

Zinc

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Canada is an important producer and exporter of zinc and zinc products. Zinc metal production in Canada dates back to the early 1900s when the Consolidated Mining and Smelting Company of Canada (which later became Cominco Limited in 1966, followed by Teck Cominco Limited in 2001) started production at a small electrolytic zinc plant at Trail, British Columbia. With a smelting capacity of just over 800 000 t/y from four smelting facilities located across the country, Canada currently produces some 10% of the world's total supply of zinc.

HISTORY OF ZINC

Zinc is a relative newcomer to the group of metals discovered and used by society. While the first use of copper pre-dates recorded history and the discovery of tin goes back 5000 years, the first recovery of metallic zinc, however, came much later. The production of metallic zinc was first described in India around 1200 A.D. By 1374, zinc was recognized as a new metal, the eighth to be discovered at that time, and a limited amount of commercial zinc production was under way. Although brass-making had developed much earlier, the zinc in brass was obtained by treating zinc ore to produce zinc vapour, which was combined with granulated copper under heat. From India, zinc production was introduced to China sometime around 1600 A.D. and then began to be exported to Europe.

The first full-scale zinc smelting operation outside of Asia started in Bristol, England, in about 1743. By the beginning of the 19th century, zinc production was established on the continent of Europe, notably in Belgium and parts of eastern Europe. In the latter half of the century, large zinc industries developed rapidly in the United States and Germany.

ZINC IN CANADA

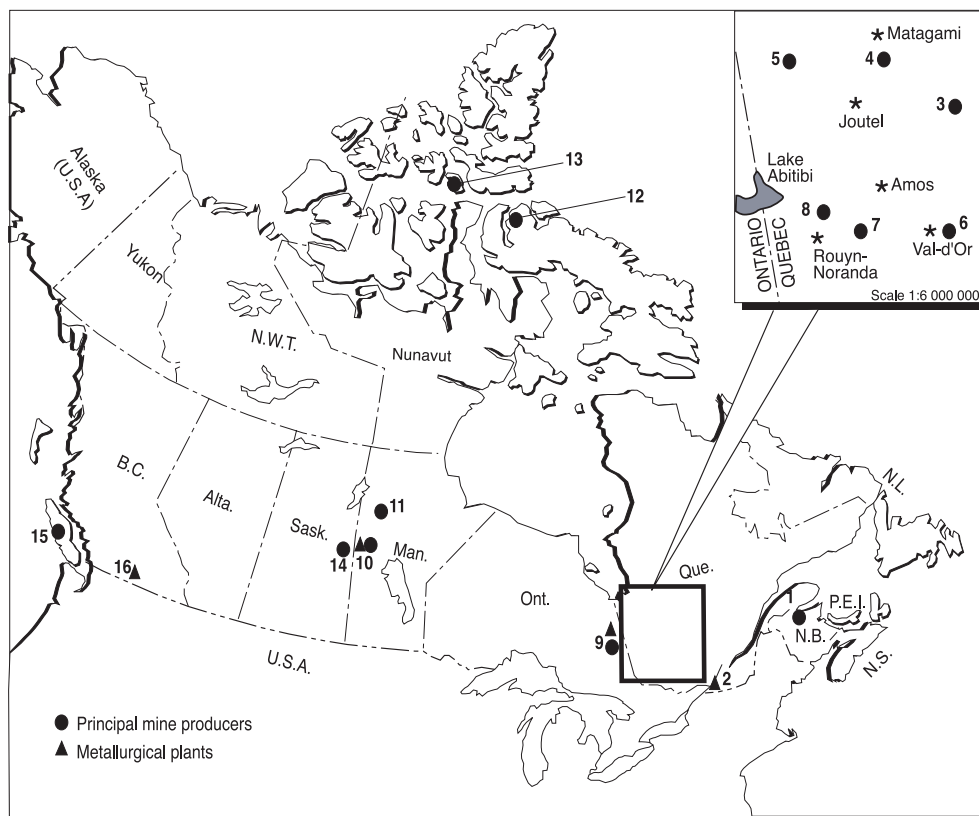
Zinc production in Canada dates back to the time around the First World War when the Consolidated Mining and Smelting Company of Canada began operating a small electrolytic zinc plant at Trail, British Columbia, to help offset a critical wartime shortage of zinc in the United Kingdom. At that time, in fact, the Consolidated Mining and Smelting Company and Anaconda Copper Mining Company in Montana were pioneering the production of zinc in North America by the electrolytic method.

The ores used at Trail came from the Sullivan mine near Kimberly, but production was hampered because the complex lead-zinc-iron ore was difficult to treat using existing methods. In 1920, however, the differential flotation method was successfully applied to separate the Sullivan ore into a lead concentrate, a zinc concentrate and an iron by-product. This marked the beginning of significant zinc production in Canada. Today the Trail operations are the world's largest, fully integrated lead and zinc smelting and refining complex. Owned and operated by Teck Cominco Limited of Vancouver, the Trail facility has a zinc production capacity of some 290 000 t/y.

