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MINERAL INDUSTRY QUARTERLY REPORT

GEOLOGICAL SURVEY OF CANADA
COMMISSION GEOLOGIQUE DU CANADA

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MINERAL INDUSTRY QUARTERLY REPORT

SUMMER 1994



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Preface

This publication is prepared by the Mining Sector of Natural Resources Canada. Data appearing in this publication are compiled from many sources using the best information available to us. This report is intended to provide the reader with a digest of general information on the status of the mineral industry in Canada. It should not be considered an authority for exact quotation or an expression of the official views of the Government of Canada.

Your comments on the format and contents of this report are welcome. Specific comments can be directed to:

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MINERAL INDUSTRY INFORMATION CONTACT POINT

In order to provide our clients with timely access to information describing the mineral industry, the Mining Sector has established a contact point through which requests for specific statistical information on the mineral industry can be channelled. Once a request has been received, it will be immediately directed to the officer most able to address that request.

This contact point is:

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Introduction

Since 1989, the Canadian mineral industry has been slowed both by economic recession and by other factors that have affected the mineral industry globally. In 1993, performance indicators for the mining industry were mixed as the recession neared its end. During that year, metal prices generally fell until October but rebounded to close at levels similar to those posted in 1987. The article entitled "The Mineral Industry in the Canadian Economy – 1993" provides a useful summary of the contribution of the mining industry to the economy in that year.

On a more positive note, there are indications that the industry may rebound in 1994. This year will show the first net increase in Canadian mines in operation since 1989 as mine openings and re-openings during the year will exceed closures and suspensions. This increase in operating mines, as described in the article "Actual and Expected Canadian Mine Openings, Re-Openings, Expansions, Closures and Suspensions in 1994," will result in a net gain in the year for both Canadian mining production capacity and employment in the industry.

A significant factor determining the future strength of the Canadian mineral industry will be its ability to harness new technologies to improve its international competitiveness. The final article in this publication describes certain new technologies in the production of primary iron and their impact on the use of coal and iron.

Finally, the Mining Sector of Natural Resources Canada is pleased to introduce the Mining FactsLine, an important service which will allow our clients easy access to a wide range of information products. More details on this new service are provided in the "Notes" section at the beginning of this report.

Notes

MINING FACTSLINE . . . (613) 947-6767

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CANADIAN MINERALS YEARBOOK

The 1993 edition of the Canadian Minerals Yearbook reports on the activities of the mineral and metal industry over the past year, identifies the predominant economic events of 1993, and indicates the major trends in the Canadian economy.

The leading chapter of the Yearbook provides a general review of the Canadian economy and the performance of the mineral industry during the year. Separate chapters address the regional and international scenes; mine reserves, developments and promising deposits; mineral exploration; and mine openings and closures.

The Yearbook's 27 commodity chapters form the major part of this publication. The subject matter spans all stages of industry activity through mining and processing to prices, trade, production and consumption. An outlook of the industry's future is also provided.

The statistical summary contains over 80 tables which provide statistical data on production; trade; consumption; prices; principal statistics; employment, salaries and wages; mining, exploration and drilling; transportation; and investment and finance.

Copies of the Yearbook can be purchased from the Canada Communication Group – Publishing, telephone: (819) 956-4802, and associated bookstores for \$45.00 plus \$5.40 for shipping and handling.

PUBLICATION OF CANADIAN LAW OF MINING

The Canadian Institute of Resources Law has published the *Canadian Law of Mining*, by Barry J. Barton. This publication contains a comprehensive study of Canadian mining law. From the broad concepts of ownership rights to the intricate details of claim-staking, it covers a variety of topics of interest to both practitioners and non-lawyers in the mining industry.

across Canada, as well as government personnel involved with regulating mining activity. In addition to practice and procedure, this report also addresses the policy inherent in different systems of disposition of mining interests, especially the free miner system. It covers many other issues important to mining, such as the acquisition of rights and interests from the Crown, transfers of mining interests, royalties, withdrawal of lands from mining, surface rights, and mining issues in relation to native lands.

The Canadian Institute of Resources Law believes that this publication would be a very useful tool for legal practitioners, explorationists, industry personnel, and government policy-makers. It provides a single reference source to all material directly relevant to mining law that is found in legislation, case law, and elsewhere.

The *Canadian Law of Mining*, priced at \$135 plus shipping, handling and GST, can be obtained from:

The Canadian Institute of Resources Law
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HIGHLIGHTS OF RECENT MINERAL INDUSTRY PUBLICATIONS BY STATISTICS CANADA

Statistics Canada has recently released a publication of interest to the mineral industry. Highlights of this publication follow.

General Review of the Mineral Industries – 1992

Catalogue no. 26-201

- In 1992, the total value of mineral production (including metallic minerals, nonmetallic minerals, structural materials, and mineral fuels) of all establishments in Canada, regardless of their industrial classification, was \$35 414 million. This total represented a small increase of 0.6% over the 1991 total of \$35 190 million.
- Non-fuel minerals (metals, nonmetals, and structurals) accounted for 41.5% of the total value of mineral production in 1992, while mineral fuels (crude petroleum, natural gas, natural gas by-products, and coal) accounted for the remaining 58.5% of the total.

VALUE OF CANADIAN MINERAL PRODUCTION, 1991 AND 1992

	1991	1992	Change
	(\$ millions)	(\$ millions)	(%)
Metals	10 462	10 210	-2.4
Nonmetals	2 382	2 207	-7.3
Structurals	2 401	2 266	-5.6
Total non-fuels	15 245	14 683	-3.7
Fuels	19 945	20 730	+3.9
Total minerals	35 190	35 414	+0.6

Note: Totals may not add due to rounding.

- The leading metals in 1992 were: gold (\$2141 million), copper (\$2137 million), zinc (\$1791 million), nickel (\$1502 million), iron ore (\$1085 million), and uranium (\$566 million).
- Potash was the leading nonmetal produced in Canada in 1992 with a value of \$981 million.
- Sand and gravel (\$760 million), cement (\$682 million) and stone (\$517 million) led the structural materials group.
- Within the mineral fuels sector, all fuel commodities continued to be major contributors to Canada's total value of mineral production: crude petroleum (\$10 908 million), natural gas (\$5719 million), natural gas by-products (\$2435 million), and coal (\$1669 million).
- The total number of establishments classified in the mining industry declined from 1172 in 1991 to 1103 in 1992. The 1992 total included 97 establishments in metal mining, 109 in nonmetal mining, 228 in structural materials, and 669 in the fuel industries.
- The total value of production by establishments classified in the mineral industry was \$30 527 million in 1992, an increase of 0.2% over the 1991 level of \$30 452 million. Both the nonmetal mines industry and the fuel industry recorded gains over the 1991 value of production.
- The contribution by the industry to Canada's Gross Domestic Product (GDP) was \$20 070 million (at 1986 prices), representing 4.0% of total GDP in 1992, as it did in the previous year.
- Employment in the industry declined by 10.4% to 89 935 in 1992, compared to the 1991 level of 100 197. Of the total employment, production and related workers numbered 54 783 in 1992, down from 60 366 in 1991.
- While total employment dropped in all sectors of the mining industry (down by 10 262 overall), most of the decline occurred in metal mining (down by 4318) and in the mineral fuels industry (down by 4863). In 1992, the metal mining industry employed 37 774 people, nonmetal mining, 10 417, the mineral fuel industries, 37 404, and the structural materials industries, 4338.
- Wages and salaries of those employed in the mining industry totalled \$4983 million in 1992. Of this total, production and related workers accounted for \$2734 million.

The Mineral Industry in the Canadian Economy – 1993

Eric Hutchison and Jane Currie

The authors are with the Mining Sector, Natural Resources Canada. Telephone: (613) 995-9119 and 992-5798, respectively.

This article summarizes the mineral industry's performance in 1993 and highlights its importance within the context of the Canadian economy. Table 1 (Economic Dimensions of the Minerals and Metals Sector) provides an economic snapshot of the mineral industry in 1993. The data in the table and in the charts accompanying this article include the metals, nonmetals, structural materials, coal and uranium industries, but exclude petroleum and natural gas. The information is presented in terms of four stages of processing activity within the mineral industry. It should be noted that activities associated with recycling are an important and integral part of mineral industry operations.

The four stages of processing activity are defined as follows:

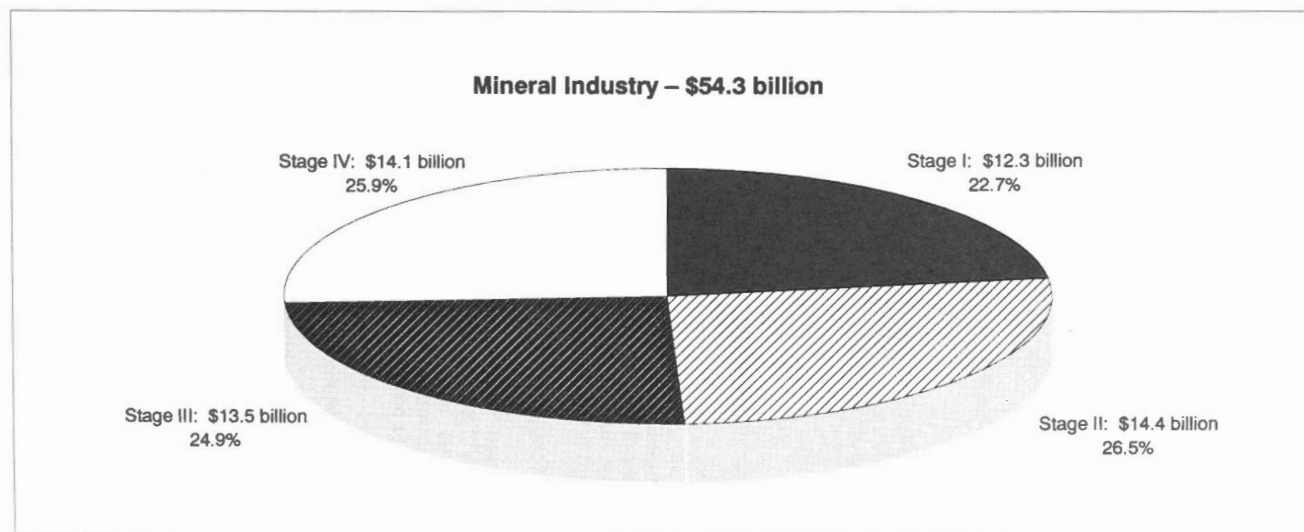
- Stage I - Primary Mineral Production (mining and concentrating);
- Stage II - Metal Production (smelting and refining);
- Stage III - Minerals and Metals-Based Semi-Fabricating Industries; and
- Stage IV - Metal Fabricating Industries.

The following sections, which briefly discuss industry output, employment, investment and trade, illustrate the overall importance of the industry to the economy, as well as the relative significance of each of the four stages of activity. The 1993 data are preliminary, while the 1992 figures incorporate revisions to the data originally presented in last year's corresponding article.

OUTPUT

Canada leads in the world production of zinc, uranium and potash, is second in the world production of nickel, cadmium, elemental sulphur and asbestos, and is among the top five producers of other important minerals and metals such as aluminum (primary

Figure 1
Value of Shipments, 1993



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

TABLE 1. ECONOMIC DIMENSIONS OF THE MINERALS AND METALS SECTOR, 1993P

	I Mining and Concentrating	II Smelting and Refining	III Semi- Fabricating	IV Metal Fabricating	Stages I + II	Stages I + II + III	Stages I + II + III + IV
OUTPUT							
Value of shipments (1992 \$ billions)	12.4	14.4	13.5	14.0	26.7	40.2	54.3
Gross Domestic Product (1986 \$ billions)	6.2	5.6	4.8	5.1	11.8	16.6	21.8
Percent share of total GDP	1.2	1.1	0.9	1.0	2.3	3.2	4.2
EMPLOYMENT							
Employment	57 000	61 000	83 000	134 000	118 000	201 000	335 000
Percent share of total employment	0.5	0.4	0.6	1.0	0.8	1.4	2.4
INVESTMENT							
Investment (capital and repair) (\$ billions)	3.2	2.2	1.2	0.5	5.4	6.6	7.1
Percent share of total investment	1.9	1.3	0.7	0.3	3.3	4.0	4.3
New investment (capital only) (\$ billions)	1.5	0.7	0.6	0.3	2.2	2.8	3.0
Percent share of total new investment	1.2	0.6	0.5	0.2	1.8	2.3	2.5
EXTERNAL TRADE							
Exports (\$ billions)	9.7	9.1	5.2	2.1	18.8	24.0	26.1
Percent share of total domestic exports	5.5	5.2	3.0	1.2	10.6	13.6	14.8
Imports (\$ billions)	3.2	3.6	6.5	2.9	6.8	13.3	16.2
Percent share of total imports	1.8	2.0	3.7	1.7	3.9	7.5	9.2
Balance of trade (\$ billions)	6.4	5.6	-1.3	-0.8	12.0	10.7	9.9

Sources: Natural Resources Canada; Statistics Canada.

P Preliminary.

Notes: Components may not add due to rounding. All dollar figures are in current dollars, except Gross Domestic Product, which is the GDP by industry at factor cost at 1986 prices. Data include coal and uranium, but exclude petroleum and natural gas and their products.

Stage I includes crude mineral ores and concentrates.

Stage II includes ferrous and nonferrous smelting and refining.

Stage III includes metal semi-fabricated products, wire and wire products, and nonmetallic mineral products.

Stage IV includes fabricated metal products, except wire and wire products which are in Stage III.

metal), lead, platinum group metals, molybdenum, cobalt, copper, titanium concentrates, gypsum, silver and gold.

In aggregate, the value of shipments of minerals and mineral products from all four stages of the mineral industry totalled \$54.3 billion in 1993 compared with \$52.7 billion in 1992. Each of the four stages accounted for roughly one quarter of the total. The value of shipments increased by 3.1% in 1993 following a 3.1% decline in 1992. However, 1993 shipments were 19.5% below the record level of \$67.5 billion set in 1989.

The total value of shipments of minerals and mineral products declined in 1993 as commodity prices generally remained low. In comparison to 1992, the results for individual commodities were mixed, as advances in the value of output of some minerals were offset by losses in others. NRCan's Metal Price Index, which tracks the monthly prices of copper, nickel, lead, zinc, gold and silver, declined for most of 1993 and reached its low in October, but then began to recover. The average annual prices for four of the six metals in the Index were lower in 1993 than in 1992, while gold and silver increased modestly in price. At year-end 1993, the Index was at a level similar to that existing in mid-1987.

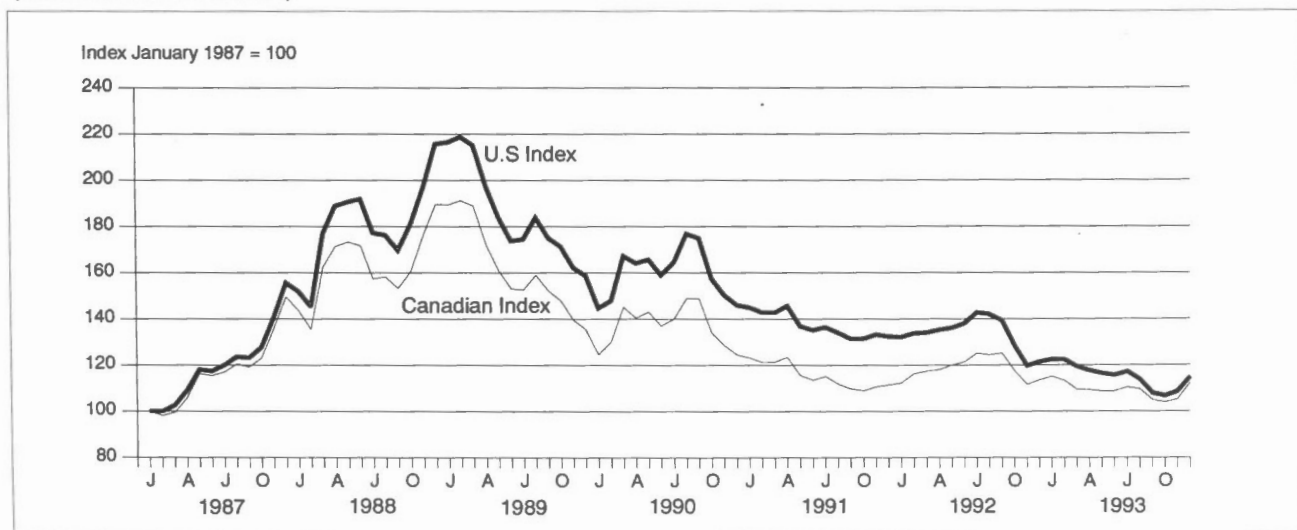
It should be noted that the "value of shipments" measure for each stage of activity is gross, not net. Therefore, since the output of one stage is the input for the next stage, there is an element of double-

counting in terms of value added. Gross Domestic Product (GDP) is a measure of output that eliminates the double-counting inherent in the "value of shipments" measure.¹

In terms of GDP by industry at factor cost (measured on the basis of 1986 prices), Statistics Canada reported that the minerals and metals industry contributed \$21.8 billion to the Canadian economy in 1993.² This level of output represents an increase of 3.6% from the 1992 level of \$21.0 billion, reflecting the modest recovery in the goods-producing industries of the economy. The smelting and refining, semi-fabricating and fabricating stages of the industry all recorded higher production in 1993, but that was partly offset by decreased production in the mining industry.

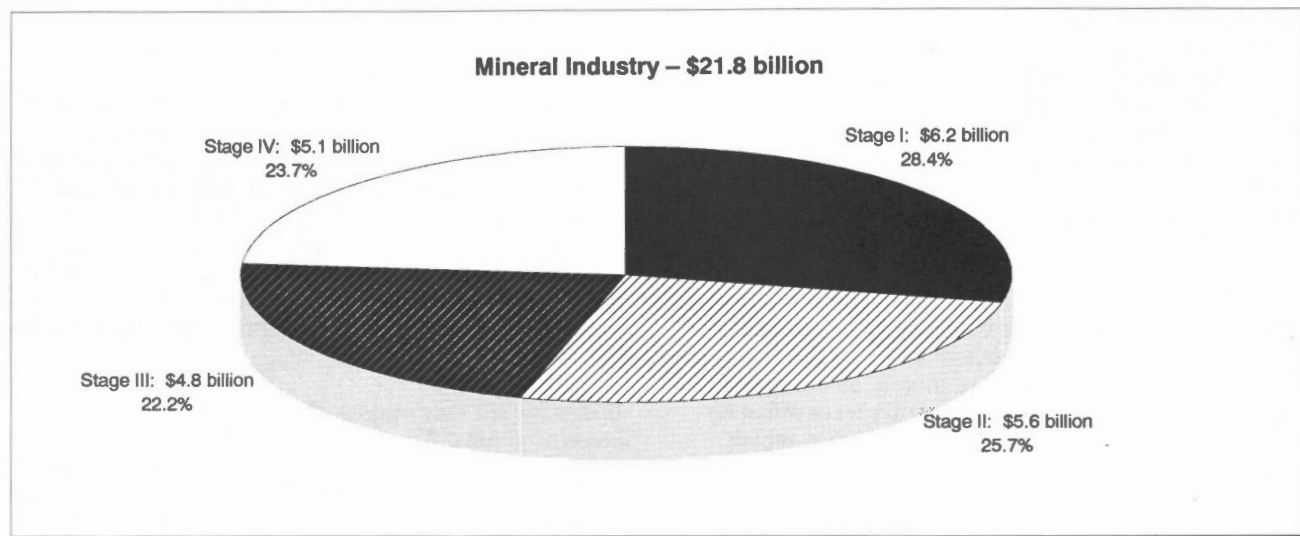
Including all four stages, the mineral industry accounted for 4.2% of total industry GDP in 1993, somewhat below its average share of 4.6% for the period 1981-92. The mineral industry's share of GDP declined by 14.2% between 1988 and 1993, with the decline taking place in the mining, semi-fabricating and fabricating stages. Within the mining sector (Stage I), the significant decreases which took place in iron mines, other metal mines, nonmetal mines and structural materials swamped the increase in GDP due to gold mines. The overall declines in Stages I, III and IV were largely the result of the recent economic downturn. The share of GDP attributed to Stage II remained fairly constant between 1988 and 1993 with weakness in the primary steel

Figure 2
Monthly Metal Price Index, January 1987 to December 1993
(Based on Current Dollars)



Source: NRCan using London Daily Metal Prices of copper, lead, zinc, nickel, silver and gold.

Figure 3
GDP at Factor Cost, 1993 (in 1986 dollars)



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

industry being offset by the strength in the smelting and refining industry. The mining sector (Stage I) has generally represented about 30% of mineral industry GDP. Across Canada, mining activities are an important part of the economic base in 115 communities and over 50%, by volume, of rail, lake and sea traffic is dedicated to moving minerals and metals from their sources through the various stages of the value-added chain to the end-user.

