a report on the state of the Canadian mining industry

facts + figures | 2009

The Mining Association of Canada

L'Association minière du Canada

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The Mining Association of Canada

The Mining Association of Canada (MAC) is the national organization of the Canadian mining industry. It comprises companies engaged in mineral exploration, mining, smelting, refining and semi-fabrication. Member companies account for the majority of Canada's output of metals and industrial materials.

The Association's functions are to promote the interests of the industry nationally and internationally, to work with governments on policies affecting minerals, to inform the public and to promote cooperation between member firms to solve common problems. MAC works closely with provincial and territorial mining associations and other industries, as well as with environmental and community groups across Canada and internationally.

Data and Sources

This annual report reflects currently available data, most of them for 2008, though with some data also from 2009 and 2007. A number of statistical differences occurred in 2002, reflecting a change from Standard Industrial Classification (SIC) statistics to the North American Industrial Classification System (NAICS). The value figures are generally expressed in Canadian dollars except as indicated otherwise.

Author: Paul Stothart, Vice-President, Economic Affairs, Mining Association of Canada

Editing/Design:
gordongroup marketing + communications

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The Canadian Mining Industry— Activities and Key Issues

The mining industry is an important contributor to Canada's economic strength. The industry employs 351,000 Canadians in mineral extraction and in the value-added smelting, fabrication and manufacturing areas.

The industry's $40 billion contribution to Canada's gross domestic product in 2008 includes $9 billion in mineral extraction and $31 billion in mineral processing and manufacturing.

Internationally, Canada is one of the world's leading mining countries and ranks among the largest producers of minerals and metals. The industry accounts for 19% of annual Canadian goods exports. Key exports in 2008 include aluminum, nickel, copper, gold, uranium, coal, potash, zinc, diamonds, iron and steel, and iron ore. Exports of these products in 2008 each ranged from $1.9 billion to $17 billion in value. Consequently, an estimated 70% of Canadian port volumes and 55% of rail freight revenues are generated by the mining industry. As well, some 3140 suppliers provide expertise to the industry, including hundreds of engineering firms, environmental firms, and legal and financial firms. Canada was the leading destination for global exploration spending in 2008, attracting 19% of world spending, followed by Australia at 14% and the United States at 7%.

While the industry is important at the local community level, it also contributes to the economy of Canada's larger cities. Toronto is a global hub for mining finance—the TSX has handled 81% of worldwide mining equity transactions over the past five years. Vancouver is home to the world's leading cluster of exploration companies, while Montreal houses important aluminum and iron ore companies, Edmonton has become a global centre for oil sands expertise and Saskatoon for uranium and potash. Mining is also the largest private-sector employer of Aboriginal Canadians and stands to offer increased opportunity to this segment of Canadian society.

Mining and its related industries are important contributors to federal, provincial and territorial coffers. According to a recent study for MAC, the industry paid an estimated $11.5 billion in taxes and royalties to federal and provincial/territorial governments in 2008. Including the fourth stage of industry activity, fabricated metal product manufacturing, would add a further amount of around $2.1 billion. This payments-to-governments total actually reached a record high in 2008, despite the economic downturn in the fourth quarter. Payments will undoubtedly decline in 2009 in line with the global recession and reduced demand for minerals and metals.

Average weekly wages and salaries in the mining industry were $1,347 in 2008. The average weekly earnings for a mining industry worker in 2008 were 44%, 42%, 35% and 33% higher than those of workers in the forestry, manufacturing, finance and construction sectors respectively.

Canadian mining companies are active investors in research and development. Companies invested a total of $648 million in 2006, the most recent year for which reliable data are available. Statistics Canada reports that 6848 R&D employees work in the minerals and metals industry, including the fabricated metals products segment. This is higher than individual totals for the agri-food, oil and gas, electrical equipment, automotive, aerospace and pharmaceutical sectors.

Key Issues Facing the Canadian Mining Industry

After seven years of growth, the global price of many minerals and metals collapsed in the third quarter of 2008 as the global recession took hold. Companies responded quickly to falling prices and demand—there were an estimated 32 temporary mine closures, deferred mine expansions and investments, and reduced operation of processing facilities announced in Canada in late 2008 and early 2009.

There are signs of recovery as of mid-2009, with price increases in some metals, continued strength in gold and some positive announcements in the oil sands, among other indicators. Medium- and long-term prospects remain strong for the Canadian and global mining industry—as middle-class economic growth continues in China and India, as the challenge of bringing new discoveries into commercial production remains, and as stimulus spending works through the American, European and other economies. There are, however, a number of challenges faced by industry and actions required of governments as Canadian companies aim to prosper from this future growth.

1. INVESTING IN GEOSCIENCE AND STRENGTHENING CANADA'S MINERAL RESERVES

Investment by the federal and provincial governments in geoscience has declined by one-half since 1988, with the result that important Canadian regions remain poorly mapped. Canada's reserves of base and precious metals have also declined significantly—generally by 50–80%—over the past quarter-century. Unless new and effective exploration is undertaken, reserves of key minerals will remain at critically low levels thereby weakening the business case for investing in value-added facilities. The federal Geo-mapping for Energy and Minerals (GEM) program, a five-year, $100 million re-investment in geological mapping that will also spark enhanced provincial spending, is a positive development for the long-term prosperity of the industry and its employees and suppliers. This program, and the related Targeted Geoscience Initiative, should be a permanent, not temporary, part of the Canadian mining landscape and should be funded as such.

2. IMPROVED TAX TREATMENT IN NICHE AREAS

The Canadian mining industry receives reasonably competitive tax treatment, treatment that will further improve as corporate income tax rates decline to 15% by 2012. However, given the declining reserves issue and the need to encourage greater investment, there are niche tax improvements that should be made by the government. One component that should be improved upon is the tax treatment accorded to investment in mineral exploration at depth within existing mine workings. An incentive to encourage greater business investment in this area could help address the declining reserves challenge. The "five-year rule" to encourage exploration in former mine sites, as discussed with federal officials, should also be adopted. As well, given the downturn in the oil sands and need to encourage investment, the government should defer by five years the phase-out of accelerated capital cost allowance.

3. REGULATIONS AND TARGETS FOR AIR POLLUTANTS AND GREENHOUSE GAS EMISSIONS

Canada's clean air regulatory agenda, encompassing air pollutants and greenhouse gas emissions, is at serious risk of becoming over-complicated by the plethora of emerging federal and provincial targets, regimes, processes and reporting requirements. It is essential that Canada's proposed targets for air pollutants and greenhouse gas emissions be achievable and effective and that the regulatory system be efficient, without duplication between jurisdictions.

4. OTHER SOCIAL-ENVIRONMENTAL CHALLENGES

Mineral extraction and processing involves an intrusion upon the landscape in forms such as access roads, excavations and tailings management facilities. These encounters between humans and the environment highlight the importance of companies effectively managing community relations, Aboriginal engagement and environmental issues. For its part, government must manage project review processes in an open and efficient manner while providing an attractive investment regime and maintaining reasonable access to land for mineral exploration purposes. Provinces must also continue to modernize their mining legislation, such as the amendments to the *Ontario Mining Act* tabled in Ontario in April 2009.

5. NEED FOR HUMAN RESOURCES AND SKILLS

The industry faces a serious human resource challenge in the coming decades. According to the sector human resources council (MiHR), some 60,000–90,000 new workers will be needed to meet anticipated Canadian production targets through to 2017. This comes at a time when the skilled core of the industry, including 65% of geoscientists, will reach retirement age. This is a more pronounced reality in mining than in other sectors, as the industry traditionally attracts fewer females, youth and new Canadians. Addressing this challenge will require a significant and coordinated effort by the industry and all levels of government in Canada.

6. NEED FOR STRATEGIC INFRASTRUCTURE INVESTMENTS

The mining industry is the largest customer for Canada's transportation sector—as such it is important that the transport system move products to market efficiently and at competitive prices. Transportation infrastructure must be modern and in some cases, such as northern Canada and the Pacific Gateway, there is need for significant government investment. Strategic investments can also serve to open up new regions for development—for example, a power line into northern BC could attract some $3.5 billion in mining investment, while the Monts Otish highway in northern Quebec could open a promising region to greater resource development and prosperity.

7. INTERNATIONAL RISK MANAGEMENT

Canadian mining companies operate over 350 mines in off-shore locations such as Peru, Chile, Australia, Zambia, Indonesia, Papua-New Guinea, Tanzania, Turkey, Greece and the United States. In times of strong mineral prices, it is not unusual for foreign governments to seek a larger share of the overall mining revenue streams, in some cases through revoking agreements. The Canadian government can help mitigate the risks associated with business investment abroad by negotiating bilateral investment treaties, double-taxation agreements and free trade agreements. For their part, global companies must continue to invest in the legal and financial protections that they need to manage successful international operations in turbulent times.

Mining Sector Contribution to the Canadian Economy

The mining and mineral manufacturing sector, generically known as the "mining industry" is comprised of mineral exploration, mining and quarry industries, primary metals, fabricated metal products and non-metallic mineral products industries.

At its core, the industry encompasses metal, non-metal and coal mines, oil sands mining operations, and manufacturing capacity in the form of smelters, refineries and fabrication facilities.

The products of this industry help build the highways, electrical and communications networks, housing, automobiles, consumer electronics, and other products and infrastructure essential to modern life. These are just a few consumer applications that rely on mining products:

- Batteries—nickel, cadmium, lithium, cobalt
- Circuitry—gold, copper, aluminum, steel, lithium, titanium, silver, cobalt, tin, lead, zinc
- Computer/TV screens—silicon, boron, lead, barium, strontium, phosphorus, indium
- Cosmetics and jewellery—iron oxide, kaolin, zinc, titanium, dioxide, gold, diamonds, copper
- Electricity—coal, uranium
- Eyeglasses—limestone, feldspar, soda ash
- Leather clothing—borax, chromium, zirconium, aluminum, titanium oxide
- Musical instruments—copper, silver, steel, nickel, brass, cobalt, iron, aluminum
- Sports equipment and helmets—graphite, aluminum, titanium, calcium carbonate, sulphur
- Sun protection—zinc oxide
- Steel—nickel, iron ore, zinc to rustproof
- Vehicles and tires—steel, copper, zinc, barium, graphite, sulphur, bromine, iodine
- Wind, solar, hybrids—nickel, aluminum, lithium, gallium, indium and germanium

The mining sector reaches into our everyday life and its opportunities, environmental challenges, investments and needs are inseparable from those of broader society. As a result of mining's innovation and investment activities, Canada has benefited from low-cost mineral and metal products, product innovations, good jobs, greater wealth and responsible stewardship of natural resources.

The cleaner products and technologies of today and tomorrow are not possible without metals and minerals as the building blocks. Water purification systems, for example, rely on nickel and a host of rare earth elements. The fundamental importance of minerals and metals is also true with respect to the clean energy revolution and investments that will be occurring over the coming decades. Hybrid vehicles for example draw energy from nickel hydride batteries. Catalytic converters require cerium and palladium. Cleaner energy sources, whether nuclear, solar, wind or hydrogen, all use a range of minerals and metals in the equipment and processes. Efficient light-weight vehicles and aircraft require aluminum and emerging still lighter composites such as the nickel-alloy material Invar.

Contribution to Canadian GDP

Until the global economic recession took hold in late 2008, the Canadian economy had experienced a decade-plus of strong growth, low inflation and low interest rates, with gross domestic product (GDP) growing at around 3% annually. The economy passed the one trillion dollar threshold in 2003 and reached $1.22 trillion in 2008. Over the past 20 years, the value of minerals and metals to Canada's economy has remained relatively stable at 3.5% to 4.5% of the country's GDP.

Figure 1 presents the breakdown of Canada's gross domestic product. The mining industry in this table is grouped with oil and gas extraction and the combined extractive industry contributed $55.3 billion to Canada's GDP in 2008, or approximately 4.5% of the national total. By this measure, the industry is 12 times larger than the forestry sector and 3 times larger than the agricultural sector.

Fact:

- The products of this industry help build the highways, electrical and communications networks, housing, automobiles, consumer electronics, and other products and infrastructure essential to modern life.

Figure 1: Canada's Gross Domestic Product, by Industry, 2000–2008

($MILLIONS)	2000	2001	2002	2003	2004	2005	2006	2007	2008
ALL INDUSTRIES	**1,026,242**	**1,040,943**	**1,068,765**	**1,091,378**	**1,124,998**	**1,155,681**	**1,189,661**	**1,219,327**	**1,225,858**
Agriculture	18,009	16,204	14,630	16,910	18,716	19,407	19,241	18,954	19,574
Fishing, hunting and trapping	985	1,085	1,118	1,138	1,164	1,111	1,107	1,139	1,214
Forestry and logging	5,632	5,676	5,893	5,756	6,142	6,080	5,794	5,160	4,313
Support activities for mining and oil & gas	4,825	5,274	4,987	5,571	5,883	6,745	6,933	5,893	6,320
MINING (INCLUDING MILLING), QUARRIES AND OIL & GAS EXTRACTION	**51,519**	**51,236**	**53,488**	**54,979**	**55,672**	**55,796**	**56,699**	**57,288**	**55,304**
Manufacturing	188,925	181,084	182,736	181,349	184,814	187,806	187,041	185,311	175,636
Construction	51,757	55,542	57,775	59,871	63,453	66,611	70,805	72,890	74,852
Transportation and warehousing	48,921	50,176	50,066	50,270	52,169	54,148	55,690	56,624	56,756
Information and cultural industries	34,007	36,498	38,229	38,631	40,813	41,888	43,227	44,349	45,114
Electric power, gas and water utilities	29,050	27,384	28,883	29,057	28,993	30,613	30,181	31,344	31,139
Trade, wholesale	52,519	53,438	55,226	57,767	59,990	63,159	66,622	70,256	70,399
Trade, retail	52,579	55,234	58,483	60,515	62,666	64,535	68,420	72,391	74,570
Finance and insurance	60,978	62,802	63,630	64,820	68,212	70,440	74,229	77,851	80,158
Real estate and rental and leasing	121,899	126,782	131,410	134,681	138,631	143,736	148,547	154,059	157,717
Community, business and personal services	243,367	249,339	256,105	262,549	269,991	277,008	286,699	295,124	301355
Public administration	57,968	59,705	61,523	63,314	64,085	64,548	66,134	67,463	69,416

Source: Statistics Canada, National Economic Accounts CANSIM Table 327-0027 and Catalogue 15-001-X, June 2009 (March 2009 reference period)

Figure 2: Gross Domestic Product — Mining and Mineral Manufacturing, 2000–2008

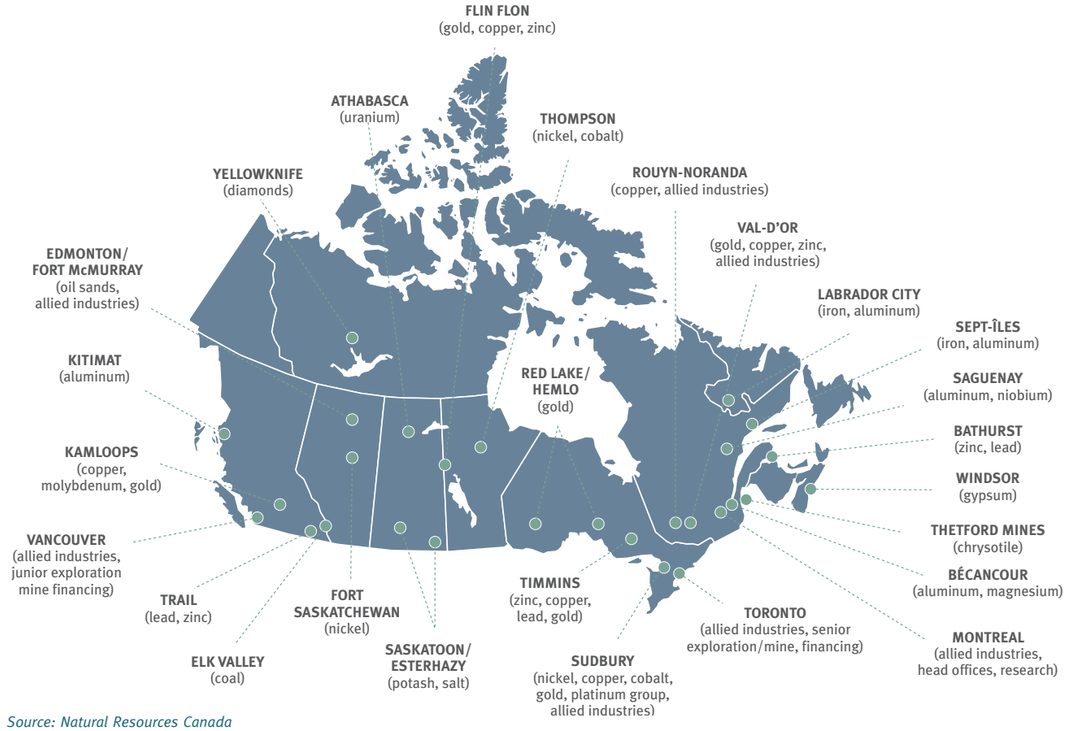
($MILLIONS)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Metal mines	4,567	4,301	4,113	4,003	3,845	3,850	3,889	3,882	3,859
Non-metal mines	3,057	3,276	3,388	4,091	4,379	4,313	4,075	4,800	4,758
Coal mines	1,185	1,321	1,057	794	993	1,028	931	1,020	1,016
TOTAL MINING	**8,825**	**8,876**	**8,559**	**8,856**	**9,093**	**9,087**	**8,854**	**9,445**	**9,381**
Primary metal manufacturing	10,882	10,663	11,087	10,897	11,550	11,855	11,956	11,910	11,824
Fabricated metal product manufacturing	14,201	13,734	14,062	13,711	13,479	13,657	13,833	14,405	13,391
Non-metallic mineral product manufacturing	4,779	4,994	5,096	5,375	5,570	5,684	5,992	5,961	5,712
TOTAL MINERAL MANUFACTURING	**29,862**	**29,391**	**30,245**	**29,983**	**30,599**	**31,196**	**31,781**	**32,276**	**30,927**
Oil and gas extraction	37,850	37,188	39,943	40,618	40,860	40,440	41,360	42,009	39,985
Petroleum and coal products manufacturing	3,056	3,423	3,477	3,477	3,432	3,297	3,338	3,339	3,247
Support activities for mining and oil & gas	4,825	5,274	4,987	5,571	5,883	5,745	6,933	5,893	6,320
TOTAL	**84,418**	**84,152**	**87,211**	**88,505**	**89,867**	**89,765**	**92,266**	**92,962**	**89,860**

Source: Statistics Canada, National Economic Accounts CANSIM Table 327-0027 and Catalogue 15-001-X, June 2009 (March 2009 reference period)

The actual contribution of the mining and mineral manufacturing sector is more usefully detailed in **Figure 2**, where the industry is divided into four stages: extraction of minerals; smelting and refining of these minerals into primary metals; processing of non-metallic mineral products; and fabrication of metal products. The total output of these four stages amounted to $40.3 billion in 2008. In comparison, the oil and gas extraction sector contributed $40.0 billion in GDP (although an estimated $16 billion of this relates to oil sands, some of which could also be logically classified under mineral extraction).

