THE WORLD ZINC FACTBOOK 2024

International Lead and Zinc Study Group (ILZSG)

International Lead and Zinc Study Group

The **ILZSG** was set up by the United Nations in 1959 as an intergovernmental organization and is one of the longest-established International Commodity Organizations.

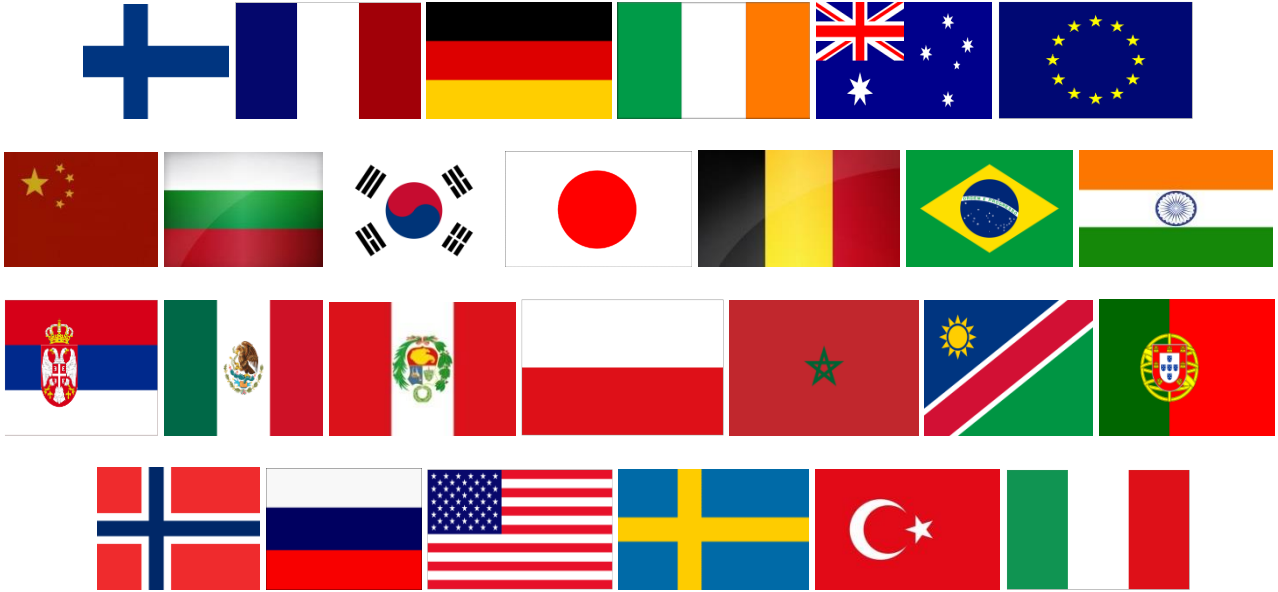
The main role of the **ILZSG** is to ensure transparency in the markets for lead and zinc worldwide. This is achieved by producing a continuous flow of information to the marketplace on supply and demand developments in lead and zinc through the monthly publication of high-quality statistics, in-depth market research, and specifically targeted economic studies. The Group also organizes international sessions and special conferences bringing together industry and governments to discuss matters of concern in the lead and zinc sectors.

The **ILZSG** provides opportunities for regular intergovernmental consultations on international trade in lead and zinc and considers possible solutions to any problems or difficulties that are unlikely to be resolved in the ordinary development of world trade. The Group publishes continuous information on lead and zinc's supply and demand position and probable development. It also prepares special studies on various subjects related to the world lead and zinc market.

The work of the Group is largely carried out by four committees: Standing, Statistical and Forecasting, Mine and Smelter Projects, Economic and Environment. Each committee is chaired by a representative from one of the ILZSG's national delegations, who helps direct the program of work. The committee chairpersons report back to the whole Study Group during formal sessions held at its headquarters in Lisbon, Portugal, or by government invitation in a member country.

International Lead and Zinc Study Group

MEMBERS



International Lead and Zinc Study Group

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International Lead and Zinc Study Group

SELECTED CURRENT PUBLICATIONS

1. Zinc and Lead Statistics - Monthly Bulletin + Interactive Database
2. Zinc and Lead Mine and Smelter Database
3. Zinc and Lead New Mine and Smelter Projects 2024
4. Lead and Zinc End Use Industry Statistical Supplement 2023
5. World Directory: Lead and Zinc Mines 2024
6. World Directory: Primary and Secondary Zinc Plants 2024
7. Environmental and Health Controls on Zinc 2023
8. World Directory: Continuous Galvanizing Lines 2022
9. Joint Study on Current Responsible Sourcing Initiatives Along Minerals and Metals Supply Chains
10. Solid Wastes in Base Metal Mining, Smelting and Refining: A Comprehensive Study for the Copper, Lead, Zinc and Nickel Industries
11. Taxation, Royalties, and Other Fiscal Measures Applied to the Non-Ferrous Metals Industry
12. Risk Factors in Developing Mineral and Metal Projects
13. Social Acceptance for Minerals and Metal Projects
14. The By-Products of Lead, Zinc, Copper and Nickel

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CHAPTER ONE: ZINC BASICS

Symbol: Zn

Atomic number: 30

Atomic Weight: 65.37

Melting Point: 419.5°C

Boiling Point (760mm Hg): 907°C

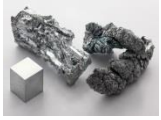
Modulus of Elasticity: $7x10^4$ MN/m^2

Heat of fusion: 7.32 kJ/mol

Heat of vaporization: 115 kJ/mol

Density: 7140 kg/m^3 at 25°C

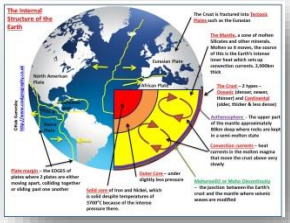
Colour: bluish-white, lustrous



- 23rd most abundant element in the Earth's crust
- 4th most common metal in use after iron, aluminum, and copper
- the principal use of zinc is to protect steel from corrosion
- around 17-18 kg of zinc is used in an average car with 7-8 kg on the façade, 9-10 kg as die-casting parts, and around 2 kg in the rubber tyres
- zinc provides essential nutrition for fauna and flora, and is recognized as a critical element for child growth and development and the proper functioning of the immune system
- zinc is a key component in sunscreen
- zinc is also used as a negative plate in batteries, gutters, and roofing

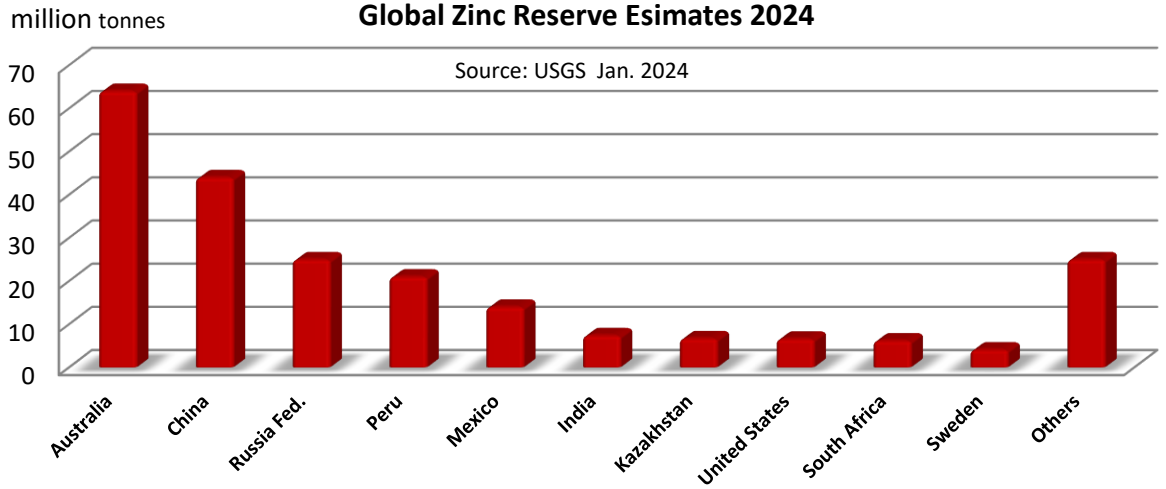
CHAPTER TWO: ZINC RESOURCES

Zinc blende, also known as sphalerite is the dominant form of zinc ore with wurtzite, smithsonite, and hemimorphite as other forms. Zinc ore is currently mined in over 50 countries with China, Australia, Peru, USA, Mexico, India, and Bolivia the most important. Aggregated zinc concentrate production for the period of 1960-2023 was over 521 million tonnes. Nowadays an increasing tonnage of zinc is produced from secondary raw materials (recycling) in the smelters and in other well-established technologies, such as re-melting. According to the USGS data released in January 2024, identified zinc ore resources (location, grade, quality, and quantity are known or estimated from specific geologic evidence) stand at around 1.9 billion tonnes with recognized reserves (legally, economically, and technically extractable ores) at about 224 million tonnes. Many zinc mines are based on mixed sulfide ores containing copper, lead, and zinc in varying proportions, often with by-products such as silver, indium, germanium, gallium, bismuth, tellurium, and cadmium.



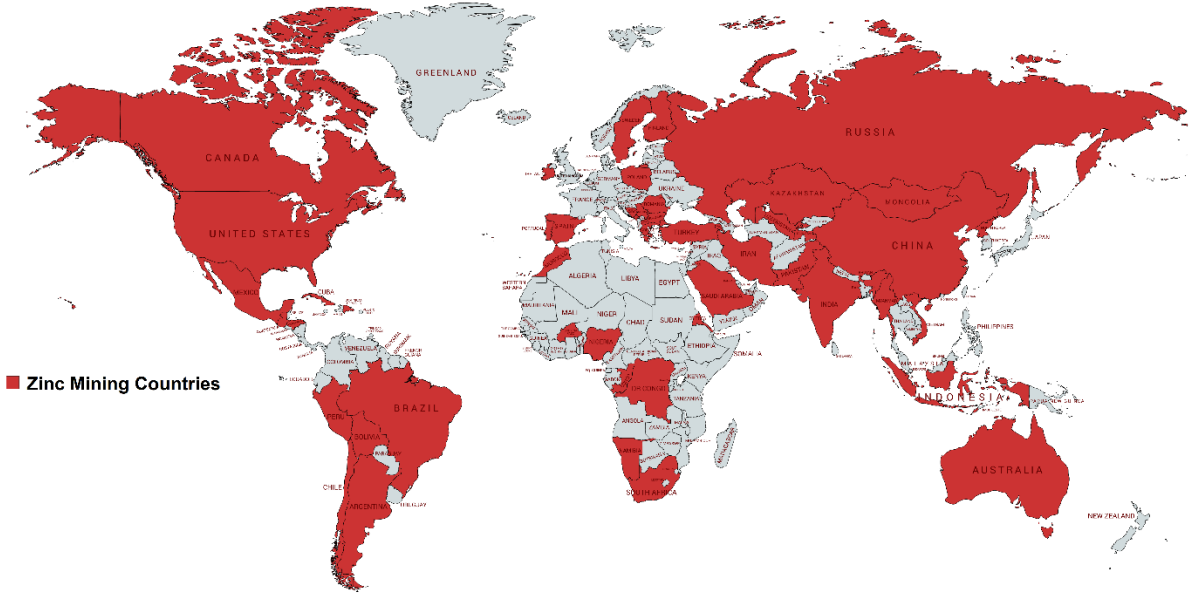
Zinc Reserves

Australia has the largest zinc reserves of around 64 million tonnes, followed by China with 44 million tonnes, Russia with 25 million tonnes, Peru with 21 million tonnes, and Mexico with 14 million tonnes.

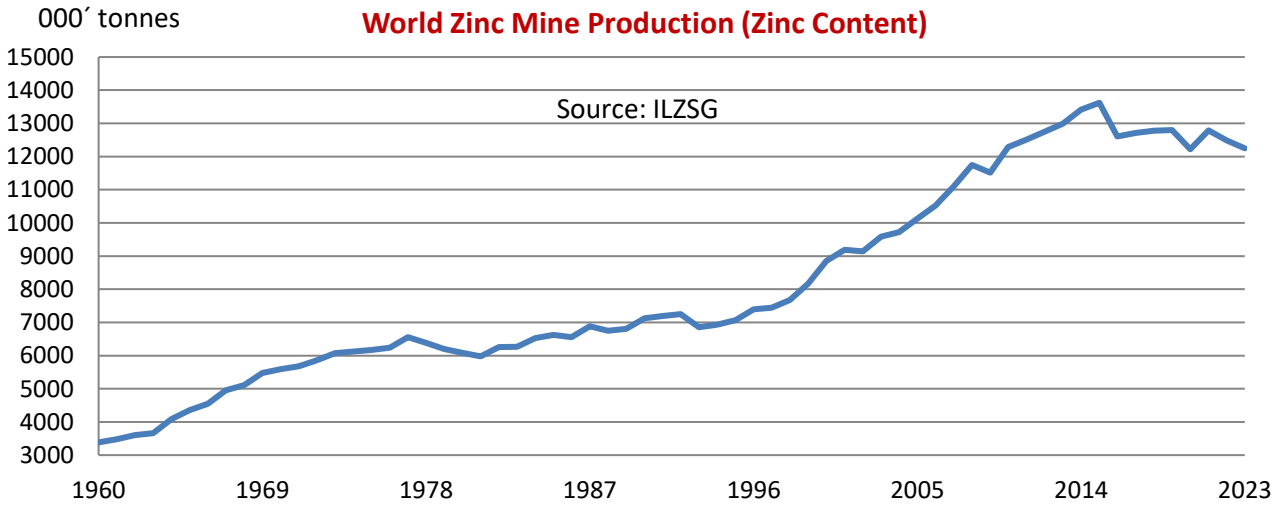


*Reserves refer to legally, economically, and technically feasible resources to be extracted for a profit as per recognized standards such as JORC, NI 43-101, and SAMREC. Different jurisdictions may develop their own classification codes.

