

ZINC RECYCLING

2050 Demand + Supply

Metal demand at global level is expected to increase over the next decades. The development is driven by the growing world population and increasing living standards in developing regions, as well as changing use patterns in a greening economy. Zinc contributes to both improved living standards and changing use patterns from its uses in the building sector, infrastructure projects, and renewable energy production and storage. To ensure long-term zinc availability, the International Zinc Association has asked renowned experts to analyze 2050 zinc demand and supply scenarios.

Zinc in Modern Society

About 60% of all zinc produced is used to protect steel from corrosion by galvanizing. Steel is the main metal needed for all projects linked to building, construction, and infrastructure. Prolonging the lifetime of steel saves valuable natural resources and energy, while at the same time increasing and preserving the living standard of societies worldwide.

Renewable energy production is at the core of climate friendly economies. Zinc not only is involved in galvanizing steel structures that support wind and solar power generation, but zinc batteries also support long-duration grid/backup storage, transforming intermittent energy generation (wind and solar) into constant energy supply.

Zinc 2050 Demand Scenario

Using the zinc global stocks and flows model, Fraunhofer ISI, Karlsruhe, Germany developed a 2050 demand scenario based on population growth and global GDP developments as described by OECD (Global Material Resources Outlook to 2060). As a result, the total amount of zinc used to produce first use goods is expected to increase from 17.5 Mt in 2019 to 28 Mt in 2050. The energy storage market is forecast to consume an additional 2.8 Mt of zinc by 2050 (Figure 3). Demand expectations estimated by Fraunhofer ISI are well in line with those described elsewhere in published literature over the past ten years and for various time horizons. Unforeseen changes in societies' use patterns to support carbon neutrality and unknown new uses for zinc will also modify scenarios in the coming years.



Figure 1: Zinc coatings protect steel infrastructure from corrosion, significantly extending service life.

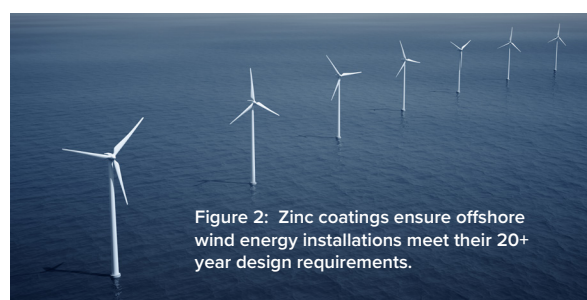


Figure 2: Zinc coatings ensure offshore wind energy installations meet their 20+ year design requirements.

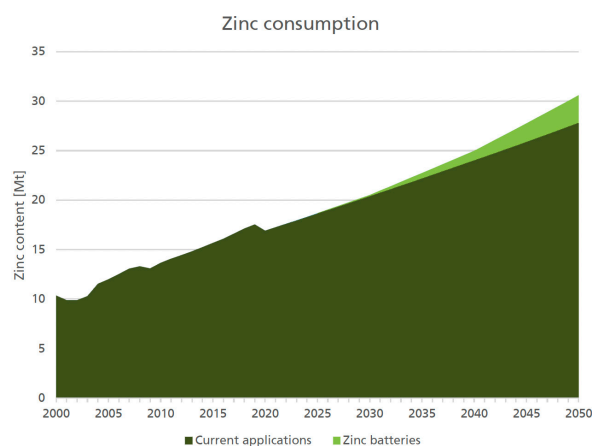


Figure 3: 2050 Zinc demand scenario (Fraunhofer ISI 2021)

Zinc Availability from Recycling

The anthropogenic stock of zinc in products in use is expected to double from 247 Mt in 2019 to 490 Mt in 2050 becoming available for recycling over time. Zinc in building and infrastructure represents the largest stock by far with high product specific recycling rates. These uses also typically have a long lifetime that can reach up to 100 years in the building sector. Two 2050 recycling scenarios have been defined (Figures 4 and 5).

Recycling zinc contributes to resource efficiency by saving valuable natural resources. Another benefit of recycling zinc from industrial wastes such as steel mill dust is that it reduces the amount of material heading to landfills.

