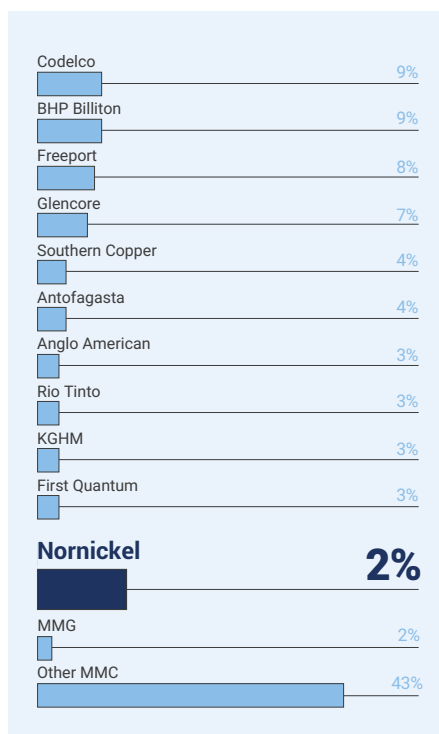


COPPER

No. 11 by copper mining in 2018



A slight decline in copper prices in the first quarter of 2018 as a result of lower imports in China and higher metal exchange inventories reversed in the second quarter, peaking at USD 7,300 per tonne, the highest over the last 4.5 years. The price growth was triggered by expectations of a deficit in the copper market in 2018 due to looming strikes at mines in Chile and Peru due to negotiations with trade unions on new labour agreements, amid lower copper exchange inventories.

In the second half of June, investor concerns over a possible slowdown in the global economic growth resulting from a risk of a trade war between the USA and the European Union and China led to a drop in copper prices, sinking

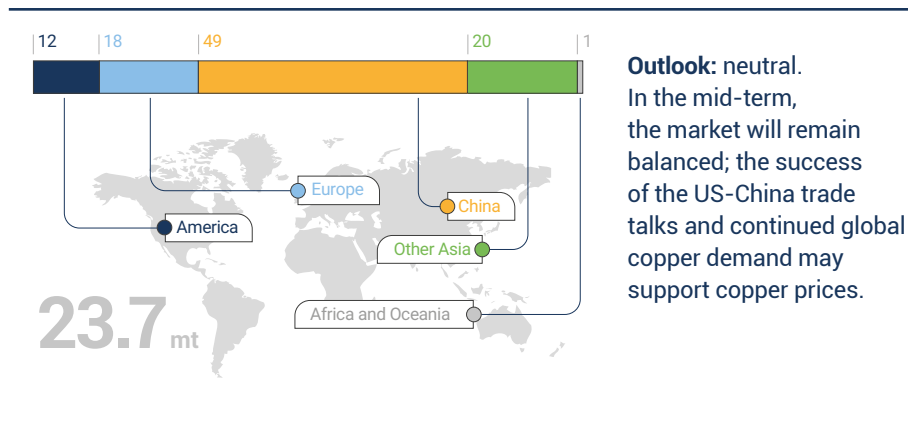
Key trends in the copper market

2018

The prices surged in the first half of the year amid expectations of strikes at copper mines in Chile and Peru with a strong copper demand from EV manufacturers

and then plunged in the second half of the year on the back of failed strikes and an escalation of the US-China trade tensions causing concerns over weaker demand.

Refined copper consumption by region (%)



Outlook: neutral. In the mid-term, the market will remain balanced; the success of the US-China trade talks and continued global copper demand may support copper prices.

Source: Company data

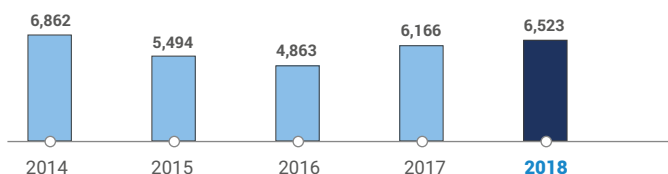
to the year's minimum of USD 5,823 per tonne by early September.

In the fourth quarter of 2018, prices stabilised in the range of USD 6,070 and USD 6,330 per tonne due to the demand and supply balance. However, in December, the pessimism of market players about the US-China trade tensions surged

again. In addition, Chile and Peru saw a successful signing of labour agreements. These were the reasons behind a decline in copper prices to USD 5,965 per tonne at the end of the year.

