

Nickel – 2012 Annual Review

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CANADIAN PRODUCTION

Canada mined roughly 15.5 million tonnes (Mt) of ore containing an estimated 218,564 tonnes (t) of nickel in 2012 (Table 1). Two companies (the Cobalt Refinery Company, which is half owned by Sherritt International Corporation (Sherritt), and Vale do Rio Doce [Vale]), produced a total of 152,500 t of refined nickel from three refineries located in Fort Saskatchewan, Alberta; Thompson, Manitoba; and Sudbury, Ontario. Overall, Canada ranked fourth¹ among world nickel producers after China (519,200 t), Russia (256,000 t), and Japan (169,000 t).

The value of Canadian nickel exports (including nickel ores, concentrates, scrap, and intermediate products) decreased to \$5.47 billion in 2012 from \$7.03 billion in 2011 and the value of nickel imports decreased to \$855,186 from \$925,024 (Table 2). Of note, Canada exported 80,746 t of nickel in matte to Norway and 39,347 t of smelted nickel oxide to the United Kingdom for further processing. These exports are presumed to have come from Glencore-Xstrata and Vale, respectively. Overall, Canada traded with more than 100 countries in nickel and nickel-related products. Data on Canadian nickel mine output and domestic use for the period 1990-2012 are provided in Table 3.

In 2012, at its Voisey's Bay Ovoid mine in Newfoundland and Labrador, Vale reported mining 2.35 Mt of ore containing 3.11% nickel (73,116 t), 1.94% copper (45,600 t), and 0.052% cobalt (1,221 t). The company also reported 61,900 t of recoverable nickel in concentrate shipped from its Newfoundland operations, 36% of which was processed by its Thompson, Manitoba, refinery and 64% by its Sudbury, Ontario, refinery.

In Quebec, Glencore-Xstrata's wholly owned Raglan mine complex reported mining 1.27 Mt of ore and milling 1.29 Mt containing 28,613 t of nickel and 602 t of cobalt in concentrate.

Ontario, which is Canada's largest nickel-producing province, mined some 10.45 Mt of ore from 13 mines (Coleman, Copper Cliff, Creighton, Ellen, Garson, Gertrude, Stobie, Fraser, Nickel Rim South, Lac des Iles, Lockerby, McCready, and Levack) containing roughly 86,759 t of nickel and 134,000 troy ounces (oz) of platinum, 251,000 oz of palladium, and 69,000 oz of gold.

In Manitoba, Vale reported mining 1.8 Mt of ore containing 1.67% nickel (30,193 t) and 0.0053% cobalt (96 t) from its Birtchtree and Thompson mines.

Sherritt is a world leader in the mining and refining of nickel with projects and operations in Canada, Cuba, Indonesia, and Madagascar. Sherritt has a 50% partnership with the General Nickel Company S.A. of Cuba in the Moa Joint Venture. Lateritic nickel and cobalt ore, mined in Cuba using an open-pit mining process, is processed on-site into mixed sulphides containing nickel and cobalt. These mixed sulphides are shipped to Sherritt's Canadian asset, the Cobalt Refining Company located in Fort Saskatchewan, Alberta, for hydrometallurgical processing into finished nickel and cobalt. Sherritt reported production of 34,264 t of refined nickel and 3,792 t of cobalt in 2012.

Glencore-Xstrata is one of the world's largest global natural resource companies supporting a network of metals, minerals, energy, and agricultural activities in more than 50 countries. In Canada, Glencore-Xstrata operates mineral- and metal-producing mines and smelters in Nunavut, New Brunswick, Nova Scotia, Quebec, Ontario, and British Columbia. Glencore-Xstrata receives nickel in concentrate from its Nickel Rim South and Fraser mines in Sudbury, Ontario; the Quebec-based Raglan mine operation; and third-party Canadian sources. In 2012, Glencore-Xstrata reported production of 72,526 t of nickel, 20,475 t of copper, and 2,193 t of cobalt in a matte from its Sudbury, Ontario, smelter that was exported to Nikkelverk, Norway, for final refining.