Zinc Mining Countries 2023

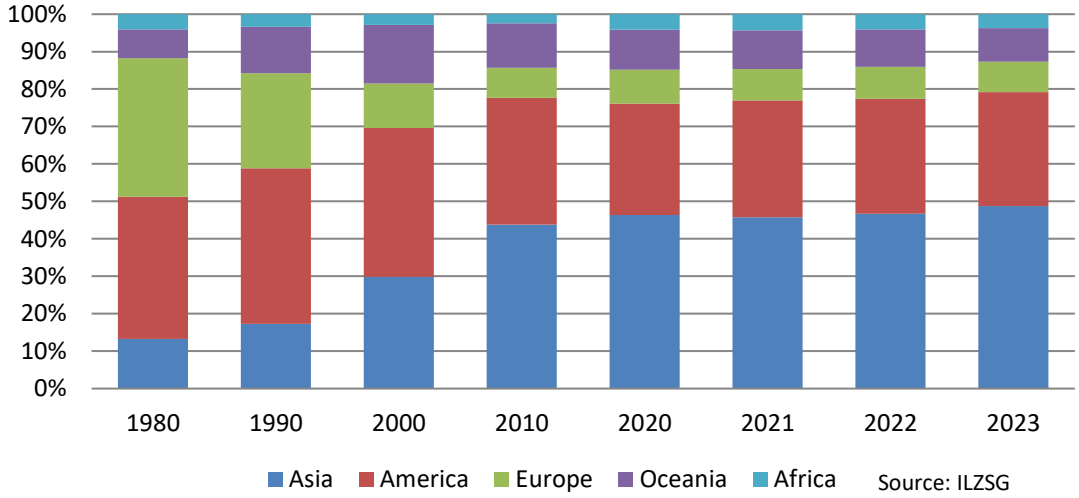


- Since 1960 over 60 countries have mined zinc ore.
- In 2023, 50 countries were actively mining zinc.



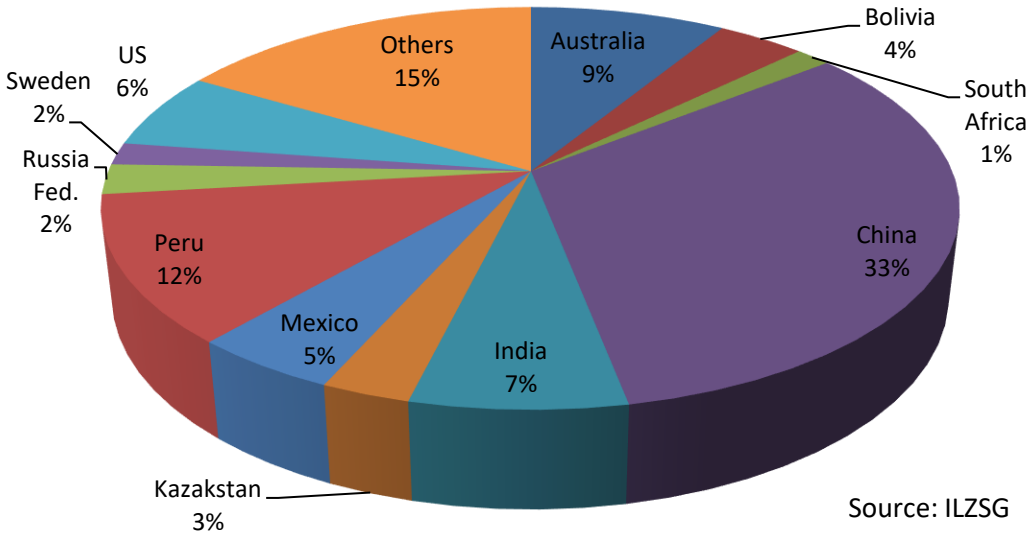
- Zinc mine production grew from 3.4 million tonnes in 1960 to over 12 million in 2010 with no significant interruption. After peaking at around 13.6 million tons in 2015, mine production has has since fluctuated between 12-13 million tonnes.

Share of Mine Production by Continent



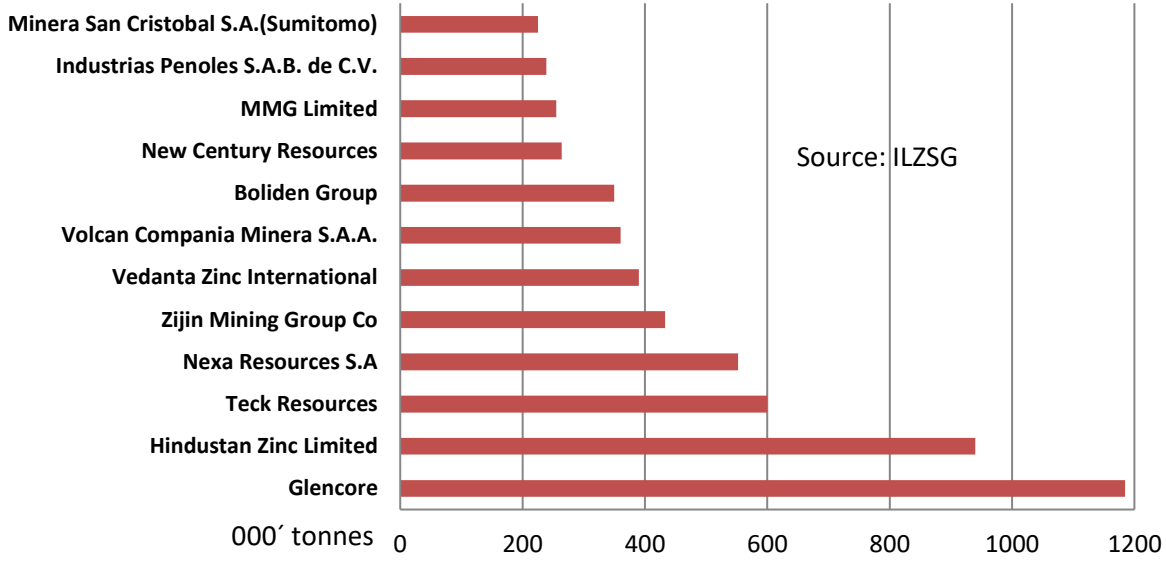
- A substantial shift in the geographic origin of zinc mine output has taken place. Before 1990, Europe and the Americas were the major contributors to mine output. Over the period 1990 to 2010 Asian mine output more or less doubled every 10 years before the proportions stabilized.

Zinc Concentrate Production Distribution by Country 2023

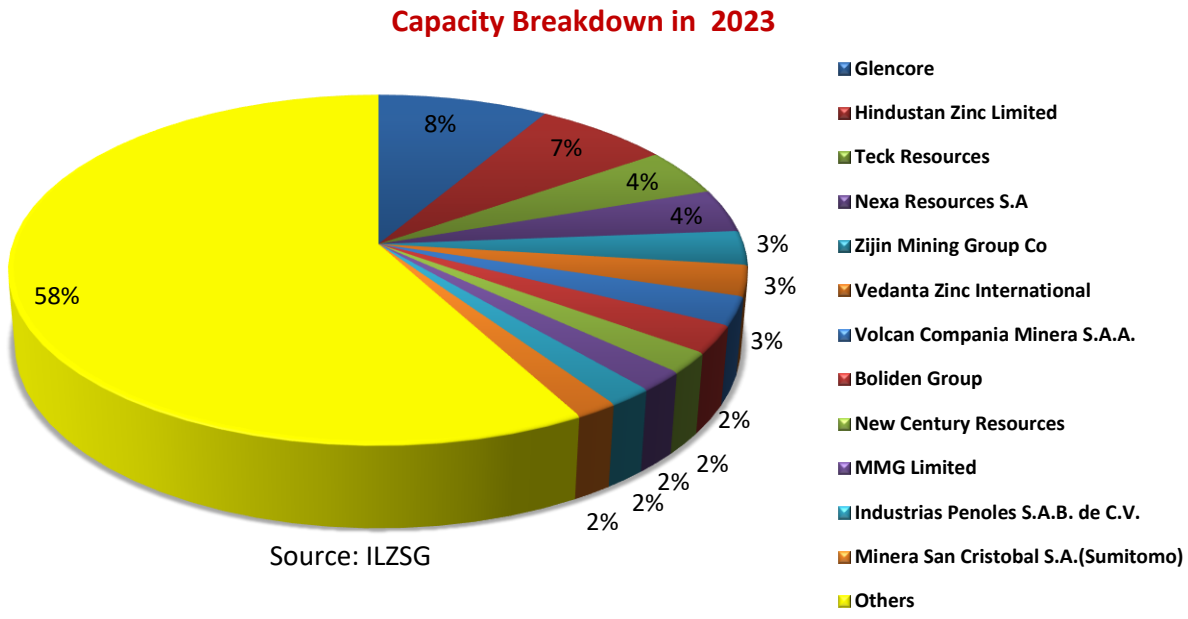


- China is currently the single largest zinc mining country followed by Peru, Australia, India, and the US. The top 10 mining countries contributed 84% of total global zinc concentrate production.

Miners with Capacity above 200,000 tonnes in 2023



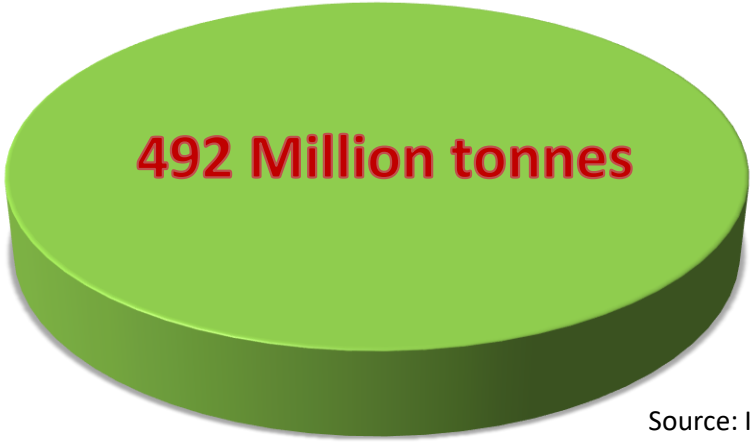
- There were 12 zinc mining companies with a capacity higher than 200,000 tonnes/year in 2023.
- The company with the largest capacity was Glencore.



Source: ILZSG

- The 12 companies with capacity higher than 200,000 tonnes/year contributed to 42% of the world's concentrate production capacity, with Glencore taking the lead.

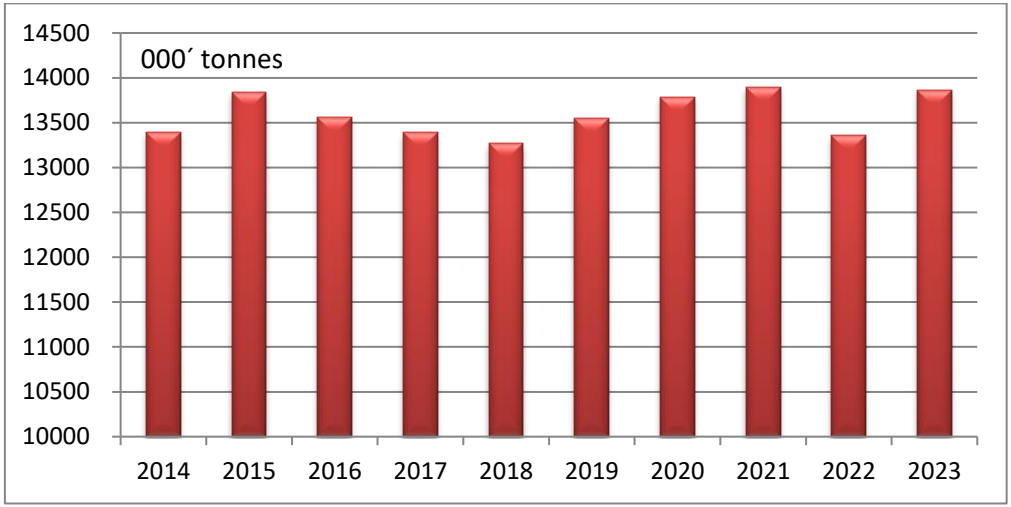
Aggregate Global Primary Refined Zinc Production 1960-2023



Source: ILZSG

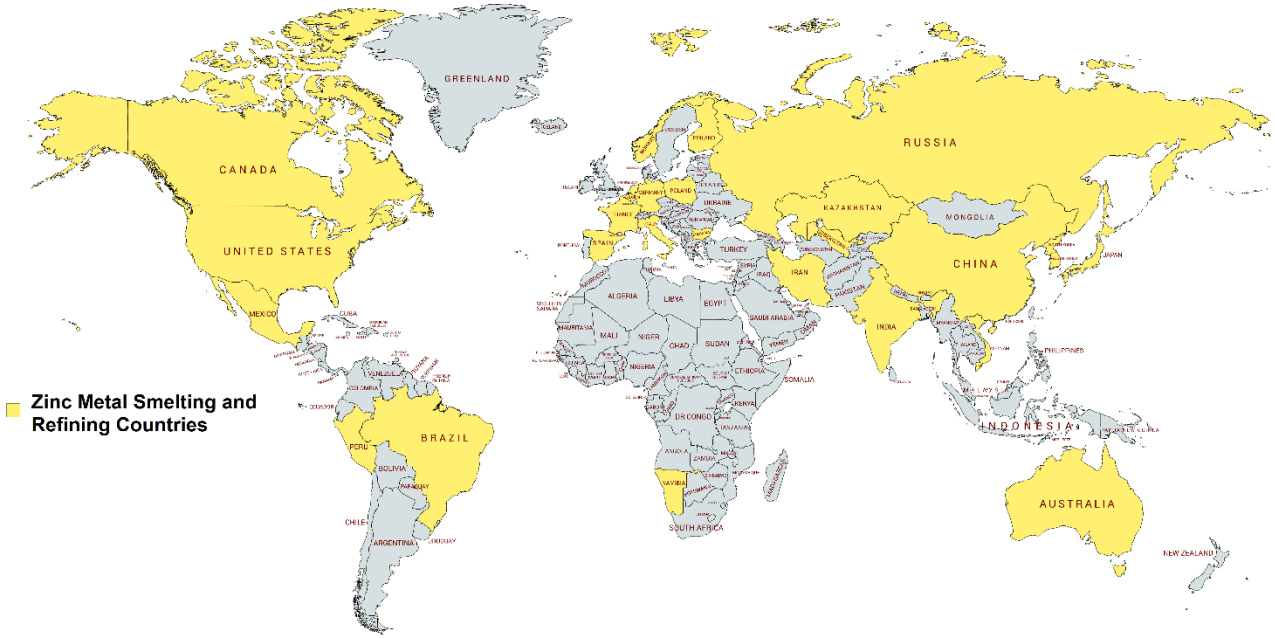
- The aggregate global primary refined zinc metal (produced from concentrate only) output over 1960-2023 was 492 million tonnes. The majority of this is still in use.