EMPLOYMENT

Total employment in the mineral industry continued the decline which began in 1989 when the number of jobs peaked at 422 000. Preliminary estimates for 1993 indicate that mineral industry employment was about 335 000, down 3.5% from 347 000 in 1992. All stages of the mineral industry experienced a decline in employment in 1993. This decline reflected the continued weak state of the Canadian economy and the consequent weakness in labour markets, particularly in the goods-producing industries. Overall employment in the goods-producing sector, which has been on a downward trend since 1989, fell to its lowest level since 1983.

However, it should be noted that productivity (as measured by real output, or GDP, per employee, usually referred to as labour productivity) improved in all four stages of the Canadian mineral industry in 1993. Particularly significant were increases of about 11% in each of Stages II and III. Over the past decade or so, productivity increases have been very notable in Stage I, where between 1982 and 1993 GDP per

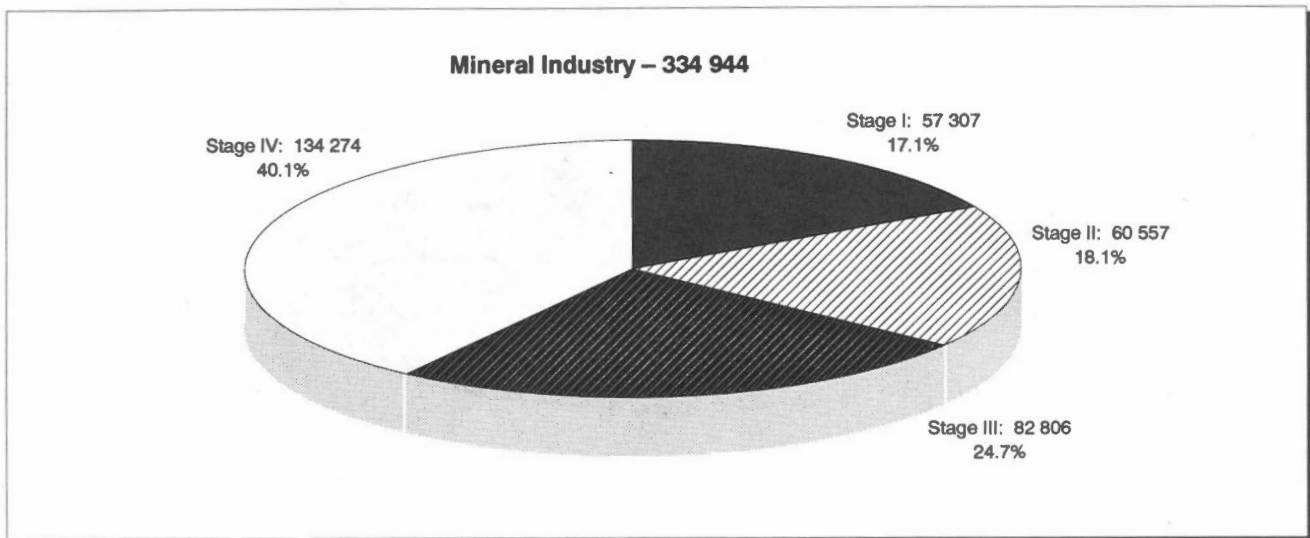
employee increased by about 144%, and in Stage II, where GDP per employee increased by about 132% over the same period. Productivity had been on a decline in Stages III and IV during the most recent recession, but started to pick up in 1992 and 1993. These increases in productivity stem not only from reductions in levels of employment over that time, but also from extensive improvements in mining methods and mining technologies as companies were forced to deal with two severe economic recessions at a time when international competition became more rigorous.³

The mineral industry employed 335 000 persons, or 2.4% of the national labour force, in 1993 compared to an average of 3.4% in the 1984-89 period. All four stages have shown declines in employment since 1989 with the largest absolute decline, of 31 000, occurring in the metal fabricating industry.

The total number of employees in Stage I (metal mining, nonmetal mining, quarrying and coal mining) was estimated at 57 000, down from 61 000 in 1992. In addition, there were approximately 7900 people employed in diamond drilling and other services incidental to mining operations. Employment in Stage II (smelting and refining and the primary steel industries) was estimated at 61 000, approximately 1000 less than in 1992.

Employment in Stages III and IV (semi-fabricating and fabricating mineral industries) fell from 224 000 in 1992 to 217 000 in 1993. Total employment in Stages I and II fell by 4.0% compared with 3.2% for Stages III and IV combined. Since 1989, the mining,

Figure 4
Employment, 1993



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

smelting and refining industries have reduced their workforce by 38 000 employees or 24.3%. In the same period, the semi-fabricating and fabricating industries have reduced their workforce by 49 000 employees or 18.6%.

INVESTMENT

Based on its annual survey of public and private investment, Statistics Canada reported that preliminary estimates of capital spending by the mineral industry on construction, machinery and equipment totalled \$3.0 billion in 1993, down from \$3.5 billion in 1992. The decrease in expenditure was attributable to a significant decline in spending by the smelting and refining industries.

Since the mid-1980s, the mining, smelting and refining industries have been responsible for almost 80% of capital expenditure by the mineral industry. In 1993, capital expenditure by the mining industry was \$1.5 billion, which was only two thirds of the average expenditure level in the 1986-92 period. Capital expenditure in the smelting and refining industry was \$0.7 billion, which was only two fifths of the expenditure levels of 1986-92. This reduction reflects a declining level of capital investment in new operations. For the mineral industry as a whole, capital expenditure in 1993 was 59% of the average spending in the previous seven years. Overall, capital spending by the mineral industry in 1993 represented 2.5% of total capital expenditures in the Canadian economy, down from 2.8% in 1992 and 4.6% in 1990.

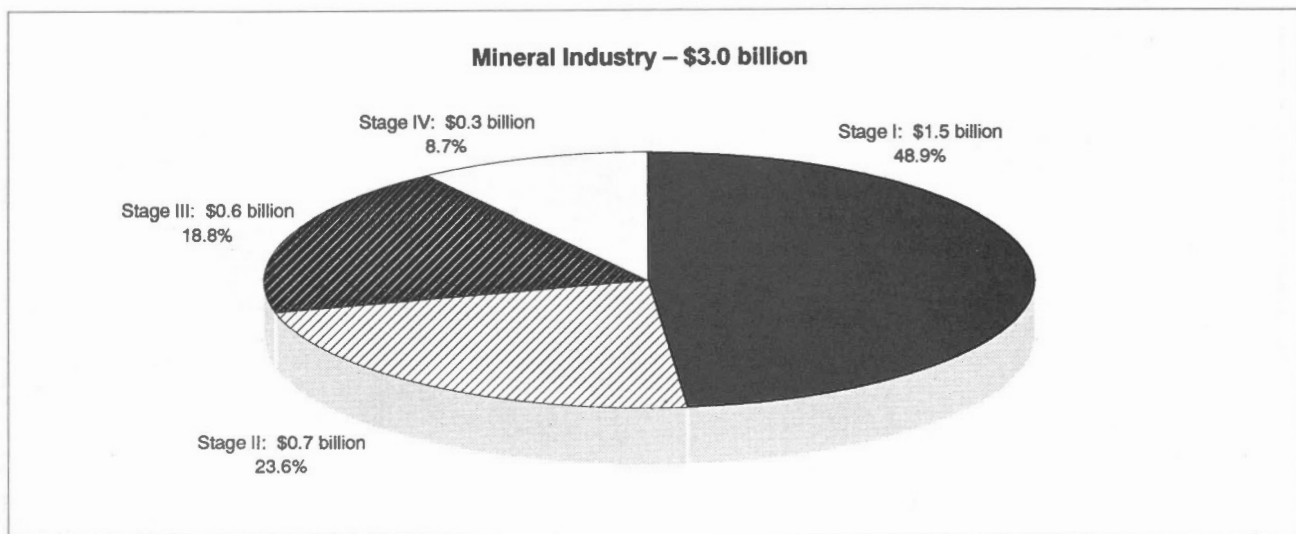
Repair expenditures were \$4.1 billion in 1993, down from \$4.2 billion in 1992 and 1991. Including these outlays, the combined spending for capital investment and repair was \$7.1 billion in 1993 compared to \$7.7 billion in 1992 and \$10.9 billion in 1990. The level of spending by the mineral industry in 1993 represented 4.3% of total capital and repair expenditures by all sectors of the Canadian economy, down from 4.7% in 1992 and 6.2% in 1990.

TRADE

The total value of exports of non-fuel minerals, mineral products, uranium and coal increased by 4.9% in 1993 to \$26.1 billion, representing the products of all four stages of the mineral industry.⁴ This included crude minerals, smelted and refined products, semi-fabricated and fabricated forms, as well as waste and scrap for recycling. Mineral and mineral product exports, including coal and uranium, continued to account for a significant share of total domestic exports with 14.8% of the total in 1993, compared to 16.2% in 1992 and 19.2% in 1989.

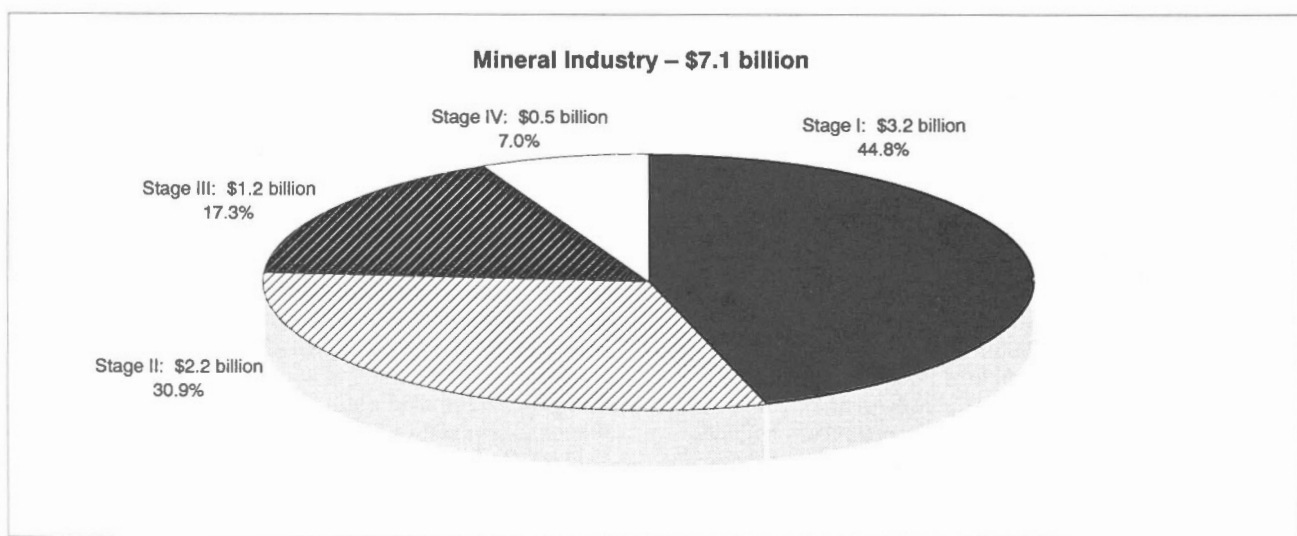
The proportion and amount of exports to the United States increased in 1993, compared to 1992, and the United States continued to be Canada's major non-fuel mineral, mineral products and coal export market. In 1993, mineral and mineral product exports valued at \$17.2 billion went to the United States, representing 65.7% of such exports, while 11.2% went to the European Union and 8.6% went to Japan.

Figure 5
Capital Expenditures, 1993



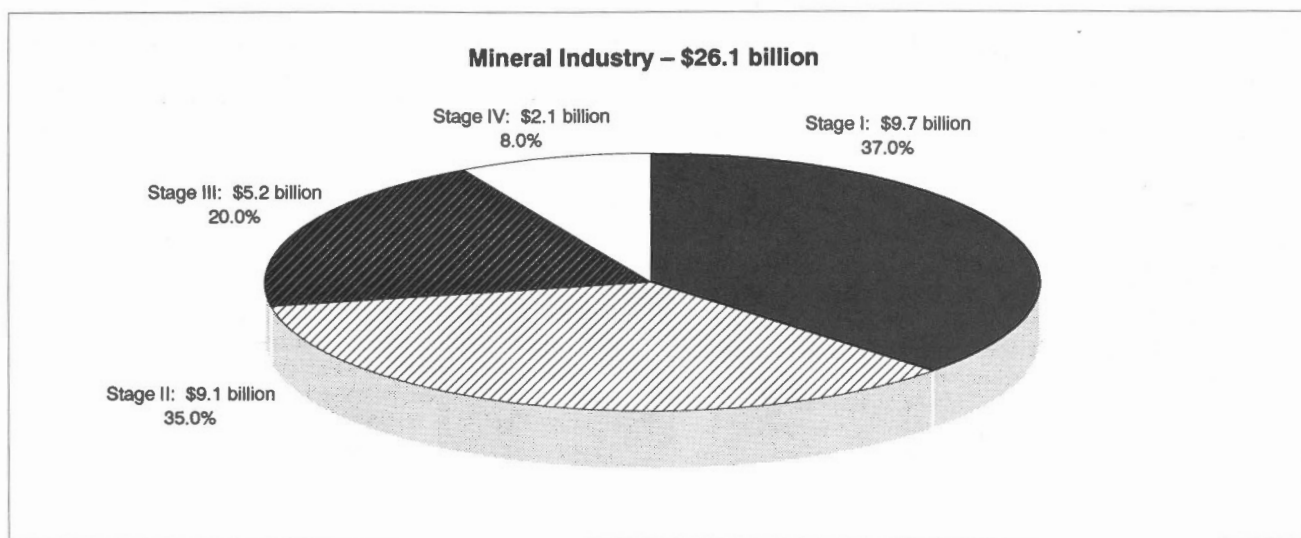
Note: Numbers may not add to totals due to rounding.

Figure 6
Capital and Repair Expenditures, 1993



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

Figure 7
Exports, 1993



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

Imports of non-fuel minerals, mineral products, uranium and coal were valued at \$16.2 billion in 1993, up from the previous year's level of \$13.9 billion. Some \$11.2 billion or 69.2% of imports in 1993 came from the United States, 10.4% from the European Union, and 2.6% from Japan.

Overall, the Canadian mineral industry contributed a trade surplus of \$9.9 billion to Canada's merchandise balance of trade in 1993, a decrease of \$1.1 billion from the 1992 mineral trade surplus. Following the general pattern of recent years, Stages I and II recorded a trade surplus (\$12.0 billion in 1993) while Stages III and IV recorded a trade deficit (-\$2.1 billion). The amount of the combined Stages III and IV deficit was approximately twice the average deficit level of the five previous years.

SUMMARY

Although the mineral industry turned in a mixed performance in terms of its relative importance in the context of the overall economy in 1993 when compared to 1992, the sector continues to make an important contribution to the Canadian economy. The industry accounted for 4.2% of GDP (the same as in 1992), 2.4% of national employment (compared to 2.5% in 1992), and 14.8% of Canadian exports (down from 16.2% in 1992).

With respect to capital investment and repair spending, the mineral industry continued to decline in its share of the Canadian total, falling to 4.3% in 1993 from 4.7% in 1992 and down from an average of 6.3% during the 1985-90 period. Nevertheless, expenditures by the mineral industry on capital investment and repair continue to represent major spending within the Canadian economy.

The charts at the end of this article (Figures 8-13) provide an historical overview of the mineral industry's performance over the past seven years in terms of the value of shipments, GDP, capital investment and repair expenditures, employment and exports.

Note: The material in this article supplements and updates the information contained in an earlier article, "General Review of the Canadian Mineral Industry in 1993," which appeared in the Spring 1994 issue of the Mineral Industry Quarterly Report. Information in this review was current as of July 15, 1994.

NOTES

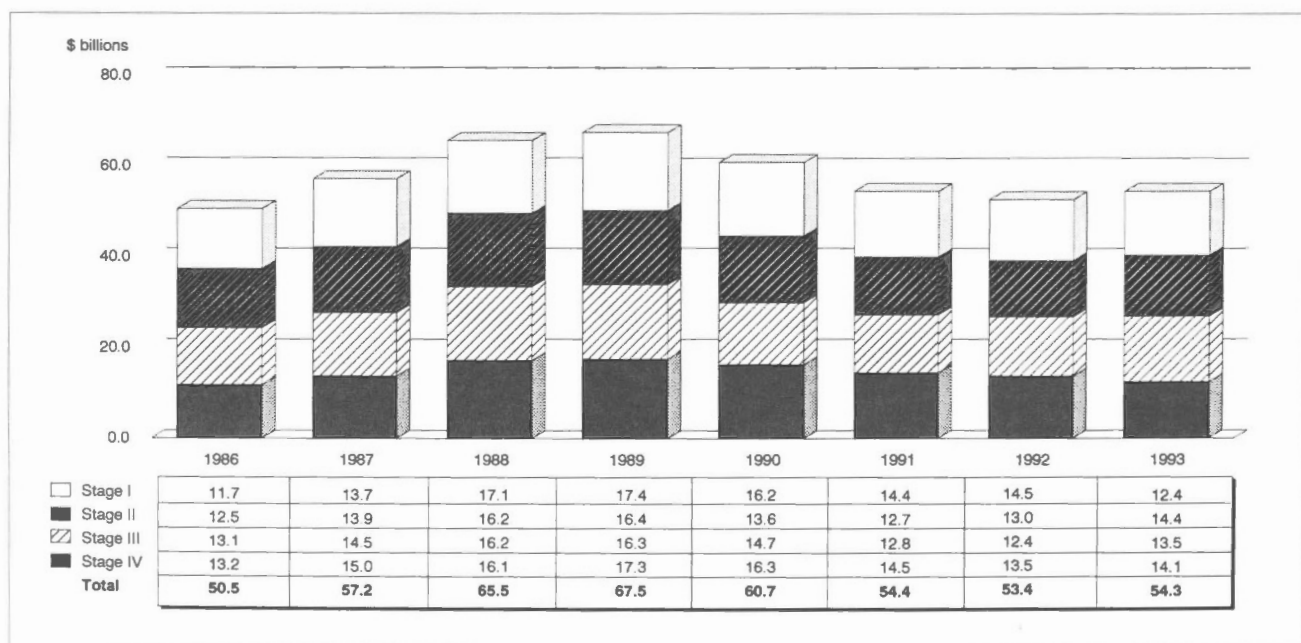
¹ Gross Domestic Product by Industry at Factor Cost represents the economic output of the various industries of the economy, i.e., it is an industry-based measure of GDP. It is a value-added concept in that it measures only the net output of an industry, namely, the value produced at a given stage of production after subtracting the costs of intermediate goods and services. Valuation at factor cost represents the costs of the factors of production (land, labour and capital) that are used in producing the output. The valuation is expressed in terms of the expense of the producer, rather than of the purchaser. It excludes all indirect taxes, such as sales tax, excise tax, customs duties and property taxes. Total GDP at factor cost, therefore, equals the sum of the values added, i.e., the net contributions made by all industries in the economy. Gross Domestic Product can also be measured at market prices. This is an expenditure-based measure of GDP whereby valuation at market prices is expressed in terms of the prices actually paid by the purchaser. It includes all indirect taxes, such as sales tax, excise tax, customs duties and property taxes; and also reflects the impact of subsidy payments. GDP at Market Prices is usually simply referred to as "GDP." In principle, the difference between "GDP by Industry at Factor Cost" and "GDP at Market Prices" (or simply GDP) is the component known as net indirect taxes (i.e., indirect taxes less subsidies).

² In 1990, Statistics Canada converted its constant price GDP series to a new base year using 1986 prices. The previous base year had been 1981. This change continued the policy of updating the time base from time to time in order to reflect more recent price structures. Constant price GDP estimates provide the necessary data to measure real economic growth from one period to another. By using the prices from a particular base year (say 1986 prices), the effect due to price changes is removed.

³ Natural Resources Canada, *The Canadian Minerals and Metals Industry: Aspects of Competitiveness*, 1994.

