



ASSESSMENT OF ALUMINIUM USAGE IN CHINA'S AUTOMOBILE INDUSTRY 2016~2030

FEBRUARY 2019

A CONFIDENTIAL REPORT PREPARED BY **CM GROUP**
FOR **IAI**



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EXECUTIVE SUMMARY

The purpose of this report is to present the findings from CM's comprehensive assessment of aluminium usage in China's auto industry, which includes passenger vehicles, commercial vehicles (buses and trucks), special-duty vehicles, 2-wheel and 3-wheel bikes.

Over the period to 2030, China's automotive sector is likely to undergo a substantial transformation, shifting from Internal Combustion Engines (ICEs) toward New Energy Vehicles (NEVs). As a material of choice amongst China's auto producers to reduce kerbside weight, aluminium is well positioned to take advantage of the transformation. Despite the outlook for ICE vehicle numbers remaining flat, weight-savings are likely to increase intensity of use and drive higher volumes.

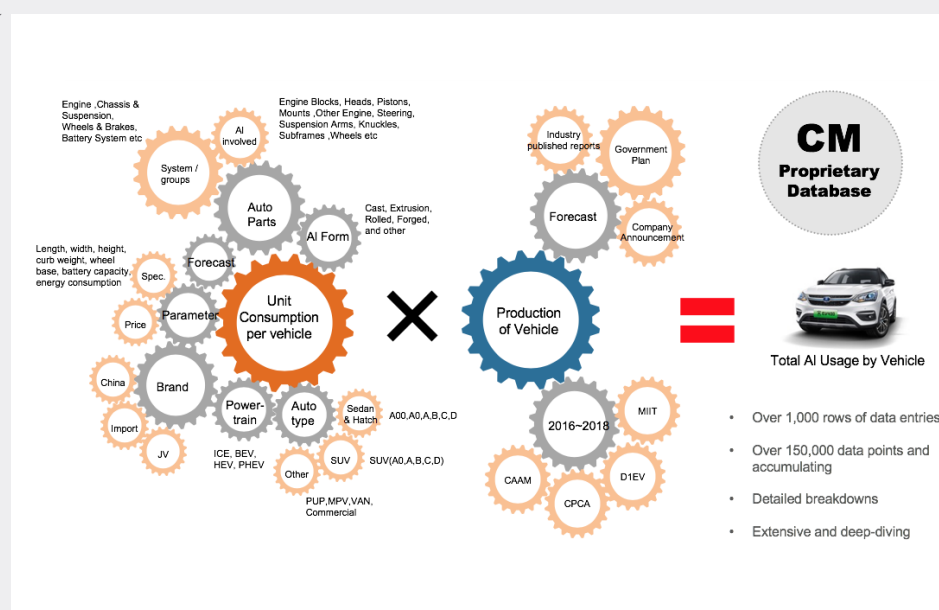
We forecast aluminium usage in China's automotive sector to increase from an estimated 3.8 Mt in 2018 to 9.1 Mt in 2030, representing a CAGR of 8.9%.

Methodology

The study was conducted on a bottom-up basis, analyzing unit aluminium consumption for each type of vehicle by individual component. To complete the project, CM referred directly to around 500 individual publications and contacted around 700 individuals in the industry through a telephone survey. Target groups included auto manufacturers, component suppliers, OEMs, aluminium products producers and others. CM also conducted two targeted field studies, covering the manufacturing intensive provinces of Jilin, Chongqing, Sichuan, Beijing, Jiangsu, and Henan.

FIGURE 1
CM Methodology on Study of Aluminium in China's Passenger Vehicle Industry

Source: CM Group



China's Automobile Production

China's total automobile production reached an estimated 31.4 million units in 2017, up 4.7% from 30 million in 2016. In 2018, however, China witnessed the first fall in 28 years in auto production, as a result of the country's general economic slowdown. Total production was 29.8 million units, broken down into 23.2 million passenger vehicles, 4.0 million trucks, 0.4 million buses and 2.2 million special-duty vehicles.