- Stage I includes the primary mineral extraction and production activities of mining and concentrating. These can be divided into metal mining, non-metal mining and coal. *Stage I contributed $9.4 billion to Canada's GDP in 2008.*
- Stage II captures metal production, including the smelting, refining, rolling, extruding, alloying and casting of primary metals such as copper, nickel, aluminum and steel. *Stage II contributed $11.8 billion to Canada's GDP in 2008.*

Figure 3: Canadian Mining Industry Clusters



Source: Natural Resources Canada

- Stage III captures non-metallic mineral processing industries such as abrasives, gypsum, lime, cement, glass and ceramics. *Stage III contributed $5.7 billion to Canada's GDP in 2008.*
- Stage IV includes the metal fabrication industries, such as forging, stamping and heat-treating activities that produce reinforcing bars, fabricated wire, cutlery, tools and hardware. *Stage IV contributed $13.4 billion to Canada's GDP in 2008.*

Economic growth came to a halt in the late months of 2008 as the effects of unstable oil prices, unsound mortgages, high consumer and corporate debt, and ineffective regulation of the financial sector in the United States served to trigger a global recession. Mineral prices fell in most commodities in response to declining global demand. In Canada, as discussed in Section 2.0, operations in some 32 Canadian mines were closed or suspended.

Across the economy, business capacity reached its lowest level in 27 years—operating at only 72% of full capacity in mining and oil and gas, 66% in non-metallic minerals, and 71% in fabricated metals.

Conditions have continued to be slow through the first half of 2009. The International Monetary Fund forecasts Canadian GDP to decline by 1.2% in 2009, while Export Development Canada forecasts a decline of 2.0%. Globally, the World Bank cut its 2009 growth forecast to minus 3% in June, worse than the bank's previous estimate of minus 1.75%. The effects of this global recession will be detailed in next year's Facts & Figures report.

See Section 3.0 The Money: Reserves, Prices, Financing, Exploration and Investments for more about this issue.

Industry Impacts in Canadian Provinces and Territories

The geographic distribution of Canadian clusters of mining expertise is illustrated in **Figure 3** and detailed in Annex 1. The Canadian mining industry continues to be an economic backbone of Canada's regional and rural economies, creating jobs and economic growth in more than 115 communities across Canada. As well, most Aboriginal communities are located within 200 kilometres of mineral properties, creating a source of potential economic opportunity.

As of end-2008, there were 841 mining establishments in Canada, including 61 in metals and 780 in non-metals (see Annex 2 for details). The non-metal sector is dominated by sand and gravel quarries (446), stone quarries (210) and peat mines (67)—these tend to be relatively small in size and local in focus. Quebec has the largest number of

Figure 4: Canada, Value of Mineral Production by Province and Territory,[1] 1998 and 2008[p]

PROVINCE/TERRITORY	1998 ($ MILLIONS)	1998 (%)	1998 RANK	2008[p] ($ MILLIONS)	2008[p] (%)	2008[p] RANK
Saskatchewan	2,426	13.0	4	9,734	21.5	1
Ontario	4,978	26.6	1	9,638	21.3	2
British Columbia	2,893	15.5	3	6,653	14.7	3
Quebec	3,560	19.0	2	5,208	11.5	4
Alberta	1,154	6.2	5	4,139	9.1	5
Newfoundland and Labrador	1,095	5.8	6	4,133	9.1	6
Northwest Territories	401	2.1	9	2,150	4.7	7
Manitoba	893	4.8	7	1,689	3.7	8
New Brunswick	863	4.6	8	1,367	3.0	9
Nova Scotia	335	1.8	10	340	0.8	10
Yukon	117	0.6	11	209	0.5	11
Nunavut	–	–	–	13	0.1	12
Prince Edward Island	6	...	12	3	...	13
TOTAL CANADA	**18,721**	**100.0**		**45,278**	**100.0**	

[p] Preliminary – Nil ... Amount too small to be expressed
1 This table includes the production of coal but excludes the production of petroleum and natural gas.
Sources: Natural Resources Canada; Statistics Canada

Figure 5: Total Capital Expenditures for Mineral Resource Development, by Province and Territory, 2008[p]

(CDN $)

PROVINCE/TERRITORY	EXPLORATION	DEPOSIT APPRAISAL	MINE COMPLEX DEVELOPMENT	TOTAL EXPENDITURES
Newfoundland and Labrador	115,518,934	23,478,195	104,373,495	243,370,624
Prince Edward Island	–	–	–	–
Nova Scotia	10,994,539	7,705,000	11,802,822	30,502,361
New Brunswick	30,607,459	1,139,807	141,602,138	173,349,404
Quebec	362,033,530	128,098,924	1,095,933,435	1,586,065,889
Ontario	538,046,031	214,381,007	1,158,880,686	1,911,307,724
Manitoba	145,559,550	1,680,000	264,523,275	411,762,825
Saskatchewan	360,372,849	73,735,927	1,250,192,226	1,684,301,002
Alberta	20,399,159	1,677,000	293,369,801	315,445,960
British Columbia	327,261,902	307,893,423	627,589,803	1,262,745,128
Yukon	108,103,706	18,998,742	0	127,102,448
Northwest Territories	88,739,327	49,496,356	824,397,949	962,633,632
Nunavut	169,214,557	193,452,263	463,252,428	825,919,248
CANADA	**2,276,851,543**	**1,021,736,644**	**6,235,918,058**	**9,534,506,245**

[p] Preliminary – Nil
Source: Natural Resources Canada, based on the Federal-Provincial-Territorial Surveys of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures

metal mines, with 20, followed by Ontario with 15 and BC with 9.

Canadian mineral production (preliminary figure) was valued at $45.3 billion in 2008, of which $9.7 billion was generated in Saskatchewan and $9.6 billion in Ontario (**Figure 4**). The Saskatchewan share has grown since 1998 due to the increased market price of uranium and potash.

The Northwest Territories' share increased from 2.1% in 1998 to 4.7% in 2008, reflecting its importance as a diamond producer. The Newfoundland and Labrador share increased to 9.1% over the past decade, as the Vale Inco nickel-copper mine opened at Voisey's Bay in 2005.

As detailed in **Figure 5**, Ontario, BC, Quebec and Saskatchewan are also the largest provinces in terms of mineral exploration expenditures. Canada's three northern territories together received 20% of total Canadian exploration spending in 2008.

While a reduced share from the previous year, this is nonetheless four times their share of production value and reflects the global interest in their mineral potential. Some $6.2 billion was invested in Canadian mine development in 2008, with Saskatchewan, Ontario, Quebec, the NWT and BC each receiving over a half-billion dollars worth of investment.

On a commodity basis (see Annex 3), the top three jurisdictions for gold production in 2008 were Ontario, Quebec and British Columbia. The top three copper producers were British Columbia, Ontario, and Newfoundland and Labrador. In both cases, the three provinces account for over 80% of production value. Gold mines were redeveloped for production during 2007 at Lamaque and Fabie Bay mines in Quebec and at QR mine in BC. Ontario, Newfoundland and Labrador, Manitoba and Quebec produced all of Canada's nickel. The opening of the Voisey's Bay mine in Newfoundland and Labrador in 2006 moved the province to second place in its first year of nickel production. Newfoundland and Labrador and Quebec produced over 99% of Canada's iron ore in 2007, while the NWT produced 98% of Canada's diamonds.

While it is perceived as bringing benefit primarily to rural, remote and northern communities, the mining industry also has strong links to major cities across Canada. Some of Canada's largest companies are located in urban centres such as Vancouver (Teck, Goldcorp), Saskatoon (Potash Corporation, Cameco), Toronto (Xstrata, Vale Inco, Barrick, Inmet) and Montreal (Alcan, Iron Ore Company, ArcelorMittal Mines).

Toronto is generally viewed as being the mining finance capital of the world. It is home to the Toronto Stock Exchange, more than 400 mining and exploration company offices, over 30 mining company head offices and several hundred mining suppliers, consulting firms and service providers.

Vancouver is the world's mining exploration centre, with more than 850 mining and exploration company offices. In addition, more than 400 mining consultants and related suppliers are located in the greater Vancouver area. It is unclear how the significant downturn in Canadian and world exploration in late 2008 and early 2009 will affect these numbers.

Montreal is an important location for Rio Tinto Alcan and its world-leading aluminum-related expertise. It also hosts significant mining research and development and education facilities. The emergence of the oil sands on a global scale over the past several years has sparked the growth of Edmonton as a hub of expertise in this area. Similarly, the strong growth in uranium and potash prices in recent years has highlighted the importance of Saskatoon as an international centre of expertise in these segments.

Suppliers to the Mining Industry

The mining industry's impact extends beyond its significant direct GDP contribution. For example, the industry contributes approximately 60% of Canada's rail-freight revenues and an estimated two-thirds of Canadian port tonnage. In this sense, organizations such as CN Rail, CP Rail, the Port of Montreal and the Port of Vancouver depend on a vibrant Canadian mining industry.

Global Infomine, a database analyst, reports that 3,140 Canadian goods and services firms provide technical, legal, financial, accounting, environmental and other expertise to the mining industry as of 2009, including:

- 91 geotechnical consulting firms
- 238 environmental consulting firms
- 140 exploration consulting firms
- 152 management and financial firms, including 50 financial analysis firms
- 67 education and training organizations and 36 health and safety consultants

Figure 6: Direct Revenues to Governments from the Mineral Sector, 2002–2008

($MILLIONS)	2002	2003	2004	2005	2006	2007	2008
MINERAL SECTOR EXCLUDING OIL SANDS MINING							
Royalties/mining taxes	434	436	561	793	872	1,409	3,008
Corporate income tax	1,085	1,049	1,572	1,810	2,858	2,815	3,576
Personal income tax	1,625	1,567	1,591	1,565	1,584	1,889	1,838
TOTAL	**3,144**	**3,052**	**3,724**	**4,168**	**5,314**	**6,113**	**8,422**
– of which federal	1,957	1,952	2,396	2,398	3,127	3,257	3,769
– of which provincial	1,187	1,101	1,328	1,770	2,187	2,857	4,653
MINERAL SECTOR INCLUDING OIL SANDS MINING							
Royalties/mining taxes	496	550	1,062	1,384	2,434	3,300	5,032
Corporate income tax	1,380	1,773	1,943	2,393	4,005	4,496	4,390
Personal income tax	1,752	1,703	1,732	1,725	1,775	2,103	2,078
TOTAL	**3,628**	**4,026**	**4,737**	**5,502**	**8,215**	**9,899**	**11,500**
– of which federal	2,243	2,540	2,620	2,731	3,692	4,301	4,486
– of which provincial	1,385	1,486	2,117	2,771	4,523	5,598	7,014

Source: ENTRANS Policy Research Group study for the Mining Association of Canada

- 21 drilling contractors and 153 drilling equipment companies
- 33 mineral processing contractors and 229 mineral processing equipment companies
- 71 crusher/conveyor equipment companies
- 89 laboratory and appliances equipment companies
- 109 transportation companies

Ontario (1,276), BC (914), Alberta (480), Quebec (371), Saskatchewan (82) and Manitoba (64) have the largest number of mining industry suppliers according to Global Infomine.

The federal government through Natural Resources Canada (NRCan) provides a higher estimated count, reporting some 4,000 companies in other sectors that supply the mining industry.

Supplier companies are essential to the introduction and dissemination of innovative technologies and ideas to the mining industry. NRCan notes that most goods and services demanded by mining companies are specialized technological and scientific products and that their employees are highly educated—an estimated 25% hold university degrees in engineering, geology, geophysics, geochemistry or related scientific disciplines.

As detailed in Section 3.0, the Canadian investment services sector is also a prominent supplier to the mining industry. During the past five years, fully 31% of global mining capital and 81% of global financing transactions were handled through the Toronto Stock Exchange. It is estimated that several thousand Canadian brokers, analysts, exchange workers, consultants, trade finance experts and securities lawyers draw benefit from the strength of the mining industry.

Taxes and Other Mining Industry Payments to Governments

Figure 6 provides a summary of payments accruing to Canadian governments as a result of mining activity—notably the extraction, smelting and processing of minerals described in the first three stages of Figure 2. These data draw from a consulting study conducted for the Mining Association of Canada in mid-2009 by ENTRANS Policy Research Group and reflect the most recently available data.

As shown, the industry, including oil sands mining, paid an estimated $11.5 billion to federal and provincial/territorial governments in 2008: approximately $5.0 billion in royalties, $4.4 billion in corporate income tax and $2.1 billion in personal income tax. Around 40% of this amount accrues to the federal government and 60% to the provincial governments. The provincial share has increased in recent years, in line with strong growth in royalty payments. In the oil sands, for example, many projects have repaid investors' initial capital spending and thus have entered a higher royalty bracket. In Saskatchewan, strength in global potash markets is contributing to royalty payment growth from $375 million in 2007/8 to $1.7 billion a year later. Beyond these two provinces, the ENTRANS data suggest that Newfoundland and Labrador, New Brunswick, Manitoba and British Columbia all derive a significant portion of government revenues from the mining industry.

In terms of growth, Figure 6 indicates that these corporate income tax payments were roughly level with the record payment levels of 2007. This reflects the strong prices and corporate profits seen through the first two-thirds of 2008. Payments to governments will decline in 2009, in line with the ongoing global economic recession. This will be examined again in next year's Facts & Figures.

The above figures do not reflect the fourth stage of activity outlined in Figure 2 (fabricated metal product manufacturing) as it can be difficult to determine where to draw a boundary around the "mining industry." Some of the outputs of this fourth stage, such as cutlery, fixtures and boilers, likely fall outside logical bounds. Including the fourth stage of activity within the above analysis would mean that the industry paid an additional amount of around $2.1 billion to governments in 2008, bringing the mining and mineral manufacturing industry total to $13.6 billion. (It is worth noting as well that the oil sands industry pays large sums—as high as $2 billion in some years—to the Alberta government in the form of land sales payments.)

With respect to federal tax policy, the Canadian mining industry was pleased with the announcement in October 2007 that the federal corporate tax rate will decline from 21% at present to 15% by 2012. The industry was pleased as well with two technical clarifications that were made by the Canada Revenue Agency in recent years. The CRA clarified the treatment of certain tangible expenses in underground mines and clarified that the expenses associated with consulting with Aboriginal and other groups on exploration projects are generally eligible for CEE/flow-through share treatment. The industry also welcomes the ongoing effort on the part of senior Finance Canada officials to reduce the paper burden associated with resource industry taxation filings. In an age of highly mobile capital, these actions serve to improve Canada's investment climate.

Among the tax policy areas where continued improvements are needed, the Canadian industry is concerned that federal tax regulations work against on-site exploration spending. Expenses for new exploration at depth (within existing underground workings) are treated less attractively than similar greenfield exploration costs, thereby reducing the incentive for companies to explore in these expensive (yet potentially resource-rich) areas. It would also be useful for the government to enhance the flow-through share incentive that encourages exploration in Canada, even if only as a temporary stimulus, in line with suggestions from the Prospectors and Developers Association of Canada. Adopting the "five year rule" to encourage exploration in former mine sites is also a positive change that should be made by the federal government.

Fact:

- Global Infomine, a database analyst, reports that 3140 Canadian goods and services firms provide technical, legal, financial, accounting, environmental and other expertise to the mining industry as of 2009.

Production, Processing and Transportation Activity of the Canadian Mining Industry

Canada's strength in mining rests on our ability to find, produce and process minerals competitively and to transport these products to domestic and international markets in an efficient manner.

This is the base from which the industry can remain globally competitive and continue to strengthen its Canadian investments.

Production of Key Minerals

Canada is richly endowed with natural resources; our major deposits and recent discoveries are proof of a diversified mineral potential. Canada held its position as a leading mineral-producing nation in 2008 with production value estimated at $45.3 billion.

We rank among the top five countries in the production of 12 major minerals and metals. Canada ranks first globally in production of potash and uranium; second in nickel and cobalt; third in titanium, aluminum, and platinum-group metals; fourth in gypsum; and fifth in chrysotile, zinc, salt and molybdenum. Canada no longer holds a top-five position in the production of gold, silver, copper or lead. Australia, Russia, the US, China and Peru are among the other leading supplier countries. *See Annex 4 for more details.*

As described in **Figure 7**, Canadian metal production values fell to $21.0 billion in 2008, down 20% from the $26.2 billion figure of the previous year and reflective of the metals price collapse of late 2008. The Canadian non-metals (industrial minerals) sector has grown at a steady pace since the mid-1990s and grew dramatically in 2008 reaching a production value of $20.0 billion. Potash, diamonds and sulphur are the largest non-metal commodities in terms of production value in 2008, while cement is the leading structural material. In the mineral fuels area, rising energy prices prompted a 57% increase in coal production value in 2008 to a value of $4.3 billion. Higher prices in recent years have made possible the opening of new Canadian coal mines—for example, the Trend mine and Brule mine, both in BC, began new production in 2008.

Potash was Canada's top-valued mineral in 2008 with production valued at $8.2 billion, a 193% increase over the previous year. This reflects the fact that potash prices remain historically high, driven in large part by changing diets and agricultural practices in China and India. Negotiated prices for 2009/10 are US$550 per tonne in China and US$750 in Korea/Japan—around four- to five- fold higher than prices of five years earlier.

Nickel production value was second, at $5.9 billion, down from $9.9 billion the prior year. Copper, coal, gold, iron ore, diamonds, sulphur, uranium and zinc were the next highest production value commodities in 2008 (**Figure 8**). These 10 minerals and metals each had 2008 production values in excess of $1.4 billion and cumulatively represent $35 billion in value—77% of total Canadian mineral production value. Annex 5 shows that potash, gold, coal and sulphur had particular production value increases during 2008, while that of uranium, zinc and nickel declined significantly.