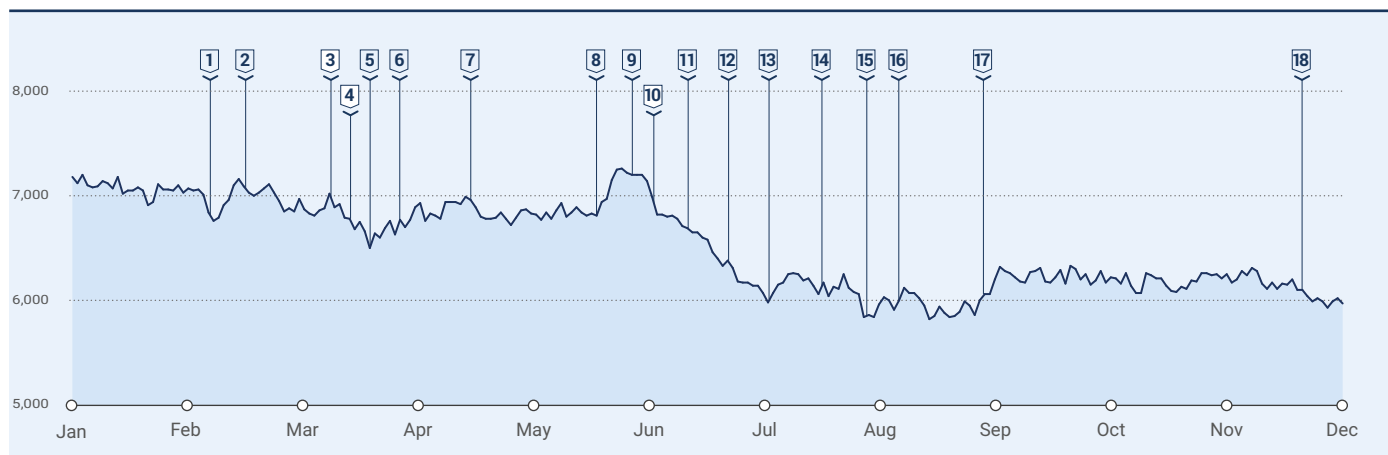
In 2018, the average LME copper price increased by 6% y-o-y to USD 6,523 per tonne vs USD 6,166 per tonne in 2017.

Average annual copper prices (USD/t)



Source: LME (settlement)

LME copper prices in 2018 (USD/t)



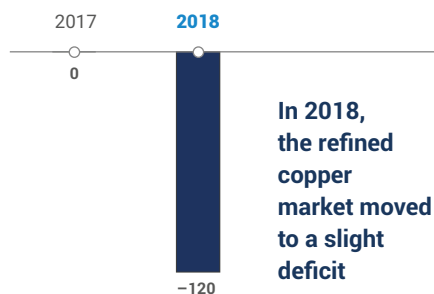
- | | | |
|--|--|---|
| <ul style="list-style-type: none"> 1 > BHP Billiton report posting production growth 2 > Copper import growth in China following scrap import restrictions 3 > Success in negotiations on the Grasberg mine sale to the government of Indonesia 4 > Signing of labour agreements at several mines in Chile and Peru 5 > Substantial growth in exchange inventories 6 > Threat of strikes at the Escondida and Chuquicamata mines | <ul style="list-style-type: none"> 7 > Report posting production growth in Chile 8 > Increase in Chinese copper concentrate and cathode imports 9 > Successful signing of labour agreements at the Escondida mine 10 > Rise in the US Federal Reserve interest rate 11 > Introduction of US import duties on Chinese imports worth USD 50 bn 12 > Signing of a new permit for the concentrates export from Indonesia | <ul style="list-style-type: none"> 13 > BHP Billiton and Rio Tinto reports posting production growth 14 > Short strike at the Chuquicamata mine 15 > Introduction of US import duties on Chinese imports worth USD 200 bn 16 > Strike at Andina mine (Chile) 17 > Research group reports on tightening market deficit 18 > Growing concerns about the consequences of the US-China trade tensions |
|--|--|---|

Sources: LME, Company data

Market balance

In 2018, the refined copper market that had been balanced by the end of 2017 moved to a slight deficit. It stood at as little as 0.5% of the total market volume, or 120 kt. Total exchange inventories dropped by 35% to 351 kt (544 kt as at the end of 2017), or a little more than nine days of global consumption, with off-exchange inventories going slightly up.