World Refined Zinc Metal Production 2014-2023

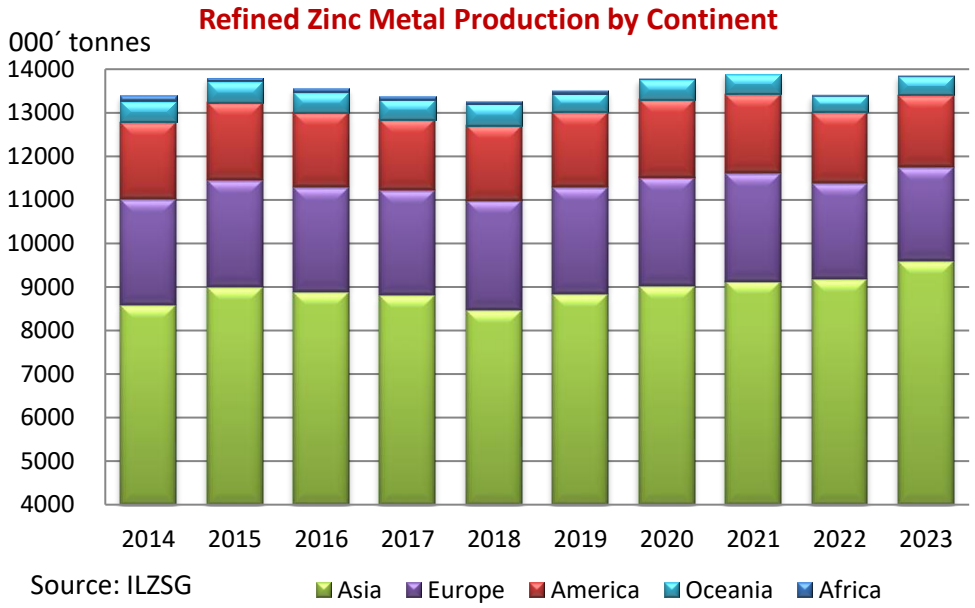


- World refined zinc output recorded its highest ever level in 2021 reaching 13.89 million tonnes. The production decline over 2016-2018 was due to mine mothballing and shutdowns as a result of both low prices and the end of mine life. The interruption in 2022 was due to the COVID-19 Pandemic.

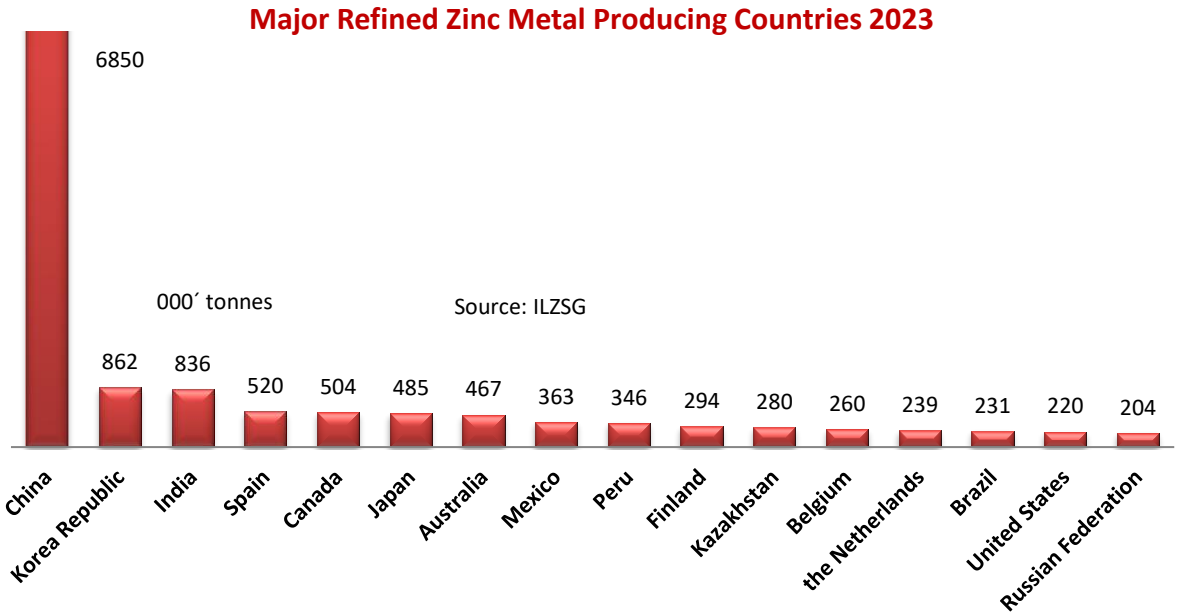
Zinc Metal Producing Countries 2023



- 30 countries had zinc metal smelting and/or refining activities in 2023.

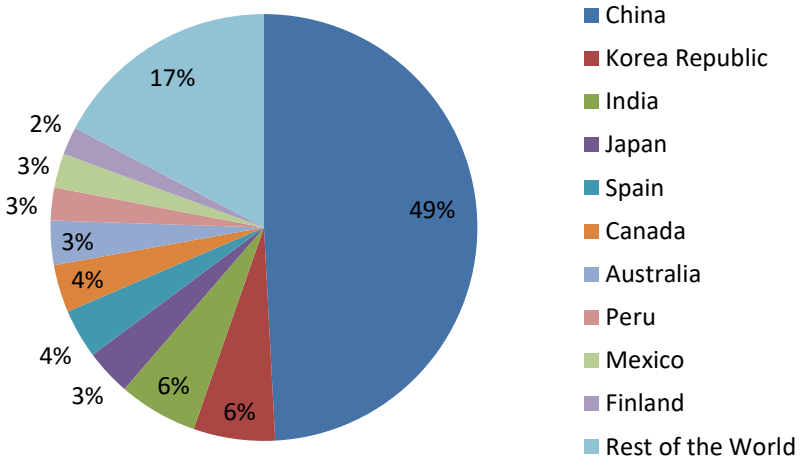


- The Americas, Asia, and Europe are the most important continents for refined zinc production. Output in all the major producing regions has been relatively stable for the observed time.



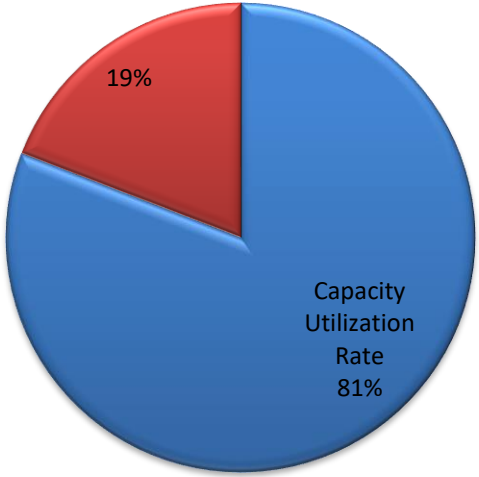
- Zinc metal production exceeded 200,000 tonnes in sixteen countries in 2023.

Top 10 Refined Zinc Metal Producing Countries 2023

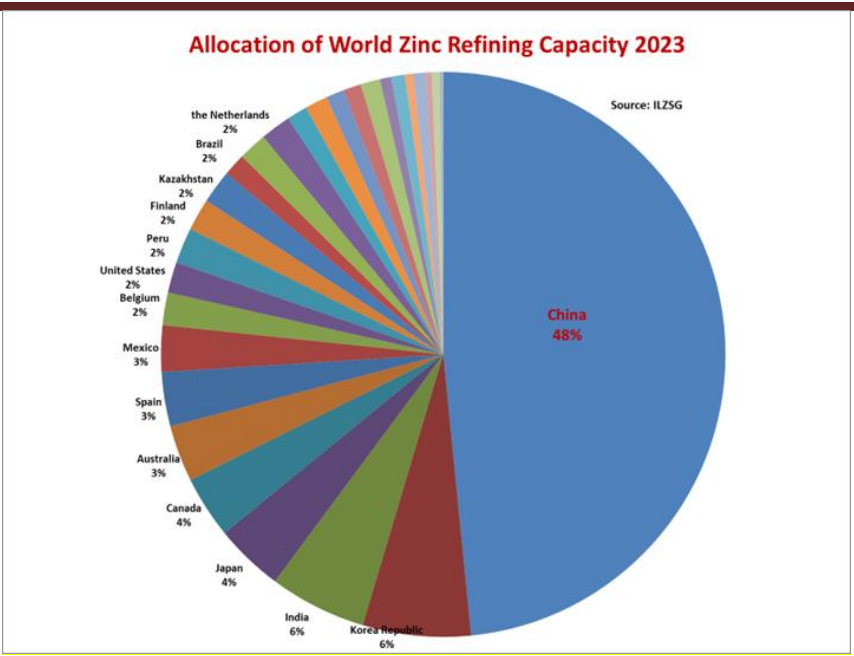


- The top 10 refined zinc metal-producing countries contributed 83% of the world's total output in 2023 with China´s share at 49%.

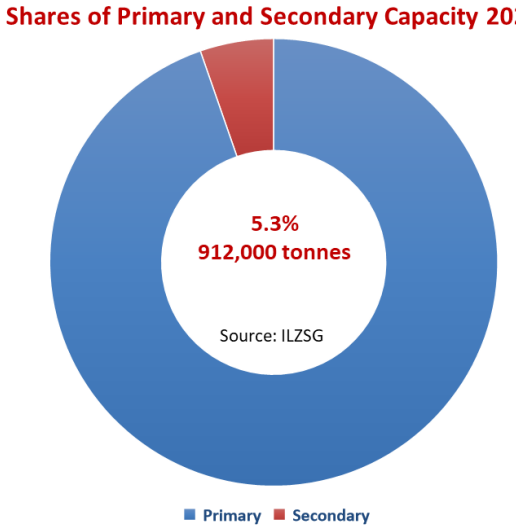
Utilization Rate of Zinc Refining Capacity 2023



- By the end of 2023, the world zinc refining capacity totalled 17.1 million tonnes with 16.2 million tonnes of primary capacity and 912,000 tonnes of secondary capacity. The overall capacity utilization rate was 81.5% in 2023.

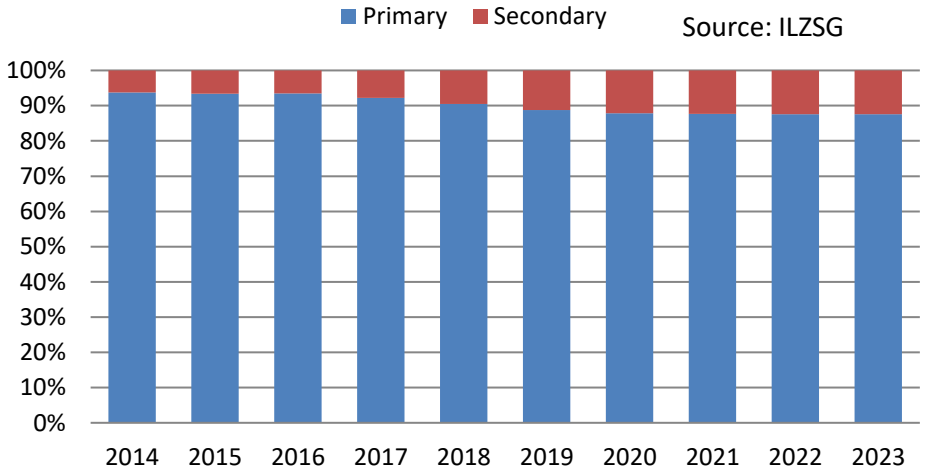


- China contributed to 48% of the zinc refining capacity in operation, other Asian countries including the Republic of Korea, India, Japan, and Kazakhstan accounted for 16%. Twelve countries in the EU had active capacities and their share as a whole was around 16% of the total.

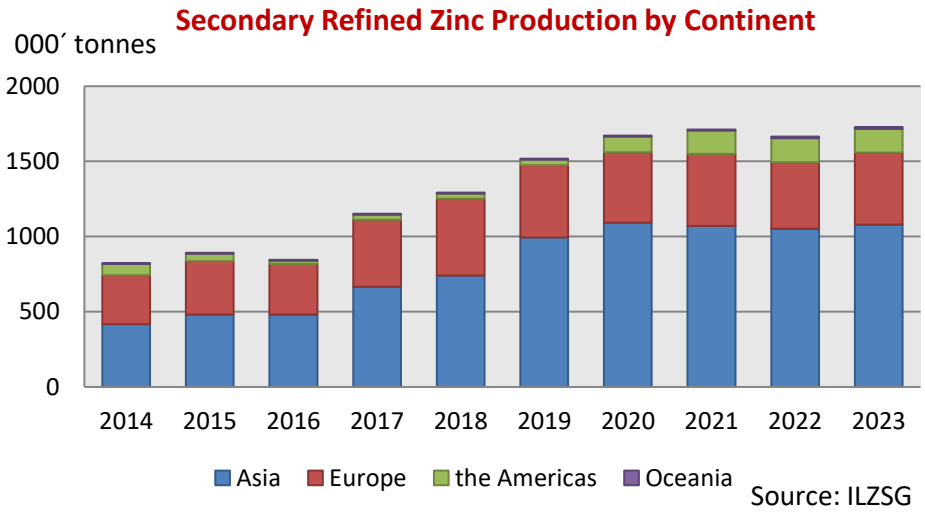


- Of the more than 17 million tonnes of capacity in operation in 2023, 5.3% or 912 thousand tonnes was secondary zinc refining capacity. Many primary zinc facilities also use scrap zinc as input as shown in the next chart secondary zinc output accounted for 13% of total zinc output in 2023.