DIAMONDS

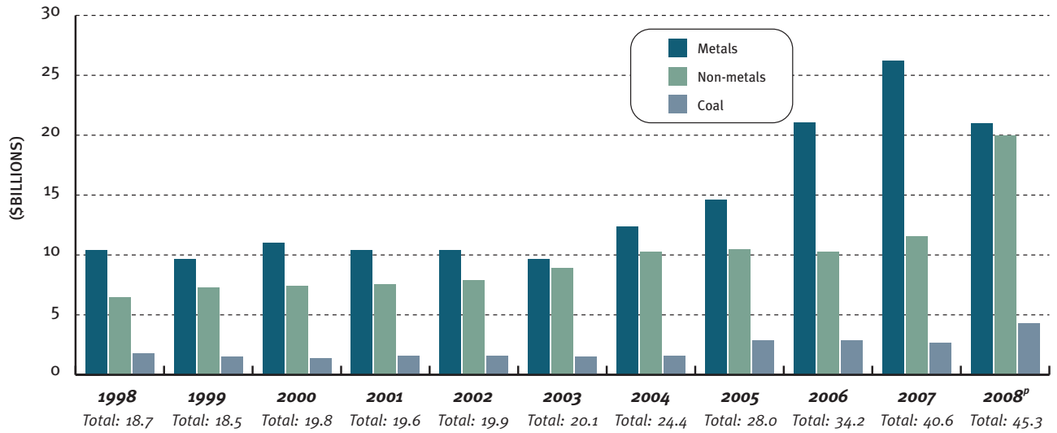
Canada has presented a particularly interesting story in diamonds over the past decade, progressing from zero production value to the world's third-ranked diamond producer during this span. Canadian diamonds, mined in the Northwest Territories and Ontario, account for 13% of global production. Canadian diamond exports totalled $2.8 billion in 2008, versus zero exports in 1998. These exports are primarily sold to Antwerp and London for further processing, although some processing is conducted in the NWT. Some 10% of the production of De Beer's Victor Mine, which came into production in Ontario in 2008, will be cut and polished locally, including at a new facility, Crossworks Manufacturing in Sudbury.

From 1998 to 2004, the Diavik and EKATI mines produced 38 million carats of high-quality diamonds worth $6 billion. The Diavik mine reached full production in 2004 and produces 7–8 million carats per year. Canadian diamond production quantity increased 38% through 2006 and 2007, although value actually decreased by 18% during these two years due to global price declines. The first half of 2008 saw strong demand for Canadian diamonds, with the opening of two new mines, Snap Lake in the NWT and Victor in northern Ontario, by De Beers. However, by year-end the industry suffered a setback in the global market, in large part due to the drop in demand for luxury goods, including jewellery. This resulted in a domino effect with a major drop in demand for rough and polished diamonds and a 40–50% drop in average rough prices and has led to stockpiling, production cutbacks and scheduled temporary mine shutdowns during 2009 for most leading diamond-producing countries, including in Canada at Snap Lake and Diavik. Diavik has also deferred progress on its planned underground mining stage.

Fact:

- Canada ranks first globally in production of potash and uranium; second in nickel and cobalt, and third in titanium, aluminum, and platinum-group metals.

Figure 7: Value of Canadian Mineral Production, 1998–2008[p]



[p] *Preliminary*

Sources: Natural Resources Canada; Statistics Canada, Catalogue 26-202 XIB

Figure 8: Canada's Top 10 Minerals, by Value of Production, 1998 and 2008[p]

		1998		2008[p]	
	UNIT	QUANTITY (MILLIONS)	$ VALUE (MILLIONS)	QUANTITY (MILLIONS)	$ VALUE (MILLIONS)
Potash (K20)	t	9	1,748	11	8,243
Nickel	kg	198	1,411,	251	5,856
Copper	kg	691	1,696	581	4,438
Coal	t	75	1,765	68	4,292
Gold	g	165	2,313	95	2,824
Iron ore	t	37	1,646	31	2,427
Diamonds	ct	...	41	15	2,404
Sulphur, elemental	t	8	62	8	2,389
Cement	t	12	1,148	14	1,792
Uranium	kg	10	508	9	1,488

[p] *Preliminary* ... *Amount too small to be expressed*

Sources: Natural Resources Canada; Statistics Canada, Catalogue 26-201-X

On a positive note, the entering into full production of DeBeers' Snap Lake and Victor projects marks a culmination of a 40-year Canadian diamond exploration and development effort for DeBeers. Future diamond potential may also exist in the northern territories and Quebec, and in Saskatchewan, where the Fort à la Corne project is among the largest kimberlite fields in the world.

URANIUM

Global demand for uranium has increased considerably in recent years, as countries embark on new nuclear energy programs or expand existing programs. This trend is reinforced by concern over air pollution and greenhouse gas emissions associated with fossil-fuel combustion.

The value of uranium produced in Canada increased by 82% in 2005, by 26% in 2006 and by 76% in 2007, reflecting the strengthened global price and supply/demand situation. However, the value of production declined by 41% in 2008; this reflects the decline in uranium prices as production volumes actually remained roughly equal to volumes in 2007.

The medium- and longer-term direction for nuclear energy and uranium demand remains positive. It is estimated by Ux Consulting that 100 new reactors could be built worldwide over the coming two to three decades, including an estimated 41 new reactors in 25 new countries. China envisions a six-fold increase in its nuclear energy capacity to 50 GW by 2020, while Russia projects adding two to three GW of nuclear power annually to 2030. In the United States, some 38 reactors have recently been granted licence extensions and 15 new reactors are anticipated by 2015.

The McArthur River uranium mine in northern Saskatchewan is the world's largest and highest-grade deposit, with reserves of more than 215 thousand tonnes of uranium oxide. McArthur River has an average ore grade of 21% and annual production of approximately 8200 tonnes uranium oxide. It is felt that production levels in Kazakhstan and Africa will increase over the coming decades. In June 2009, Uranium One announced its purchase of a 50% share of the Karatau uranium mine in Kazakhstan, a mine that is expected to triple production over the next four years. Areva's large Imouraren uranium mine in Niger is scheduled for commissioning in 2010 and full production in 2012.

OIL SANDS

The development of the western oil sands constitutes one of the world's most significant economic stories of the past decade. Technological advances and increases in crude oil prices from $20 per barrel in the 1990s to $70 in 2007 and to $140 in mid-2008 together reinforced the oil sands' economic viability and sustained its production growth from test-well quantities to volumes exceeding one million barrels per day. Oil sands development increased wealth and economic activity in western Canada during the past decade, creating 200,000 jobs that helped to offset job losses in Canada's manufacturing sector. The hub of oil sands activity in Fort McMurray, Alberta has grown from a population of 6,000 in 1968 to around 80,000 in 2008.

The significant oil price reductions of late 2008, falling from $140 to the $40 per barrel range, caused many companies to delay or shelve expansion projects and contributed to job loss and diminished government revenues, among other impacts. There are signs that these impacts have reached bottom and that growth and investment is returning to the region and sector. Oil prices rebounded to $62 by June 2009.

Imperial Oil announced in May 2009 that it was proceeding with the first phase of the Kearl oil sands project, a surface mining operation northeast of Fort McMurray, Alberta. The Kearl project could ultimately produce more than 300,000 barrels a day of bitumen. The first phase of the project, expected to begin production in late 2012 with total production to average 110,000 barrels per day, is anticipated to cost about $8 billion to construct.

The merger of Suncor and Petro-Canada, in the approvals stage in June 2009, would create Canada's largest company and would significantly impact the oil sands scene, including creating efficiencies and accelerating particular projects. The impact of this proposed mega-merger will become clearer over the coming months.

Over the long-term, Alberta's oil sands production is projected to increase from around 1.3 million barrels per day (BPD) at present to 4.7 million in 2025. A more recent study by US energy consultancy HIS Energy Research Associates projects that output could reach 6.3 million barrels by 2035, depending on longer-term economic growth and oil price performance.

Most output is exported to the United States although future customers may include Asian countries. Enbridge has a plan to build a dual pipeline between Edmonton and coastal facilities in Kitimat, BC, that could open up Asian market potential for the oil sands. A projected 525 thousand barrels per day could move through this project to Asian markets.

Prior to the recent downturn in oil prices, it was projected that around $100 billion in oil sands investment would be made over the coming 15 years, an estimated 40% of which was for mining projects where oil sands bitumen is extracted through mining rather than being treated in-situ. The exact timetable and investment amounts have been adjusted in recent announcements, although the overall amounts and timelines may prove over time to be close to these figures. This investment is reflected in several oil sands operations, including Suncor's Voyageur project, Syncrude, Shell Albian Sands, Petro-Canada's Fort Hills project, the above-mentioned Imperial Kearl expansion, and Canadian Natural Resources' Horizon project.

As detailed in **Figure 9**, synthetic crude oil accounted for around 19% of Canada's crude-oil-and-equivalent production (22% by value) in 2007, up from 14% a decade earlier. The absolute value of this production increase is considerable. Canada produced $2.9 billion in synthetic crude in 1996 and $13.5 billion in 2007. All of this production is from Alberta, although Saskatchewan also holds reserves that are attracting interest.

There remains considerable room for expansion of oil sands development in the medium and longer term. Alberta's oil sands deposits are estimated to contain 2.5 trillion barrels of bitumen that, using existing technologies, would yield 300 billion barrels—larger than Saudi Arabia's reserves. According to the Alberta Energy Department, the lease agreements in place cover only some 20% of potential oil sands areas.

Until the recent downturn, it was felt that rising labour costs and a shortage of skilled and unskilled labour could serve to curtail investment in the oil sands in the medium term. By some measures, the cost of oil sands expansion had increased three-fold during the 2003 to 2008 period—the cost of equipment and supplies had increased considerably and availability had tightened. As the global and Canadian economy emerges from the recession over the coming year, analysts believe that the costs and supplies associated with oil sands investment will be on a sounder footing.

Figure 9: Production of Synthetic Crude Oil by Oil Sands Mining Plants, Alberta and Canada, by Quantity and Value, 1997–2007

	SYNTHETIC CRUDE OIL (000'S OF M3)	TOTAL CRUDE OIL AND EQUIVALENTS	SYNTHETIC CRUDE AS % OF TOTAL	SYNTHETIC CRUDE OIL ($000)	TOTAL CRUDE OIL AND EQUIVALENTS ($000)	SYNTHETIC CRUDE AS % OF TOTAL
ALBERTA						
1997	16,798.0	93,975.9	17.9	2,899,537	13,909,397	20.8
1998	17,870.8	94,676.2	18.9	2,313,518	9,734,475	23.8
1999	18,766.9	89,065.5	21.1	3,252,547	13,727,829	23.7
2000	18,608.0	89,136.1	20.9	5,188,916	21,687,681	23.9
2001	20,260.6	89,364.5	22.7	4,995,003	17,734,825	28.2
2002	25,494.6	89,885.1	28.4	6,455,743	19,778,759	32.6
2003	25,028.8	95,311.4	26.3	6,777,342	22,187,602	30.5
2004r	26,661.9	101,007.0	26.4	8,570,468	27,767,704	30.9
2005	21,932.5	98,878.7	22.2	9,213,624	33,282,754	27.7
2006	30,114.0	109,759.0	27.4	14,831,145	38,498,843	38.5
2007	29,824.6	108,999.9	27.4	13,464,316	40,125,893	33.6
CANADA						
1997	16,798.2	123,826.7	13.6	2,899,537	17,831,933	16.3
1998	17,870.8	128,400.3	13.9	2,313,518	12,940,149	17.9
1999	18,766.9	122,287.0	15.4	3,252,547	18,698,282	17.4
2000	18,608.0	127,769.2	14.6	5,188,916	30,523,595	17.0
2001	20,260.7	128,951.0	15.7	4,995,003	24,911,953	20.1
2002r	25,494.6	136,969.8	18.6	6,455,743	29,956,080	21.6
2003	25,028.8	144,813.2	17.3	6,777,342	33,610,498	20.2
2004r	26,661.9	149,159.6	17.9	8,570,468	40,639,940	21.1
2005	21,932.5	146,207.9	15.0	9,213,624	49,159,801	18.7
2006	30,114.0	161,434.0	18.7	14,831,145	63,649,683	23.3
2007	29,824.6	160,584.3	18.6	13,464,316	60,915,734	22.1

[r] *Revised*

Source: Statistics Canada

Figure 10: Non-ferrous Smelters and Refineries, 2009[1]

OWNER	OPERATION	TYPE OF FACILITY	LOCATION	OUTPUTS
NEW BRUNSWICK				
Xstrata Zinc Canada (Brunswick)	Brunswick	(Sm.)	Belledune	Pb,Bi,PM
QUEBEC				
Alcoa Inc.	Baie-Comeau	(Sm.)	Baie-Comeau	Al
Alcoa Inc.	Deschambault	(Sm.)	Deschambault	Al
Alcoa Inc./Rio Tinto Alcan Inc.	Bécancour	(Sm.)	Bécancour	Al
Newalta Income Fund	Sainte-Catherine	(Ref.), (Sec. Sm.)	Sainte-Catherine	Recycled Pb
Rio Tinto Alcan Inc.	Alma	(Sm.)	Alma	Al
Rio Tinto Alcan Inc.	Arvida	(Sm.)	Saguenay	Al
Rio Tinto Alcan Inc.	Beauharnois	(Sm.)	Beauharnois	Al
Rio Tinto Alcan Inc.	Grande-Baie	(Sm.)	Grande-Baie	Al
Rio Tinto Alcan Inc.	Laterrière	(Sm.)	Saguenay	Al
Rio Tinto Alcan Inc.	Shawinigan	(Sm.)	Shawinigan	Al
Rio Tinto Alcan Inc. (Vaudreuil)	Vaudreuil	(Ref.)	Saguenay	Alumina
Rio Tinto Alcan Inc./Aluminum Austria Metall Québec/ Hydro Aluminum a.s./Société générale de financement du Québec/Marubeni Québec Inc. (Alouette)	Alouette	(Sm.)	Sept-Îles	Al
Rio Tinto Alcan Inc.	Sorel-Tracy	(Sm.)	Sorel-Tracy	Titanium, Fe
Xstrata Copper Canada (CCR)	CCR	(Ref.)	Montréal-Est	Cu, Au, Ag, Se, Te, Ni, PGM
Xstrata Copper Canada (Horne)	Horne	(Sm.)	Noranda	Cu, PM
Xstrata Zinc Canada (General Smelting Company of Canada)	General Smelting Company of Canada	(Sec. Sm.)	Lachine	Recycled Pb
Xstrata Zinc Canada/Noranda Income Fund (Canadian Electrolytic Zinc Limited – CEZinc)	Canadian Electrolytic Zinc Limited (CEZinc)	(Ref.)	Valleyfield	Zn,Cd, S*
ONTARIO				
Cameco Corporation	Fuel Services Division	(Con. Fac.)	Port Hope	U
Cameco Corporation	Fuel Services Division	(Ref.)	Blind River	U
Johnson Matthey Limited	Brampton	(Sm.), (Ref.)	Brampton	Au, Ag, Recycled Pb
Royal Canadian Mint	Ottawa	(Ref.)	Ottawa	Au, Ag
Vale Inco Limited	Copper Cliff complex	(Sm.), (Ref.), (Pl.)	Sudbury	Ni, Cu, Au, Ag, Se, Te, PGM, S*
Vale Inco Limited	Port Colborne	(Ref.)	Port Colborne	Electrolytic Co, PGM, Co oxide
Aleris International, Inc.	Mississauga	(Sec. Sm.)	Mississauga	Recycled Zn
Xstrata Copper Canada (Kidd Metallurgical)	Kidd Metallurgical	(Sm.), (Ref.), (Pl.)	Timmins	Cu, Zn, Cd, In, S*
Xstrata Nickel Canada	Sudbury	(Sm.), (Pl.)	Sudbury	Ni-Cu, Co, Au, Ag, PGM
MANITOBA				
HudBay Minerals Inc.	Flin Flon	(Sm.), (Ref.)	Flin Flon	Zn, Cu, Cd
Vale Inco Limited	Manitoba	(Sm.), (Ref.)	Thompson	Ni, Co oxide, PM
ALBERTA				
Sherritt International Corporation/General Nickel Company S.A. (The Cobalt Refinery Company Inc.)	The Cobalt Refinery Company Inc. The Cobalt Refinery	(Ref.)	Fort Saskatchewan	Ni, Co, Cu sulphide, ammonium sulphate
BRITISH COLUMBIA				
Thompson Creek Mining Limited/Sojitz Moly Resources Inc. (Endako)	Endako	(Pl.)	Fraser Lake	Mo trioxide
Rio Tinto Alcan Inc.	Kitimat	(Sm.)	Kitimat	Al
Metalex Products Ltd.	Richmond	(Sec. Sm.)	Burnaby	Recycled Pb
Teck Cominco Limited	Trail	(Sm.), (Ref.), (Pl.)	Trail	Zn, Pb, Bi, Cd, In, Ge, PM, S*

(Sm.) Smelter; (Ref.) Refinery; (Sec. Sm.) Secondary smelter; (Pl.) Plant; (Con. Fac) Conversion facility; S Sulphuric acid*
1 In operation, as of December 31, 2008.
Source: Natural Resources Canada, Map 900A.

As discussed in Section 5.0, environmental issues surrounding oil sands development are receiving increased public and political attention. Furthermore, a shift toward greater in-situ treatment of bitumen could reduce tailings volumes though increased energy requirements and GHG emissions. The ability to manage these issues will affect the pace of future development. For example, Statoil's Chief Executive Officer noted in July 2008 that uncertainty regarding Canada's climate change regulatory regime and the associated cost of carbon has prompted the company to delay its oil sands upgrader investment decision by two years. As well, NGOs in the United States and Canada have argued that carbon-intensive fuels such as oil from oil sands should be disadvantaged for environmental reasons. Whether this becomes a significant trade issue remains to be seen—particularly given the US energy dependency on Canada and the fact that under long-term plans some 90% of oil refined in the US Midwest is projected to come from Canada. As shown in **Figure 32**, there are also some 30 US states that have an equivalent or greater coal-related GHG challenge than that faced by Canada's oil sands operations.

Mineral Processing

Canada has a significant mineral-processing industry, with 34 non-ferrous metal smelters and refineries operating in six provinces (**Figure 10**). Some of these facilities contain both a smelter and a refinery.

