



# Market Outlook

Kathrine Fog, SVP Corporate Strategy & Analyses

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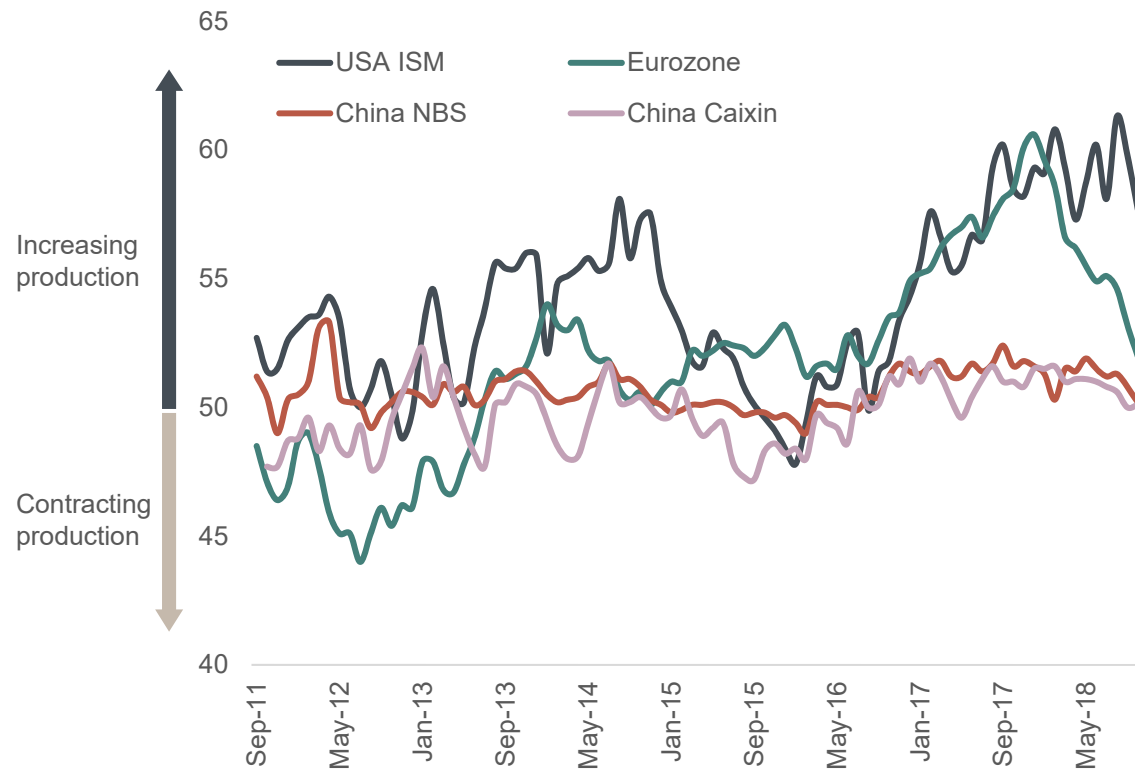
Macro and trade

# Macro sentiment still moderately positive despite trade tensions

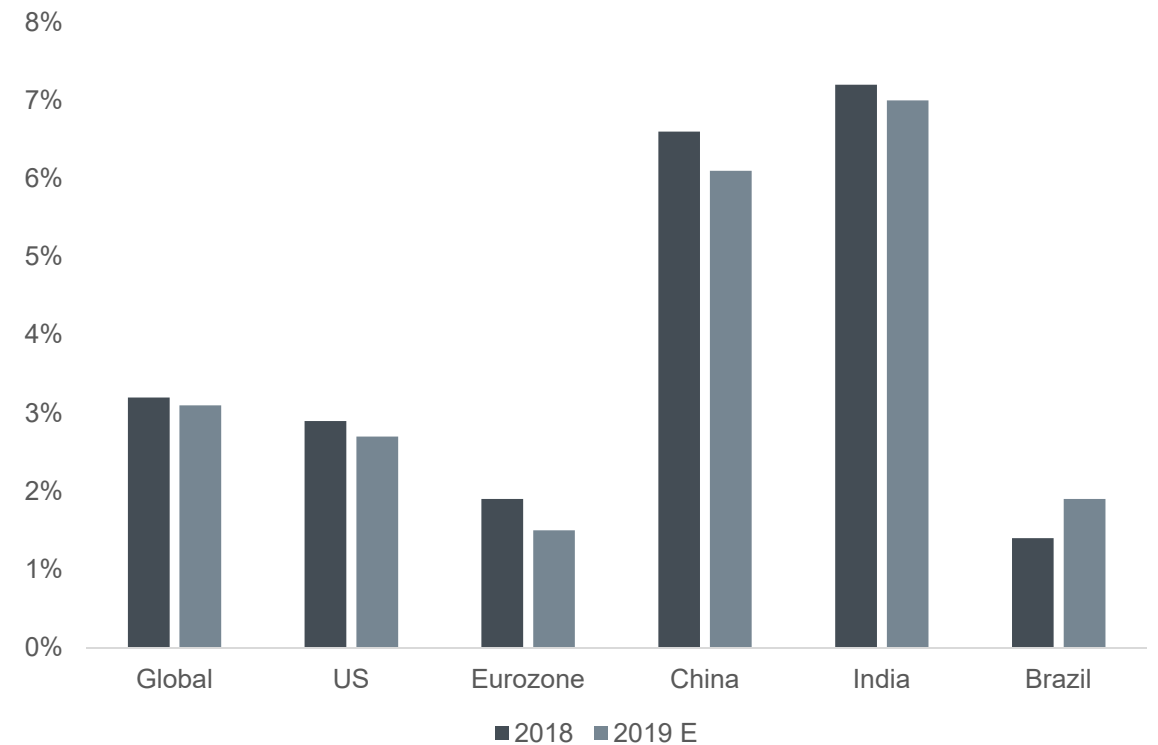


Increasing uncertainty on GDP-effects from trade disputes

Manufacturing PMI's



Annual GDP-growth, key regions



# Trade sanctions and tariffs impacting global flows of aluminium



## US

- Section 232: aluminium
- Section 232: auto (potential)
- Section 301
- Common alloy sheet and foil
- USMCA\*

## Europe

- Monitoring of aluminium imports
- Potential safeguards

## Russia

- Rusal sanctions

## India

- Duties on primary and scrap imports
- Potentially more/higher duties

## China

- Limitations on scrap imports

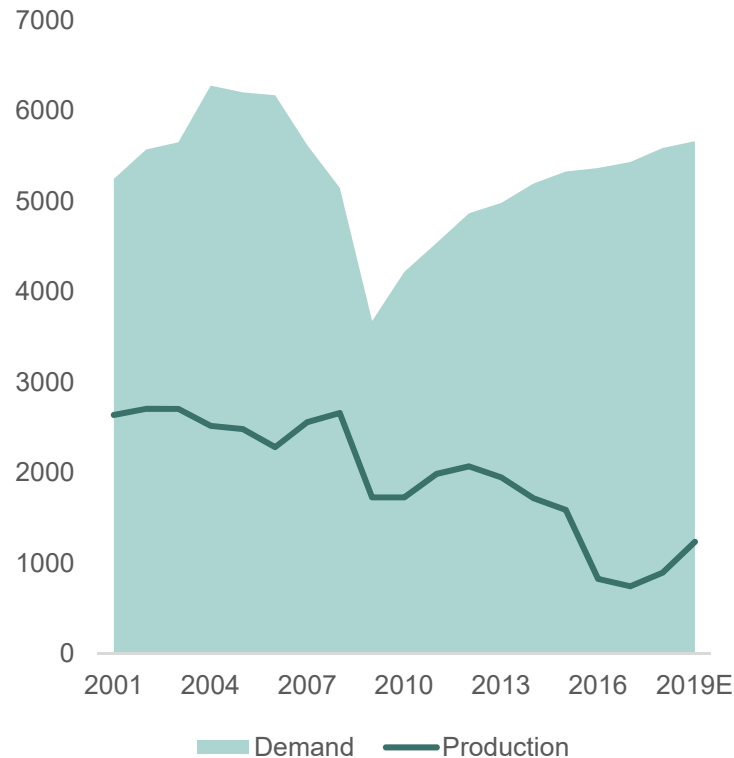
## Indonesia

- Safeguard investigation into aluminium foil

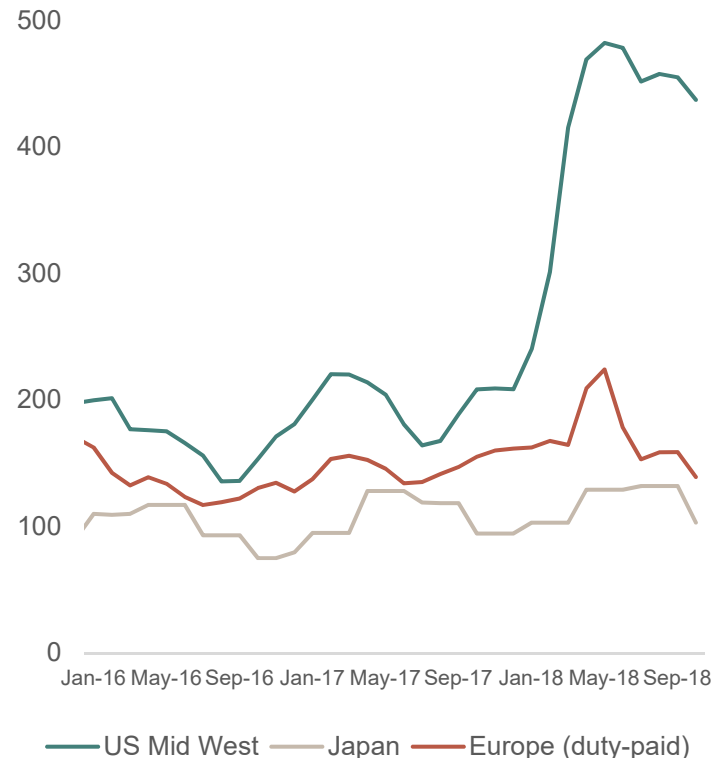
# Section 232 impacting US metal premiums

Premiums reflecting high underlying metal deficit

US primary demand and production ('000t)



Ingot premiums USD/t



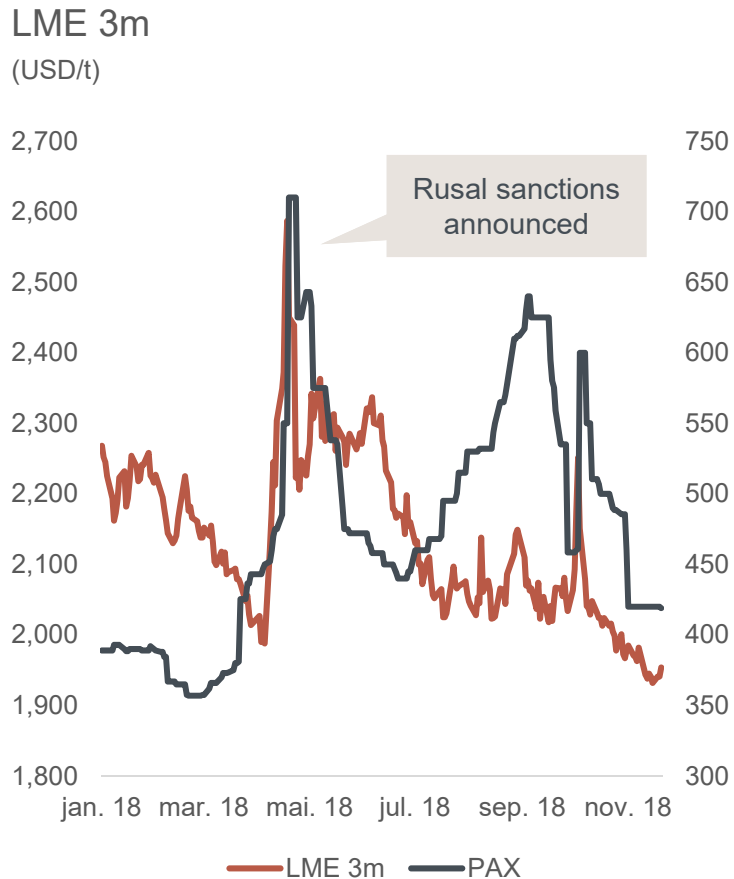
## Section 232

- 10% duty on aluminium imports
- The US has a large underlying metal deficit and needs to attract large metal volumes
- Some US restarts so far – however, limited overall restart potential
- Restart of Hawesville and New Madrid adding volumes in 2019

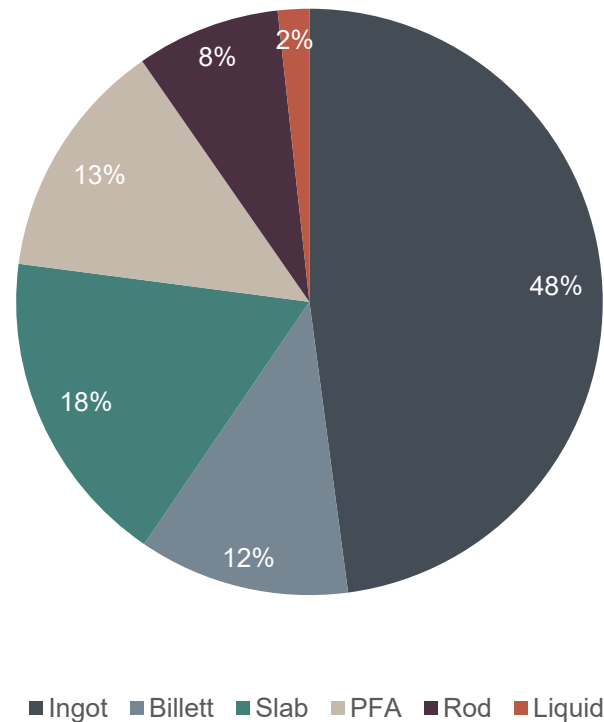


# Rusal sanctions leading to price volatility

Large producer of value added products, impacting regional product premiums



Rusal primary production per product (total 2017: 3.8 million tonnes)



