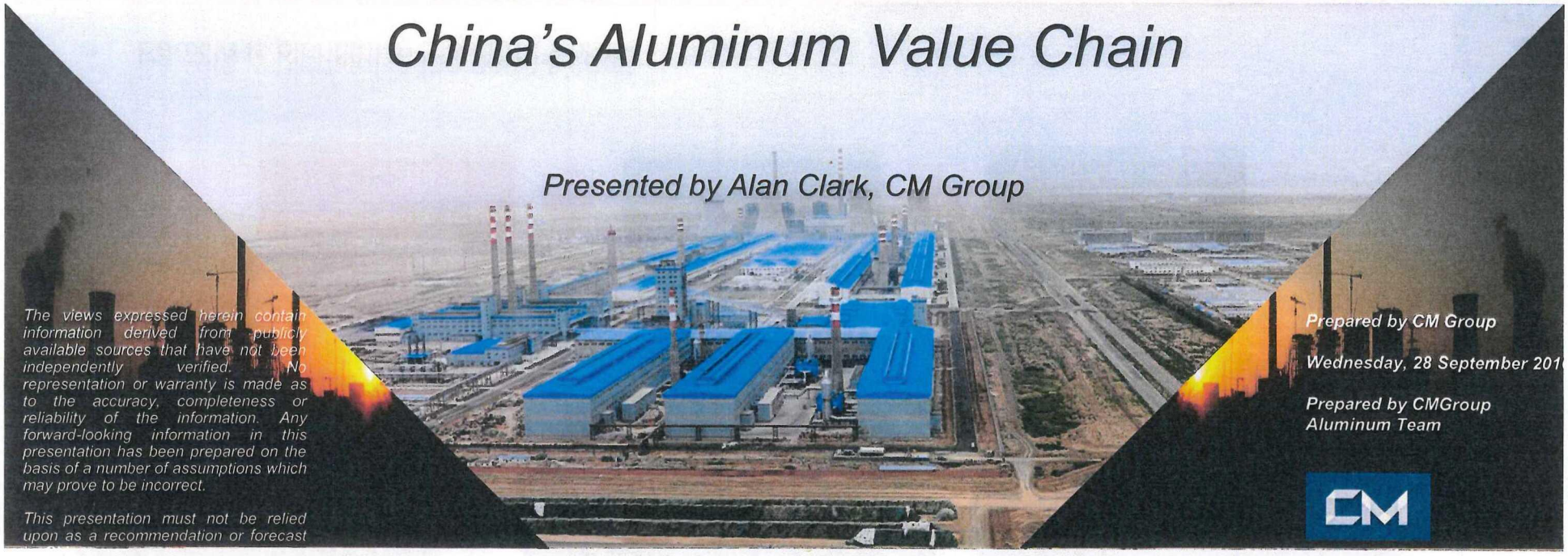
China's Aluminum Value Chain

Presented by Alan Clark, CM Group



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Prepared by CM Group

Wednesday, 28 September 201

Prepared by CMGroup Aluminum Team

CM

Alumina	Bauxite	Magnesium	Manganese	Copper	Zircon	Tin
Aluminium	Nickel	Titanium	Tungsten	Molybdenum	Zinc	Scandium

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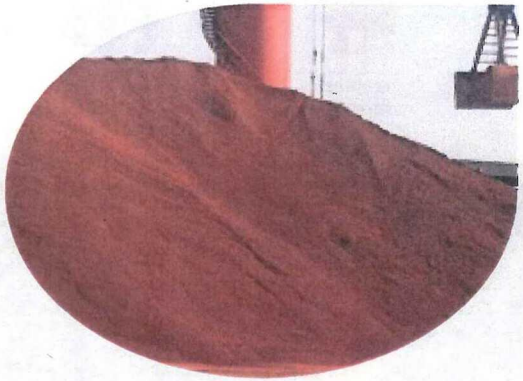
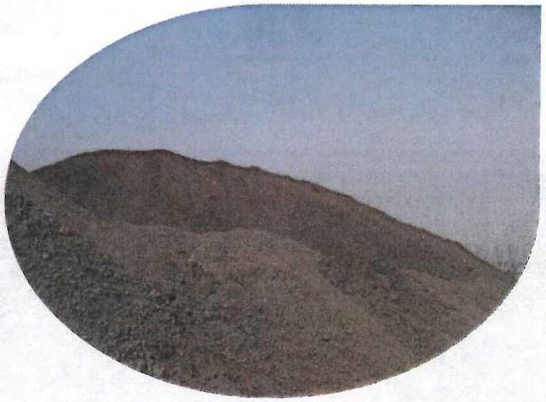
Bauxite – main mineral from which alumina is extracted