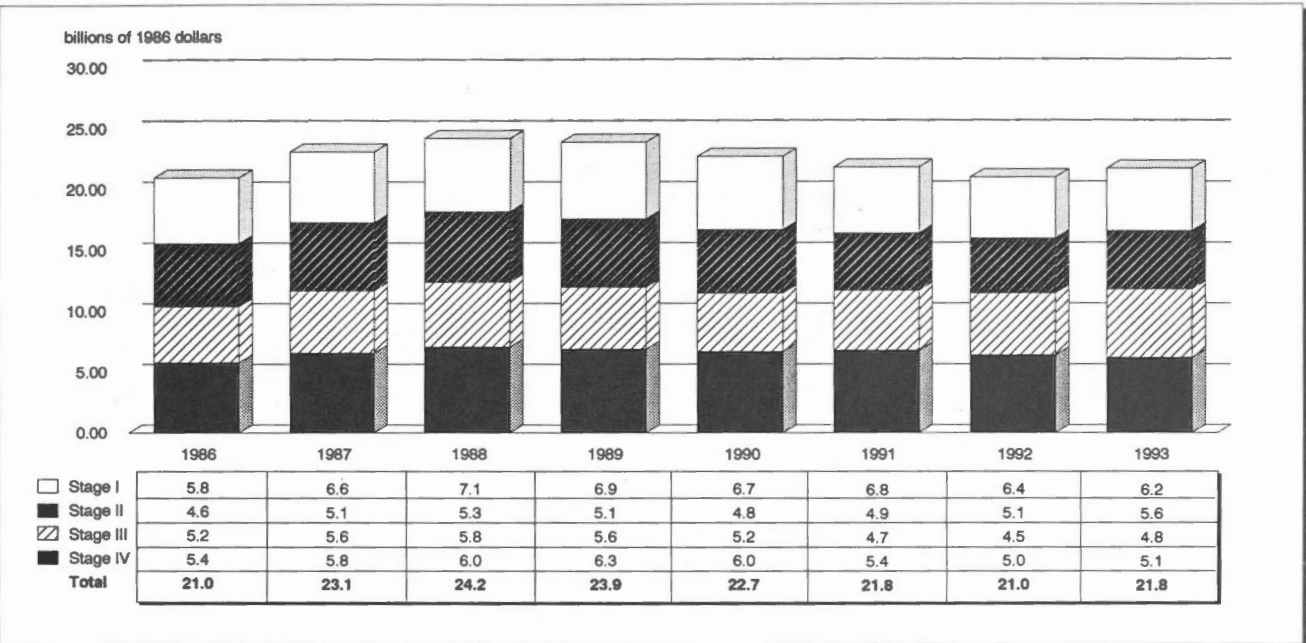
⁴ As of January 1, 1988, Canadian external trade statistics have been classified and reported by Statistics Canada according to a new international commodity coding system referred to as the "H.S." or "Harmonized System" (Harmonized Commodity Description and Coding System). Starting with the year 1988, total exports and imports referred to in this article are based on data as reported according to H.S. chapter summaries, i.e., those classes or commodity chapters that represent the mineral and metal product groups. Due to the implementation of the new H.S. coding system, as well as other changes in data collection and reporting procedures at Statistics Canada, the year-to-year historical data may not be directly comparable. The breakout of trade data by stage is based on a preliminary approximation by the Modelling & Mining Statistics Division of the Mining Sector at the Department of Natural Resources Canada.

Figure 8
Mineral Industry, Value of Shipments, 1986-93



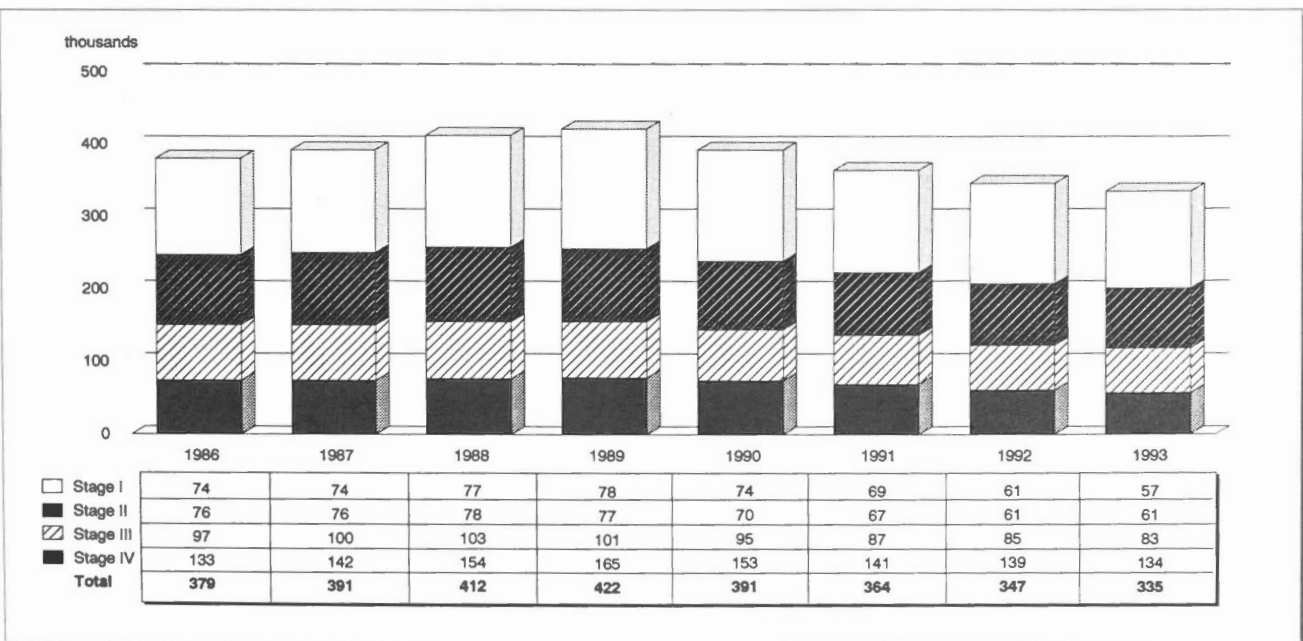
Note: Numbers may not add to totals due to rounding.

Figure 9
Mineral Industry GDP, 1986-93
 Factor Cost at 1986 Prices



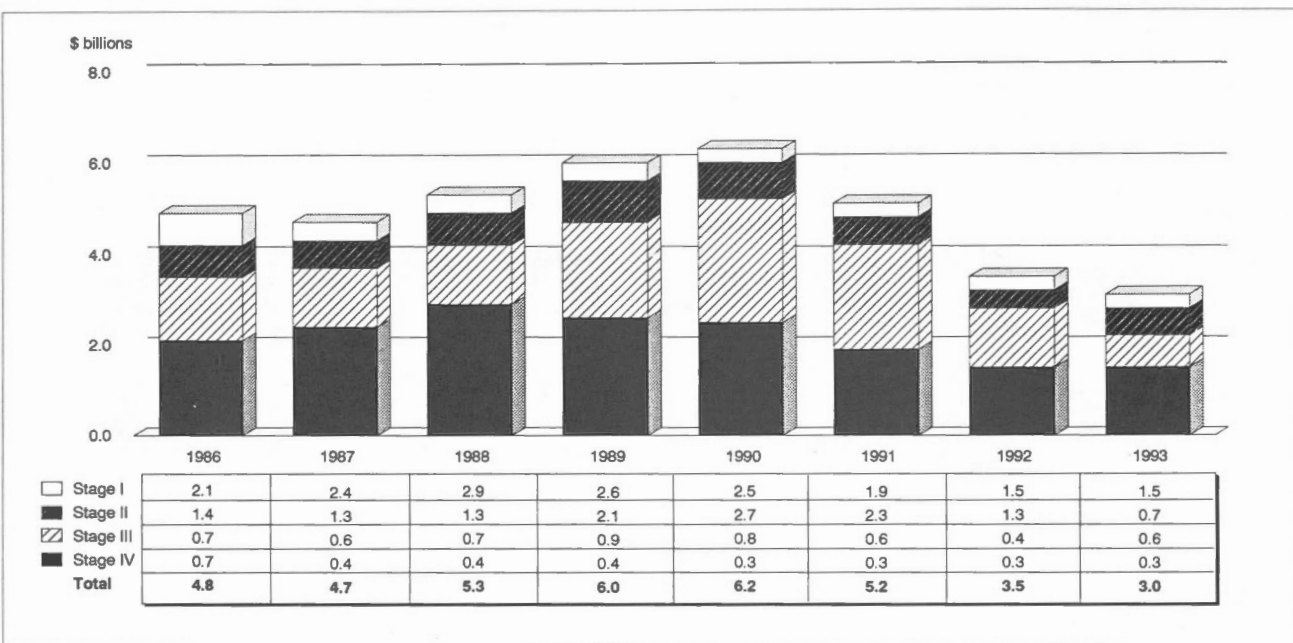
Note: Numbers may not add to totals due to rounding.

Figure 10
Mineral Industry Employment, 1986-93



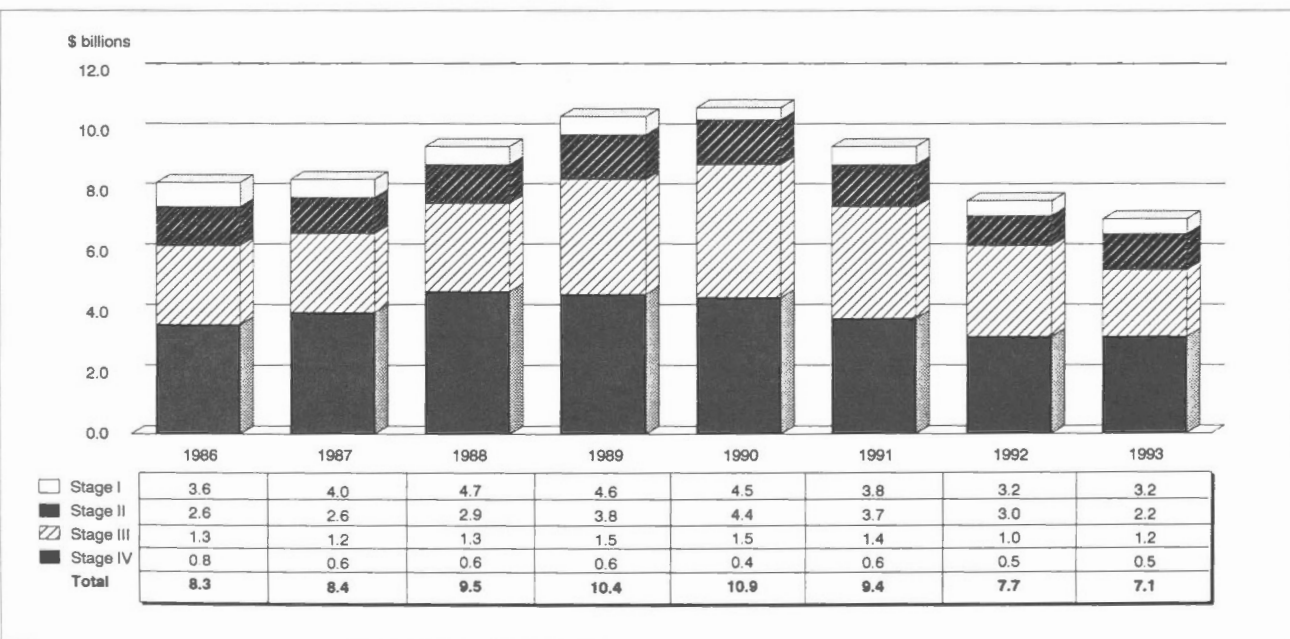
Note: Numbers may not add to totals due to rounding.

Figure 11
Mineral Industry, Capital Expenditures, 1986-93



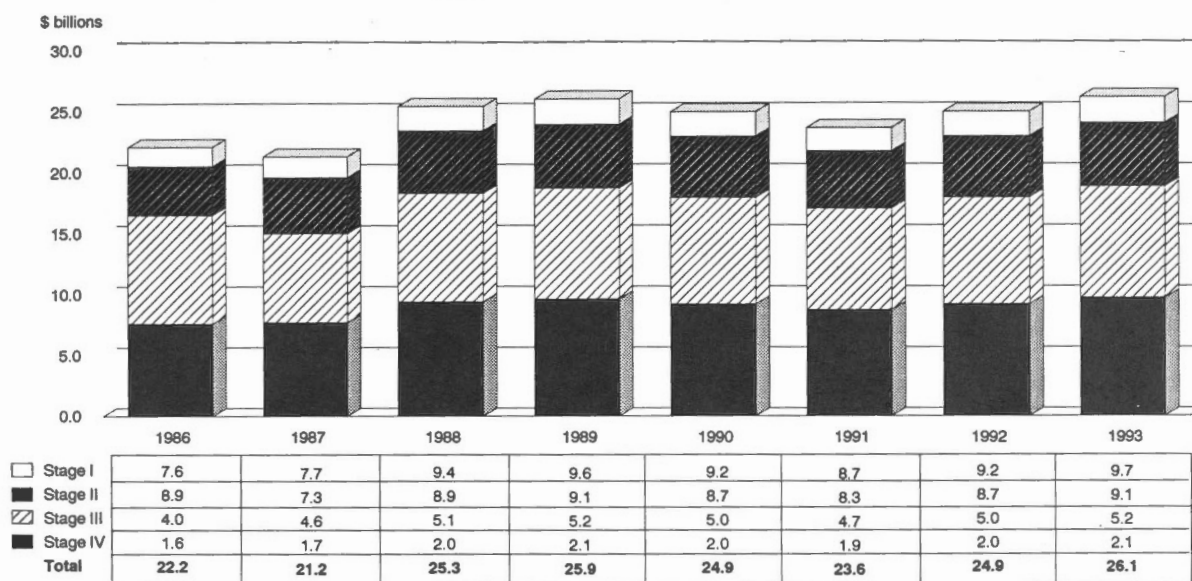
Note: Numbers may not add to totals due to rounding.

Figure 12
Mineral Industry, Capital and Repair Expenditures, 1986-93



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

Figure 13
Mineral Industry Exports, 1986-93



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

Actual and Expected Canadian Mine Openings, Re-Openings, Expansions, Closures and Suspensions in 1994

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OVERVIEW

During 1994, at least 12 mines will open or re-open and 8 will close or suspend operations. This will result in a net increase in the number of mine openings over mine closings for the first time since 1989 (Tables 1 and 2). Of the openings/re-openings, 3 are new mines (1 precious-metal, 1 base-metal and 1 uranium) and 9 are re-openings (4 precious-metal and 5 base-metal). Of the closures/suspensions, 7 are closures (5 precious-metal and 2 base-metal) and 1 is a suspension (base-metal). Should company decisions remain firm, mine opening and closing events in Canada in 1994 will be dominated by re-openings and by the closure of gold and base-metal mines.

The most important new mines in 1994 are the Louvicourt copper-zinc-gold mine in Quebec and the Eagle Point uranium mine in Saskatchewan. The most important re-openings are the Heath Steele zinc-copper-lead-silver mine in New Brunswick; the Macassa gold mine and the Garson nickel-copper mine in Ontario; the Afton-Ajax, Gibraltar and Similco copper mines in British Columbia; and the Colomac gold mine in the Northwest Territories. The Lockerby nickel-copper mine in Ontario was the only mine that suspended operations in 1994. The Stall Lake copper-zinc mine and the Chisel Lake zinc-copper mine in Manitoba and the Equity silver-gold-copper mine and the Premier gold mine in British Columbia are the significant closures scheduled for this year.

All 7 mine closures in 1994 were due to ore depletion. The decision to suspend operations at the Lockerby mine in June was made because of high costs and low present and expected metal prices at that time. Falconbridge Limited, owner of the mine, plans to use the shut-down period to study the cost of deepening the mine shaft to reach high-grade ore at depth.

REGIONAL PERSPECTIVE

With no mine closings and the re-opening of Heath Steele in northern New Brunswick and Colomac in the Yellowknife area of the Northwest Territories, and the opening of Eagle Point in northern Saskatchewan, these three regions should gain both in mine production capacity and in employment.

With three openings (Louvicourt, Eastmain and Donaldald) and two closures (Dumont and Ferderber), all in northern and northwestern Quebec, the province of Quebec will likely incur net gains from mine openings over closings in 1994. Gains from the opening of Louvicourt alone will offset the losses from the two mines that were closed, both in the value of annual mine production and in terms of employment. In the two years 1991 and 1992, Quebec suffered considerable net losses both in mine production capacity and in employment. In 1994, however, the province can expect net gains of some 3850 tonnes (t) of daily ore production capacity and nearly 480 new mining jobs.

In Ontario, although the suspension of operations at Lockerby and the closure of Dona Lake in northern and northwestern Ontario, respectively, have offset much of the positive effects of the re-opening of Macassa and Garson, both located in northern Ontario, there is a positive overall impact. This is mainly because the loss of production from the shut-down of Lockerby is expected to be temporary. And, with all 90 affected workers being absorbed by mine-site maintenance at Lockerby and by Falconbridge's other operations in the Sudbury area, there will be a net gain of nearly 220 mining jobs in Ontario in 1994. This compares favourably with the annual net job losses incurred by mining in the province since 1990. In addition, because of significant expansions that are taking place at the Dome and Detour Lake gold mines in northern Ontario, 1994 could prove to be a turning point for mining in Ontario after several years of negative net impact from mine closings.

Although two mines (Equity Silver and Premier in mid-western British Columbia) are expected to close permanently in 1994, four mines (Table Mountain, Similco, Afton-Ajax, and Gibraltar) are scheduled to open or re-open in the year, giving that province a

needed boost in metal mining after four consecutive years of decline in mine openings. Net gains in 1994 are expected to be 64 500 t/d of ore capacity and 650 mining jobs.

With the closure of the Stall Lake and Chisel Lake base-metal mines in the Snow Lake area and without any openings in the foreseeable future, Manitoba is the only province in Canada that is expected to incur a net loss in mine production capacity and employment from mine openings and closings in 1994.

IMPACT

In 1994, new and re-opened mines are expected to add some 87 000 t to Canada's daily ore production capacity as well as 2145 jobs. Mine closures and suspensions are expected to remove nearly 8800 t of daily capacity and 420 jobs. This will result in a net gain in Canada of more than 78 000 t of daily capacity and 1725 jobs. Job losses from mine closings in 1994 are also expected to be the lowest since 1989. In 1994, 6% of production capacity and 27% of job gains will come from new mines. The reactivation of former operations will account for 94% of new mine capacity and 73% of new employment. Base-metal mines will account for 87% of the gains in capacity and 76% of the gains in employment in 1994. On the other hand, base-metal mines will also contribute 45% of the capacity losses and 28% of the employment losses from mine closings in the year.

MINE AND MILL EXPANSIONS

Several significant expansion projects are taking place in 1994. The most important ones are those at the Dome and Detour Lake gold mines in northern Ontario, and at the Casa Berardi Est and Ouest gold mines in northwestern Quebec. Placer Dome Inc., owner of both Dome and Detour Lake, is spending \$117 million to expand the open-pit operation and the mill at Dome. Construction began in April 1994 and is expected to be completed in March 1995. Upon completion, production at Dome, from both the open-pit and underground operations, is expected to more than double to 9100 t/d from the current 3800 t/d, producing some 315 000 oz/y of gold. In addition to 350 construction jobs, 120 permanent jobs should be created at the open-pit. The \$10 million expansion program at Detour Lake will, when completed at year-end 1994, extend the current mine life of five years to the year 2003 with an annual production of 168 000 oz of gold.

A \$30 million deep development program was approved by joint-venture partners TVX Gold Inc. and Golden Knight Resources Inc. for the Casa Berardi Est and Ouest mines at La Sarre, Quebec.

When completed in 1996, production at the two mines is due to increase to 800 000 t/y from the current rate of 560 000 t/y, allowing for an increase in gold production to 140 000 oz/y of gold from the planned 1994 level of 100 000 oz.

At the BT gold mine in northern Manitoba, Granduc Mining Ltd. plans to increase the mine's production capacity to 1600 t/d by the end of 1994 from the current 1100 t/d, with some prospect of an increase in employment as well. With two consecutive expansions at the Quinsam coal mine on Vancouver Island successfully completed in the past two years, Hillsborough Resources Limited is making its final drive to achieving its ultimate goal of producing 1 Mt/y of thermal coal by the end of 1994.

OUTLOOK

In view of the stronger metal prices experienced in the first half of the year, 1994 is expected to finish well, with net positive impacts on production and employment from more mine openings than closings. Should metal prices remain at current levels for copper, nickel, lead and gold, more new mines and re-openings than closings will occur in 1995. Many advanced projects, already in the final stages of development, are poised to begin production in 1995. Although old mines will continue to close because of ore depletion, new mines will be developed for production and re-openings will occur at higher rates than closings as long as favourable prices can be obtained on world markets.

Note: Information in this review was current as of July 31, 1994.

TABLE 1. ACTUAL AND EXPECTED MINE OPENINGS AND CLOSINGS IN CANADA, 1994

Province/ Territory	New Mines			Mines Re-Opened			Mines Suspended			Mines Closed		
	Precious Metals	Base Metals	Other Minerals	Precious Metals	Base Metals	Other Minerals	Precious Metals	Base Metals	Other Minerals	Precious Metals	Base Metals	Other Minerals
New Brunswick	-	-	-	-	1	-	-	-	-	-	-	-
Quebec	1	1	-	1	-	-	-	-	-	2	-	-
Ontario	-	-	-	1	1	-	-	1	-	1	-	-
Manitoba	-	-	-	-	-	-	-	-	-	-	2	-
Saskatchewan	-	-	1	-	-	-	-	-	-	-	-	-
British Columbia	-	-	-	1	3	-	-	-	-	2	-	-
Northwest Territories	-	-	-	1	-	-	-	-	-	-	-	-
Canada, total by commodity group	1	1	1	4	5	-	-	1	-	5	2	-
Total, Canada		3			9			1			7	

Source: Natural Resources Canada.