Breakdown of World Refined Zinc Production



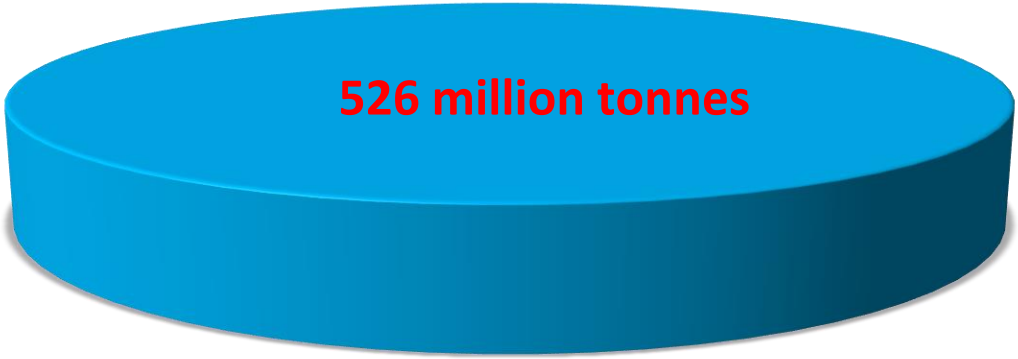
- In 2023 about 13% of refined zinc was produced from secondary (recycled) material including scrap, EAF dust, and residues from the galvanizing process. In addition, significant quantities of zinc are recycled from new and old scrap, for example by remelting zinc sheets and die-castings, and by direct use of zinc in the brass and chemical industries.



- Secondary refined zinc is produced mainly in Asia, Europe, and the Americas. In Asia, secondary production has been quite stable at around 1 million tonnes for the past five years. Secondary production in the US significantly increased in 2020/2021 due to the reopening of American Zinc Recycling´s plant at Mooresboro. Secondary refined zinc is mainly recovered via the processing of EAF dust, Waelz oxide, and other mostly oxidic secondary zinc raw materials.

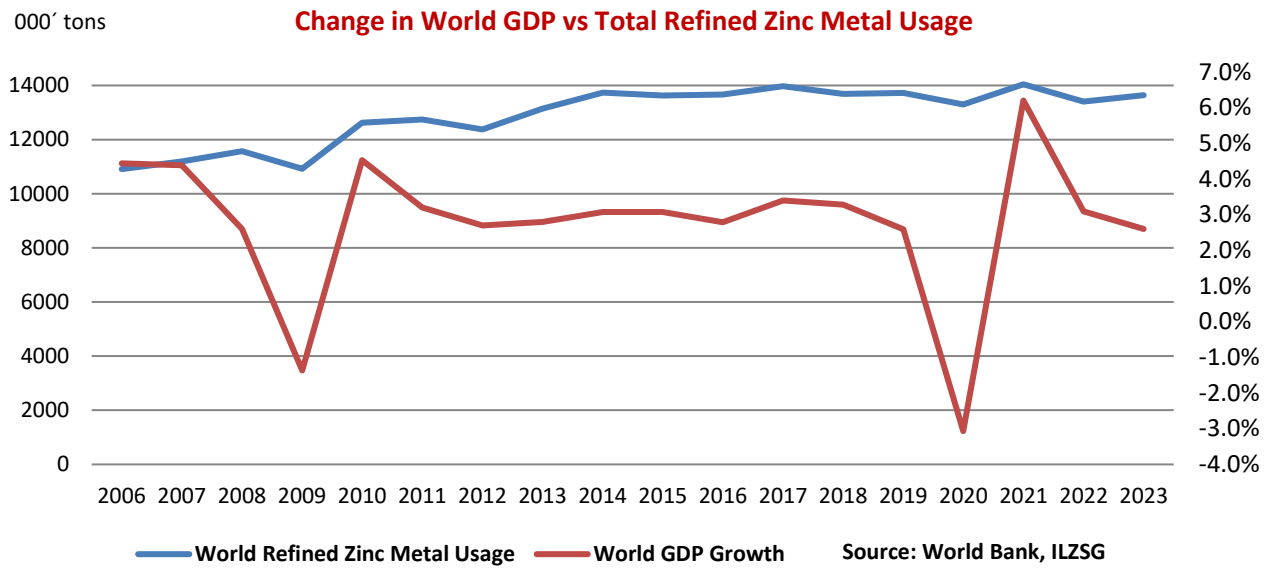
CHAPTER FOUR: REFINED ZINC USAGE

Aggregated Zinc Metal Usage 1960-2023

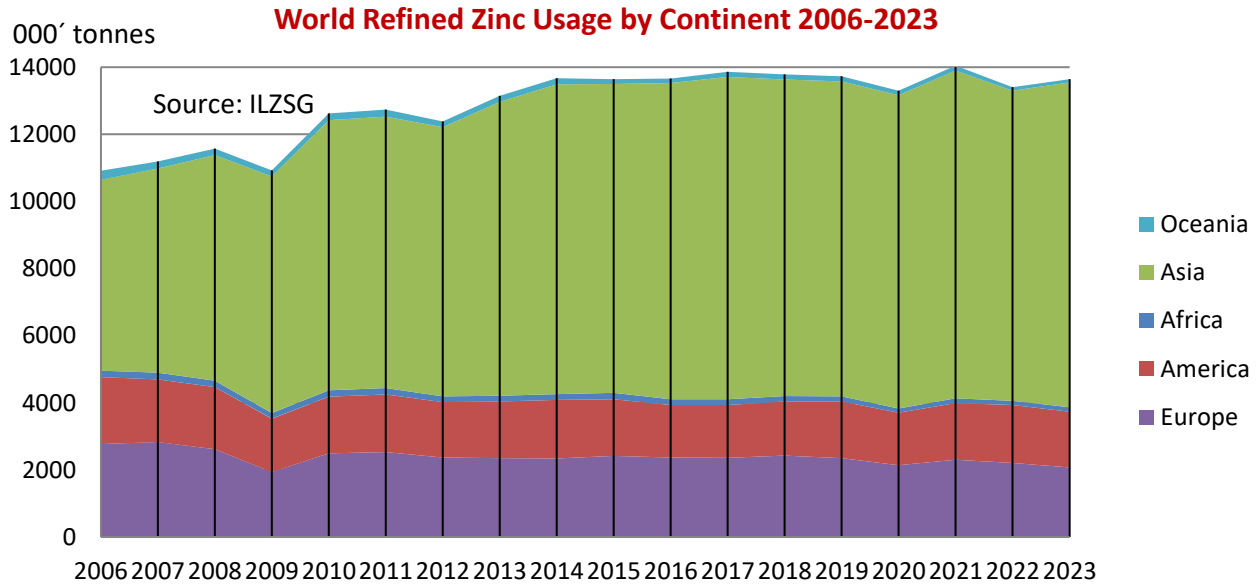


Source: ILZSG

- The aggregate usage of refined zinc metal was 526 million tonnes from 1960 to 2023.

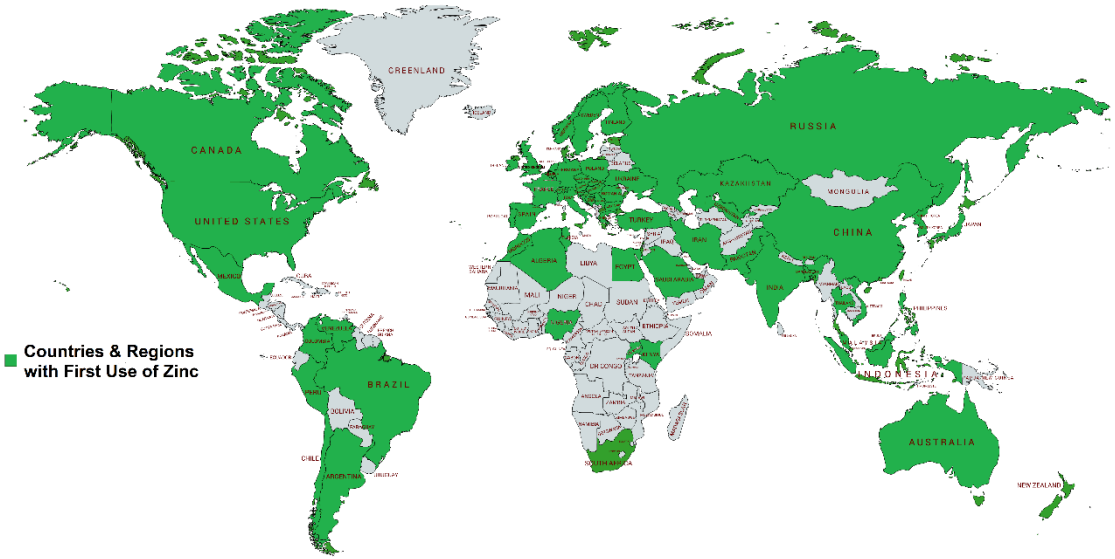


- It is interesting to note that in recent years global refined zinc usage has maintained a relatively stable and upward trend despite sharp fluctuations in the world GDP growth, with only minor downward adjustments in 2009, 2012, and 2020 resulting from the world financial crisis, a deterioration in the Eurozone debt crisis, and the COVID-19 Pandemic.

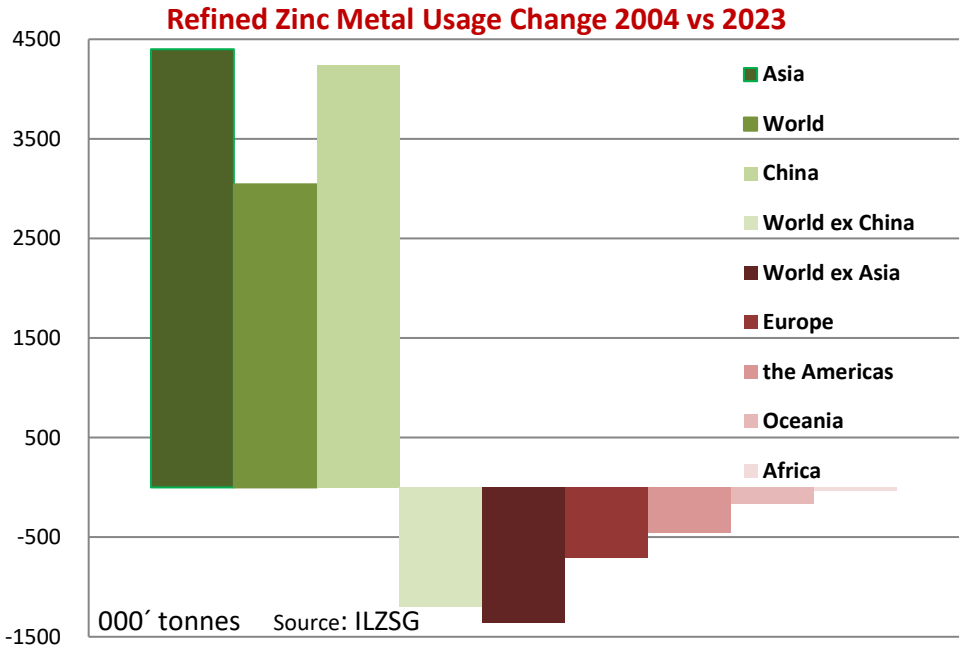


- Most refined zinc is used in Europe, America and Asia.
- The Usage volume in Europe and America has been stable since 2010.
- Usage growth has been mainly in Asia.

Countries and Regions with First Use of Zinc 2023

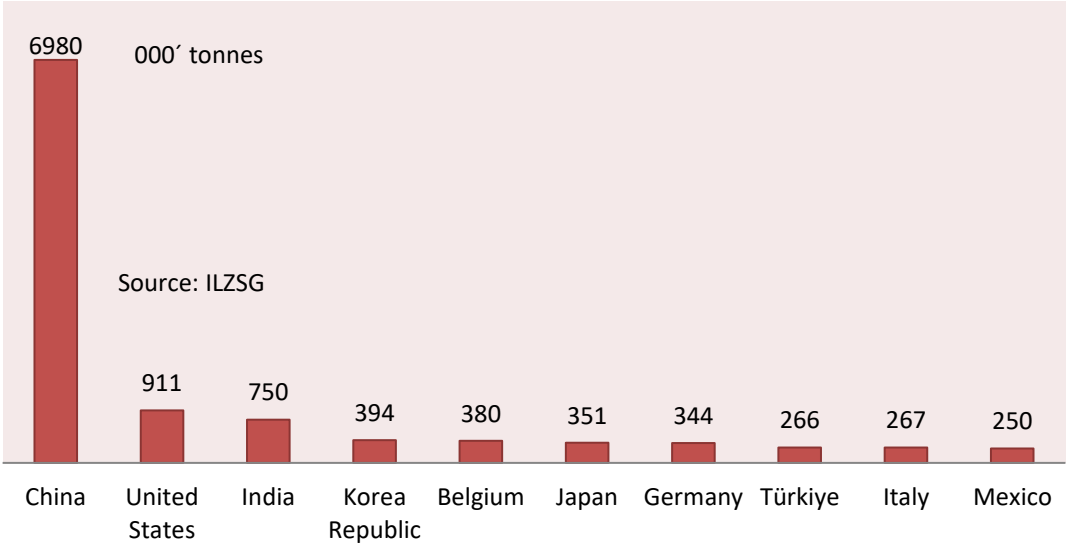


- The ILZSG statistics recorded first use of refined zinc metal in more than 75 countries in 2023. However, many of the other countries will also use zinc even if only in very small quantities.



- Since the early 2000s, nearly all growth in zinc metal usage has been in Asia, where demand has been primarily driven by growth in China.

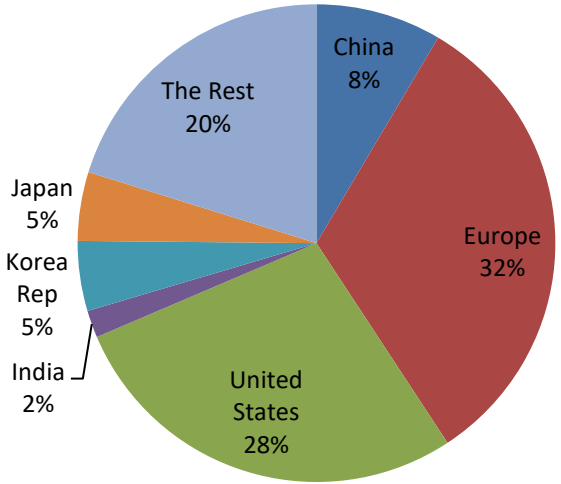
Top Ten Users of Refined Zinc Metal in 2023



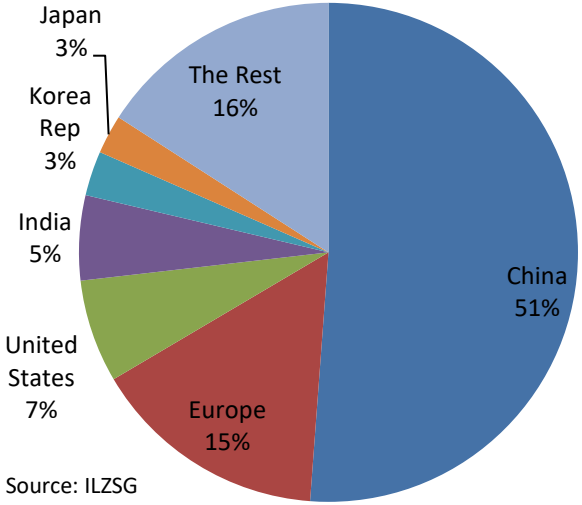
- China´s annual usage of refined zinc metal is significantly higher than the next nine countries combined.