Indonesian Bauxite

North Chinese Bauxite



Indian Bauxite

Bauxite mining (~5 tonnes) → Alumina refining (2 tonnes) → Al smelting (1 tonne)

- Bauxite is plentiful in the earth's crust.

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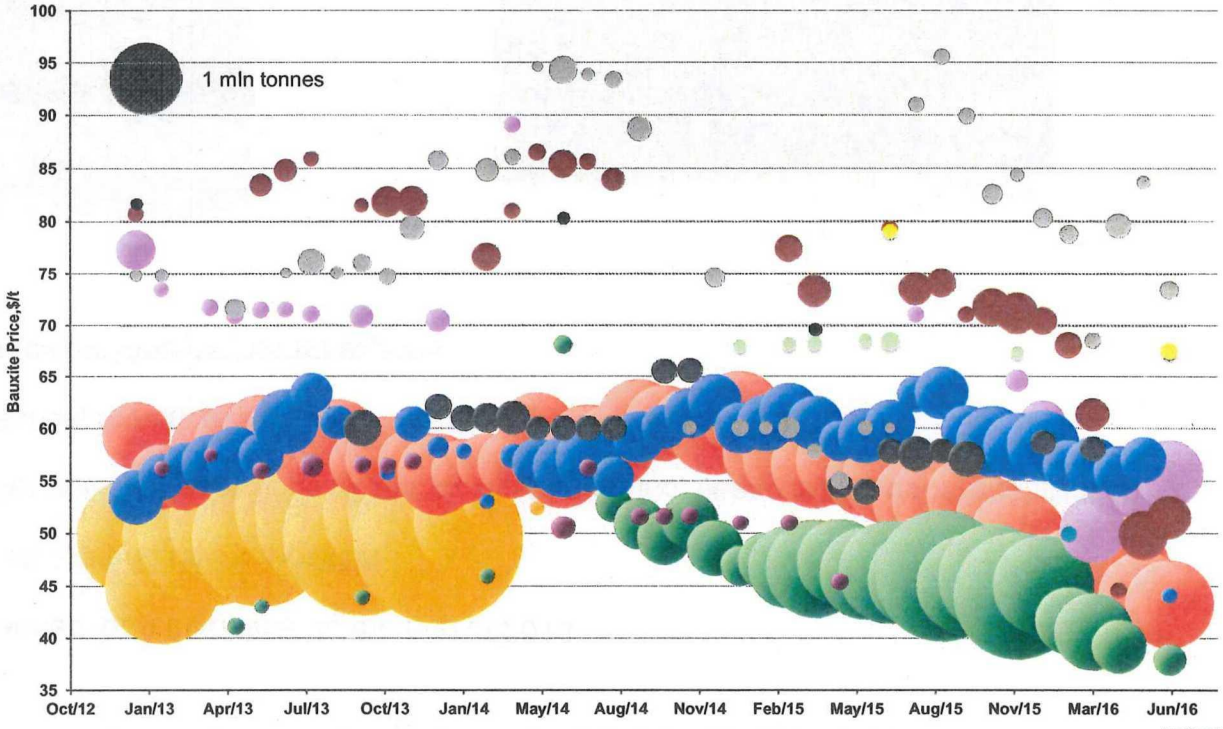
China has looked to many source countries for imported bauxite

- China sourced most of its imported bauxite from Indonesia, up to January 2014 when the 'Minerals Export Ban' was introduced.
- Australia has been a steady bauxite suppliers to China.
- Malaysia has emerged as a significant supplier substituting Indonesia, but the current mining ban is influencing the export volume.
- Guinea is gradually becoming a major bauxite source to China, with the SMB consortium actively extracting bauxite.
- Other countries such as Brazil, India, and Ghana also export bauxite to China intermittently.