In Manitoba, the discovery of significant zinc and copper ore with important quantities of gold in 1915 led to the development of the Flin Flon-Snow Lake mining camp, smelter complex and dedicated power plant in the late 1920s. Since 1930, Hudson Bay Mining and Smelting Company Limited has owned and operated some 30 mines, which in turn have fed the company's metallurgical complex at Flin Flon. Since it first started operations in 1930, the Flin Flon smelter and refinery complex has undergone significant capital improvements with the introduction of zinc pressure leach technology in the early 1990s and a new tank house in 2000 that expanded zinc production capacity to 115 000 t/y.

The Kidd Creek orebody was discovered in 1963 and Texasgulf began open-pit mining the deposit in 1966 near Timmins, Ontario. The Kidd Creek zinc plant started production in 1972. In 1983, Kidd Creek started up a zinc pressure leaching facility plant. Today, Falconbridge Limited owns and operates the Kidd Creek complex with a production capacity of 145 000 t/y.

Figure 1
Zinc Producers in Canada, 2002



Numbers refer to locations on map above.

ZINC-PRODUCING MINES

1. Brunswick	Noranda Inc.
3. Langlois (on care-and-maintenance)	Breakwater Resources Ltd.
4. Bell Allard	Noranda Inc.
5. Selbaie	Les Mines Selbaie
6. Louvicourt	Aur Resources Inc./Novicourt Inc.
7. LaRonde	Agnico Eagle Mines Limited
8. Bouchard-Hébert	Breakwater Resources Ltd.
9. Kidd Creek	Falconbridge Limited
10. Callinan	Hudson Bay Mining and Smelting Co., Limited
Trout Lake	Hudson Bay Mining and Smelting Co., Limited
Chisel North	Hudson Bay Mining and Smelting Co., Limited
777	Hudson Bay Mining and Smelting Co., Limited
11. Ruttan (closed June 2002)	Hudson Bay Mining and Smelting Co., Limited
12. Nanisivik (closed September 2002)	Breakwater Resources Ltd.
13. Polaris (closed September 2002)	Teck Cominco Limited
14. Konuto Lake	Hudson Bay Mining and Smelting Co., Limited
15. Myra Falls	Boliden Limited

ZINC METALLURGICAL PLANTS

2. Valleyfield	Canadian Electrolytic Zinc Limited
9. Kidd Creek	Falconbridge Limited
10. Flin Flon	Hudson Bay Mining and Smelting Co., Limited
16. Trail	Teck Cominco Limited

WEB SITE

www.noranda.com
www.breakwater.ca
www.noranda.com
www.bhpbilliton.com
www.aurresources.com
www.agnico-eagle.com
www.breakwater.ca
www.falconbridge.com
www.angloamerican.co.uk
www.angloamerican.co.uk
www.angloamerican.co.uk
www.angloamerican.co.uk
www.angloamerican.co.uk
www.breakwater.ca
www.teckcominco.com
www.angloamerican.co.uk
www.boliden.ca

www.noranda.com
www.falconbridge.com
www.angloamerican.co.uk
www.teckcominco.com

With the discovery of significant zinc-bearing ores in northern Quebec and in Ontario in the late 1950s and early 1960s, Noranda Inc. began looking at options to build an electrolytic zinc plant. Construction began at Valleyfield, Quebec, just west of Montréal, in 1962 and Canadian Electrolytic Zinc (CEZ), a subsidiary of Noranda, was brought into production in 1963. The plant's capacity has increased steadily from its original 64 000 t/y at the time of opening to 260 000 t/y today.

Zinc mines have been found in every province and territory with the exception of Alberta and Prince Edward Island. Operations in 2002 are listed in Figure 1.

USES FOR ZINC

The greatest use for zinc is as a coating for iron and steel products to make them resistant to rust and corrosion. The application of a zinc coating, known as galvanizing, is accomplished electrolytically or by hot-dip methods. Galvanizing accounts for about 47% of the worldwide use of zinc.

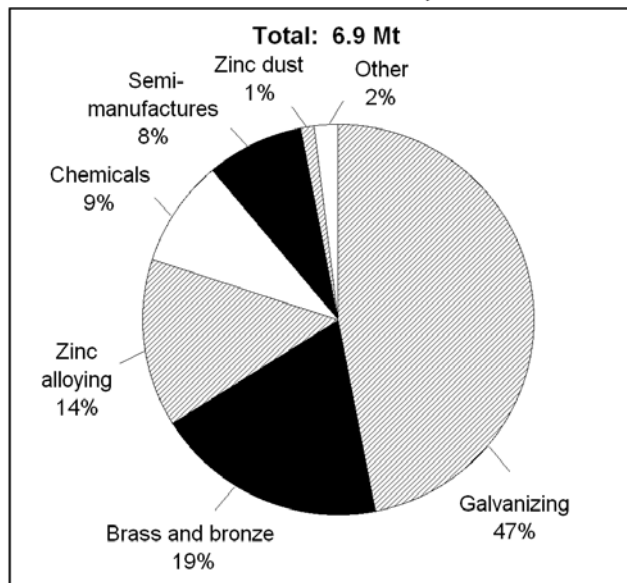
The most commonly galvanized products are sheet and strip steel, tube and pipe, and wire and wire rope. The automobile industry is the largest user of galvanized steel. The desire to reduce weight and improve fuel efficiency has led to the increased use of galvanized steel by the automotive industry to protect the thinner gauges of steel from corrosion. Both hot-dipped and electro-galvanized steel are used, the thicker coating of hot-dipped steel giving more corrosion protection to unexposed surfaces and the thinner coating of electro-galvanized steel providing a smoother finish for exposed painted surfaces.