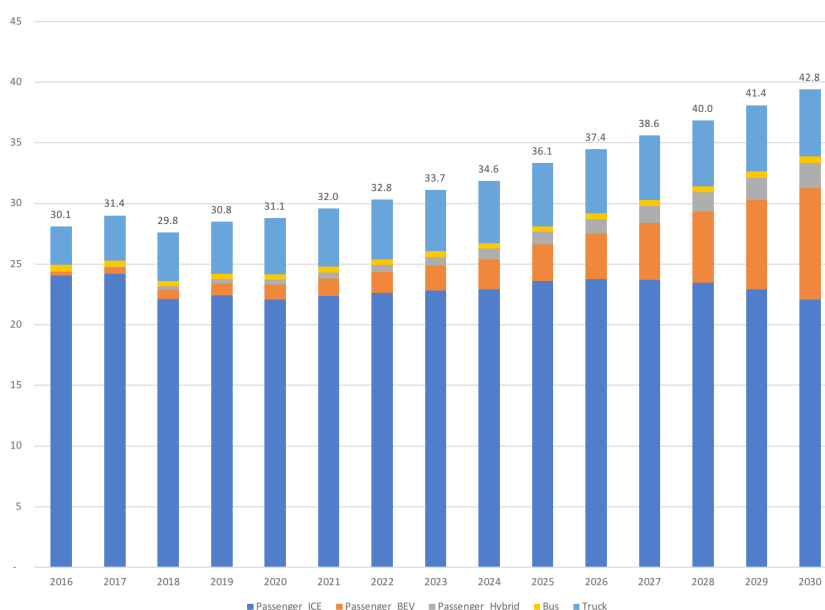
Bucking the trend was China's NEV (New Energy Vehicles) market, which produced 1.1 million units in 2018 and is forecast to reach 11.6 million units in 2030, representing a CAGR of 21.4%. Notably, BEV (Battery Electric Vehicle) production is forecast to grow at a CAGR 23% over the same period, from its 2018 level of 0.77 million units to 9.2 million in 2030. This forecast growth is likely to drive strong aluminium growth, given projections for intensity of use in the sector.

China also produced a total of 15.8 million traditional Internal Combustion Engine (ICE) motorbikes and 31.8 million electric bikes (E-bike) in 2018. With the domestic market considered saturated, , especially for traditional ICE motorbikes, future growth will likely target exports.

We forecast E-bike production to grow at CAGR 2%, while ICE motorbike production is forecast to fall at a CAGR 2%. By 2030, production of ICE motorbikes is forecast to fall to 12.4 million and e-bikes increase to 40.3 million.

FIGURE 2
China Automobile Industry
Production Outlook

Source: CAAM, National Bureau of Statistics, Company Reports, Public sources, CM Group



Aluminium Consumption

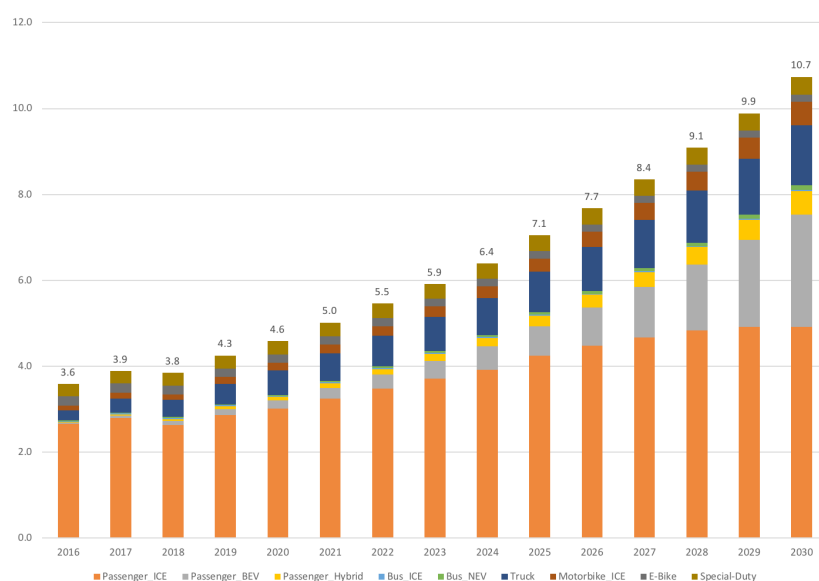
With China's automobile industry gradually shifting its focus to light-weighting, as it strives to meet tightening legislation, we are forecasting an increase in demand, and therefore use, of aluminium.