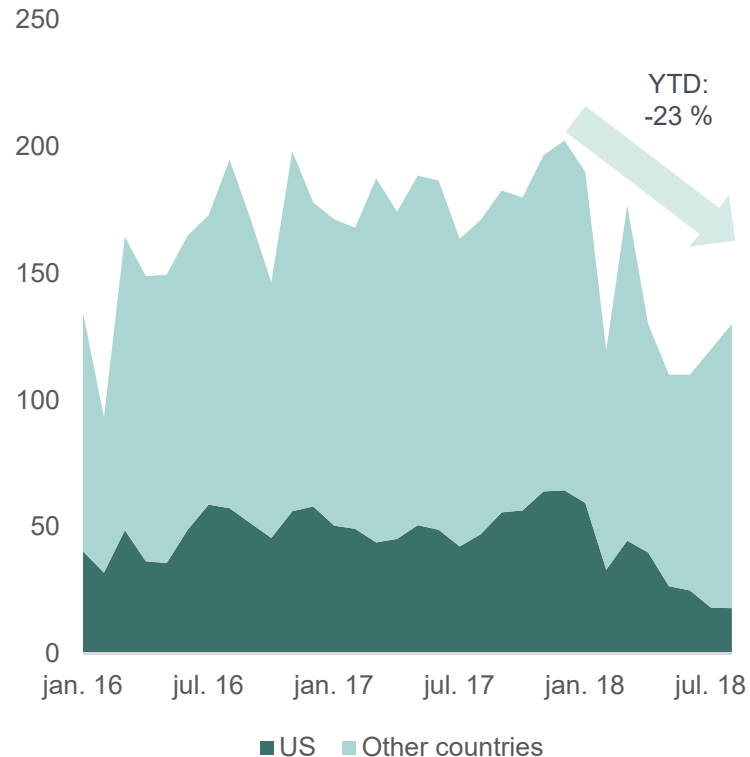
## Rusal sanctions

- Deadline for imposition of UC Rusal sanctions further extended to 7 January
- Supply contract deals for 2019 are permissible provided they were similar to 2018 deals
- Uncertainty still lingers on VAP sales and overall market premiums
- Aughinish is an important supplier of alumina to European smelters

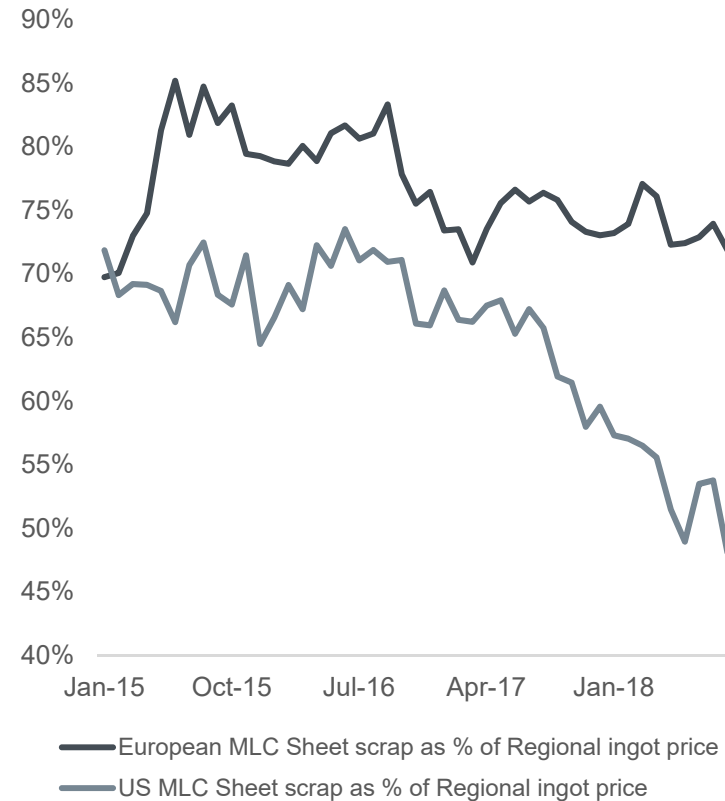


# Chinese limitations on scrap imports leaving more scrap in North America and Europe

Chinese scrap imports, monthly  
(‘000 tonnes)



Scrap prices as a percentage of  
Regional ingot price



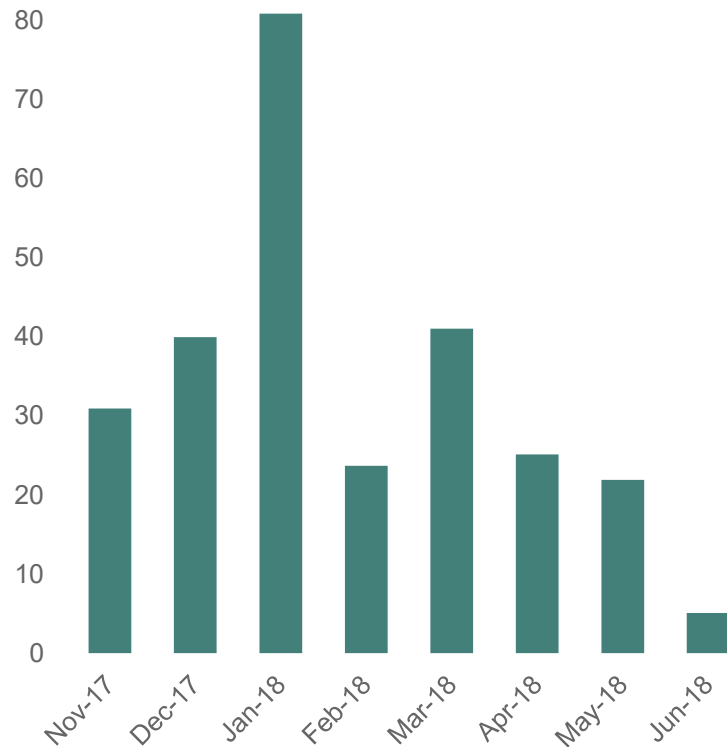
## Chinese limit scrap imports

- Stricter import policy and 50% import duty on US scrap has led to a sharp fall in scrap imports
- More scrap left in the US, putting pressure on scrap prices
- US scrap exports to alternative destinations such as Malaysia and India increasing
- Scrap imports to the US not affected by 232

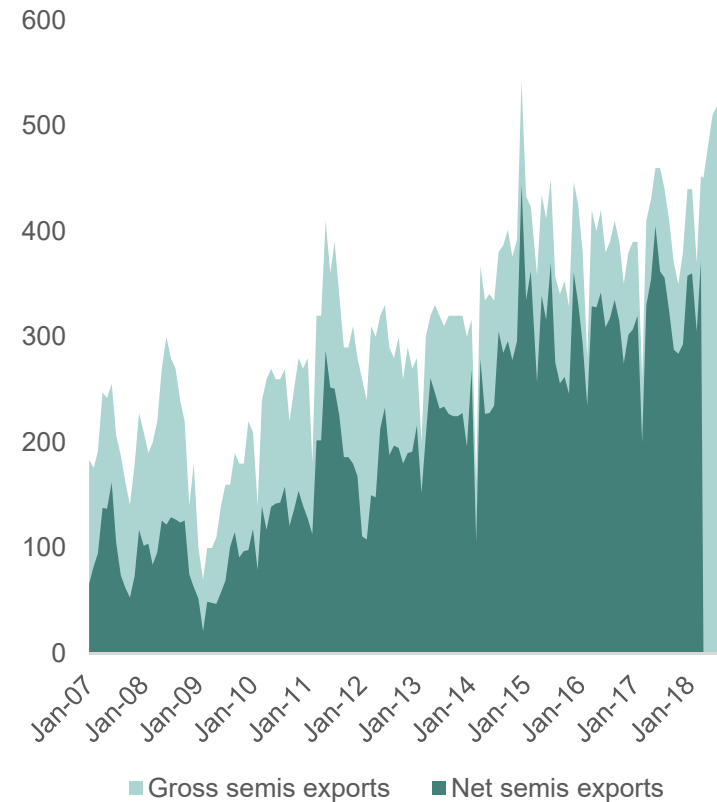


# Chinese semis exports increasing in 2018, less volumes going to the US

US imports of sheet and plate from China  
000s tonnes



Semis exports  
(monthly, kmt)



## Chinese semis exports

- Increasing volumes in 2018 amid higher export arbitrage
  - YTD + 19%
- Export arbitrage supported by weak RMB
- Asia key destination
  - More than 50% of export volumes in 2017
- AD and CVD against Chinese foil and Chinese common alloy sheet have led to sharp declines in US imports from China





02

Downstream

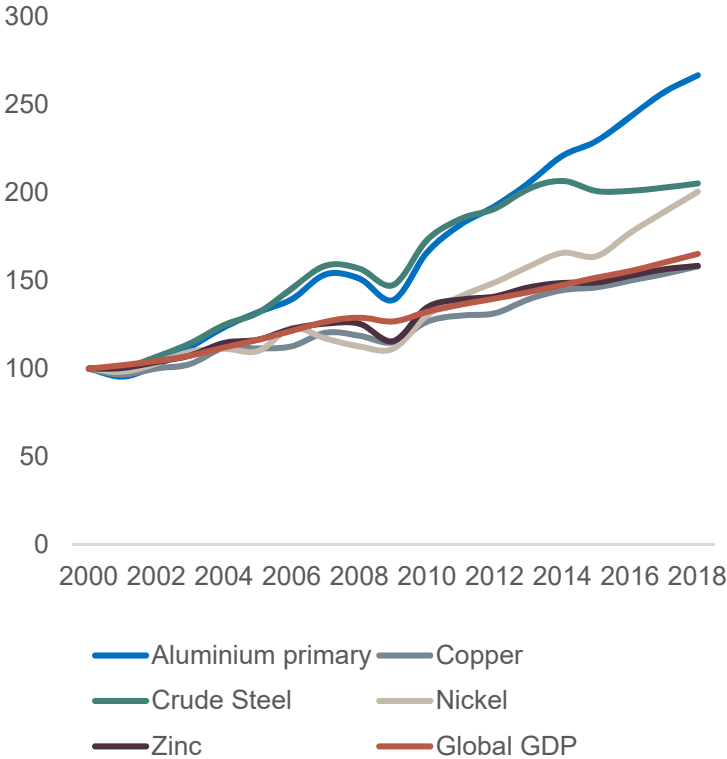
# Aluminium continues to be the fastest growing base metal



Gaining market share from other metals in key segments

## Global metal demand

Index 2000=100



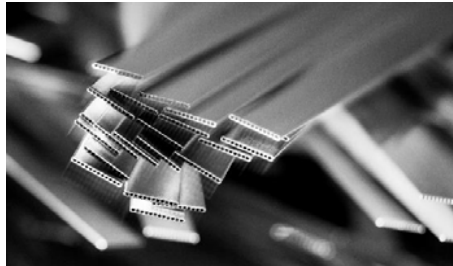
## New segments and applications supporting aluminium demand



Offshore / Marine applications, e.g. fish farms



Railway, including new technologies like maglev



HVAC&R



Aluminium formwork for B&C



Automotive, strong drive towards EV



Middle and high voltage cables, wire and cable for electrical applications

Source: Hydro analysis, Republished under license from CRU International Ltd, Zhongwang, World-aluminium.org

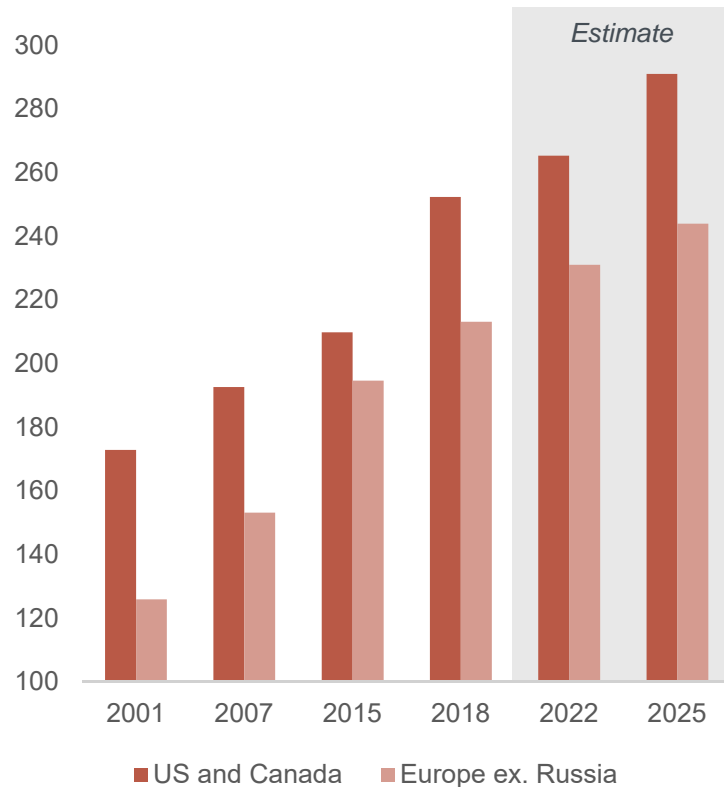
# Substitution trend in automotive progressing



