CHINA'S ALUMINIUM VALUE CHAIN

QUARTERLY UPDATE Q4 2018

JANUARY 2019

BAUXITE

- CBIX ViU up 2% in Q4 2018 to average US$51.3/dmt. Total 2018 Chinese bauxite imports at 82.6Mt up 21% on 2017. Guinea bauxite again topped the import volume list in Q4, up 5% QoQ to 9.3 Mt. Indonesian bauxite made a strong return to the Chinese market, up 42% QoQ to 2.5 Mt. Malaysian ban extended for a 7th time to end March 2019, with existing stockpiles to be moved before mining can recommence.
- Domestic bauxite prices trended higher for most of Q4, before falling marginally end-December. As some mines acquired appropriate permits and licenses and resumed normal production, domestic bauxite supply tightness began to ease. Despite this, some inland refiners continued to import bauxite, which partially undermined the returning domestic supply, placing pressure on domestic ore prices. Henan, Shanxi, Guizhou and Guangxi witnessed average price increases during Q4, up 4.9%, 2.8%, 3% and 11.8% QoQ respectively.

ALUMINA

- 2018-2019 winter cuts program has had less impact than the previous program, with alumina and primary Al curtailment estimated at 330kt and 70kt respectively for the period Nov 15 to Dec 31, 2018, down by 63% and 50% YoY respectively.
- Domestic alumina prices continued to move higher during the first half of Q4, before heading lower over the remainder of the quarter. Q4 average prices declined 0.03% QoQ to RMB 3,089/t (incl. VAT) (US$447/t) in Northern China.
- China's Q4 alumina exports reached 920kt, up 208% QoQ. Annual alumina exports totaled 1.46 Mt.
- Alumina exports started to fall in October, due to the arbitrage window between China and ROW prices closing in October, as ROW prices began to fall.
- Guizhou's average refining cost surpassed Shandong for the first time, as domestic bauxite prices pushed costs higher. Of the four major domestic refining provinces only Guangxi has a lower average refining cost than Shandong (imported Bx). Almost all refiners were profitable for the quarter.

PRIMARY ALUMINIUM

- China's Changjiang spot price trended lower over the quarter, averaging RMB 11,916/t (excl. VAT), down 5.1% QoQ.
- Average primary Al smelting costs increased by 2% on extra fees imposed on captive power plants.
- Lower prices and increased costs resulted in an estimated 55% of Chinese smelters being cash negative during Q4.
- China's Q4 primary Al production fell by 1.5% to 9.14 mln t, due to cuts at high-cost smelters in Henan, Gansu and Qinghai.

FEATURE ARTICLE

- Slowing growth and trade tensions with the US are pointing towards a further slow-down in the Chinese economy. On the flip-side, growth in primary Al demand in sectors such as electric vehicles and high-speed rail look promising. How will 2019 and beyond likely play out for the Al industry? CM examines the trends impacting China and their implications for the Al supply chain, from bauxite through to primary Al.

USD:RMB 6.92	Unit	Q4 '18	QoQ%	YoY%
Key Prices - Bauxite, Alumina and Primary Al (Q4 average)				
Bx - CBIX ViU	US$/dmt	51.3	2.0%	2.4%
Aa - CMAAX - N	US$/t	447	0.03%	-14.2%
Aa - CMAAX - S	US$/t	450	2.4%	-12.0%
Al - Changjiang	US$/t	1,727	-5.1%	-12.1%
Al - LME	US$/t	1,970	-4.2%	-6.2%
China Bauxite Imports - by Country				
Guinea	Mln T	9.3	5%	24%
Australia	Mln T	7.3	-12%	8%
Indonesia	Mln T	2.5	42%	180%
Brazil	Mln T	0.6	37%	-20%
Other	Mln T	1.3	-18%	-20%
China Total Alumina Supply				
Production	Mln T	18.1	1.7%	5.4%
Import	kt	110	120%	-83%
China Alumina Exports				
Export	kt	922.7	208%	6704%
China Total Primary Al Supply				
Production	Mln T	9.1	-1.5%	2.9%
Import (net)	kt	0	-	-
China Average Production Costs				
Alumina	RMB/t	2,144	8.6%	14.6%
Primary Al	RMB/t	13,108	4.9%	16.0%

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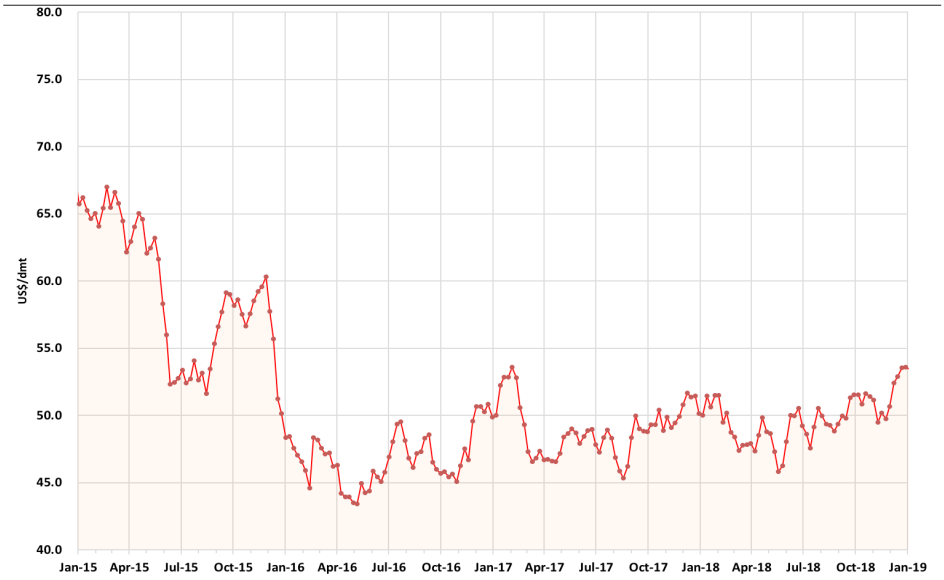
Q4 Average of CBIX	
US$ 51.3/dmt	(2.0% QoQ)
Q4 Lowest	
US$ 49.3/dmt	
Q4 Highest	
US$ 54.4/dmt	
2018 Lowest	
US$44.9/dmt	
2018 Highest	
US$ 54.4/dmt	

FIGURE 1 Imported Bauxite Price - CBIX (US$/dmt) (thebauxiteindex.com)



CBIX ViU-BAUXITE PRICES

ViU prices were up 2% over Q4 2018 to average US$51.3/dmt. Cargo's from Alufer's newly operational 5MTPY Bel Air mine (Guinea) started landing in China, at US$52.6/dmt ViU adjusted (US$57.0/dmt unadjusted). Solomon Islands bauxite was again the lowest priced source, at US$36.2/dmt ViU adjusted (landed US$48.5/dmt unadjusted) – ViU adjusted some US$3/dmt higher than Q3 2018.

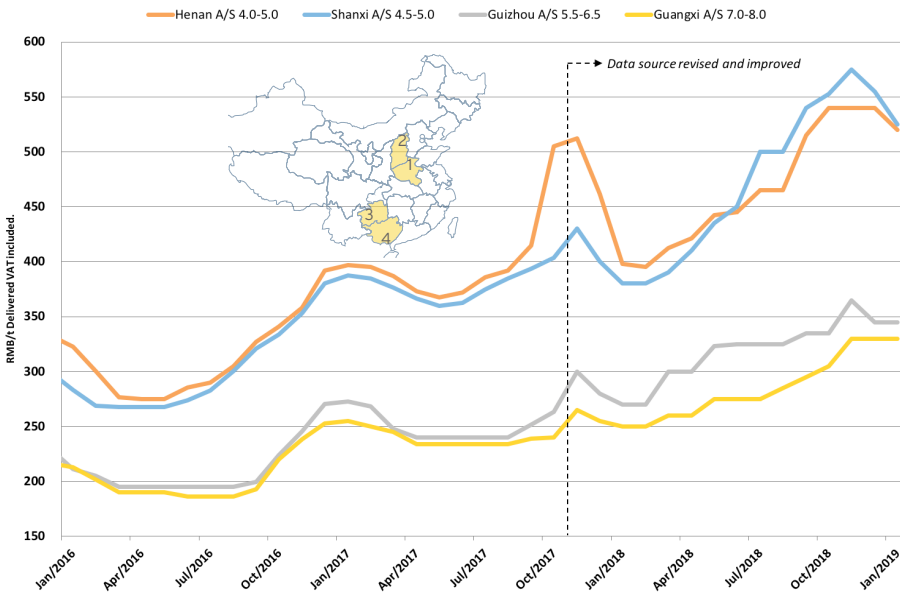
DOMESTIC BAUXITE PRICES

China's domestic bauxite prices continued to move higher during Q4 2018, with record highs being reached constantly, although they were tempered by some mild decreases by end December. October and November saw mainstream prices in China increase on tight supply, which even forced some refineries to cut production on bauxite shortage. Under these circumstances, a number of inland refiners imported bauxite on the basis of supplementary blending feed with domestic ore, although some refiners ceased the practice given unsatisfactory results from processing imported bauxite. Most refiners remain clearly in favour of domestic bauxite.

Late Q4 saw some temporary relaxation of environmental regulatory requirements, particularly in Shanxi, leading some mines to resume normal operation after acquiring appropriate licenses and approvals, resulting in increased supply and lower prices. Henan, Shanxi, Guizhou and Guangxi witnessed continuous price increases in Q4, up 4.9% , 2.8%, 3% and 11.8% QoQ respectively.