According to CM's survey, a total of 3.9Mt of aluminium was consumed in the industry in 2017, up 8% compared with 2016. In 2018, total consumption fell slightly, by 1%, as a result of stagnant sales of passenger vehicles. However, we are bullish on the outlook of aluminium usage in the automobile industry and forecast total aluminium consumption in the auto industry to reach 10.7Mt by 2030, representing a CAGR of 8.9%.

FIGURE 3

Total Aluminium Consumption in China's Auto Industry

Source: CM Group



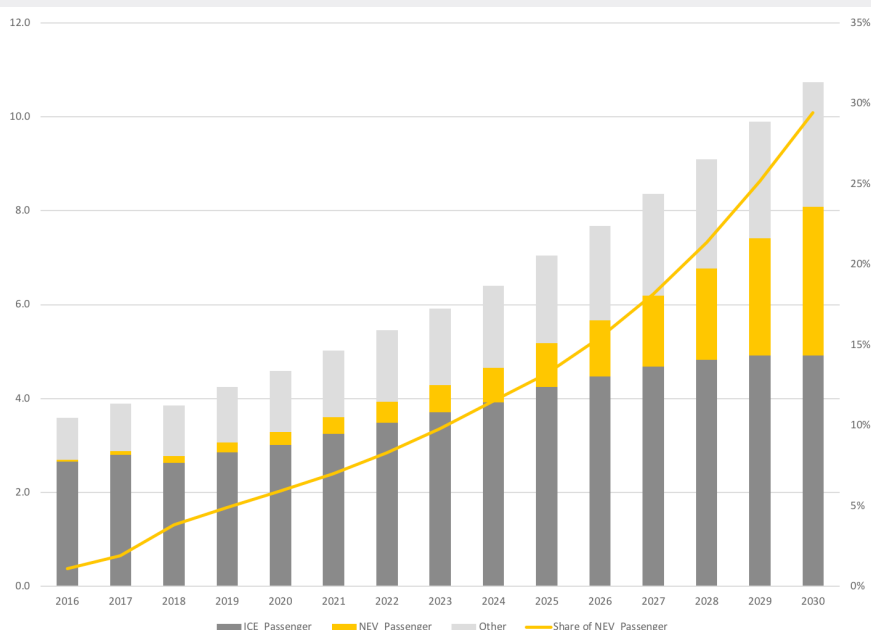
Passenger cars are the key market sector for aluminium, consuming an estimated 2.9Mt in 2017, and representing 74% of the total. Due to China's recent slowdown in economic activity, total passenger car production in 2018 fell 6.6%, resulting in a 3.6% fall in aluminium usage in passenger cars.

However, new-energy passenger vehicle (NEV) production increased significantly in 2018, up 75%, mainly owing to robust demand for BEVs. As a result, aluminium consumption in China's NEVs jumped 96%, from 75kt in 2017 to 146kt in 2018. Supported by the government's mandated energy-saving policies and emission reduction targets, we remain bullish on the outlook for China's NEV industry and forecast the proportion of aluminium use in this sector to grow from its current 3.8% of total aluminium consumption to 29.4% in 2030.

