<b>69.6</b>
<b>BALANCE</b>	<b>-2.3</b>	<b>-2.3</b>	<b>0.8</b>	<b>3.6</b>	<b>3.7</b>

Source: IFA / Argus, September 2013

# Middle East balance forecast reflects increased export potential

Middle East sulphur balance 2012-2021 (million tons)

	2012	2015	2018	2021
Production	11.5	15.0	17.8	21.8
Consumption	2.7	4.1	5.0	5.9
Export Potential	8.80	10.90	12.80	15.90

- Export potential growth to impact trade patterns
- Increased volatility in market has led Middle East producers to shift to short term contracts

Source: Integer, IFA





# **TSI's Sulphur World Symposium 2014**

**April 7 – 9, 2014  
Long Beach, California, USA**

**For more information on TSI programs please visit:**

**[www.SulphurInstitute.org/symposium14](http://www.SulphurInstitute.org/symposium14)**

# Thank You

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