Galvanized sheet and strip steel are also widely used by the construction industry for roofing and siding, and for heating and ventilation ducts, as well as for many other applications. Nails and other building materials are often hot-dip galvanized. Zinc and zinc-aluminum thermally sprayed coatings are used for the long-term corrosion protection of large steel structures such as bridges and hydroelectric transmission towers.

Another important use of zinc is in the manufacture of a vast range of die-cast products. Because it has a relatively low melting point and is very fluid, zinc is easy to pour when melted. Therefore, it is well suited to rapid assembly-line die-casting, particularly to produce small and intricate shapes.

A major use of die castings is in the automobile industry as trim pieces, grills, door and window handles, carburetors, pumps and other components. However, with the trend toward lighter, more energy-efficient cars, zinc demand for this purpose has declined in recent years. Other familiar zinc die castings include small electrical

Figure 2
Western World Zinc Markets, 2001



Source: International Lead and Zinc Study Group.

appliances, business machines and other light equipment, tools and toys.

Another important use of zinc is in the manufacture of brass, which is essentially an alloy of copper and zinc, with the proportion of zinc ranging from 5 to 40%. The zinc brasses have good physical, electrical and thermal properties, and are corrosion resistant. They are used in plumbing, heat exchange equipment, and a wide range of decorative hardware, to name a few applications. Rolled zinc metal is a basic component in dry-cell batteries, and zinc oxide is used as a catalyst in the manufacture of rubber and as a pigment in white paint. It is also used in agricultural products, cosmetics and medicinal products.

NATURAL OCCURRENCE

Zinc is never found as a free metal but is found in association with other elements to form a number of important ores of zinc such as sphalerite (zinc blende, zinc sulphide, ZnS), smithsonite (zinc carbonate, ZnCO₃), zincspar (also zinc carbonate, ZnCO₃), and marmatite (zinc sulphide, ZnS, containing some iron sulphide, FeS). Like all metals, zinc is a natural component of the Earth's crust and is therefore present in varying concentrations in rock, soil, water and air.

In Canada, zinc deposits fall into four main categories: sedimentary exhalative (sedex); massive sulphide, Mississippi Valley-type (MVT); volcanogenic massive

sulphide (VMS); and skarn deposits. As the name suggests, SEDEX deposits comprise layers of massive sulphide minerals interbedded with sedimentary rocks and tend to be associated with large deposits of lead and zinc. Examples of such deposits include the Sullivan mine in British Columbia. MVT deposits are named after large-scale lead and zinc deposits found in the region in the United States along the Mississippi River where they were first discovered. MVT deposits are characterized by a simple mineralogy that includes pyrite (iron sulphide), galena (lead sulphide), and sphalerite (zinc sulphide) hosted in undeformed calcium and magnesium-rich carbonate rocks (limestones). Examples of this type of deposit are found at the Polaris and Nanisivik mines in Nunavut, both of which closed in late 2002.

VMS deposits can be classified into sub-categories depending on their mineralogy: copper-zinc, copper-zinc-lead and Besshi-type. As found with SEDEX deposits, VMS deposits are formed through the exhalation of hydrothermal fluids on the sea floor. In the case of VMS, the host rocks are submarine igneous rocks rather than sedimentary rocks. The largest example of a VMS-type deposit in Canada is the Kidd Creek copper-zinc mine near Timmins, Ontario. Other examples include the Flin Flon copper-zinc deposits in north-central Manitoba. Many of these types of deposits can also contain significant quantities of gold, such as those deposits in the Abitibi region of northwestern Quebec. While the copper-zinc deposits are found typically associated with greenstone (mafic) volcanic host rocks such as basalts, the zinc-lead-copper deposits are associated with more felsic to intermediate volcanic rocks such as rhyolite and dacite. Examples of these types of deposits include the mines in the Bathurst region of New Brunswick. Skarn deposits are formed at or near the contact between a typically carbonate-rich host rock with an igneous intrusion. Variations in the type of igneous intrusion result in variations in the mineralization that follows. An example of a lead-zinc skarn is the Sa Dena Hes deposit near Watson Lake, Yukon.