Refined copper balance (kt)



In 2018, the refined copper market moved to a slight deficit

Source: Company data

Consumption

Given its high electrical and thermal conductivity, ductility and corrosion resistance, copper is widely used in various industries. Up to 75% of refined copper produced globally is used for manufacturing electrical conductors, including various types of cable and wire. Key copper-consuming industries include construction, electrical and electronic equipment manufacturing, power supply, transport, engineering, machine building and consumer goods production.

In 2018, global consumption of refined copper totalled 23.7 mt (up 3%, or 0.7 mt y-o-y), primarily owing to stronger demand from cable and wire manufacturers. Consumption in pipe, flat rolled products and billet production segments saw moderate growth.

China remains the key copper consumer globally, with its market share reaching 49% in 2018 due to the demand growth of 5%. Market concerns about China's economic slowdown (also due to the US-China trade tensions) did not materialise. The country kept ramping up copper imports and copper feedstock in particular. In 2018, Chinese refined copper imports added 13% to reach 5.3 mt offsetting a one-third drop in copper scrap imports due to the environmental constraints imposed by the state. Copper concentrate imports

went up by 14% to 19.7 mt, which helped to meet China's growing consumption needs through the ramp-up of local production.

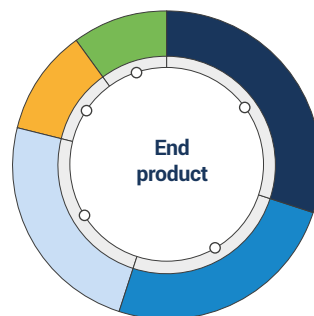
The demand for copper in developed economies saw only a moderate increase

in 2018, with Europe (the Company's key market for copper cathodes) and North America up by 1.7% and 3.2%, respectively, and Asia (excluding China) remaining flat. Russian domestic copper cathode consumption in 2018 was moderately down.

Refined copper consumption by industry (%)



Wire rod	74
Flat rolled products	13
Billets	4
Pipe	9



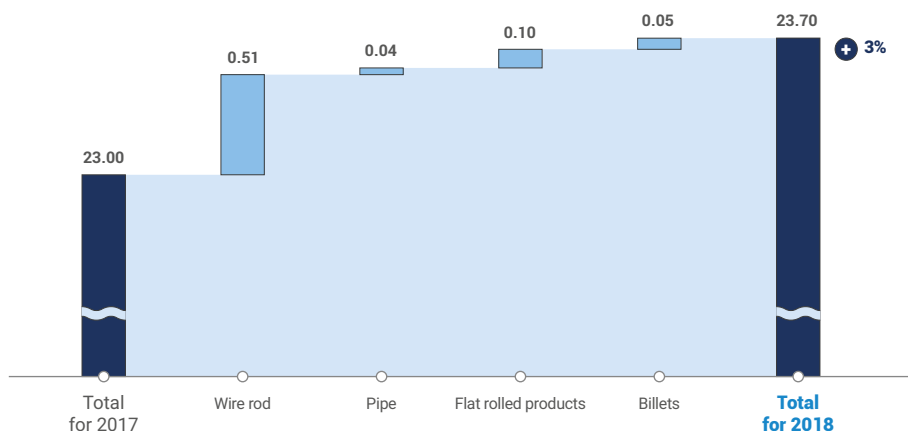
Construction	30
Consumer goods and equipment	25
Power grids	24
Transport	11
Heavy engineering	10

Total 23.7 mt

Sources: Company data, Wood Mackenzie

The demand for copper in developed economies saw a moderate increase in 2018

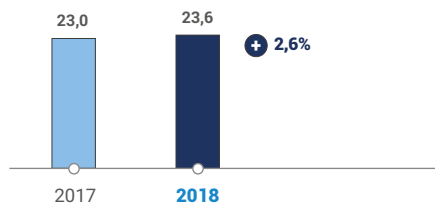
Changes in refined copper consumption in 2018 by industry (mt)



Sources: Company data, Wood Mackenzie

Production

Refined copper production in 2017–2018 (mt)



Sources: Company data, Wood Mackenzie

In 2018, global production of refined copper increased by 2.4%, or 0.56 mt, compared to 2017, totalling 23.6 mt. China remains the production leader, firmly committed to the expansion of domestic smelting and refining capacities. In 2018, refined copper production in China grew by 5% to 8.7 mt, while its share in global output was 37%. Only 20% of Chinese production is local extraction, with another 80% coming from imported copper concentrates and scrap.