Geographical Shift of Global Refined Zinc Metal Usage

Usage Distribution 2000

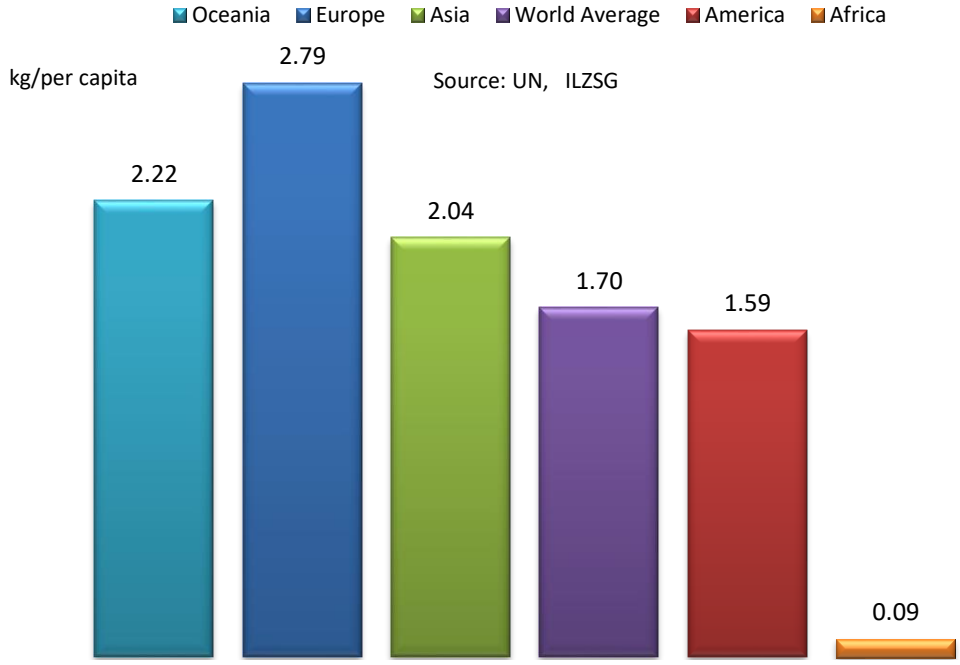


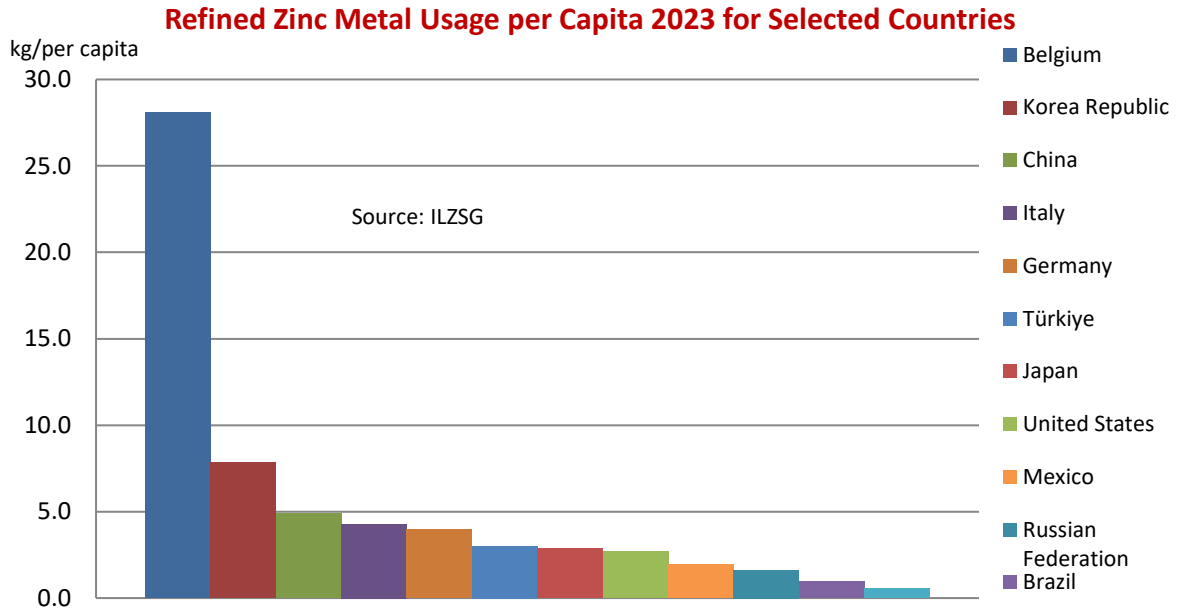
Usage Distribution 2023



Source: ILZSG

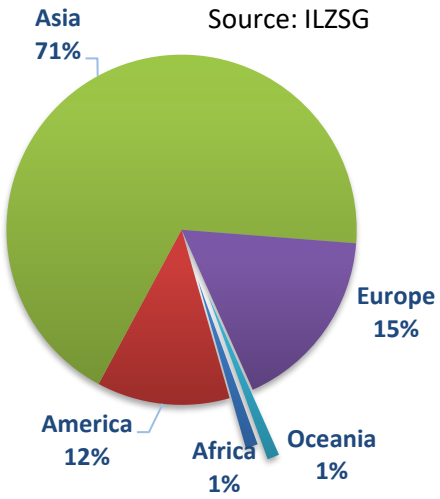
Refined Zinc Metal Usage per Capita by Continent 2023



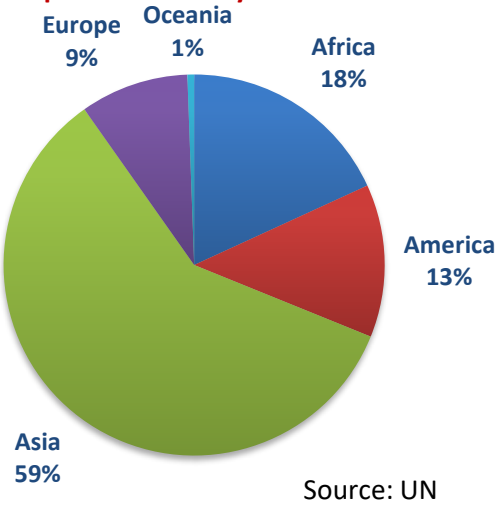


- Belgium and the Republic of Korea are major producers of zinc alloys, most of which are exported.

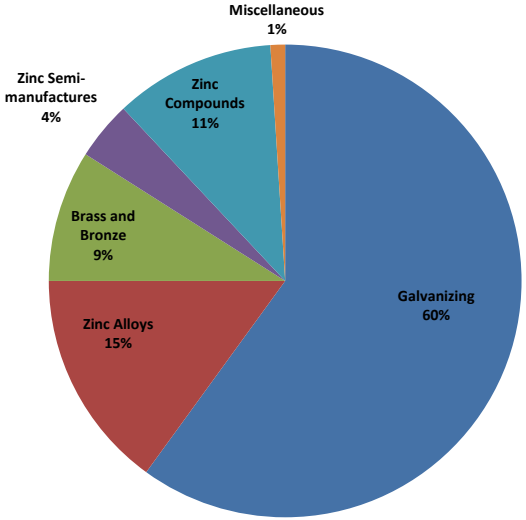
Geographical Allcocation of Refined Zinc Metal Usage 2023 by Continent



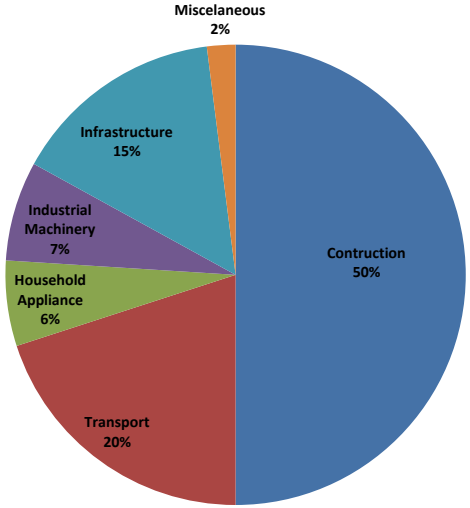
Geographical Allocation of World Population 2023 by Continent



Zinc Usage by First Use Application



Zinc Usage by End Use Sector



Source: ILZSG, IZA

Properties and Uses of Zinc

Property	First-Use	End-Use
Reactivity with iron Corrosion resistance electrochemical	• Corrosion protection (galvanizing, zinc thermal spraying, electroplating, zinc-rich paints)	○ Building/construction, energy/power, street furniture, agriculture, automotive/transport
Low melting point Fluidity Capacity for surface treatment strength	• Die Casting and gravity casting	○ Automotive equipment, household appliances, fittings, toys, tools, etc.
Alloying characteristics	• Brass (copper-zinc alloy), aluminum alloys, magnesium alloys	○ Building/construction, fittings, automotive and electrical components, etc.
Formability Resistance to corrosion	• Rolled zinc	○ Building/construction
Electrochemical	• Batteries	○ Automotive/transport, computers, medical equipment, consumer products, energy storage systems
Chemical	• Zinc oxide, zinc stearate	○ Tyres, all rubber goods, paint pigments, ceramic glazes, electrostatic copying paper
Essential nutrient	• Zinc compounds	○ Food industry, animal feed, fertilizer ○
Healing	• Zinc compounds	○ Pharmaceutical industry, cosmetics industry

Corrosion and Galvanization

- Metallurgy is the process of transforming mineral ores into metals, corrosion is the reverse process of metallurgy by which metals tend to revert to their original state after exposure to oxygen, sulfides, and carbonates.

- Galvanization is a zinc coating process in which the steel surface is coated with a dense and adherent layer of zinc to seal it from exposure to oxygen, sulfides, and carbonates.

- The dense and adherent alloy layer on the surface chemically bonds to the steel. It tends to corrode in preference to steel thus protecting the steel from corrosion through both barrier and sacrificial protection.

- The idea of galvanization was first proposed by French chemist Paul Jacques Malouin in 1742, the process has been widely adopted since it was patented by another French chemist Stanislas Sorel in 1836.

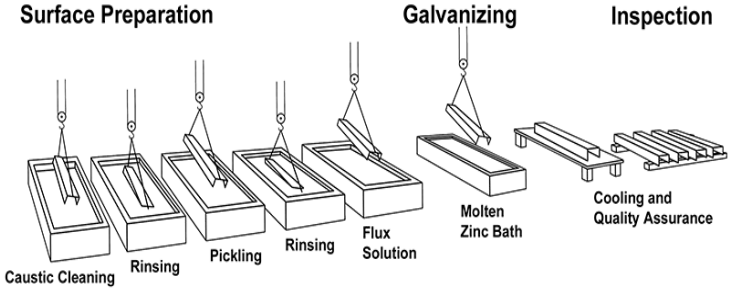
Continuous Hot-dip Galvanizing

Coiled and rolled steel is galvanized in a molten zinc bath at the steel plant after it leaves the annealing furnaces and a vacuum chamber at speeds of up to 150 meters a minute. An Air knife is applied on the coating surface to create a uniform coating thickness. The coating layer is mostly pure zinc with the presence of minimal alloying elements. Line capacities can be quite high, exceeding 600,000 tonnes of coated steel per year. This process is very capital intensive and therefore usually carried out by the large integrated steel producers. The galvanized steel sheet, strip and wire are ductile and abrasion resistant and therefore ready for further fabrication before they are used to produce car bodies, household appliances, corrugated steel parts, etc.

Batch (General) Hot-dip Galvanizing

Unlike continuous hot-dip galvanizing, the batch (general) hot-dip galvanizing industry is quite fragmented with many small plants located close to their markets. Costs of entry are relatively low compared to a continuous galvanizing line.

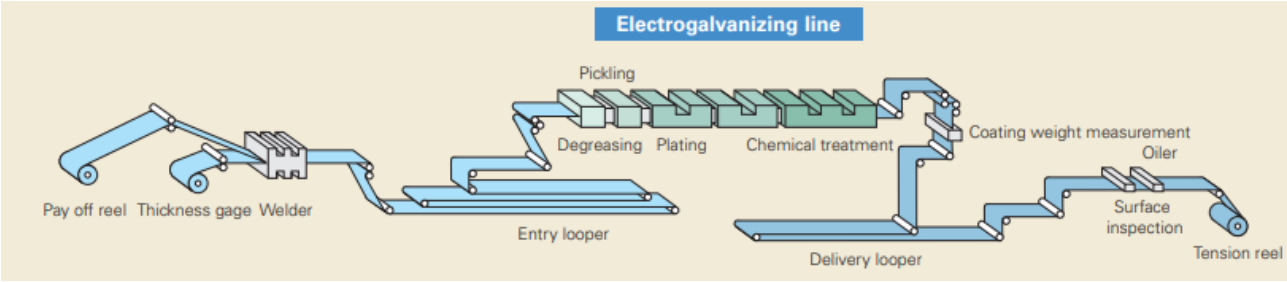
A variation of shapes of steel parts from nuts, bolts, and nails to structural steel parts and complicated steel profiles can all be galvanized through this process. Pre-fabrication and complete immersion create a uniform, complete coating of the parts surface both interior and exterior as well as complex recesses.