HEALTH AND THE ENVIRONMENT

Zinc plays an important role as a micro-nutrient in the development and health of a variety of plants and animals. In humans, zinc plays an important role in the function of more than 200 enzymes, for the stabilization of DNA and the expression of genes, and for the transfer of nervous signals.

The human body contains 2-3 g of zinc. The recommended daily zinc intake is 12 mg/day for adult women and 15 mg/day for adult men. Daily intake is not only dependent on food, but also on sex, age and general health status. Growing infants, children, adolescents, women in pregnancy, and the elderly have a higher zinc requirement.

Food is the primary source of zinc for humans with only a small part coming from drinking water. The major sources of zinc in the diet are red meat, poultry, fish, seafood, whole cereals and dairy products.

PRICE OUTLOOK

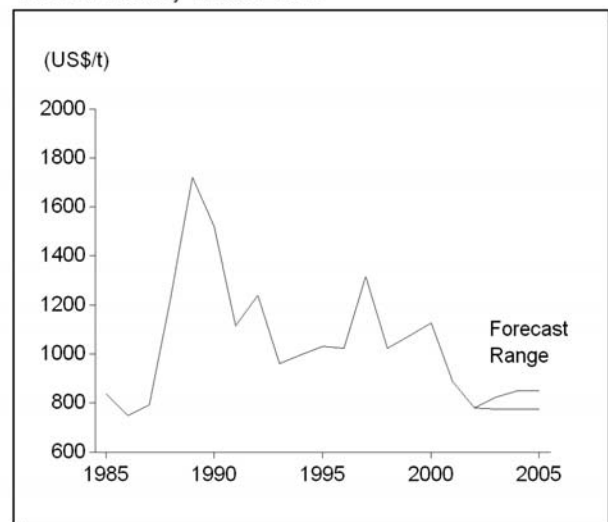
Cash settlement prices struggled throughout the year to remain above US\$800/t on the London Metal Exchange (LME). Overall zinc prices followed a downward trend, reaching record lows of \$725.50/t by mid-August, only to rise again briefly to US\$823/t in December and finish the year at US\$749.50/t. The continued low zinc prices did not, however, lead to any significant cuts in production.

While user stocks fell by about 105 000 t during the year, stocks on the LME continued their upward climb from 434 000 t in early January to over 651 000 t by the end of the year. Overall, the International Lead and Zinc Study Group forecast anticipates that the Western World market for refined zinc metal will again remain in substantial surplus in both 2002 and 2003.

Prices reflected the oversupply in the market and averaged US\$779/t in 2002 and are expected to rise slightly to average about \$800/t in 2003.

Beyond 2003, continued growth in galvanizing markets, combined with good growth overall for principal zinc markets, is expected in the remainder of the forecast period with zinc prices ranging from US\$800 to \$850/t through to 2005.

Figure 3
Zinc Prices, 1985-2005



Source: International Lead and Zinc Study Group.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to Chapter 64. (2) Information in this review was current as of May 30, 2003. (3) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mms/cmy/com_e.html.

NOTE TO READERS

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TARIFFS

Item No.	Description	Canada			United States	EU (1)	Japan
		MFN	GPT	USA	Canada	MFN	WTO (2)
2603.00	Copper ores and concentrates						
2603.00.00.30	Zinc content	Free	Free	Free	Free	Free	Free
2607.00	Lead ores and concentrates						
2607.00.00.30	Zinc content	Free	Free	Free	Free	Free	Free
2608.00	Zinc ores and concentrates						
2608.00.00.30	Zinc content	Free	Free	Free	Free	Free	Free
2616.10	Silver ores and concentrates						
2616.10.00.30	Zinc content	Free	Free	Free	Free	Free	Free
26.20	Ash and residues (other than from the manufacture of iron or steel) containing arsenic, metals, or their compounds.						
2620.11	Hard zinc spelter	Free	Free	Free	Free	Free	Free
2817.00	Zinc oxide; zinc peroxide	Free-6%	Free	Free	Free	6.6%	4.3%
28.33	Sulphates; alums; peroxosulphates (persulphates)						
2833.26	Of zinc	Free	Free	Free	Free	5.5%	3.9%
79.01	Unwrought zinc						
	Zinc, not alloyed:						
7901.11	Containing by weight 99.99% or more of zinc	Free	Free	Free	Free	2.5%	Free-4.30 yen/kg
7901.12	Containing by weight less than 99.99% of zinc	Free	Free	Free	Free	2.5%	Free-4.30 yen/kg
7901.20	Zinc alloys:						
7901.20.00.10	Containing by weight 90% or more but less than 97.5% of zinc	Free	Free	Free	Free	2.5%	Free-4.20 yen/kg
7901.20.00.20	Containing by weight less than 90% of zinc	Free	Free	Free	Free	2.5%	Free-4.20 yen/kg
7902.00	Zinc waste and scrap	Free	Free	Free	Free	Free	Free
79.03	Zinc dust, powders and flakes						
7903.10	Zinc dust	Free	Free	Free	Free	2.5%	3%
7903.90	Other:	Free	Free	Free	Free	2.5%	3%
7904.00	Zinc bars, rods, profiles and wires	Free	Free	Free	Free	5%	3%
7905.00	Zinc plates, sheets, strip and foil	Free	Free	Free	Free	5%	3%
7906.00	Zinc tubes, pipes, and tube or pipe fittings (for example, couplings, elbows, sleeves)	3%	Free	Free	Free	5%	3%
7907.00	Other articles of zinc						
7907.00.10	Anodes for electroplating	Free	Free	Free	Free	5%	3%
7907.00.20	Discs or slugs, containing by weight 90% or more of zinc; gutters, roof capping, skylight frames and other fabricated building components	3%	Free	Free	Free	5%	3%
7907.00.90	Other	3%	3%	Free	Free	5%	3%