Vale is a Brazilian, multinational, diversified metals and mining company and the second largest mining company in the world. Its products include iron ore, manganese, ferroalloys, nickel, copper, bauxite, potash, kaolin, alumina, and aluminum. Vale reported 2012 refined nickel production of 24,300 t from ores extracted from the Birchtree and Thompson mines at its Thompson, Manitoba, integrated nickel smelting and refining facility. A further 21,500 t of refined nickel were produced from Vale's Ovoid mine in Newfoundland and Labrador. Vale further reported 2012 refined nickel production of 65,500 t extracted from its Sudbury-based mines and processed at the Copper Cliff nickel smelter and refinery in Sudbury, Ontario. An additional 6,900 t of refined nickel, together with roughly 39,400 t of nickel oxide, were produced from nickel-bearing concentrate from Vale's Ovoid mine and with concentrate purchased from third-party Canadian sources. The nickel oxide is believed to have been shipped to Vale's Clydach refinery in the United Kingdom for further processing. Vale reported 2012 production of 1,284 t of cobalt recovered as a minor metal and by-product of its nickel operations and refined at its Port Colborne, Ontario refinery, 606 t in a cobalt-based intermediate product at the Thompson nickel operations, and an additional 452 t of cobalt contained in other intermediate products such as nickel concentrates.

WORLD PRODUCTION

World nickel mine production for 2012 reached an all-time high of 2.2 Mt, representing an increase of 12.5 % from 1.9 Mt in 2011. World primary refined nickel production for 2012, as reported by the International Nickel Study Group (INSG), was 1.8 Mt, up slightly from 1.6 Mt in 2011. The top five producing countries were China (519,200 t), Russia (256,000 t), Japan (169,500 t), Canada (144,500 t), and Australia (128,800 t).

MARKETS AND PRICES

Demand for nickel in 2012, according to the INSG, amounted to 1.67 Mt, up from the 1.60 Mt consumed in 2011. Increased consumption was driven by strong growth in stainless steel output in China, reflected in

global stainless steel production reaching 35.4 Mt in 2012, which was up 5.2% from 2011 production. While consumption was strong throughout 2012, nickel stocks increased significantly throughout the latter half of the year with London Metal Exchange (LME) inventories to end 2012 at 141,700 t, up from 90,500 t at the end of 2011. LME average nickel inventory levels were 111,500 t in 2012, compared to an average of 109,222 t in 2011. Strong 2012 production of 350,000 t of nickel pig iron (compared to the 70,000 t produced in 2011), together with primary production from new projects, influenced the build-up of nickel stocks as less Class 1 nickel was used in China for the production of stainless steel.

The LME's Official Settlement Price for nickel started 2012 at US\$18,430/t. By year-end, it had fallen to US\$17,100/t. The price for 2012 peaked on February 8 at US\$21,830/t and hit its lowest level at US\$15,190/t on August 16. The average price during the year was US\$17,527.81/t, roughly 23% lower than in 2011.

OUTLOOK

Important global issues for 2013 include the speed at which new nickel projects will be developed and, potentially, how the new Indonesian regulations affecting the export of unprocessed ores will be implemented, as well as the impact this will have on the volume of nickel pig iron. Indonesia is considering imposing export restrictions on several unprocessed minerals, including nickel, to encourage further domestic value-added manufacturing.

The INSG projects world primary refined nickel production will increase to 1.86 Mt in 2013 with nickel consumption rising to the 1.77-Mt level. Nickel prices are expected to remain volatile in the short to medium term with downward pressure as new production enters the marketplace, outstripping demand. The nickel industry will pay close attention to China's production of stainless steel as a barometer of demand, particularly throughout the first quarter of 2013. Strong demand from China could push nickel prices upward, despite projected increases in production and stock accumulation. While the role of China as a consumer has been emphasized, the strength of the global economy and the overall rate of economic recovery, particularly in Europe and the United States, will also affect nickel prices and may moderate the projected increase in nickel supply.