Process and Application of Batch Galvanizing

Electro Galvanizing/Zinc Electroplating

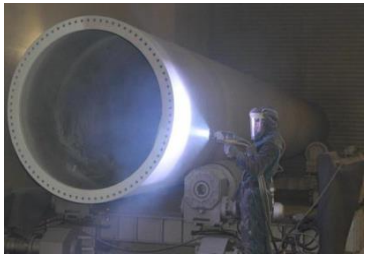
Electro galvanizing is a continuous coating process for steel sheets and strips by dipping them in zinc electrolyte-anode such as lead-silver, electrolytes of zinc sulfates, or other insoluble anodes. Pure zinc-soluble anodes can also be used. The coating develops as positively charged zinc ions in the solution are electrically reduced to zinc metal and deposited on the positively charged cathode (sheet steel). Electro galvanizing only forms a thin layer of zinc up to 0.36 mils (9.1 µm) per side on the steel surface. Zinc Plating is the same process for small parts such as fasteners, crank handles, springs, and other hardware items rather than sheet and strip, but with a zinc coating up to a maximum thickness of 1 mil (25 µm). The service life of electro-galvanized items is short but with an excellent surface finishing of uniform thickness compared to hot-dip galvanizing, and the coating is highly ductile remaining intact even after severe deformation.



Metalizing (Zinc Thermal Spraying)

After the steel surface has been abrasively cleaned, pure zinc or zinc alloys are loaded into a heated gun and sprayed onto it using combustion gases and/or auxiliary compressed air to provide the necessary velocity. The coating can provide both galvanic cathodic and barrier protection to the steel.

Versatility is one of the biggest advantages of Zinc Thermal Spaying as different coating thicknesses can be applied to different parts of the steel. The process can take place in both the workshop and field. Restrictions regarding the size of the steel parts and composition of the steel are therefore removed. In addition, overall, part coating and enhanced coating become possible. Improvements currently being worked on include limitations of coating thickness on corners and edges, the inability to coat interior surfaces, and difficulties in coating recesses and cavities.

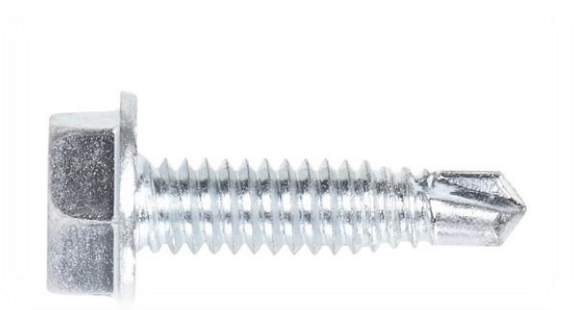


Zinc-Rich Paint

Zinc-rich paint is a type of surface coating whereby the coating is bonded to the steel surface mechanically. However, in case of high concentrations of zinc dust, conductivity between zinc particles and the steel may stimulate cathodic protection. Substrate steel should be cleaned to nearly white steel before the organic or inorganic zinc-rich paint is brushed and sprayed onto its surface. Constant agitation and a homogenous mixture of the zinc-rich paint are important to ensure a quality finish.

Mechanical Plating

The mechanical zinc plating process is designed to coat high-strength fasteners and other small parts with less complicated shapes that are not suitable for hot-dip galvanizing. The flash copper-coated steel parts are tumbled in a drum filled with zinc powder, proprietary chemicals (activator), and glass beads (impact medium) which peen (glass beads act as ball-peen hammers) zinc powder onto the surface. The coating is mechanically bonded to the steel so it has less adhesion compared with hot-dip galvanizing.



Sherardizing

Sherardizing is named after the British metallurgist Sherard Osborn Cowper-Coles who invented and patented the method, the process is also known as thermal diffusion galvanizing, dry galvanizing, or solid-state galvanizing. Small fabricated articles are charged in a closed rotating drum that also contains metallic zinc powder and sand. At temperatures above 300°C, the zinc evaporates and diffuses onto the steel substrate forming diffusion-bonded uniform, hard, abrasion-resistant coatings on complex parts.

Zinc Die-casting

Refined zinc is combined with elements, such as aluminum, copper, and magnesium to produce alloys for casting applications. Aluminum gives the alloy its mechanical properties, particularly tensile and impact strength. Copper, in small amounts, increases tensile strength and hardness, but reduces ductility, particularly as the alloy ages. Magnesium, in very small amounts, increases hardness, reduces ductility, and offsets the effects of metallic impurities, particularly lead, cadmium, and tin.

Zinc die casting allows for a high level of precision together with outstanding physical and mechanical properties and low cost. The main advantages are the ability to produce complex shapes with thin walls, excellent tensile strength and dimensional stability, RFI/EMI(radio frequency interference/electromagnetic interference) shielding capabilities, long service life with minimal maintenance, and a wide range of finishing options. The strength, fluidity, and aesthetics of zinc die-cast alloys make them ideal for many applications including household appliances, car parts, telecommunication equipment, and door handles.




Brass and Bronze

Brass is an alloy that consists of copper and zinc. The amount of zinc can range from 5% to 45% depending on the end use. Brass is commonly used for decorative purposes. Its high workability and durability also enable it to be widely used to make musical instruments. The proportion of zinc in brass results in differences in the color and other physical characteristics of the material. If the zinc content of the brass ranges from 32% to 39%, it will have increased hot-working abilities but the cold-working properties will be limited. If the brass contains over 39% zinc, it will have a higher strength and lower ductility at room temperature. Tin is commonly added to brass to inhibit dezincification for good hot forgeability and good cold formability for the manufacture of fasteners, marine hardware, machine parts, pump shafts, and corrosion-resistant mechanical products. Bronze is a copper-tin alloy that typically comprises less than 1% Zn. Bronze is used in the construction of sculptures, musical instruments, and medals. Its low friction properties also allow it to be employed in industrial uses such as bushings and bearings.

Zinc compounds (Zinc Chemicals)

The main zinc chemicals in current use include zinc oxide, zinc borate, zinc carbonate, zinc chloride, zinc sulfate, zinc sulfide, zinc selenite, zinc powder, and nanoform zinc compounds.

Zinc oxide is widely used in the animal feed, pharmaceutical, rubber/tyre, ceramic/glass, and electronics industries.

Zinc borate is primarily used in plastics and cellulose fibres, paper, rubbers, and the textiles industry.

Zinc sulfate is widely used in the production of fertilizer and animal feeds.

Zinc chloride is mainly used as a catalyst in chemical metal production and manufacturing.

Zinc sulfide is used in cathode ray tubes, X-ray screens, and as an optical material and pigment.

Zinc selenite is mainly used in the glass industry.

Zinc powder is used in solution purification in electrolytic zinc plants, alkaline batteries, brake lines, spray metalizing, catalysts, mechanical plating, plastics, and pharmaceuticals.

Zinc nanoparticles, nanodots, and nanopowder are nano-scale zinc chemicals and are used as high-niche materials in a wide range of applications.

Rolled Zinc

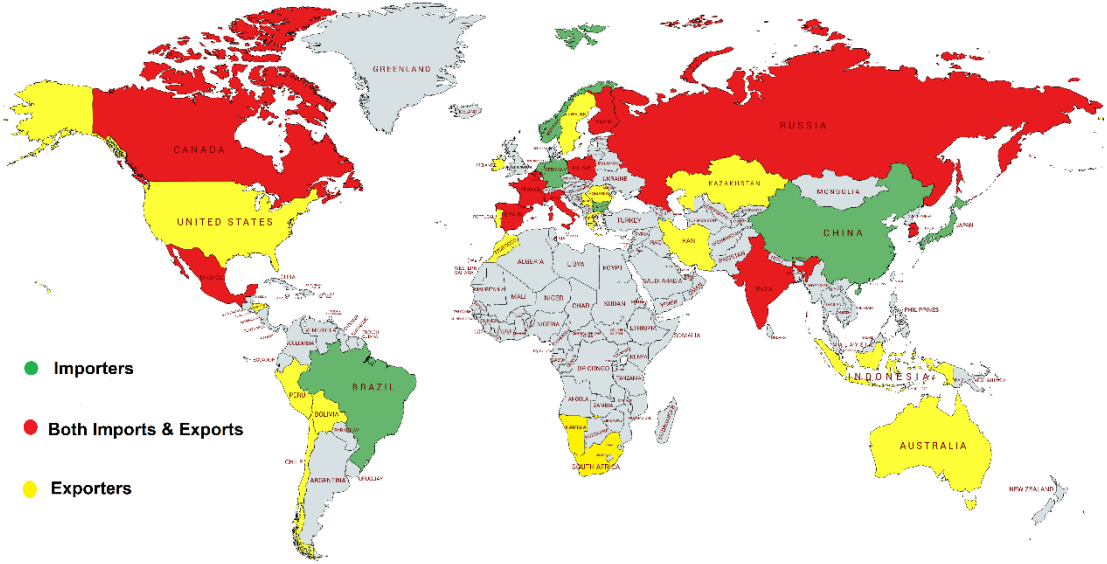
Rolled zinc products include sheet, strip, plate, rod, and wire, and can include alloying elements depending on the requirements of the end product. These are used in façades, cladding, roofing, gutters, and drain pipes, for ornamental applications and as flashing. Rolled zinc products have a long service life of up to 100 years, and can be recycled and reused.

Rolled zinc corrodes at a very low rate due to protection from the zinc patina formed by the reaction between the metallic zinc surface, oxygen, rainwater, and carbon dioxide. The compact, bonded, and insoluble patina layer blocks exchange between the atmosphere and the zinc.



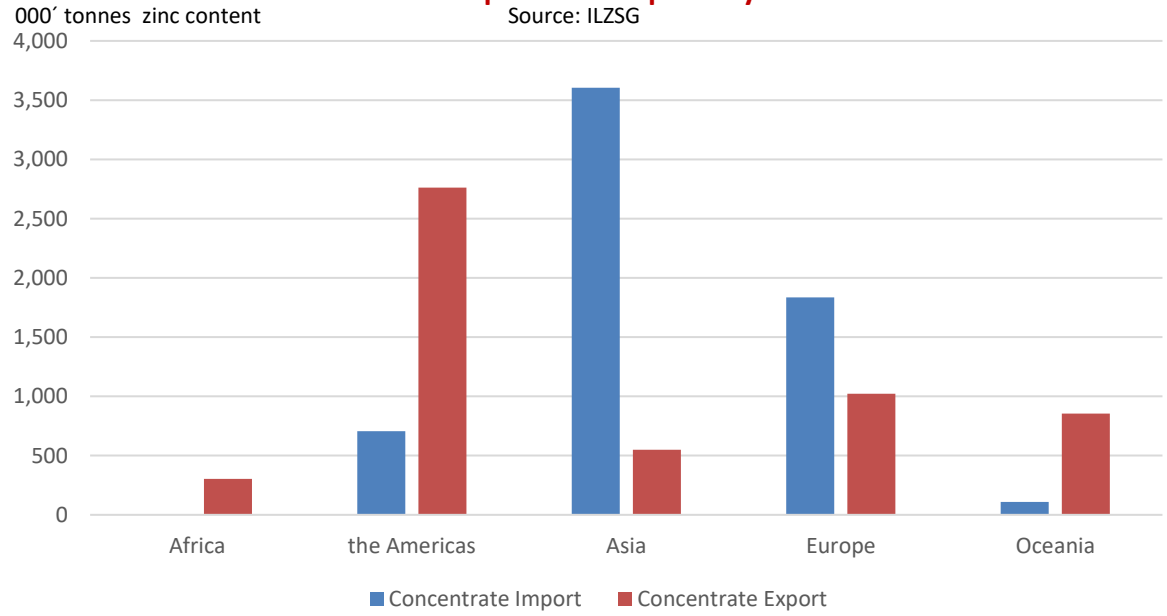
CHAPTER FIVE: ZINC MARKET AND TRADE

Geographic Distribution of Zinc Ore and Concentrate Importing and Exporting Countries



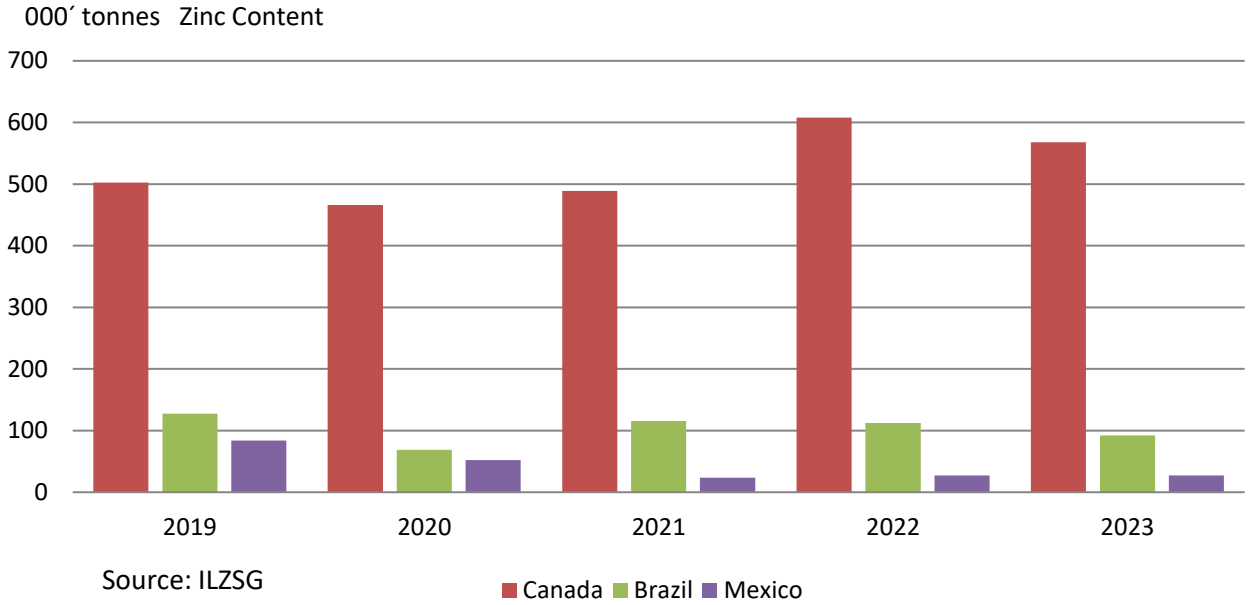
- Globally, more than 60 countries and regions have been involved in the international trade of zinc ore and concentrate in recent years.