FIGURE 2 Domestic Bauxite Price (Delivered RMB/t Bauxite Including VAT)*

	Province	A/S Ratio	End Q4
1	Henan	4.0-5.0	450-630
2	Shanxi	4.5-5.0	480-630
3	Guizhou	5.5-6.5	320-370
4	Guangxi	7.0-8.0	310-350

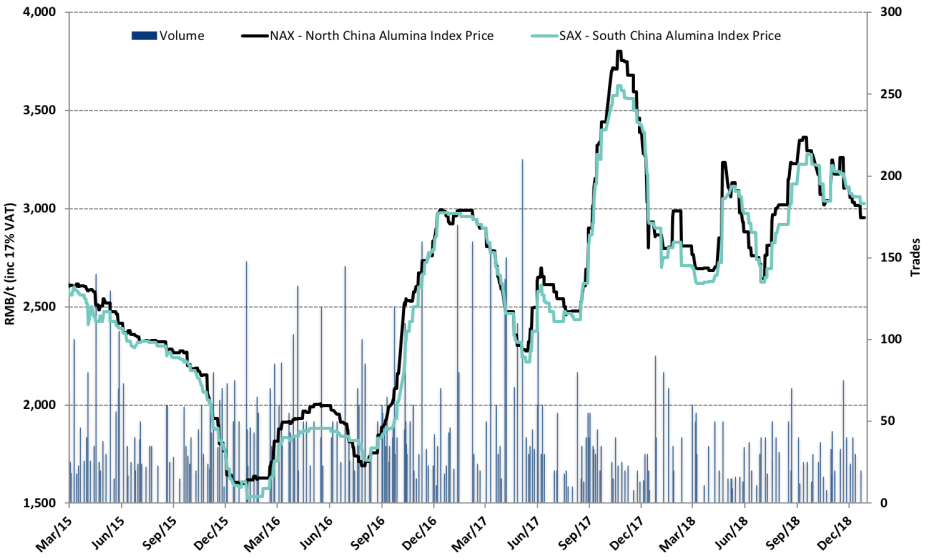


* Monthly average, Delivered, VAT included.

Source: CM

Q4 Average - North China - NAX (Incl. VAT)
RMB 3,089/t ~ US$ 447/t (-0.03% QoQ)
Q4 Average - South China - SAX (Incl. VAT)
RMB 3,111/t ~ US$ 450/t (4.1% QoQ)
Q4 Lowest - NAX
RMB 2,953/t
Q4 Highest - NAX
RMB 3,259/t
2018 Lowest - NAX
RMB 2,645/t
2018 Highest - NAX
RMB 3,364/t

FIGURE 3 Alumina Price - CMAAX (RMB/t incl. VAT) (thebauxiteindex.com)



ALUMINA PRICES

Domestic alumina prices increased until mid-quarter, over production losses as a result of bauxite shortage and winter cut policy. However, the trend didn't last for the quarter, with the second half seeing price fall, as exports dried up and anticipated winter cuts were less severe than originally anticipated.

CMAAX north alumina index rose from RMB 3,019/t to RMB 3,259/t, then retreated to RMB 2,953/t by end Q4. Q4 average price ended virtually unchanged from Q3, up 0.03% QoQ to RMB 3,089/t (incl. VAT) (US$447/t) in North China.

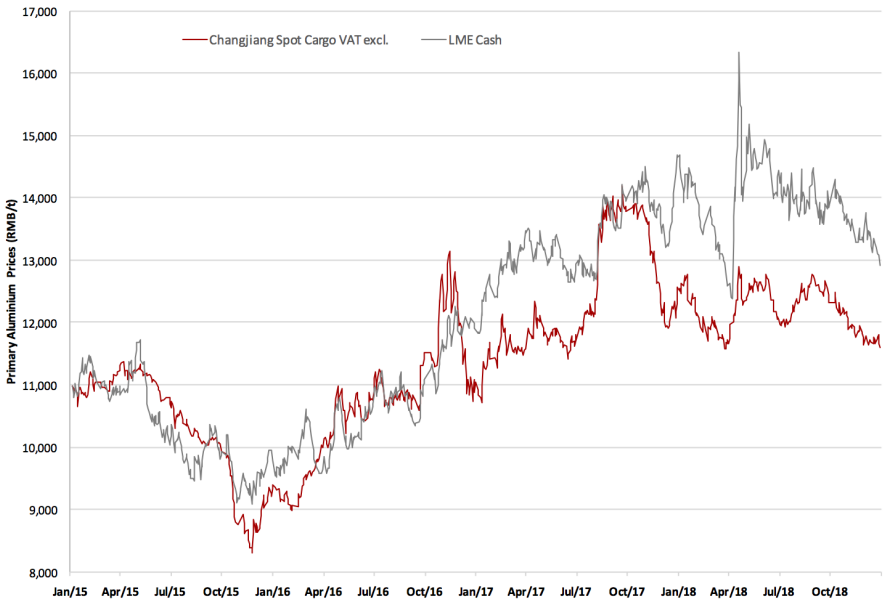
Outside China, WA FOB alumina prices continued falling, from US$525/t in early October to US$412/t by end December. China's alumina exports had all but ceased by the end of the quarter.

DOMESTIC CAUSTIC PRICES

Caustic soda prices in Shandong averaged at RMB 2,700/t (100% NaOH equivalent, delivered Shandong, VAT excl. delivered) during Q4, up 2.4% QoQ.

Changjiang Q4 Average
RMB 11,916/t ~ US$ 1,727/t (-5.1% QoQ)
LME Q4 Average
RMB 13,593/t ~ US$ 1,970/t (-4.2% QoQ)

FIGURE 4 Primary Aluminium Prices LME vs Changjiang (RMB/t excl. VAT)



PRIMARY ALUMINIUM PRICES

With Hydro unsuccessful in its attempts to restart Alunorte and the US delaying the deadline for sanctions against Rusal, LME prices trended lower over the quarter, from US$ 2,047/t at the beginning of Q4 to US$ 1,869/t by quarter's end.

Domestic prices followed a similar downtrend due to falling downstream demand and lower alumina prices. Production cuts from winter cuts exerted little influence on prices over the quarter.

FIGURE 5 Historic Bauxite Import By Country with China's Bauxite Stock (Mln t)

China's Q4 Imports by Source

Guinea

9.3 mln t (5% QoQ) (24% YoY)

Australia

7.3 mln t (-12% QoQ) (8% YoY)

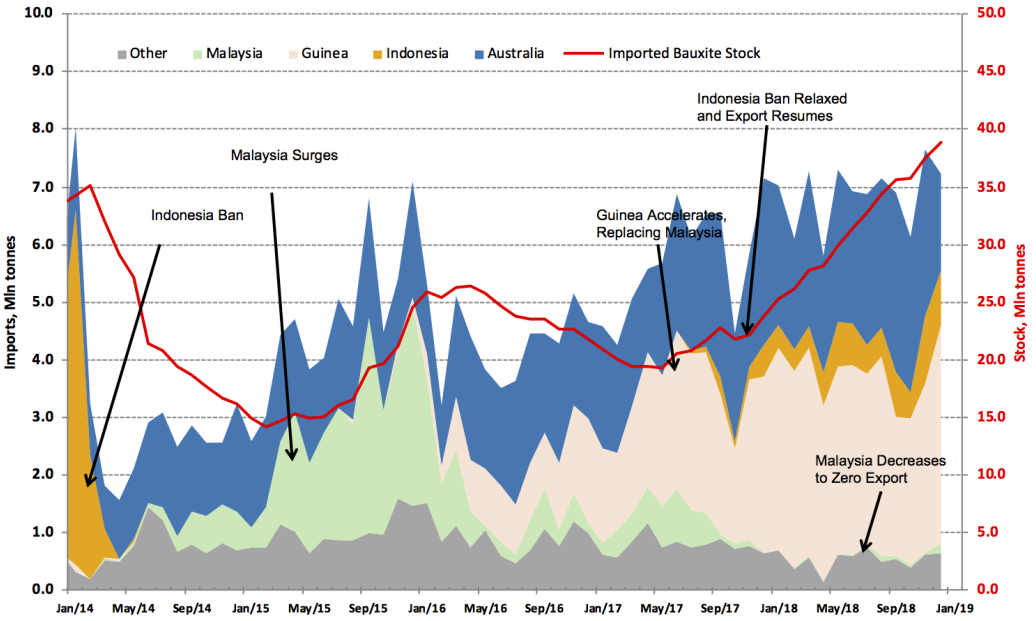
Indonesia

2.5 mln t (42% QoQ) (180% YoY)

Brazil

0.6 mln t (37% QoQ) (-20% YoY)

Source: CM, China Customs



Guinea exports increased buoyed by the startup of Alufer bel Air

China bauxite imports up 0.09Mt (0.4%) QoQ to 21.0Mt driven by increased imports from Indonesia (up 0.7 Mt or 42%) and Guinea (up by 0.5Mt or 5%) to 9.3Mt.

Australia's exports fell 1.0 Mt or 12% QoQ as RTA transitioned production from the depleted East Weipa mine to the newly commissioned Amrun mine. Moreover, it was the local rainy reason during the quarter with bauxite production restricted.

Metro Mining completed its maiden production year and commenced a planned shutdown for the Nth Qld wet season. Australia accounted for 35% of total imports in Q4.

Guinea (44% of total imports) was buoyed by the start of Alufer Bel Air which exported an estimated 0.95Mt (dry) for the quarter and is on track for planned production of 5Mt in 2019.

Indonesian exports ramped up, as Xinfa and Chalco increased purchases and miners sought to export ore to the limit of their 2018 export quotas before they expired end 2018.

