

Zinc Recycling

Material Supply



The world is naturally abundant in zinc, which is an essential element for all living organisms. Its unique metallurgical and chemical properties have also made it the material of choice for an extensive range of applications in modern society. At the end of their useful life, the zinc recovered from these products can be recycled without loss of its metallurgical characteristics or value. Further, while the attributes of zinc contribute significantly to sustainability during use, zinc recycling plays an important role in reducing concentrate demand, energy use, emissions, and minimizing waste disposal.

How much zinc is available?

There is an estimated 2,800 million metric tons (Mt) of zinc contained in the earth's crust in such form and amount that economic extraction is currently or potentially feasible (Resources; Figure 1). Not all of this zinc, however, is immediately available for extraction. The complex interaction of economic, political, and environmental considerations dictate whether a particular ore body can or should be developed. The most recent estimate of Reserve Base (meets specified minimum physical criteria related to current mining and production practices) was made in 2009 and calculated to be roughly 480 Mt. Zinc Reserves, on the other hand, are geologically identified ore bodies whose suitability for recovery is economically based (location, grade, quality, and quantity) at the time of determination.

Since exploration and mine development is an ongoing process, the amount of zinc reserves is not a fixed number and sustainability of zinc ore supplies cannot be judged by simply extrapolating the combined mine life of today's zinc mines. This concept is well supported by data from the United States Geological Survey (USGS), which illustrates that although refined zinc production increased 80% between 1990 and 2010, the reserve lifetime for zinc has remained unchanged (Table 1).

Are reserves the only source of zinc?

While reserves are determined by geology and the interaction of economics, technology, and politics; available zinc resources also include in-use stocks or secondary (recycled) sources of zinc. Due to zinc's unique metallurgical properties and long lifetime in product applications, the stock of material currently in use (~305

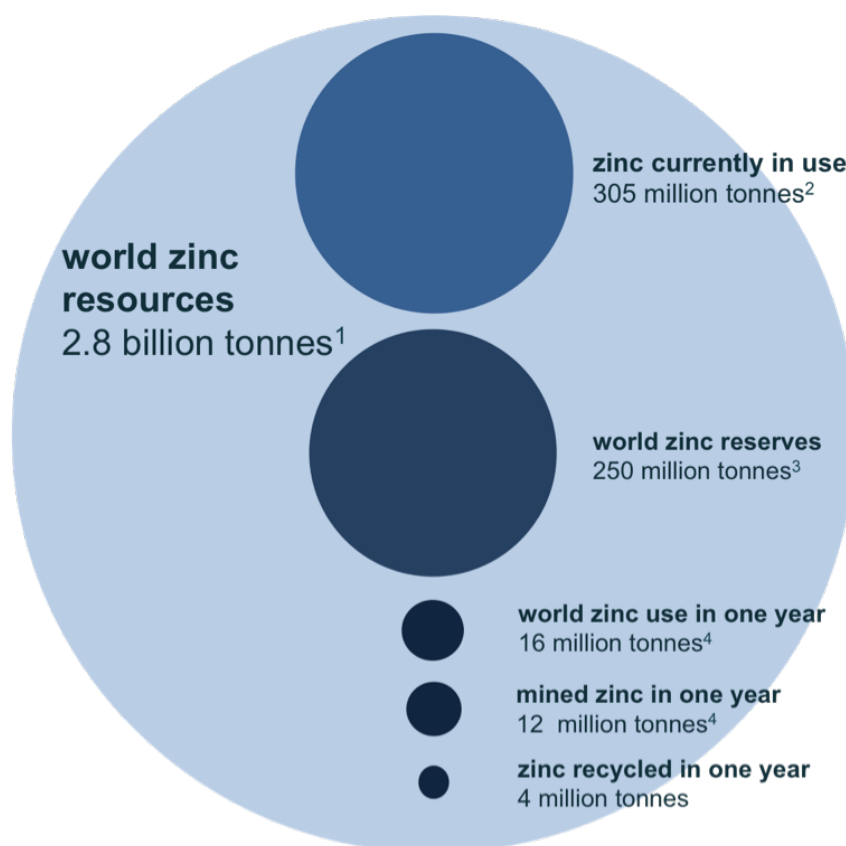


Figure 1. Global estimates of zinc resources, reserves, production, and use, 2010.
1) UNEP Resource Panel, 2011. 2) Gerst MD & Graedel TE, 2008. 3) USGS Mineral Commodities Summary, 2015. 4) International Lead Zinc Study Group (ILZSG), 2015.

Table 1. Historic estimates of zinc reserve lifetime.

Year	Global Production of Refined Zinc (Mt)	Identified Reserves (Mt)	Reserve Lifetime* (yrs)
1960	3.5	84.5	24
1970	5.6	117	21
1980	6.1	140	23
1990	7.3	144	20
2000	7.6	190	25
2010	12.9	250	19

Mt = million tonnes

*Identified Reserves divided by annual Refined Zinc Production.

Source: US Geological Survey. Mineral Commodity Summaries - Zinc. <http://minerals.usgs.gov/minerals/pubs/commodity/zinc/index>. (Accessed 24 June 2015). Personal Communication; Amy Tolcin, USGS.

Mt) is greater than that considered as reserves. As zinc-bearing products come to their end-of-life (old scrap), they are collected, processed, and recycled into new products. In 2010, nearly 4 Mt of zinc was recovered and returned to use through mature recycling networks.

What is the difference between zinc metal production and use?

Zinc metal production quantifies the amount of 'refined' zinc (zinc which is processed through a smelter or refinery) while use encompasses both refined zinc and that which is available from other sources. To illustrate, there is an estimated 13 Mt of refined zinc metal produced annually. Of this, 12 Mt comes from ores and concentrates (Figure 1) while the remaining million tonne feedstock is supplied from old scrap that requires refinement before reuse. The amount of zinc consumed annually, however, is approximately 16 Mt. This 3 million tonne gap is supplied from secondary or recycled sources that do not require further refinement prior to reuse. This category is made up primarily of alloys (brass and die castings) and zinc sheet, which are simply re-melted. Therefore, refined zinc production is only one source of material available to satisfy overall annual zinc demand.

How are estimates of recycling currently applied?

Many chemicals management policy initiatives, from product efficiency declarations to public procurement legislation, apply estimates of Recycled Content (secondary material

in refined metal production) as targets for achieving sustainability and resource efficiency. For example, the U.S. Green Building Council, (the designer of the LEED certification program), prescribes thresholds of recycled content in building materials to satisfy certain certifications. LEED certification is only recognized where >10%-recycled content is achieved for all building materials used in a project. For zinc, as with many other metals, restricting such estimates to refined metal alone introduces significant limitations. Instead, recycled content should include all sources of secondary zinc used for fabrication of new products (i.e. about 25% recycled content; Figure 1). Further, by considering End-of-Life Recycling Rates – the amount recycled relative to what was used in original fabrication – recycling indicators can be as high as 90% for some products (see Zinc Recycling: Closing the Loop).

How does the zinc industry use material supply data?

The International Zinc Association (IZA) generates and monitors information on the effectiveness of zinc recycling to help communicate and promote the many ways zinc contributes to a sustainable society. The industry is also advancing technologies for recovering zinc from products at end of life. In addition, the IZA is working with regulators, producers, fabricators, architects, and builders to communicate the practical aspects of interpreting production and use data to facilitate objective decision-making.



More detailed information is available on the IZA website at www.zinc.org.

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