¹International Nickel Study Group.

Notes: (1) For definitions and valuation of mineral production, shipments and trade, please refer to the document entitled "Definitions and Valuation: Mineral Production, Shipments, and Trade." (2) Information in this review was current as of June 30, 2013. (3) This and other reviews, including previous editions, are available on the Internet at www.nrcan.gc.ca/mining-materials/markets/commodity-reviews/8360.

Nickel - Other Information

NICKEL USES

Nickel's resistance to corrosion, high strength over a wide temperature range, pleasing appearance, and suitability as an alloying agent make it useful in a wide variety of applications.

Stainless steel accounts for the predominant use of nickel. Stainless steel is the material of choice when designing containers and products that require consumer safety and hygiene. As such, containers and equipment made of stainless steel include household equipment, domestic appliances, equipment for the food industry, pharmaceutical production tools, and surgical equipment. Stainless steel is also extensively used in building and construction, transportation, and heavy industries such as chemicals and petrochemicals.

In 2012, the principal uses for primary nickel were stainless steel (65%), nickel-based alloys (12%), electroplating (10%), casting and alloy steels (8%), rechargeable batteries (3%), coins (1%), and other nickel uses (1%). Nickel is also intensively recycled; between 45% and 48% of the nickel used to make stainless steel is in the form of stainless steel scrap.

TABLE 1. CANADA, NICKEL PRODUCTION BY PROVINCE, 2010-12

	2010		2011		2012 (p)	
	(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
MINE OUTPUT						
Nickel content of concentrates produced	160,063	..	219,025	..	203,114	..
SHIPMENTS						
Recoverable content of nickel in concentrates shipped from Canadian mines						
Newfoundland and Labrador	44,313	995,272	69,885	1,582,480	63,458	1,103,979
Quebec	29,791	669,098	26,464	599,240	28,127	489,321
Ontario	52,708	1,183,811	89,452	2,025,549	79,071	1,375,599
Manitoba	30,359	681,866	25,616	580,054	25,815	449,104
Total	157,171	3,530,047	211,417	4,787,323	196,471	3,418,003
Finished nickel output = refined nickel in various shapes in Class I, plus Class II nickel (as defined by the International Nickel Study Group), which includes nickel oxide sinter	105,413	..	142,445	..	141,828	..

Sources: Natural Resources Canada; Statistics Canada.

.. Not available; (p) Preliminary.

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

TABLE 2. CANADA, NICKEL TRADE, 2010-12

		2010		2011		2012	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
EXPORTS							
2604.00.40	Nickel ores and concentrates (nickel content)						
	China	32	289	31	374	20	178
	Finland	—	—	7,670	165,231	—	—
	Other countries	—	—	1	13	...	5
	Total	32	289	7,702	165,618	20	183
2825.40	Nickel oxides and hydroxides (weight of material, not nickel content)						
	United States	96	852	118	973	173	1,064
	Brazil	13	139	9	101	8	91
	South Africa	11	118	14	148	3	30
	Other countries	105	1,363	6	70	—	—
	Total	225	2,472	147	1,292	184	1,185
2827.35	Nickel chlorides (weight of material, not nickel content)						
	Mexico	—	—	...	...	—	—
2833.24	Nickel sulphates (weight of material, not nickel content)						
	Brazil	90	626	—	—	—	—
	Hong Kong	...	1	4	28	—	—
	United States	2	16	—	—	—	—
	Total	92	643	4	28	—	—
3815.11	Catalysts and other reaction initiators, reaction accelerators and catalytic preparations with nickel or nickel compounds as the substance (weight of material, not nickel content)						
	United States	148	79	64	36	163	124
	Belgium	—	—	—	—	7	75
	Other countries	—	—	5	52	...	2
	Total	148	79	69	88	170	201