FIGURE 6 Imported Bauxite Inventory

Stock (End of Q4 2018)

38.9 Mln t

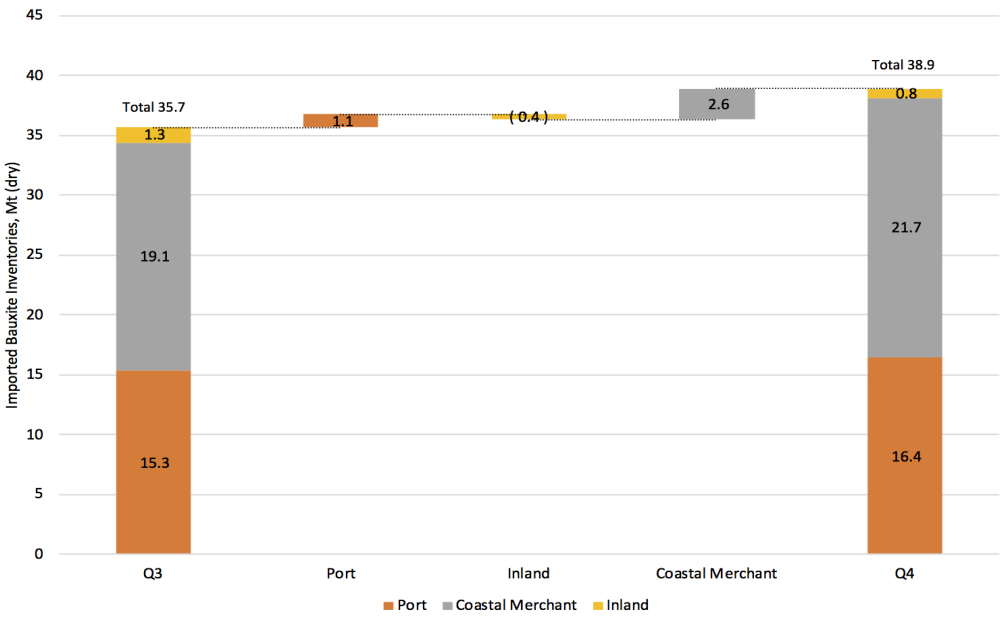
Weeks of Supply

29

Bauxite Stocks Increase 9%

Increasing imports, particularly from Guinea and Indonesia, added to China's already large imported stockpile, estimated to have increased 3.2Mt or 9% QoQ to 38.9Mt (dry). This represents 29 weeks equivalent supply, up from 27 weeks end Q3.

Stocks held by domestic inland producers are estimated to have dropped slightly, while those at ports and coastal merchant refineries have swelled.



Source: CM, China Customs

2018-2019 Winter Cut Program

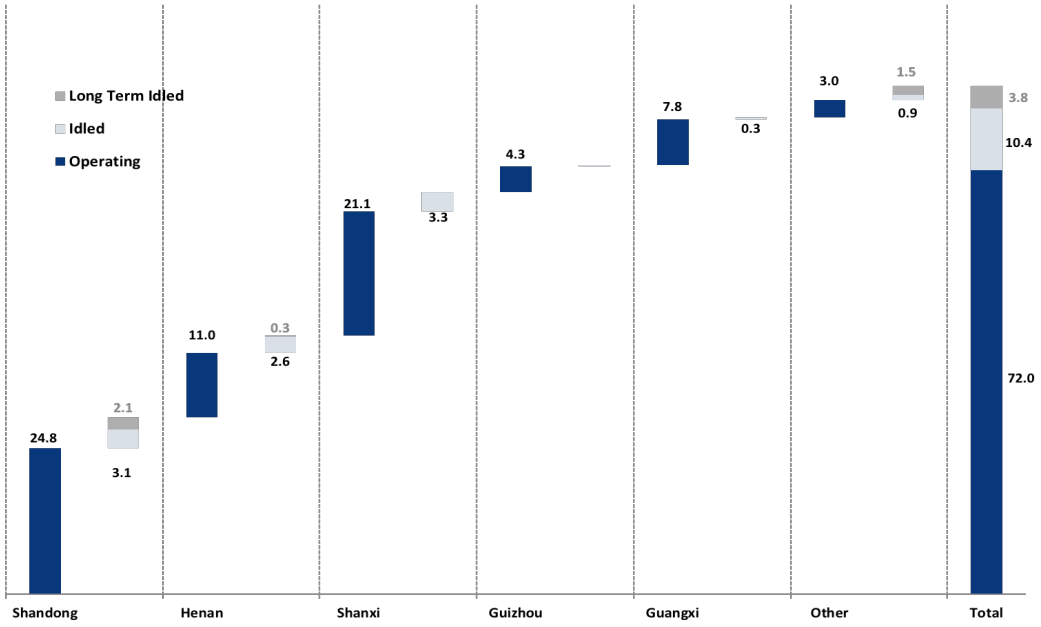
Local governments issued detailed 2018-2019 winter cut policies in succession, which turned out to have had little impact on alumina and primary Al production. During the period Nov 15 to Dec 31, 2018, net alumina production curtailment was estimated at 330kt, down by 63% from 892kt compared with the same period last year, as some new projects (2 MTPY alumina projects from Xiaoyi Xinfa and East Hope Lingshi) came on stream in Shanxi and refineries in Shandong did not implement the policy during the quarter. Meanwhile, the impacted aluminium production reached 70kt, down by 50% YoY.

Alumina production increase

China's Q4 alumina production rose 1.7% QoQ to 18.1 mln t. Alumina production in Shandong and Shanxi increased, while production from other provinces recorded falls during Q4. Although local governments in Shandong released their own winter cut policies, most impacted refiners ran normally. Meanwhile in Shanxi, impacted refiners cut production in accordance with the winter cut policy, while others lifted production over easing bauxite supply tightness, offsetting production losses and resulting in a net increase. The 1 MTPY expansion project of Xiaoyi Xinfa came on stream end-September and operated at full capacity during Q4.

FIGURE 7 China Alumina Capacity Status (MTPY)

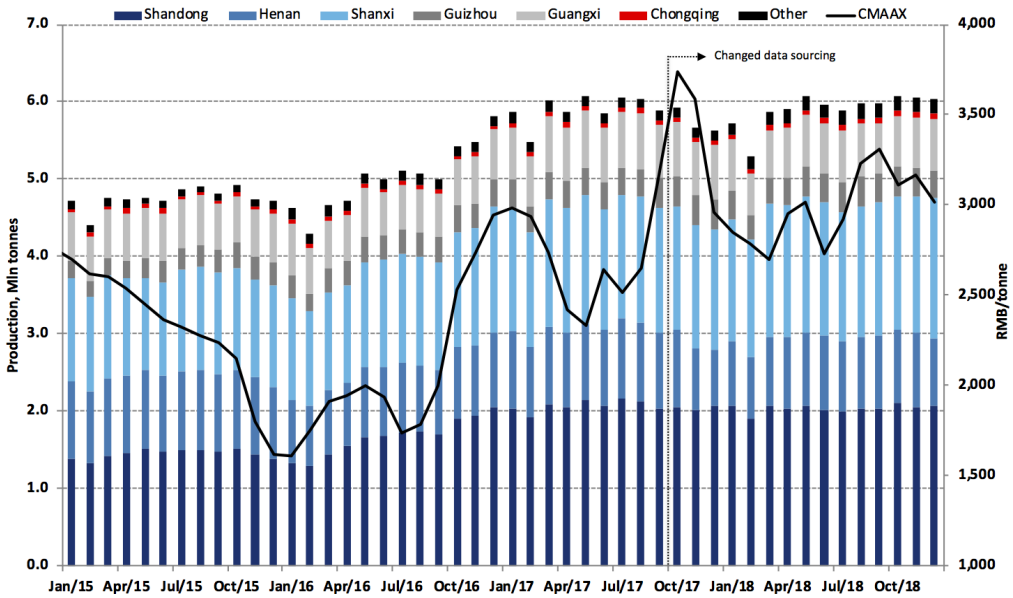
Province	Operating QoQ - MTPY	Idled QoQ - MTPY
Shandong	0.6	-0.6
Henan	-0.1	0.1
Shanxi	1.1	0.9
Guizhou	-0.3	0.3
Guangxi	-0.1	0.1
Other	0	0
QoQ Change	1.2	0.8



Source: CM

FIGURE 8 Monthly Alumina Production by Province & Price (mln t, %)

Q4 Production by Province	
Shandong	
6.24 mln t	(2.6% QoQ)
Shanxi	
5.32 mln t	(5.3% QoQ)
Henan	
2.76 mln t	(-0.6% QoQ)
Guangxi	
1.96 mln t	(-1.4% QoQ)
Guizhou	
1.01 mln t	(-5.8% QoQ)
Other	
0.55 mln t	(-2.8% QoQ)



Source: CM

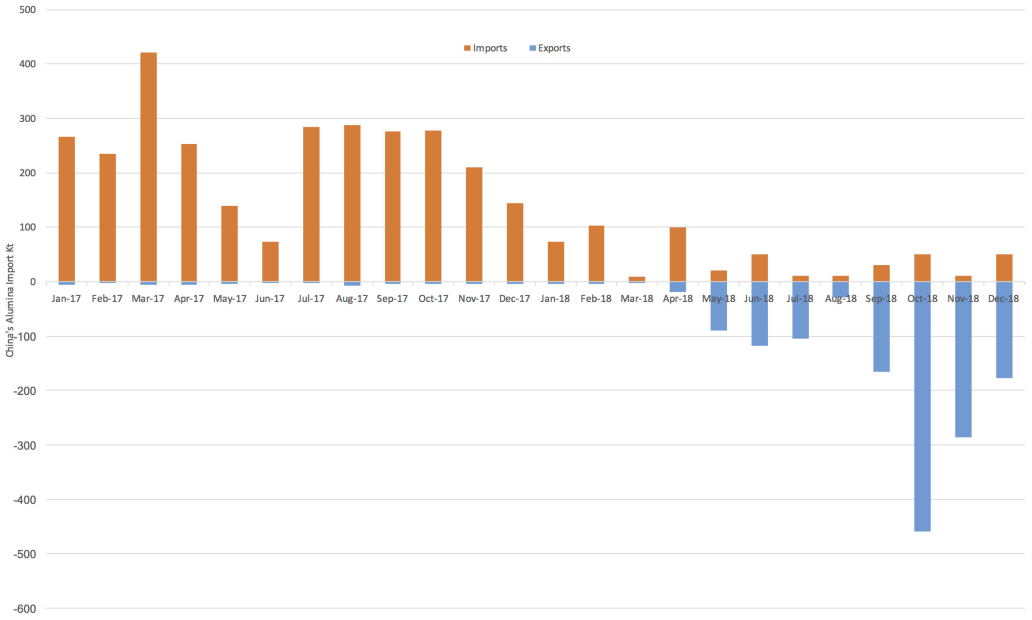
China's alumina exports hit a new record

China's Q4 alumina exports reached 920 kt, up 208% QoQ. However, the price gap between Chinese and ROW prices narrowed in November, closing the export arbitrage window and making Chinese producers less interested in exporting the material. Exports subsequently stopped.