Positive US demand despite moderate auto sales, Europe gaining ground

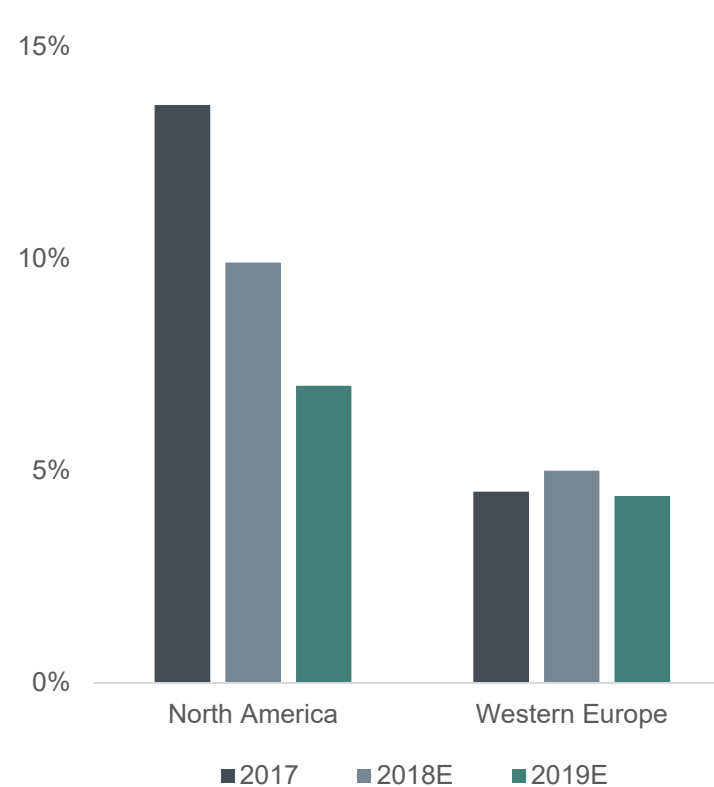
### Aluminium vehicle penetration\*

Demand per vehicle, kg/car



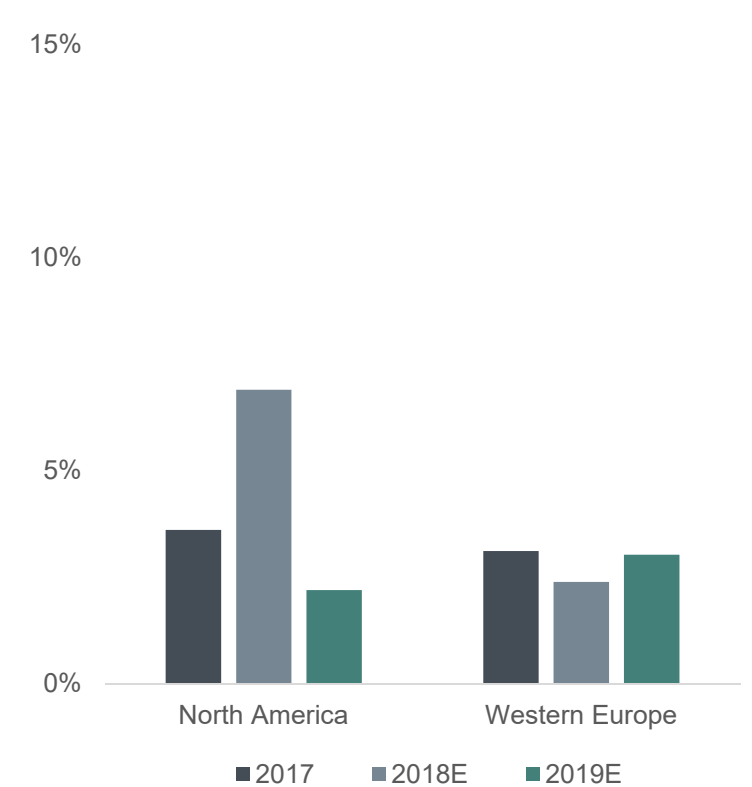
### Rolled products demand in transport

(annual growth)



### Extrusions demand in transport

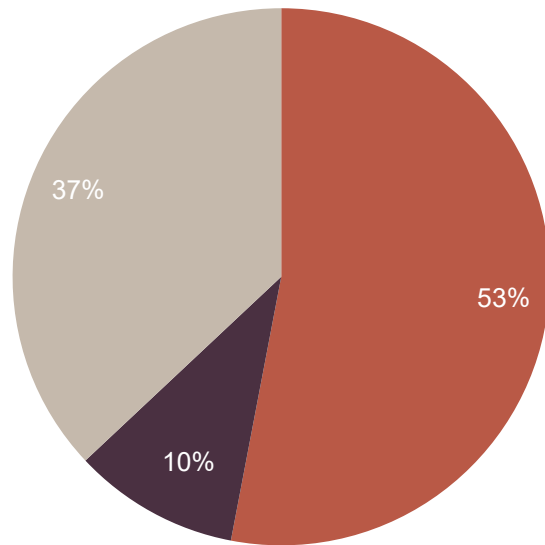
(annual growth)



Source: Hydro analysis, Republished under license from CRU International Ltd  
\*Aluminium demand per vehicle (captures the consumption from the sector. The amount in a vehicle will be less due to fabrication losses)

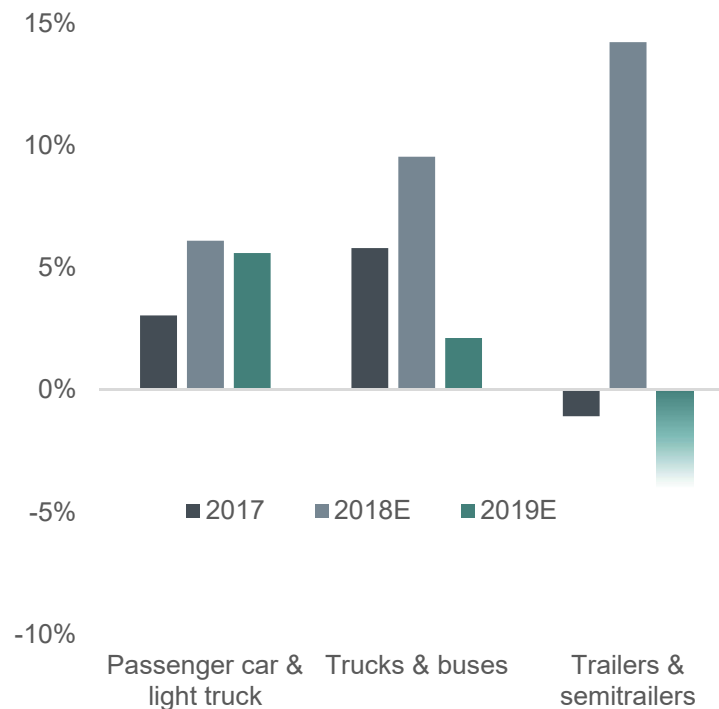
# Extrusion demand in US & Canada strongly impacted by expected moderation in truck & trailer

Extrusions demand in transport (cars & trucks\*), segment split (Average share 2016-2018)

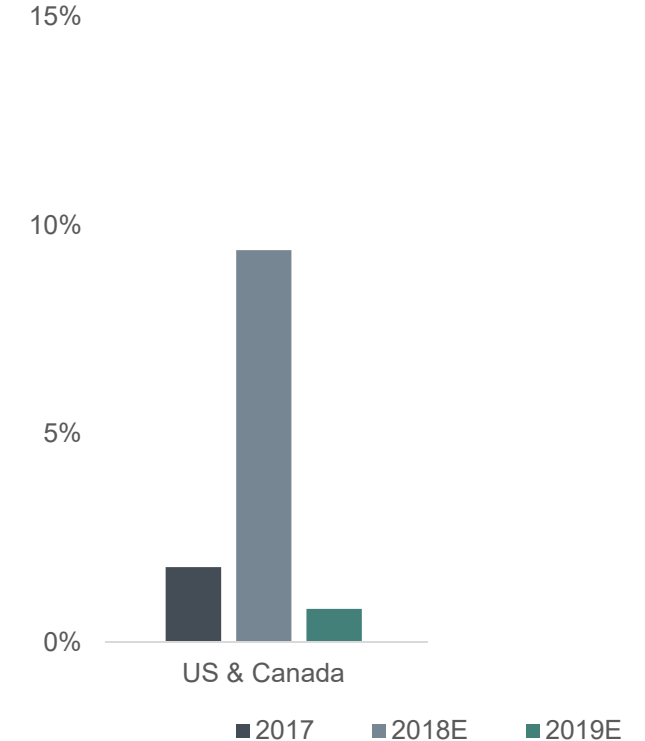


- Passenger car & light truck
- Trucks & buses
- Trailers & semitrailers

Extrusions demand per transport (cars & trucks) segment (annual growth)



Extrusions demand in transport (cars & trucks) (annual growth)



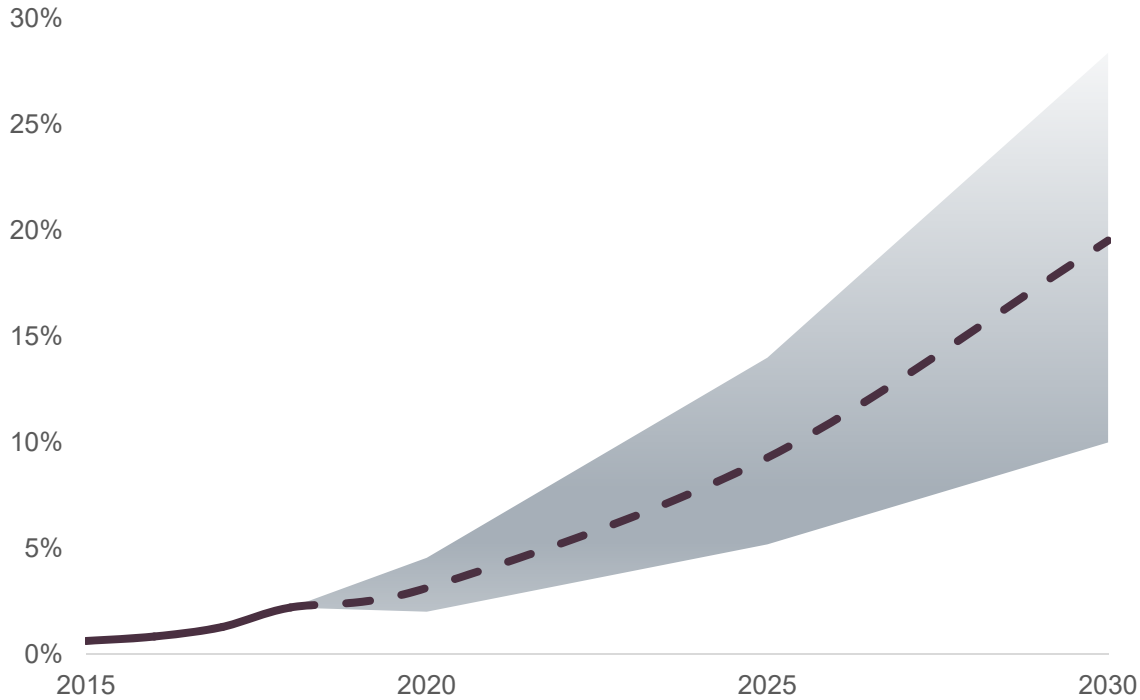
\*Transport segment also include some other transport (e.g. railway), cars & trucks make up >70% of total transport demand  
 Source: Hydro analysis, Republished under license from CRU International Ltd

# E-mobility trend favourable for aluminium demand

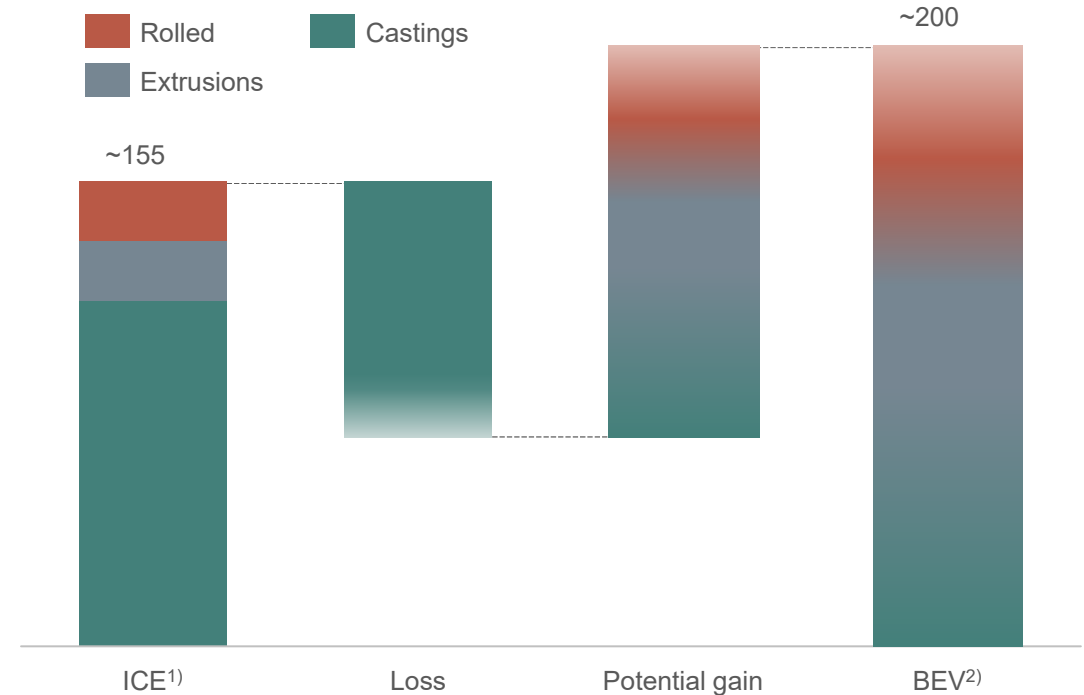


High aluminium content in BEVs, increasing share of total car sales

Electric vehicle\* share of new car sales (%)



Net increase in aluminium content in electric vehicle's  
Average kg aluminium per vehicle type in 2018



Source: Hydro analysis, Republished under license from CRU International Ltd

\* Battery electric vehicles & plug-in-hybrid vehicles

1) ICE= Internal Combustion Engine, 2) BEV= Battery Electric Vehicle

Forecast based on 10 different sources including CRU, Wood MacKenzie, JP Morgan, IEA, Bloomberg New Energy Finance and others