Zinc Concentrate Imports and Exports by Continent 2023



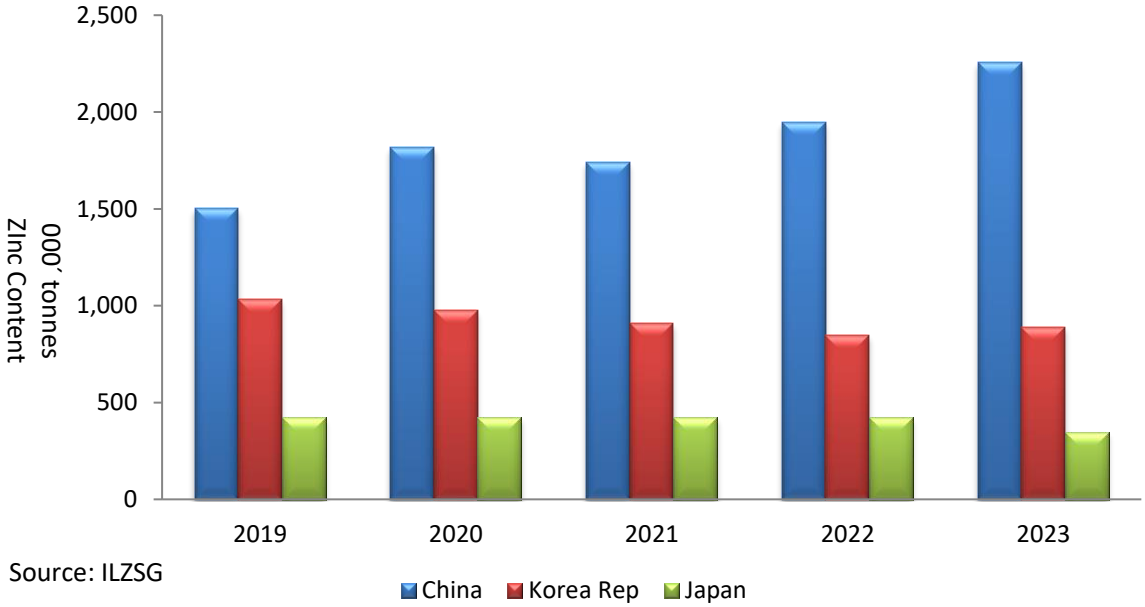
- Nearly 90% of the world's concentrate imports flowed into Asia and Europe. Total trade includes inter- and intra-continent trade.

Main Zinc Concentrate Importers in the Americas 2019-2023



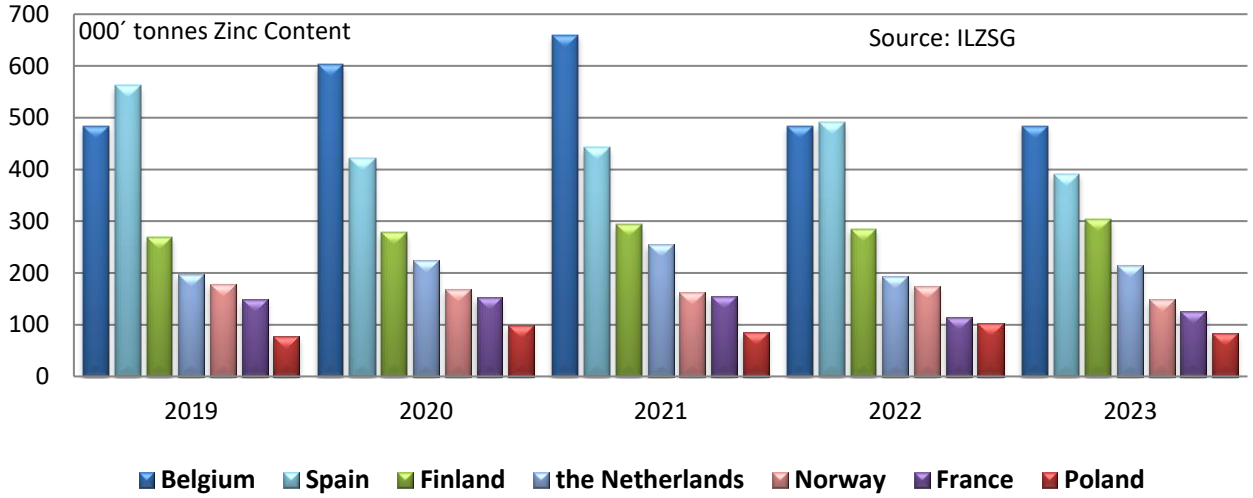
Source: ILZSG

Asia´s Main Zinc Concentrate Importing Countries 2019-2023



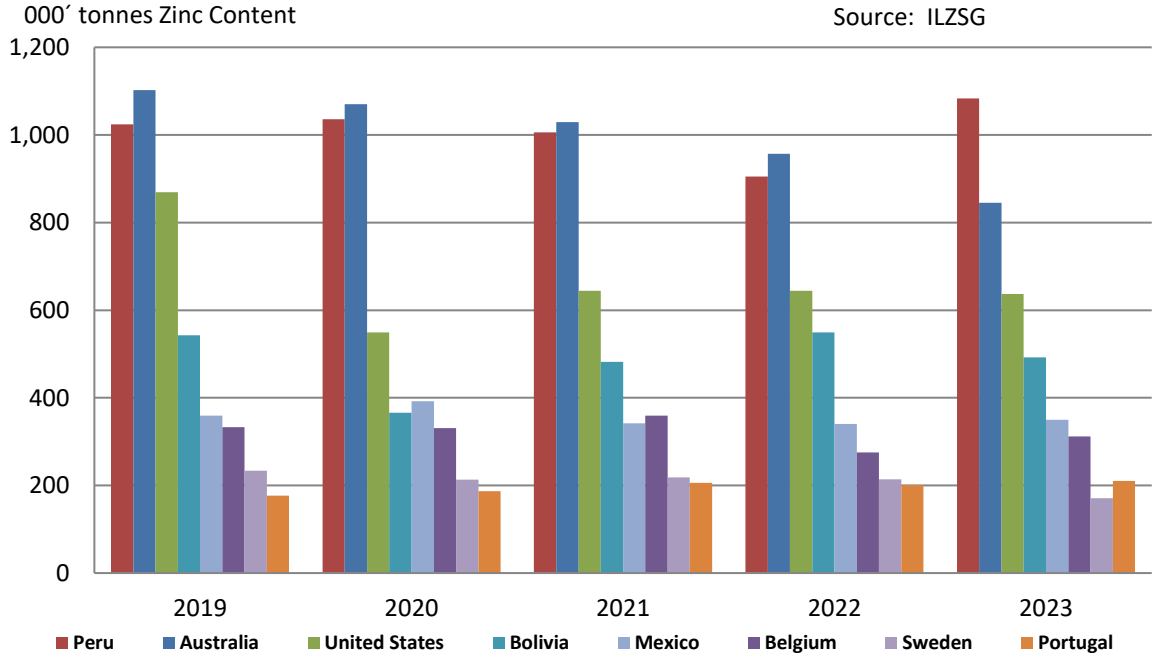
Source: ILZSG

Europe´s Main Zinc Concentrate Importing Countries 2019-2023

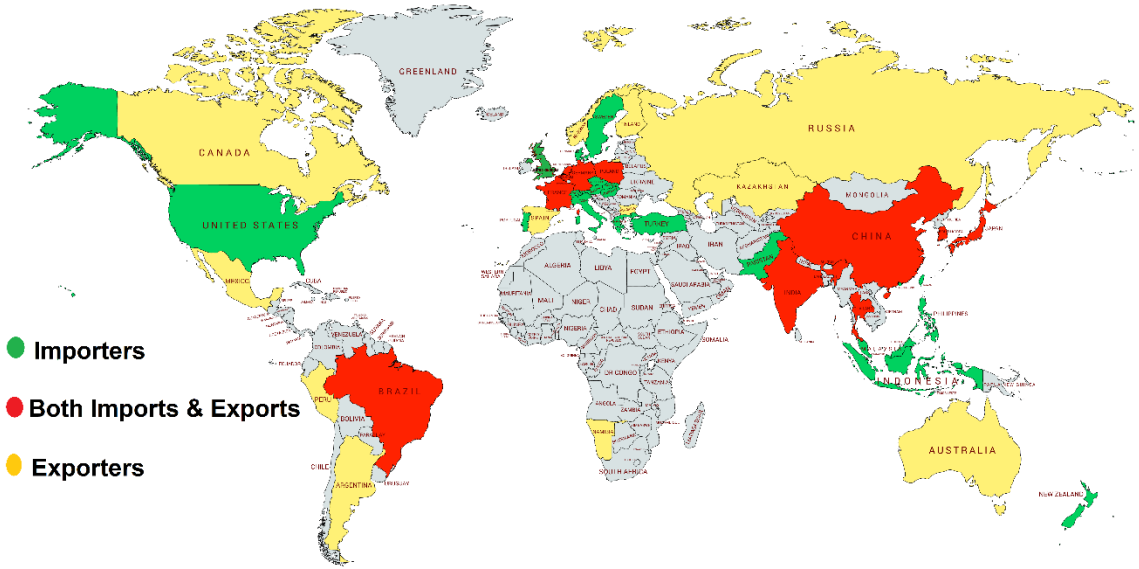


- A large proportion of the imports into Belgium and the Netherlands are forwarded through Antwerp and Rotterdam respectively and exported again to other countries.

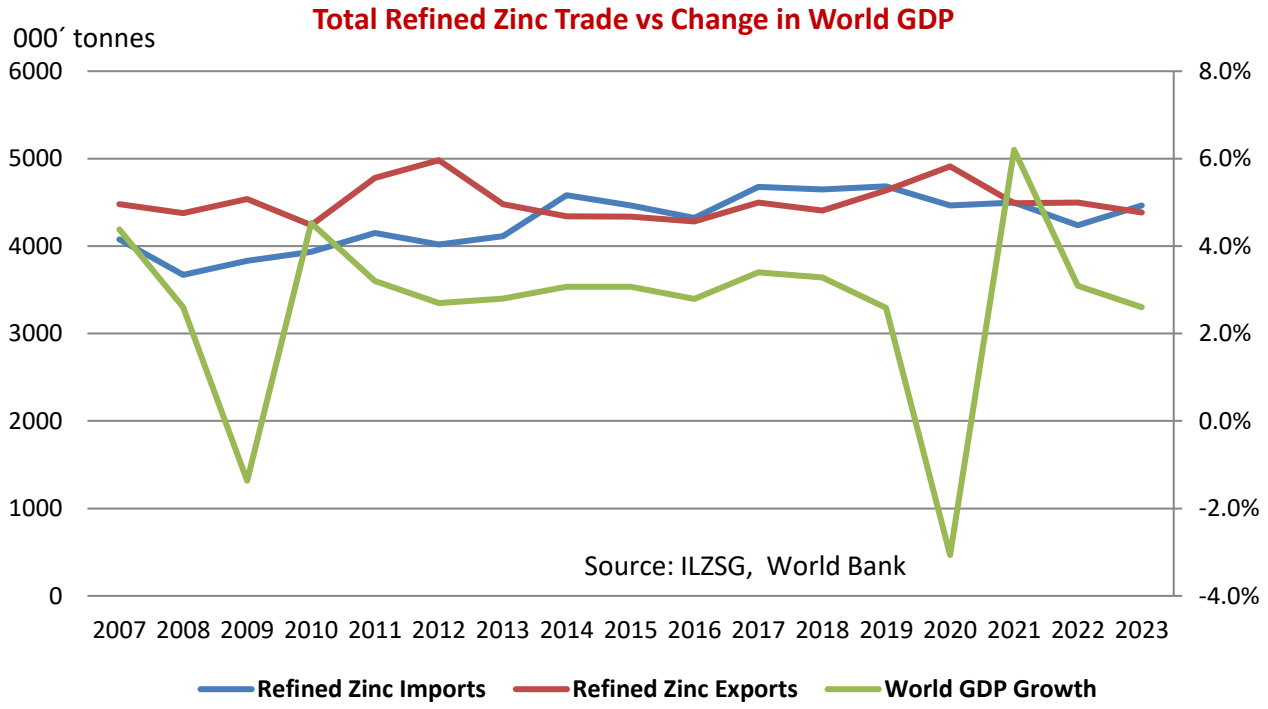
Main Zinc Concentrate Exporting Countries 2019-2023



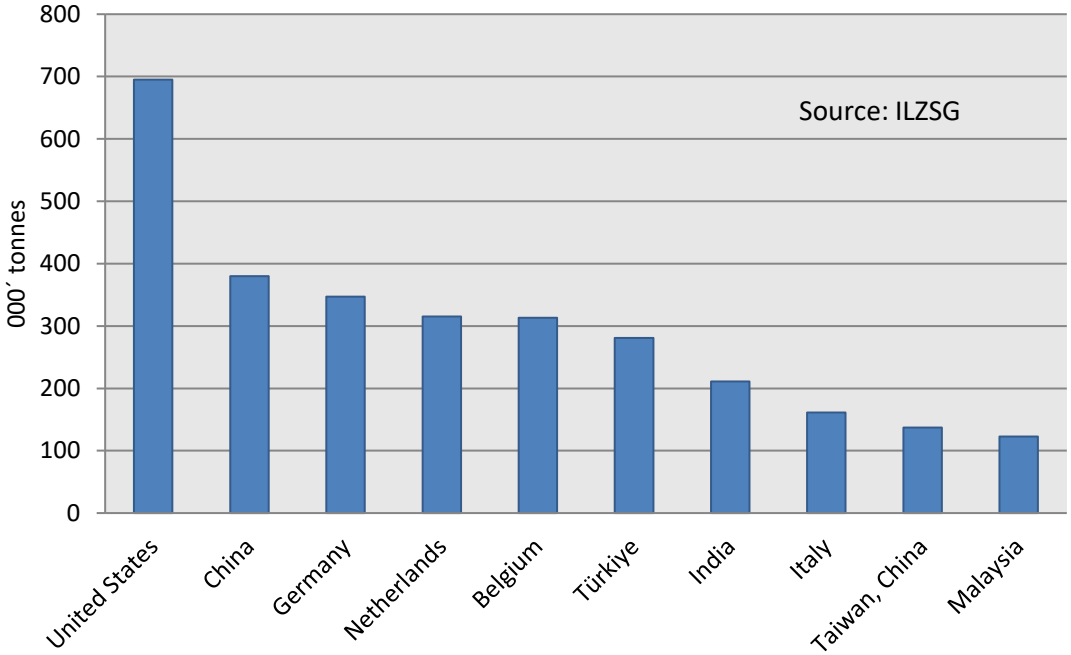
Geographic distribution of Refined Zinc Metal Importing & Exporting Countries