China exported a total of 1.46 Mt in 2018, while the imports were almost 515 kt.

FIGURE 9 **Alumina Imports by Source Country** (kt)

Q4 Imports	
110 kt	(120% QoQ)
Q4 Exports	
923 kt	(208% QoQ)



Source: China Customs

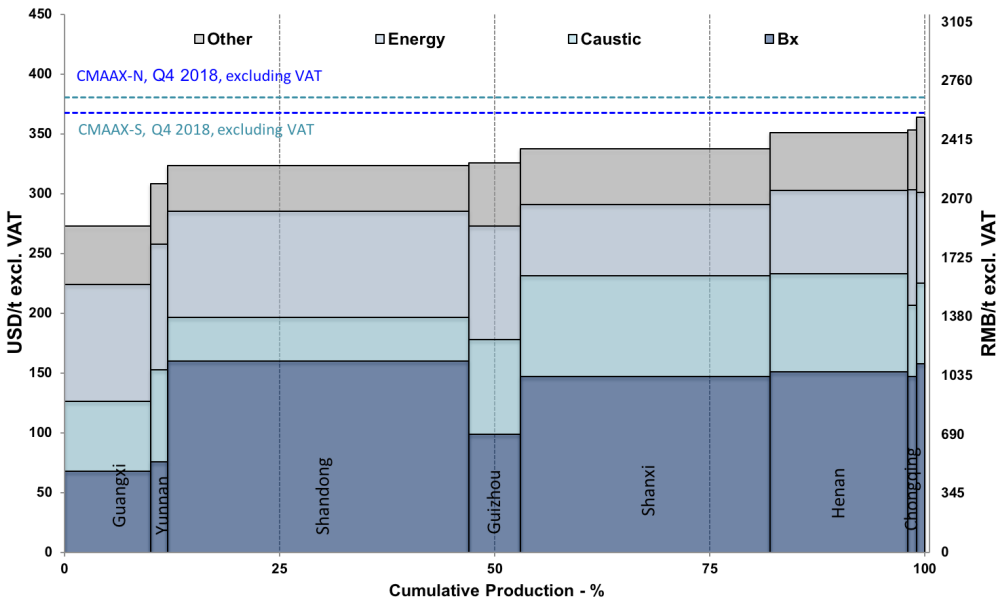
Guizhou Surpassed Shandong on Average Costs

Average alumina refining costs increased 1% QoQ on higher domestic ore prices. Bauxite input cost increased by 6% in Guizhou due to environmental inspections and local bauxite trade flow to Henan. As a result, Guizhou surpassed Shandong for the first time in terms of Q4 average refining costs.

Given the high alumina prices during Q4, 96% of Chinese refineries remained cash positive.

FIGURE 10 **Alumina Cost Curve Excl. VAT by Province** (US$/t, RMB/t)

Cost	Q4 '18	QoQ%	YoY%
Shandong	324	-4.2%	-2.7%
Guangxi	273	-1.5%	7.0%



Source: CM

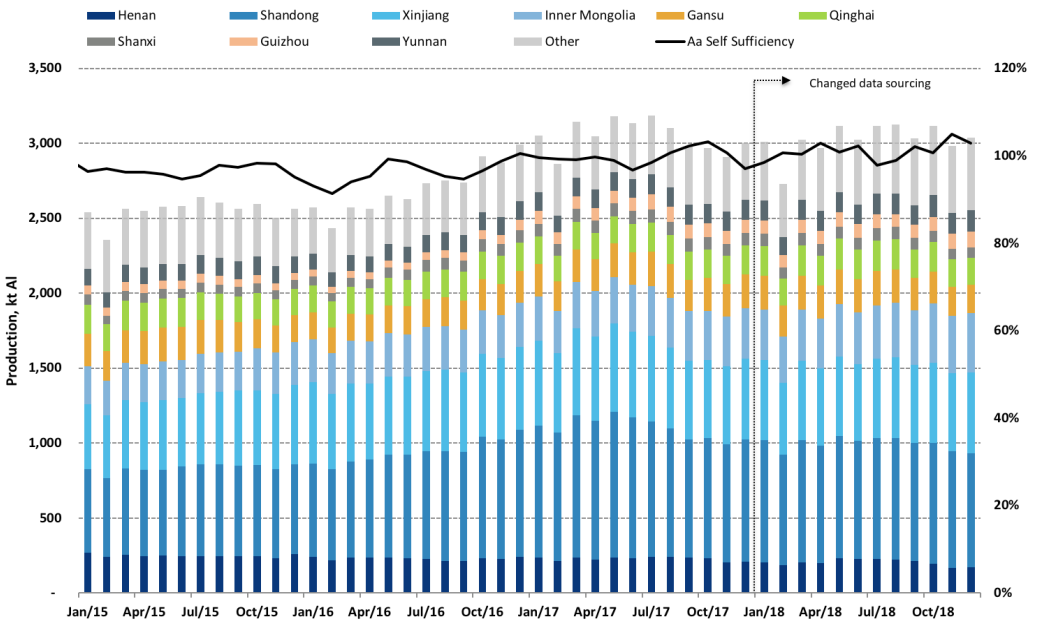
Primary Al Production Lower, Production Cuts Implemented

China's primary Al production fell during the quarter, down 1.5% QoQ (0.14 mln t) to 9.14 mln t, mainly attributable to production curtailments in Henan, where Linfeng and Shenhuo relocated their capacity to Sichuan and Yunnan. Production cuts were also seen in Gansu, Qinghai and Shanxi due to high losses. Weiqiao was said to start implementing its winter cut in December, which is likely to see primary Al production continue to decrease in January 2019.

FIGURE 11 Monthly Primary Aluminium Production By Province (Kt)

Q4 Production by Province	
Shandong	
2.35 mln t	(-2.3% QoQ)
Xinjiang	
1.59 mln t	(0.3% QoQ)
Inner Mongolia	
1.17 mln t	(8.2% QoQ)
Gansu	
0.60 mln t	(-10.9% QoQ)
Henan	
0.53 mln t	(-19.7% QoQ)
Other	
2.90 mln t	(1.0% QoQ)

Source: CM



Smelters under Pressure due to Low Margins

The Q4 weighted average cost increased RMB 247/t, up 2% QoQ, while the Changjiang aluminium price dropped 5.1% over the quarter. An estimated 45% of smelters were cash positive during Q4, mainly those operating in Xinjiang and Shandong, taking advantage of lower electricity prices.

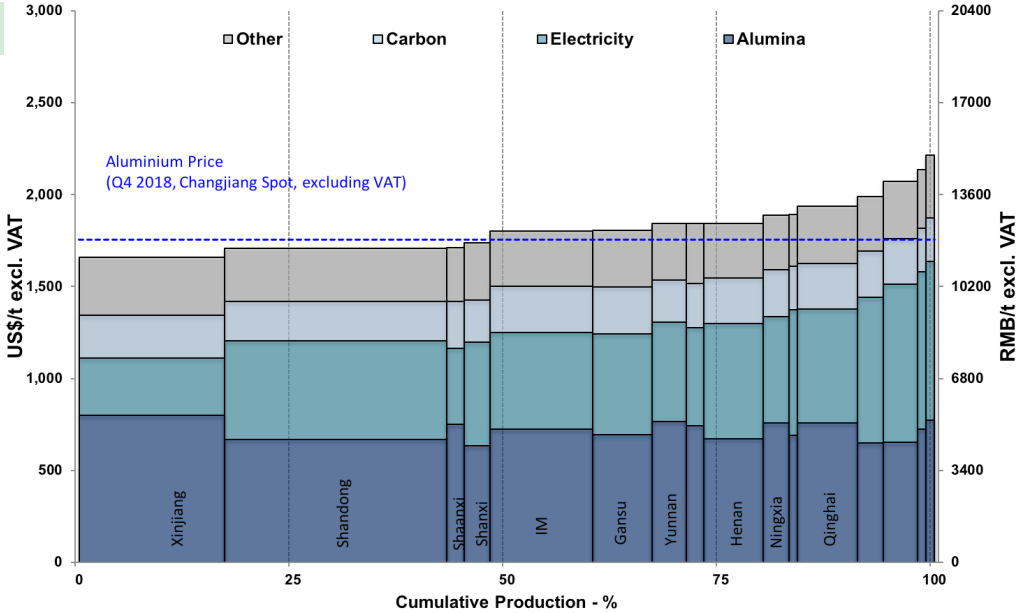
With high coal prices and extra fees imposed on captive power plants, captive thermal power prices became less competitive than hydroelectric power prices and negotiated prices for thermal power from third party suppliers.

Alumina prices are becoming the most significant cost driver in total smelting costs. As a result, smelters with integrated alumina supply are likely to be more competitive in the future.

FIGURE 12 Primary Aluminium Cost Curve Excl. VAT by Province (US$/t, RMB/t)

Cost	Q4 (US$)	QoQ%	YoY%
25th Percentile	1,708	3.2%	-5.8%
75th Percentile	1,847	-1.4%	-5.9%

Source: CM



ALUMINIUM: A BEARISH OUTLOOK IN THE CONTEXT OF CHINA'S MACRO-ECONOMIC SLUMP

The second half of 2018 saw a slowdown in the global economy, during which the US Federal Reserve raised interest rates multiple times and an escalation of the China-US trade war constantly made world headlines. At home, China's economy came under mounting pressure, with the first three quarters featuring consecutive falls in official GDP growth rates, from 6.8% to 6.5%, as well as in the growth rates of its value added industries. Q4 GDP growth slowed further, to 6.4%. Additionally, the PMI, an indicator of manufacturing industry prosperity, also experienced decreases for five consecutive months during 2018.