7202.60	Ferronickel (weight of material, not nickel content)						
	United States	39	464	597	4,968	58	610
7204.21	Stainless steel waste and scrap (weight of material, not nickel content)						
	United States	113,461	211,164	93,630	200,098	100,564	175,403
	Netherlands	17,594	43,021	25,619	65,087	122,717	50,434
	Other countries	11,400	24,207	31,001	28,591	15,555	36,023
	Total	142,455	278,392	150,250	293,776	238,836	261,860
7501.10	Nickel mattes (nickel content)						
	Norway	70,127	1,831,888	73,724	1,990,028	80,746	1,629,048
	United Arab Emirates	—	—	—	—	19	51
	Total	70,127	1,831,888	73,724	1,990,028	80,765	1,629,099
7501.20	Nickel oxide sinters and other intermediate products of nickel metallurgy (weight of material, not nickel content)						
	United Kingdom	36,248	828,649	42,874	973,553	39,347	701,024
	China	6,060	68,920	3,500	82,340	3,646	68,396
	South Korea	2,728	57,439	3,859	83,860	1,453	27,227
	Taiwan	216	5,070	2,456	53,412	1,180	22,497
	Other countries	37	820	449	8,173	163	747
	Total	45,289	960,898	53,138	1,201,338	45,789	819,891
7502.10	Nickel unwrought, not alloyed (nickel content)						
	United States	17,287	389,621	48,881	1,129,328	49,958	933,143
	China	29,482	655,788	26,256	616,403	19,942	375,153
	Netherlands	14,281	318,374	16,670	379,316	20,213	354,092
	Hong Kong	7,301	157,668	6,137	149,549	7,780	149,534
	Other countries	18,523	425,583	29,941	699,147	29,654	541,858
	Total	86,874	1,947,034	127,885	2,973,743	127,547	2,353,780
7502.20	Nickel unwrought, alloyed (weight of material, not nickel content)						
	United States	59	209	599	2,278	2,411	8,526
	United Kingdom	—	—	—	—	3	85
	Other countries	...	22	1	23	...	21
	Total	59	231	600	2,301	2,414	8,632
7503.00	Nickel waste and scrap (weight of material, not nickel content)						
	United States	3,831	38,498	2,635	25,798	4,165	38,807
	Other countries	274	3,383	2,005	11,452	602	4,797
	Total	4,105	41,881	4,640	37,250	4,767	43,604
7504.00	Nickel powders and flakes, alloyed and unalloyed (weight of material, not nickel content)						
	United States	1,675	54,680	2,727	80,967	2,961	75,147
	Japan	2,581	72,329	2,700	79,257	3,041	70,303
	Other countries	2,618	68,734	5,309	145,944	6,799	143,029
	Total	6,874	195,743	10,736	306,168	12,801	288,479
7505.11	Bars, rods and profiles of nickel, not alloyed (nickel content)						
	Total	—	—	...	10	...	3
7505.12	Bars, rods and profiles of nickel alloy (weight of material, not nickel content)						
	United States	103	815	24	1,329	9	595
	Other countries	1	50	1	105	1	55
	Total	104	865	25	1,434	10	650
7505.21	Nickel wire, not alloyed (weight of nickel wire plus coating if any, not nickel content)						
	Total	...	34	...	...	...	6
7505.22	Wire, nickel alloy (weight of alloy plus coating, if any, not nickel content)						
	Total	34	943	11	431	19	853
7506.10 to 7506.20	Nickel plates, sheets, strip and foil						
	Total	34	318	2	65	38	710
		(n.a.)	(\$000)	(n.a.)	(\$000)	(n.a.)	(\$000)
7507.11 to 7507.20	Tubes, pipes, and tube or pipe fittings alloyed and unalloyed (weight of material, not nickel content)						
	United States	..	11,637	..	13,855	..	11,881
	Netherlands	..	120	..	992	..	259
	Other countries	..	2,041	..	3,029	..	1,288