- British Columbia—2 smelters, 1 smelter/refinery, 1 processing plant
- Alberta—1 refinery
- Manitoba—2 smelters/refineries
- Ontario—2 smelters, 3 refineries, 3 smelters/refineries, 1 conversion facility
- Quebec—13 smelters, 3 refineries, 1 smelter/refinery
- New Brunswick—1 smelter

Canada's integrated smelters and refineries typically accompany development of a world-class mine, especially when it is inland without access to low-cost marine transport. As local ore reserves are depleted and production of base-metal concentrate declines, smelters and refineries are moving from integrated production toward more costly custom treatment of concentrates from other nations. Another trend is the switch toward using more secondary raw materials and scrap feed.

With the depletion of ore reserves across Canada (discussed in greater detail in Section 3.0) and our increased dependency on imported concentrates, the quantity and value of refined metal production has been irregular in recent years. Canadian production volumes of refined lead, aluminum, copper and zinc have remained reasonably steady over the past five years (**Figure 11**). Refined nickel production increased in the three years since the opening of Voisey's Bay mine, after several years of marginal decline.

The ability to source raw material supplies from domestic mines remains an important influence on costs and hence profitability of

Fact:

- Exploration and domestic production are vital to obtaining reliable feedstock and to maintaining the competitiveness of the Canadian mineral processing industry—particularly in an age when China and other countries are expanding their processing capacity and competing fiercely for global raw material supplies.

Figure 11: Canadian Production of Selected Refined Metals, 2003–2008[p]

(TONNES)	2003	2004	2005	2006	2007	2008[p]
Aluminum	2,791,915	2,592,160	2,894,204	3,051,128	3,082,625	3,120,148
Cadmium	1,759	1,880	1,727	2,090	1,388	1,409
Cobalt	3,851	4,673	4,618	4,555	4,883	4,867
Copper	454,866	526,955	515,223	500,463	453,453	442,050
Lead	223,434	241,169	230,237	250,464	236,688	258,431
Nickel	124,418	151,518	139,683	153,743	162,646	175,522
Zinc	761,199	805,438	724,035	824,464	802,103	764,312

[p] Preliminary
Sources: Natural Resources Canada; Statistics Canada

Figure 12: Crude Minerals and Processed Mineral Products Transported by Canadian Railways, 2001–2008

(MILLION TONNES)	2001	2002	2003	2004	2005	2006	2007	2008
Total revenue freight[1]	240.6	236.9	234.8	250.2	259.4	258.7	255.7	244.4
Total crude minerals	105.0	102.1	104.0	106.9	112.8	108.1	112.0	111.9
Total processed mineral products	39.7	43.8	41.8	42.4	42.8	44.0	44.2	43.6
Total crude and processed minerals	144.7	145.9	145.8	149.3	155.6	152.1	156.2	155.5
(%)								
Crude minerals and processed mineral products as a percentage of revenue freight	60.1	61.6	62.1	59.7	60.0	58.8	61.1	63.7

1 Revenue freight refers to a local or interline shipment from which earnings accrue to a carrier.
Notes: Total crude minerals includes coal, but not oil and gas.
Source: Statistics Canada

Canadian refining and smelting operations. Exploration and domestic production are vital to obtaining reliable feedstock and to maintaining the competitiveness of the Canadian mineral processing industry—particularly in an age when China and other countries are expanding their processing capacity and competing fiercely for global raw material supplies. The age of some Canadian processing operations, combined with their ability to meet emerging regulatory requirements also impacts their viability. In this regard, HudBay Minerals recently announced that it would be closing its 80-year-old copper smelter in Manitoba by July 2010.

Transportation Activities

Canada's transportation system is critically important to facilitating the flow of mined and refined products to markets in Canada and abroad. The Canadian mining industry is, by some measures, the single most important customer for the transportation sector. Minerals and fabricated mineral products provide significant tonnage for Canada's transportation system, particularly bulk commodities such as iron ore, coal, potash and sulphur.

Global shipping is dominated by container traffic. Containers can be stacked, handled by cranes and efficiently transferred between rail, truck and marine modes of transportation. In recent years, there has been a dramatic increase in container volumes bringing furniture, electronics, clothing, building products and other products from Asia to Canada. This has created a surplus situation, where imported containers are relatively full with products while those leaving Canada are not. There is an ongoing effort in Canada to adapt products so they can be containerized—some agri-food products for example are now being shipped in containers rather than in bulk. A similar trend may develop in the mining sector over the coming years.

A further impact of this supply/demand situation is that the cost of transportation from China to Canada is more expensive than the cost of cargo transportation in the opposite direction. This works against the business case for investing in China. Rising oil prices add a further variable to this equation. As noted in July 2008 by economist Jeff Rubin, the cost of shipping a container from Shanghai has increased from $2,000 to $8,000 over the past eight years and this will reach $15,000 if oil reaches $200 per barrel. While these rates have declined since the recession, if oil prices increase from present rates in the coming years, this variable has the potential to dramatically change global shipping patterns for all industry sectors.

RAIL

In its annual *Transportation in Canada* publication, published in May 2008, Transport Canada reports that the minerals and metals sector (coal, fertilizer, iron ore, ores and metals) accounted for 48% of the 282 million tonnes in commodity volumes carried by railroads in Canada in 2007. Among the next largest segments, grain accounted for 11%, forest products for 15% and chemicals for 5% of this volume. According to Statistics Canada, shipments of crude and processed minerals transported by Canadian railways represent approximately 60% of total rail revenue freight (**Figure 12**).

The Canadian freight rail system operates as a dual monopoly shared by Canadian National and Canadian Pacific. In many instances, communities are served by only one company, thereby offering shippers little competitive choice. The strike of CN rail conductors in February 2007 illustrates the importance of a competitive, efficient freight rail system. After less than one week of the strike, Canadian mine sites and processing operations were significantly affected in their ability to move raw material in and finished products out to customers.

In 2007, the federal government tabled changes to the *Canada Transportation Act* aimed at strengthening provisions that protect rail shippers from the potential abuse of market power by railways. The changes were supported by the Canadian mining industry and MAC—they received Royal Assent and became law in February 2008. The changes aim to find a competitive balance between the interests of shippers (lower rates, better service) and those of rail companies (higher rates and profitability). Of particular interest, the new law strengthens the ability to arbitrate disputes over rail fees and ancillary charges.

As follow-on to these legislative changes, the federal government is undertaking a review of railway service levels. The intent of the review is to assess service by CN and CP, identify problems, examine best practices, and recommend commercial, regulatory or other remedies that would improve levels of service. MAC is involved in this issue and contributing information as appropriate. A key message conveyed by MAC and other shipper voices is that railways should face the same kind of penalties and disciplines on their service performance as shippers already do. It is expected that this review will conclude in late 2009 or early 2010.

Some mining companies are also involved in periodic dialogue with the government regarding the Transportation of Dangerous Goods legislation and processes, in the aim of ensuring that these products can be moved safely and efficiently into and out of mining facilities.

TRUCKING

Automobiles and parts, machinery and equipment, base metals and related articles, plastics and chemicals, and agri-food products represent the largest volumes of products shipped internationally by truck. Trucks carried $180 billion worth of exports in 2007, of which $20 billion, or 11.2%, was base metals and articles of base metal. Of the $220 billion in imports shipped by truck, $18 billion (8.2%) was base metals and articles of base metal. Only small quantities of minerals, ores and concentrates are traded by truck—around 0.4% of total truck exports and 0.3% of imports. There is no comparable information of sufficient detail to describe domestic truck shipments by commodity.

MARINE

The federal government's annual *Transportation in Canada* report lists total industrial exports sent via ship to the US at $19 billion in 2006, most of this being gasoline and crude petroleum. Marine imports from the US are relatively small—one-ninth the level of exports. In the mining sphere, Canada exported around $410 million worth of iron ore and $340 million in non-ferrous products and alloys via ship to the US, while importing $240 million worth of iron ore.

Canadian industrial exports by ship to overseas (non-US) countries totalled $50 billion in 2006, led by metals and alloys, grains and food, and wood products. Imports totalled $73 billion, led by crude oil, machinery, automobiles and appliances. In mining, Canada exported a significant value of non-ferrous products and alloys ($7 billion), non-ferrous metals ($2 billion), iron ore ($1.5 billion) and potash ($1 billion) via ship, while significant imports were seen in primary and fabricated iron and steel products ($3.2 billion), non-ferrous products and alloys ($2.3 billion) and non-ferrous metals ($1.1 billion).

The mining sector is an important contributor to the business volumes of the St. Lawrence Seaway. According to the Seaway Corporation's annual traffic report, shipments of iron ore and coal represented 35% of total Seaway traffic in 2007, while other mine products contributed a further 15%.

The mining sector is also an important customer at Canadian ports, typically accounting for 60–75% of commercial volumes handled at Canada's ports. Of the four primary marine shipping regions in Canada, mineral products are most important in the St. Lawrence and Great Lakes regions and least important in the Atlantic region. Coal is particularly important in the Pacific region as shipments move to Japan and other Asian markets. The Port of Montreal handles important volumes of iron ore, copper ore, gypsum and zinc ore—generally as inbound cargo arriving via ship and being transferred to rail or truck for distribution to the copper/zinc smelting and refining facilities in the region. Among mining products at the Port of Vancouver, coal accounts for 22% of the total volume handled by the port, fertilizer for 10%, and metals and minerals for an additional 11%.

The Money: Reserves, Prices, Financing, Exploration and Investments

This section discusses the five principal financial and monetary aspects of the Canadian mining industry—namely, reserves, prices, financing, exploration and capital investment.

The combination of accessible mineral reserves and global prices for these minerals allows companies the opportunity to be profitable and broaden Canadian benefits. The availability of financing is necessary for companies to fund their exploration, resource appraisal and mine development programs. Capital investment in mines and processing facilities allows these minerals to be extracted and converted into valuable products.

Canadian Reserves

As shown in **Figure 13**, there has been a significant decline in proven and probable Canadian mineral reserves over the past 25 years—in all major base metals. This long-term trend may have reached bottom in 2004/5, as modest increases have been seen in 2006 and 2007 in some key minerals.

The most dramatic decline over the past quarter-century—over 80%—was seen in lead, zinc, molybdenum and silver reserves, while copper and nickel declined by over half. Reserves of lead, zinc, silver and nickel are all at or near their lowest levels since 1977 (see Annex 6). Gold reserves in 2007 are around one-half the levels of a decade earlier. It is evident that without sustained and effective exploration, Canadian mineral production will outstrip reserve additions, our smelters and refiners will be forced to rely increasingly on imported raw materials, and Canada's mining industry will be at serious competitive and strategic risk.

On the positive side, exploration investment reached historically high levels in Canada until the recent downturn and Canada remains the world's top destination for mineral exploration. Consistent investment over an extended period, combined with the development of modern geological mapping data, has the potential to add significantly to Canada's proven and probable reserves. As discussed earlier, the Government of Canada should aim to continuously improve the policy environment that fosters exploration spending and a strong, dynamic mining industry—there are some tax measures that could be considered toward this end.

Figure 13: Canadian Reserves of Selected Metals, 1980–2007

YEAR	COPPER (000 T)	NICKEL (000 T)	LEAD (000 T)	ZINC (000 T)	MOLYBDENUM (000 T)	SILVER (T)	GOLD (T)
1980	16,714	8,348	9,637	27,742	551	33,804	826
1985	14,201	7,041	8,503	24,553	331	29,442	1,373
1990	11,261	5,776	5,643	17,847	198	20,102	1,542
1995	9,250	5,832	3,660	14,712	129	19,073	1,540
2000	7,419	4,782	1,315	8,876	97	13,919	1,142
2003	6,037	4,303	749	6,251	78	9,245	1,009
2004	5,546	3,846	667	5,299	80	6,568	801
2005	6,589	3,960	552	5,063	95	6,684	965
2006	6,923	3,940	737	6,055	101	6,873	1,032
2007	7,565	3,778	682	5,984	213	6,588	987

Source: Natural Resources Canada, based on company reports and the federal-provincial/territorial survey of mines and concentrators

Global Metal Prices

Global economic events and trends have a direct and daily impact upon mineral and metal prices. As price takers in the international marketplace, the Canadian mining industry is accustomed to fluctuations driven by world economic conditions and varying prices on terminal exchanges such as the London Metal Exchange.

In some respects, the global industry is still recovering from low prices and low exploration in the mid-to-late 1990s when investors pursued better returns in the information technology, telecom, biotechnology and pharmaceutical sectors. In Canada, mineral exploration expenditures were depressed throughout the 1990s and bottomed out in 2000. While prices and exploration levels grew strongly from 2002 to 2007, Canada continues to face a mineral reserves crisis.

The Canadian industry responds to prices driven largely by the strength of the US and Chinese economies. China imports over $100 billion in metals annually and presently buys around 25% of the world's base metals versus a 5% share in the 1980s. China accounts for around 28% of world zinc consumption, 22% of world nickel consumption and 26% of world copper consumption.

China is also known to have increased its strategic stockpiling efforts to acquire significant amounts of iron ore, aluminum, copper, nickel, tin, zinc and oil at a low price. (This stockpiling makes it more difficult for analysts to project future mineral prices and marine shipping prices.)

Since the beginning of the global recession in the third quarter of 2008, many mining companies have been curtailing production in order to bring supply into balance with demand. For example, some 20 zinc smelters worldwide have moved in late 2008 and early 2009 to curtail production. In Canada, some 32 mining operations have been closed or seen temporary production cuts during these months.

The information in **Figure 14** illustrates three stories—the strong mineral price growth seen in the 2000-to-2007 period; the dramatic decline seen in late 2008 in most metals; and the fact that prices of zinc, nickel and copper have rebounded through the first half of 2009. Some interesting commodity-specific price observations include the following:

- Gold prices are largely driven by geo-political uncertainties such as the mounting US fiscal and trade deficits, the evolving situation in Iran and Iraq, and the impact of high fuel prices. Gold prices are at their highest level since the early 1980s and have continued to increase throughout the recession. As discussed in Section 6.0, gold producers will likely be active on the mergers/acquisition front over the coming year.
- Copper remains a "bellwether commodity" with demand tied closely to economic growth and consumption of wire, computer chips, electronics and vehicles. Copper is attracting particular attention from analysts, especially regarding whether the price increases seen to date in 2009 are sustainable. Some forecast that soft demand outside of China could push prices back to US$1.50 per pound.

Figure 14: Metal Prices, 2000 to June 2009

MINERAL PRICES	2000	2007	'08/12	'09/06
Aluminum (US$/lb)	0.70	1.20	0.79	0.75
Copper (US$/lb)	0.82	3.23	1.28	2.31
Zinc (US$/lb)	0.51	1.47	0.49	0.72
Nickel (US$/lb)	3.92	16.88	4.38	7.20
Uranium (US$/lb)	8.29	98.81	53.00	54.00
Gold (US$/oz)	279	697	836	946
Crude Oil (US$/brl)	30	72	100	69

Source: Scotiabank Commodity Price Index

- Spot prices for uranium reached US$99 per pound in 2007 (from $8 in 2000), driven by increasing global demand and production difficulties in Australia. Prices declined during the first half of 2008 though have since rebounded to $54. The enduring strength of the uranium price has served to intensify exploration interest in Saskatchewan and other regions, including Argentina and Peru.
- Iron ore prices tend to be set through contractual agreements between lead suppliers and customers, rather than through global trading. Spot pricing has become more prevalent in recent months, to the point where some speculate that it may replace the annual benchmarking price system. Such a shift would bring greater transparency while being more aligned with a steel system where prices are re-priced daily. The long delays in 2009 in reaching benchmark price agreement between Rio Tinto, BHP Billiton, Vale and Chinese steel companies have reinforced the emerging importance of the spot price market. Agreements between Rio Tinto, Vale, and Japanese and Korean steel companies in June 2009 suggest a price reduction of approximately one-third over last year's prices.

In the medium term, most mining analysts believe that a combination of continued development in China, a depreciated US dollar, aging western infrastructure, industry consolidation and a dearth of new mining projects worldwide will create strong mineral price fundamentals. With the more gradual emergence of India and its related demand for minerals and metals—perhaps over time on a scale comparable to China—the mining industry may enjoy an extended boom in the commodity price cycle.

Another predictor of an extended boom is that, while China is now the world's largest consumer of all major metals, its metal consumption per person is still low in comparison with developed Asian and Western economies. For example, while Chinese ownership of motor vehicles has climbed from a total of less than one million in 1990 to around 20 million at present, Chinese consumers still have only an estimated two cars per one hundred people, versus around 76 cars for the US. Though not a definitive benchmark of national economic development and while such gaps may never be totally closed, similar discrepancies nonetheless exist in many metals-intensive areas.

The challenge of bringing new discoveries into commercial production is another variable that may support high mineral prices in the medium and longer term. Underinvestment in new copper-mine capacity during the price downturn of the 1990s for example, means that refined supplies are likely insufficient to meet future global demand.

According to Scotiabank's commodity research analysts, other supply-side factors that could affect future mineral prices include growing resource nationalization in Latin America and moves by many governments to increase royalty rates—this issue is discussed in greater detail in Section 6.0.

Finally, the effects of the global stimulus spending being seen in China, the United States, Japan and Europe will begin to be seen in late 2009 and 2010 and will serve to enhance mineral prices in some commodities in the short and medium term.

Financing

The development and implementation of a successful exploration and capital investment program depends on a company's ability to raise capital. Canada has historically had a strong global presence in mining finance. Canadian firms are responsible for the largest share of exploration spending in Canada, the United States, Latin America, Central America, Europe and, most recently, Africa. This exploration strength, combined with the ability to turn properties into mining projects, has helped make Canada a world centre for mining finance.

CANADIAN FINANCE

The Toronto Stock Exchange (TSX) is home to the largest group of mining companies in the world. As of end-2008, the TSX listed 55% of the world's public mining companies, with 1427 listed companies compared to 684 on the Australian exchange and 216 on London. TSX mining stock trading nearly tripled between 2005 and 2007 before levelling off at $450 billion in 2007 and 2008.

The TSX is a global destination for financing international projects. Listing companies are required to meet disclosure standards known as National Instrument 43-101—this standard is increasingly viewed as the global mining disclosure benchmark.

The TSX is also home to the Venture Exchange, the former Canadian Venture Exchange purchased by TSX in 2001, headquartered in Calgary and with offices in Toronto, Winnipeg, Vancouver and Montreal. TSX Venture provides emerging companies with efficient access to capital while offering investors a regulated market for making venture investments. The 1071 mining issuers listed on TSX Venture in 2008 were valued at $9 billion, a 75% decline over market value one year earlier. The amount of equity raised during the year also declined significantly—from $7 billion in 2007 to $3 billion in 2008. These two measures reflect the collapse of metal prices and exploration that occurred in late 2008. Gold, uranium, silver, copper, nickel and diamonds were the main target of Venture Exchange issuers, while these plus potash were the main focus of the senior exchange.