# Emerging softness in key housing market indicators, moderating growth rates



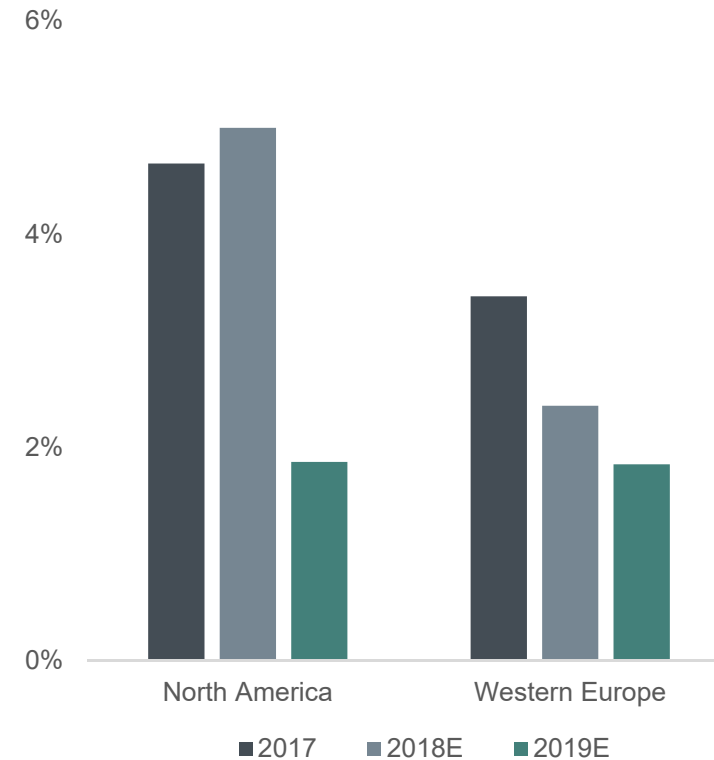
### Housing market indicators

Index, Jan 2000=100



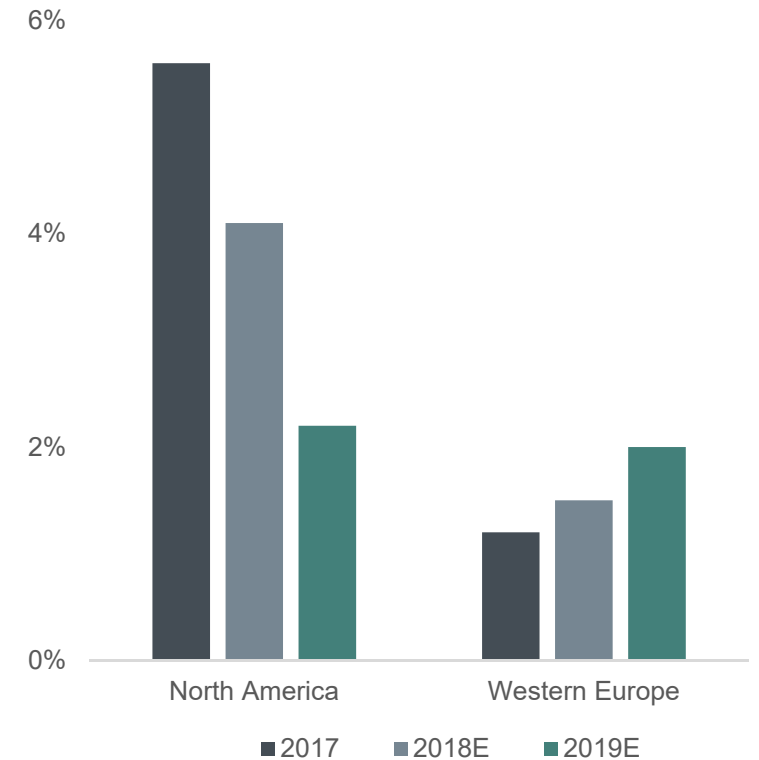
### Extrusions demand in B&C

(annual growth)



### Rolled products demand in B&C

(annual growth)

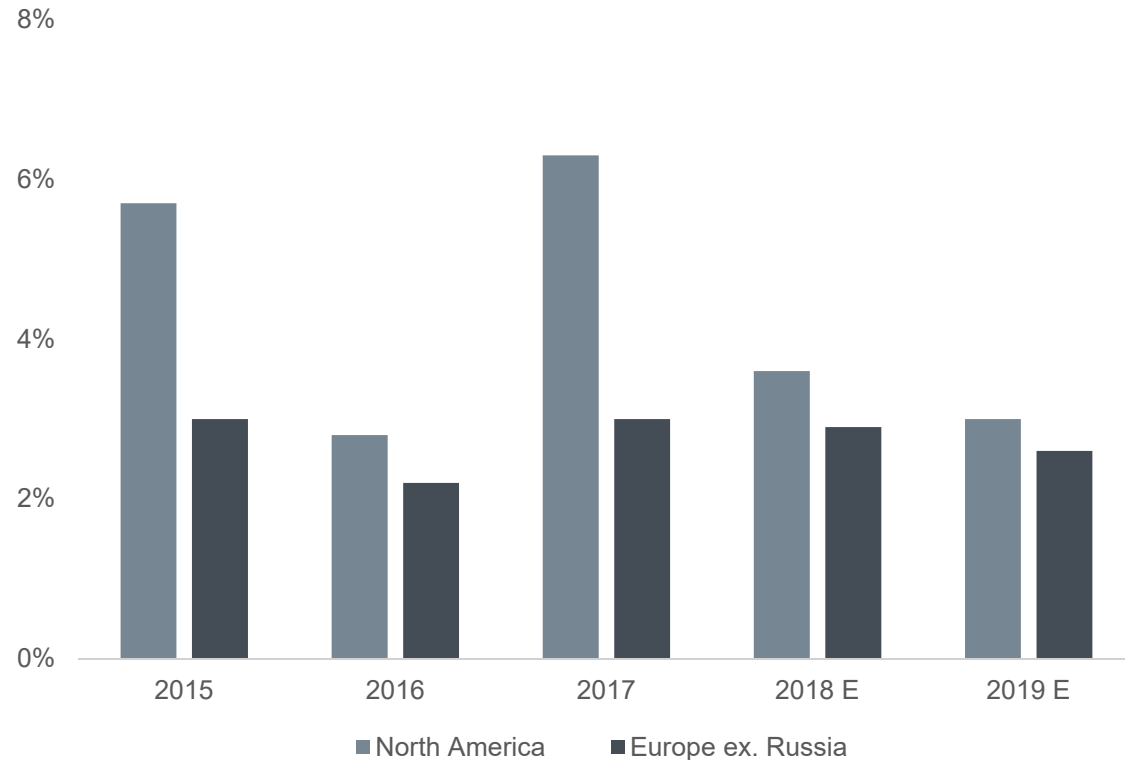


# Rolled products demand driven by transport segment

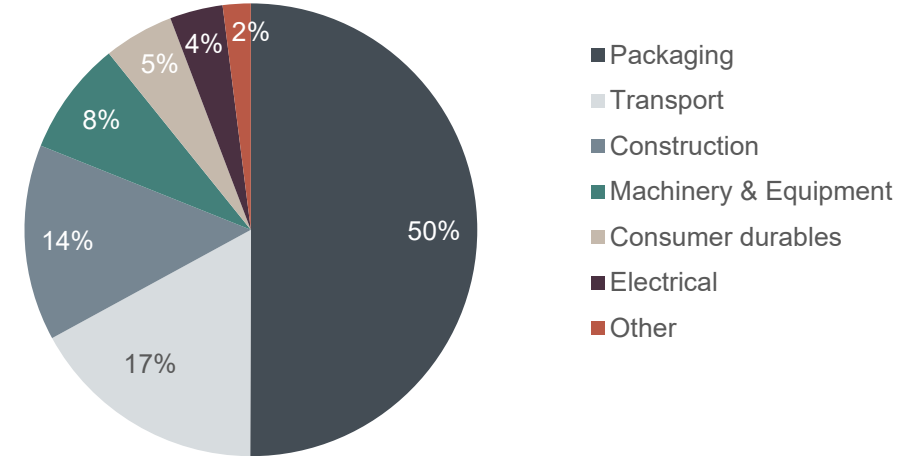
Transport share increasing in total rolled products demand

General rolled products demand, selected regions

YoY-growth



Global segment composition, rolled products (2017)

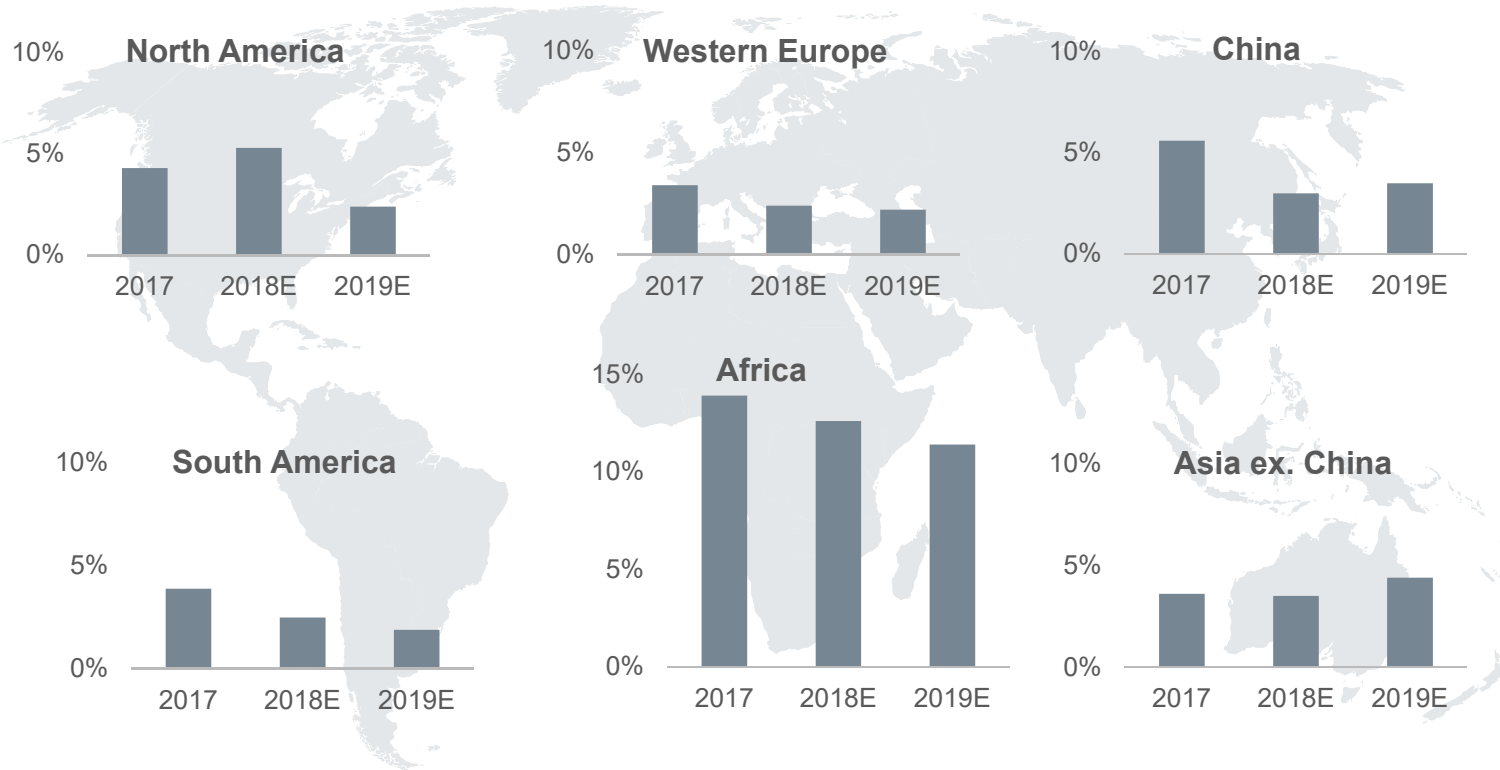


## Expected market development

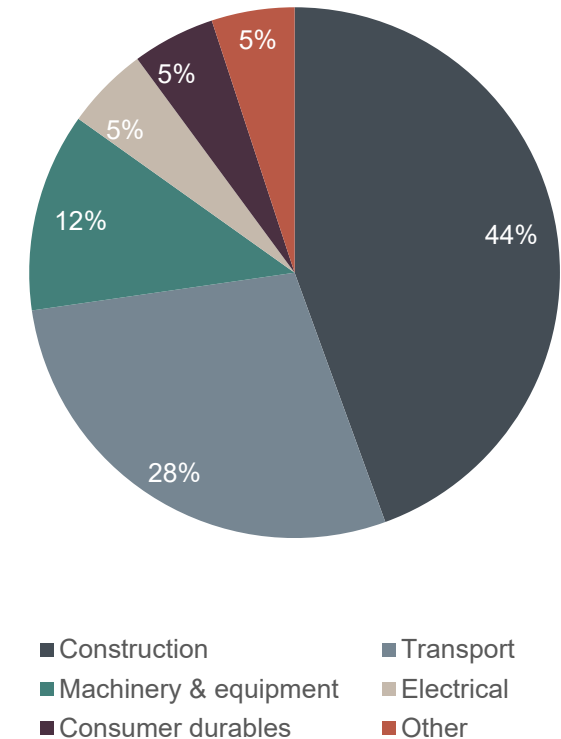
- Continued substitution trend in transport main demand driver
- Growth in packaging driven by can stock and foil in emerging markets

# Moderating extrusion demand growth in Western Europe and North America, improving in Asia

Extrusion demand, selected regions  
YoY-growth



European segment composition, extrusion  
(2017)





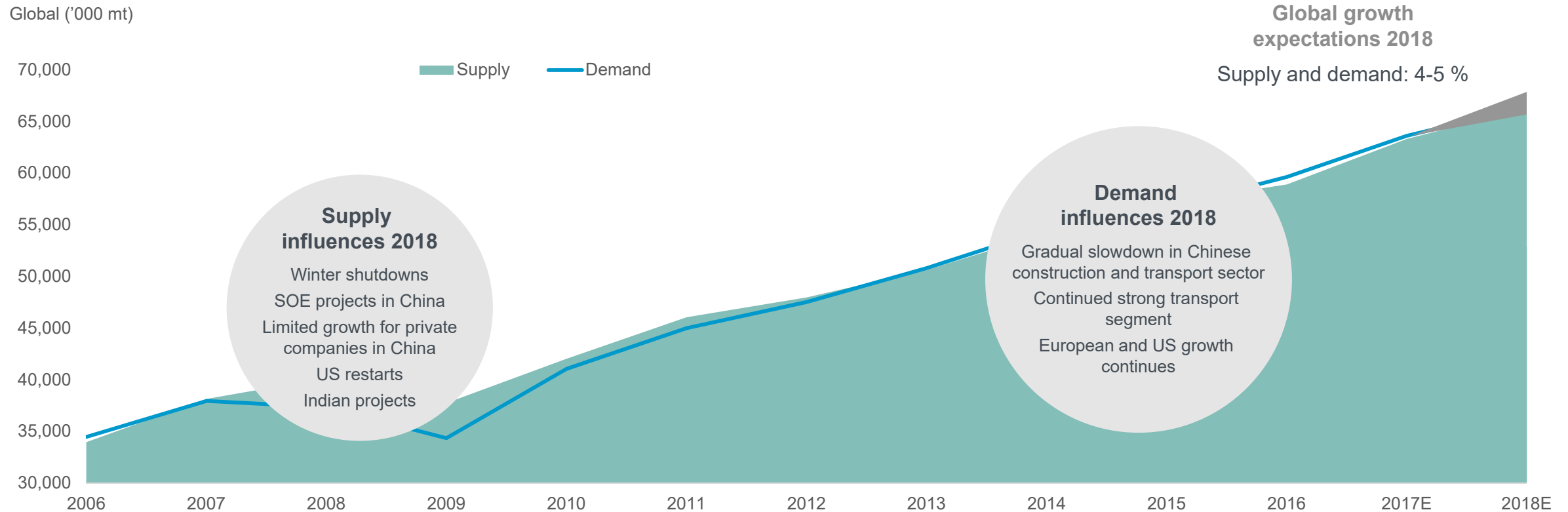
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# Primary metal market