Source: China Customs, CM Group

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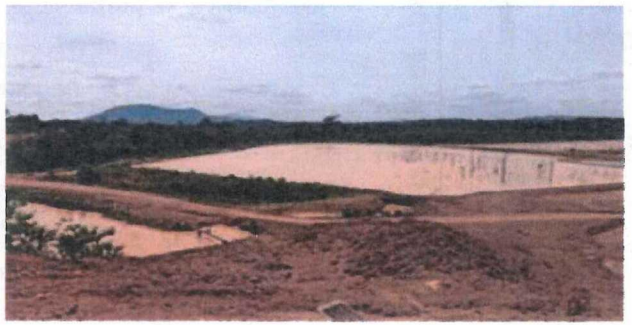
Malaysia extends its bauxite mining ban: lessons for other countries?

- Malaysian mining ban extended for a third time, to the end of 2016
- Requirement to fully clear stocks and review position
- Environmental, safety: water pollution from wash plants, dust, overloading, heavy traffic, poor rehabilitation
- Illegal mining – licensing issues, royalty gaps
- Lessons if Indonesia resumes (or Vietnam starts) exports?



West Kalimantan, Indonesia, 2014

Kuantan, Malaysia, 2015

Source:, CM

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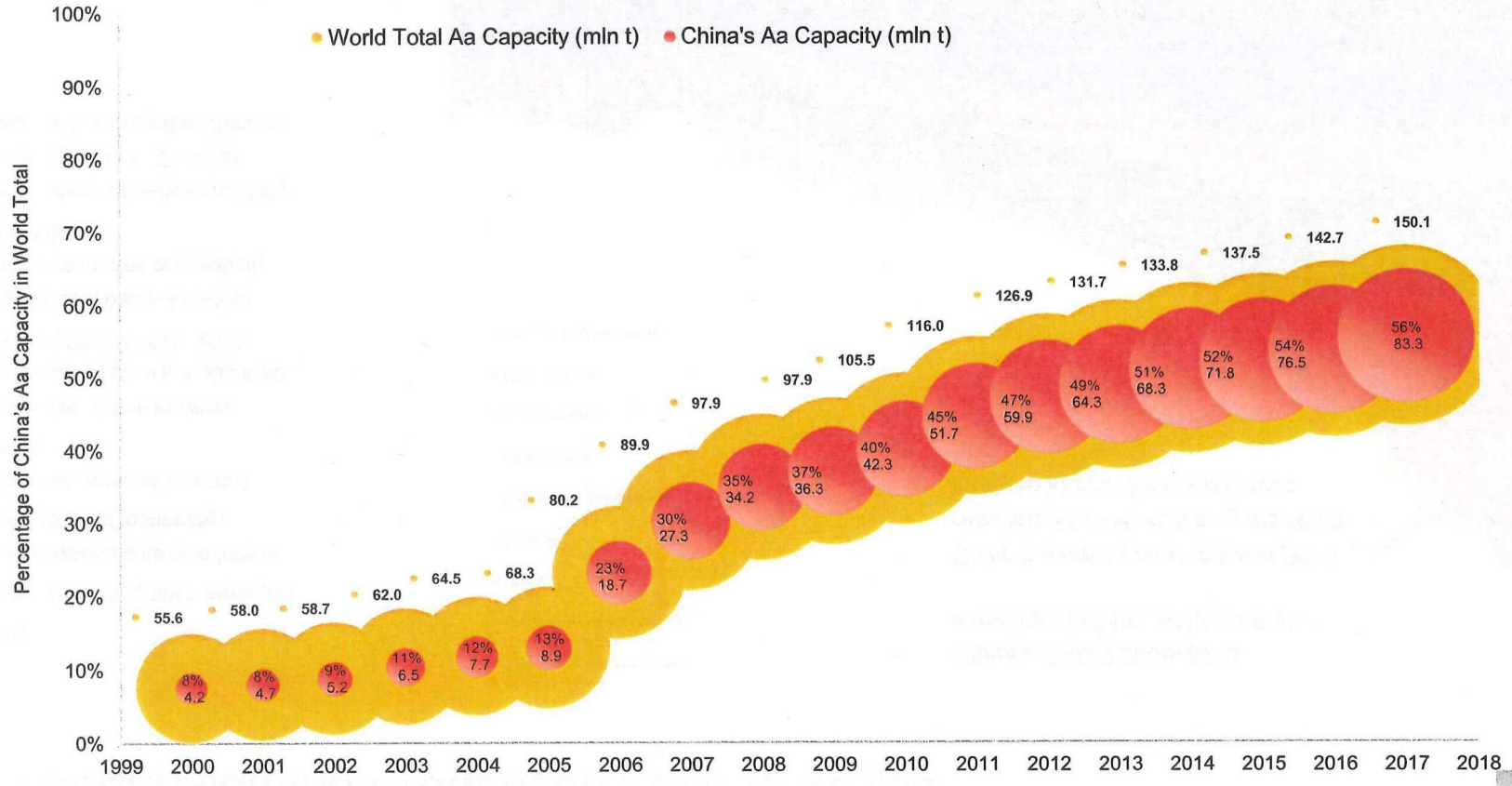
China vs ROW Alumina Capacity 2000 – 2017(f) (MTPY)



