Open pit vs. underground

Around 1 billion tonnes of ore were extracted in 2011 from underground hard rock mines worldwide and closer to 1.2 billion tonnes if taken together with industrial minerals. In South Africa, underground mining accounts for nearly half of the sector's output, but in other regions such as the U.S. Peru and Brazil, the majority of the output is accounted for by open pit mines.

Among the economically most important metals, zinc and lead are primarily extracted using underground mining methods, with over 70% of all zinc/lead ore deposits being excavated underground. While the majority of coal is produced from underground mining, open pit mining accounts for the majority of the production of iron ore, gold, copper and nickel. Open pit mining accounts for the majority of the production. Overall, the the ratio of open pit to underground mining will remain stable or increase towards open pit for the major metallic ores. Globally, the increase in volume of ore extracted through underground mines, has not been higher than volumes extracted through surface and open pit mining. The higher costs associated with underground mining have instead encouraged companies to take advantage of scale and operate deeper open pits instead. Thus the ratio of ore volumes between open pit and underground mining has not seen a major change over the last decade.

Ore grades

The increase in metal and mineral prices over the past decade has pushed for higher output in the sector, but this has led to lower ore grades to be mined to fulfill such demand, as shown in Figure 3.

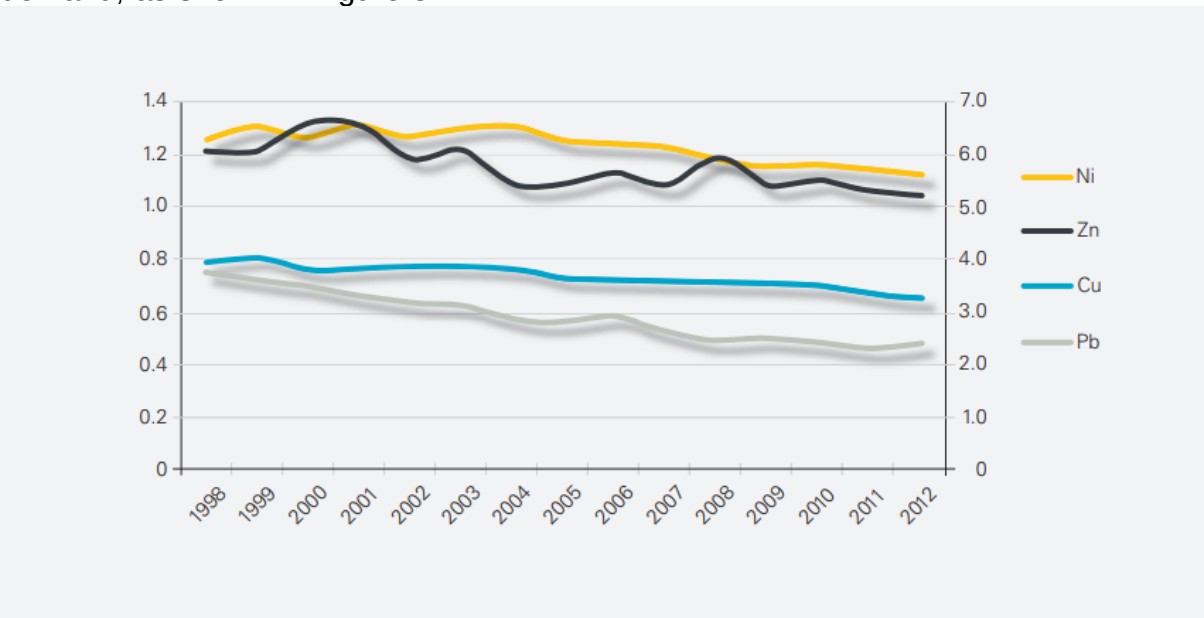

Figure 3: Falling ore grades (%) for nickel, zinc, copper and lead.

Recycling

More sustainable use of metals and minerals has encouraged recycling of a number of these products, but recycling rates still remain low. The United Nations Environment Program (UNEP) estimates that for 30 metals the end-of-life recycling rate is above 30%, while for another 34 elements this rate is below 1%. There are differences for ferrous and non-ferrous metals; for example, iron and steel have an estimated end-of-life recycling rate between 70–90%, while for copper it is lower (43–53%) and lower still for zinc (35–60%). In terms of recycled content (fraction of secondary metal in the total metal input of metal production) between 28 and 52% of iron, 20–37% of copper and 18–27% of zinc production includes scrap metal.

While the importance of recycling metals is increasing, both in the public and private spheres, which is in line with promoting sustainable use of resources, the share of this sector is still outweighed by “new” production. Given that the major consumers of metals are now to be found in emerging economies, metals in use in these countries are at the beginning stages of their life cycles and it will be decades before they enter their recycle phases. For example, new construction in China consumes metals and on average it takes 40 years for a building to be replaced. Hence these materials will not enter the recycled metals category during this time.

Trends for the future

2012 was a difficult year for the global economy; however, with anticipated improvements in China’s economic growth (the Chinese economy accounting for almost half of global consumption of metals), a stronger Eurozone and continued restoration of the U.S. economy, the future is expected to improve. As global growth heads towards more positive numbers in the future, drilling and exploration activity is expected to follow suit. A mining project has a long gestation period. It can take more than 10 years from the start of exploration through project development and construction to eventual output. Therefore, by fully utilizing current capacity, the response to an increase in metal and mineral prices can be met with a small increase in supply in the short term.

For more meaningful supply to come online, a longer time period is required. Therefore, the full impact of the price boom that set off in 2003 will continue to be realized in the next few years. New mines have often been located in remote areas and away from traditional metal markets. They are often in developing economies with fewer well-developed road and port facilities. In addition, the orebodies are low grade and are located much deeper. All these factors contribute toward new sources of mineral supply being more costly as well as time consuming to become operational.

The mining sector will continue to face such serious challenges as the search for new orebodies takes them further into non-traditional mining regions. Coupled with increases in the costs of equipment, increased lag times (compared to pre-2003 level) for equipment delivery, rising labor costs and slow growth in production capacity, the upward pressure on metal and mineral prices remains in place.

While the global economy, particularly the global financial markets, has, to some extent, affected the ability of exploration and mining firms to raise capital, the vigor of the mining sector remains robust. Commodity prices are expected to continue to remain strong and above their pre-2003 levels. Mining firms have been cautious in the last few years and, in some cases, have responded by scaling back planned expansions, but overall the underlying demand for metals remains strong. Even for projects that have been currently mothballed, an increase in price will solicit their return to operations quickly. As global economic growth recovers, mining activity and investments will continue expanding. The mining sector will remain in good health in the future.