FIGURE 4

Forecast Aluminium Consumption in China's Automobile Industry to 2030 (MTPY)

Source: CM Group



In terms of unit consumption, in 2018, the new-energy bus sector consumed the most aluminium, at an estimated 210kg of aluminium per bus, followed by hybrid passenger vehicles at 179.6kgpv. BEV passenger vehicles and ICE passenger vehicles consumes 128.4kg and 118.7kg of aluminium respectively, still a long way short of the levels in developed regions such as USA, EU and Japan.

The gap in intensity of use between China and several first-world countries, we believe, will reduce, as Chinese producers face the real prospect of tightening legislation leading to an unavoidable need for light weighting. Notably, we forecast the unit aluminium consumption of BEVs to reach 283.5kgpv by 2030.

TABLE 1
Unit Consumption
Assessment, kg per vehicle

Source: CM Group

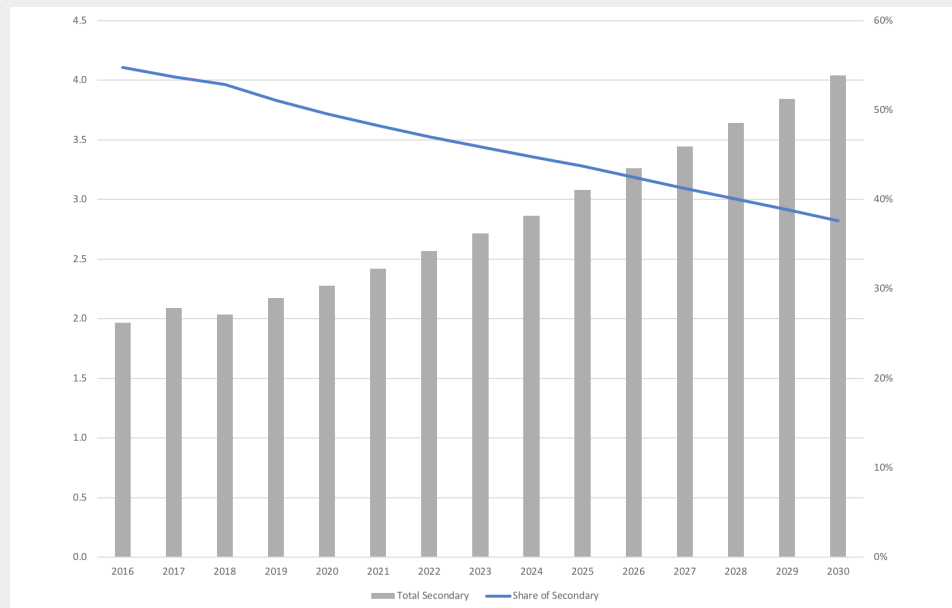
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Passenger	110.4	115.9	119.7	129.1	138.6	148.1	157.7	167.4	177.4	187.1	197.3	207.9	219.0	230.7	242.2
ICE	110.3	115.7	118.7	127.6	136.4	145.2	153.9	162.5	171.2	179.8	188.5	197.2	205.8	214.5	222.8
BEV	107.1	117.9	128.4	143.0	157.9	173.1	188.2	201.9	215.5	226.8	238.1	249.8	261.8	274.2	283.5
Hybrid	147.4	160.0	179.6	188.8	198.1	206.8	215.5	224.2	232.9	238.3	243.7	249.0	254.4	259.8	265.2
Commercial	76.5	87.0	99.3	110.9	122.6	133.9	145.1	156.2	165.9	180.1	194.8	209.1	223.6	238.3	253.2
Bus	92.8	92.0	94.4	101.4	109.3	118.2	128.1	139.1	151.5	165.4	181.0	198.3	217.7	239.3	263.4
ICE	60.5	62.8	65.3	67.8	70.3	73.0	75.7	78.6	81.5	84.6	87.9	91.2	94.7	98.3	102.1
NEV	189.0	196.4	210.1	220.8	232.2	244.5	257.7	271.8	287.1	303.6	321.4	340.6	361.5	384.1	408.7
Truck	73.8	86.4	99.9	112.0	123.9	135.4	146.7	157.8	167.2	181.4	196.0	210.1	224.1	238.2	252.3
Special-Duty	53.2	58.6	61.6	67.7	74.0	80.6	87.5	94.8	102.4	110.5	119.0	128.1	137.6	147.8	158.6
2,3-Wheel	10.4	10.5	10.5	10.5	10.6	10.6	10.7	10.7	10.7	10.8	10.8	10.9	10.9	11.0	11.0
ICE	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
E-Bike	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0	10.1	10.1	10.2	10.3	10.4