Among senior companies, there are 356 mining issuers listed on the Toronto Stock Exchange, valued at $207 billion (versus $338 billion in 2007). Twenty-two of the 356 TSX-listed mining companies have a market capitalization exceeding $1 billion as of mid-2009 with Barrick Gold, Goldcorp, Potash Corporation, Kinross Gold, Agnico-Eagle Mines, Cameco Corporation and Yamana Gold heading up the list. This represents a significant decline from 48 companies a year earlier. There were 42 new mining listings financed on the senior TSX exchange in 2008, down from 78 in 2007.

Figure 15: Global Mining Financings, 2004–2008

(US$ BILLION)

EXCHANGE	FINANCINGS	%	VALUE	%
TSX – Toronto	8253	81	45	31
LSE-AIM – London	869	9	28	19
ASX – Australia	884	9	16	11
Shanghai	4	-	19	13
BOVESPA – Brazil Sao Paulo	1	-	12	8
NYSE – New York	27	-	9	6
HKGSE – Hong Kong	8	-	7	5
Japan	14	-	3	2
Other	129	1	6	5
TOTAL	**10,176**	**100**	**145**	**100**

Source: Gamah International, 2004–2008, compiled by TSX Group

INTERNATIONAL PERSPECTIVE

The global mining industry completed 1467 public financings in 2008 raising $46.6 billion in equity. As detailed in **Figure 15**, over a five-year period, around 81% of these financings have been undertaken on the TSX, followed by the Australian and London exchanges handling around 9% each. By value, the TSX handled 31%, London 19%, Shanghai 13% and Australia 11%. Much of the London exchange's mining market capitalization is due to three companies (BHP Billiton, Anglo and Rio Tinto).

The proportion of equity value handled on the TSX has fallen in 2008 primarily due to very large single-equity financings that were handled on the Sao Paulo and Shanghai exchanges during the year. Removing these two financings, the TSX provided one-third of the world's mining equity in 2008, a figure comparable to recent years.

The fact that 81% of all public financings were conducted on the TSX reflects its strong appeal to both junior and senior business players. The ability of TSX Venture to handle equity financing in the $1 to $5 million range efficiently is unique to Canada. It is one reason why Canadian companies are world leaders in the exploration business.

As detailed in **Figure 16**, some $47 billion in equity was raised worldwide by the mining industry in 2008. This represents a decline from the record $50 billion of the previous year, although it was significantly larger than in prior years (US$3 billion in 2000 for example). As an indication of the growth in market capitalization of the global mining industry, in 2007 alone BHP Billiton's market cap grew from approximately $110 billion to $190 billion, Rio Tinto's from $80 billion to $165 billion and Vale's from $70 billion to $150 billion. These figures declined in late 2008 and early 2009.

Figure 16: Mining Equity Raised—Role of Toronto Stock Exchange, 2000–2008

(US$ BILLION)	2000	2001	2002	2003	2004	2005	2006	2007	2008
Worldwide equity raised	3.1	3.5	8.4	9.6	8.8	9.7	26.5	50.3	46.6
Equity raised on TSX exchanges	1.1	1.0	2.2	4.1	4.1	4.0	10.1	17.6	8.3
Percent of worldwide total on TSX	36	28	26	43	47	41	38	35	18

Source: Gamah International, compiled by Toronto Stock Exchange

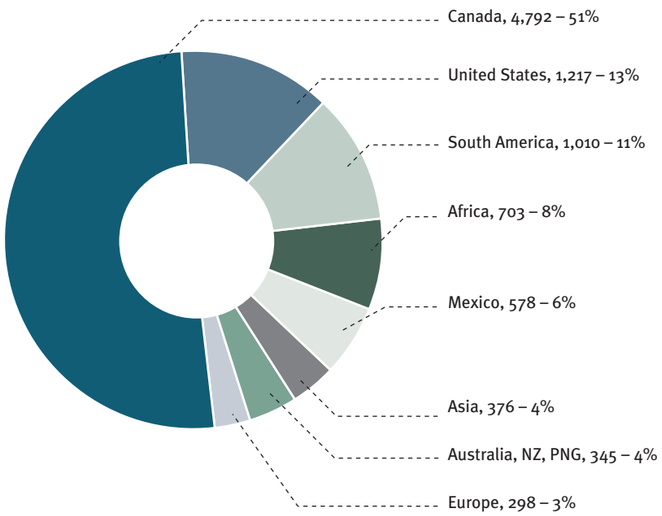
The Canadian mining industry has a strong international focus and this is also evident in the activities of the TSX (**Figure 17**). TSX-listed companies had 9,319 mineral projects in progress worldwide in 2009, of which 51% were located inside Canada and 49% outside. The United States, South America, Africa and Mexico were home to 13%, 11%, 8% and 6% respectively of the mineral projects undertaken by TSX-listed companies, proportions that are roughly comparable to the prior year. Within Asia, there were 91 Chinese projects in progress in 2009, down from 125 the previous year.

Canada's continued status as a leading mining finance country over the long term depends in part on the efficiency and competitiveness of our securities regulatory regime.

The mining industry agrees with the sentiment in federal Budget 2006 that "Canadians would be best served by a common securities regulator that administers a single code, is responsive to regional needs, and has a governance structure that ensures broad provincial participation." Following a period of consultation, the Canadian Securities Regulator Transition Office was created as a national body in June 2009 to make progress on this issue, although with the proviso that each province and territory would have the right to stay independent should it wish. In the view of the mining industry, as with most global industries, continuing with a balkanized approach would limit Canada's ability to be a leader in this global competition.

Figure 17: Geographic Reach of TSX-listed Companies, June 2009

(BY LOCATION OF MINERAL PROJECT)



Source: InfoMine, compiled by TSX, June 2009

Exploration

The objective of exploration is to locate large, high-grade reserves with minimal ground disturbance and disruption to the environment.

For the purpose of its annual survey, Natural Resources Canada categorizes exploration and development as follows:

- Exploration expenditures: Spending on activities up to and including the first delineation of a previously unknown mineral deposit.
- Deposit appraisal expenditures: Spending on activities that bring a delineated deposit to the stage of detailed knowledge required for a production feasibility study.
- Mine complex development expenditures: Spending on activities that increase ore reserves and/or that outline, block out and gain access to the ore and prepare it for production on a mine property that is in production or committed to production.

Exploration, like research and development, requires healthy levels of investment to ensure long-term success. Unless exploration spending is successful in replacing existing reserves, the value-added aspects of the mining industry will also diminish over time. This would have a strongly negative impact on Canada's national and regional economies.

EXPLORATION AND DEPOSIT APPRAISAL IN CANADA

Exploration and deposit appraisal expenditures are a benchmark of the health of the mineral exploration sector and help predict Canada's future mineral production. The most recent estimate from Natural Resources Canada places exploration and deposit appraisal expenditures at $2.8 billion in 2008 (**Figure 18**), over double the level of 2005 and four times the level of 2003. Exploration spending generally accounts for around 80% of this total and deposit appraisal spending for 20%—the combined spending is generically referred to as "exploration spending."

The figure for 2008 gives a somewhat misleading picture of the present state of Canadian and global exploration. Investment plummeted in the late months of 2008, in line with falling prices, and 2009 exploration spending results are expected to be dismal. NRCan's exploration spending intentions estimate for 2009 is $1.5 billion, roughly half of the 2008 figure.

According to PricewaterhouseCoopers annual review, *Junior Mine*, the market capitalization of the top 100 mining firms on the TSX Venture Exchange fell from $18 billion in June 2008 to $4 billion six months later. Many companies are facing cash crunches. The flow-through share market through the first quarter of 2009 has reportedly been close to non-existent.

Approximately 25% of Canadian exploration spending in 2008 focused on base metals, 38% on precious metals, 8% on diamonds and 13% on uranium (**Figure 19**). Actual dollar expenditures have increased significantly in each area between 2002 and 2008, most dramatically in uranium, where the absolute amount being spent has increased twelve-fold and some 350 uranium exploration projects are in play, primarily in Saskatchewan and Newfoundland and Labrador. Precious metals exploration spending continued to be very robust in 2008 and, given the strong gold price performance through the recession, it is likely that the share of exploration spending directed to precious metals will increase further in 2009. Under the "other" category, spending on potash exploration has increased significantly in line with buoyant prices and Saskatchewan's world-leading position. Coal exploration spending also showed an increase in 2008, especially in British Columbia.

Junior companies' share of exploration investment increased significantly between 2004 and 2007, although the proportion declined in 2008 and 2009. Juniors accounted for $1.8 billion in Canadian exploration in 2008 (roughly two-thirds of Canada's overall total) and a projected $0.8 billion in 2009 (**Figure 20**). This traditionally strong junior presence reflects the success of federal and provincial flow-through share programs in stimulating investment by firms that can take advantage of these incentives. There is an interesting form of harmony between the juniors and majors as the latter often acquire the properties or assets of the former.

Fact:

- Global price data illustrate three stories—the strong mineral price growth seen in the 2000-to-2007 period; the dramatic decline seen in late 2008 in most metals; and the fact that prices of zinc, nickel and copper have rebounded through the first half of 2009.

Figure 18: Mineral Exploration and Deposit Appraisal Expenditures, by Province/Territory, 2003–2009[i]

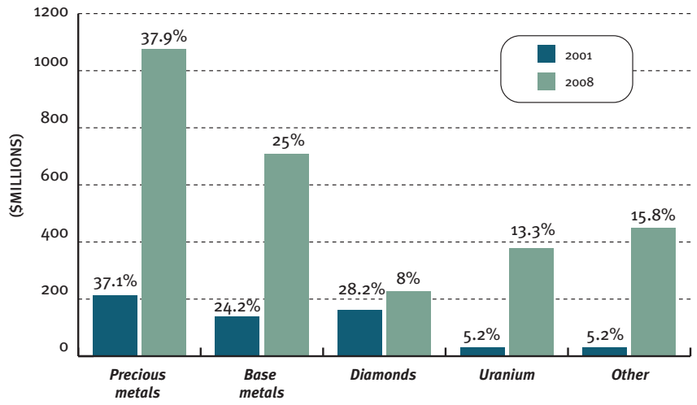
($MILLIONS)	2003	2004	2005	2006	2007	2008[p]	2009[i]	% CHANGE FROM 2008–2009
Newfoundland and Labrador	23.1	33.2	48.7	100.8	148.0	138.3	70.9	-48.7
Nova Scotia	6.4	9.1	6.5	11.0	23.5	17.3	13.7	-20.8
New Brunswick	2.6	13.4	10.1	13.4	35.8	31.5	25.3	-19.7
Quebec	134.0	227.2	205.1	295.1	476.4	434.9	255.5	-41.3
Ontario	219.4	306.9	294.0	346.5	571.7	666.8	421.2	-36.8
Manitoba	27.2	36.0	52.9	52.9	102.6	141.5	77.4	-45.3
Saskatchewan	47.7	71.8	133.9	235.6	314.0	430.8	243.9	-43.4
Alberta	4.9	6.3	6.6	18.7	11.8	22.1	8.1	-63.3
British Columbia	62.5	151.9	218.1	344.2	470.6	423.2	157.3	-62.8
Yukon	12.7	22.0	54.0	106.4	144.7	123.4	25.3	-79.5
Northwest Territories	53.6	112.4	96.3	176.2	193.7	133.1	28.4	-78.7
Nunavut	92.7	187.5	178.7	210.6	338.0	273.6	168.2	-38.5
TOTAL	**686.7**	**1,177.8**	**1,304.9**	**1,911.4**	**2,830.8**	**2,836.6**	**1,495.0**	**-47.3**

[p] *Preliminary* [i] *Intentions*

Note: Figures include field work, overhead, engineering, feasibility studies, environment, and land access costs.

Source: Natural Resources Canada, based on the Federal-Provincial-Territorial Surveys of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures

Figure 19: Canadian Exploration Spending, by Target, 2002 and 2008[p]



Note: Figures denote the percentage of total exploration spending in the year.
Source: Natural Resources Canada, based on the Federal-Provincial-Territorial Surveys of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures (current dollars)

Most Canadian exploration spending occurs off-site in greenfield areas, rather than close to existing mine sites. As discussed in Section 1.0, there is a need for fiscal measures to encourage greater on-site exploration spending, as significant reserves may still exist in close proximity to existing mine sites.

INTERNATIONAL EXPLORATION

Globally, Canada has been the number one destination for mineral exploration investment for 17 of the past 31 years, dropping to number two in 1992. From 1992 to 2003, Australia was the primary destination for exploration while Canada has retained the top position since 2004.

The Metals Economic Group (MEG) has tracked international mineral exploration activity since 1989. Its present figures are obtained through analysis of the exploration budgets of 1912 surveyed companies. The analysis indicates that worldwide investments have increased to US $13.2 billion in 2008, continuing a six-year, 550% rise since the bottom of the cycle in 2002 when $2 billion was invested. Uranium exploration is not included within these figures and would add a further US$1.2 billion to the 2008 total.

MEG identified the 10 countries that accounted for 69% of total global exploration investment in 2008 (**Figure 21**). The traditional big three—Canada, Australia and the United States—head the list, with Canada hosting 19% of total global exploration spending, Australia 14% and the United States 7%. Mexico is fourth at 6% of the world total, followed by Peru and Russia at 5% each. Chile, Brazil, China and South Africa are also important destinations, each receiving approximately $400 million in annual exploration investment. Chile, China, and Brazil are attracting increasing market shares in recent years. In general, there has been an increase in the number of companies willing to explore in higher-risk countries—with greater risk traded off against the possibility of finding large-scale deposits. This appetite has diminished somewhat with the mineral price collapse through late 2008 and early 2009. MEG anticipates that exploration spending allocated to high-risk countries in 2009 will decline more steeply than in the more stable countries. The issue of international investment and risk is discussed in Section 6.0.

As indicated in **Figure 22**, gold exploration accounted for approximately 39% of worldwide exploration budgets in 2007 with the balance claimed by base metals (40%), diamonds (8%) and platinum group metals (3%). This reflects a continued increase in the base metals share, of which copper allocations account for around 60%, nickel for 25% and zinc for 15% of the base metals exploration total. While its share of the global total declined slightly in 2008, the investment in gold exploration continues at record levels in response to price levels not seen since 1980. The gold share will likely show a significant increase in 2009 as gold prices have remained very strong, particularly in contrast to base metal and diamond prices.

According to the Xinhua News Agency, foreign companies have invested in some 277 mineral exploration projects in China, including 166 gold projects. China will be changing its approach to operating gold mining entities between 2006 and 2010, by which time the state will no longer play the role of sole investor. The industry will reportedly be called upon to diversify and restructure by welcoming foreign investment, new technology and management expertise. Sino Gold and Gold Fields, as well as Canada's Dynasty Gold, are among the firms that have entered Chinese joint ventures to explore for and develop gold projects.

The diamond share of worldwide exploration spending has declined for six consecutive years. Africa and Canada have been the largest recipients of diamond exploration spending over the past decade, with each receiving around $2 billion during this period. Silver, molybdenum, cobalt, potash, mineral sands and manganese are among the other important targets of exploration spending.

According to MEG, Canadian companies account for about 40% of global exploration spending, the largest share of any nation. It is estimated by Natural Resources Canada that some 800 Canadian companies are exploring outside Canada in over 100 countries. These numbers will presumably show a decrease in 2009 as the current economic recession and curtailed exploration programs become reflected in year-end statistics. Small exploration companies have been significantly affected by the economic downturn.

Given the large global exploration spending totals in the half-dozen years preceding the downturn in late 2008, it is of concern that only a handful of major discoveries and projects will come into production over the next five years. The global community is still paying for the dearth of exploration spending of the 1990s and early 2000s, and major new discoveries may require many years to be converted to producing mines. This concern—that the world's easiest reserves have been found—was complicated by the fact that demand for services such as drilling and assaying, and rising input costs for geoscientists and fuel, combined to "significantly increase the costs of exploration in the current cycle beyond that of overall inflation." In this sense, the actual rise in exploration activity on the ground through 2003 to

Figure 20: Mineral Exploration and Deposit Appraisal Expenditures[1] by Type of Company, 2004–2009[i]

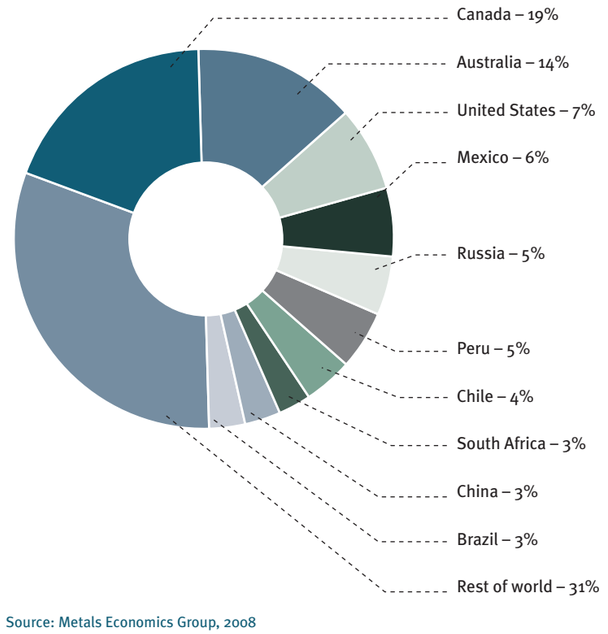
($MILLIONS)

TYPE OF COMPANY	2004	%	2005	%	2006	%	2007	%	2008[p]	%	2009[i]	%
Junior	600	51	801	61	1,238	65	1,904	67	1,783	63	785	53
Senior	578	49	504	39	674	35	927	33	1,054	37	710	47
TOTAL	**1,178**	**100**	**1305**	**100**	**1,912**	**100**	**2,831**	**100**	**2,837**	**100**	**1,495**	**100**

[p] Preliminary [i] Intentions
1 Includes on-mine-site and off-mine-site activities. Includes field work, overhead costs, engineering, economic and pre- or production feasibility studies, environment, and land access costs.
Source: Natural Resources Canada, based on the Federal-Provincial-Territorial Surveys of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures (current dollars)

Figure 21: Top 10 Countries, by Exploration Budgets, 2008

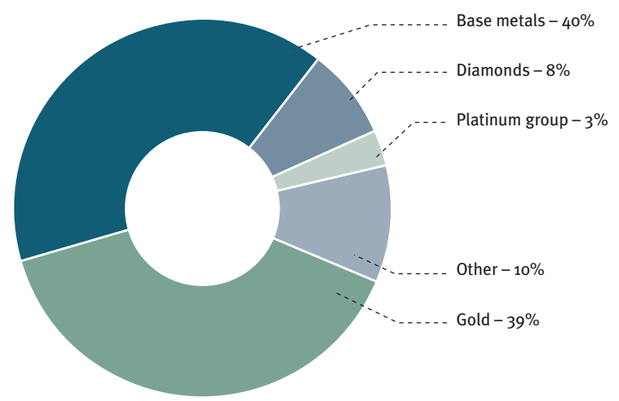
(AS % OF WORLDWIDE EXPLORATION)



Source: Metals Economics Group, 2008

Figure 22: Worldwide Exploration Spending, by Target, 2008

(AS % OF WORLDWIDE EXPLORATION)



Source: Metals Economics Group, 2009

Figure 23: Capital Expenditures in the Canadian Mining Industry, 2007–2009

($MILLIONS)	2007	2008	2009
Stage 1 – Total Mineral Extraction	6,832	7,615	5,605
Metal ore mineral extraction	3,874	4,739	3,331
Non-metallic mineral extraction	2,553	2,301	1,889
Coal mining	405	574	385
Stage 2 – Primary Metal Manufacturing	1,558	1,995	1,944
Stage 3 – Non-Metallic Mineral Product Manufacturing	969	888	785
Stage 4 – Fabricated Metal Product Manufacturing	793	799	783
TOTAL	**10,152**	**11,297**	**9,117**
Non-conventional oil extraction (oil sands)	16,816	19,236	13,247

Source: Statistics Canada, Catalogue 61-205

2008 did not exactly parallel the increase in monetary budgets. It is anticipated that one effect of the current recession will be to bring mineral exploration and production costs into a more realistic range. Nonetheless, there is a concern among some analysts that the recession-driven standstill in exploration spending could drive mineral prices to new heights when the global economy recovers. A May 2009 report by Ernst & Young highlighted this exact concern.