- Nil.

TABLE 2. CANADIAN MINE OPENINGS, RE-OPENINGS, EXPANSIONS, SUSPENSIONS, AND CLOSURES IN 1994

Mining Operation	Location	Province	Ore Capacity (tonnes/day)	Employment ¹	Date of Opening, Re-Opening, Expansion, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
NEW OPERATIONS									
Precious Metals									
Eastmain	Chibougamau	Que.	500	76	End of September	U/G	Gold	MSV Resources Inc.	The mine is situated 310 km northeast of Chibougamau and is a fly-in, fly-out operation. MSV plans to mine 80 000 t of ore to produce 24 000 oz of gold in 1994, and 160 000 t of ore to produce some 50 000 oz of gold in 1995. Ore will be trucked to the company's Copper Rand mill in Chibougamau. As of December 1993, ore reserves (proven and probable) at Eastmain were 862 000 t grading 12 g/t gold. The capital cost of bringing the mine into production is expected to be more than \$11 million.
Base Metals									
Louvicourt	Val-d'Or	Que.	4 000	500	July	U/G	Copper, zinc, gold	Aur Resources Inc., Novicourt Inc. and Teck Corporation	Discovered in 1989, ore reserves stand at 15.7 million t grading 3.4% copper, 2.2% zinc, 31 g/t silver and 0.9 g/t gold. Expected mine life is about 12 years. Based solely on the reserves identified to date, Louvicourt is considered to be the tenth largest deposit of its type ever discovered in Canada. Capital cost is about \$289 million instead of the projected \$319 million. The mine is expected to reach commercial production in October 1994.
Other Minerals									
Eagle Point	Rabbit Lake	Sask.	800	See "Remark"	July 1	U/G	Uranium	Cameco Corporation and Uranerz Exploration and Mining Limited	Ore reserves stand at 787 000 t grading 1.65% U ₃ O ₈ . Planned production in 1994 is about 114 000 t of ore to yield some 1900 t U ₃ O ₈ . Ore will be processed at the Rabbit Lake mill. No new employment is being created because the company's existing workforce at the Rabbit Lake operation is being shared.
RE-OPENINGS									
Precious Metals									
Donalda	Rouyn-Noranda	Que.	350	50	March 25	U/G	Gold	Orco Resources Inc., Metall Mining Corporation and Thunderwood Resources Inc.	Ore is being mined from the No. 1 vein and milled at the nearby Norbec mill. The mine is expected to produce 20 000 oz of gold in 1994 at a projected operating cost of US\$240/oz. The mine operated between 1948 and 1955. Current ore reserves stand at about 661 300 t grading 8.85 g/t gold. The No. 2 vein, discovered in 1954, is yet to be developed. The mine is owned 65% by Metall and 35% by Thunderwood. Orco is the operator.

Macassa	Kirkland Lake	Ont.	450	123	May	U/G	Gold	Lac Minerals Ltd.	Mine closed in late November 1993 due to rock burst. Production resumed at an initial rate of 150 short tons per day, rising to 350 st/d in October.
Colomac	Indin Lake	N.W.T.	9 000	234	June	O/P	Gold	Royal Oak Mines Inc.	The mine produced between August 1990 and July 1991. Current ore reserves stand at 16 million t grading 0.055 oz/t gold. The mine is expected to produce 70 000 to 80 000 oz/t gold in 1994 and 170 000 oz/t gold when full production rate is achieved in 1995. Capital cost of re-opening the mine is about \$5 million. An additional \$13 million is committed for equipment rental. Operating costs are targeted at the US\$275/oz level.
Table Mountain	Cassiar	B.C.	360	25	May	U/G	Gold	Cusac Industries Ltd.	The mine is part of the Erickson gold mine which operated between 1979 and 1988. Mining resumed in March 1994 with milling starting in April. The mine is expected to produce at least 23 000 oz of gold from the West Bain Vein at a cost of less than US\$200/oz in 1994. Ore reserves at the West Bain Vein and the Bonanza Vein are about 104 000 st grading 0.769 oz/st gold. Production is expected to increase substantially as a result of the discovery of the higher-grade West Bain Vein Extension and the possible continuation between the West Bain and Bonanza veins.
Base Metals									
Garson	Sudbury	Ont.	500	175*	March	O/P & U/G	Nickel, copper	Inco Ltd.	The mine was first opened in 1907. Operation was suspended in 1986. Production is currently on a limited scale while development work towards accessing the main orebody continues. Full production at a rate of 2000 st/d is planned for 1995.
Heath Steele	Newcastle	N.B.	3 500	234	October 13	U/G	Zinc, copper, lead, silver	Brunswick Mining and Smelting Corporation Ltd. and Noranda Minerals Inc.	Mining suspended in July 1993 due to low metal prices. Ore reserves stand at 3.6 million t grading 7.1% zinc, 2.0% lead, 0.9% copper and 73 g/t silver. Employment will increase gradually to 234. Full production is planned for November 1, 1994.
Similco	Princeton	B.C.	22 680	300	August	O/P	Copper	Princeton Mining Corporation	Mining suspended in November 1993 because of low copper prices. The decision to resume production was based on the strengthened price of copper and successful negotiations with the company's main customer, Mitsubishi Materials, which is providing a US\$3.6 million advance payment for start-up costs. Ore reserves as of January 1, 1993, were 103.9 million t averaging 0.402% copper.
Afton-Ajax	Kamloops	B.C.	8 500	150	End of September	O/P	Copper, gold	Teck Corporation	Mining suspended in August 1991 because of low metal prices. Current ore reserves stand at 14.1 million t averaging 0.46% copper.

TABLE 2 (cont'd)

Mining Operation	Location	Province	Ore Capacity (tonnes/day)	Employment ¹	Date of Opening, Re-Opening, Expansion, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
Base Metals (cont'd)									
Gibraltar	McLeese Lake	B.C.	36 280	277	October	O/P	Copper	Gibraltar Mines Ltd.	Mining suspended in December 1993 because of low metal prices. Ore reserves as of January 1, 1993, were 147.5 million t averaging 0.301% copper and 0.084% molybdenum.
EXPANSIONS									
Precious Metals									
Dome	Timmins	Ont.	4 000	353	1994-95	O/P & U/G	Gold	Placer Dome Inc.	Recent installation of a computer expert system has resulted in an increase in the mining and ore processing rate from 3000 t/d to 3800 t/d. Expansion of the open-pit operation and processing plant will enable the combined underground and open-pit operations to produce 315 000 oz/y gold. With mineable ore reserves estimated at 22.9 million t grading 2.33 g/t gold, mine life is estimated to be about 11 years. Construction began in April 1994. The \$117 million expansion project is expected to be completed in March 1995, by which time Dome's production rate will be increased to 9100 t/d from 3800 t/d and the cash production cost will be reduced to US\$210/oz from US\$227/oz. During construction, 350 jobs will be created. The expansion will result in the creation of 120 permanent jobs at the open pit.
Detour Lake	Detour Lake	Ont.	2 800	270	1994	U/G	Gold	Placer Dome Inc.	A \$10 million expansion program will take place in two phases. Phase 1 will extend the current mine life through to the year 2000, with production from a combined reserve-resource of 7.3 million t grading 5.1 g/t gold. Phase 2 will extend the mine life a further three years. Annual production at Detour is expected to be 168 000 oz while the cash production cost will be reduced to US\$240/oz from US\$250/oz.
Casa Berardi Est and Ouest	La Sarre	Que.	1 800	232	1994-96	U/G	Gold	TVX Gold Inc. and Golden Knight Resources Inc.	A \$30 million deep development plan by the partners will allow the expansion in ore production at the two mines to 800 000 t/y from the current 560 000 t/y, increasing gold production to 140 000 oz/y from the current plan of 100 000 oz for 1994. The companies intend to keep the cash production cost competitive as well.
BT (Keystone)	Lynn Lake	Man.	1 100	60	1994	O/P	Gold	Granduc Mining Ltd. and Black Hawk Mining Inc.	The mine is increasing its production capacity to 1600 t/d in 1994. Employment at the mine is likely to increase to about 80 at the expanded operating capacity.

Other Minerals

Quinsam	Campbell River	B.C.	1 650	104	1992-94	O/P & U/G	Coal	Hillsborough Resources Limited	The company increased coal production to 550 000 t in 1993 from 470 000 t in 1992 and plans a further increase to 1 million t in 1994. The mine produced 250 000 t of thermal coal in 1991.
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SUSPENSIONS**Base Metals**

Lockerby	Sudbury	Ont.	1 500	90*	June 1	U/G	Nickel, copper	Falconbridge Limited	Mining was suspended because of high operating costs and low nickel prices prior to the decision. Production began in 1977. The mine accounted for about 9% of Falconbridge's nickel output annually. The company plans to use the shut-down period to study the cost of deepening the shaft to reach high-grade ore at depth. About 90 miners were affected, but they have been reassigned to other positions in the Sudbury area.
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CLOSURES**Precious Metals**

Equity Silver	Houston	B.C.	1 000	55	January 23	U/G	Silver, gold, copper	Placer Dome Inc.	Mine closed due to ore depletion. About 25 workers were retained to carry out closure and reclamation work through 1994. The mine began production in 1980 as an open-pit operation. The company posted a bond totalling \$37.5 million with the provincial government to cover reclamation costs.
Ferderber	Val-d'Or	Que.	550	158	March	U/G	Gold	Aur Resources Inc. and Belmoral Mines Ltd.	Mine closed due to ore depletion. Mine began production in 1981.
Dumont	Val-d'Or	Que.	450	(included in Ferderber)	March	U/G	Gold	Aur Resources Inc. and Belmoral Mines Ltd.	Mine closed due to ore depletion. Mine began production in 1981.
Dona Lake	Pickle Lake	Ont.	560	80	September	U/G	Gold	Ross-Finlay Ltd. and Société minière Ecuror	Mine to close due to ore depletion. Company acquired the mine from Placer Dome Inc. in mid-1993. Production first began in June 1989.
Premier	Smithers	B.C.	2 300	45	December	U/G	Gold	Westmin Resources Limited, Pioneer Metals Corporation and Canacord Resources Inc.	Mine to close due to ore depletion. Production began in May 1989.

Base Metals

Stall Lake	Snow Lake	Man.	1 100	114	February	U/G	Copper, zinc, gold, silver	Hudson Bay Mining and Smelting Co., Limited	Mine closed due to depletion of ore reserves. Production began in 1964.
Chisel Lake	Snow Lake	Man.	1 300	15	March	O/P	Zinc, copper, gold, silver	Hudson Bay Mining and Smelting Co., Limited	Mine closed due to depletion of open-pit ore reserves. Production began in January 1989.

Source: Natural Resources Canada, based on company reports.

O/P Open-pit; U/G Underground.

* Estimated; oz Troy ounce; st Short ton; t tonne.

1 Employment refers to workers on the company's payroll and to contract workers at an operation, or at an operation prior to its closure.

Notes: A mine that closed and re-opened in the same year is shown under both categories. Information in this table was current as of July 31, 1994.

New Technologies in the Production of Primary Iron and Their Impact on Iron Ore and Metallurgical Coal Use

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INTRODUCTION

Iron and steel production is considered by many to be a "smoke-stack" industry, an industry in which there is little growth and little technological change. This could not be further from the truth. The rate of technological change has been very high for the past 10 years, and is likely to remain high for the next 10 to 15 years. The rapid growth of electric steel production and the need to improve product quality, productivity and competitiveness drove the changes that occurred in the mid-1980s to early 1990s. Environmental considerations will be important in the changes that will occur to the end of the century and beyond. For example, the coke ovens of the world are near the end of their economic life, and are unlikely to be replaced because of the very high capital costs involved, costs which are increased by the requirements of environmental protection regulations.

This article attempts to summarize what these new technologies are and, in the context of the history of the North American steel industry, to examine their likely impact on demand for iron ore and metallurgical coal.

Vital Statistics – Canadian Industry

The Canadian primary steel industry is world-class in terms of the quality of the steel that it produces and its cost of production. It is also very important to the Canadian economy, adding over \$2.5 billion to the national Gross Domestic Product and employing close to 35 000 persons directly. Many more are indirectly employed in related industries such as iron ore mining.

The industry is composed of two distinct segments, each an industry in its own right. These segments are the integrated mills that begin the steel-making process with iron ore, and the electric furnace-based industry that is dependent on ferrous scrap as raw material. About 30% of the steel made in Canada is

produced in electric furnaces. The balance is from the integrated producers.

Ferrous scrap is a major raw material for the steel industry, as important as iron ore or coke. The electric steel-makers are virtually dependent on scrap. Scrap is also an important feedstock to the integrated industry. About 30% of the iron units (blast furnace iron, ferrous scrap or direct reduced iron (DRI)) charged to the basic oxygen furnace (BOF) is in the form of scrap. For the entire industry, over 50% of the steel produced comes from recycled iron and steel.

The History of Technological Change in North America

Canada

In the context of the world steel industry, the Canadian industry is quite young. It became a significant industry during World War II, with most of its growth occurring in the post-war years. In the 1950s and early 1960s, industry members were mostly integrated primary producers. The industry planned its growth to match the needs of the domestic market, thus achieving profitable, or "high," levels of capacity utilization. Since the industry was not export-oriented, it added capacity only when demand was greater than industry capacity, even at the bottom of the economic cycle. In periods of high demand, at the top of the economic cycle, imports covered the shortfall.

The Canadian investment climate in the 1950s and 1960s encouraged capital investment. There were high expectations and tax benefits in the form of favourable depreciation rates and mineral resource depletion allowances. Companies undertook aggressive capital expenditure programs that resulted in modern facilities with state-of-the-art equipment. The Canadian industry thus achieved higher productivity levels than many American companies. In the United States, excess capacity and a less favourable tax regime were factors which inhibited investment decisions. Canadian companies enjoyed this productivity advantage until the late 1980s when the U.S. industry began a massive restructuring. The magnitude of this restructuring is illustrated by the fact that employment in the U.S. steel industry fell from 531 000 in 1970 to 399 000 in 1980, and even further to 164 000 in 1990. Many U.S. companies now (in 1994) enjoy equal, if not greater, productivity than Canadian producers.

In Canada, the arrival of the electric furnace steel producer, or "mini mill," in the early 1970s effectively ended the careful control of growth by the steel industry. At this time, the oil scare and rapidly increasing oil prices resulted in the downsizing of automobiles, the producers of which are an important market for the steel industry. To complicate the situation further, low-priced imported steel captured a significant percentage of the Canadian market. Capacity soon exceeded domestic demand, forcing companies, especially integrated ones, to seek export sales to maintain rational production levels. The industry was successful in its export efforts, and Canada became a net exporter of steel, mainly to the United States. Today, Canada is still a net exporter, but the ratio of exports to imports is much lower.

United States

In the 1950s and 1960s, the U.S. industry was not only older than the Canadian industry, but it was export-oriented, with a production capacity considerably larger than domestic demand. During the 1960s, the United States lost export markets and faced increased competition from imports, changes which resulted in low capacity utilization and declining profits. Government control of prices in the United States also contributed to industry losses. Industry profits were therefore not sufficient to fund the necessary levels of capital investment for the modernization of plants and equipment. This failure reduced the industry's relative competitiveness even further, with serious consequences. The industry lost virtually all of its export markets, and its domestic market was flooded with imports. Capacity utilization levels and profits plunged even further so that necessary capital expenditures were again delayed. The industry simply could not afford them.

By the early 1970s the United States had become a net importer of steel. Imports of low-priced steel had captured about 30% of the U.S. market. U.S. steel producers alleged that much of this steel had been dumped and demanded government protection. At the industry's request, many investigations for dumping and countervailable subsidies were conducted, and a period of protection under a diverse array of tariff and non-tariff barriers to trade began. One type of non-tariff barrier, voluntary restraint agreements, was still in force in 1991. Technological change added to the problems faced by the integrated steel companies in the United States. Improved electric arc melting furnaces and techniques for continuous casting steel billets fostered the rise of "mini-mills." Rapid growth of this segment of the steel-making industry altered both the organization and the pricing behaviour of the industry. Today, about 40% of U.S. steel is produced in electric furnaces.

In the United States, mini-mills also gained market shares at the expense of imports. Exporters to the United States responded to mini-mill competition by

moving their focus to products not made by mini-mills, further increasing competition for the integrated producers. The U.S. industry finally responded to these pressures with a massive restructuring, often with benefits arising from protection under Chapter 11 of the U.S. bankruptcy legislation. Such Chapter 11 companies are called restructured mills and have some significant cost advantages.

The recent improvements in U.S. productivity are due to large capital expenditures, more flexibility in job classification, and growth in the electric furnace-based industry. Some capital improvements were assisted by the formation of joint ventures with off-shore steel companies. Since 1982, U.S. crude steel capacity has dropped over 30%. A commonly used measure of productivity is the number of man-hours required to produce a tonne of steel. In the United States, man-hours per tonne has dropped from about 10 to slightly more than 5 in the last 10 years. In comparison, the drop in Canada has been less dramatic: man-hours per tonne decreased from 6.2 in 1971 to 5.4 in 1984, and to 5.1 in 1989. At present (in 1994), Canadian and American rates are nearly equal.

The Immediate Future

Technological change has altered, and will continue to dramatically alter, the nature of the steel industries of North America and the world. Some of the technologies that have recently or will soon become important in the production of steel and of primary iron are described below.

STEEL-MAKING

Technological change during the past decade has been concentrated in the steel-making portion of the industry. These new technologies emphasized processes that improved product quality and productivity, and reduced costs. Significant new processes and technologies include:

- **Continuous Casting** – This process takes molten steel and casts it into billets or slabs in a continuous operation. The most significant effect of its use is higher product yield. Compared to the cast ingot roughing mill process, up to 15% more product can be produced from the same quantity of molten steel. The main source of this improvement is the elimination of ingot casting and the breakdown of these ingots to billets or slabs in the roughing mill. Considerable trimming of the ingot prior to rolling, and of the billet or slab after rolling, is required.

Other benefits of using this process are improved product quality and significant energy savings. Its use impacts on coke and iron ore use in two

ways. Higher yields reduce the amount of in-house scrap generated, which increases the amount of purchased scrap consumed, and thus reduces the amount of steel that originates as pig iron. This is a well-established technology and about 85% of steel produced in North America is continuously cast.

- **Thin Slab Casting** – This recently commercialized process has the potential to revolutionize the production of steel sheet and strip. This technology continuously casts slabs of a thickness such that only a few rolling stations are necessary to produce sheet steel. This dramatically reduces the capital costs of the rolling mill and allows electric furnace-based mills to compete in the sheet steel market, a market that previously was served only by the integrated mills. The first commercial plant was recently built in the United States by Nucor Corp., and production from this plant has already forced the price of some sheet steel to a level so low that many integrated mills cannot maintain their profitability. A number of new plants in various countries are under construction or contracted for.
- **Ladle Refining** – This process, while not very new, has recently become very popular and is used by both electric and integrated producers. Its use separates the steel-making operation, either melting in the case of the electric furnace or conversion in the case of the integrated producers, from the steel refining stage. In both cases, the primary steel-making vessel is used just to make steel and, since the time-consuming operation of adjusting steel chemistry is done in a separate, less expensive vessel, the overall effect is to increase plant capacity. This process also tends to allow the production of higher quality steel. This technology has been very important in allowing the electric furnace-based mills to gain market share.
- **Direct Rolling** – In this process, the billet or slab goes directly from the continuous casting machine to the rolling mill. The major benefit is energy saving as only a small amount of energy is used to ensure that the steel is at a uniform temperature as it enters the rolling equipment. The older practice required that steel from storage be heated to rolling temperature in large, energy-intensive reheating furnaces. There are also some savings associated with reduced materials handling and storage requirements.
- **Computer-Assisted Manufacturing** – Many of the processes and the equipment used for steel production are now closely controlled by the use of computers. For example, computer control of the rolling mill speed allows steel to be rolled to considerably tighter specifications. Also, the

chemistry of steel is very accurately controlled with considerable savings in both time and raw materials.

- **High-Strength, Low-Alloy Steels** – Increasing use of these steels over the past decade has reduced the amount of steel required in parts used in many applications. Specifically, parts of equal strength can now be made with less steel.

IRON-MAKING

During the next decade, much more emphasis will be placed on alternative means of iron-making. However, it should be noted that blast furnaces will continue to produce the bulk of primary iron in the near future. By the turn of the century, blast furnaces will still account for about 90% of iron production.

The coke oven-blast furnace technology has been developed to high levels of efficiency, but few plants based on this technology are likely to be built in the future, partly because of costs, partly because of the need to meet more stringent environmental protection regulations, and partly because of a loss of market share to the electric furnace-based industry.

