

# ZINC RECYCLING

## Material Supply

The world is naturally abundant in zinc. Its unique metallurgical and chemical properties make it the material of choice for an extensive range of applications in a modern and greening society. At the end of their useful lives, 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 also plays a role in reducing mined zinc demand, energy use, emissions, and minimizing waste disposal.

## Zinc is Available from Geological, Mined Sources

There is an estimated 198,000 billion metric tons of zinc contained in the earth's crust in such form and amount that economic extraction is currently feasible or will become feasible by 2050 (accessible crustal content; Figure 1). However, not all of this zinc is immediately available for extraction.

The complex interaction of economic, political, and environmental considerations dictates whether a particular ore body can or should be developed. Due to these factors, 63 billion tons of zinc are estimated as extractable global zinc resources. Of this, about 250 million tons (Mt) are proven and probable reserves that meet specified criteria for production to achieve current market demands.

Since exploration and mine development are ongoing processes, 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 2019, the reserve lifetime for zinc has remained unchanged.

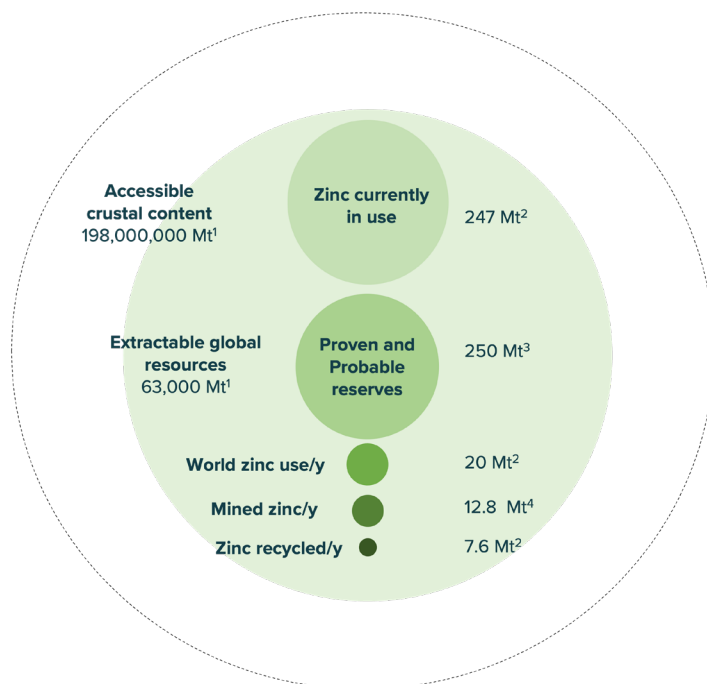


Figure 1: Global estimates of zinc resources, reserves, production, and use 2019, Mt = million tons

1. Pirard E. 2021

2. Rostek L. et al., 2022

3. U.S. Geological Survey, 2021

4. International Lead Zinc Study Group, 2022

## The Growing Urban Zinc Mine

The availability of zinc resources includes in-use stocks or secondary (recycled) sources of zinc. Due to zinc's unique metallurgical properties and long lifetime in product applications, in 2019 the stock of material in use (~247 Mt, Figure 2), the so-called urban mine, was of the same order of magnitude as that considered as proven and probable reserves to meet current market demands. Because of the long lifetime of zinc products, e.g., 30-100 years in the building sector, zinc builds up in the urban mine. By 2050 zinc in-use stocks will reach 490 Mt, which will become available for recycling over time.

## Zinc is Produced from Recycled Sources

According to the International Lead and Zinc Study Group statistics, in 2019 about 13.5 Mt of refined zinc metal was produced. Of this, 1.5 Mt originated from steel mill dusts that undergo enrichment before reentering the zinc refining stage. In addition, 6 Mt of zinc alloys (brass, sheet and die castings) and industrial wastes were recycled without the need for refining (remelting), bringing total zinc use in 2019 up to 19.5 Mt. In conclusion, refined zinc production is only one source of material available to satisfy overall annual zinc demand (Figure 3).

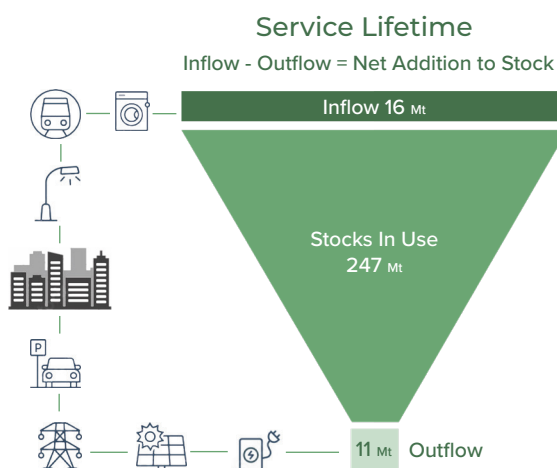


Figure 2: The urban zinc mine: In 2019, about 247 million tons (MT) of zinc were in use that will become available for recycling in the future.

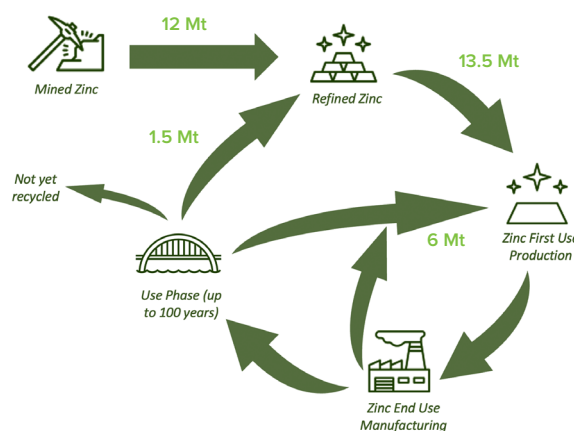


Figure 3: Zinc flows in 2019: Zinc is recycled in the refining stage and via direct reuse and remelting in first use production.

## What is the Zinc Industry Doing to Increase Circularity?

The zinc industry is advancing technologies to recover materials more efficiently from products at end of life. The International Zinc Association (IZA) monitors zinc production, use, and recycling statistics to measure the industry's contribution to circularity, identify recycling gaps, and determine potential for improvement. IZA facilitates the exchange of information among zinc producers, users, and recyclers to work towards innovative solutions. As a result, zinc recycling from all sources doubled between 2010 and 2019 (Figure 4).

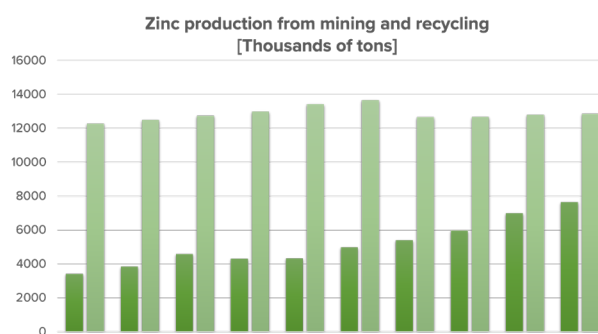


Figure 4: Zinc recycling increases: zinc production from recycled sources has doubled between 2010 and 2019, while zinc production from mined ore has remained almost constant.

### Available Recycling Factsheets



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zinc association

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