# Recap CMD 2017: Global primary market expected to be largely balanced in 2018



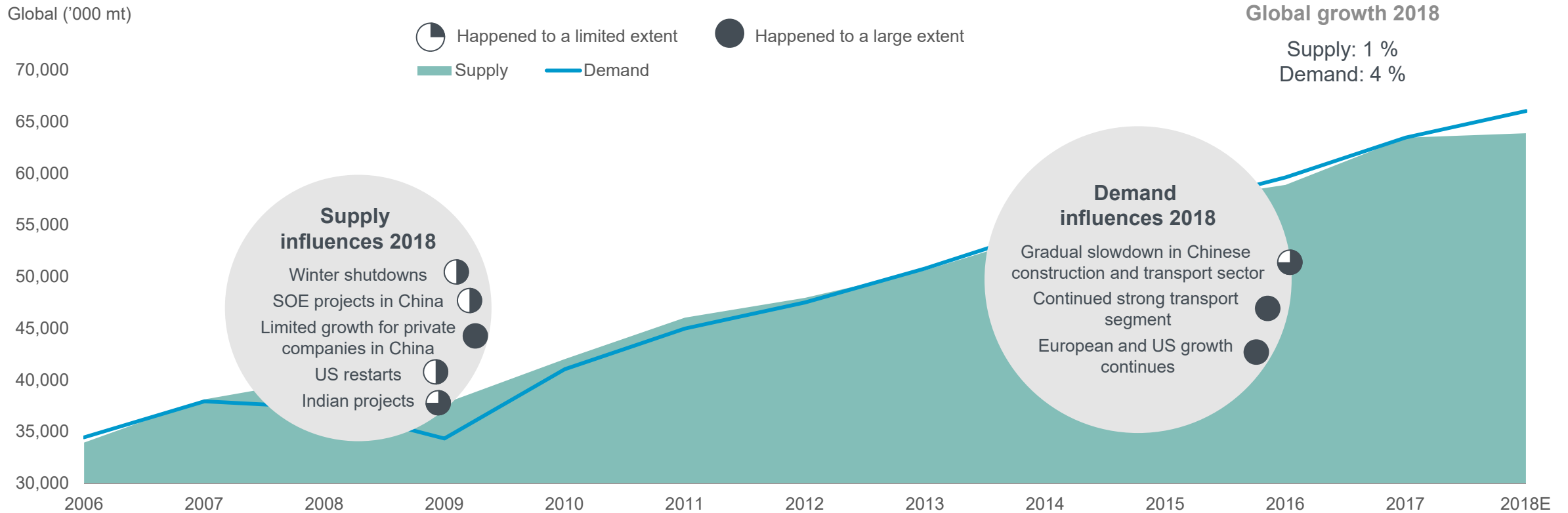
Primary supply and demand growth expected to be largely similar



# Global primary market in deficit in 2018



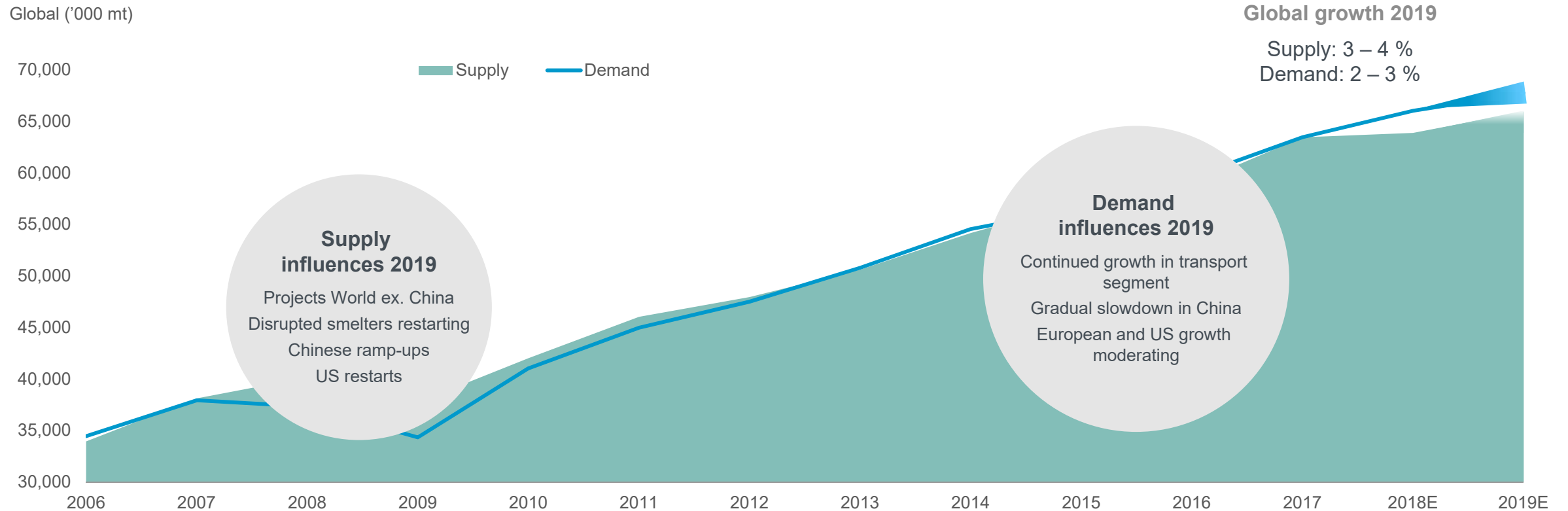
Demand progressing largely as expected, supply growth falling short of expectations



# Global primary market expected to be in deficit also in 2019



Supply growth picking up, demand growth slowing



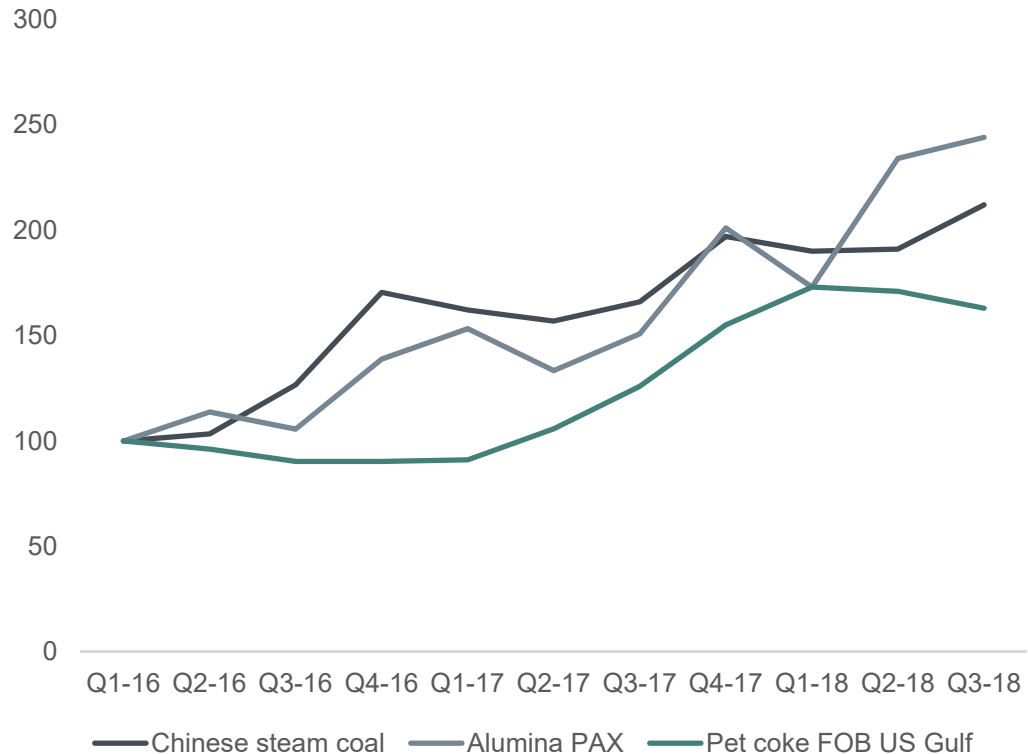
# High input costs challenging smelter profitability



Higher end of the cost curve dominated by Chinese smelters

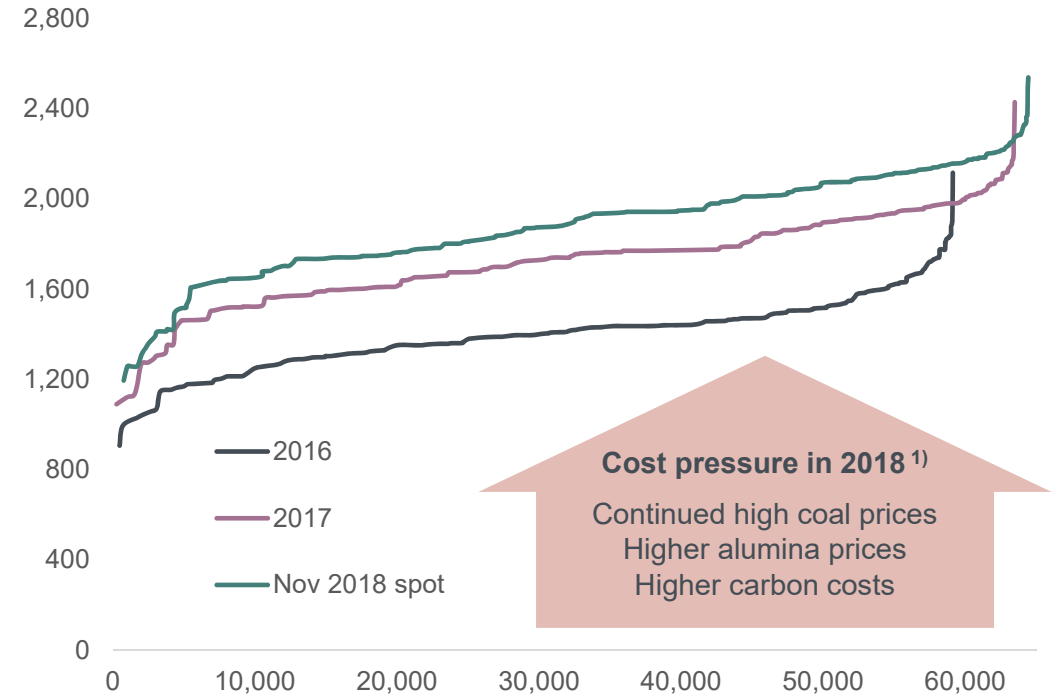
Input costs aluminium production

Index: Q1 2016 = 100



Business operating cost (BOC)

USD/t



Source: Hydro analysis, IHS, Platts, Republished under license from CRU International Ltd  
 1) Average cost factors 2018 versus average costs 2017

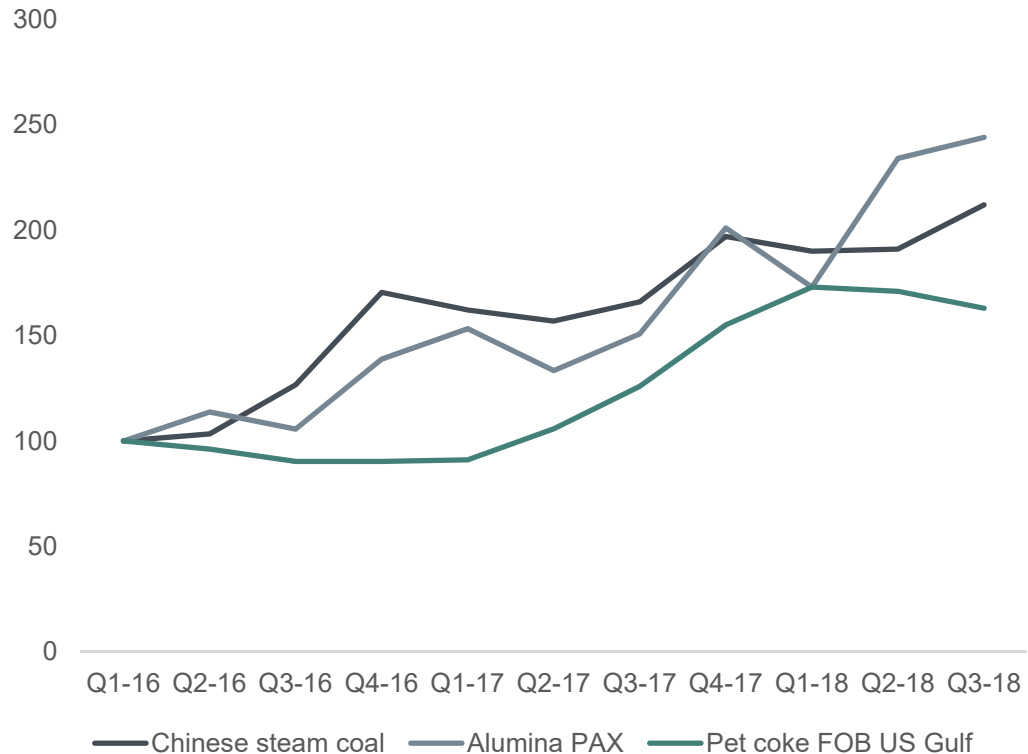
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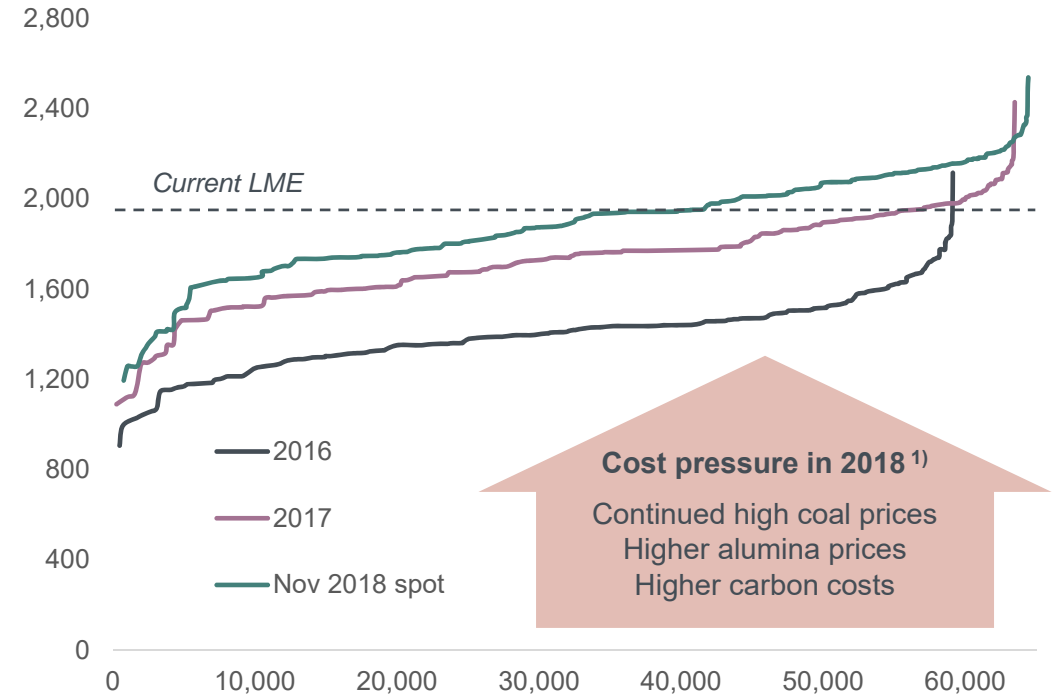
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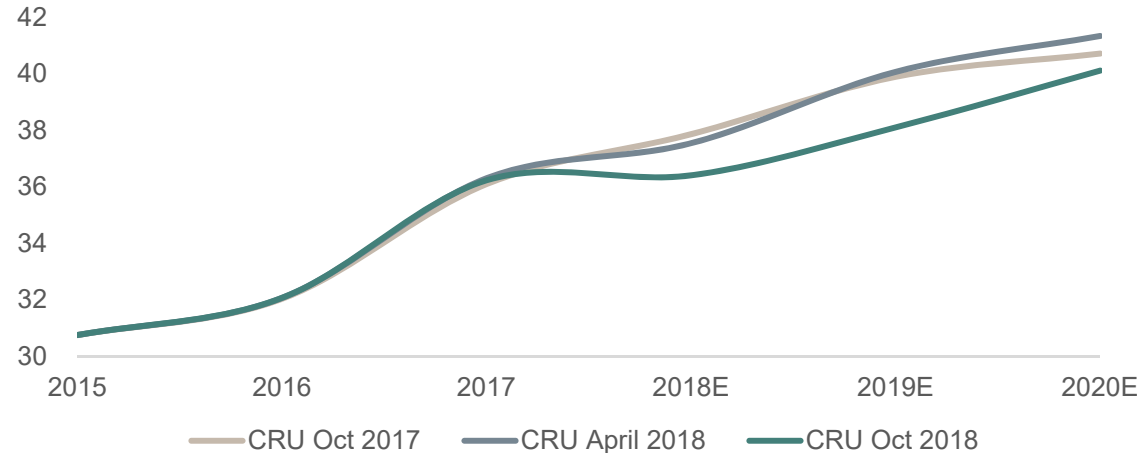
Source: Hydro analysis, IHS, Platts, Republished under license from CRU International Ltd  
 1) Average cost factors 2018 versus average costs 2017