Coke ovens, which are a major portion of a blast furnace complex, have a particularly serious problem, as they produce many compounds that would be injurious to the environment should they be released. The costs of the equipment used to prevent release of such substances are very high, as are their operating costs. These problems are being addressed in research projects that are aimed at developing alternative methods of producing coke. Developments in iron-making will have the greatest impact on the future demand for metallurgical coal. Many of the new technologies recently developed or under development are applicable to the blast furnace. Many processes have reached the stage of commercial viability and their use is expected to increase significantly in the next decade. They are:

- **Pulverized Coal Injection (PCI)** – This technology is used with existing blast furnaces. It involves the injection of pulverized coal into the air blast at the air injection nozzles (called tuyeres) at the base of the blast furnace. This proven technology, which is rapidly becoming a standard procedure, requires relatively low capital expenditures, thus shortening the pay-back period. Facilities now in operation can use up to 150 kg of coal per tonne of pig iron produced. This represents a substitution of about 30% of coke. Higher substitutions may be possible but would likely require costly changes to the structure and operating practices of the blast furnace. It should be noted that the injection of hydrocarbons such as natural gas and oil has been

practiced for many years, with the amount used being a direct function of relative costs of the contained energy. At lower levels of injection, low-cost grades of coal can be used, while at high levels the physical and chemical properties of the coal become more critical. However, the overall effect is that lower-cost coal can be substituted for metallurgical coal.

- **Blast Furnace Enhancements** – A number of companies are working on ways to utilize the blast furnace as the basis of a direct smelting type process. The object is to reduce or eliminate the need for coke. The processes require extensive modifications to the furnace and generally involve very high levels of coal injection, with oxygen added to the blast air. Alternatively, a pre-reduction step similar to the Direct Reduction Process is used. In either case, the process produces molten metal.
- **Direct Reduction** – This process was the first commercially successful alternative to the blast furnace. The iron ore used is either pelletized concentrate or lump ore, and the product, direct reduced iron (DRI), often called sponge iron, remains a solid, never becoming molten during the process. Natural gas is the fuel used in most existing DRI plants. However, most of the work now being done on this technology is concentrated on the use of coal.

World production of DRI has grown steadily over the past decade, and growth should continue, probably at an increased rate. DRI tends to be used as a scrap substitute in electric furnaces rather than as a product used by the integrated companies because: (1) integrated plants need molten iron to be charged to their basic oxygen furnaces (BOFs), and (2) electric furnace mills need high-purity iron units. DRI has high purity and is particularly valuable to the electric furnace users who use it to dilute the impurities generally found in scrap. Two technologies dominate the DRI industry, MIDREX and Hyl 1 and 111. The largest share of production is held by the MIDREX process. MIDREX is the process used by Sidbec in Quebec.

Approximately 65% of the world's DRI is produced in MIDREX plants. The MIDREX process, which began commercial production in 1969, uses natural gas to reduce iron ore pellets in a shaft furnace. Reduction rates of 92% are easily achieved. In today's world, its major advantage is its proven track record. An inherent disadvantage is its use of very high-grade energy in the form of natural gas. In industrialized countries, where demand for, and thus the price of, natural gas is high, MIDREX plants are seldom built. However there are many countries, remote from

normal markets, where quantities of low-cost natural gas are available or even flared off, as is often the case of gas associated with the oil industry in the Middle East. In such a situation the MIDREX process is very viable. Some disadvantages inherent in direct reduction processes are: a) the need for more costly high-grade lump or pelletized ore, b) the carry-over of nonmetallic material called "gangue" in the reduced iron, and c) the possibility of rapid rusting or even burning if the DRI is not consolidated by a process such as briquetting.

The Hyl process was developed in Mexico where most of the plants using the technology were built. Accounting for 38% of world DRI capacity, it is a natural gas-based batch process where the ore being reduced is packed into vessels that are externally heated.

World production of DRI was 20.7 million tonnes (Mt) in 1992, a considerable increase over the 4.83-Mt level of 1978. The industry has experienced a steady growth of over 5% a year and presently accounts for about 3% of world steel production. Similar growth rates are expected in the short and medium term. The market for merchant DRI is excellent and available supplies have been sold out for several years. Production of DRI is an effective way to utilize natural gas that would otherwise be wasted. Thus, DRI production can be viewed as a way of transporting and selling energy.

- **Iron Carbide** – The iron carbide process uses natural gas and non-agglomerated iron ore to produce a stable compound (Fe_3C) that contains about 6% carbon. This contained carbon is a significant source of energy in steel production. Iron carbide can be a useful source of iron units for both electric and integrated steel producers.

Steel industry specialists have stated that iron carbide offers a US\$10 to \$15 per tonne saving over the costs of blast furnace iron. In electric furnace steel production, iron carbide has the same benefits of high purity as DRI with the additional advantage of significant contained energy.

Should iron carbide become a popular substitute for blast furnace iron in integrated mills, coal consumption would be adversely affected.

- **Direct Smelting** – The main difference between direct reduction and direct smelting is the form of the product. In direct reduction, the product is a porous solid, 95% metallic lump that contains some iron oxide and some unwanted nonmetallic impurities. In direct smelting, the product is molten metal that is very similar to blast furnace

iron, with perhaps less contained carbon. Many of the direct smelting processes are coal-based technologies because in industrialized nations, where there is a potential demand for the process, natural gas is too valuable a source of energy to use for the smelting of iron ore. A direct smelting plant would generally be on the same site as the steel works so that molten iron could be readily delivered to the steel-making shop. The Corex process is the most advanced of the various direct smelting processes.

All of these technologies tend to be focused on plants of quite small minimum economic size that are still capable of producing high-grade iron at a total cost (capital and operating) lower than the traditional coke oven blast furnace route. Most of the current developmental work is being concentrated on coal-based processes that do not require metallurgical grades of coal, but generally use large volumes of pure oxygen. These have a basic advantage in that an integral part of their design is the ability to operate without significant emissions, therefore easily coping with environmental protection regulations and considerations. These technologies have been, and are being, developed by large corporations that have many years of experience in extractive metallurgy. Many of the technologies have been proven either by the operation of pilot plants or commercial installations. More widespread usage has been delayed by economic considerations, since the steel industry has not been particularly profitable for years. Since the early 1970s, the steel industry in the developed nations has been downsizing because of a serious drop in demand for steel in their domestic markets. This situation affected the use of the new technologies in two ways: (1) there was excess capacity to produce iron with existing paid-for equipment, and (2) there was little profit available to pay for the new capital equipment. In the late 1980s, the situation was considerably different. Many old plants had been closed and there was a shortage of coke and, thus, a shortage of iron. The industry also had a number of years of high demand and good profits.

High levels of research and development are being maintained by both major companies and governments. The U.S. Department of the Environment is contributing to the funding of research into direct steel-making in cooperation with The American Iron and Steel Institute. This three-year US\$3 million project commenced in February 1990 with the construction of a pilot plant at the University of Pennsylvania. The pilot plant was completed in June 1990. The project will concentrate on in-bath smelting and refining processes. In Japan, a number of projects are at advanced stages of development.

By the year 2010, direct reduction, direct smelting and iron carbide plants will be quite common and will account for a significant percentage (up to 10%) of

iron production. MIDREX plants have operated for many years, and the Corex process has reached the level of a proven commercial process as a full-scale plant has been operating at ISCOR's steel plant in Pretoria, South Africa, since August 1988. The official commissioning was in June 1990. The hot metal from this first commercial plant met the design specifications. Additional commercial plants will be built in the near future. Currently, LTV Steel Co. in the United States is planning a 1-Mt Corex plant, and a 600 000-t Corex plant has been ordered by Pohang Iron and Steel Co. of South Korea. Nucor Corp. has announced its intention to build an iron carbide plant in Trinidad.

However, as previously noted, the blast furnace will be the major source of molten iron well into the twenty-first century, because blast furnaces are efficient, have high productivity and the very important consideration of being part of the sunk cost of most integrated steel producers, i.e., they are paid for.

IMPACT ON DEMAND FOR CANADIAN COAL AND IRON ORE

Demand for iron ore should be slightly improved by the use of new direct smelting technologies as they consume iron ore and are an appropriate technology for both integrated and electric furnace steel producers. Indeed, the steel plant of the future may combine the technologies of both the integrated and electric furnace industries so that the distinction between the two may very well disappear. In the shorter term, as the North American electric steel industry continues to improve product quality and gain market share, the demand for high-purity iron units will increase. In fact, there may well be an opportunity to build merchant iron plants in several areas of North America. Such plants would require a source of low-cost energy to be economically viable.

The impact on metallurgical coal demand is less promising as the special properties of metallurgical coal would not be as important and the premium price now charged would become more difficult to maintain. The total volume of coal consumption in the production of a tonne of primary iron will likely decline only moderately. Also, the coke that will still be required will have to be of very high quality. At this point in time, the properties of the coal best suited for the new technologies, i.e., high levels of PCI and direct smelting processes, have yet to be established.

The Coal and Ferrous Division of the Mining Sector of Natural Resources Canada is working on studies of future demand for coal and iron ore, and the international competitiveness of these Canadian industries.

Statistical Tables

TABLE 1. CANADA, PRODUCTION OF LEADING MINERALS (JANUARY, FEBRUARY, 1994)

TABLE 1. CANADA, PRODUCTION OF LEADING MINERALS (JANUARY, FEBRUARY, 1993)										
		1993			1994			Percentage Changes		
		January	February	Total 2 Months	January	February	Total 2 Months	February 1994 February 1993	February 1994 January 1994	2 Months 1994 1993
(000 tonnes except where noted)										
METALS										
Copper		54.3	56.5	110.8	34.5	42.1	76.6	-25.5	21.8	-30.8
Gold	kg	12 838.8	11 757.2	24 596.0	10 809.3	11 016.7	21 826.0	-6.3	1.9	-11.3
Iron ore		1 216.6	858.8	2 075.4	1 531.4	1 030.1	2 561.6	19.9	-32.7	23.4
Lead		21.4	18.0	39.4	8.4	12.7	21.1	-29.3	52.2	-46.4
Molybdenum	t	1 022.3	817.9	1 840.2	637.9	796.9	1 434.8	-2.6	24.9	-22.0
Nickel		12.4	14.9	27.3	2.5	6.7	9.2	-54.9	174.4	-66.3
Silver	t	86.7	77.3	164.0	48.6	54.0	102.6	-30.2	11.0	-37.5
Uranium ¹	t	292.0	815.1	1 107.1	927.9	875.6	1 803.5	7.4	-5.6	62.9
Zinc		76.8	56.0	132.8	48.6	59.2	107.8	5.8	21.9	-18.8
NONMETALS										
Asbestos		41.9	43.4	85.3	38.4	35.0	73.3	-19.5	-9.0	-14.1
Clay products	\$000	1 514.9	5 039.5	10 181.4	2 473.8	3 791.3	6 265.0	-24.8	53.3	-38.5
Gypsum		561.8	573.3	1 135.1	544.8	568.9	1 113.7	-0.8	4.4	-1.9
Potash K ₂ O		545.6	571.5	1 117.1	510.4	542.2	1 052.6	-5.1	6.2	-5.8
Cement		256.9	325.4	582.2	284.2	303.4	587.7	-6.7	6.8	0.9
Lime		191.7	178.5	370.2	191.8	177.9	369.7	-0.4	-7.2	-0.1
Salt		760.9	744.2	1 505.1	999.9	821.4	1 821.3	10.4	-17.9	21.0
FUELS										
Coal		5 602.3	5 685.0	11 287.3	6 209.1	5 357.9	11 567.0	-5.8	-13.7	2.5
Natural gas	million m ³	13 470.3	12 481.0	25 951.3	14 651.0	13 236.0	27 887.0	6.0	-9.7	7.5
Crude oil and equivalent	000 m ³	8 438.0	7 745.0	16 183.0	9 125.0	8 412.0	17 537.0	8.6	-7.8	8.4

Sources: Natural Resources Canada; Statistics Canada.

¹ Tonnes uranium (1 tonne U = 1.2999 short tons U₃O₈).

Note: Percentage changes are calculated on the basis of actual production figures as opposed to the rounded figures as shown.

TABLE 1a. CANADA, PRODUCTION OF LEADING MINERALS (MARCH, APRIL, 1994)

		1993			1994			Percentage Changes		
		March	April	Total 4 Months	March	April	Total 4 Months	April 1994 April 1993	April 1994 March 1994	4 Months 1994 1993
(000 tonnes except where noted)										
METALS										
Copper		62.3	67.9	241.0	49.0	49.2	174.8	-27.5	0.5	-27.5
Gold	kg	12 831.3	12 214.8	49 642.2	13 445.1	12 649.0	47 920.1	3.6	-5.9	-3.5
Iron ore		1 133.7	2 532.8	5 741.9	1 351.9	3 132.2	7 045.2	23.7	131.8	22.7
Lead		21.9	13.9	75.2	14.7	11.6	47.4	-16.9	-21.4	-37.0
Molybdenum	t	834.5	777.2	3 451.9	917.1	1 019.4	3 371.3	31.2	11.2	-2.3
Nickel		18.7	17.0	63.0	16.4	14.9	40.5	-12.3	-9.1	-35.7
Silver	t	84.2	77.0	325.1	72.7	55.7	231.0	-27.6	-23.3	-29.0
Uranium ¹	t	862.8	656.9	2 626.9	963.2	931.3	3 698.0	41.8	-3.3	40.8
Zinc		98.1	84.2	315.1	74.1	71.5	253.5	-15.1	-3.6	-19.6
NONMETALS										
Asbestos		39.5	47.4	172.2	43.5	48.5	165.4	2.4	11.5	-3.9
Clay products	\$000	7 228.9	9 736.9	27 147.2	6 101.2	11 583.1	23 949.3	19.0	89.8	-11.8
Gypsum		590.7	710.4	2 436.2	672.0	619.1	2 404.8	-12.8	-7.9	-1.3
Potash K ₂ O		728.2	818.0	2 663.3	879.8	964.9	2 897.2	18.0	9.7	8.8
Cement		472.0	661.5	1 715.7	566.3	714.1	1 868.1	8.0	26.1	8.9
Lime		200.3	212.9	783.4	210.5	197.7	777.9	-7.1	-6.0	-0.7
Salt		687.8	711.6	2 904.5	681.2	875.7	3 378.1	23.1	28.6	16.3
FUELS										
Coal		6 111.6	5 395.3	22 794.3	6 401.5	5 808.4	23 777.0	7.7	-9.3	4.3
Natural gas	million m ³	13 674.0	13 028.0	52 653.3	13 774.0	13 508.0	55 169.0	3.7	-1.9	4.8
Crude oil and equivalent	000 m ³	8 752.0	8 375.0	33 310.0	9 357.0	8 685.0	35 579.0	3.7	-7.2	6.8

Sources: Natural Resources Canada; Statistics Canada.

¹ Tonnes uranium (1 tonne U = 1.2999 short tons U₃O₈).

Note: Percentage changes are calculated on the basis of actual production figures as opposed to the rounded figures as shown.

TABLE 1b. CANADA, PRODUCTION OF LEADING MINERALS (MAY, JUNE, 1994)

		1993			1994			Percentage Changes		
		May	June	Total 6 Months	May	June	Total 6 Months	June 1994 June 1993	June 1994 May 1994	6 Months 1994 1993
(000 tonnes except where noted)										
METALS										
Copper		62.6	61.7	365.2	49.5	54.1	278.4	-12.3	9.2	-23.9
Gold	kg	11 735.9	13 021.1	74 399.2	12 969.4	12 703.1	73 592.6	-2.4	-2.1	-1.1
Iron ore		3 036.0	3 504.7	12 282.6	4 030.8	4 062.0	15 138.0	15.9	0.8	23.2
Lead		10.9	11.7	97.9	14.4	9.7	71.4	-17.7	-32.9	-27.1
Molybdenum	t	747.7	668.0	4 867.6	741.3	810.0	4 922.6	21.3	9.3	1.1
Nickel		16.8	17.1	97.0	14.4	16.4	71.4	-4.2	13.9	-26.4
Silver	t	69.5	78.0	472.6	63.8	61.3	356.1	-21.4	-3.9	-24.7
Uranium ¹	t	877.1	952.3	4 456.2	1 140.4	895.1	5 733.6	-6.0	-21.5	28.7
Zinc		60.0	83.2	458.3	68.7	75.8	397.9	-8.9	10.4	-13.2
NONMETALS										
Asbestos		42.8	38.5	235.5	41.7	41.3	248.4	7.2	-1.0	-2.0
Clay products	\$000	10 852.8	11 221.7	49 221.8	13 556.6	13 150.9	50 656.8	17.2	-3.0	2.9
Gypsum		641.0	724.3	3 801.5	609.2	756.4	3 770.4	4.4	24.2	-0.8
Potash K ₂ O		821.2	462.2	3 946.7	999.4	761.7	4 658.3	64.8	-23.8	18.0
Cement		912.7	1 057.8	3 686.2	1 060.9	1 218.9	4 147.8	15.2	14.9	12.5
Lime		216.9	204.6	1 204.9	213.5	190.6	1 182.0	-6.9	-10.7	-1.9
Salt		935.5	1 052.5	4 892.4	1 000.0	1 228.7	5 606.9	16.7	22.9	14.6
FUELS										
Coal		5 552.9	5 538.7	33 885.9	..	..	23 777.0	..	..	..
Natural gas	million m ³	11 856.0	11 909.0	76 418.3	..	..	55 169.0	..	..	..
Crude oil and equivalent	000 m ³	8 658.0	8 907.0	50 875.0	..	..	35 579.0	..	..	..

Sources: Natural Resources Canada; Statistics Canada.

.. Not available.

¹ Tonnes uranium (1 tonne U = 1.2999 short tons U₃O₈).

Note: Percentage changes are calculated on the basis of actual production figures as opposed to the rounded figures as shown.

TABLE 2. METAL PRICES, 1994

	January	February	March	April	May	June	July
COPPER							
Electrolytic, U.S. producer f.o.b. refinery, cents (US)	86.510	89.825	92.197	90.339	102.741	111.093	114.292
Electrolytic, COMEX, 1st pos. plus 5 cents (US)	83.648	87.132	89.759	87.868	100.305	108.580	111.675
Electrolytic, LME Grade A settlement, cents (US)	81.889	84.658	86.857	85.358	97.550	107.239	111.502
LEAD							
U.S. producer, cents (US)	34.000	34.000	34.000	34.000	34.000	36.000	37.500
LME cash, cents (US)	22.214	22.003	20.462	19.937	21.455	23.798	26.297
SILVER							
Handy & Harmon, cents per troy oz (US)	513.143	527.237	545.109	530.868	543.643	539.341	528.650
Handy & Harmon, cents per troy oz (C)	676.015	707.605	743.692	733.925	690.481	746.340	730.859
ZINC							
North American SHG, cents (US)	47.763	46.962	44.847	44.492	46.067	47.150	47.721
GOLD							
London, p.m., US\$ per troy oz	386.875	381.910	384.128	377.271	381.413	385.643	385.491
NICKEL							
New York, dealers, cathode, US\$	2.548	2.699	2.572	2.503	2.786	2.876	2.870
LME cash, US\$	2.530	2.642	2.534	2.453	2.761	2.849	2.824
PLATINUM							
London PM fix, US\$ per troy oz	387.515	394.035	400.283	395.879	398.258	401.257	411.941
ALUMINUM							
LME cash, cents (US)	53.278	57.603	58.470	58.002	59.992	63.529	67.695
LME cash, cents (C)	70.188	77.309	79.771	80.188	76.196	87.911	93.588

Sources: Metals Week; The Northern Miner.

Notes: Prices are per pound unless otherwise stated. Average U.S. Exchange Rate for January = 1.3174, February = 1.3421, March = 1.3643, April = 1.3825, May = 1.3810, June = 1.3838, July = 1.3825.