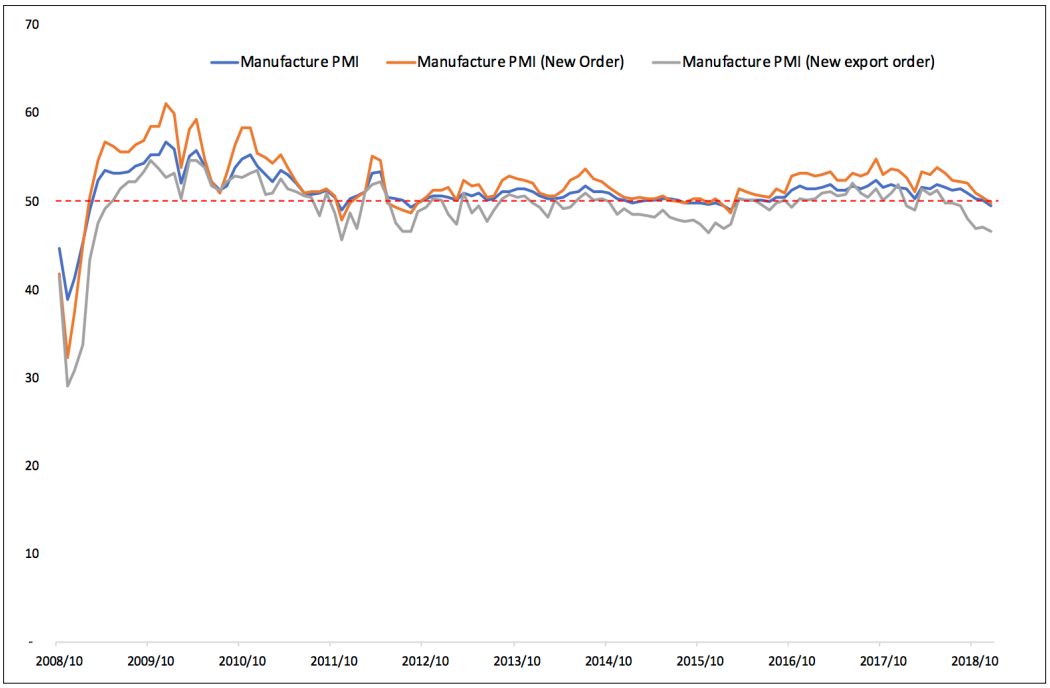
Going forward, China seems likely to continue its gradual slowing of economic growth and, in this context, demand growth for primary aluminium is also forecast to weaken.

1. Macro-economic Environment: Neutral to Short

China December manufacturing PMI fell below the key 50 mark, its lowest level in the past 34 months, and manufacturing PMI with export orders fell further in Q3 2018, as a result of the trade war between China and the U.S. Given strengthening international trade friction and slower economic growth, manufacturing prosperity slackened and, in our view, is unlikely to improve in the near term.

FIGURE F1
China's manufacturing PMI (%)

Source: China Federation of Logistics & Purchasing

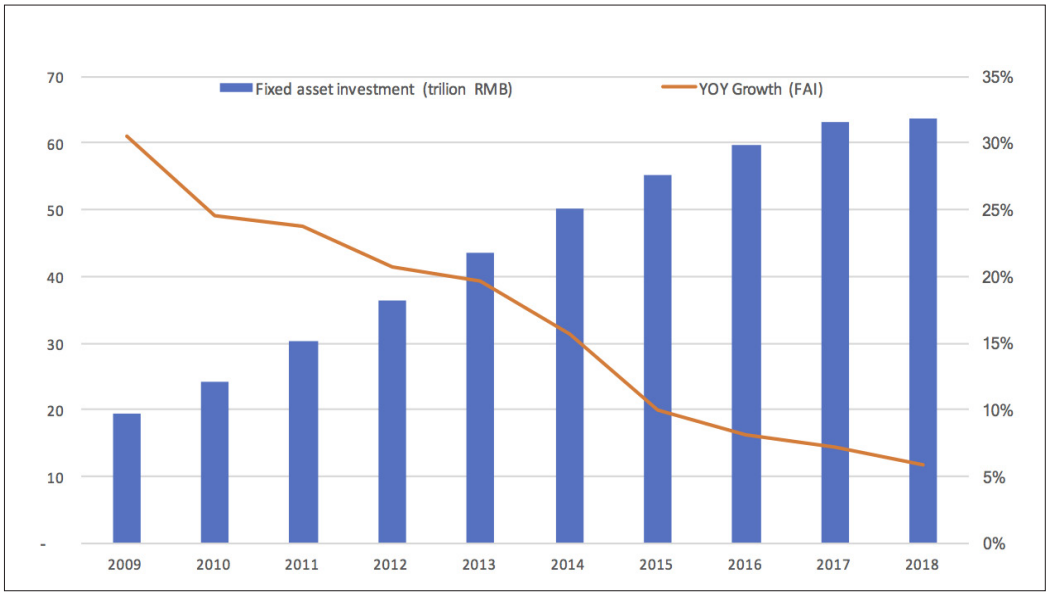


China's fixed asset investment growth also continued to slow, with investment reaching RMB 64 trillion in 2018, up only 6% YoY, mainly due to the slow growth from infrastructure investment. Supported by government policy, infrastructure investment is likely to increase, while manufacture and real estate investment growth may decline. As a result, total investment will struggle to rise significantly.

FIGURE F2

China's Fixed Asset Investment (Trillion RMB)

Source: NBS



In China's industrial sectors, major consumers of primary aluminium are construction, transportation, packaging, electronics and electric power infrastructure. Most of these industries underperformed during 2018, with the domestic real estate market in a slump, a clear reduction in sales of automobiles and limited contribution to primary Al consumption from the electric power industry. Against the backdrop of slowing economic growth, both within and outside China, 2019 is forecast to see only moderate growth in primary Al demand from the major end-user markets.

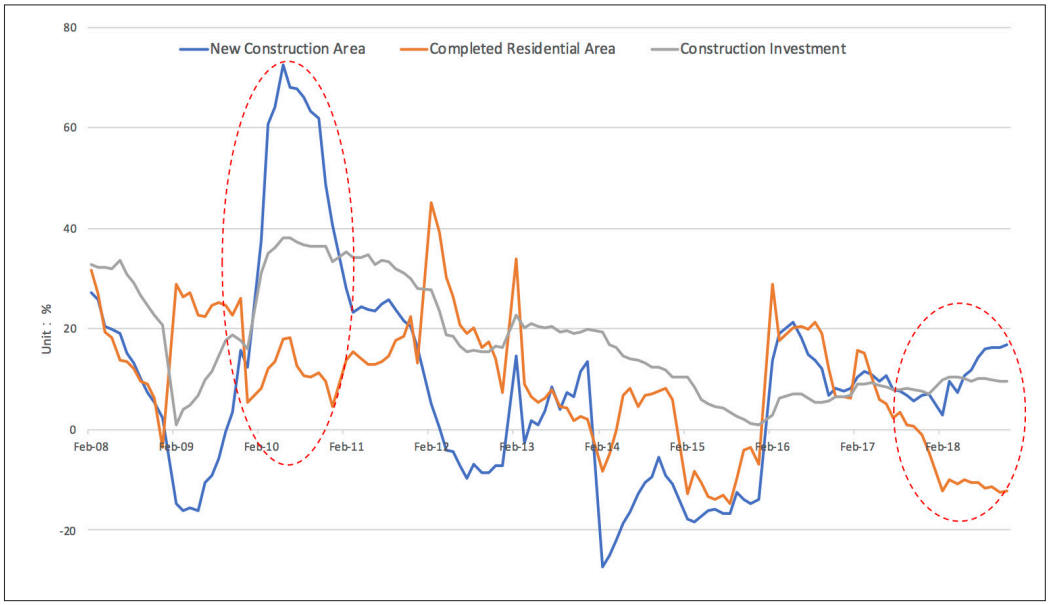
1.1 Real Estate

Accumulated acreage of real estate construction commenced over the first 11 months of 2018 continued to increase in comparison with the same period in 2017, while accumulated acreage of completed real estate continued to decrease. Going forward, as more real estate buildings are completed (although at the end of construction boom), 2019 is likely to see reasonably strong demand for primary Al. However, with governments persistently tightening their regulations over the real estate industry, and the continuous deleveraging of residential loans, the era of high-speed growth in the real estate sector has come to an end and, therefore, this sector is forecast to make a limited contribution to the growth of primary Al demand.