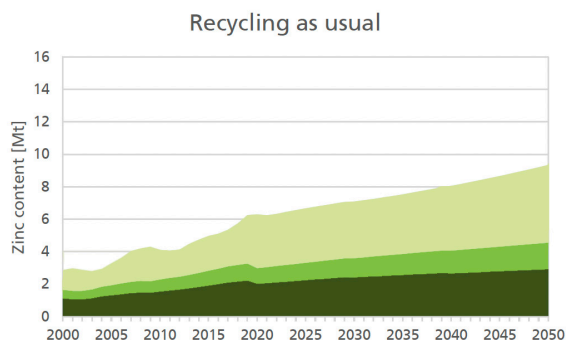


Figure 4: Minimum scenario representing a continuous but slow increase in overall recycling scrap availability. No improvements in waste processing take place (Fraunhofer ISI 2021).

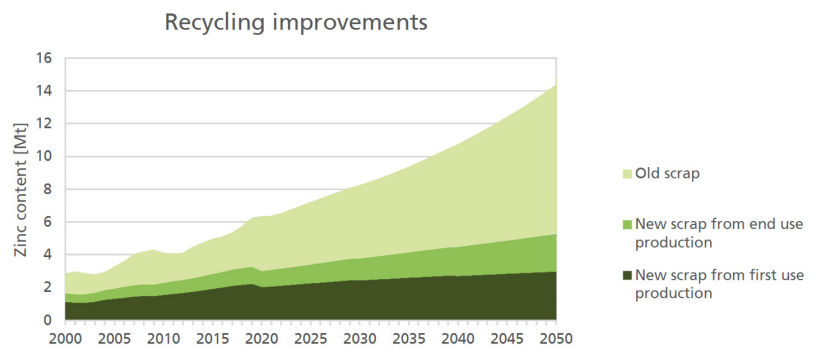


Figure 5: Maximum scenario reflecting the implementation of the best available recycling technology on global scale. It shows a strong increase in recycling practice (Fraunhofer ISI 2021).

Zinc Supply From Mining

Both mining and recycling are necessary and available to meet 2050 zinc demand. Depending on the recycling scenarios presented above, zinc supply from mining would be required to grow from 12 Mt in 2020 to between 17 and 22 Mt by 2050, depending on what comes back from recycling (Figure 6). Despite previous suggestions in the literature, zinc resources available via mining (crustal content, known and extractable resources, etc.) exceed those necessary to ensure long-term availability of zinc from mined sources (Pirard, 2021).

Taken together with the anticipated improvements in waste management and increased recycling of industrial by-products, the End-of-Life Recycling Rate (EoL RR) for zinc could rise from 34% in 2019 to over 50% by 2050.

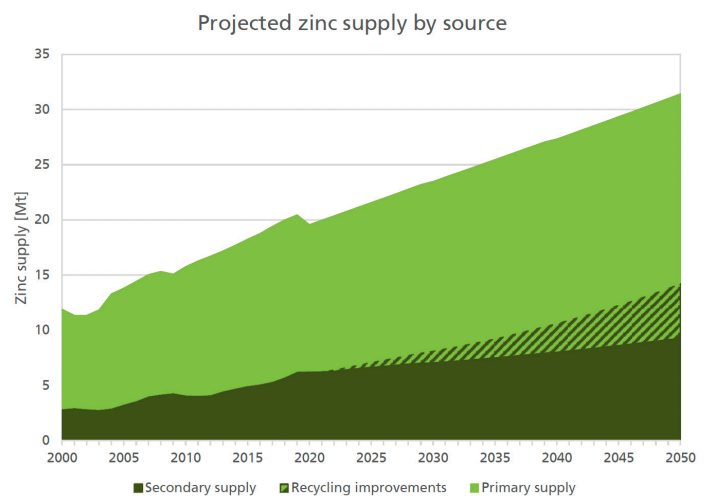


Figure 6: Zinc supply from mining is required to grow depending on success of recycling improvements (Fraunhofer ISI 2021).

Available Recycling Factsheets



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