TABLE 3. CANADA, REAL GROSS DOMESTIC PRODUCT AT FACTOR COST BY INDUSTRY, IN 1986 PRICES, QUARTERLY (SEASONALLY ADJUSTED AT ANNUAL RATES)

Industry Sector	1993 2nd Quarter	1993 3rd Quarter	1993 4th Quarter	1994 1st Quarter	1994 2nd Quarter	% Change 2nd Quarter 1994 1st Quarter 1994	% Change 2nd Quarter 1994 2nd Quarter 1993
(\$ millions)							
TOTAL ECONOMY	509 906.8	511 970.6	516 650.6	520 573.1	527 757.7	1.4	3.5
Business Sector							
Agriculture	10 584.2	10 701.3	10 901.1	10 828.6	10 935.2	1.0	3.3
Fishing and trapping	1 134.5	1 181.9	1 020.2	1 014.7	1 042.8	2.8	-8.1
Forestry	2 926.4	2 649.8	2 818.6	2 916.5	2 937.3	0.7	0.4
Mines, quarries and oil wells	22 005.5	22 047.9	21 854.3	21 754.3	22 962.7	5.6	4.3
Mining industries	5 680.5	5 503.2	5 632.6	5 344.8	5 677.7	6.2	-0.0
Gold mines	1 528.9	1 549.8	1 576.2	1 611.3	1 612.4	0.1	5.5
Iron mines	391.3	397.9	420.4	452.6	454.2	0.4	16.1
Other metal mines	2 102.2	1 917.9	1 848.6	1 593.4	1 788.0	12.2	-14.9
Asbestos mines	92.9	86.5	85.7	91.3	86.1	-5.7	-7.3
Salt mines	155.2	157.3	157.8	181.3	182.1	0.4	17.3
Other nonmetal mines	494.6	441.3	499.1	506.2	561.5	10.9	13.5
Coal mines	915.5	952.5	1 044.8	908.8	993.3	9.3	8.5
Crude petroleum and natural gas	13 413.6	13 740.2	13 427.8	13 642.7	14 026.0	2.8	4.6
Quarry and sand pit industries	413.2	408.0	400.2	394.3	409.1	3.8	-1.0
Services related to mineral extraction	2 498.2	2 396.6	2 393.8	2 372.5	2 849.9	20.1	14.1
Manufacturing	90 726.0	91 363.9	93 070.0	93 383.3	96 002.0	2.8	5.8
Construction industry	26 119.6	25 793.0	26 351.7	26 093.5	27 064.2	3.7	3.6
Transportation and storage	21 561.5	21 834.9	22 178.4	22 200.6	22 751.7	2.5	5.5
Communications	19 450.1	19 675.7	19 923.7	20 407.2	20 783.1	1.8	6.9
Other utilities	15 941.9	16 412.3	16 181.4	16 915.0	16 892.0	-0.1	6.0
Wholesale trade	30 684.4	31 317.3	32 457.2	32 883.3	33 773.3	2.7	10.1
Retail trade	31 046.1	31 333.7	31 551.1	32 593.6	33 012.5	1.3	6.3
Finance, insurance and real estate	83 132.1	83 587.5	84 609.0	85 833.0	85 155.3	-0.8	2.4
Community, business and personal services	61 805.5	61 639.6	61 585.6	61 923.7	62 537.7	1.0	1.2
Non-Business Sector							
Government service industries	33 902.7	33 660.6	33 529.0	33 498.6	33 426.2	-0.2	-1.4
Community and personal services	54 614.0	54 504.5	54 351.4	54 098.9	54 297.8	0.4	-0.6
Other non-business industries and services	4 272.3	4 266.7	4 267.9	4 228.3	4 183.9	-1.1	-2.1

Source: Statistics Canada.

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

TABLE 4. CANADA, REAL GROSS DOMESTIC PRODUCT AT FACTOR COST BY INDUSTRIES INVOLVED IN MINERAL MANUFACTURING, IN 1986 PRICES, QUARTERLY (SEASONALLY ADJUSTED AT ANNUAL RATES)

Industry	1993 2nd Quarter	1993 3rd Quarter	1993 4th Quarter	1994 1st Quarter	1994 2nd Quarter	% Change 2nd Quarter 1994 1st Quarter 1994	% Change 2nd Quarter 1994 2nd Quarter 1993
(\$ millions)							
PRIMARY METAL INDUSTRIES	7 208.4	7 276.7	7 395.5	7 227.5	7 259.3	0.4	0.7
Primary steel industries	2 549.2	2 548.0	2 652.3	2 640.1	2 540.9	-3.8	-0.3
Steel, pipe and tube industries	533.7	531.7	554.6	538.4	582.5	8.2	9.1
Iron foundries	389.3	388.5	412.6	400.5	401.3	0.2	3.1
Nonferrous smelting and refining industries	2 879.8	2 922.4	2 831.5	2 702.8	2 808.4	3.9	-2.5
FABRICATED METAL PRODUCTS INDUSTRIES	5 618.4	5 733.8	5 907.7	6 031.1	6 217.1	3.1	10.7
Power boiler and heat exchanger industry	943.3	984.3	1 009.0	1 046.3	1 073.9	2.6	13.8
Ornamental and architectural metal products industry	656.6	672.7	672.9	669.1	706.4	5.6	7.6
Stamped, pressed and coated metals	1 266.3	1 282.7	1 290.5	1 271.4	1 317.0	3.6	4.0
Wire and wire products industries	489.1	502.8	520.6	538.6	545.4	1.3	11.5
Hardware, tool and cutlery industries	834.6	853.5	899.5	943.7	1 005.6	6.6	20.5
Heating equipment industry	166.8	172.5	188.6	182.4	184.4	1.1	10.6
Machine shops industry	638.3	635.1	673.6	711.1	717.5	0.9	12.4
Other metal-fabricating industries	623.4	630.2	653.0	668.5	666.9	-0.2	7.0
NONMETALLIC MINERAL PRODUCTS INDUSTRIES	2 373.1	2 410.4	2 411.5	2 352.1	2 482.0	5.5	4.6
Cement industry	332.0	345.6	356.8	356.5	367.1	3.0	10.6
Concrete products industries	271.0	279.5	260.3	253.3	274.2	8.3	1.2
Ready-mix concrete industry	358.8	368.8	357.0	338.1	376.5	11.4	4.9
Glass and glass products industries	605.4	621.8	638.6	607.8	630.2	3.7	4.1
Miscellaneous nonmetallic mineral products	723.6	718.9	723.4	731.2	743.2	1.6	2.7

Source: Statistics Canada.

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

TABLE 5. CANADA, SELLING PRICE INDEXES OF MINERAL RAW MATERIALS AND MINERAL PRODUCTS, 1991-JUNE 1994

Base (1986 = 100)	1991	1992	1993	June 1994
METALLIC MINERALS				
Copper concentrates	131.5	134.7	120.1	168.1
Iron ore	81.7	85.2	90.5	96.8
Lead concentrates	123.9	121.7	120.7	145.6
Nickel concentrates	149.9	133.0	102.6	127.7
Other base metals	80.3	81.0	81.0	108.0
Precious metals	78.0	78.0	86.9	101.8
Gold and alloys in primary form	78.8	78.7	87.5	101.9
Platinum	68.4	68.6	76.6	88.7
Silver	61.7	63.2	73.3	101.6
Radioactive concentrates	49.8	48.1	57.4	54.2
Zinc concentrates	121.9	126.9	105.0	112.1
NONMETALLIC MINERALS				
Asbestos fibres	111.0	117.0	123.1	123.9
Other crude minerals	104.7	103.9	104.9	111.0
Potash (muriate)	137.9	136.5	138.5	145.0
Quartz and silica sand	108.3	98.9	101.6	101.9
Sand and gravel	124.3	124.9	130.8	124.5
Stone	116.4	114.1	115.6	117.1
Building	119.5	119.7	119.7	122.8
Crushed	120.4	121.8	123.5	124.7
Other	119.5	119.7	119.7	122.8
Sulphur	53.0	20.6	4.3	0.8
MINERAL FUELS				
Coal (thermal)	94.6	99.9	105.9	108.3
Crude mineral oil	108.3	105.0	98.7	113.4
Natural gas	87.2	87.4	92.0	98.5
IRON AND STEEL PRODUCTS INDUSTRIES				
Ferroalloy and steel foundry industries	108.2	109.1	107.3	111.6
Iron foundries	110.9	113.1	116.0	121.5
Primary steel industries	105.0	97.9	101.3	109.3
Steel pipe and tube industry	101.2	94.0	96.9	105.1
NONFERROUS PRIMARY METAL PRODUCTS INDUSTRIES				
Aluminum rolling, casting and extruding industry	91.5	90.3	91.7	104.9
Copper rolling, casting and extruding industry	138.9	142.4	137.2	157.0
Jewellery and precious metals industries	89.7	90.2	94.8	102.6
Other rolling, casting and extruding industry	101.7	102.8	103.0	114.9
Nonferrous metal smelting and refining industries	99.0	99.5	93.8	117.8
NONMETALLIC MINERAL PRODUCTS INDUSTRIES				
Agricultural chemicals industries	97.6	97.4	100.1	111.5
Hydraulic cement industry	110.3	109.5	110.3	115.6
Clay products industry (from domestic clay)	119.8	117.5	115.7	125.9
Clay products industry (from imported clay)	124.6	125.8	127.9	129.1
Concrete products industries	119.9	117.7	118.2	120.5
Glass and glass products industries	109.8	108.6	107.0	111.7
Nonmetallic mineral insulating materials industry	114.2	115.2	112.1	119.7
Refined petroleum and coal products industries	97.7	89.9	90.0	89.4
FABRICATED METAL PRODUCTS INDUSTRIES				
Agricultural implement industry	109.9	112.4	115.5	119.4
Miscellaneous fabricated structural metal products	111.4	107.8	110.6	114.3
Hardware, tool and cutlery industries	120.0	122.1	125.3	128.2
Heating equipment industry	115.6	118.0	120.7	122.5
Other metal fabricating industries	117.8	118.2	120.5	126.1
Power boiler and heat exchanger industry	130.1	136.7	139.3	140.1
Stamped, pressed and coated metal products industries	103.9	103.7	104.7	108.3
Wire and wire products industries	112.7	113.8	116.2	120.7

Source: Statistics Canada, catalogue no. 62-011.

TABLE 6. CANADA, PRINCIPAL STATISTICS OF THE MINERAL INDUSTRY,¹ 1992

	Establish- ments	Mining Activity							Total Activity ²		
		Production and Related Workers			Costs		Value of Production	Value Added	Employees	Salaries and Wages	Value Added
		Employees	Person- Hours Paid	Wages	Fuel and Electricity	Materials and Supplies					
	(number)	(number)	(000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(number)	(\$000)	(\$000)
METALS											
Nickel-copper-zinc	22	12 656	27 382	667 897	230 811	1 844 359	4 701 312	2 626 142	17 128	932 405	2 640 282
Gold	50	7 166	15 841	408 532	127 621	516 638	1 945 637	1 301 378	9 403	537 836	1 303 025
Uranium	5	1 378	2 934	73 838	40 061	66 857	579 683	472 765	1 702	98 045	475 810
Silver-lead-zinc	10	2 373	5 459	120 926	57 905	597 013	1 337 732	682 814	3 664	192 797	687 520
Iron	5	3 738	8 171	235 568	143 118	369 239	1 086 201	573 844	5 090	323 452	580 932
Miscellaneous metal mines ³	5	597	1 265	25 357	12 662	34 917	116 567	68 988	787	34 794	70 998
Total	97	27 908	61 052	1 532 118	612 179	3 429 023	9 767 131	5 725 930	37 774	2 119 328	5 758 567
INDUSTRIALS											
Potash	11	2 829	6 230	122 705	100 685	127 072	1 032 983	805 226	3 779	174 872	803 480
Stone	116	1 870	4 233	68 674	32 446	92 139	367 511	242 925	2 496	96 907	244 137
Sand and gravel	112	1 299	3 046	45 427	23 374	62 293	242 297	156 630	1 842	67 315	159 716
Miscellaneous nonmetals ⁴	31	1 567	3 451	62 061	29 745	57 104	362 374	275 525	2 231	93 432	274 896
Asbestos	4	1 774	4 028	78 853	30 875	62 086	245 863	152 902	2 289	105 838	152 981
Peat	53	1 216	2 684	30 848	5 701	25 853	147 782	116 228	1 448	37 919	118 965
Gypsum	10	552	1 266	18 709	7 271	15 458	69 766	47 037	672	23 469	46 873
Total	337	11 107	24 938	427 276	230 096	442 005	2 468 576	1 796 474	14 757	599 752	1 801 048
FUELS											
Oil, crude and natural gas	634	7 964	16 032	455 124	418 896	1 445 037	16 822 462	14 958 529	27 678	1 845 769	15 128 679
Coal	35	7 804	15 075	319 110	118 138	378 840	1 469 441	972 463	9 726	417 714	1 006 608
Total	669	15 768	31 107	774 234	537 034	1 823 877	18 291 903	15 930 992	37 404	2 263 483	16 135 287
Total mineral industry	1 103	54 783	117 097	2 733 628	1 379 309	5 694 905	30 527 610	23 453 397	89 935	4 982 563	23 694 902

Sources: Natural Resources Canada; Statistics Canada.

¹ Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. ² Total activity includes sales and head offices.³ Includes molybdenum. ⁴ Includes salt.

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

TABLE 6a. CANADA, PRINCIPAL STATISTICS OF THE MINERAL INDUSTRY,¹ 1991 (revised)

	Establish- ments	Mining Activity							Total Activity ²		
		Production and Related Workers			Costs		Value of Production	Value Added	Employees	Salaries and Wages	Value Added
		Employees	Person- Hours Paid	Wages	Fuel and Electricity	Materials and Supplies					
	(number)	(number)	(000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(number)	(\$000)	(\$000)
METALS											
Nickel-copper-zinc	27	13 454	30 194	690 877	246 507	1 912 099	4 898 042	2 739 436	18 634	980 522	2 772 333
Gold	60	8 563	18 555	463 010	139 954	546 017	2 228 023	1 542 051	10 869	594 521	1 543 209
Uranium	5	1 924	3 828	93 853	43 372	69 375	609 045	496 298	2 391	130 846	495 795
Silver-lead-zinc	12	2 167	4 994	106 737	57 670	475 175	978 570	445 726	3 459	176 256	446 009
Iron	5	4 230	9 257	239 064	162 588	397 999	1 226 507	665 920	5 683	327 029	674 318
Miscellaneous metal mines ³	5	830	1 839	33 712	17 607	51 990	154 812	85 215	1 056	44 382	87 220
Total	114	31 168	68 666	1 627 254	667 698	3 452 655	10 094 999	5 974 646	42 092	2 253 556	6 018 884
INDUSTRIALS											
Potash	11	2 854	6 292	120 649	106 277	134 869	988 361	747 215	3 825	172 675	745 379
Stone	118	2 080	4 756	73 171	31 679	90 474	386 445	264 292	2 774	101 872	268 870
Sand and gravel	122	1 564	3 647	52 859	25 254	74 841	313 472	213 376	2 252	77 813	218 755
Miscellaneous nonmetals ⁴	34	1 686	3 643	63 692	30 446	57 674	345 556	257 435	2 409	96 105	256 748
Asbestos	5	1 769	3 790	72 591	32 269	57 080	273 954	184 604	2 423	107 260	190 147
Peat	51	1 229	2 747	27 723	6 280	30 713	131 783	94 790	1 519	36 823	97 044
Gypsum	10	517	1 205	16 826	6 975	15 511	66 981	44 496	636	21 873	44 145
Total	351	11 699	26 080	427 512	239 180	461 163	2 506 551	1 806 208	15 838	614 421	1 821 088
FUELS											
Oil, crude and natural gas	674	8 724	17 670	480 966	383 096	1 504 989	16 092 573	14 204 488	31 450	1 940 737	14 423 165
Coal	33	8 775	17 598	391 289	136 675	404 636	1 757 479	1 216 168	10 817	495 142	1 254 601
Total	707	17 499	35 268	872 255	519 771	1 909 625	17 850 052	15 420 656	42 267	2 435 879	15 677 766
Total mineral industry	1 172	60 366	130 014	2 927 021	1 426 650	5 823 443	30 451 603	23 201 510	100 197	5 303 856	23 517 737

Sources: Natural Resources Canada; Statistics Canada.

¹ Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. ² Total activity includes sales and head offices.

³ Includes molybdenum. ⁴ Includes salt.

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

TABLE 7. CANADA, PRINCIPAL STATISTICS OF THE MINERAL INDUSTRY¹ BY REGION, 1992

	Establish- ments	Mines, Quarries and Oil Wells Activity							Total Activity ²		
		Production and Related Workers			Costs				Employees	Salaries and Wages	Value Added
		Employees	Person- Hours Paid	Wages	Fuel and Electricity	Materials and Supplies	Value of Production	Value Added			
	(number)	(number)	(000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(number)	(\$000)	(\$000)
Atlantic provinces ³	81	7 122	14 634	318 590	117 728	563 255	1 721 147	1 040 165	9 223	421 068	1 072 311
Quebec	170	9 335	20 517	447 659	208 870	745 188	2 206 403	1 252 345	12 928	636 866	1 281 521
Ontario	132	12 720	27 963	663 997	209 769	1 182 681	4 238 741	2 846 292	17 275	935 797	2 833 077
Prairie provinces	525	16 359	33 820	823 512	609 812	2 008 584	18 333 065	15 714 669	38 208	2 340 957	15 868 753
British Columbia ⁴	167	7 781	16 503	383 726	186 813	938 443	2 981 010	1 855 754	10 177	515 489	1 892 628
Yukon and Northwest Territories ⁵	28	1 466	3 661	96 144	46 317	256 755	1 047 245	744 173	2 124	132 385	746 613
Total	1 103	54 783	117 097	2 733 628	1 379 309	5 694 905	30 527 610	23 453 397	89 935	4 982 563	23 694 902

Sources: Natural Resources Canada; Statistics Canada.

¹ Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. ² Total activity includes sales and head offices.³ Includes eastern Canada offshore. ⁴ Includes western Canada offshore. ⁵ Includes Arctic Islands.

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

TABLE 7a. CANADA, PRINCIPAL STATISTICS OF THE MINERAL INDUSTRY¹ BY REGION, 1991 (revised)

	Establish- ments	Mines, Quarries and Oil Wells Activity							Total Activity ²		
		Production and Related Workers			Costs				Employees	Salaries and Wages	Value Added
		Employees	Person- Hours Paid	Wages	Fuel and Electricity	Materials and Supplies	Value of Production	Value Added			
	(number)	(number)	(000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(number)	(\$000)	(\$000)
Atlantic provinces ³	85	7 391	15 476	313 528	134 284	507 233	1 568 466	926 950	9 624	422 511	957 787
Quebec	175	10 401	22 587	472 169	217 523	804 665	2 425 060	1 402 872	14 285	668 759	1 427 696
Ontario	145	14 570	32 396	726 572	223 355	1 239 862	4 585 131	3 121 914	19 895	1 033 717	3 137 122
Prairie provinces	557	16 709	34 585	832 607	581 860	2 052 374	17 715 113	15 080 879	41 661	2 413 160	15 267 563
British Columbia ⁴	182	9 425	20 495	466 028	213 705	975 893	3 223 623	2 034 025	12 117	610 129	2 087 552
Yukon and Northwest Territories ⁵	28	1 870	4 476	116 117	55 923	243 417	934 210	634 870	2 615	155 580	640 018
Total	1 172	60 366	130 014	2 927 021	1 426 650	5 823 443	30 451 603	23 201 510	100 197	5 303 856	23 517 737

Sources: Natural Resources Canada; Statistics Canada.

¹ Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. ² Total activity includes sales and head offices.³ Includes eastern Canada offshore. ⁴ Includes western Canada offshore. ⁵ Includes Arctic Islands.

