

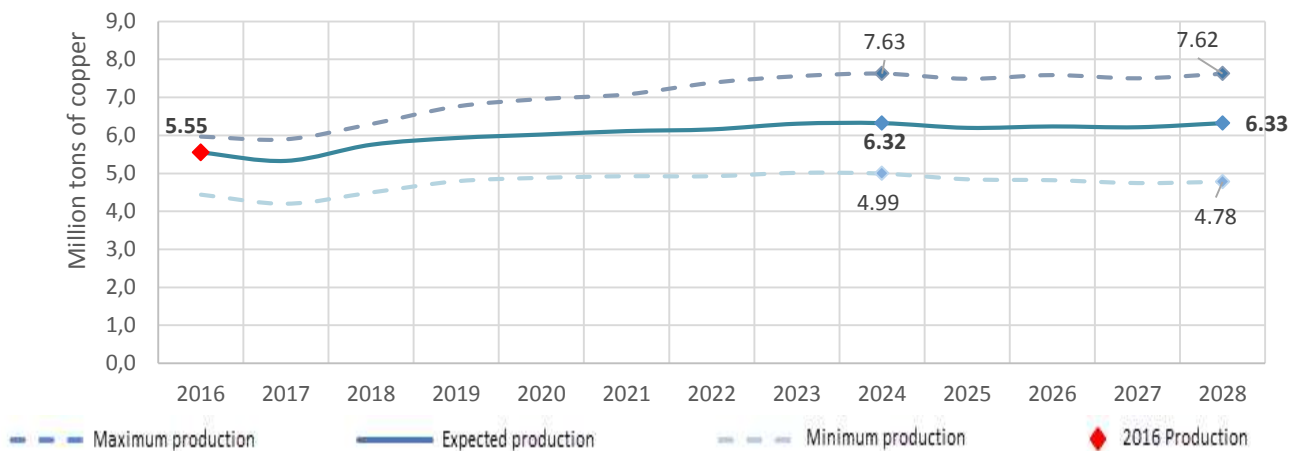
Expected copper production forecast in Chile 2017 - 2028

Abstract

Based on the results obtained through the forecast of national copper production from current operations and the projects included in the report “Investment update in Chilean mining - Projects portfolio 2017 - 2026”, as well as information related to the current copper operations in the country from the Annual Survey of Copper Production, it is possible to determine the profiles of maximum production from mining in Chile. Afterwards, through a Monte Carlo method to determine expected copper production forecasts towards 2028.

The results of the production forecast, based on the certainty status of mining projects contemplated in the 2017 investment portfolio show a 13.9% increase in the expected production of copper towards 2028 with reference to the actual production of 2016; this means our country would reach a copper production of 6.32 million tons by 2028, with a first peak by 2024 of 6,323.6 thousand tons at a 1.5% growth rate in relation to 2016, and a second productive peak of 6,324.5 thousand tons by 2028 at a 1.01% growth rate in relation to 2016.

Figure 1: Mine copper production 2016 and forecast for the 2017 - 2028 period at national level.



Source: Cochilco, 2017.