FIGURE F3

China's Accumulated Investment Growth on Real Estate (%)

Source: NBS



1.2 Transportation

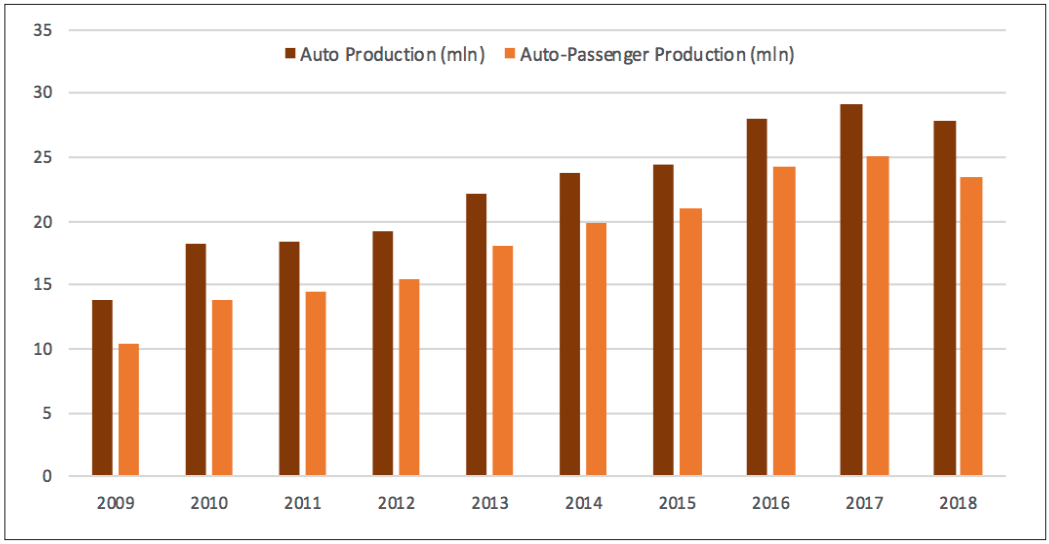
1.2.1 Automobiles

The second half of 2018 saw a downturn in China's automobile sector, with conspicuous decreases in manufacturing and sales of automobiles in general and passenger vehicles, compared with the same period in 2017. Furthermore, exports of autos also fell significantly. This can be partly attributed to the moderating growth of the economy in general, and partly to the exit of the preferential auto purchase tax policy in 2018, prior to which demand for automobiles had been satiated in advance. In 2018, China produced 27.81 million automobiles, down by 4.2% YoY. In 2019, production of autos is unlikely to see any significant growth, rather it will remain at around current levels.

Recent years have seen new energy vehicles (NEV) embark on a rapid development and growth trajectory, with NEV production registering a high YoY growth rate (59.9%) during 2018. With the light-weighting of NEVs high on the agenda, aluminium is a natural choice, outperforming steel comfortably in terms of weight reduction, which is likely to result in increasing usage of aluminium in NEV production. However, given the small manufacturing base of NEVs, as well as existing constraints such as high costs for example in joining techniques for parts made from different materials, NEVs are unlikely to contribute much to the growth of aluminium demand in 2019. We forecast China's NEV production to increase by around 300,000 units in 2019 compared with 2018, with primary aluminium usage in NEVs estimated to increase by 40-50 kt in 2019, assuming an average Al usage of 139 kg per vehicle.

FIGURE F4
China's Auto Production (Mln)

Source: China Association of Automobile Manufactures



1.2.2 High-speed Trains and Urban Rail Transit System

China's total railway mileage has been growing steadily in recent years; by 2019, total mileage in operation reached over 131,000 km, including more than 29,000 km of high-speed railways. According to the 13th Five-Year Plan, China's total railway mileage will reach 150,000 km by 2020, including 30,000 km of high-speed railways. Based on the intensity of high-speed trains per km, demand for high-speed trains will increase steadily along with the addition of railway mileages, which will result in higher demand, estimated at around 400kt of primary aluminium for high-performance aluminium fabrication.

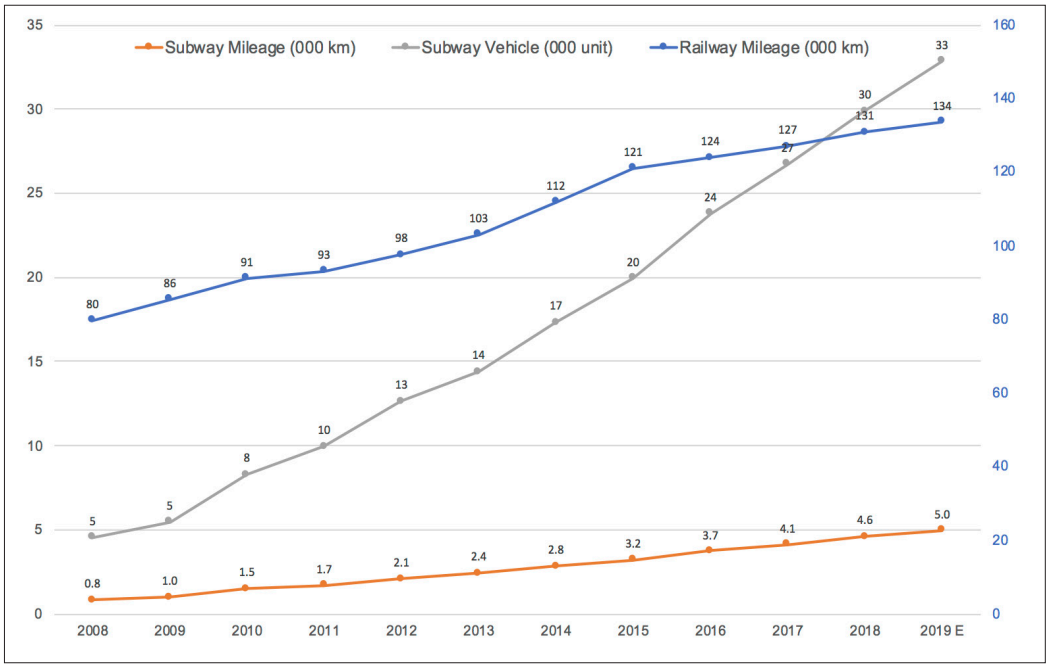
Furthermore, China has also seen steady growth in its urban rail transit mileages in recent years. The current urban rail transit system contains several types, such as subways, light rails and maglev (magnetic levitation), among which 35% of the body of subway trains and light rail trains manufactured from aluminium alloys.

During Q4 2018, China's National Development and Reform Commission (NDRC) approved a series of infrastructure investment projects, covering urban rail transit, railway, airport facilities, etc., with a total investment of over RMB 120 million. As China continues to progress ahead with its urbanization program, total mileage of its subways will see continuous growth, as will the demand for trains. Demand for processed aluminium products is estimated to reach around 100kt.

FIGURE F5

China's Subway and Railway Mileage (000 km) and Subway Vehicle (000 unit)

Source: Ministry of Railways



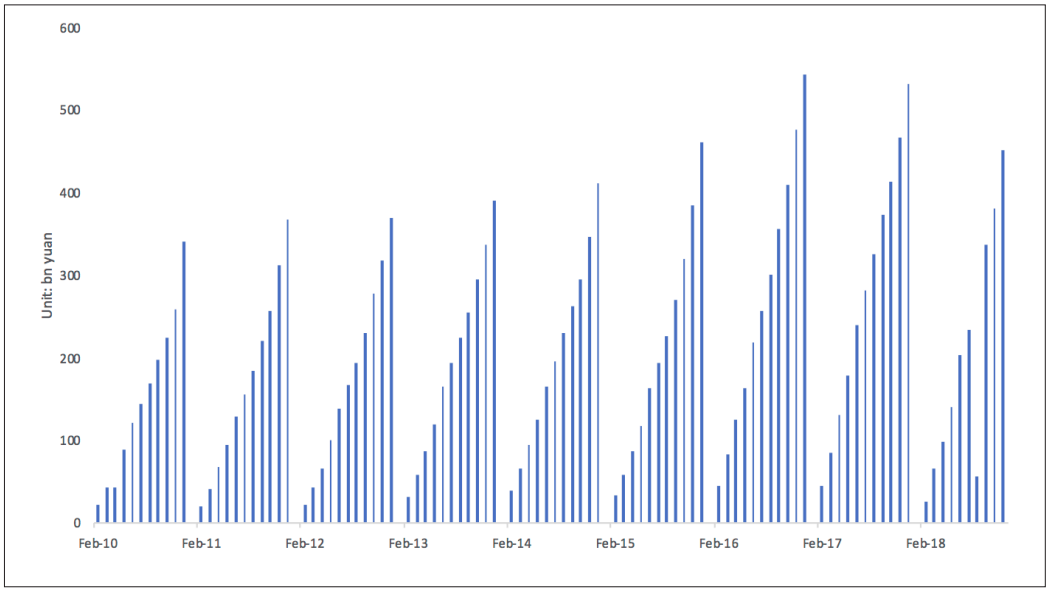
1.3 Power Grid

During the first 11 months of 2018, China invested a total of RMB 451.1 billion in power grid development projects, down 3.2% compared with the same period in 2017. Growth in power grid investment started to fall in 2017, coinciding with a shift from high pace growth to high quality growth. Last November, the National Energy Administration released a list of 12 ultra-high voltage power grid projects for assessment, the completion of which will activate a combined investment of around RMB 200 billion. Total primary Al demand from these projects is estimated at 500-600 kt.

FIGURE F6

China's Power Grid Investment (bn yuan)

Source: China Electricity Council



2. Industry Fundamentals

2.1 Primary Aluminium

In our view, China's 2019 primary Al consumption is unlikely to grow significantly relative to 2018, with an annual growth rate estimated to be level with that of 2018, at 3%. On the supply side, affected by on-going supply-side reform and on-going implementation of China's primary aluminium capacity replacement quota system, primary Al production in 2019 is estimated to increase by 1 mln t to 37.3 mln t. 2019 will see an additional 2.12 MTPY of new capacity completed, however, some new projects will only come on stream in the second half of the year, due to low prices and potentially severe losses, which means actual contribution from new capacity to production is around 1 mln t during 2019.

2.2 Alumina

China has seen continuous and rapid growth of alumina production in recent years, although 2018 annual production, at around 71 mln t, was up only 3% YoY. For the first time, China became a net exporter of alumina in 2018. With high alumina prices for the most of 2018, the majority of China's alumina producers made profits.

As China's domestic bauxite reserves deplete further and faster, in terms of both grade and volume, the proportion of imported ore in total ore consumption is on the rise, especially given the number of new coastal merchant refining projects proposed during 2018. However, progress with these projects was disappointingly slow in 2018. During 2019, we forecast China will see 7.3 MTPY of additional capacity come onstream, either from newly completed projects or resumed from previously idled capacity. With part of this addition to be commissioned in H2 2019, the actual contribution to production is estimated at only 2.9 mln t. China's annual alumina production in 2019 is forecast to reach 74-75 mln t and, given the unusual export circumstances of 2018 are unlikely to be repeated in 2019, the domestic alumina market is likely to see a small surplus in supply.