Capital Investment

Capital expenditure is a barometer of management and investor confidence in future market demand and existing production capacity. Capital spending pays for productivity-enhancing and cost-cutting measures such as process and technology improvement; facility construction, modernization and expansion; new product lines; mill improvements; energy retrofits and environmental improvements; smelter improvements; increased mine production rates; and the extension of production life.

Capital spending, by governments and business, can also serve to open up new regions for development. For example, a recent study by MacQuarrie Engineering concluded that a power line into northern BC could stimulate $3.5 billion in mining investment over time. Ongoing policy discussions regarding the future of public infrastructure such as the Ridley bulk-handling marine terminal could also affect future economic development in northern BC.

As detailed in **Figure 23**, capital investment in the mining industry totalled $11.3 billion in 2008 and is projected to decline to $9.1 billion in 2009. This comprises spending through the four stages of the industry, although around 80–90% is invested in the first two stages—extraction and smelting/refining. As detailed in the Statistics Canada catalogue, roughly 60% of capital spending in mineral extraction is on construction and 40% on machinery and equipment, while at the smelting/refining stage only 15% of spending is on construction with the remainder directed toward machinery and equipment.

Repair expenditures are not included in Figure 23 and are not available from Statistics Canada for the most recent years. In 2006, they represented an additional $2 billion in spending at the mining extraction stage and $2.7 billion in the three mineral manufacturing stages. Combining this estimate with the above capital ($11.3 billion) and exploration ($2.8 billion) spending figures generates an estimated total amount of $18.8 billion in Canadian mineral development investment in 2008.

The largest capital investors in the metal mining sector in 2008 were nickel-copper mines at $1.5 billion followed by gold/silver mines at $1.3 billion, copper-zinc mines at $703 million and iron ore mines at $395 million. The coal mining industry invested $574 million in capital spending, while the potash industry invested $919 million.

Among the major Canadian mine developments of recent years, Aur Resources' Duck Pond metals mine (now owned by Teck Resources) and Vale Inco's Voisey's Bay base metal mine both opened in Newfoundland and Labrador, Western Canadian Coal opened its Wolverine coal mine in BC, and Agnico-Eagle announced that it would build the LaRonde 2 gold mine in northern Quebec. In addition, six gold mines and two base metal mines reopened in Ontario, Quebec, BC and Manitoba, while two new coal mines and a molybdenum mine in BC were expected to open in 2008. Finally, seven mines were being redeveloped for production in 2007/8, namely, Lamaque gold and Fabie Bay copper-zinc-gold-silver mines in Quebec, Caribou and Restigouche lead-zinc mines in New Brunswick, the Scotia lead-zinc mine in Nova Scotia, and the QR gold and Gibraltar copper mines in British Columbia.

Figure 23 also details the magnitude of capital investment in the oil sands, where spending reached $19.2 billion in 2008. This area remained one of the world's hot spots for investment in 2008, particularly as global oil prices approached $140 per barrel in mid-year. However this buoyant investment performance reversed direction in late 2008 as oil prices fell sharply and as the global economic recession took hold. As shown, investment projections for 2009 show a decline to $13.2 billion. The Canadian Energy Research Institute estimates that some $200 billion in announced oil sands projects and expansions have been affected by the present economic conditions.

Saskatchewan produces one-third of the world's potash, though this production draws upon mines that are all over 40 years old. Potash prices have remained strong, driven in part by changing diets in India and China and the related fertilizer needs of beef and other protein-based agricultural products. A new mine, Potash One's Legacy mine, is expected to open in Saskatchewan in 2013, while other significant mining companies are undertaking expanded exploration programs in the province. In northern Saskatchewan, the Cigar Lake uranium project has experienced delays associated with flooding problems, though is scheduled to start production within a few years.

Future potential also remains significant in the Canadian diamonds sector. Peregrine's Chidliak project on Baffin Island, Stornoway's Aviat diamond field on Melville Peninsula, also in Nunavut, and Stornoway's Renard project in central Quebec all offer promise. Stornoway's recently announced expansion of reserves in the Renard deposit, along with the Quebec government's funding commitment toward an access road to the Otish

Fact:

- In the medium term, most mining analysts believe that a combination of continued development in China, a depreciated US dollar, aging western infrastructure, industry consolidation and a dearth of new mining projects worldwide will create strong mineral price fundamentals.

Mountains region, suggests that Quebec may be the next province to enter diamond production in Canada.

Investment by Governments in Geoscience

Exploring for minerals is akin to "searching for a needle in a haystack." It is public investment in basic geological surveying that helps the industry build knowledge regarding where the haystacks may be. Being able to spend high-risk exploration dollars in areas where good geological data are available helps improve the likelihood of success.

The Geological Survey of Canada's (GSC) mandate since 1842 has been to maintain a national geoscience knowledge base sufficient to support mineral and hydrocarbon exploration and development across Canada. The GSC is also responsible for providing information to understand and address industry health, safety and environmental issues and to advocate the interests of Canadian geoscience at the international level.

The parliamentary appropriation supporting investment in basic geological science in Canada has declined significantly over the past 20 years at both the federal and provincial/territorial levels (**Figure 24**). Spending dropped by about half between 1988 and 2007—from $98 million to $50 million for the federal government and from $74 million to $33 million for the provincial/territorial governments.

The decline in geoscience spending in Canada is a trend that greatly troubles the mining industry and the Mining Association of Canada. One example of the consequences of underinvestment is that some 73% of Nunavut is either unmapped or has inadequate geological maps and, at current investment levels, would not be fully mapped for a further 80 years. Other Canadian regions have similar challenges, particularly in the north. Given the level of interest in diamonds, uranium, base metals and other northern resources, one must question how the public good is served by this underinvestment. Underinvestment weakens Canada's preparedness for northern development and sovereignty.

In response to this decline, MAC has worked in recent years with federal, provincial and territorial governments to support the case for federal re-investment in geoscience that would be matched at the provincial level. Through Budget 2008, the federal government responded to this request by investing $100 million in new money over five years. Approximately three-quarters of this spending will be directed toward investment in the three territories and one-quarter in the provinces. This Geo-mapping for Energy and Minerals (GEM) program funding will be further supplemented through provincial funding increases, while the National Geological Survey Committee, comprising federal/provincial/territorial governments, will guide the planning and investment of the overall initiative. This federal investment is classed as a "temporary" allocation of funds that increased from $21 million in 2007 to $29 million in 2008 and $32 million in 2009. This funding is a positive development for the medium-term prosperity of the industry and its employees and suppliers, although a preferred approach would be to increase the permanent appropriation for GEM.

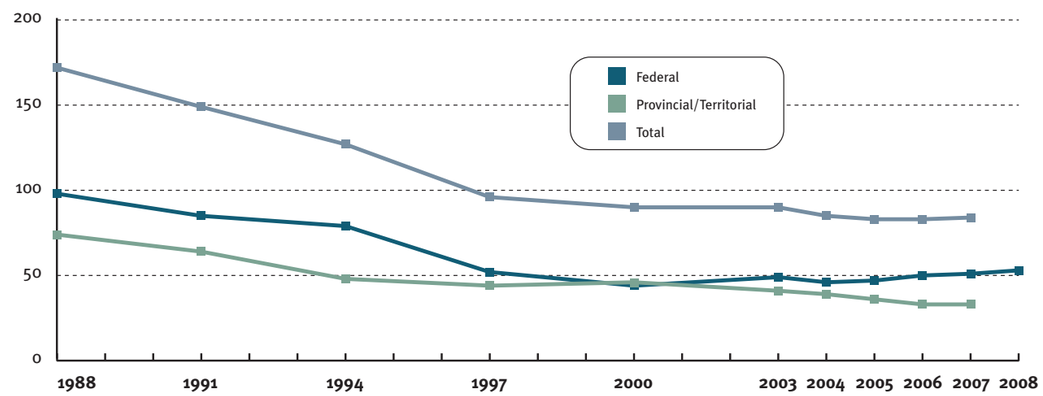
The federal Targeted Geoscience Initiative (TGI) is a parallel, though smaller investment program aimed at geoscience for base metals around existing camps. Ideally, TGI would be extended beyond 2010 and rolled into the GEM as a permanent infusion of geoscience investment. In the lead-up to future federal budgets, MAC may become engaged in supporting such a direction.

It is estimated that every dollar invested in a basic geological survey triggers five dollars in exploration spending by the private sector, while also increasing the likelihood of discovering commercial-scale deposits. Given this estimate, it is evident that the government investments in geoscience through GEM and TGI will pay economic dividends over the coming years.

Investment in geoscience is an important requirement for attracting mining investment, regardless of the country. It is interesting to note that Madagascar, for example, released for purchase by the private sector airborne geophysical data covering large tracts of land during 2007. This attracted high interest from the mining industry gauging potential in gold, heavy mineral sands, bauxite, iron ore and coal. In its periodic meetings with foreign delegations, MAC highlights investment in geological mapping as a fundamental economic building block for these national governments.

Figure 24: Geoscience Spending in Canada, 1988–2008

($MILLIONS)



Source: Natural Resources Canada, Geological Survey of Canada

The People: Employment, Costs, Innovation

The Canadian mining industry has traditionally been viewed as a leader in investment, innovation and skills. As noted earlier, the industry invested an estimated $18.8 billion in Canadian mineral development investments in 2008, along with a further $19.2 billion in oil sands investment.

Though investment flows are easier to commit in a period of buoyant prices, the Canadian industry has also invested during less-prosperous times.

The industry improved productivity and cost-competitiveness during the 1990s, primarily due to implementing new technologies. Global communications systems and automation transformed business procedures, including human resource management, while investment in technology and process improvements helped turn previously uneconomic deposits into ore by lowering production costs. The availability of skilled, well-paid industry workers is the key to maximizing the potential benefit of these investments.

Minerals and Metals Industry Employment

Total employment across the Canadian economy averaged around 17 million workers in 2008, comprised of approximately 4 million workers in the goods sector and 13 million in the services sector.

OVERALL INDUSTRY EMPLOYMENT

The mining industry accounts for approximately 1 of every 48 Canadian jobs. As defined by Statistics Canada and Natural Resources Canada, the mining and mineral processing industry directly employed 351,000 in 2008 (**Figure 25**). This is comprised of 59,000 workers in mineral extraction; 69,000 in primary metal manufacturing; 53,000 in non-metallic mineral product manufacturing; and 171,000 in fabricated metal product manufacturing. As noted earlier, there are also around 3,140 companies that supply goods and services to the industry—a recent taskforce report in BC estimated an indirect employment multiplier of 2.5 as applicable to the industry's direct employment.

Mineral extraction employment is divided: 28,000 in metal mining, 24,000 in non-metal mining and 6,000 in coal mining. The number of Canadian workers in mining extraction increased by 11% in 2008 and is roughly even with levels of a decade earlier (**Figure 26**). Increases were seen in each of metal mining, non-metal mining and coal mining during 2008, although over the past decade employment in metal and coal mining has declined while that in non-metal mining has increased—reflecting, among other factors, the emergence of Canada as a major diamond producer.

The primary metal manufacturing sector employed 69,000 workers in 2008. This includes employment in iron and steel mills, steel product manufacturing, alumina and aluminum production, non-ferrous metal production and processing, and foundries. The number of workers in the non-ferrous metal smelting and refining sector has declined from 23,000 to 13,000 over the past 15 years—a decrease of 43%. This is attributable to technological advancement and increased foreign competition.

Overall mining and oil sands employment statistics are changing rapidly due to industry growth and mergers/acquisitions. The acquisitions of Placer Dome, Noranda, Falconbridge, Inco, Alcan and others in recent years have changed the competitive landscape in Canadian mining.

Figure 25: Employment in the Canadian Mining and Mineral Manufacturing Industries,[1] 1998–2008

(NUMBER OF EMPLOYEES)

	MINING AND QUARRYING NAICS 212	NON-METALLIC MINERAL PRODUCT MANUFACTURING NAICS 327	PRIMARY METAL MANUFACTURING NAICS 331	FABRICATED METAL PRODUCT MANUFACTURING NAICS 332	**TOTAL MINING AND MINERAL PROCESSING**
1998	60,090	52,166	100,957	165,626	378,839
1999	57,353	53,286	100,529	173,072	384,240
2000	56,698	56,440	104,253	183,246	400,637
2001[r]	51,118	53,719	91,185	184,269	380,291
2002[r]	47,782	51,423	90,322	181,096	370,623
2003[r]	46,875	51,329	85,402	180,561	364,167
2004[r]	45,824	51,403	79,703	176,439	353,369
2005[r]	46,689	51,304	78,731	176,068	352,792
2006[r]	48,830	53,701	80,681	179,728	362,940
2007[r]	52,877	52,807	78,802	175,091	359,577
2008	58,506	52,707	69,107	171,126	351,446

1 Excludes oil and gas, and services incidental to mining.
NAICS, North American Industry Classification System.
[r] Revised
Sources: Natural Resources Canada; Statistics Canada

Figure 26: Employment in the Mineral Extraction Stage, 1998–2008

(NUMBER OF EMPLOYEES)

YEAR	METAL MINES	NON-METAL MINES	COAL	TOTAL
1998[r]	32,354	19,431	8,304	60,089
1999[r]	29,555	19,987	7,812	57,354
2000	29,468	20,031	7,199	56,698
2001[r]	25,564	19,524	6,030	51,118
2002[r]	22,585	19,497	5,700	47,782
2003[r]	21,810	20,224	4,841	46,875
2004[r]	21,374	19,907	4,543	45,824
2005[r]	21,196	20,456	5,037	46,689
2006[r]	22,007	21,487	5,336	48,830
2007[r]	23,850	23,183	5,844	52,87
2008	28,074	23,988	6,443	58,505

[r] Revised
Source: Statistics Canada, Survey of Employment, Payroll and Hours (SEPH)

The leading mining employers, as listed in the 2008 *Report on Business Top 1000* rankings, are Barrick (17,800 employees); Teck Cominco (8,900); Yamana Gold (8,700); First Quantum (7,427); Pan American Silver (7,300); Sherritt International (5,392); Goldcorp (5,304); Alcoa (5,200); Kinross Gold (5,000); Fording Coal (3,000); Cameco (2,720); Anvil Mining (2,550); FNX Mining (1,500); HudBay Minerals (1,489); Eldorado Gold (1,388); Agnico Eagle (1,303); and Inmet (1,100). These figures also include employees at international operations.

Among the large industry employers who have been acquired and/or no longer report separate figures, Rio Tinto Alcan employed 64,700, Xstrata 14,500, Vale Inco 11,700, Iron Ore Company of Canada 1900, and LionOre 1,400 (figures are for 2007). Among the main oil sands extraction companies, Suncor employed 5,766 and Syncrude employed around 4,300. Employment at these and other oil sands companies increased significantly between 2003 and 2008, although declines may be seen in next year's 2009 data in response to the global recession.

While exact statistics are dated and difficult to obtain, it is evident that the industry employs relatively few female workers. In analyzing Statistics Canada data, MiHR estimates that 13% of mineral extraction and processing workers are female. The female representation in Canadian engineering programs is reportedly less than 20% and women represent only 10% of the 160,000 licensed engineers across Canada. These proportions are particularly low when one considers that women account for 60% of the student body in Canadian universities and for half of the total Canadian workforce.

EMPLOYMENT OF ABORIGINAL CANADIANS

The information from Statistics Canada regarding Aboriginal employment in the mining extraction industry is drawn from recent census data and indicates that 4,515 Aboriginal people worked in the mining industry in 2006. This figure has increased 43% since 1996. The number of Aboriginals employed in the mining industry in the Northwest Territories increased from 100 to 560 during the 1996 to 2006 period. Significant increases have also been seen in Newfoundland and Labrador (from 40 in 1996 to 350 in 2006), in British Columbia (from 360 to 650) and in Saskatchewan (from 630 to 930). It is estimated that Aboriginal workers accounted for 7.5% of the mining workforce in 2006 versus 3.6% in 1996.

In addition to these figures, there are also significant levels of Aboriginal Canadians employed in the oil sands sector. As of 2007, over 1,500 Aboriginal employees worked in permanent operations jobs, representing a 90% increase over 1998 levels. Oil sands companies have also awarded an estimated $1.5 billion worth of contracts to local Aboriginal companies over the past decade. These contracts are increasing each year. In 2007 alone, $606 million in contracts were awarded to local Aboriginal companies by the Alberta oil sands operations.

There remains potential to increase the number of Aboriginal mining workers. The growth rate of the Aboriginal population is double that of the non-Aboriginal Canadian population and many communities are located near mining operations.