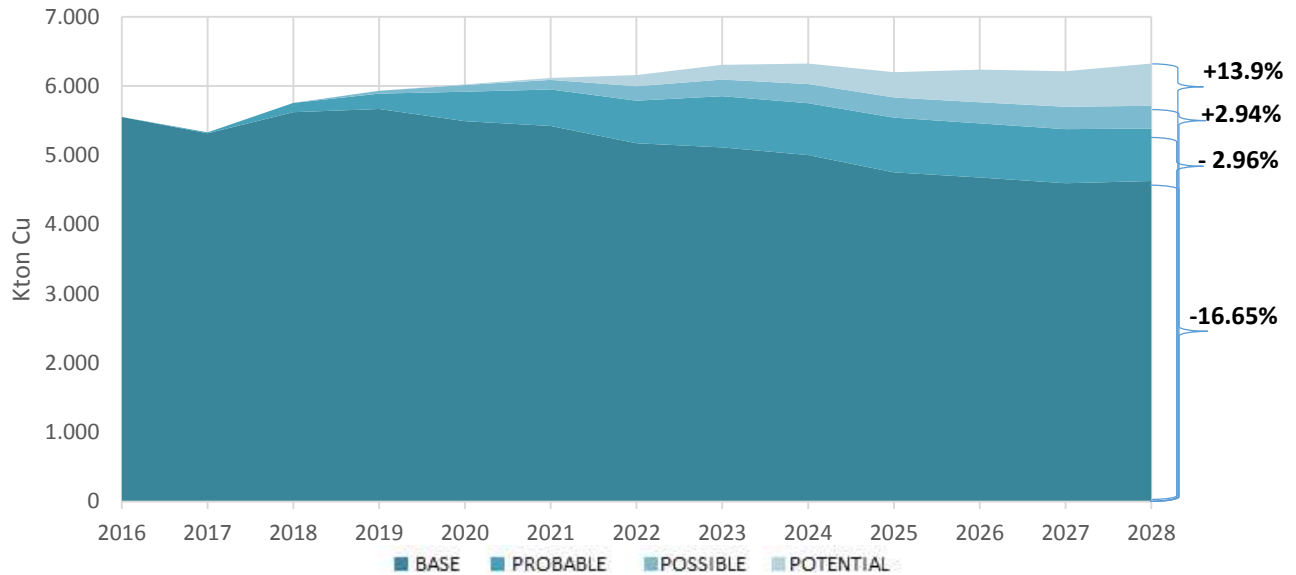
Due to the natural depletion of active deposits, along with the corresponding natural decrease in grades already considered for future mining plans, this is a hypothetical scenario without replacement projects or development of current operations which, by the year 2028, may reduce their production by 31.54%, at a decrease rate of 2.87% in relation to 2016, reaching 3.8 million tons of fine copper.

By adding the replacement and expansion projects for current operations development it is possible to offset in part the natural decrease in production, reaching 4.95 million tons of fine copper. This situation highlights the need for the national copper mining to effectively face the current challenges and materialize those projects categorized as new to be able to reach the expected production of 6.32 million tons by 2028, thus offsetting the production decrease scenario and obtaining an increase of over 15% in relation to the current expected production by 2017. It is worthy of mention that the current operations and related projects in the oxide line, due



to their natural depletion, affect the productive performance of operation labors. The production should be reversed with higher production rates of copper sulfides.

Figure 2: 2016 copper production and 2017 - 2028 expected forecast per condition.



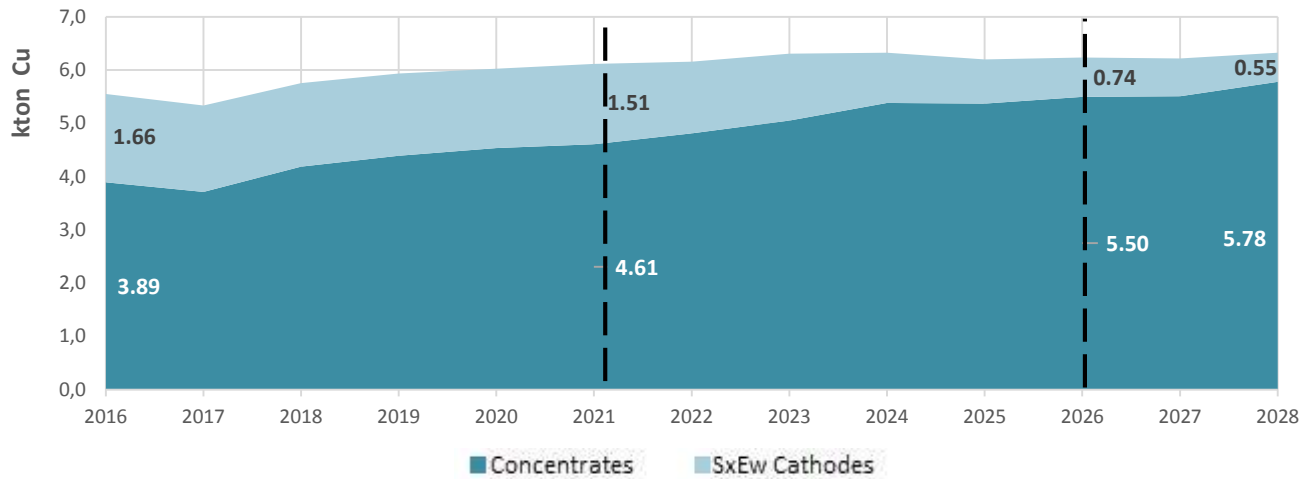
Source: Cochilco, 2017.