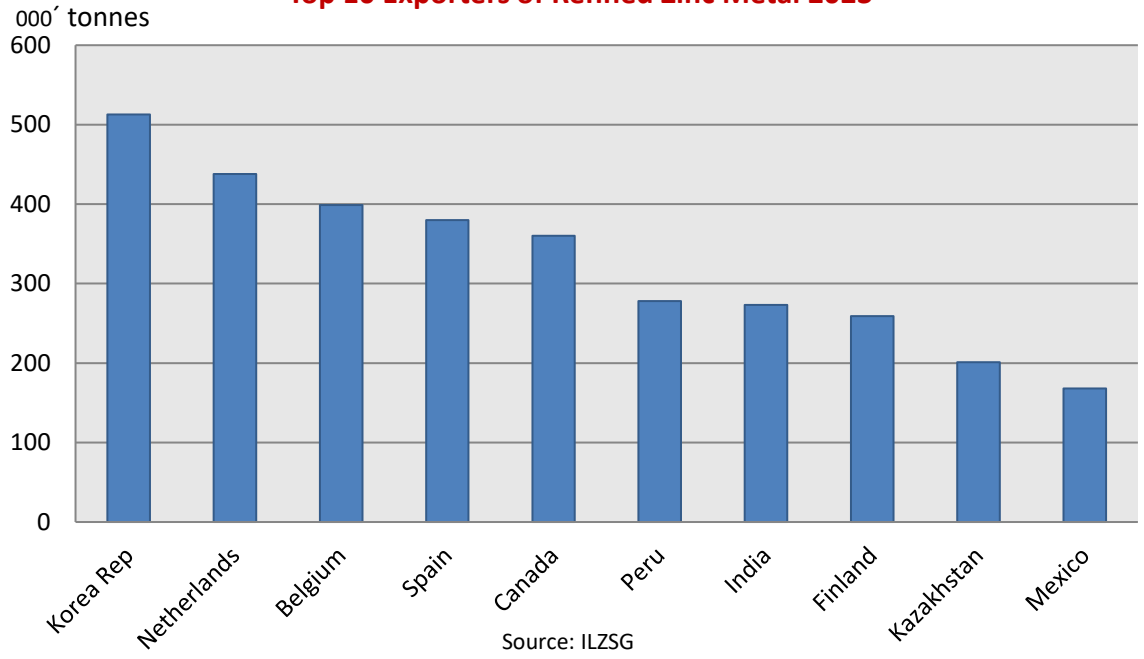
- There are more than 80 countries and regions participating in the global trade of refined zinc metal currently.


Total Refined Zinc Trade vs Change in World GDP
000´ tonnes
6000
5000
4000
3000
2000
1000
0
8.0%
6.0%
4.0%
2.0%
0.0%
-2.0%
-4.0%
Source: ILZSG, World Bank
2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
Refined Zinc Imports
Refined Zinc Exports
World GDP Growth

Top 10 Importers of Refined Zinc Metal 2023

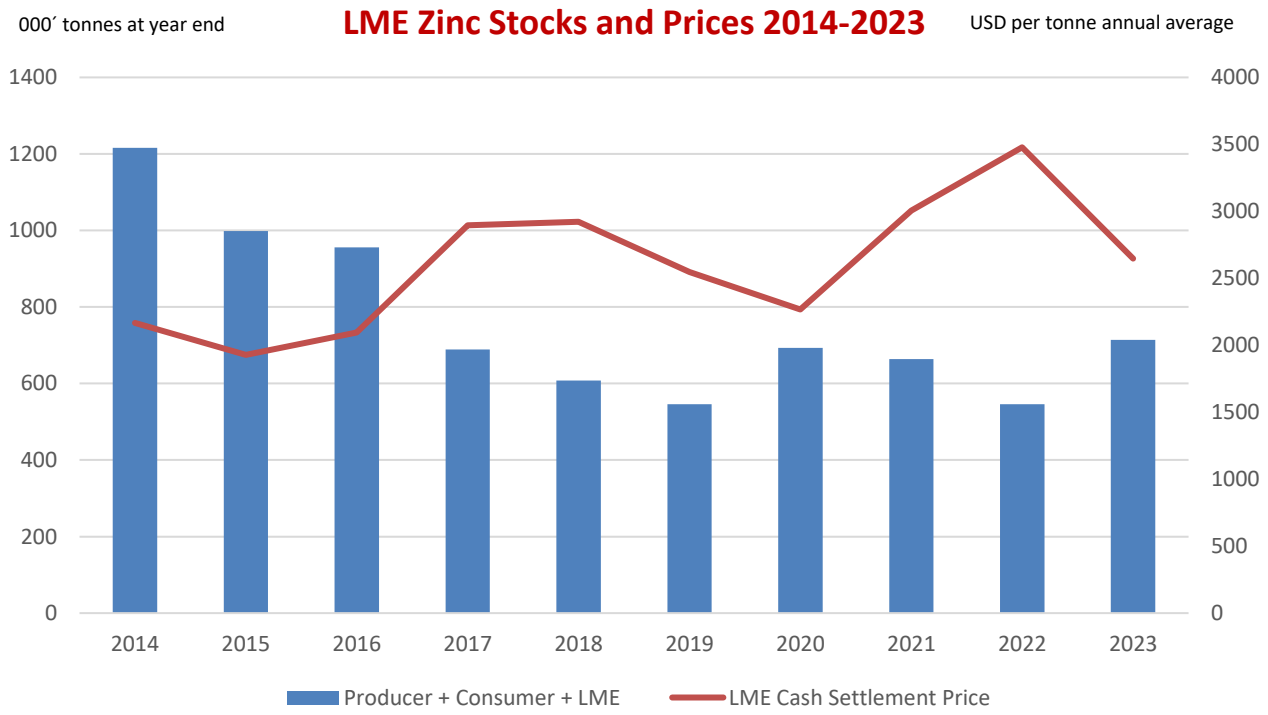


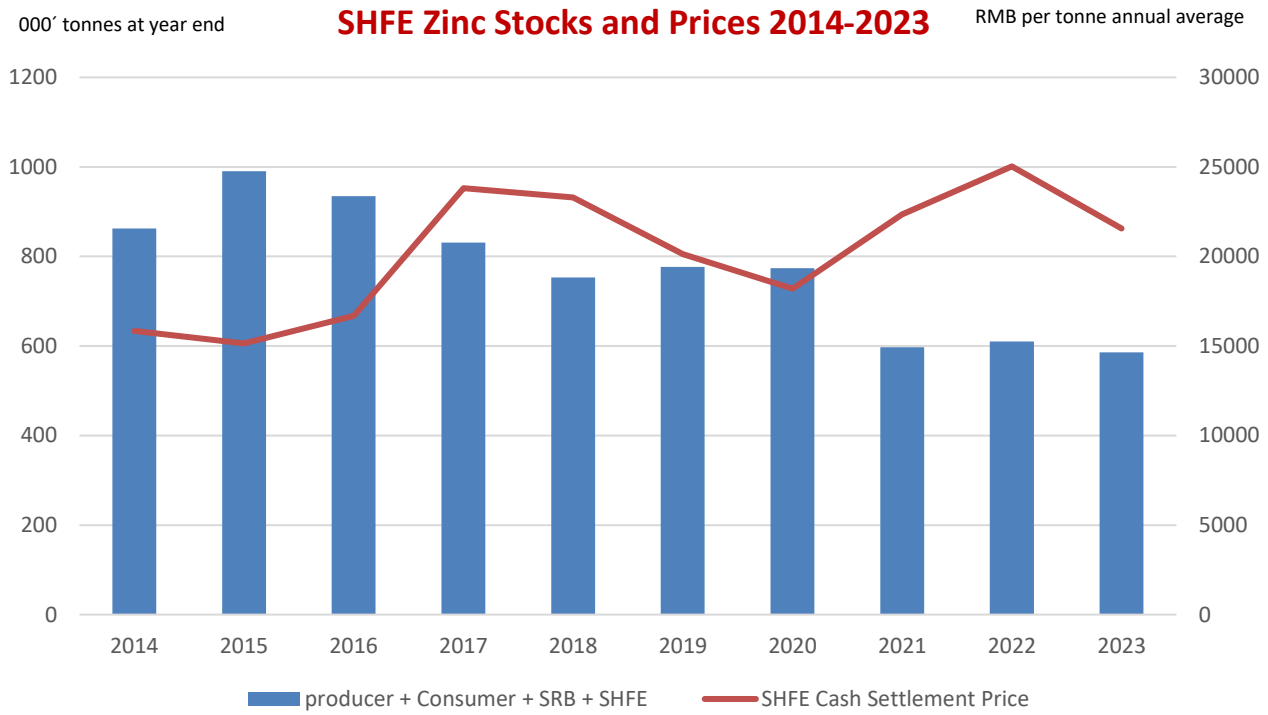
Top 10 Exporters of Refined Zinc Metal 2023



Source: ILZSG


Canada´s Refined Zinc Export Structure 2013-2023
800
700
600
500
400
300
200
100
0
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Canada´s Total Refined Zinc Production
Canada´s Total Refined Zinc Exports
Canada´s Refined Zinc Exports to the US


000´ tonnes at year end
LME Zinc Stocks and Prices 2014-2023
USD per tonne annual average
1400
1200
1000
800
600
400
200
0
4000
3500
3000
2500
2000
1500
1000
500
0
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Producer + Consumer + LME
LME Cash Settlement Price


000´ tonnes at year end
SHFE Zinc Stocks and Prices 2014-2023
RMB per tonne annual average
1200
1000
800
600
400
200
0
30000
25000
20000
15000
10000
5000
0
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
producer + Consumer + SRB + SHFE
SHFE Cash Settlement Price

Occupational Exposure

Occupational exposure to zinc occurs in the process of mining, smelting, welding, and the manufacture of brass, bronze, or other zinc-containing alloys. The major intake route is inhalation. According to data published by the World Health Organization, Typical airborne exposures observed include 0.19–0.29 mg/m3 during the smelting of zinc-containing iron scrap, 0.90–6.2 mg/m3 at non-ferrous foundries, and 0.076–0.101 mg/m3 in hot-dip galvanizing facilities.

The US Occupational Safety and Health Administration (OSHA) has set an average legal limit of 1 mg/ m3 for zinc chloride fumes and 5 mg/m3 for zinc oxide (dusts and fumes) in workplace air during an 8-hour workday, 40-hour workweek. The US National Institute for Occupational Safety and Health (NIOSH) recommends that the level of zinc oxide in workplace air should not exceed an average of 1 mg/m3 over a 10-hour period of a 40-hour work week.

In Europe, the Institute for Health and Consumer Protection of the European Commission coordinated its member states and compiled the European Union Risk Assessment Report on Zinc Metal to provide information about the risks to human health and the environment from over-exposure to zinc. Refer to the link below for further details.

https://publications.jrc.ec.europa.eu/repository/bitstream/JRC61245/lbna24587enn.pdf

Exposure of the General Population to Zinc

The estimated average daily dietary zinc intakes range from 5.6 to 13 mg/day in infants and children from 2 months up to 19 years and from 8.8 to 14.4 mg/day in adults aged 20–50 years. Flesh foods (i.e., meat, poultry, fish and other seafood) are rich sources of readily available zinc, while fruits and vegetables contain relatively low zinc concentrations. For omnivorous adults, more than one-third of dietary zinc can be provided by flesh foods, whereas for vegetarians, plant-based foods are the major dietary source. Mean daily intake of zinc from drinking-water is estimated to be < 0.2 mg/day.

Intakes via dermal and inhalation routes are generally insignificant in the general population. Consumption of dietary supplements of zinc as well as prolonged treatment with pharmaceuticals containing zinc may result in a higher exposure to zinc.

Citation: WHO´s Evaluation of Human Health Risks and Effects on the Environment

Risks of Zinc Deficiency and Zinc Excess

Syndromes of Zinc Deficiency include impaired neuropsychological functions, oligospermia, growth retardation, impaired reproduction, immune disorders, dermatitis and impaired wound healing. Most of these effects are treatable with adequate amounts of zinc. Dietary reference values for zinc for adults range from 6 to 15 mg/day. The estimated absolute absorbed amount of zinc for adults is 2.5 mg daily. This implies a dietary need at 20% bioavailability of 12.5 mg daily.

Intentional or accidental ingestion of large amounts of zinc can result in abdominal pain, vomiting, and diarrhea. In the case of long-term ingestion of large amounts of zinc, the effects are reversible upon discontinuation of zinc intake and/or repletion of copper because some symptoms result from zinc-induced copper deficiency.

Citation: WHO´s Evaluation of Human Health Risks and Effects on the Environment

Zinc in Soil and Water

Zinc in the form of zinc compounds is an essential nutrition element added to fertilizers to increase crop yields. It has been identified by the UN Food and Agriculture Organization as the most common micronutrient deficiency found in agriculture crops, with nearly 50% of soils being found deficient in zinc. It is also an important element in agricultural fungicides to protect crops such as cotton, pears, cabbage, apples, broccoli, etc.

Natural background levels of zinc occur in all soils; however, enrichment due to industrial activities may affect plant biodiversity as well as micro-organism and invertebrate activity in certain areas.

The average zinc concentration in seawater is 0.6-5 ppb. Rivers generally contain between 5 and 10 ppb of zinc. Algae contain 20-700 ppm, sea fish and shells contain 3-25 ppm, oysters contain 100-900 ppm and lobsters contain 7-50 ppm. The World Health Organization reports a legal limit of 5 mg/L for zinc in drinking water.

ILZSG Environmental and Health Controls on Zinc 2023

Report Available Free of Charge

- ILZSG has been publishing its Environmental and Health Controls on Zinc Reports for over thirty years.

- In the latest version, published in 2023, regulations, legislation, guidelines, and industrial initiatives have been gathered from 40 countries as well as a variety of regional economic bodies, and intergovernmental organizations.

- This report represents a broad summary of the requirements in force, or proposed in the countries that are listed. As such it is intended only as a guide to the principal features of the controls affecting zinc and zinc-related industries.

- This edition contains multiple links to official sources where more detailed information may be found.

- In the report, 167 pieces of the most relevant regulations, legislations, directives, acts, standards, and recommendations are listed in 6 categories: Jurisdiction, Recommended Daily Intake Level, Chemical form, Title of Regulation, Controlling Authority, and Comments.

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NEW: Lead and Zinc New Mine and Smelter Projects 2024	390	780	
NEW: World Directory: Lead and Zinc Mines 2024	305	610	
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