Apart from light-weighting, another growing advantage of aluminium is its favourable recycling credentials relative to its peers. It's low-cost and simple to recycle, evident by the increasing use of secondary aluminium in China's automobile industry. Secondary aluminium is mostly used in casting applications such as the manufacturing of engines, housings and wheels.

As China's automobile producers become more sophisticated and cost focused, and recycled metal becomes more widely accepted, we forecast total consumption of secondary aluminium to increase significantly. However, the share of secondary aluminium in China's total consumption is forecast to fall, as a result of stronger growth in the BEV sector, which does not require engines.

FIGURE 5**Secondary Aluminium Usage in China's Auto Industry**

Source: CM Group

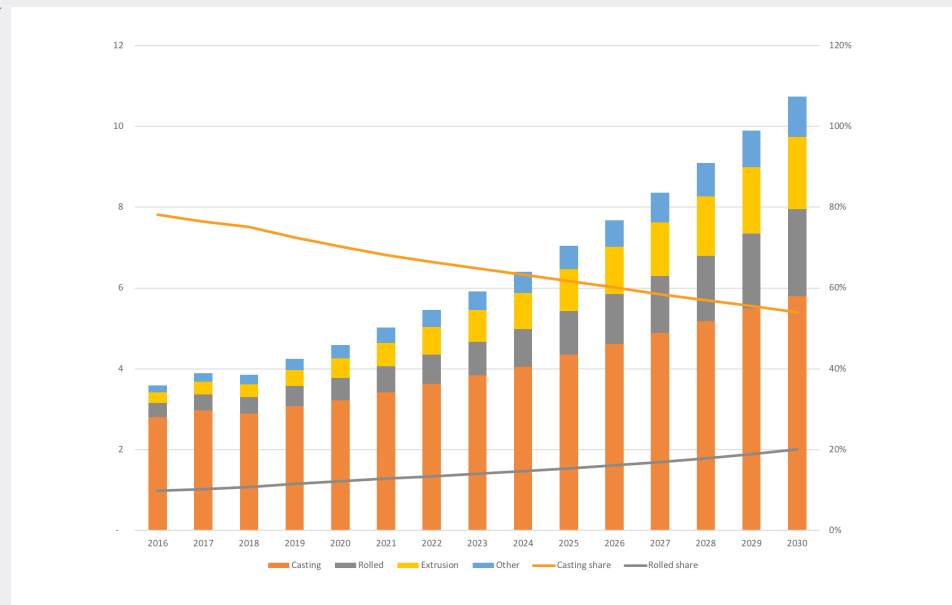


Aluminium is used in China's automobile sector in many different applications and, therefore, many different forms, including castings, rolled products, extrusions, forgings etc. Casting plays a pivotal, high-volume role in the auto sector, in applications such as engines, wheels and transmission housings.

According to CM's survey, an estimated 2.9Mt of aluminium castings were consumed in 2018, representing 75% of total consumption. However, as more and more market share is taken by BEVs in the future, we forecast the share of castings to fall, while the share of rolled products, mainly used for manufacturing battery housings and body closures will increase.