Hydrometallurgical production goes from a 29.9% share of the total production in 2016 to 8.6% towards 2028, a 67.2% decrease towards 2028 in relation to the production reported in 2016, at an annual decrease rate of 8.21%. The closing of oxide operations forces this situation, where out of the 33 active hydrometallurgical operations by the end of the decade, only 13 remain operative⁸ will belong to the large scale mining and 5 from Enami. Although just a few hydrometallurgical projects exist¹, they cannot offset the fall in SxEw production.

¹ El Espino oxide (2019-2028), Diego de Almagro oxide (2019-2029), and Sierra Gorda oxide (2019-2030) plus operational extensions and reopening of current labors.



Figure 3: 2016 copper production and 2017 - 2028 expected forecast per product

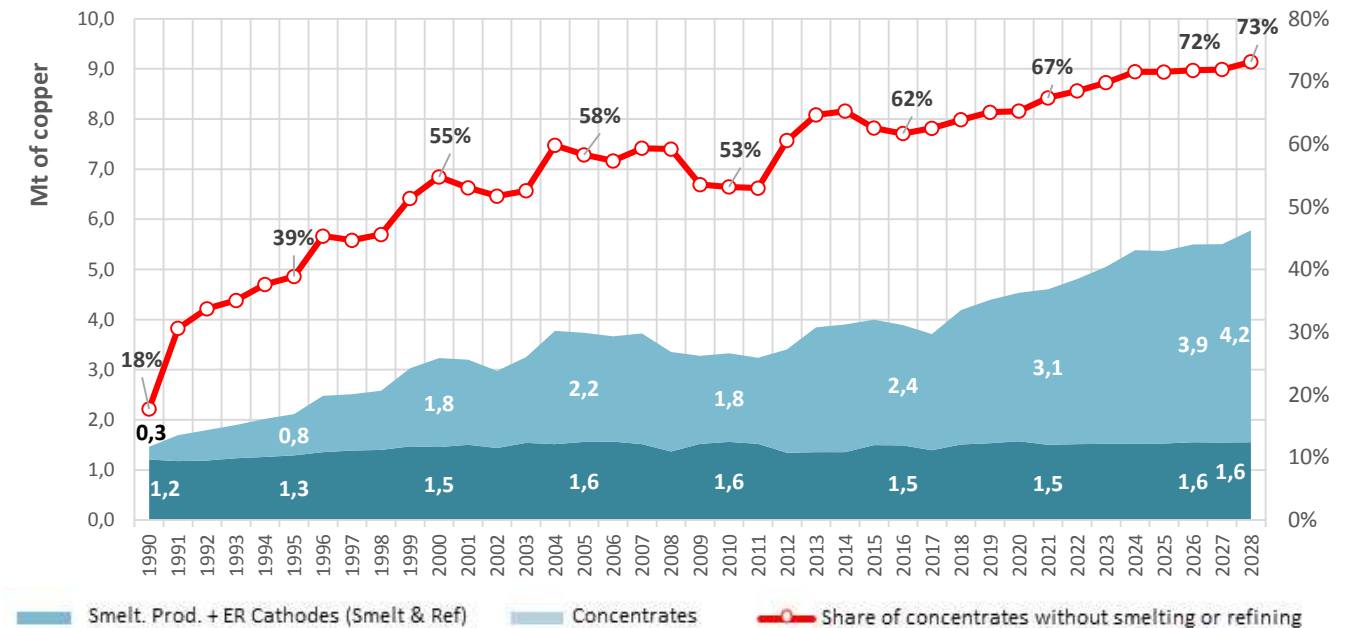


Source: Cochilco, 2017.