Source:, CM

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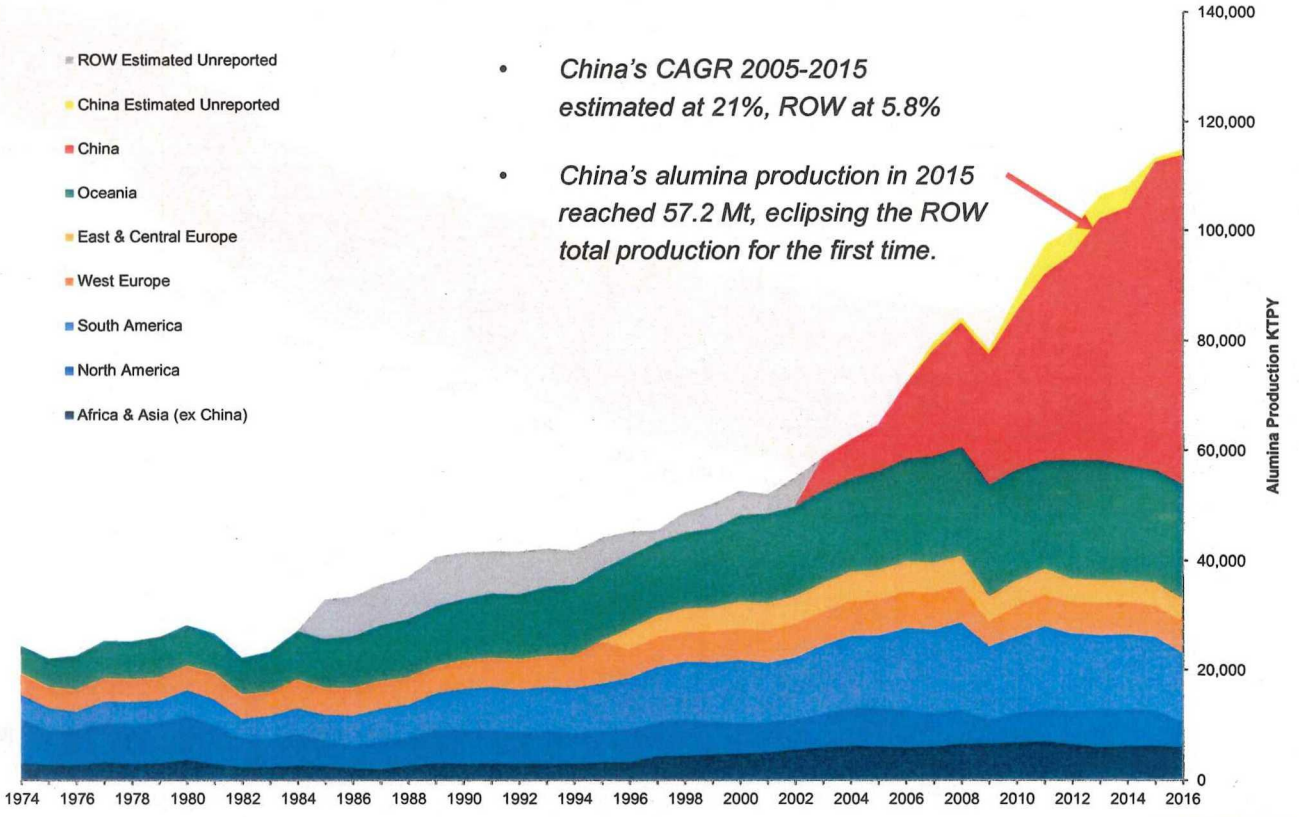
Global Alumina Production 1974 to 2016e