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

TABLE 8. CANADA, PRINCIPAL STATISTICS OF THE MINERAL MANUFACTURING INDUSTRIES, 1992

	Mineral Manufacturing Activity								Total Activity ¹		
	Establish- ments	Production and Related Workers			Costs			Value Added	Employees	Salaries and Wages	Value Added
		Employees	Person- Hours Paid	Wages	Fuel and Electricity	Materials and Supplies	Value of Shipments				
	(number)	(number)	(000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(number)	(\$000)	(\$000)
PRIMARY METAL INDUSTRIES											
Smelting and refining	37	19 475	44 027	1 003 850	716 252	2 845 740	5 959 256	2 373 084	27 837	1 485 913	2 368 747
Primary steel	64	27 053	58 274	1 255 842	557 812	4 028 513	7 233 902	2 632 370	35 268	1 684 442	2 619 344
Wire and wire products industries ²	264	8 789	18 353	272 698	41 813	825 592	1 588 146	712 579	11 580	383 149	744 002
Steel pipe and tube	48	3 759	7 915	142 584	21 405	761 383	1 212 739	400 928	4 808	191 968	401 542
Iron foundries	80	6 478	13 888	258 892	70 603	321 773	946 148	554 460	7 394	303 256	548 302
Aluminum rolling, casting and extruding	67	3 946	8 942	150 862	36 383	1 167 009	1 597 921	412 490	4 998	206 226	408 833
Metal rolling, casting and extruding n.e.s.	91	4 547	9 477	146 050	27 072	381 665	725 740	319 748	5 100	174 014	314 457
Copper and alloy rolling, casting and extruding	38	1 795	37 777	61 825	12 692	229 201	369 515	128 962	2 066	72 815	126 889
Total	689	75 842	198 653	3 292 603	1 484 032	10 560 876	19 633 367	7 534 621	99 051	4 501 783	7 532 116
NONMETALLIC MINERAL PRODUCTS INDUSTRIES											
Ready-mix concrete	659	8 843	18 411	283 070	59 950	877 994	1 517 211	575 966	10 982	362 411	587 278
Cement	22	1 893	4 137	84 893	128 327	168 395	724 136	429 953	2 962	143 310	439 286
Glass products	143	4 641	9 768	141 849	19 885	264 741	595 800	314 105	5 490	176 342	360 592
Primary glass and glass containers	20	3 632	7 945	129 346	54 196	171 504	554 570	323 939	4 563	172 207	325 354
Mineral insulating products	40	1 884	4 018	61 789	32 088	131 503	383 378	217 449	2 775	104 034	277 897
Other concrete products	257	3 293	6 905	89 198	15 934	170 621	429 919	240 995	4 198	127 512	254 915
Structural concrete products	58	1 724	3 583	56 690	4 873	70 180	215 786	139 372	2 250	77 986	139 001
Other nonmetallic mineral products	148	2 002	4 213	57 885	10 291	96 217	276 322	167 562	2 603	80 652	172 647
Refractory products	27	1 028	2 137	32 362	5 955	77 470	185 359	103 169	1 532	55 295	113 894
Gypsum products	28	1 207	2 612	44 002	24 765	169 565	307 888	111 735	1 786	70 010	123 420
Concrete pipe	40	1 003	2 168	32 066	4 974	53 375	155 032	92 833	1 293	44 915	93 682
Lime	13	611	1 378	26 207	36 820	30 683	174 545	106 726	771	34 570	108 258
Abrasives	30	1 236	2 577	35 795	40 188	91 493	227 896	95 376	1 523	47 071	110 339
Clay products (domestic)	23	582	1 183	17 047	17 245	16 944	108 483	76 314	928	30 119	78 183
Clay products (imported)	37	1 045	2 084	27 529	5 877	37 246	113 519	70 000	1 276	36 249	72 258
Asbestos products industry	5	87	173	1 893	306	4 089	10 336	5 811	123	3 051	6 739
Total	1 550	34 711	73 292	1 121 621	461 674	2 432 020	5 980 180	3 071 305	45 055	1 565 734	3 263 743

TABLE 8 (cont'd)

	Mineral Manufacturing Activity								Total Activity ¹		
	Establish- ments	Production and Related Workers			Costs		Value of Shipments	Value Added	Employees	Salaries and Wages	Value Added
		Employees	Person- Hours Paid	Wages	Fuel and Electricity	Materials and Supplies					
	(number)	(number)	(000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(number)	(\$000)	(\$000)
FABRICATED METAL PRODUCTS INDUSTRIES											
Stamped and pressed metal products industries	933	23 404	48 856	687 463	86 010	2 283 928	3 979 651	1 615 854	28 512	895 423	1 695 565
Fabricated structural metal products industries	444	11 988	24 880	394 129	28 166	844 462	1 783 856	915 267	15 236	529 003	924 201
Hardware, tool and cutlery industry	779	15 883	33 583	506 793	28 951	591 834	1 693 787	1 069 985	19 084	654 392	1 098 771
Other metal fabricating industries	550	11 576	23 982	334 070	36 346	891 608	1 824 133	868 746	15 312	485 952	905 588
Machine shop industry	1 469	15 328	31 544	448 997	26 586	442 825	1 371 866	900 163	18 374	567 571	926 918
Ornamental and architectural metal products industries	754	12 629	26 099	335 085	23 760	891 741	1 729 385	809 151	16 523	492 838	828 778
Power boiler and heat exchanger industry	47	3 696	7 624	124 066	6 653	284 406	531 129	256 861	5 557	200 232	268 744
Heating equipment industry	119	3 172	6 538	77 565	5 608	216 774	458 937	238 030	4 107	111 496	240 729
Total	5 095	97 676	203 106	2 908 168	242 080	6 447 578	13 372 744	6 674 057	122 705	3 936 907	6 889 294
PETROLEUM AND COAL PRODUCTS INDUSTRIES											
Petroleum refining products	32	5 132	10 863	284 274	322 837	14 434 306	16 936 724	1 919 046	11 032	617 258	1 934 459
Lubricating oils and greases	28	566	1 203	20 243	6 545	158 439	249 980	85 598	993	39 299	100 550
Other petroleum and coal products	88	935	1 955	29 649	13 311	158 557	263 636	90 973	1 390	47 601	109 648
Total	148	6 633	14 021	334 166	342 693	14 751 302	17 450 340	2 095 617	13 415	704 158	2 144 657
Total mineral manufacturing industries	7 482	214 862	489 072	7 656 558	2 530 479	34 191 776	56 436 631	19 375 600	280 226	10 708 582	19 829 810

Source: Statistics Canada, catalogue no. 31-203.

n.e.s. Not elsewhere specified.

¹ Total activity includes sales and head offices. ² Wire and wire products have been included in the primary metal industries group.

TABLE 8a. CANADA, PRINCIPAL STATISTICS OF THE MINERAL MANUFACTURING INDUSTRIES, 1991 (revised)

	Mineral Manufacturing Activity								Total Activity ¹		
	Establish- ments	Production and Related Workers			Costs		Value of Shipments	Value Added	Employees	Salaries and Wages	Value Added
		Employees	Person- Hours Paid	Wages	Fuel and Electricity	Materials and Supplies					
	(number)	(number)	(000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(number)	(\$000)	(\$000)
PRIMARY METAL INDUSTRIES											
Smelting and refining	36	20 006	43 798	954 933	594 819	2 767 593	5 873 880	2 515 718	28 817	1 424 983	2 544 680
Primary steel	63	29 282	61 677	1 277 185	522 127	3 794 421	6 826 510	2 472 013	38 126	1 735 019	2 466 248
Wire and wire products industries ²	274	9 552	19 841	281 946	40 141	875 134	1 550 156	620 143	12 369	397 305	656 795
Steel pipe and tube	48	4 458	9 325	169 698	20 085	1 026 188	1 590 376	537 988	5 618	224 167	537 451
Iron foundries	84	6 537	13 802	253 240	65 467	342 781	897 381	484 206	7 680	311 277	489 632
Aluminum rolling, casting and extruding	64	4 007	8 843	148 799	32 053	1 034 703	1 473 404	393 939	5 169	210 410	392 016
Metal rolling, casting and extruding n.e.s.	100	4 008	8 409	128 132	25 450	446 666	775 754	299 456	4 710	161 598	297 277
Copper and alloy rolling, casting and extruding	43	1 840	3 788	58 503	12 920	261 678	413 888	140 803	2 211	76 566	140 619
Total	712	79 690	169 483	3 272 436	1 313 062	10 549 164	19 401 349	7 464 266	104 700	4 541 325	7 524 718
NONMETALLIC MINERAL PRODUCTS INDUSTRIES											
Ready-mix concrete	658	9 526	20 146	297 317	65 838	964 443	1 672 825	646 957	11 633	379 778	660 234
Cement	21	1 964	4 247	85 405	138 030	152 132	746 276	465 054	3 111	140 662	476 565
Glass products	155	4 747	9 917	142 099	18 727	260 224	586 880	307 642	5 660	178 557	357 377
Primary glass and glass containers	19	4 129	8 631	137 082	50 495	159 064	498 267	280 526	5 195	187 587	300 937
Mineral insulating products	42	1 989	4 244	64 048	33 160	146 058	401 845	220 404	2 956	111 300	287 532
Other concrete products	267	4 227	8 874	107 295	20 113	224 446	486 709	239 719	4 993	138 116	253 240
Structural concrete products	58	2 505	5 284	81 332	5 361	96 118	291 904	185 706	3 101	105 011	184 016
Other nonmetallic mineral products	158	2 710	5 700	72 795	12 709	116 320	296 505	174 310	3 206	91 413	180 598
Refractory products	29	1 154	2 369	34 953	6 677	73 837	197 608	111 912	1 668	56 885	127 254
Gypsum products	29	1 137	2 392	39 624	22 791	163 983	295 661	108 831	1 711	64 357	117 435
Concrete pipe	41	1 049	2 329	33 975	5 499	61 858	172 788	100 373	1 348	46 691	105 177
Lime	13	647	1 368	26 301	39 218	28 229	168 954	102 124	861	37 824	103 324
Abrasives	30	1 046	2 205	31 193	33 442	84 230	205 922	86 895	1 408	46 402	100 196
Clay products (domestic)	28	730	1 533	21 512	14 983	14 808	106 749	69 693	1 036	33 546	71 139
Clay products (imported)	39	1 032	2 089	26 348	5 827	32 871	105 473	67 237	1 218	33 681	69 290
Asbestos products industry	6	164	377	4 442	380	8 191	17 220	8 099	229	7 031	9 702
Total	1 593	38 756	81 707	1 205 721	473 250	2 586 812	6 251 586	3 175 482	49 334	1 658 841	3 404 016

TABLE 8a (cont'd)

	Establish- ments	Mineral Manufacturing Activity							Total Activity ¹		
		Production and Related Workers			Costs		Value of Shipments	Value Added	Employees	Salaries and Wages	Value Added
		Employees	Person- Hours Paid	Wages	Fuel and Electricity	Materials and Supplies					
	(number)	(number)	(000)	(\$000)	(\$000)	(\$000)	(\$000)	(\$000)	(number)	(\$000)	(\$000)
FABRICATED METAL PRODUCTS INDUSTRIES											
Stamped and pressed metal products industries	963	24 932	52 724	713 004	84 394	2 158 718	3 950 549	1 682 420	30 348	927 153	1 750 726
Fabricated structural metal products industries	469	15 099	31 248	490 799	31 392	1 079 018	2 235 906	1 117 521	18 667	637 978	1 136 528
Hardware, tool and cutlery industry	815	19 559	40 873	591 512	31 303	584 874	1 660 346	1 035 594	21 912	688 310	1 064 639
Other metal fabricating industries	596	13 087	27 357	372 422	38 821	995 685	2 001 972	962 543	16 770	516 627	1 007 093
Machine shop industry	1 564	21 198	44 121	593 473	40 440	553 048	1 493 641	901 720	23 092	656 780	923 203
Ornamental and architectural metal products industries	784	15 966	32 888	415 224	27 419	1 026 021	1 961 590	895 119	19 885	566 788	915 900
Power boiler and heat exchanger industry	42	3 211	6 908	120 381	6 559	235 636	568 003	286 955	5 081	199 180	297 021
Heating equipment industry	142	4 265	8 861	101 613	6 657	251 630	502 269	243 906	5 246	136 042	248 245
Total	5 375	117 317	244 980	3 398 428	266 985	6 884 630	14 374 276	7 125 778	141 001	4 328 858	7 343 355
PETROLEUM AND COAL PRODUCTS INDUSTRIES											
Petroleum refining products	33	5 582	11 713	301 828	382 237	14 248 136	17 512 636	2 234 534	12 459	680 969	2 227 092
Lubricating oils and greases	28	649	1 426	23 076	6 558	181 595	275 000	85 990	1 046	40 154	99 683
Other petroleum and coal products	79	789	1 677	24 992	14 052	178 412	278 799	83 375	1 138	38 705	99 586
Total	140	7 020	14 815	349 896	402 847	14 608 143	18 066 435	2 403 899	14 643	759 828	2 426 361
Total mineral manu- facturing industries	7 820	242 783	510 984	8 226 481	2 456 144	34 628 749	58 093 646	20 169 425	309 678	11 288 852	20 698 450

Source: Statistics Canada, catalogue no. 31-203.

n.e.s. Not elsewhere specified.

¹ Total activity includes sales and head offices. ² Wire and wire products have been included in the primary metal industries group.

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

TABLE 9. CANADA, MINING WAGES AND SALARIES BY PROVINCE AND BY MINERAL CLASS, 1991 AND 1992

	1991					1992				
	Metals	Nonmetals	Mineral Fuels	Quarries and Sand Pits	Total	Metals	Nonmetals	Mineral Fuels	Quarries and Sand Pits	Total
	(\$000)									
Newfoundland	149 002	3 894	—	2 049	154 944	156 928	4 591	—	1 579	163 098
Prince Edward Island	—	—	—	—	—	—	—	—	—	—
Nova Scotia	x	x	92 725	6 010	136 186	x	x	84 412	3 386	114 803
New Brunswick	x	x	6 249	x	122 498	72 964	x	5 722	x	133 262
Quebec	490 642	121 974	—	56 142	668 759	452 414	130 368	—	54 085	636 867
Ontario	880 280	54 747	13 905	84 784	1 033 717	794 571	55 608	11 077	74 541	935 797
Manitoba	178 687	4 237	2 939	3 922	189 786	x	x	2 884	3 198	194 496
Saskatchewan	x	143 991	76 664	x	268 819	x	147 224	81 996	x	272 356
Alberta	x	x	1 953 463	7 164	1 968 839	x	x	1 855 309	6 345	1 874 106
British Columbia	295 341	20 736	323 664	15 560	655 301	290 965	4 249	203 650	16 625	515 489
Yukon and Northwest Territories	138 738	—	16 842	—	155 580	123 858	—	8 527	—	132 385
Offshore	—	—	8 883	—	8 883	—	—	9 906	—	9 906
Total	2 253 556	434 736	2 495 334	179 685	5 363 311	2 119 328	435 531	2 263 483	164 222	4 982 564
Services incidental to mineral extraction ¹					1 293 110					1 050 941
Grand total					6 656 421					6 033 505

Sources: Natural Resources Canada; Statistics Canada.

— Nil; x Confidential.

¹ Includes establishments primarily engaged in providing contract drilling and other services to petroleum and natural gas industries.

TABLE 10. CANADA, CONSUMPTION OF FUEL AND ELECTRICITY IN THE MINERAL INDUSTRY,¹ 1992

	Unit	Metals	Industrials ²	Total
Coal	000 t	67	—	67
	\$000	3 799	—	3 799
Gasoline	000 litres	16 581	14 692	31 273
	\$000	7 376	7 339	14 715
Fuel oil, kerosene, diesel oil	000 litres	693 972	207 588	901 560
	\$000	150 423	60 199	210 622
Liquefied petroleum gas	000 litres	100 145	14 697	114 842
	\$000	18 450	3 121	21 571
Natural gas	000 m ³	122 581	622 774	745 355
	\$000	11 944	39 570	51 514
Other fuels ³	\$000	20 643	1 864	22 507
Total value of fuels	\$000	212 635	112 093	324 728
Electricity purchased	million kWh	11 347	2 485	13 832
	\$000	399 545	118 004	517 549
Total value of fuels and electricity purchased in the non-fuel mineral industry	\$000	612 179	230 096	842 275
Total value of fuels and electricity purchased in the fuel industry	\$000	..	..	537 032
Total value of fuels and electricity purchased in the mineral industry, all reporting companies	\$000	..	..	1 379 309

Sources: Natural Resources Canada; Statistics Canada.

— Nil; .. Not available.

¹ Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. ² Includes structural materials. ³ Includes wood, manufactured gas, steam purchased, and other miscellaneous fuels.

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

TABLE 11. CANADA, EMPLOYMENT, SALARIES AND WAGES IN THE MINERAL INDUSTRY,¹ 1985-92

	Unit	1985	1986	1987	1988	1989	1990	1991	1992
METALS									
Production and related workers	Number	36 618	34 941	34 329	36 140	37 451	33 895	31 168	27 908
Salaries and wages	\$000	1 288 990	1 308 956	1 327 119	1 539 838	1 707 653	1 674 050	1 627 254	1 532 118
Annual average salary and wage	\$	35 201	37 462	38 659	42 608	45 597	49 389	52 209	54 899
Administrative and office workers	Number	12 054	11 546	11 167	12 137	11 954	11 353	10 924	9 866
Salaries and wages	\$000	487 398	489 402	489 609	561 205	600 238	603 486	626 302	587 210
Annual average salary and wage	\$	40 435	42 387	43 844	46 239	50 212	53 157	57 333	59 519
Total metals									
Employees	Number	48 672	46 487	45 496	48 277	49 405	45 248	42 092	37 774
Salaries and wages	\$000	1 776 388	1 798 358	1 816 728	2 101 043	2 307 891	2 277 536	2 253 556	2 119 328
Annual average salary and wage	\$	36 497	38 685	39 932	43 521	46 714	50 335	53 539	56 105
INDUSTRIALS²									
Production and related workers	Number	12 535	12 376	12 989	12 969	12 976	12 702	11 699	11 107
Salaries and wages	\$000	354 460	361 039	401 626	429 111	440 750	438 725	427 512	427 276
Annual average salary and wage	\$	28 278	29 173	30 920	33 087	33 967	34 540	36 543	38 469
Administrative and office workers	Number	4 380	4 887	4 930	4 627	4 619	4 189	4 139	3 650
Salaries and wages	\$000	148 090	169 237	183 979	189 650	191 558	181 420	186 909	172 477
Annual average salary and wage	\$	33 811	34 630	37 318	40 988	41 472	43 309	45 158	47 254
Total industrials									
Employees	Number	16 915	17 263	17 919	17 596	17 595	16 891	15 838	14 757
Salaries and wages	\$000	502 550	530 276	585 605	618 761	632 308	620 145	614 421	599 753
Annual average salary and wage	\$	29 710	30 717	32 681	35 165	35 937	36 715	38 794	40 642
FUELS									
Production and related workers	Number	17 792	17 043	17 052	18 251	18 277	17 660 ^r	17 499 ^r	15 768
Salaries and wages	\$000	703 634	708 529	716 189	780 402	837 158	828 061 ^r	872 255 ^r	774 234
Annual average salary and wage	\$	39 548	41 573	42 000	42 759	45 804	46 889 ^r	49 846 ^r	49 102
Administrative and office workers	Number	33 004	28 640	27 209	26 633	25 698	25 283	24 768	21 636
Salaries and wages	\$000	1 438 982	1 408 406	1 330 835	1 376 003	1 455 629	1 408 133	1 563 624	1 489 249
Annual average salary and wage	\$	43 600	49 176	48 912	51 665	56 644	55 695	63 131	68 832
Total fuels									
Employees	Number	50 796	45 683	44 261	44 884	43 975	42 943 ^r	42 267 ^r	37 404
Salaries and wages	\$000	2 142 616	2 116 935	2 047 024	2 156 405	2 292 787	2 236 194 ^r	2 435 879 ^r	2 263 483
Annual average salary and wage	\$	42 181	46 340	46 249	48 044	52 138	52 074 ^r	57 631 ^r	60 514
TOTAL MINERAL INDUSTRY									
Production and related workers	Number	66 945	64 360	64 370	67 360	68 704	64 257 ^r	60 366 ^r	54 783
Salaries and wages	\$000	2 347 084	2 378 524	2 444 934	2 749 351	2 985 561	2 940 836 ^r	2 927 021 ^r	2 733 628
Annual average salary and wage	\$	35 060	36 957	37 983	40 816	43 455	45 767 ^r	48 488 ^r	49 899
Administrative and office workers	Number	49 438	45 073	43 306	43 397	42 271	40 825	39 831	35 152
Salaries and wages	\$000	2 074 470	2 067 045	2 004 423	2 126 857	2 247 425	2 193 039	2 376 835	2 248 936
Annual average salary and wage	\$	41 961	45 860	46 285	49 009	53 167	53 718	59 673	63 977
Total mineral industry									
Employees	Number	116 383	109 433	107 676	110 757	110 975	105 082 ^r	100 197 ^r	89 935
Salaries and wages	\$000	4 421 553	4 445 569	4 449 357	4 876 209	5 232 986	5 133 875 ^r	5 303 856 ^r	4 982 564
Annual average salary and wage	\$	37 991	40 624	41 322	44 026	47 155	48 856 ^r	52 934 ^r	55 402

Sources: Natural Resources Canada; Statistics Canada.

^r Revised.¹ Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. ² Includes structural materials.

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

TABLE 12. CANADA, CRUDE MINERALS TRANSPORTED BY CANADIAN RAILWAYS, 1990-92

	1990	1991	1992
	(000 tonnes)		
METALLIC MINERALS			
Iron ores and concentrates	35 801	38 602	34 052
Alumina and bauxite	3 909	4 236	4 721
Nickel-copper ores and concentrates	3 262	3 377	3 007
Zinc ores and concentrates	973	886	1 251
Copper ores and concentrates	1 049	1 040	1 046
Lead ores and concentrates	192	122	180
Metallic ores and concentrates, n.e.s.	46	22	131
Nickel ores and concentrates	7	14	40
Total	45 239	48 296	44 428
NONMETALLIC MINERALS			
Potash (KCl)	11 317	10 740	10 627
Gypsum	5 258	4 227	4 540
Sulphur, n.e.s.	4 925	4 893	3 547
Sulphur, liquid	568	1 235	1 907
Salt, rock	934	637	1 140
Limestone, n.e.s.	1 955	1 191	1 005
Phosphate rock	1 040	950	996
Sodium carbonate	531	457	474
Nepheline syenite	294	296	331
Sodium sulphate	519	264	275
Limestone, industrial	173	253	250
Sand, industrial	275	185	189
Clay	109	102	94
Nonmetallic minerals, n.e.s.	105	88	69
Salt, n.e.s.	77	71	66
Limestone, agricultural	6	3	22
Stone, n.e.s.	46	35	20
Abrasives, natural	9	5	13
Barite	14	20	7
Silica	2	1	2
Asbestos	3	3	1
Sand, n.e.s.	2	1	1
Peat and other mosses	2	1	1
Total	28 164	25 658	25 577
MINERAL FUELS			
Coal, bituminous	36 861	39 120	31 368
Coal, lignite	1 757	1 298	—
Natural gas and other crude bituminous substances	70	42	31
Oil, crude	8	6	9
Coal, n.e.s.	5	—	—
Total	38 701	40 465	31 408
Total crude minerals	112 104	114 419	101 413
Total revenue freight ¹ moved by Canadian railways	226 338	233 290	226 166
Crude minerals as a percentage of total revenue freight	49.5	49.0	44.8

Source: Statistics Canada.