# Primary supply in China impacted by policy and cost, captive power market reform influencing power cost



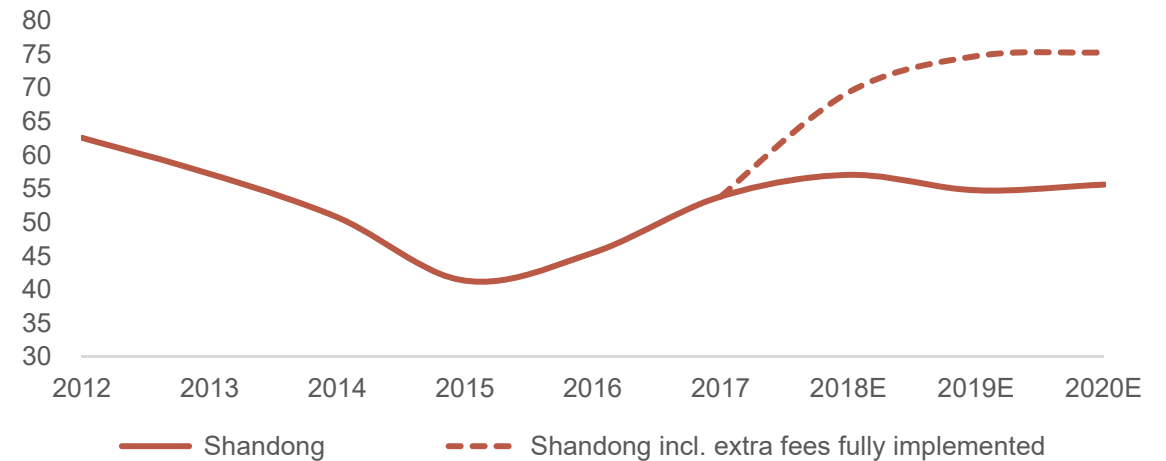
## Chinese primary supply forecasts

Million tons



## Shandong power price for captive power plants

Power price in real 2018 USD/MWh



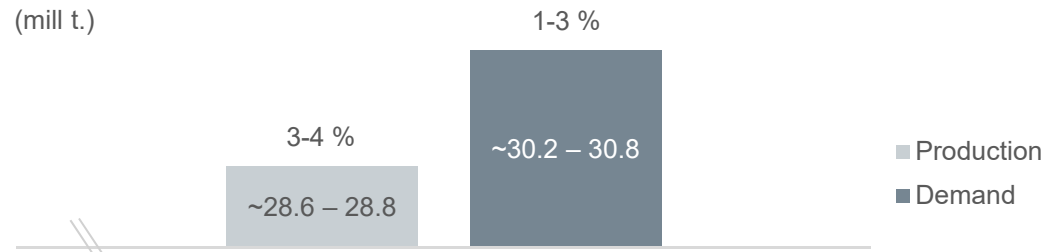
### Primary supply growth moderating

- Supply-side reform and winter shutdowns reducing primary supply growth
  - Limited impact from winter shutdown expected in 2018/19
- Ramp-up speed of new projects subdued by replacement quotas and high input cost
- SOE gaining share versus private companies

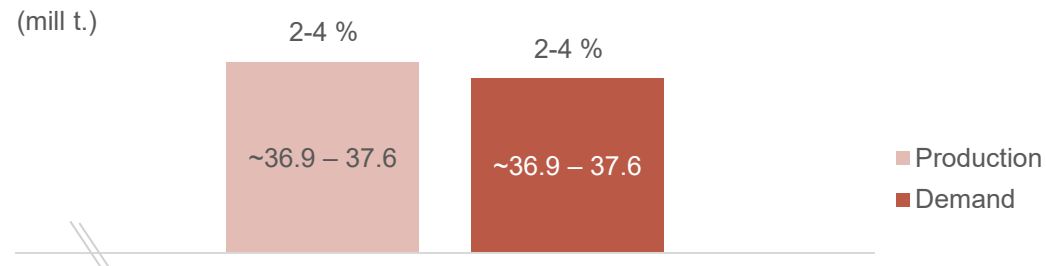
- Shandong Provincial Price Bureau have issued a notice on improving the price policy of captive power plants
- Weiqiao and Xinfu have captive coal fired power plants in Shandong, with a total production of 8 million tons
- Weiqiao have announced that they want to negotiate with the local government on these additional charges

# China expected to be largely balanced in 2019, global market in deficit

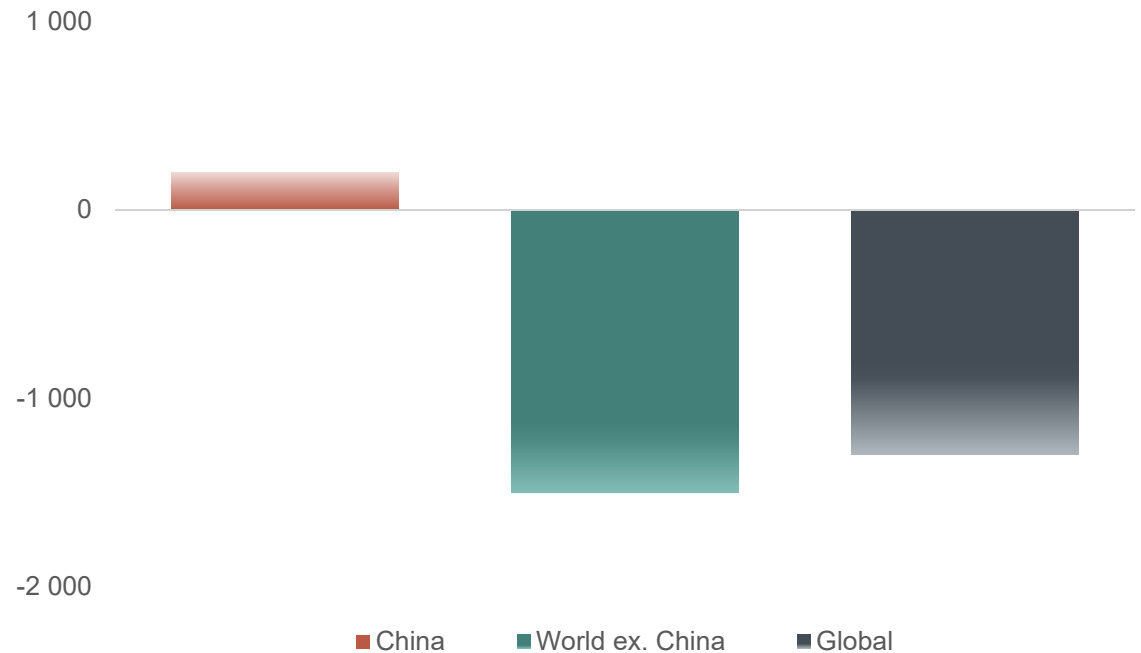
World ex. China 2019  
(mill t.)



China 2019  
(mill t.)



Estimated primary market balance 2019  
('000t)

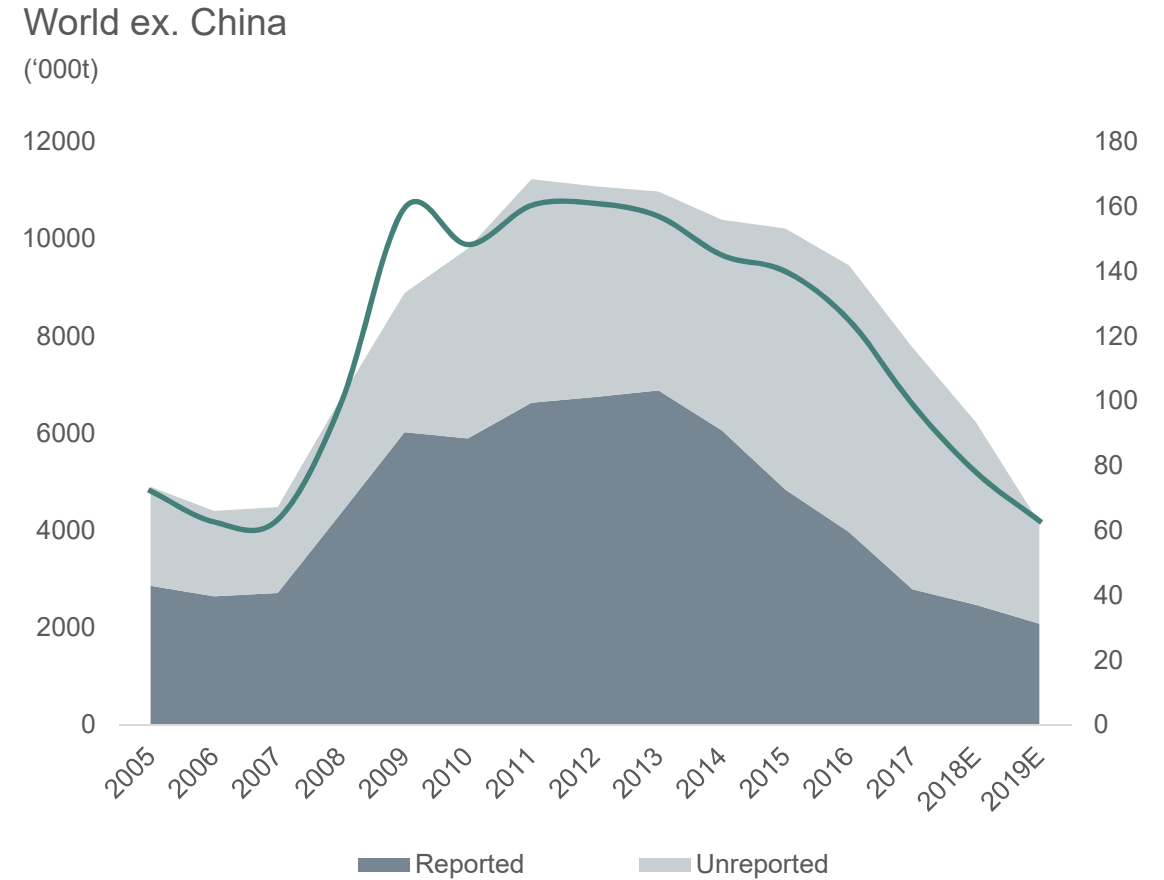
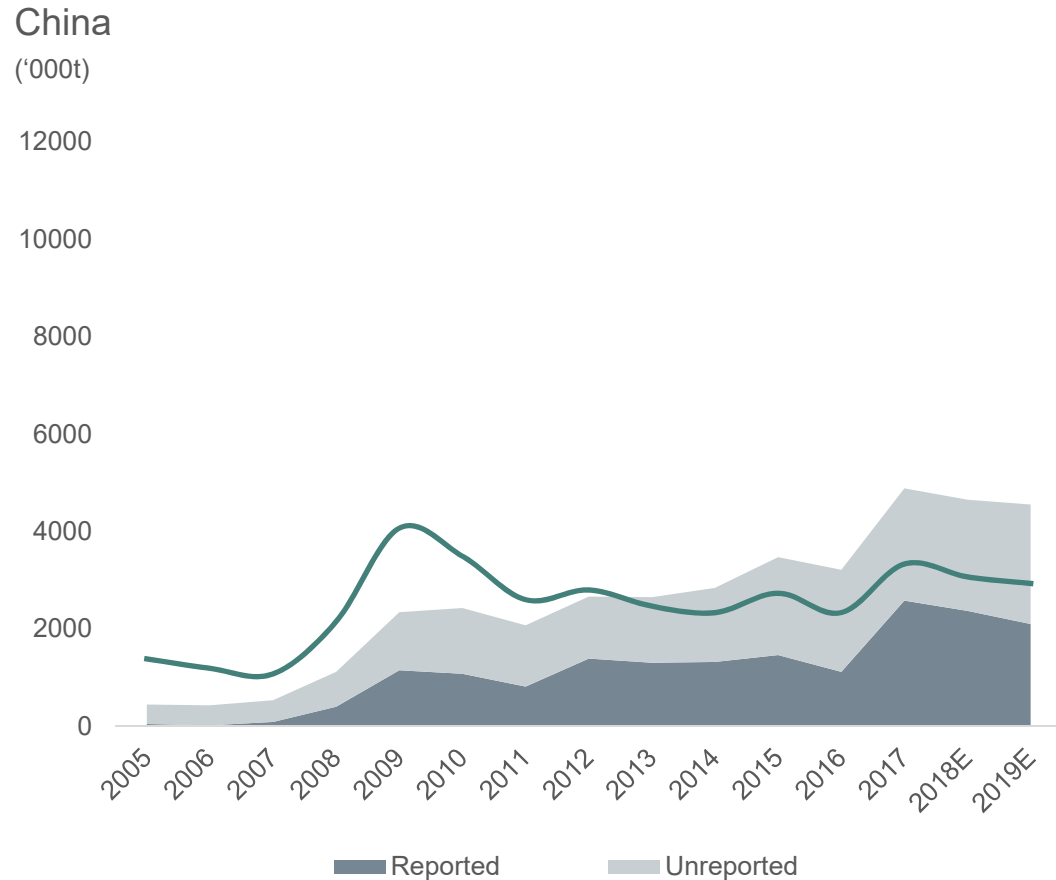