Some of the industry's anticipated worker shortages could be filled through the training and skills enhancement of Aboriginal Canadians. Progressive socio-economic agreements, such as the EKATI Mine Project agreement in the NWT and the Raglan Agreement in Quebec, can provide literacy and other training, employment, profit-sharing and environmental benefits to signatory Aboriginal groups. Agreements between Vale Inco and the Innu and Inuit in Labrador comprised sections on training, employment, work conditions, contracting, shipping, financial benefits, environmental commitments and dispute settlement—these provided the necessary confidence and mutual benefit for the project to move forward. In total, there are over 50 such impact benefit agreements in place relating to mineral extraction projects—these involve companies such as Barrick, Voisey's Bay Nickel, Syncrude, Tahera Diamond, Diavik, BHP Billiton, De Beers, Cameco, Raglan-Falconbridge and Aber Resources.

INDUSTRY NEED FOR HUMAN RESOURCES AND SKILLS

The Canadian and global mining industry faces a serious human resource challenge in the coming decade. The Mining Industry Human Resources Council (MiHR) estimated in early 2009 that the sector will need to hire 6,000–9,000 new workers per year for the next decade to meet anticipated production targets. This comes at a time when the skilled core of the industry, including some 65% of geoscientists, will reach retirement age. Teck Resources, as one example, estimates that as many as half its workers in BC will retire over the next five years. In virtually all skill categories, the number of Canadian mining workers over age 50 is two to five times greater than the number below age 30. This is a more pronounced reality in mining than in other Canadian sectors. Addressing these challenges will require a significant and coordinated effort by the industry and all levels of government in Canada.

The predominance of advanced technology in today's mining industry translates into a requirement for highly educated workers. The industry requires technical mining extraction expertise, as well as skills in computer technology, information management and mineral process technology, among others.

MiHR is a sector council focused on the development of solutions to national human resources challenges facing the minerals and metals industry. In a recent study, MiHR noted that the industry has historically faced challenges recruiting women, visible minorities and immigrants. The study also estimated that Canadian universities in the coming year would graduate one-third fewer mining engineers than the number required by the industry. *The Globe and Mail* noted in March 2008 that there would be 1,200 geology graduates in Canada in 2008 to fill 9,000 positions. This reality is compounded by the fact that companies in other countries are also actively recruiting Canadian graduates and workers. As well, several university mining programs in the US have been closed or cut back in the past decade in response to the industry downturn of the 1990s.

The human resources and skills pressure is being felt by the mining industry worldwide. For example, in Australia, where mining employment has increased by almost two-thirds in five years, it is estimated (pre-recession) that the industry will need an extra 70,000 workers by 2015.

The MiHR report proposes such actions as increasing the promotion of the industry to youth, Aboriginals and non-traditional groups; developing programs to bring back retired workers, retain older workers and increase mentoring; enhancing educational programs and employer-provided training; and implementing standards for key occupations.

The specific numbers cited in this section may have eased somewhat given the ongoing economic recession, although the core longer-term message and challenge remain.

Wages and Strikes

The globally competitive nature of Canada's mining industry has traditionally been reflected in its wages and salaries, which are the highest of any industry in Canada.

Average weekly wages and salaries in the mining industry (see Annex 7) exceeded $1,300 in 2008. Canada's coal mines and metal mines offered the highest average weekly wages followed by smelting and refining and non-metal mining. These wage levels increased around 5% in 2008 on top of 12% in 2007, reflecting the buoyant price and profitability situation that existed until late 2008. These percentage increases will be smaller in 2009, and likely in 2010, as the effects of the recession become reflected in wage levels.

As detailed in Annex 8, the average weekly earnings for a mining industry worker in 2008 were 44%, 42%, 35% and 33% higher than those of workers in the forestry, manufacturing, finance and construction sectors respectively.

There were a total of 16 strikes and lockouts in the mining and mineral manufacturing sector in 2008 involving a total of 2,629 workers. These totals are comparable to the 15 incidents involving 2,766 workers as reported by the federal government in 2007 (see annexes 9 and 10). This suggests that approximately 1.5% of industry workers in these three stages were involved in strikes and lockouts during 2008. Economy-wide, approximately 0.2% of Canada's workers were involved in strikes and lockouts—the level of strike activity in the mining sector was therefore higher than its proportion of overall Canadian employment.

Fact:

- Some of the industry's anticipated worker shortages could be filled through the training and skills enhancement of Aboriginal Canadians. Progressive socio-economic agreements can provide training, employment, profit-sharing and environmental benefits to signatory Aboriginal groups—there are over 50 such bilateral agreements already in place.

Figure 27: Selected Costs of Production in the Mineral Industry, 2007

BY INDUSTRY	ESTABLISHMENTS SURVEYED (NUMBER)	WAGES FOR PRODUCTION & WORKERS RELATED ($000)	FUEL & ELECTRICITY ($000)	MATERIALS & SUPPLIES ($000)	VALUE OF PRODUCTION ($000)
Metal ore mining	67	1,485,403	988,131	4,074,632	24,721,174
Non-metallic mining and quarrying	710	838,754	742,251	1,448,367	8,177,913
Coal	22	324,279	237,321	423,348	2,407,065
TOTAL MINERAL INDUSTRY	**799**	**2,648,436**	**1,967,703**	**5,946,347**	**35,306,152**

Sources: Natural Resources Canada; Statistics Canada, Catalogue 26-201-X

Production Costs

Because mineral prices are generally established through international trading and exchanges, mining companies have limited control over the revenue side of the income statement. To remain globally competitive, companies must therefore maintain control over production costs.

Statistics Canada's annual survey of business production costs (**Figure 27**) is drawn from NRCan's Annual Census of Mines; it reports three major production cost elements for 789 mining establishments: wages, energy (fuel and electricity), and materials and supplies. For the overall industry, these three cost components amounted to $2.6 billion, $2.0 billion and $5.9 billion respectively in 2007, the most recent year for which data were available. Wages amounted to about 8% of the industry's production value, energy 6%, and materials and supplies 17%.

Mining companies in Canada and abroad faced mounting costs through 2005, 2006 and 2007. In its regular global cost commentary in mid-2006, BHP Billiton noted that costs were being driven by increased competition for capital, energy, personnel, equipment and materials—and that high costs and lengthening equipment delivery times were causing delays in its development of new capacity in Australia and elsewhere.

Until the onset of the recession, the increased exploration levels and intense activity in the oil sands sector was putting upward pressure on labour supply and wages throughout the Canadian resource economy. One oil sands project operator estimated that the overall per barrel cost of building/operating an expansion was 3.2 times higher in 2007 than five years earlier. A Metals Economics Group study reported one mining executive's estimate that (between 2004 and 2007) the overall contract drilling rate increased by 35%, geophysics costs by 28–50%, assaying costs by 27% and vehicle fuel costs by 25%. In this scenario, according to PricewaterhouseCoopers, costs among 40 tracked mining companies increased 38% during 2007, while sales advanced 32%, leading to a squeeze in profit margins and to a pre-recession slowing of major resource development projects in Canada and abroad.

Productivity and Technology

Productivity is a measure of the efficiency of the inputs—people, capital and natural resources—that are employed to create an output. There are general indications that the Canadian minerals and metals industry is innovative and employs advanced technologies, although the supporting statistics may not be easily comparable. According to the Centre of Living Standards and Statistics Canada data, annual productivity growth during the past decade, 1997 to 2006, was approximately as follows:

- All Canadian industries: 1.5% per year
- Manufacturing sector: 2.1% per year
- Mineral extraction: 1.8% per year
- Non-metallic mineral product manufacturing: 1.6% per year
- Primary metal manufacturing: 4.8% per year
- Fabricated metal product manufacturing: 1.2% per year

These data suggest that productivity growth in the mineral extraction phase and in the primary metal phase exceeded that of the "All Canadian Industries" category. Productivity growth in the primary metal stage was over double that of the Canadian manufacturing sector as a whole.

Through the 1990s, the combination of low commodity prices, consolidations, globalization and regulatory constraints drove Canadian mining companies to higher levels of innovation and productivity. The rapid development of the Internet helped the industry enhance productivity while minimizing operational costs—an industry such as mining, with facilities in remote locations, could draw particular benefit from information management and communications technologies.

Productivity comparisons with other countries should be drawn carefully. Available data from the US Bureau of Labour Statistics suggest that annual labour productivity growth in the US during the past decade (1997 to 2006) was approximately 1.1% in mineral extraction, 1.5% in non-metallic mineral product manufacturing, 3.4% in primary metal manufacturing and 2.0% in fabricated metal product manufacturing. These data suggest that productivity growth in the first three stages of the Canadian industry exceeded the performance recorded in the US industry.

In terms of technology, at the exploration stage of the industry, the technological challenge is to locate large, high-grade reserves with minimal ground disturbance and disruption to the environment. New technologies, including GPS surveying information, 3-dimensional data maps, airborne technologies and down-hole seismic imaging, are allowing companies to locate new deposits not otherwise discoverable with traditional methods.

In extraction, a high portion of Canada's remaining mineral inventory is likely located two kilometres or more below the surface. This presents geo-mechanical, labour, energy efficiency and operational challenges to the industry's productivity and profitability. The industry has responded by investing in remote-operated equipment, automated loading and transportation systems, robotics and seismic mapping. These technologies are providing companies with the capability to exploit deposits at greater depths and keep open mines that would otherwise have closed—a task that is more viable in times of strong prices.

International mineral smelting and refining technology has not experienced any step-change advances over the past 20 years. Pyrometallurgical operations drawing upon thermal treatment, and newer hydro-metallurgical operations drawing upon electricity and chemistry, continue to be adjusted and improved upon—in the aim of extracting maximum metal from the mineral while minimizing energy use and emissions. Similar gradual improvements are seen in iron ore pelletizing facilities—for example ArcelorMittal Mines (formerly QCM) aims to improve the energy efficiency of its pelletizing operations and conceivably reduce GHG emissions by 30%. In terms of particulate matter emissions, traditional technologies such as bag-houses and electrostatic precipitators continue to be utilized.

In the coming years, it is likely that the industry in Canada and internationally will be directing increased attention to energy management and carbon emissions. This will be driven both by increased energy costs—such as a potential return to $150 per barrel oil—and by the plethora of new greenhouse gas regulations, taxes and trading systems that will emerge over the next decade. Emerging regulatory requirements may affect the viability of some older processing facilities in Canada. This is a consideration, for example. in the recently announced HudBay decision to close its 80-year-old copper smelter in Flin Flon, Manitoba, by July 2010, thereby affecting 225 jobs.

In one emerging area, carbon capture and sequestration (CCS), it is already mandated that Canadian oil sands projects after 2011 will be required to invest in this area. The future evolution and commercial viability of CCS technology will likely remain unclear for several years. One of the few operating CCS projects in the world is located in Saskatchewan, where Encana is buying CO_2 from a coal gasification plant in North Dakota and piping it for injection into an oil field near Weyburn. The Alberta government announced three

Fact:

- Available data suggest that Canadian productivity growth over the past decade (such as 4.8% per year in primary metal manufacturing) exceeds US performance in each of the first three stages of the mining industry.

demonstration projects from its $2 billion CCS fund in June 2009, two relating to capturing CO_2 from oil sands upgraders and one involving a clean coal plant. Some industry analyses in the oil sands area have concluded that a carbon price of over $100 would be needed to make CCS investments approach viability, while CCS projects at some coal-fired power plants may be viable at a significantly lower carbon price. Cost will remain an unknown variable for years to come. In 2007, SaskPower cancelled plans for a clean coal plant incorporating CCS after estimated costs ballooned to $3.8 billion from $1.5 billion. In 2008, the U.S. Department of Energy pulled out of a similar project in Illinois after the estimated cost doubled to US$1.8 billion.

RESEARCH AND DEVELOPMENT

According to the Statistics Canada catalogue 88-202 entitled *Industrial Research and Development*, Canadian mining companies invested $648 million in research and development in 2006. This R&D spending comprises $63 million in mineral extraction, $272 million in primary metals, $238 million in fabricated metal products and $75 million in non-metallic mineral products (**Figure 28**). It should be noted that these data in the most recent survey catalogue (2008) are presented as "unreliable" as the portion provided through questionnaire responses is too low for Statistics Canada's tightened quality standards.

The R&D investment of the mining industry in 2006 exceeded that of several large sectors in Canada, including oil and gas extraction, motor vehicles and parts, forestry and wood/paper products, and machinery. As detailed in **Figure 29**, there are 6,848 R&D workers in the four stages of the industry. This figure is larger than that in the aerospace and pharmaceutical sectors—sectors that receive significant government financial and policy support.

he Canadian corporate R&D database, RE$EARCH Infosource Inc. (2008), ranked seven mining and oil sands companies among the top 100 private-sector R&D investors in Canada in 2007:

- Vale Inco ranks 28 at $77 million
- Alcan ranks 37 at $58 million
- Syncrude ranks 43 at $53 million
- Suncor ranks 46 at $50 million
- Novelis (aluminum rolling/recycling firm) ranks 50 at $45 million
- Teck Cominco ranks 66 at $32 million
- Rio Tinto Iron & Titanium ranks 93 at $16 million

Some of these firms have increased their investment over the previous year, while others have reduced their R&D spending. For example, investment by Vale Inco increased from $68 million in 2006 to $77 million and Teck Cominco from $17 million to $32 million, while reported spending on R&D by Alcan declined from $250 million in 2006 to $58 million in 2007 as Rio Tinto Alcan.

R&D spending is also seen in the supply segments. One noteworthy announcement in June 2009 was by the simulator equipment company CAE indicating that it would be allocating some of a $274 million R&D commitment toward the mining and heavy equipment sector. Simulator technology could facilitate training in a sector where machinery and equipment are generally used to the maximum, limiting access to the machines to train operators and drivers.

The mining industry, through the involvement of the Mining Association of Canada and other organizations, is engaged in the federal government's new Science and Technology Policy and its support of business-led networks of centres of excellence under the umbrella of the newly created Canada Mining Innovation Council (CMIC). The funding, structure and activities of the CMIC will develop further through 2009 as an executive director and strategic direction are put in place. There is a broad range of mining education and R&D centres in Canada that could benefit from better national focus and priority setting in mining innovation.

Figure 28: R&D Expenditures by the Mining Industry, 2004–2008

($MILLIONS)	2004	2005	2006	2007	2008[1]
Mining – extraction	58	47	63	na	na
Primary metals – non-ferrous	225	250	272	236	244
Fabricated metal products	202	214	238	na	na
Non-metallic mineral products	44	73	75	81	67
TOTAL – MINING AND METALS	**529**	**584**	**648**	**NA**	**NA**
Others – Oil and gas extraction	314	386	515	na	na
Others – Petroleum and coal products	190	214	202	239	239
Others – Motor vehicles and parts	657	638	608	568	590
Others – Wood products and paper	500	443	496	416	405
Others – Aerospace products and parts	na	857	na	na	928
TOTAL MANUFACTURING	**8,343**	**8,435**	**8,563**	**8,426**	**8,607**
TOTAL ALL INDUSTRIES	**15,299**	**15,791**	**16,137**	**16,159**	**16,316**

Note: 2008 figure denotes R&D intentions.
Source: Statistics Canada, Catalogue 88-202-XIE

Figure 29: Number of Persons Engaged in R&D, by Industry, 2006

	PROFESSIONALS	TECHNICIANS	OTHER	TOTAL
Mining – extraction	165	108	36	309
Primary metals – non-ferrous	696	557	214	1,467
Fabricated metal products	1,530	1,972	670	4172
Non-metallic mineral products	441	348	111	900
TOTAL – MINING AND METALS	**2,832**	**2,985**	**1,031**	**6,848**
Others – Oil and gas extraction	452	272	109	833
Others – Petroleum and coal products	195	117	12	324
Others – Motor vehicles and parts	2,253	1,934	1,018	5,205
Others – Paper and wood products	1,104	1,032	737	2,873
Others – Aerospace products and parts	2,637	1,115	1,446	5,198
Others – Pharmaceutical and medicine	3,440	1,395	1,055	5,890
TOTAL MANUFACTURING	**41,080**	**22,391**	**10,356**	**73,827**
TOTAL ALL INDUSTRIES	**87,577**	**44,284**	**16,952**	**148,813**

Source: Statistics Canada, Catalogue 88-202-XIE

The Environment

Few industry sectors face the degree of scrutiny from environmental and social groups that is accorded to the mining industry.

Mineral extraction and processing, virtually by definition, involves an intrusion upon the landscape—whether to build access roads and power lines, to undertake exploration programs, to conduct open pit or underground mining, or to treat and manage waste products. These actions represent encounters between humans and the surrounding environment—and the attendant need to manage and minimize the risk that accompanies these encounters. In the Canadian context, mining can mean accessing lands situated within the Boreal Forest. Accessing land and resources in northern Canada can frequently raise issues of Aboriginal rights and relationships. Comparable issues face the mining industry in its international operations, which often occur in countries with less developed infrastructure and environmental protection and community consultation capacities.

In response to these challenges, as discussed in this section, the Canadian mining industry places a high priority on enhancing environmental performance and responding to social issues within a sustainable development framework. Globally, the Canadian mining industry is generally regarded as operating at the leading edge of social-environmental practices.

Progress Through the Towards Sustainable Mining Initiative

Launched in 2004, the Towards Sustainable Mining (TSM) initiative addresses the mining industry's social licence to operate. It reflects industry commitment to align priorities and values with those of its communities of interest, while improving business and environmental performance. TSM includes performance indicators and targets for tailings management, energy use and greenhouse gas emissions management, external outreach, and crisis management. Participation in TSM and its annual reporting requirements is a requirement of membership in the Mining Association of Canada.

In 2007, TSM added two new indicators to address biodiversity and Aboriginal relations and required members to implement outside verification of their 2006 company performance assessment. The new TSM biodiversity criteria will help drive continued improvements in such areas as mine and facility closure. One example of planning for closure is the DeBeers process that preceded opening of the Snap Lake and Victor mines. The company worked with Laurentian University to determine how to best re-establish vegetation with local species following project closure. A baseline of local fauna and flora species has been assembled to guide the future restoration of these sites.

In recognition of its TSM initiative, the Globe Foundation awarded the Industry Association Award for Environmental Performance to the Mining Association of Canada in 2005. This award is presented annually to associations whose industry has gone beyond regulatory compliance to improve environmental performance through research, development and education.