Sources: Canadian Customs Tariff, effective January 2003, Canada Customs and Revenue Agency; Harmonized Tariff Schedule of the United States, 2003; Worldtariff Guidebook on Customs Tariff Schedules of Import Duties for European Union (42nd Annual Edition: 2002); Customs Tariff Schedules of Japan, 2003.

(1) Duty suspension may apply for certain goods. (2) WTO rate is shown; lower tariff rates may apply circumstantially.

Note: Where there is a tariff "range," a complete match of the HS code was not available; therefore, the high and low for the product in question are shown.

TABLE 1. CANADA, ZINC PRODUCTION AND TRADE, 2001 AND 2002, AND USE, 1999-2001

Item No.	2001		2002 (p)		
	(tonnes)	(\$000)	(tonnes)	(\$000)	
PRODUCTION					
	All forms (1)				
	New Brunswick	313 089	441 142	256 696	313 683
	Quebec	252 143	355 269	235 566	287 862
	Ontario	77 776	109 586	100 775	123 146
	Manitoba	91 782	129 321	89 198	109 000
	Saskatchewan	2 047	2 884	5 172	6 320
	British Columbia	108 855	153 377	44 885	54 849
	Nunavut	166 356	234 396	159 632	195 070
	Total	1 012 048	1 425 976	891 924	1 089 931
	Mine output (2)	1 064 744	...	911 624	...
	Refined (3)	661 172	...	793 475	...
EXPORTS					
2603.00.30	Zinc content in copper	-	-	-	-
2607.00.30	Zinc content in lead	-	-	-	-
2608.00.30	Zinc content in zinc ores and concentrates				
	Belgium	122 681	87 732	103 377	65 917
	Germany	24 365	24 100	57 649	62 121
	Japan	31 964	12 820	45 618	47 707
	Spain	67 622	53 142	61 395	40 572
	Finland	55 279	54 054	44 715	40 497
	South Korea	27 468	13 716	21 199	20 449
	Norway	25 844	26 704	18 448	14 148
	Switzerland	3 936	2 729	15 708	10 084
	Italy	18 302	14 580	8 700	9 059
	China	5 033	3 400	3 665	5 671
	Peru	-	-	7 495	4 572
	Other countries	80 718	73 438	10 916	6 903
	Total	463 212	366 415	398 885	327 700
2620.11	Ash and residues containing hard zinc spelter				
	United States	161	119	439	318
2620.19	Ash and residues containing mainly zinc, n.e.s.				
	United States	7 728	5 942	10 884	7 762
	India	256	195	139	90
	Taiwan	-	-	40	40
	Japan	21	23	41	34
	Total	8 005	6 160	11 104	7 926
2817.00	Zinc oxide; zinc peroxide				
	United States	47 548	71 160	44 782	60 902
	Belgium	20	22	740	793
	Brazil	212	277	395	546
	France	281	365	502	536
	Hong Kong	59	128	168	286
	Saint Vincent	-	-	94	142
	Other countries	1 690	2 127	193	297
	Total	49 810	74 079	46 874	63 502
2833.26	Zinc sulphate				
	United States	208	216	2 127	2 180
7901.11	Zinc, not alloyed, unwrought, containing by weight 99.99% or more of zinc				
	United States	304 103	474 988	374 128	507 762
	Taiwan	2 772	6 435	7 089	8 673
	Malaysia	1 171	1 605	5 392	7 082
	Philippines	420	566	4 867	6 331
	Italy	-	-	4 947	6 078
	Hong Kong	3 830	5 578	3 734	4 838
	Indonesia	3 920	6 164	2 674	3 630
	Singapore	1 469	2 379	1 331	1 833
	Other countries	10 584	14 831	688	917
	Total	328 269	512 546	404 850	547 144

TABLE 1 (cont'd)