# Stocks outside China continue to decrease



Inventory days approaching pre-crisis levels world outside China



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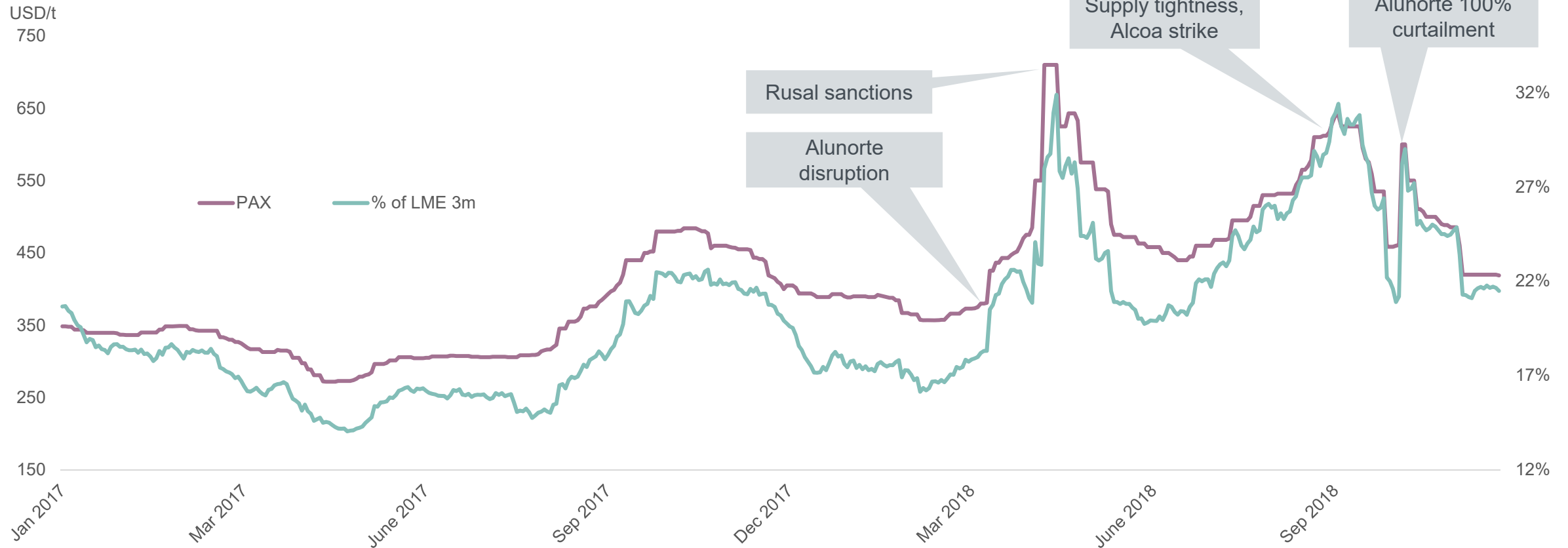
# Bauxite and alumina market

# Volatile alumina market due to supply disruptions



Alunorte embargo and Rusal sanctions lead to increased volatility

Alumina price (PAX) and share of LME



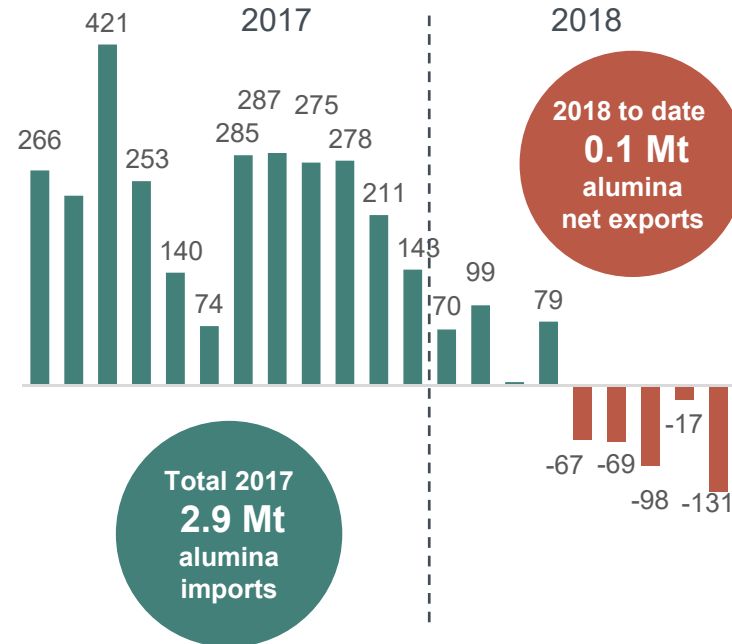
# PAX increase triggers Chinese exports

Chinese alumina required to balance the global market

China alumina export arbitrage (USD/t)



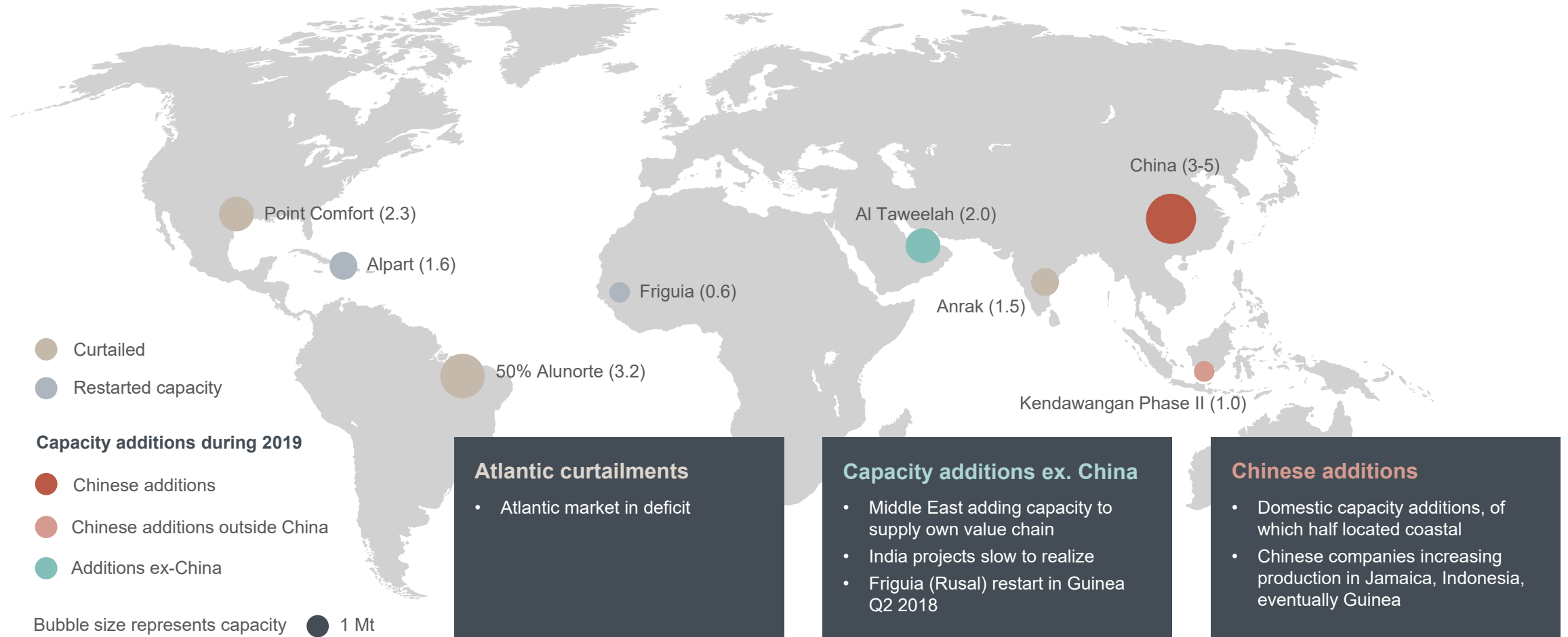
Chinese alumina trade balance by month 2017-2018 (kt)



- Challenging port logistics related to de-bagging alumina
- Quality issues
- Exported alumina incurs VAT (16%), logistics costs, port fees
- Shortage of domestic bauxite causing refinery curtailments

# Limited new capacity ex-China expected short term

Chinese additions continue to dominate



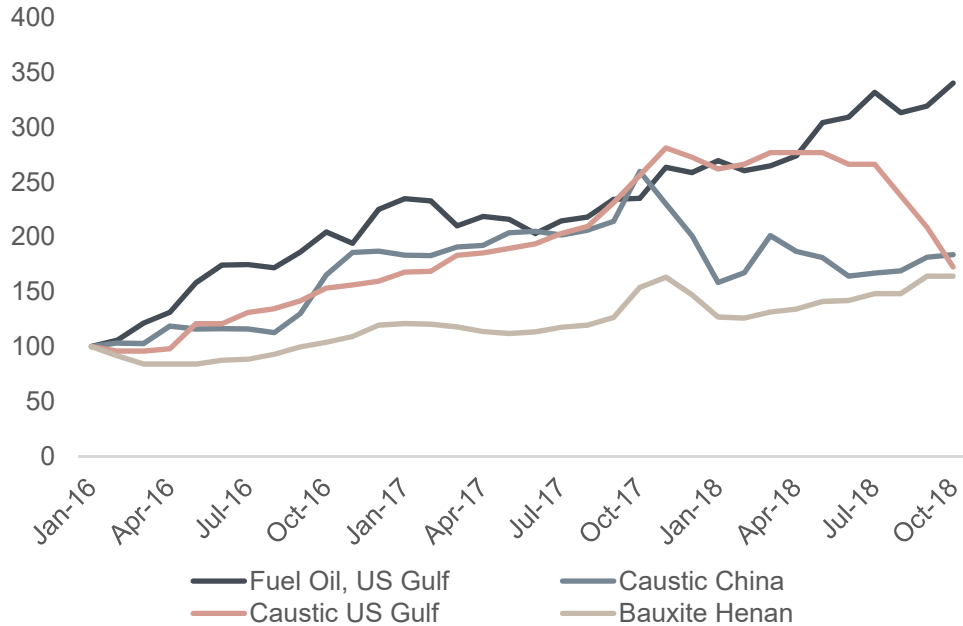
# Higher alumina costs in 2017 and 2018



Upper half of cost curve dominated by Chinese refineries

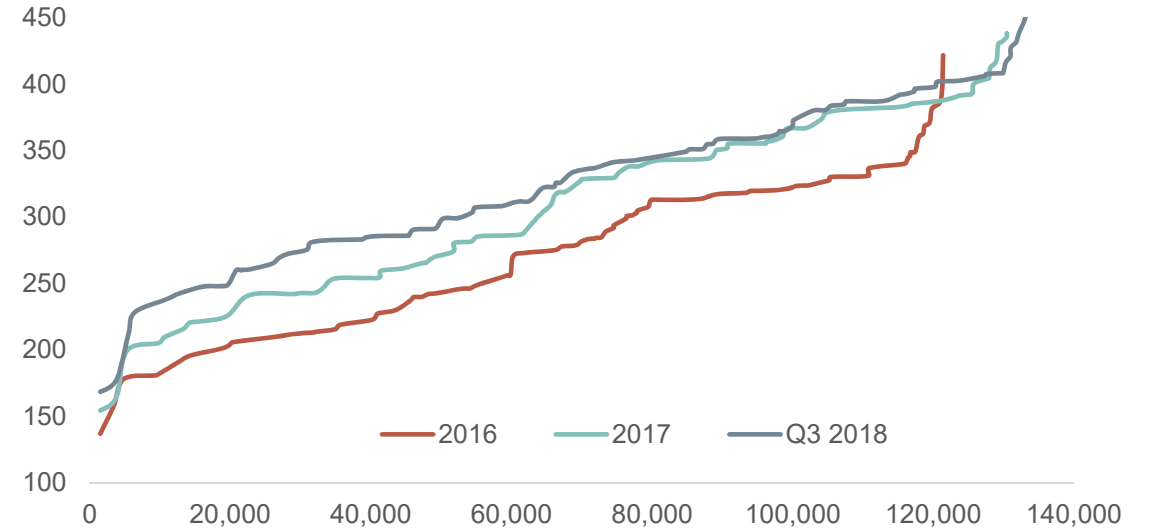
### Input costs alumina production

Index: Jan 2016 = 100



### Site Operating Costs

(USD/t) in 2018 real \$



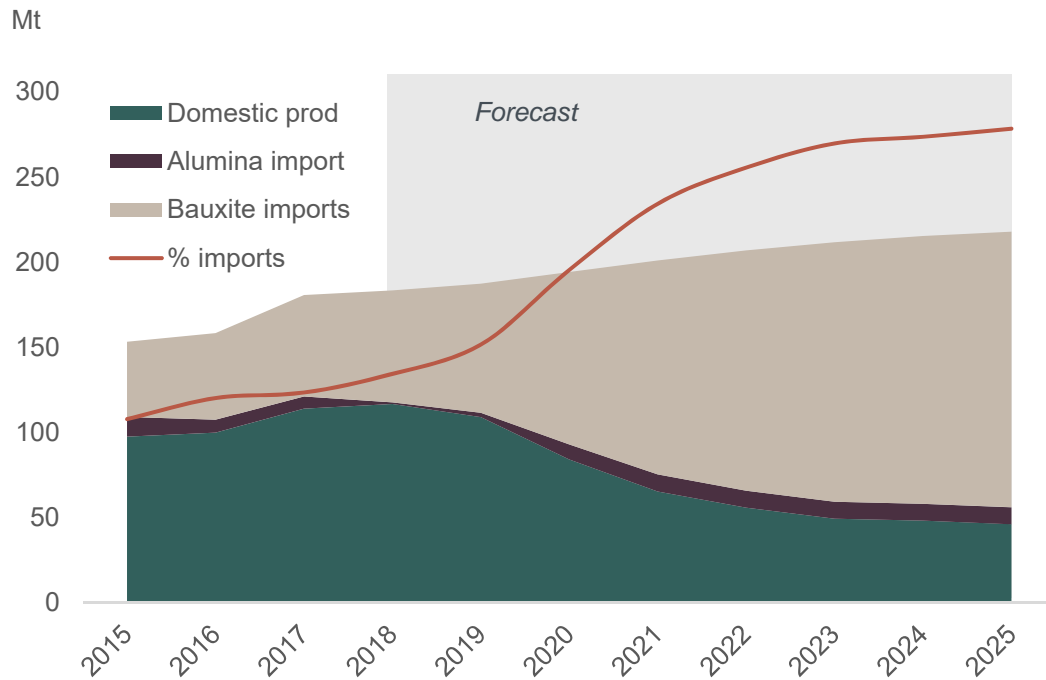
**Cost pressure in 2017 and 2018**  
 High caustic prices,  
 Chinese bauxite prices