Since 2006

- Strong China Al growth emerged
- China developed its own 'home-grown' refining technology
- Build times were as low as 9 months
- China's proportion in world alumina production jumped from 13% in 2005 to 50% in 2015
- On a full-cost basis, low-cost Chinese refineries are globally competitive
- New alumina refineries are likely to be built either in China or outside of China by the Chinese



- *China's CAGR 2005-2015 estimated at 21%, ROW at 5.8%*
- *China's alumina production in 2015 reached 57.2 Mt, eclipsing the ROW total production for the first time.*

Source: ROW - IAI, China - CM Group

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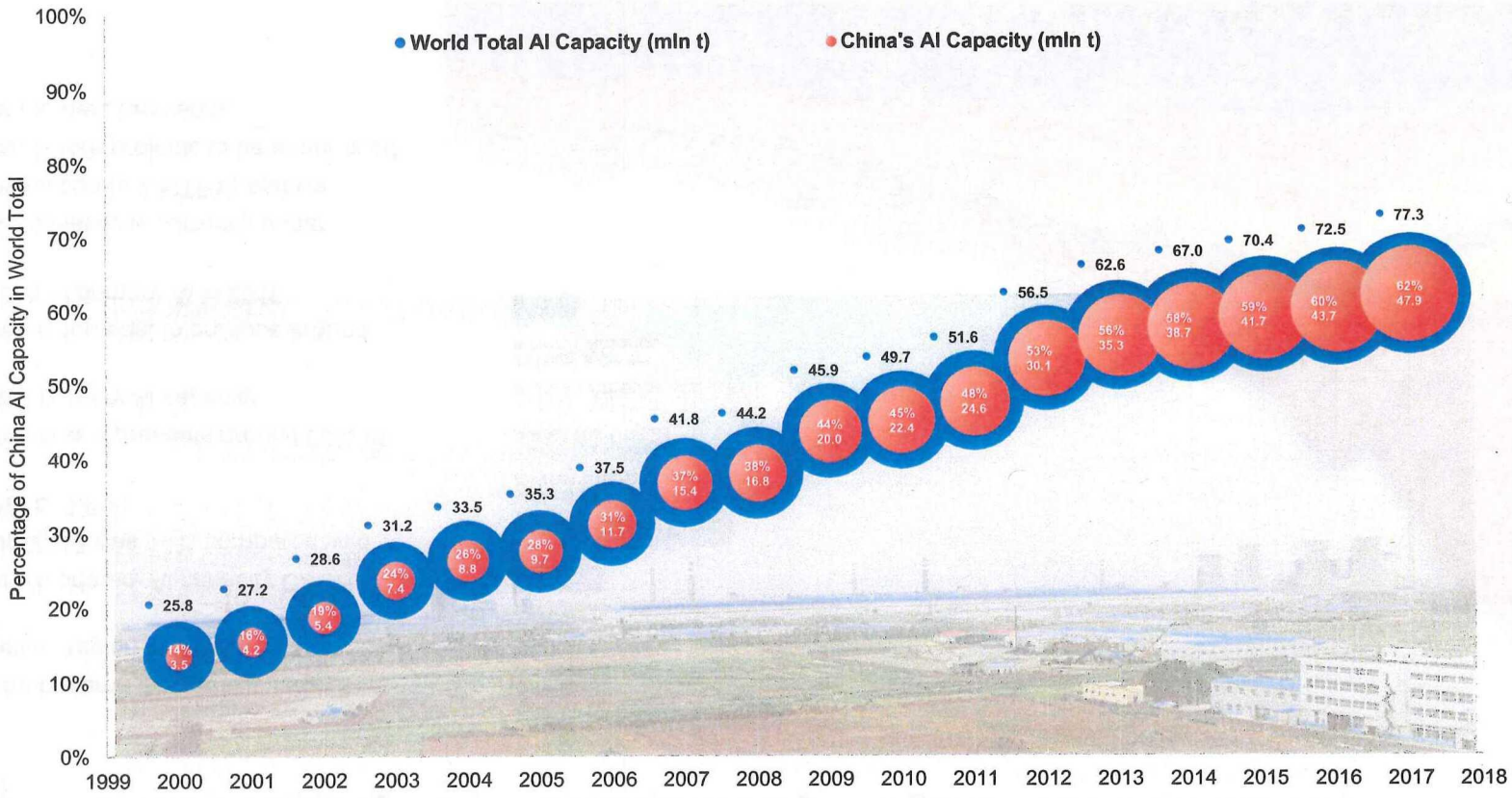
China vs ROW AI Capacity 2000 – 2017(f) (MTPY)