On the other hand, the expected production of fine copper contained in concentrates would increase from 3.89 million tons in 2016 to 5.78 million tons by 2028. This means a 48.5% increase in the period analyzed with an annual growth rate of 0.31% and an increase of relative share from 70.1% in 2016 to 91.4% by 2028. The previous considering no substantial changes in the productive lines of Smelting and Refinery complex. Therefore, if in the 90's the share of exportable concentrates respect with the national copper production reached an average of 32%, in the 2000-2010 decade the average was 56% and in recent years that share has skyrocketed to nearly 63% in average. Future estimates show it will reach a 73% by 2028. This means that in the 2006 - 2016 decade our exports of around 2.1 million tons of fine copper in concentrates as an average -around 7.65 million metric tons of concentrate- would become 3.4 million tons of fine copper in concentrates as an average for the next decade, approximately 12.5 million metric dry tons of concentrates.



Figure 4: Production of refined and unrefined concentrates, recorded, and expected

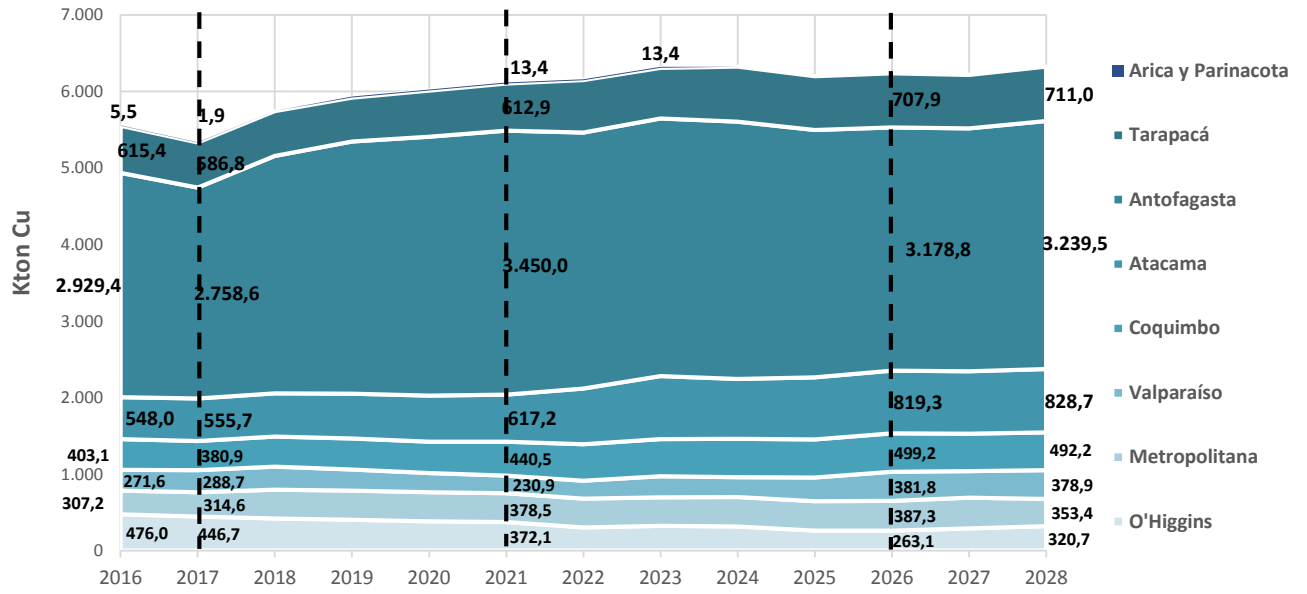


Source: Cochilco, 2017.

With regards to the regional production, Antofagasta would keep its leadership in the share of copper production at country level by 2028 with 3,240 thousand tons of fine copper, a 51% of national production, compared to 53% of share in 2016, with a production increase of around 310 thousand tons of fine copper in relation to 2016. However, the big actor is the Atacama Region, which currently has 7% of the shares together with the Metropolitan Region. By 2028, however, it would displace the Tarapacá Region by becoming second in the national copper production with a 51% increase in copper production with respects to the figure reached in 2016, that is 281 thousand tons more of copper production, reaching 13% of share in the national production. The other Regions will remain relatively stable in their percentages.



Figure 5: 2016 regional copper production and 2017 - 2028 expected production forecast.



Source: Cochilco, 2017.