FIGURE 6**Aluminium Usage by Form in China's Auto Industry**

Source: CM Group



Passenger Vehicles- NEV

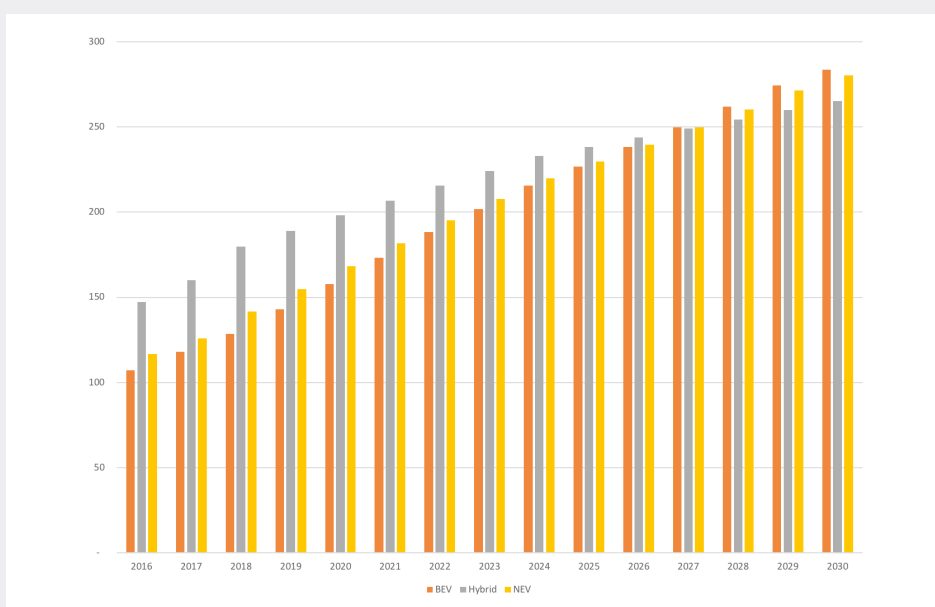
In this report, the term new-energy vehicles (NEVs) refers to vehicles that are partially or fully powered by electricity, including battery electric vehicles (BEVs), hybrids and plug-in hybrids (HEVs and PHEVs). Although the development of China's NEV sector is still in its infancy, supportive government policy has driven strong growth over the past few years and is forecast to support growth momentum over the short to medium term.

China produced a total of 478,000 BEVs in 2017, 67% of which were 'mini cars' (A00 type). Total production reached 770,000 in 2018, up 61% in one year, yet the share of A00 cars in the total dropped to 55%. This reflects the increasing number of larger BEV's produced, a trend we forecast will be sustained in the future.

Average aluminium consumption of NEVs in 2018 was an estimated 141.5kgpv (BEV 128.4kgpv and Hybrid 179.6kgpv). We forecast this to top 280kgpv by 2030, with unit aluminium consumption of BEVs reaching 283.5kgpv.