Source: CM Analysis

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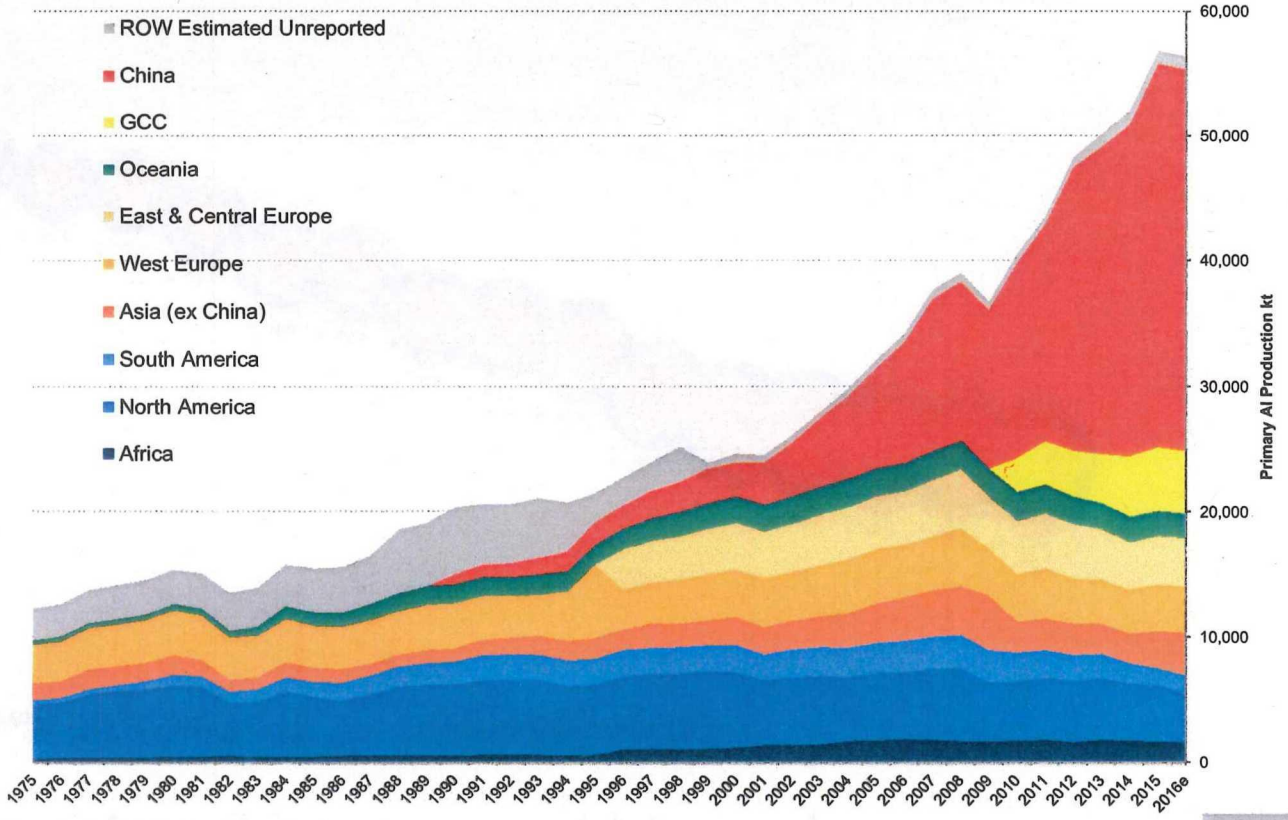
Global Primary Al Production by Region 1975 to 2016e