	Total	..	13,798	..	17,876	..	13,428
7508.10 to 7508.90	Other articles of nickel (weight of material, not nickel content)						
	United States	..	21,241	..	20,281	..	34,188
	Other countries	..	8,224	..	11,123	..	10,514
	Total	..	29,465	..	31,404	..	44,702
Total exports	..	5,305,437	..	7,027,818	..	5,467,876	
		(tonnes)	(\$000)	(tonnes)	(\$000)	(tonnes)	(\$000)
IMPORTS							
2604.00.00.20	Nickel ores and concentrates (nickel content)						
	Australia	17,215	360,461	15,998	374,982	16,331	294,358
	Finland	...	...	—	—	1,714	27,892
	Other countries	1,980	45,458	753	17,287	2	59
	Total	19,195	405,919	16,751	392,269	18,047	322,309
2620.99.00.90	Ash and residues: other (containing mainly nickel)						
	United States	130,648	8,466	115,553	16,106	111,122	19,298
	South Africa	15,326	6,605	45,627	19,760	12,125	15,289
	Other countries	66,105	20,060	1,688	20,069	1,849	15,991
	Total	212,079	35,131	162,868	55,935	125,096	50,578
2825.40	Nickel oxides and hydroxides (weight of material, not nickel content)						
	United States	1,357	4,118	759	2,145	807	2,305
	Japan	...	...	13	150	14	173
	Other countries	43	516	...	...	1	7
	Total	1,400	4,634	772	2,295	822	2,485
2827.35	Nickel chlorides (weight of material, not nickel content)						
	Norway	—	—	1	7	52	377
	France	80	574	72	510	62	345
	United States	4	31	16	108	32	214
	Other countries	...	2	16	114	5	34
	Total	84	607	105	739	151	970
2833.24	Nickel sulphates (weight of material, not nickel content)						
	United States	2,238	6,935	5,666	16,153	2,835	7,846
	Other countries	3,375	19,339	3,265	14,778	1,032	4,763
	Total	5,613	26,274	8,931	30,931	3,867	12,609
3815.11	Catalysts and other reaction initiators, reaction accelerators, and catalytic preparations with nickel or nickel compounds as the substance (weight of material, not nickel content)						
	Denmark	183	3,661	127	2,666	181	4,328
	Germany	219	5,294	105	2,562	151	3,431
	United States	293	6,034	217	4,972	153	2,797
	Other countries	325	5,468	535	9,080	286	5,231
	Total	1,020	20,457	984	19,280	771	15,787
7202.60	Ferronickel (weight of material, not nickel content)						
	Total	—	—	79	271	1,358	4,570
7204.21	Stainless steel waste and scrap (weight of material, not nickel content)						
	United States	136,172	40,071	315,521	39,768	547,648	37,039
	Other countries	233	510	336	130	123	103
	Total	136,405	40,581	315,857	39,898	547,771	37,142
7501.10	Nickel mattes (nickel content)						
	Australia	—	—	—	—	4,383	35,679
	Germany	...	...	653	3,216	1,626	6,694
	Singapore	—	—	—	—	924	6,605
	Other countries	2,537	38,843	—	—	265	2,924
	Total	2,537	38,843	653	3,216	7,198	51,902
7501.20	Nickel oxide sinters and other intermediate products of nickel metallurgy (weight of material, not nickel content)						
	Germany	11,730	26,349	15,256	41,934	14,854	30,265
	Other countries	13,813	21,221	9,077	18,132	7,367	14,941
	Total	25,543	47,570	24,333	60,066	22,221	45,206