FIGURE 7
Unit Aluminium Usage in
China's NEV Industry

Source: CM Group



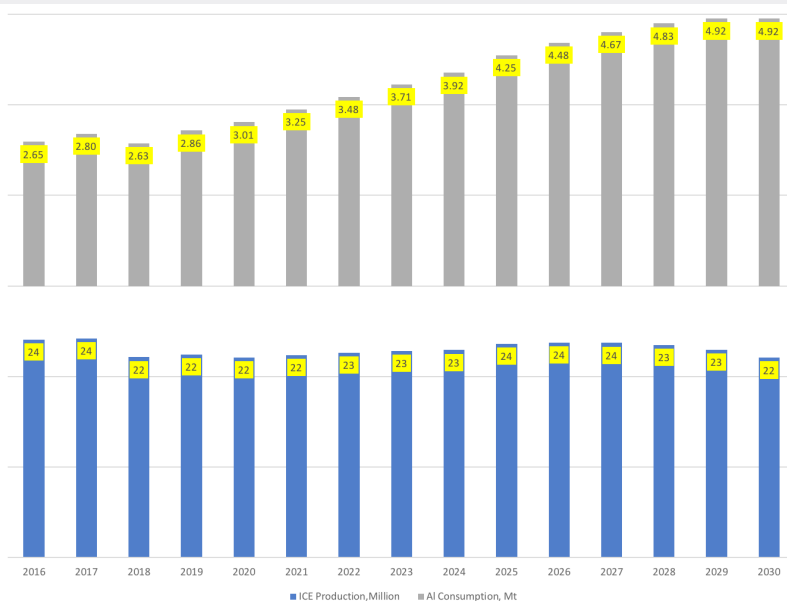
Passenger Vehicles - ICE

Internal Combustion Engine (ICE) vehicles represent the overwhelming majority of China's automobiles. The country produced a total of 22.1 million ICE vehicles in 2018, down 8.6% from the 2017 number. An estimated 2.6Mt of aluminium were consumed by ICE vehicle production in 2018, representing an average unit consumption of 118.7kgpv. The outlook for China's ICE sector remains weak, given the government's clear encouragement on NEVs. We forecast China's total ICE production to remain at or near 2018 levels for the next decade. Despite the flat outlook, we forecast total aluminium consumption in ICE vehicles to grow steadily, from the current 2.6Mt to 4.9Mt by 2030, as a result of increased intensity of use of aluminium, driven by the need to achieve light-weighting.

FIGURE 8

Aluminium Consumption by ICE vehicles in China

Source: CM Group

**Other**

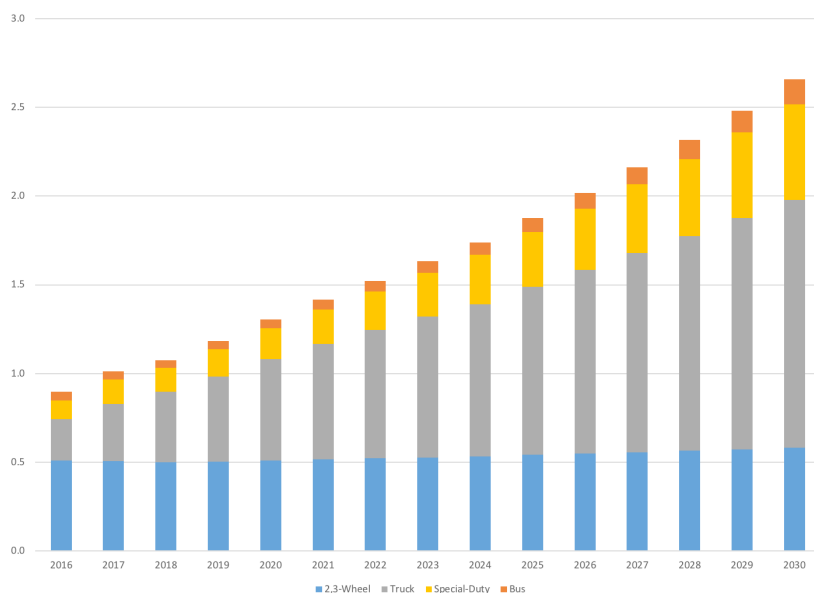
A total of 1.1 Mt of aluminium were consumed by 'other' vehicles, including buses, trucks, special-duty vehicles and 2-wheel & 3-wheel bikes. The outlook for aluminium usage in commercial vehicles also remains promising, especially on trucks.

Light-weighting is a particular focus for trucks and other commercial vehicles, because the lower the weight, the more cargo can be carry and, ultimately, the higher the income. We forecast aluminium use in trucks and NEV buses to reach 1.4Mt by 2030, representing a CAGR of 11%.

FIGURE 9

Aluminium Consumption by Other vehicles in China

Source: CM Group





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CM BUSINESS CONSULTING

T +61 8 8294 7261

E INFO@CMGROUP.NET

AUSTRALIA PO BOX 789 GLENELG
SOUTH AUSTRALIA 5045 AUSTRALIA

CHINA B1321, COFCO PLAZA
NO. 8 JIANGUOMENNEI AVENUE
BEIJING, 100005



cmgroup.net