# China increasingly reliant on bauxite imports



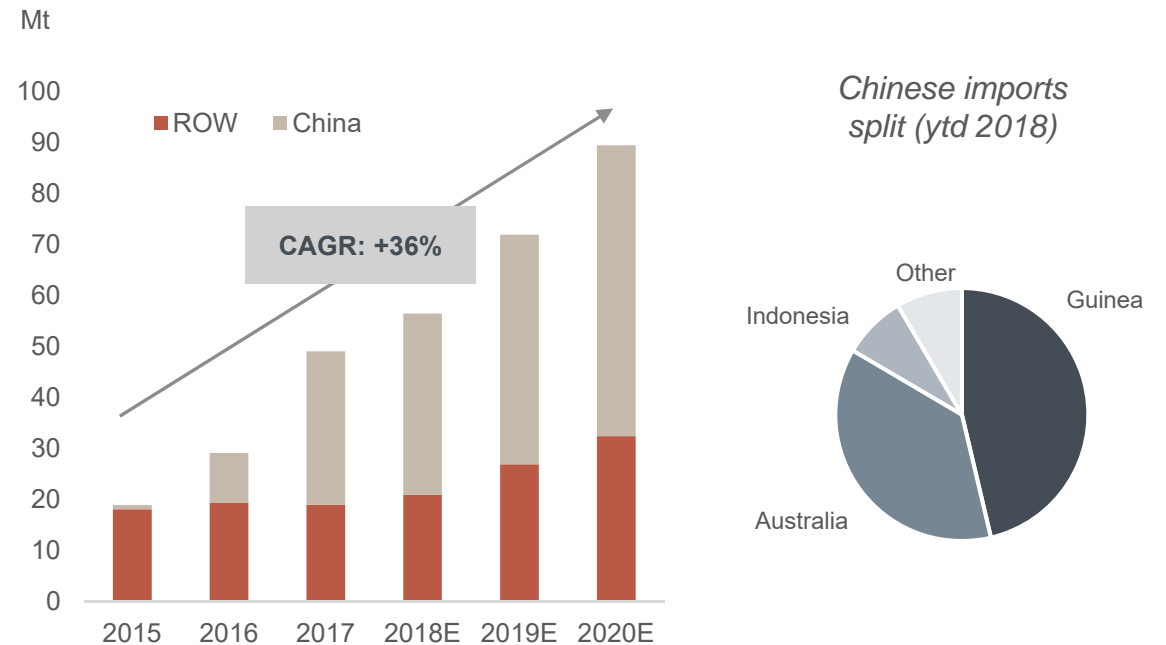
Guinea bauxite increasingly filling Chinese demand

Growing need for bauxite imports amid domestic depletion



- Increasing Chinese bauxite prices triggering more bauxite imports
  - Chinese quality deteriorating
  - Unlicensed mines closures

Guinea bauxite production increasing, but still need for other sources



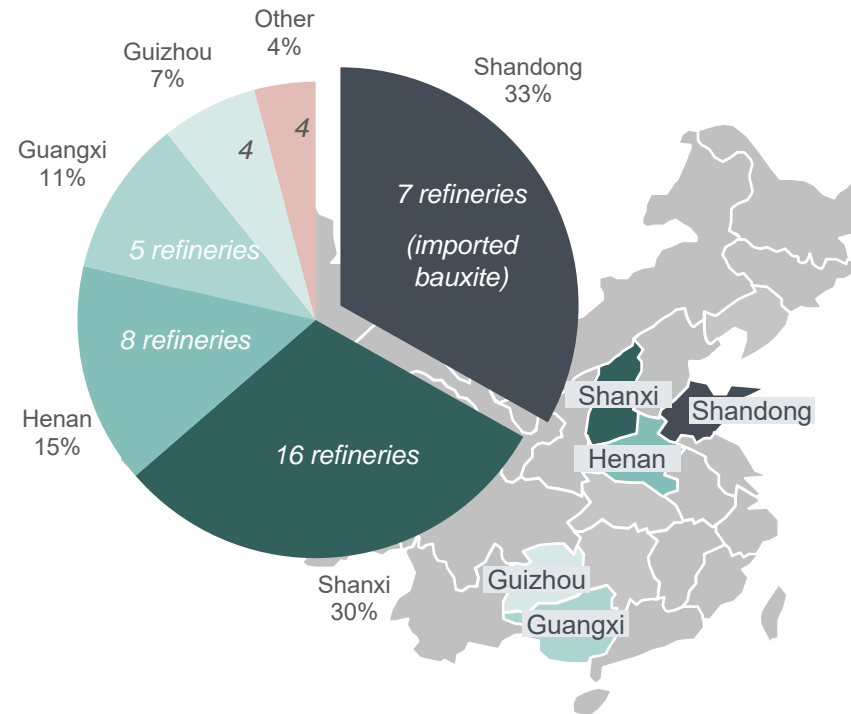
- Guinea bauxite production increasing dramatically
  - Includes non-Chinese players
  - Atlantic-sourced seaborne bauxite continues to grow, adding freight exposure

# More imported bauxite going to inland refineries

Delivered bauxite prices <sup>1)</sup>



2018 refinery production forecast: total ~73 Mt



- Extremely tight domestic bauxite market leading to price escalations for poor quality (high silica)
  - Not economic for some refineries to operate on local bauxite
- YTD September; 2.6 million tonnes of bauxite imported to 9 refineries in Henan and Shanxi
  - Incurs additional inland freight of ~ \$25/t
  - Refinery processing issues when switching bauxite type
  - Costs partially offset by low silica of imported (Guinea) bauxite

Source: China customs, CM, CRU, Hydro analysis

<sup>1)</sup> Prices index delivered at refinery (Henan = 100 in Jan 2016. Bauxite quality: Henan A/S 4.0 to 5.0, Shanxi A/S 4.5 to 5.0, Guangxi A/S 7.0 to 8.0, imported prices by CM Group)



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# Long-term outlook and summary

# Strong growth drivers across segments providing solid demand outlook

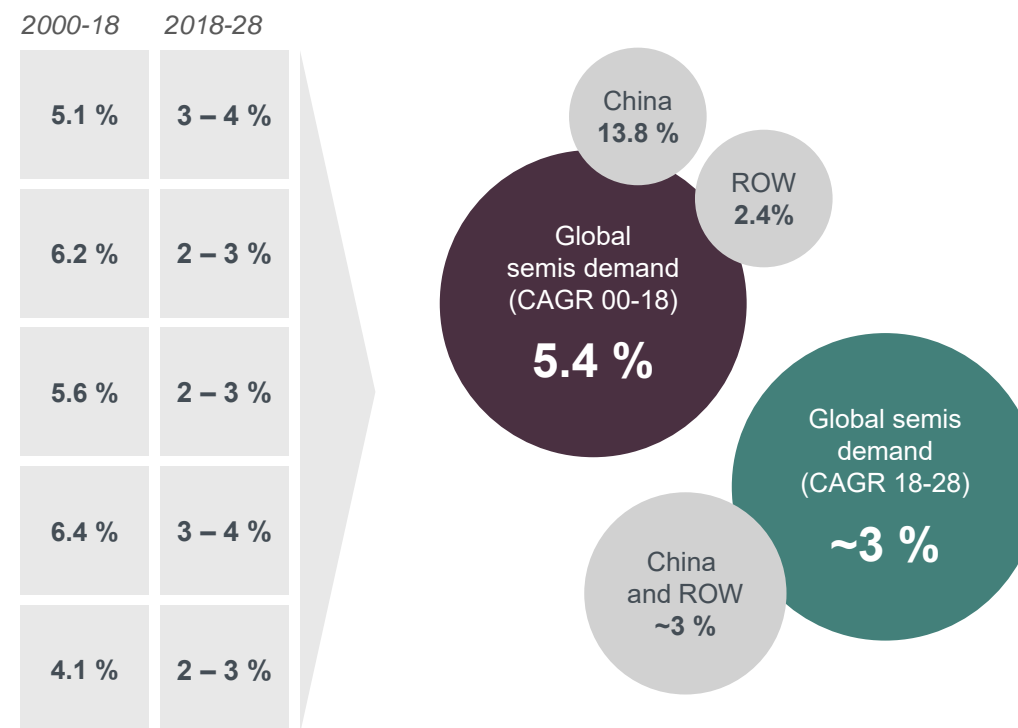


Still encouraging demand outlook from strong base – converging demand China and outside China

## Strong demand drivers in key aluminium segments

Transport	Growth in automotive vehicle production Aluminium content in cars increasing Growth in other transport modes, e.g. railway
Construction	Urbanization Housing market recovery in mature regions Energy neutral buildings
Electrical	Urbanization Copper substitution
Machinery & equipment	Improving industrial sentiment in mature regions Manufacturing activity and industrial growth in emerging countries
Packaging & foil	Urbanization Environmentally-friendly solutions

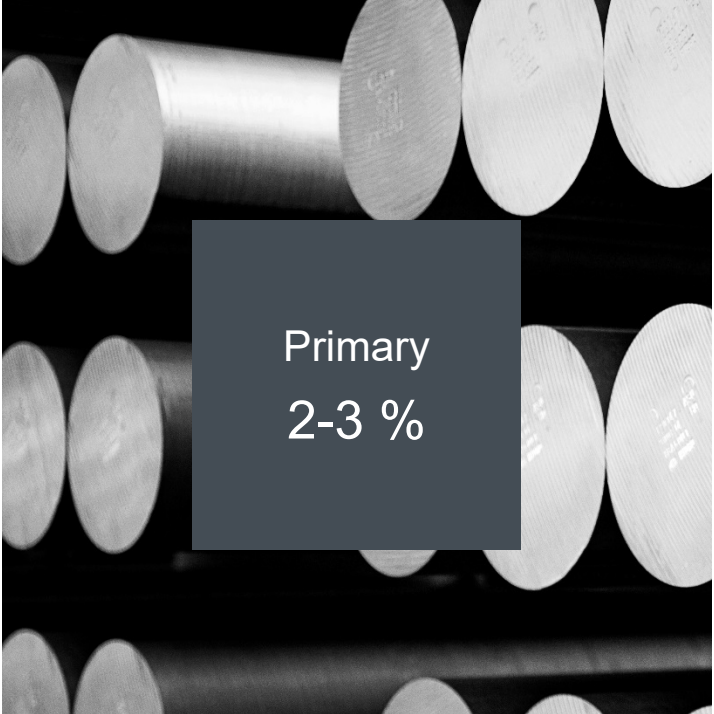
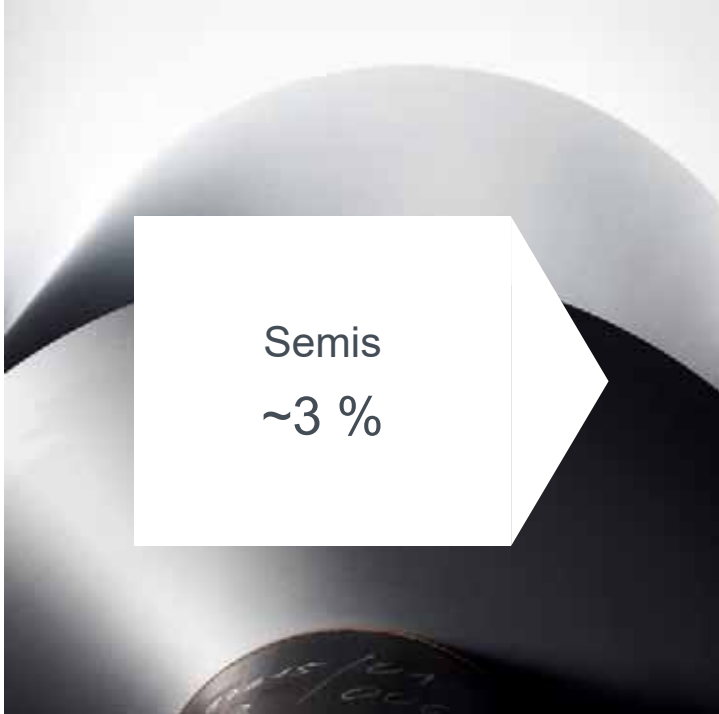
## Global semis demand per segment, CAGR



# Growth in global semis demand creates opportunities for both primary and recycled material



Solid growth for semis, primary and recycling 2018-2028



Source: CRU, Hydro Analysis  
1) Post-consumer and fabrication scrap

*Better*  
*Bigger*  
*Greener*

## Summary

- Solid long-term demand outlook, trade disputes and geopolitical tensions adding uncertainty
- Global primary market in deficit in both 2018 and 2019
- Chinese metal exports facing headwinds in key consumer regions
- China increasingly dependent on imported bauxite, Guinea as key supplier
- Recycling growth accelerating with increased generation of post-consumer scrap