7502.10	Nickel unwrought, not alloyed (nickel content)						
	Russia	353	8,232	110	2,611	106	2,233
	Finland	27	477	88	2,224	92	1,684
	Canada	478	11,089	226	5,835	92	1,681
	Australia	164	3,457	114	2,585	77	1,243
	Other countries	787	19,407	184	4,217	200	3,408
	Total	1,809	42,662	722	17,472	567	10,249
7502.20	Nickel unwrought, alloyed (weight of material, not nickel content)						
	United States	67	1,471	50	1,144	58	1,430
	Other countries	86	2,197	91	2,324	70	1,559
	Total	153	3,668	141	3,468	128	2,989
7503.00	Nickel waste and scrap (weight of material, not nickel content)						
	United States	11,814	51,193	16,849	69,899	19,232	84,534
	Other countries	1,647	11,101	2,266	14,245	1,877	10,813
	Total	13,461	62,294	19,115	84,144	21,109	95,347
7504.00	Nickel powders and flakes, alloyed and unalloyed (weight of material, not nickel content)						
	Australia	1,285	17,939	1,448	16,508	715	13,825
	Other countries	755	25,005	537	18,407	744	19,081
	Total	2,040	42,944	1,985	34,915	1,459	32,906
7505.11	Bars, rods and profiles of nickel, not alloyed (nickel content)						
	Total	6	252	5	317	7	280
7505.12	Bars, rods and profiles of nickel alloy (weight of material, not nickel content)						
	United States	574	21,755	722	28,385	908	30,669
	Other countries	88	2,695	123	4,490	127	4,970
	Total	662	24,450	845	32,875	1,035	35,639
7505.21	Nickel wire, not alloyed (weight of nickel wire plus coating if any, not nickel content)						
	Total	23	759	18	620	19	816
7505.22	Wire, nickel alloy (weight of alloy plus coating, if any, not nickel content)						
	United States	149	4,770	250	8,972	167	7,167
	Other countries	138	4,518	163	6,185	207	6,388
	Total	287	9,288	413	15,157	374	13,555
7506.00	Nickel plates, sheets, strip and foil						
	United States	546	18,970	675	29,507	397	16,837
	Other countries	256	7,702	455	17,094	296	8,731
	Total	802	26,672	1,130	46,601	693	25,568
7507.00	Tubes, pipes, and tube or pipe fittings alloyed and unalloyed (weight of material, not nickel content)						
	Japan	10	437	410	33,607	213	35,958
	United States	366	18,774	496	19,799	316	16,338
	Other countries	180	6,493	132	4,994	101	6,210
	Total	556	25,704	1,038	58,400	630	58,506
7508.00	Other articles of nickel (weight of material, not nickel content)						
	United States	154	15,615	163	20,244	253	25,570
	Other countries	79	5,043	96	5,911	169	10,203
	Total	233	20,658	259	26,155	422	35,773
Total imports		423,908	879,367	557,004	925,024	753,745	855,186

Sources: Natural Resources Canada; Statistics Canada.

– Nil; . . Not available; . . . Amount too small to be expressed; n.a. Not applicable.

Notes: Numbers may not add to totals due to rounding. Harmonized system code descriptions in this table may have been abbreviated.

**TABLE 3. CANADA, HISTORICAL
NICKEL PRODUCTION AND USE,
1990-2012**

Year	Production (1) (Mine Output)	Use (2)
	(tonnes)	
1990	196,225	8,410
1991	192,259	13,322
1992	186,384	15,528
1993	188,080	17,384
1994	149,886	20,746
1995	181,820	20,973
1996	192,649	24,504
1997	190,529	19,447
1998	208,302	19,787
1999	186,236	22,527
2000	190,793	24,976
2001	194,058	17,735
2002	189,297	18,955
2003	163,244	13,010
2004	186,694	9,491
2005	199,932	9,251
2006	232,948	7,787
2007	254,915	7,196
2008	259,651	..
2009	135,037	..
2010	160,063	..
2011	219,025	..
2012 (p)	203,114	..

Sources: Natural Resources Canada; Statistics Canada.

.. Not available; (p) Preliminary.

(1) Refined nickel and nickel in oxides and salts produced, plus recoverable nickel in matte and concentrates exported. Data are for nickel contained in concentrates produced. (2) Use of metallic nickel, all forms (refined metal, nickel in ferronickel oxides and salts, and other forms of nickel, including nickel in purchased scrap) as reported by users on the Natural Resources Canada survey "Nickel Use."

Note: The Nickel Use survey is currently suspended.