- China became the world's largest smelting region in 2003.
- China's primary Al capacity CAGR 2005-2015 was 14% compared with ROW at 0.6%.
- China now represents around 60% of global primary Al capacity..
- China is forecast to produce around 30.8Mt of primary Al in 2016.
- More capacity is currently under construction (2.5 MTPY) and we expect more projects to be announced over the next two years.



Source: ROW - IAI, China - CM Group

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The past year by the numbers…..

- Bauxite Mining
  - **30 MTPY** new mining and export facility built in Guinea, West Africa, by Chinese consortium
  - Domestic bauxite mining in China up by **4% to 94 million tonnes**.
  - Imported bauxite up 20 **million tonnes** from 2014 to 2015

- Alumina Refining
  - **6.9 MTPY** domestic refining capacity built.
  - **1.0 MTPY** refining capacity built outside China (Indonesia)
  - **1.7 MTPY** refining capacity acquired by Chinese interests (Alpart, Jamaica)
  - **11.5 MTPY** domestic refining capacity currently under construction (with more planned)

- Primary Al Smelting
  - **2.4 MTPY** new domestic smelting capacity built
  - **2.5 MTPY** domestic smelting capacity currently under construction (with more planned)

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Supply-Side Reform: Control Capacity Increases and Structural Reform

"Guide on Creating a Healthy Market Environment to Boost Industrial Adjustment, Business Transformation and Profit Increase in the Chinese Nonferrous Metal Industry"

By General Office of State Council on Jun 5th , 2016

Supply-side reform is implemented in the aluminum industry:

A

Any **expansion** of aluminum capacity shall be strictly **controlled** and all aluminum **reconstruction** or capacity **expansion** projects must be carried out through **capacity equivalent replacement** or capacity reduced replacement, and the public must be notified online.

B

Rectification or **closure** of aluminum capacity in line with environmental protection requirements and **energy consumption indices** by which **uncompetitive** aluminum capacity should **exit**.

C

Balance between supply and demand of major products such as aluminum and copper is to be achieved by improving **technological innovation**, **developing deep processing** and expanding applications.

Overcapacity discussed by Obama and Xi during G20 meeting

Obama, Xi discussed China's role in addressing excess capacity in aluminum sectors

The collective production cuts is one way to implement the supply-side reform. In 2016 H1 approximately 4.2 mln t capacity estimated to cut down over all the major aluminum producing regions.
The further elimination of the obsolete capacities echoing the policy promotes the structural adjustment of the industry.

END OF PRESENTATION