In the rest of Asia (excluding China), production dropped by 2.7% (going down in India and Philippines, and up in Japan). In North America, it grew by 3.5% (up in the USA and Canada) and in South America, output remained unchanged. In Europe, copper production slipped

by 1.4% triggered by Germany and Poland. According to preliminary estimates, Russia's production of refined copper saw modest growth.

In 2018, global copper production grew by 2.8% to 20.7 mt. Some 2.9 mt of refined copper was produced from accumulated concentrate stockpiles and scrap on the back of higher scarp collection in the first half of the year driven by higher copper prices. The growth in copper production came mainly on the back of the recovered production in Chile (facing a significant drop due to strikes a year earlier), a significant increase in production in Africa (Democratic Republic of the Congo and Zambia), in Indonesia (following the lifted state ban on concentrate exports) and the development of Chinese domestic mining industry.

Chile, the top global supplier of copper, saw a 5% production increase y-o-y (to 5.8 mt) in 2018 due to a 1.5-month strike at BHP's Escondida, the largest copper mine, where the workers did not agree with the conditions of their new labour agreements. The country also kept facing a lower output by the state-owned Codelco (1.8 mt, down 2% y-o-y) owing to a lack of investments in the old fields with declining copper grade.

A 12% growth in African production to USD 2.4 mt was mainly backed by KOV and Kamoto mines in the Democratic Republic of the Congo and Sentinel mine in Zambia.

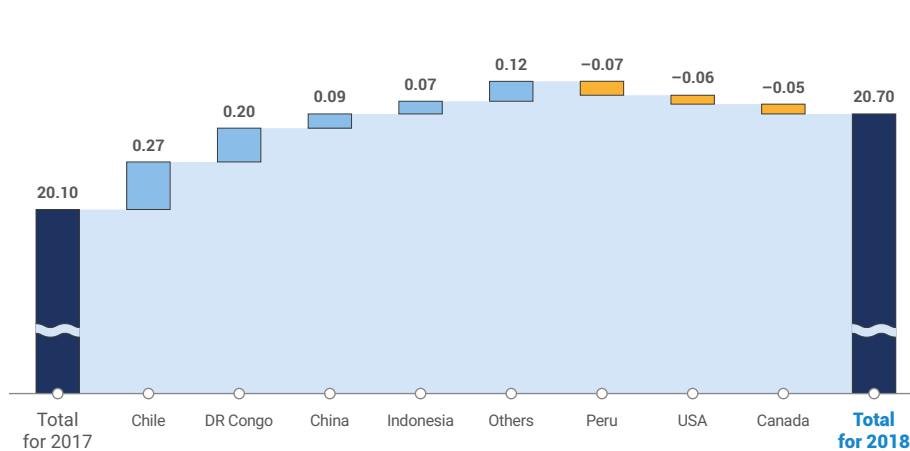
China, which is currently developing smaller mines, saw its production grow by 6% to 1.6 mt. Indonesia saw its copper output go up by 10% to 0.7 mt after the government lifted the ban on copper concentrate exports following the decision of Freeport-McMoRan and Rio Tinto to sell a majority stake (51%) in the Grasberg mine to Indonesia. In Kazakhstan, development of the new Bozshakol mine by KAZ Minerals drove the output up by 7%.

In Peru, production was below the expectations (2.3 mt, down 3% y-o-y) caused by some technical issues of lower copper output at the new Las Bambas mine purchased by China's MMG from Glencore several years ago. In North America, production dropped by 4% to 2.6 mt due to declining copper contents along with technical issues at some small mines in the USA and Canada.

According to preliminary estimates, Russia saw its production grow by about 6%.

The actual refined copper production for 2018 was above the analyst forecasts issued early in 2018 thanks to the production surge above expectations. The actual refined copper consumption was also above the analyst forecasts thanks to China maintaining its demand and the USA even increasing it despite the ongoing trade tensions between these two countries. This brought the global deficit close to the initial estimates.

Copper production in 2017–2018 (mt)



Sources: Company data, Wood Mackenzie