— Nil; n.e.s. Not elsewhere specified.

¹ Revenue freight refers to a local or interline shipment from which earnings accrue to a carrier.

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

TABLE 13. CANADA, FABRICATED MINERAL PRODUCTS TRANSPORTED BY CANADIAN RAILWAYS, 1990-92

	1990	1991	1992
	(000 tonnes)		
METALLIC MINERAL PRODUCTS			
Ferrous mineral products			
Iron and steel scrap	1 251	1 049	1 003
Sheets and strips, steel	1 053	957	953
Bars and rods, steel	571	449	762
Ingots, blooms, billets, slabs of iron and steel	658	553	536
Pipes and tubes, iron and steel	265	407	502
Structural shapes and sheet piling, iron and steel	239	212	202
Plates, steel	193	168	188
Rails and railway track material	68	42	73
Castings and forgings, iron and steel	53	45	48
Pig iron	40	22	34
Ferroalloys	17	9	13
Other primary iron and steel	6	4	4
Wire, iron or steel	2	1	2
Total ferrous mineral products	4 416	3 919	4 320
Nonferrous mineral products			
Aluminum and aluminum alloy fabricated material, n.e.s.	703	777	818
Zinc and alloys	389	383	425
Aluminum paste, powder, pigs, ingots, shot	377	378	410
Copper and alloys, n.e.s.	381	396	401
Other nonferrous base metals and alloys	120	104	140
Lead and alloys	87	114	132
Slag, dross, etc.	51	63	67
Nonferrous metal scrap	56	52	41
Copper matte and precipitates	1	2	5
Total nonferrous mineral products	2 165	2 269	2 439
Total metallic mineral products	6 581	6 188	6 759
NONMETALLIC MINERAL PRODUCTS			
Sulphuric acid	2 102	1 990	2 626
Fertilizers and fertilizer materials, n.e.s.	2 143	2 285	2 203
Portland cement, standard	1 559	1 400	1 259
Cement and concrete basic products, n.e.s.	189	163	223
Lime, hydrated and quick	181	181	209
Natural stone basic products, chiefly structural	115	123	150
Nonmetallic mineral basic products, n.e.s.	159	128	127
Gypsum basic products, n.e.s.	45	17	31
Dolomite and magnesite, calcined	15	16	28
Asbestos and asbestos-cement basic products	25	20	16
Refractories, n.e.s.	4	8	3
Fire brick and similar shapes	6	6	2
Plaster	2	4	2
Glass basic products	3	7	1
Bricks and tiles, clay	3	—	1
Total nonmetallic mineral products	6 551	6 347	6 881
MINERAL FUEL PRODUCTS			
Refined and manufactured gases, fuel type	2 377	2 416	2 945
Fuel oil, n.e.s.	1 185	1 235	1 249
Diesel fuel	1 349	896	817
Gasoline	531	511	610
Other petroleum and coal products	442	367	465
Coke, n.e.s.	355	363	390
Petroleum coke	266	333	325
Lubricating oils and greases	267	213	224
Asphalts and road oils	191	214	216
Total mineral fuel products	6 963	6 547	7 241
Total fabricated mineral products	20 095	19 081	20 881
Total revenue freight ¹ moved by Canadian railways	226 338	233 290	226 166
Fabricated mineral products as a percentage of total revenue freight	8.9	8.2	9.2

Source: Statistics Canada.

— Nil; n.e.s. Not elsewhere specified.

¹ Revenue freight refers to a local or interline shipment from which earnings accrue to a carrier.

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

TABLE 14. CANADA, CRUDE MINERALS LOADED AND UNLOADED IN COASTWISE SHIPPING, 1993

	Loaded					Unloaded				
	Atlantic	St. Lawrence	Great Lakes	Pacific	Total	Atlantic	St. Lawrence	Great Lakes	Pacific	Total
	(tonnes)									
METALLIC MINERALS										
Iron ore and concentrates	—	6 925 132	51 938	—	6 977 070	—	726 768	6 250 302	—	6 977 070
Aluminum ores and concentrates	—	16 434	—	—	16 434	—	—	16 434	—	16 434
Other ores and concentrates	—	1 701 970	226 411	—	1 928 381	—	1 701 970	226 411	—	1 928 381
Total metallic minerals	—	8 643 536	278 349	—	8 921 885	—	2 428 738	6 493 147	—	8 921 885
NONMETALLIC MINERALS										
Salt	1 264 682	—	1 254 451	11 511	2 530 644	397 254	1 204 822	917 056	11 511	2 530 644
Limestone	—	—	1 213 497	640 618	1 854 116	—	—	1 213 497	640 618	1 854 116
Sand and gravel	104 825	—	237 293	1 203 599	1 545 717	104 825	—	—	1 203 599	1 545 717
Gypsum	624 063	—	—	47 820	671 883	33 314	407 321	183 428	47 820	671 883
Potash	—	—	60 173	—	60 173	—	14 907	45 266	—	60 173
Sulphur	—	—	—	2 734	2 734	—	—	—	2 734	2 734
Other mineral products (including clays, coal briquettes, greases and asphalt)	1 246 851	340 484	1 756 833	43 099	3 387 267	1 068 360	889 924	1 386 103	42 880	3 387 267
Total nonmetallic minerals	3 240 421	340 484	4 522 247	1 949 381	10 052 534	1 603 753	2 516 974	3 745 350	1 949 162	10 052 534
MINERAL FUELS										
Coal and coke	—	9 000	1 990 771	—	1 999 771	—	88 572	1 911 199	—	1 999 771
Crude petroleum	—	—	13 389	100 197	113 586	100 197	—	13 389	—	113 586
Total mineral fuels	—	9 000	2 004 160	100 197	2 113 357	100 197	88 572	1 924 588	—	2 113 357
Total crude minerals	3 240 421	8 993 020	6 804 756	2 049 578	21 087 775	1 703 950	5 034 284	12 163 085	1 949 162	20 850 481
Total all commodities ¹	6 060 028	12 261 470	14 345 625	17 308 533	49 975 656	5 266 230	12 208 466	15 301 097	17 199 863	49 975 656
Crude minerals as a percentage of all products	53.5	73.3	47.4	11.8	42.2	32.4	41.2	79.5	11.3	41.7

Source: Statistics Canada.

— Nil.

¹ Includes metallic minerals, nonmetallic minerals and mineral fuels, along with all other cargo loaded and unloaded in coastwise shipping.

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

TABLE 15. CANADA, FABRICATED MINERALS LOADED AND UNLOADED IN COASTWISE SHIPPING, 1993

TABLE 101 CANADA, FABRICATED MINERAL PRODUCTS AND COMMODITIES IN EXPORTS AND IMPORTS, 1993

	Loaded					Unloaded				
	Atlantic	St. Lawrence	Great Lakes	Pacific	Total	Atlantic	St. Lawrence	Great Lakes	Pacific	Total
	(tonnes)									
METALLIC MINERAL PRODUCTS										
Iron, steel and alloys	1 404	24 913	26 397	4 133	56 847	18 651	26 692	7 366	4 138	21 410
Aluminum and aluminum products	—	28 889	—	—	28 889	—	28 889	—	—	28 889
Other base-metal products	4 943	194 825	—	4 500	204 267	11 771	187 996	—	4 500	204 267
Total metallic mineral products	6 347	248 627	26 397	8 633	290 004	30 422	243 577	7 366	8 638	290 003
NONMETALLIC MINERAL PRODUCTS										
Cement and related products	419	—	406 894	61 378	468 691	419	16 328	390 566	61 378	468 691
Other fabricated nonmetallic minerals, n.e.s.	11 020	48 982	52 827	220 495	333 324	35 007	32 474	45 349	220 495	333 325
Total nonmetallic mineral products	11 439	48 982	459 721	281 873	802 015	35 426	48 802	435 915	281 873	802 016
MINERAL FUEL PRODUCTS										
Gasoline	899 632	865 545	257 843	531 396	2 554 416	947 233	782 556	293 231	531 396	2 554 416
Petroleum coke	—	—	—	—	—	—	—	—	—	—
Other fabricated mineral fuels, n.e.s.	1 425 763	1 574 102	922 353	599 812	4 522 030	1 568 858	1 513 236	848 669	591 265	4 522 028
Total mineral fuel products	2 325 395	2 439 647	1 180 196	1 131 208	7 076 446	2 516 091	2 295 792	1 141 900	1 122 661	7 076 444
Total fabricated mineral products	2 343 181	2 737 256	1 666 314	1 421 714	8 168 465	2 581 939	2 588 171	1 585 181	1 413 172	8 168 463
Total all commodities ¹	6 060 028	12 261 470	14 345 625	17 308 533	49 975 656	5 266 230	12 208 466	15 301 097	17 199 863	49 975 656
Fabricated minerals as a percentage of all commodities	38.7	22.3	11.6	8.2	16.3	49.0	21.2	10.4	8.2	16.3

Source: Statistics Canada.

— Nil; n.e.s. Not elsewhere specified.

¹ Includes metallic mineral products, nonmetallic mineral products and mineral fuel products, along with all other cargo loaded and unloaded in coastwise shipping.

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

TABLE 16. CANADA, CRUDE MINERALS LOADED AND UNLOADED AT CANADIAN PORTS IN INTERNATIONAL SHIPPING TRADE,¹ 1991-93

	1991		1992		1993	
	Loaded	Unloaded	Loaded	Unloaded	Loaded	Unloaded
(tonnes)						
METALLIC MINERALS						
Iron ore and concentrates	28 842 400	5 530 400	26 181 230	5 401 658	27 302 851	6 225 081
Aluminum ores and concentrates	755	2 506 141	206	2 597 421	56 640	2 708 218
Lead and zinc ores and concentrates	620 254	302 976	630 641	369 808	681 955	285 744
Copper and nickel ores and concentrates	1 196 012	97 223	1 055 909	127 739	917 920	234 293
Other ores and base-metal products	1 074 545	78 048	1 001 411	277 730	1 397 088	340 882
Total metallic minerals	31 733 966	8 514 788	28 869 397	8 774 356	30 356 454	9 794 218
NONMETALLIC MINERALS						
Limestone	1 238 636	417 760	1 525 801	2 007 454	2 362 180	2 663 411
Sand and gravel	494 771	1 348 947	584 135	1 346 022	706 779	1 710 088
Gypsum	4 779 328	260 324	4 934 822	266 173	5 629 219	290 415
Salt	2 564 940	677 604	2 363 201	772 021	3 144 915	655 322
Sulphur	4 544 358	2 234	3 706 559	14	3 011 867	482
Potash	6 079 029	30 068	5 069 877	109	4 524 907	6 558
Other mineral products (including clays, coal, briquettes, greases and asphalt)	4 490 644	2 928 547	2 813 131	2 619 601	2 569 221	2 638 689
Total nonmetallic minerals	24 191 706	5 665 484	20 997 526	7 011 394	21 949 088	7 964 965
MINERAL FUELS						
Coal and coke	32 750 231	11 362 713	27 606 538	12 882 982	28 191 082	9 024 932
Crude petroleum	1 489 166	18 018 389	1 126 694	16 488 431	921 273	20 938 720
Other mineral fuels	—	—	—	—	—	—
Total mineral fuels	34 239 397	29 381 102	28 733 232	29 371 413	29 112 355	29 963 652
Total crude mineral products	90 165 069	43 561 374	78 600 155	45 157 163	81 417 897	47 722 835
Total all commodities ¹	168 030 334	65 863 148	153 786 355	69 369 223	152 161 869	72 009 073
Crude minerals as a percentage of all commodities	53.7	66.1	51.1	65.1	53.5	66.3

Source: Statistics Canada.

. . Not available; n.e.s. Not elsewhere specified.

¹ Includes metallic mineral products, nonmetallic mineral products and mineral fuel products, along with all other cargo loaded and unloaded at Canadian ports.

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

TABLE 17. CANADA, FABRICATED MINERALS LOADED AND UNLOADED AT CANADIAN PORTS IN INTERNATIONAL SHIPPING TRADE,¹ 1991-93

	1991		1992		1993	
	Loaded	Unloaded	Loaded	Unloaded	Loaded	Unloaded
(tonnes)						
METALLIC MINERALS						
Iron, steel and alloys	2 745 360	1 309 350	2 186 859	1 220 731	1 654 602	2 004 280
Nonferrous metals, n.e.s.	1 194 058	2 940 088	1 138 551	3 503 298	1 203 432	3 806 560
Total metallic minerals	3 939 418	4 249 438	3 325 410	4 724 029	2 858 034	5 810 840
NONMETALLIC MINERALS						
Cement and related products	1 552 827	396 660	1 663 864	283 935	2 060 410	150 121
Other nonmetallic minerals, n.e.s.	1 666 767	1 532 368	1 456 179	1 060 617	1 665 939	1 098 402
Total nonmetallic minerals	3 219 594	1 929 028	3 120 043	1 344 552	3 726 349	1 248 523
MINERAL FUELS						
Gasoline	2 743 888	628 298	2 471 471	975 292	2 929 309	1 455 239
Fuel oil	4 486 712	4 293 526	3 825 015	4 209 834	4 659 986	3 088 207
Coke, petroleum and coal products	311 138	684 225	245 481	852 349	501 535	914 819
Other mineral fuels, n.e.s.	1 437 542	1 202 321	1 655 145	1 296 153	2 047 851	1 459 897
Total mineral fuels	8 979 280	6 808 370	8 197 112	7 333 628	10 138 681	6 918 162
Total fabricated minerals	16 138 292	12 986 836	14 642 565	13 402 209	16 723 064	13 977 525
Total all commodities ¹	168 030 334	65 863 148	153 786 355	69 369 223	152 161 869	72 009 073
Fabricated minerals as a percentage of all commodities	9.6	19.7	9.5	19.3	11.0	19.4

Source: Statistics Canada.

n.e.s. Not elsewhere specified.

¹ Includes metallic minerals, nonmetallic minerals and mineral fuels, along with all other cargo loaded and unloaded at Canadian ports.

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

TABLE 18. CANADA, SOURCE OF MATERIAL HOISTED OR REMOVED FROM SELECTED TYPES OF MINES, 1992

SELECTED TYPES OF MINES, 1992

	Underground		Open-Pit			
	Ore	Waste	Ore	Waste	Over-burden	Tailings
	(000 tonnes)					
METALS						
Gold	17 746	3 217	3 095	15 212	—	20 466
Silver-lead-zinc	13 288	153	18	711	—	11 183
Uranium	1 345	241	217	8 530	796	2 012
Iron	672	1	80 852	42 695	6 178	48 766
Nickel-copper-zinc	26 980	5 613	90 621	102 974	6 102	112 733
Miscellaneous metals	973	22	9 707	12 847	—	10 643
Total metals	61 005	9 247	184 511	182 969	13 077	205 804
NONMETALS						
Asbestos	1 637	—	12 200	25 407	4 390	7 456
Gypsum	938	68	7 019	2 230	3 411	678
Potash	32 152	23	..	..	..	20 256
Rock salt	9 966	—	—	—	—	802
Miscellaneous nonmetals	272	31	2 192	1 201	137	743
Total nonmetals	44 965	122	21 411	28 837	7 938	29 936
FUEL						
Coal	5 388	..	76 027	..	..	..
Total metals, nonmetals and fuel	111 358	9 369	281 948	211 806	21 015	235 740

Sources: Natural Resources Canada; Statistics Canada.

— Nil; .. Not available.

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

TABLE 19. CANADA, SOURCE OF ORES HOISTED OR REMOVED FROM SELECTED TYPES OF MINES, 1990-92

Mines	1990			1991			1992		
	Underground	Open-Pit	Total	Underground	Open-Pit	Total	Underground	Open-Pit	Total
(000 tonnes)									
METALS									
Gold	19 924.2	2 878.1	22 802.4	18 450.6	4 400.1	22 850.7	17 746.5	3 095.4	20 841.9
Silver-lead-zinc	11 487.3	189.4	11 676.7	12 345.9	226.3	12 572.2	13 288.0	18.0	13 306.0
Uranium	4 781.0	1 107.3	5 888.3	1 852.8	454.7	2 307.5	1 345.1	217.1	1 562.1
Iron	757.7	91 387.9	92 145.6	977.2	97 202.2	98 179.4	671.6	80 852.3	81 524.0
Nickel-copper-zinc	27 156.1	102 545.3	129 701.5	27 533.6	91 020.0	118 553.6	26 980.0	90 621.4	117 601.4
Miscellaneous metals	995.6	17 363.3	18 358.9	1 007.7	15 882.4	16 890.1	973.3	9 706.7	10 680.0
Total metals	65 102.0	215 471.4	280 573.4	62 167.8	209 185.7	271 353.5	61 004.5	184 510.9	245 515.4
NONMETALS									
Asbestos	1 463.4	13 020.4	14 483.7	2 328.4	11 369.5	13 697.9	1 637.0	12 200.2	13 837.2
Gypsum	1 201.5	7 829.2	9 030.7	736.9	6 465.9	7 202.8	938.0	7 018.7	7 956.7
Potash	31 760.0	..	31 760.0	32 577.8	..	32 577.8	32 152.0	..	32 152.0
Rock salt	11 225.8	—	11 225.8	11 034.8	—	11 034.8	9 966.2	—	9 966.2
Miscellaneous nonmetals	424.4	1 759.3	2 183.8	260.1	1 749.5	2 009.6	271.9	2 191.9	2 463.8
Total nonmetals	46 075.1	22 608.8	68 683.9	46 938.0	19 585.0	66 523.0	44 965.1	21 410.8	66 375.9
FUEL									
Coal	4 951.4	84 510.7	89 462.0	5 558.8	84 731.8 ^r	90 290.6 ^r	5 387.9	76 026.7	81 414.6
Total metals, nonmetals and fuel	116 128.4	322 590.9	438 719.4	114 664.6	313 502.5	428 167.1 ^r	111 357.6	281 948.3	393 305.9
Percentage	26.5	73.5	100.0	28.9	73.2	100.0	28.3	71.7	100.0

Sources: Natural Resources Canada; Statistics Canada.

— Nil; .. Not available; ^r Revised.

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

TABLE 20. CANADA, ORE MINED AND ROCK QUARRIED IN THE MINING INDUSTRY, 1987-92

	1987	1988	1989	1990	1991	1992
	(000 tonnes)					
METALS						
Gold	15 326	18 746	20 335	22 802	22 851	20 842
Silver-lead-zinc	15 147	12 758	12 785	11 677	12 572	13 306
Uranium	6 383	6 337	6 404	5 888	2 308	1 562
Iron	87 077	102 392	99 962	92 146	98 179	81 524
Nickel-copper-zinc	130 452	127 119	126 169	129 701	118 554	117 601
Miscellaneous metals	11 787	14 747	18 135	18 359	16 890	10 680
Total metals	266 172	282 098	283 791	280 573	271 353	245 515
NONMETALS						
Asbestos	13 526	15 373	17 147	14 484	13 698	13 837
Gypsum	9 439	9 204	9 499	9 031	7 203	7 957
Potash	34 875	38 965	34 494	31 760	32 578	32 152
Rock salt	7 091	7 960	8 560	11 226	11 035	9 966
Miscellaneous nonmetals	3 564	1 737	1 985	2 184	2 010	2 464
Total nonmetals	68 496	73 239	71 685	68 684	66 523	66 376
STRUCTURAL MATERIALS						
Stone, all kinds quarried ¹	113 291	120 126	119 335	111 355	87 807	89 338
Stone used to make cement	12 543	12 539	13 899	12 991	9 719	10 360
Stone used to make lime	3 134	2 346	2 162	2 367	2 354	3 142
Total structural materials	128 969	135 010	135 395	126 713	99 879	102 840
FUELS						
Coal	77 452	89 256	87 683	89 462	90 290	81 415
Total ore mined and rock quarried	541 088	579 603	578 554	565 433	528 046 ^r	496 146

Sources: Natural Resources Canada; Statistics Canada.

^r Revised.¹ Excludes stone used to manufacture cement and lime in Canada.

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