Item No.		2001		2002 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)
EXPORTS (cont'd)					
7901.12	Zinc, not alloyed, unwrought, containing by weight less than 99.99% of zinc				
	United States	146 162	226 649	165 910	221 224
	Hong Kong	6 550	11 451	8 985	13 238
	Indonesia	4 702	7 598	4 526	6 125
	Taiwan	308	579	3 868	5 133
	Philippines	1 793	2 924	2 753	3 652
	Malaysia	457	672	2 335	3 294
	Japan	4 493	6 914	2 194	2 972
	Singapore	416	611	1 124	1 528
	Other countries	2 034	5 840	1 705	2 453
	Total	166 915	263 238	193 400	259 619
7901.20	Zinc alloys, unwrought				
	United States	1 823	2 709	501	866
	Trinidad and Tobago	–	–	2	5
	Total	1 823	2 709	503	871
7902.00	Zinc waste and scrap				
	United States	37 446	16 844	28 935	13 178
	China	71	78	611	670
	Hong Kong	2 025	2 100	562	622
	Other countries	808	706	163	107
	Total	40 350	19 728	30 271	14 577
7903.10	Zinc dust				
	United States	6 086	13 769	6 224	13 112
	Other countries	19	31	57	134
	Total	6 105	13 800	6 281	13 246
7903.90	Zinc powders and flakes				
	United States	8 016	19 463	10 863	24 423
	Other countries	763	1 103	549	832
	Total	8 779	20 566	11 412	25 255
7904.00	Zinc bars, rods, profiles and wire				
	United States	190	1 058	160	1 079
	Other countries	2	6	7	20
	Total	192	1 064	167	1 099
7905.00	Zinc plates, sheets, strip and foil				
	United States	6	64	46	203
	South Korea	–	–	10	46
	Germany	–	–	8	30
	France	32	174	–	–
	Total	38	238	64	279
7906.00	Zinc tubes, pipes and tube or pipe fittings (for example, couplings, elbows, sleeves)				
	United States	1 097	8 509	831	5 244
	Other countries	–	–	5	17
	Total	1 097	8 509	836	5 261
7907.00	Other articles of zinc				
	United States	2 597	22 977	2 925	25 786
	Spain	–	–	134	820
	Sweden	–	–	21	102
	Other countries	118	432	129	203
	Total	2 715	23 409	3 209	27 001
	Total exports	1 077 679	1 312 796	1 110 422	1 295 978

TABLE 1 (cont'd)

Item No.		2001		2002 (p)	
		(tonnes)	(\$000)	(tonnes)	(\$000)
IMPORTS					
2603.00.00.30	Zinc content in copper ores and concentrates	–	–	2	2
2607.00.00.30	Zinc content in lead ores and concentrates	5 031	4 904	2 637	2 882
2608.00.00.30	Zinc content in zinc ores and concentrates	140 465	91 534	276 053	127 658
2616.10.00.30	Silver ores and concentrates	8 514	6 494	–	–
2620.11	Ash and residues containing hard zinc spelter	–	–	–	–
2620.19	Ash and residues containing mainly zinc, n.e.s.	572	338	537	507
2817.00	Zinc oxide; zinc peroxide	11 284	15 237	10 463	13 126
2833.26	Zinc sulphate	6 245	4 426	4 441	3 089
7901.11	Zinc, not alloyed, unwrought, containing by weight 99.99% or more of zinc	6 121	8 990	5 027	7 004
7901.12	Zinc, not alloyed, unwrought, containing by weight less than 99.99% of zinc	347	509	91	124
7901.20	Zinc alloys, unwrought	4 844	9 562	4 353	7 457
7902.00	Zinc waste and scrap	302	244	343	315
7903.10	Zinc dust	5 536	10 388	6 170	10 727
7903.90	Zinc powders and flakes	428	723	536	729
7904.00	Zinc bars, rods, profiles and wire	2 618	5 275	1 706	2 507
7905.00	Zinc plates, sheets, strip and foil	1 691	6 186	1 210	4 459
7906.00	Zinc tubes, pipes and tube or pipe fittings (for example, couplings, elbows, sleeves)	1 149	8 222	972	6 212
7907.00	Other articles of zinc	4 897	19 195	5 330	20 731
	Total imports	200 044	192 227	319 068	207 529

	1999			2000 (a)			2001 (p) (a)		
	Primary	Recycled	Total	Primary	Recycled	Total	Primary	Recycled	Total
	(tonnes)								
QUANTITY USED (5) (6)									
Zinc used for or in the production of:									
Copper alloys (brass, bronze, etc.)	x	x	2 395	x	x	2 847	x	x	2 412
Galvanizing: electro	x	x	2 472	x	x	2 335	x	x	2 018
hot dip	x	x	75 716	x	x	73 568	x	x	72 676
Zinc die-cast alloys	x	x	29 550	x	x	31 105	x	x	26 632
Other products (including rolled and ribbon zinc, zinc oxides, electroplating)	x	x	33055	x	x	38057	x	x	40819
Total	142 451	737	143 188	136 544	11 369	147 913	143 431	1 125	144 556
User stocks, year-end	12 175	89	12 264	7 834	938	8 772	9 814	375	10 189

Sources: Natural Resources Canada; Statistics Canada.

– Nil; . . Not available; n.e.s. Not elsewhere specified; (p) Preliminary; x Confidential.