2.3 Bauxite

With increasingly stringent environmental auditing and irreversible depletion in grades of domestic bauxite reserves, 2018 saw a continuous tightening in domestic bauxite supply and increasing domestic ore prices, which forced inland refineries in Henan and Shanxi to start importing bauxite as a blending feed in order to supplement supply. As a result, the proportion of domestic ore in China's total bauxite consumption fell from 63.2% in May 2018 to 61.1% in October 2018. However, most imported material has not been a good fit for the high-temperature processing lines of inland refiners, which, in addition to the high inland transport costs, constrained inland producers from importing in large volumes in the short term. Domestic ore is still preferred and remains the dominant supply to inland refineries. In 2019, China is unlikely to relent on its environmental inspection efforts, and we forecast domestic bauxite prices to maintain current high levels, with limited room for price falls.

In the medium to long term, as China's domestic bauxite resources continue to deplete at a faster pace, and as industry participants grow more aware of the importance of mineral resource conservation, large Chinese refineries will search globally to obtain bauxite mining leases outside China, which will see China's bauxite imports on a rising trajectory.

APPENDIX A ADDITIONAL CHARTS

FIGURE A1 Bauxite Import By Company (mln t)
(Source: China Customs, CM)

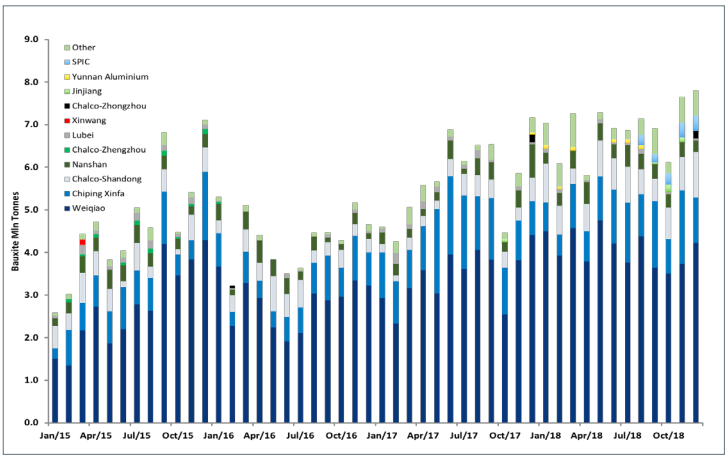


FIGURE A2 Apparent Bauxite Consumption (mln t/month)
(Source: CM)

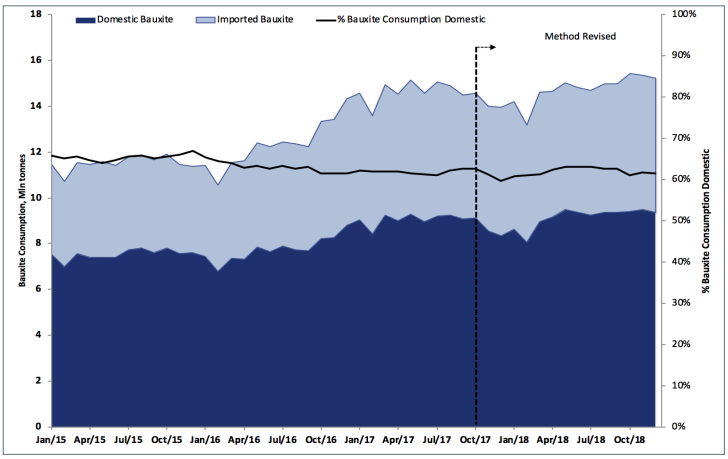


FIGURE A3 Imported Bauxite Sources, Volumes and Prices (Non-ViU Adjusted) (mln t/mth, US$/t) (Source: China Customs, CM)

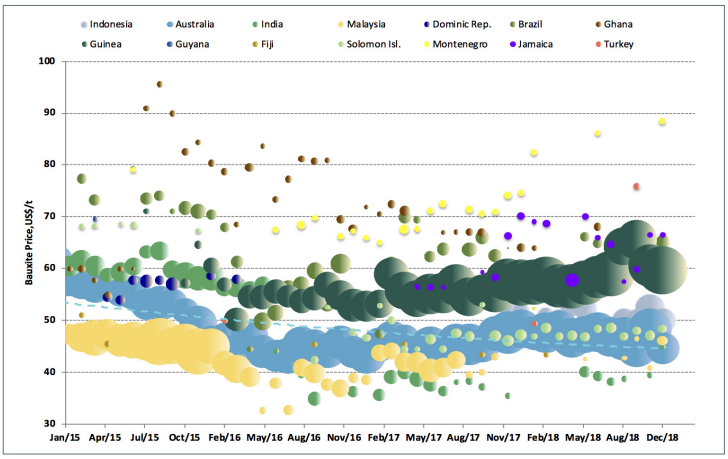


FIGURE A4 Estimated Alumina Production from Imported Bauxite (Annualised) (MTPY) (Source: CM)

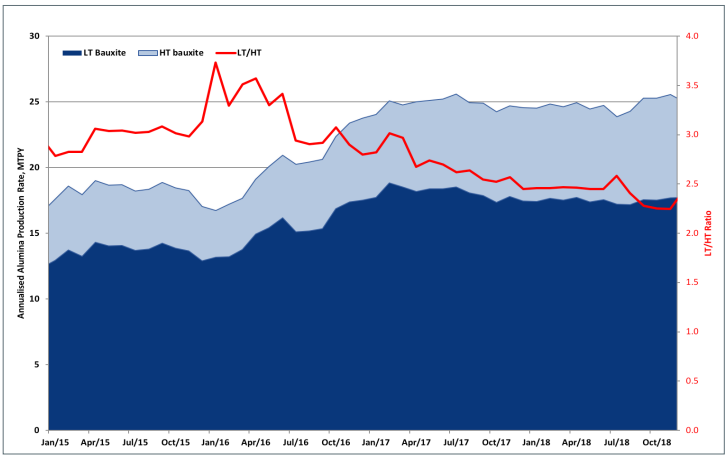


FIGURE A5 Domestic to Imported Alumina Price Difference and Alumina Imports (US$/t , kt/month) (Source: CM, China Customs)

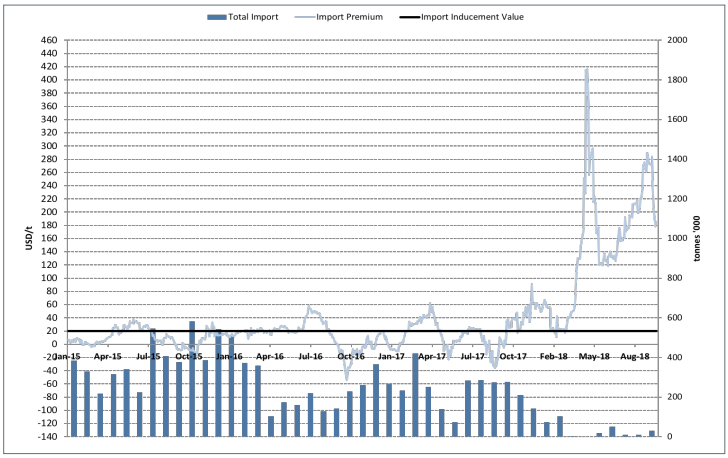


FIGURE A6 Alumina Capacity, Production and Utilisation (MTPY, %)
(Source: CM, CNIA)

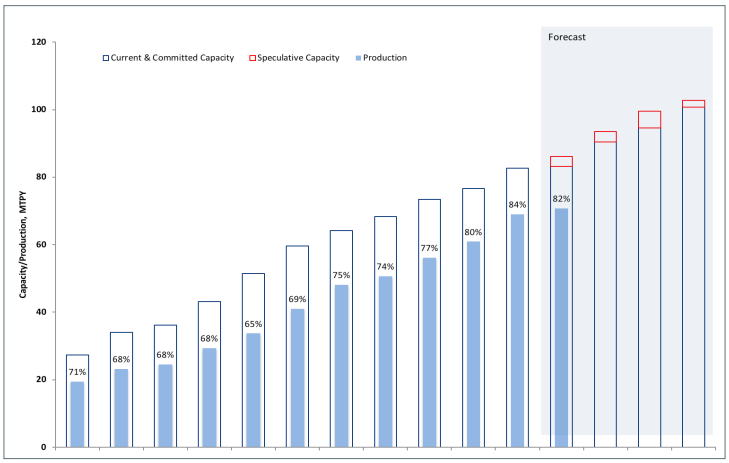


FIGURE A7 Alumina Cost Curve by Producer Excl. VAT (US$/t, RMB/t) (Source: CM)

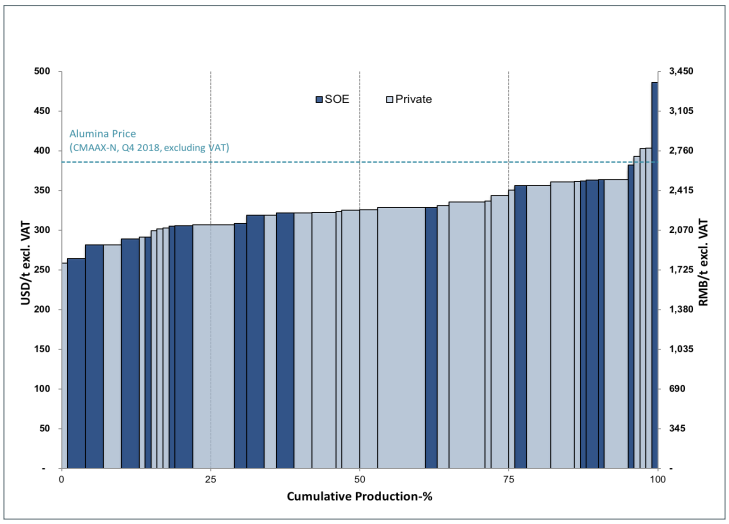


FIGURE A8 China Alumina Refinery Utilisation (%) (Source: CM)