(a) Increase in number of companies being surveyed.

(1) New refined zinc produced from domestic primary materials (concentrates, slags, residues, etc.) plus estimated recoverable zinc in ores and concentrates shipped for export. (2) Zinc content of ores and concentrates produced. (3) Refined zinc produced from domestic and imported ores. (4) Includes HS classes 2603.00.30, 2607.00.30 and 2616.10.30. (5) User survey does not represent all Canadian users and is therefore consistently less than the apparent quantity used. (6) Due to confidentiality in some end-use categories, a breakdown of primary and recycled sources is not provided in order to be consistent.

Note: Numbers may not add to totals due to rounding.

TABLE 2. CANADA, ZINC PRODUCTION AND EXPORTS,⁽¹⁾ 1975, 1980 AND 1986-2002

	Production		Exports		
	All Forms (2)	Refined (3)	In Ores and Concentrates	Refined	Total
	(tonnes)				
1975	1 055 151	426 902	705 088	247 474	952 562
1980	883 697	591 565	434 178	471 949	906 127
1986	988 173	570 981	450 249	427 176	877 425
1987	1 157 936	609 909	613 185	441 227	1 054 412
1988	1 370 000	703 206	816 885	551 521	1 368 406
1989	1 272 854	669 677	614 223	495 061	1 109 284
1990	1 179 372	591 786	716 185	452 251	1 168 436
1991	1 083 008	660 552	566 815	520 508	1 087 323
1992	1 195 736	671 702	678 172	509 744	1 187 916
1993	990 727	659 881	455 953	493 264	949 217
1994	976 309	690 965	450 320	551 168	1 001 488
1995	1 094 703	720 346	609 575	533 179	1 142 754
1996	1 162 720	716 467	670 789	581 604	1 252 393
1997	1 026 864	703 798	489 697	546 964	1 036 661
1998	991 584	745 131	425 341	576 926	1 002 267
1999	963 321	776 927	327 662	610 793	938 455
2000	935 713	779 892	326 907	602 626	929 533
2001	1 012 048	661 172	463 212	495 184	958 396
2002 (p)	891 924	793 475	398 885	598 250	997 135

Sources: Natural Resources Canada; Statistics Canada.

(p) Preliminary.

(1) Beginning in 1988, exports are based on the new Harmonized System and may not be in complete accordance with previous method of reporting. Ores and concentrates include HS classes 2608.00.30, 2603.00.30, 2607.00.30 and 2616.10.30. Refined production includes HS classes 7901.11 and 7901.12. (2) New refined zinc produced from domestic primary materials (concentrates, slags, residues, etc.) plus estimated recoverable zinc in ores and concentrates shipped for export. (3) Refined zinc produced from domestic and imported ores.

TABLE 3. WESTERN WORLD PRIMARY ZINC STATISTICS, 1998-2002

	1998	1999	2000	2001	2002 (p)
	(000 tonnes)				
Mine production (zinc content)	5 694	5 897	6 314	6 600	6 548
Metal production	5 713	5 832	6 138	6 275	6 623
Metal used	6 531	6 827	7 134	6 911	7 035

Source: International Lead and Zinc Study Group.

(p) Preliminary.

TABLE 4. WORLD MINE PRODUCTION OF ZINC, 1998-2002

	1998	1999	2000	2001	2002 (p)
	(000 tonnes)				
EUROPE					
Finland	31	20	16	20	35
Ireland	180	200	263	298	253
Poland	158	155	157	153	140
Russia	114	161	163	164	162
Spain	128	154	204	161	70
Sweden	161	175	177	159	158
Others	104	82	83	98	100
Subtotal	880	947	1 063	1 053	918
AFRICA					
Morocco	112	112	105	89	84
Namibia	42	35	40	38	41
South Africa	70	70	63	62	58
Others	33	51	48	48	46
Subtotal	257	268	256	237	229
OCEANIA					
Australia	1 020	1 110	1 379	1 476	1 444
AMERICAS					
Bolivia	151	145	149	145	148
Brazil	88	96	93	93	121
Canada	1 062	1 021	1 002	1 065	916
Mexico	395	363	393	429	495
Peru	869	900	910	1 056	1 233
United States	755	852	852	842	783
Others	88	106	110	120	119
Subtotal	3 408	3 483	3 509	3 750	3 815
ASIA					
China	1 273	1 476	1 780	1 572	1 499
India	195	185	208	222	248
Iran	86	98	102	105	121
Japan	68	64	64	45	43
Kazakhstan	224	283	322	320	376
North Korea	44	37	34	28	28
Thailand	25	24	27	24	25
Turkey	58	57	48	36	43
Others	32	34	38	42	40
Subtotal	2 005	2 258	2 623	2 394	2 423
Total world	7 569	8 065	8 830	8 910	8 829
Total Western World	5 694	5 891	6 314	6 600	6 548

Source: International Lead and Zinc Study Group.

(p) Preliminary.

TABLE 5. WORLD ZINC METAL PRODUCTION,⁽¹⁾ 1998-2002

	1998	1999	2000	2001	2002 (p)
	(000 tonnes)				
EUROPE					
Belgium	205	232	264	256	239
Finland	199	225	223	249	249
France	320	318	318	329	334
Germany	361	361	357	357	378
Italy	232	145	170	179	176
Netherlands	217	221	217	206	203
Norway	138	144	138	145	145
Poland	175	179	173	175	160
Russia	197	232	242	250	257
Spain	385	383	391	443	512
Others	262	252	277	291	270
Subtotal	2 691	2 692	2 770	2 880	2 923
AFRICA					
Algeria	27	27	26	26	24
South Africa	108	108	103	109	112
Others	–	–	–	–	2
Subtotal	135	135	129	135	138
AMERICAS					
Argentina	39	40	36	40	39
Brazil	177	187	192	193	255
Canada	745	777	780	661	793
Mexico	229	219	233	300	312
Peru	184	191	200	190	171
United States	368	372	371	329	289
Subtotal	1 741	1 785	1 812	1 713	1 859
ASIA					
China	1 486	1 703	1 957	2 078	2 106
India	180	189	204	234	246
Japan	608	633	654	644	640
Kazakhstan	240	243	262	277	285
South Korea	390	430	477	508	608
Thailand	89	95	101	105	105
Others	150	119	119	131	142
Subtotal	3 143	3 412	3 774	3 977	4 132
OCEANIA					
Australia	311	344	494	556	567
Total world	8 021	8 369	8 979	9 261	9 619
Total Western World	5 713	5 832	6 138	6 275	6 623

Source: International Lead and Zinc Study Group.

– Nil; (p) Preliminary.

(1) Total production by smelters and refineries of zinc in marketable form or used directly for alloying, including production on toll in the reporting country, regardless of the type of source material from which it is produced, i.e., whether ores, concentrates, residues, slag or scrap. Remelted zinc and zinc dusts are excluded.

TABLE 6. ZINC USE,⁽¹⁾ BY COUNTRY AND BY REGION, 1998-2002

	1998	1999	2000	2001	2002 (p)
	(000 tonnes)				
EUROPE					
Belgium	260	367	383	374	352
France	285	300	311	327	318
Germany	573	561	532	549	512
Italy	373	336	385	348	374
Russia	111	120	137	150	153
Spain	197	190	203	228	226
United Kingdom	219	220	210	191	185
Others	632	621	662	655	660
Subtotal	2 650	2 715	2 823	2 822	2 780
AFRICA					
South Africa	91	87	92	89	92
Others	62	70	78	76	79
Subtotal	153	157	170	165	171
OCEANIA					
Australia	192	210	217	222	223
New Zealand	17	15	14	16	17
Subtotal	209	226	231	238	240
AMERICAS					
Brazil	177	179	188	198	216
Canada	170	169	176	180	192
Mexico	186	200	212	210	225
United States	1 307	1 342	1 348	1 181	1 168
Others	157	168	181	173	173
Subtotal	1 997	2 058	2 105	1 942	1 974
ASIA					
China	920	1 200	1 350	1 500	1 650
India	232	254	270	286	310
Japan	659	634	676	633	603
South Korea	318	389	438	401	476
Taiwan	241	273	294	276	302
Others	532	590	644	669	699
Subtotal	2 902	3 340	3 672	3 765	4 040
Total world	7 911	8 496	9 000	8 931	9 205
Total Western World	6 531	6 827	7 134	6 911	7 035

Source: International Lead and Zinc Study Group.

(p) Preliminary.

(1) Total refined zinc use, including zinc used directly for the production of zinc alloys, regardless of the type of source material from which it is produced, i.e., ores, concentrates, residues, slags or scrap. Remelted zinc and zinc dusts are excluded.

TABLE 7. CANADA, ZINC METAL CAPACITY, 2002

Company and Location	Annual Rated Capacity
	(000 tonnes of slab zinc)
PRIMARY	
Canadian Electrolytic Zinc Limited Valleyfield, Quebec	260
Falconbridge Limited Timmins, Ontario	145
Hudson Bay Mining and Smelting Co., Limited Flin Flon, Manitoba	115
Teck Cominco Ltd. Trail, British Columbia	290
Total primary, Canada	810

Source: Natural Resources Canada.

TABLE 8. MONTHLY AVERAGE ZINC PRICES, 2001 AND 2002

	LME Special High Grade Settlement
	(US\$/t)
2001	
January	1 033.4
February	1 020.9
March	1 004.7
April	969.5
May	937.9
June	894.9
July	852.4
August	828.1
September	798.6
October	761.5
November	772.9
December	754.7
Yearly average	886.3
2002	
January	793.2
February	771.3
March	819.3
April	808.2
May	769.6
June	767.1
July	794.8
August	747.6
September	756.2
October	754.7
November	765.3
December	797.8
Yearly average	778.6

Source: International Lead and Zinc Study Group.