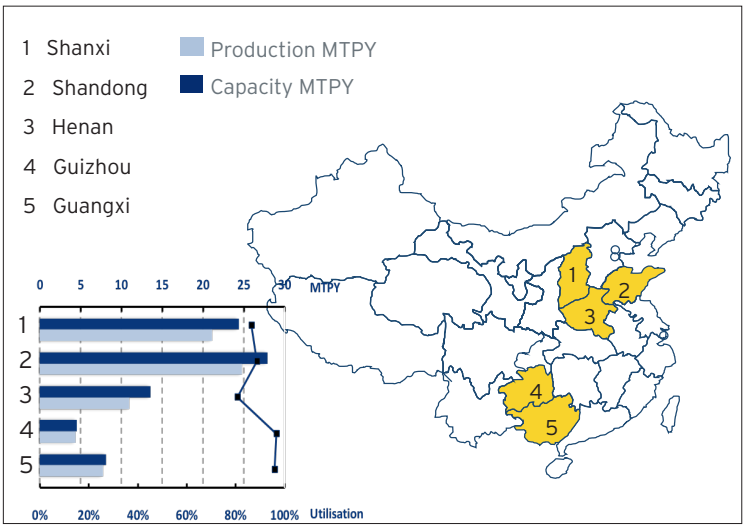


FIGURE A9 Primary Aluminium Capacity, Production and Utilisation (MTPY, %) (Source: CM)

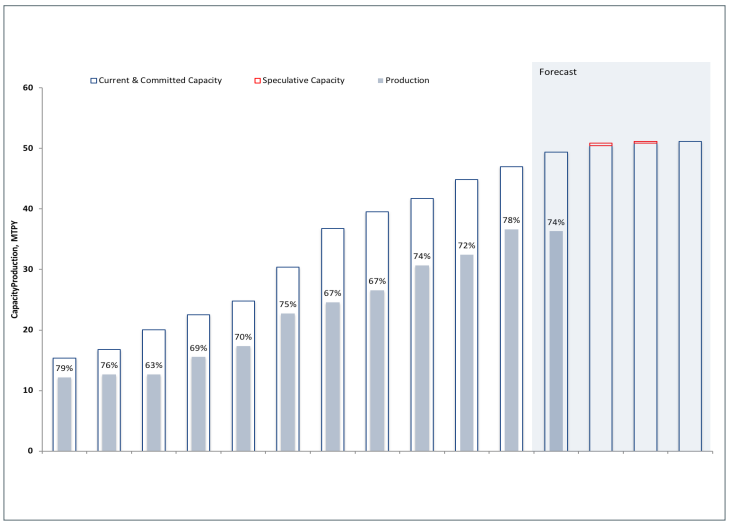


FIGURE A10 Primary Aluminium Smelter Utilisation (%) (Source: CM)

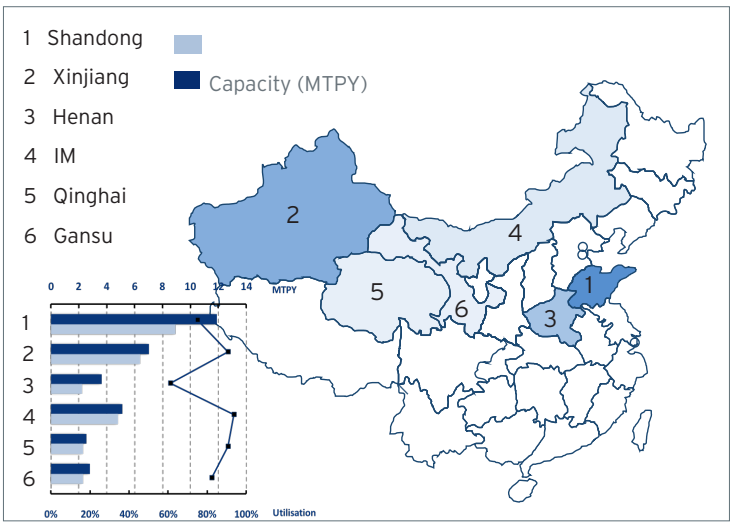


FIGURE A11 China Primary Al Capacity Status (MTPY) (Source: CM)

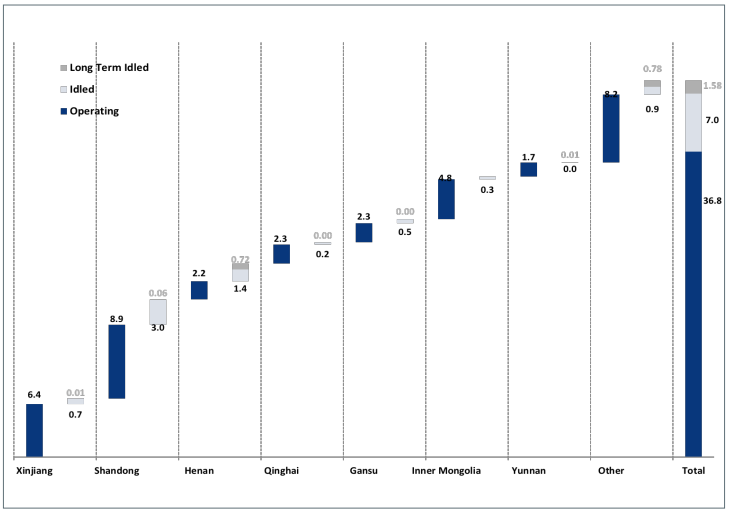
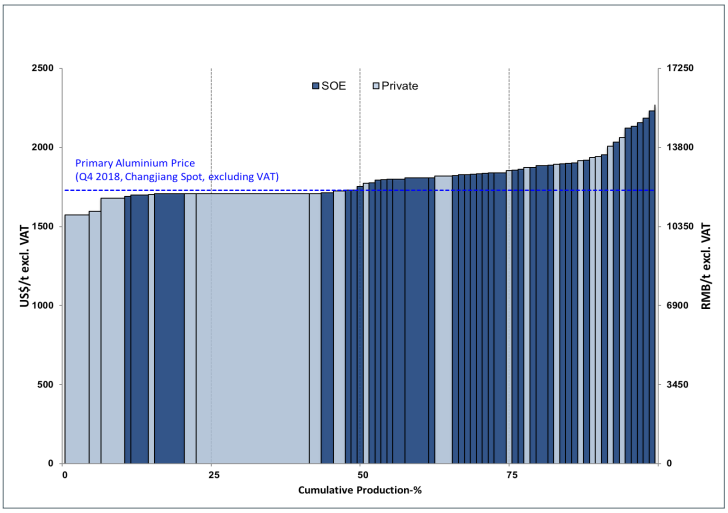


FIGURE A12 Primary Aluminium Cost Curve by Producer Excl. VAT (US$/t, RMB/t) (Source: CM)



APPENDIX B ADDITIONAL DATA

Table B1 Alumina Supply (Source: CM, CNIA, China Customs)

Unit: tonnes	2017	2018			
Province	Q4	Q1	Q2	Q3	Q4
Shandong	6,150,000	6,058,000	6,118,000	6,085,000	6,241,000
Henan	2,520,000	2,494,000	2,835,000	2,779,000	2,763,000
Shanxi	4,740,000	4,839,000	5,197,000	5,054,800	5,322,000
Guizhou	1,160,000	1,014,000	1,103,000	1,164,000	1,096,000
Guangxi	2,090,000	1,811,000	1,951,000	1,988,000	1,960,000
Chongqing	181,000	184,000	205,000	210,000	210,000
Hunan	-	-	-	-	549,000
Jiangsu	-	-	-	-	-
Other	364,000	488,100	534,000	565,000	18,141,000
China Totals					60,000
Production	17,205,000	16,888,100	17,943,000	17,845,800	18,201,000
Imports	631,537	184,905	78,145	50,000	50,000
Total Supply	**17,836,537**	**17,073,005**	**18,021,145**	**17,895,800**	**17,895,800**

Table B2 Primary Aluminium Supply (Source: CM, CNIA)

Unit: tonnes	2017	2018			
Province	Q4	Q1	Q2	Q3	Q4
Henan	645,000	595,065	660,712	665,452	534,548
Shandong	2,408,000	2,366,529	2,384,948	2,404,389	2,348,712
Inner Mongolia	996,000	985,332	1,023,918	1,082,603	1,171,260
Gansu	663,517	661,935	677,740	671,384	598,164
Qinghai	571,000	579,742	600,101	595,929	562,093
Shanxi	248,341	235,161	238,096	243,205	212,164
Guizhou	266,285	261,027	269,699	261,753	299,438
Yunnan	385,000	391,935	396,411	400,767	425,973
Sichuan	137,552	142,258	143,356	144,932	144,932
Guangxi	207,707	238,258	351,562	413,918	451,288
Ningxia	295,345	300,129	319,123	325,973	327,671
Xinjiang	201,636	194,516	196,959	187,589	1,592,986
Others	26,810	25,258	25,679	25,460	471,918
China Totals					
Production	8,883,091	8,764,472	9,109,637	9,279,696	9,141,148
Imports	15,602	(3,205)	-	-	-
Total Supply	**8,898,693**	**8,761,267**	**9,109,637**	**9,279,696**	**9,141,148**

Table B3 Industry Prices (Source: CMAAX, CBIX, CM)

Unit: RMB/t	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18
Changjiang Spot Al (VAT excl.)	12,317	12,460	12,286	12,078	12,501	12,541	12,219	11,854	11,712
Chalco Spot Alumina (VAT excl.)	2,680	3,017	2,581	2,596	2,811	2,974	2,825	2,776	2,711
CMAAX - North (VAT incl.)	2,949	3,013	2,727	2,922	3,228	3,307	3,110	3,166	3,019

* *On Jan 1, 2018, CM moved fully to in-house data sourcing for Chinese alumina and aluminium production data, rather than using in-house plus 3rd parties. Q1 2018 changes have been calculated using Q4 2017 and Q1 2018 data based on the updated methodology.*

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