The global context surrounding TSM is affected by the large number of international sustainability and social licence initiatives that continue to be developed. The Global Reporting Initiative (GRI), for example, calls upon international organizations in numerous sectors to report on economic, environmental and social performance and to adhere to sector-specific guidelines. With respect to the mining sector, a GRI Mining and Metals Sector Supplement was developed in 2005. Numerous other international initiatives have been designed pertaining to specific mining industry segments, including diamonds, gold and jewellery, as well as to overall responsible mining extraction practices.

Canadian firms are also actively involved in domestic environmental research and consultation initiatives such as Mine Environment Neutral Drainage (MEND) and the National Orphaned and Abandoned Mines Initiative (NOAMI). As well, MAC is presently engaged in a pollutants dialogue with the federal government in two areas—in helping government and industry respond to a recent court ruling regarding reporting of data to the National Pollutant Release Inventory (NPRI) and in contributing to an evolving federal consultation regarding new air pollutant targets. *See the Mining Association of Canada's annual Towards Sustainable Mining Report at* www.mining.ca *for details.*

Figure 30 highlights MAC member companies' progress in reducing releases to the environment over the past 15 years or so. These figures reflect data from those companies accounting for a large majority of Canada's mining production. As indicated, the industry has made significant progress in most areas relative to the base year. Mercury releases have been reduced by 93%, lead by 87%, zinc by 85%, arsenic by 74%, cadmium by 79%, copper by 61% and hydrogen sulphide by 60% between the early 1990s and 2007. This illustrates the success of investment by mining companies in cleaner processes and technologies in response to early-stage voluntary actions and emerging Canadian regulatory requirements. Performance results in the past

Figure 30: Mining Industry Release of Substances to the Environment

	BASE YEAR	2003	2005	2007	% CHANGE (BASE-07)
Arsenic	319	133	81	85	(74)
Cadmium	130	28	31	27	(79)
Copper	976	274	353	384	(61)
Hydrogen Sulphide	442	86	64	178	(60)
Lead	1,844	297	199	231	(87)
Mercury	28	1	2	2	(93)
Nickel	1,372	260	393	247	(82)
Zinc	3,015	467	405	444	(85)

Notes: The air/water pollutant releases are tonnes per year. Data are drawn from industry submissions to the National Pollutant Release Inventory (NPRI).
Base year varies by company though is generally around 1993.
Source: MAC Member Companies, TSM Progress Report, 2009

Fact:

- The cleaner products and technologies of today and tomorrow are not possible without metals and minerals as the building blocks. Water purification systems rely on nickel and rare earth elements. Hybrid vehicles draw energy from nickel hydride batteries. Catalytic converters require cerium and palladium. Wind and solar technologies use a range of minerals and metals in the equipment and processes. Efficient lightweight vehicles require aluminum and lighter nickel-alloy composites.

few years have been more mixed—namely continued decreases in nickel and increases in zinc, lead and some other pollutants as industry reaches the limits of current technology and deals with natural variability in metal content of feedstock.

Vale Inco's operations in Sudbury provide one example of a recent investment aimed at improving the environment. The company announced in 2006 that it would invest $115 million in its Sudbury operations using fluidized-bed roaster off-gas scrubbing technology to reduce sulphur dioxide emissions by one-third. For its part, Xstrata Nickel's sustainable development policy outlines targets in air emissions, energy management, water use, and waste management, as well as a plan to rehabilitate 50 acres of land and plant 60,000 trees. One of the environmental undertakings of HudBay Minerals involves restoring some 94 acres of forest in Manitoba and Saskatchewan.

There may be potential over the medium and long term for Canadian mining companies to use their metallurgical facilities to process discarded electronic material and thereby reduce landfill volumes. As an industry leader, Teck Resources is using furnace and metallurgical processing capacity in its Trail, BC, facility to process e-scrap and, in so doing, recover zinc, lead, indium, cadmium and other metals. The future of such businesses will depend in part on the extent to which manufacturers and consumers are required by government regulation to take responsibility for life-cycle management and stewardship of the products they produce and consume. It will also be important that greenhouse gas and clean air policies being developed by the federal government, as discussed later in this section, do not actually work against the practice of greater recycling.

Aboriginal Relations and Impact Benefit Agreements

It is important that the mining industry have a strong and progressive relationship with Canada's Aboriginal community. As noted earlier, mining is the largest private-sector employer of Aboriginal Canadians and, given the relatively high proportion of Aboriginal youth, there is potential to draw upon this human resources source in greater numbers. Approximately 1200 Aboriginal communities are located in reasonable proximity of mineral exploration and production sites. Some governments, at the provincial level, are in the process of modernizing mining legislation with the objective of bringing legislative requirements into the new millennium and clarifying the consultation requirements affecting companies and Aboriginal groups. Ontario, for example, is amending its mining act to modernize its map-staking system and to implement a consultation system during the exploration and mining processes, among other features.

At the industry-wide level, the Mining Association of Canada places a high priority upon this area and, among other activities, completed and signed a memorandum of understanding with the Assembly of First Nations in early 2009. MAC is also developing the TSM architecture to help guide and support company undertakings and reporting in the area of Aboriginal relations. A TSM framework was approved by MAC's board of directors in late 2008, while decisions regarding how best to implement this framework will be taken over the coming year.

A strong relationship is equally or more important at the individual company level. Beyond meeting applicable laws and regulations, and passing through relevant environmental review processes, it is increasingly evident that companies must have formal agreements in place with affected Aboriginal groups to facilitate progress on extractive projects. These agreements, generally known as Impact Benefit Agreements (IBAs), are usually signed between mining companies and Aboriginal communities and, among other components, may contain commitments regarding education, training, jobs, business contracts and financial payments. IBAs have also been developed in Canada for pipeline, hydro-power and oil sands projects. There are over 50 IBAs in place relating to mineral extraction projects—these involve companies such as Barrick, Voisey's Bay Nickel, Syncrude, Diavik, BHP Billiton, De Beers, Cameco, Raglan-Falconbridge and Aber Resources.

Energy Efficiency and Greenhouse Gas Emissions

Energy and greenhouse gas policy issues have gained visibility and importance in Canada in recent years. Heightened awareness of climate change, increased linkages between clean air and health, strong growth of oil sands development and frequent front-page political attention have moved these issues to the top of the public's environmental mind.

MINERAL EXTRACTION

The extraction segment of the mining industry was exempted from the large-final-emitters regime under the previous Liberal federal government and continues to be exempt from the present Conservative government's clean air and GHG emissions targets. There are around 200 operating metal and non-metal mines in Canada that cumulatively account for a fraction of 1% of Canada's total emissions. The government has concluded that it is more fruitful to focus new clean air and GHG targets on the relatively few smelters, refineries and pelletizing facilities whose emissions are higher.

While not subject to regulated targets, many mining operations in Canada have nonetheless been improving their capabilities in compressed air, ventilation, metering and energy management. Investment in such areas will continue to be a priority for the Mining Association of Canada and the industry in its dealings with Natural Resources Canada, the department that oversees federal programs for energy efficiency. MAC and NRCan funded the preparation and translation of a detailed energy and GHG management guidance document, and delivery of workshops, during the past year to help companies in their continuous improvement efforts.

Among the energy-efficiency challenges facing mine sites is the fact that today's older and deeper mines require more energy to access and extract the ore. Mining operations in northern Canada also face a particular energy challenge, given the lack of electrical grid capacity. Both the Diavik and EKATI operations are dependent on fuel oil being transported to the site over a winter ice road and therefore are less able to lower their carbon emissions. The mines have been designed with energy efficiency as a key consideration.

METALS SMELTING AND REFINING

Each stage of the value-added chain in the mining and metals sector is energy intensive; hence the Canadian mining industry is a relatively large user of energy and emitter of air pollutants and greenhouse gases. The industry's base metal smelters, iron ore pellet plants and oil sands operations are classified as "large emitters" by the federal government and are the subject of ongoing discussions within the government's clean air and climate change regulatory framework. (The oil sands operations are grouped within the oil and gas sector for the purposes of the government's framework.)

The most energy-intensive players in the mining sector—namely smelting and refining—have made considerable progress in improving energy and greenhouse gas intensity performance over the past 17 years. The metal smelting and refining industry has reduced its energy requirements from 50.4 terajoules per kilotonne of production output in 1990 to 41.1 TJ/kt in 2007—an improvement of 18%.

As detailed in **Figure 31**, the primary metal smelting and refining industry has reduced its GHG emissions intensity from 4.0 kilotonne of CO2e per kilotonne of unit production output in 1990 to 2.3 in 2007—an intensity improvement of 43%.

In terms of absolute emissions, this industrial segment has bettered Canada's economy-wide target under the Kyoto Protocol. These improvements are due to investments in energy efficiency and, where possible, a shift away from carbon-intensive energy sources such as heavy fuel oil.

Given that it has taken the industry seventeen years to improve GHG intensity by 43% (2.5% per year), it is evident that the

Figure 31: Mining Industry Energy and GHG Emissions Data, 1990–2007

	1990	1995	2000	2005	2007
TOTAL CANADIAN ECONOMY					
Energy use (PJ)	9,608	10,155	11,362	11,851	11,125
GHG emissions (Mt)	592	642	718	734	720
ALL CANADIAN INDUSTRY					
Energy use (PJ)	2,400	2,533	2,724	2,682	2,091
Direct GHG emissions (Mt)	105	107	111	113	112
Total GHG emissions (Mt)	142	144	161	163	160
METAL ORE MINING					
Energy use – from electricity (PJ)	47	42	36	37	31
Energy use – from natural gas (PJ)	7	4	3	3	2
Energy use – from heavy fuel oil (PJ)	15	16	12	12	11
Energy use – from middle distillates (PJ)	17	13	13	14	17
Energy use – from coal coke (PJ)	11	11	12	12	10
Total energy use (PJ)	102	91	81	82	73
Share of Canadian energy use (%)	1.06	.90	.71	.70	.66
Energy per unit (TJ/kt)	0.36	0.34	0.33	0.33	0.32
Energy per output index	1.0	0.86	0.69	0.66	0.67
Total GHG emissions (mt CO2e)	3.9	3.6	3.3	3.3	3.1
GHG emissions per output index	1.0	0.88	0.72	0.70	0.74
PRIMARY METAL SMELTING AND REFINING					
Energy use – from electricity (PJ)	31	41	42	36	33
Energy use – from natural gas (PJ)	23	23	22	18	18
Energy use – from heavy fuel oil (PJ)	6	4	4	na	3
Energy use – from coal (PJ)	13	10	11	na	na
Total energy use (PJ)	77	84	86	73	73
Share of Canadian energy use (%)	0.80	0.83	0.75	0.62	0.66
Energy per unit (TJ/kt)	50.4	45.9	45.3	42.4	41.1
Energy per output index	1.0	0.99	0.87	0.75	0.79
Total GHG emissions (mt CO2e)	6.1	4.9	5.4	3.7	4.0
Share of Canadian GHG emissions (%)	1.0	0.8	0.8	0.5	0.6
GHG emissions per unit (kt CO2e/kt)	4.0	2.7	2.9	2.1	2.3
GHG emissions per output index	1.0	0.74	0.70	0.48	0.55

Source: Assorted tables in CIEEDAC Report, March 2009

target proposed under the federal government's *Turning the Corner* strategy (18% improvement from 2007 to 2010) would not be achieved over three years. Under such a scenario, companies would likely pay into a technology fund to meet a portion of the gap unless a legitimate carbon trading regime or offsets regime is operational and effective in the near future (which seems unlikely given the slow pace of federal government progress in these areas). As a further complication, the government proposes to phase out the technology fund after only a handful of years.

Apart from its emissions intensity improvement target, the framework presented by the government poses problems on other fronts. First, in terms of emissions trading, a carbon or SOX/NOX trading regime that is limited to the domestic market would be too small and illiquid to be workable. Second, the carbon budget allocated as credit for early action is relatively tiny and may not be worth the bureaucratic effort to pursue these credits. Third, it seems likely that a hodgepodge of regulatory and reporting obligations could emerge as provincial governments unveil plans that do not mesh with the proposed federal approach and vice versa.

It is also important that any federal plan on GHG emissions engage all Canadians in the solution. The proposed federal plan leaves the consumer element of Canadian society largely unaffected, focusing instead on easier political targets. This approach leaves some 55% of Canadian GHG emissions "on the sidelines" and consequently places an inordinate competitiveness burden on Canadian industry. One interesting illustration of the global competitiveness context is that China is presently commissioning new coal-fired power plants at a rate of one every few weeks, generally using old technology. China's GHG emissions *growth* each year exceeds the sum of Canada's total annual emissions from all sectors. In value-added areas such as aluminum smelting, China has added massive processing capacity in recent years drawing on its under-priced coal-fired electricity generation. Development in China and other competing countries should take place within a global GHG framework and using the cleanest possible technologies.

It is increasingly evident that there will eventually be a price attached to carbon emissions in Canada and elsewhere, whether in the form of a tax or a cap and trade system. Designing a cap and trade system is not easy—as the European example illustrates. A decade after beginning to design a system, the carbon price of the ETS is in the $10 per tonne CO_2 range. The widespread allocation of free permits and special exemptions caused a collapse of the ETS and continues to affect the system's design and function. This precedent also complicates matters for an eventual Canadian system, given the importance of providing a level playing field for Canadian business. US President Obama has outlined an objective of cap and trade legislation passing Congress in the coming months and has also projected US$79 billion in carbon permit revenues accruing to the federal government in 2012 and US$646 billion between 2012 and 2017. Precedent suggests that this timeline is very ambitious.

OIL SANDS

Oil sands operations face particular challenges with respect to GHG emissions. By some projections, oil production from Alberta's oil sands projects will increase from 1.3 million barrels per day to a projected 4.7 million in 2025 and 6.3 million barrels by 2035. Given current technology, this could create a five-fold or greater increase in greenhouse gas emissions. The scale of the GHG challenge facing Alberta and Canada, while significant, is placed in context through **Figure 32**, which shows the oil sands challenge as being comparable to the coal-emissions challenge faced by 15 US states and smaller than the GHG challenge faced by each of Texas, Missouri, Illinois, Indiana, Ohio, Kentucky, Tennessee, Alabama, Georgia, Florida, Ohio, Michigan, West Virginia, Pennsylvania and North Carolina. This places the emerging debate over "trade barriers against GHG-intensive oil", as advanced by some NGOs in the US and Canada, in a more realistic context. The US faces comparable or greater GHG challenges in thirty of its own states drawing electricity from coal combustion.

Developing nuclear power plants in the region to supply electricity and steam could improve the oil sands industry's GHG intensity and, toward this end, Energy Alberta Corp. and Atomic Energy of Canada, as well as Total SA and Areva of France, have had discussions on this issue. However, there are many challenges facing this option, including the fact that Alberta has no nuclear infrastructure or past history with nuclear energy and the oil sands projects are located at relatively great distance from each other, negating the ease of transporting steam.

A second major technology that could produce "step improvements" in GHG intensity is the development, construction and operation of a large-scale carbon capture and sequestration system. Future oil sands projects (post-2011) will be required to invest in this area. However, this technology is in its infancy, with only a couple of active CCS operations in the world, and the cost of developing a system of controlled underground repositories could be extremely high. Examination of this technological option is underway in the US, Canada and elsewhere—governments around the world are allocating significant funding toward this end.

The Emerging Clean Energy Economy

The global demand for environmental goods and services is expected to reach $800 billion by 2010. The most promising future technologies, according to a *Climate Change Business Journal* survey, relate to low-carbon energy, energy storage, carbon capture and storage, green buildings and materials, clean vehicles and renewable energy.

It is worth noting that this cleaner society, and particularly our ability to make progress over the coming decade, will depend upon the availability of metals and minerals as building blocks.

Hybrid vehicles, for example, draw energy from nickel hydride batteries. Catalytic converters, used to reduce vehicle air pollutants, require platinum, rhodium and cerium. Rechargeable batteries require lithium, while solar cells require gallium, indium and germanium. Water purification systems rely on nickel and a host of rare earth elements. Developing other clean energy sources, whether nuclear, wind or hydrogen, requires a range of minerals and metals.

Nickel, to take one example, has the strength and corrosion-resistant properties necessary for air pollution abatement hardware and renewable energy infrastructure—for example wind turbines are made from nickel alloys. Small biogas projects (such as some Clean Development Mechanism projects in India) use gas turbines made from nickel alloys—the rotor, nozzle, shaft, heat shield and fuel injectors are also made from nickel-containing alloys.

New materials will continue to be developed with the aim of being made lighter and stronger. For example, aircraft fuel efficiency has improved 70% in forty years because of materials such as aluminum, yet next-generation technologies will draw upon still lighter composites such as the nickel-alloy material Invar. Similar examples are evident throughout many facets of our residential, municipal, communications and transportation infrastructure.

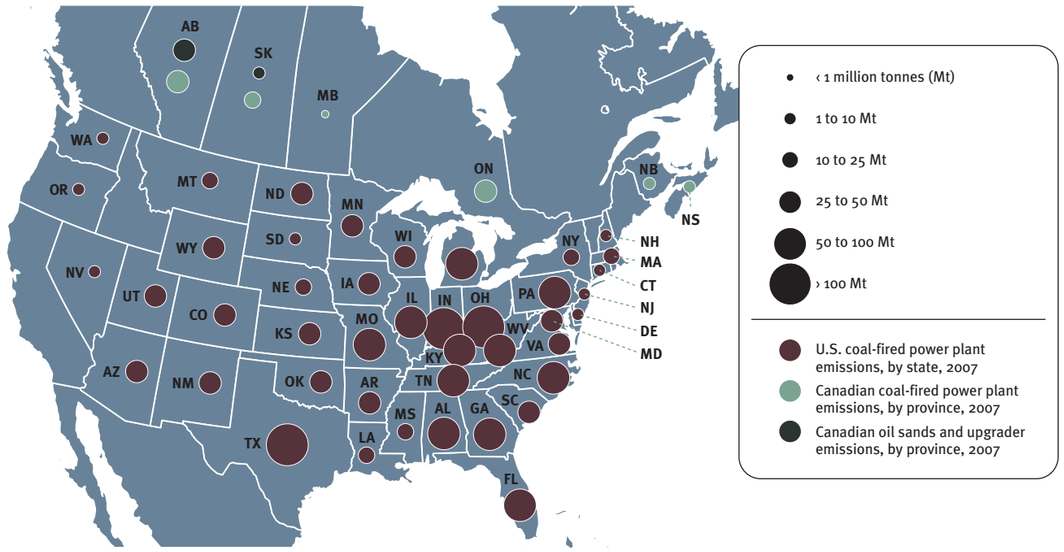
Regulatory Environment

The Canadian mining industry, in particular the large mineral producers and processors, operate within a complex regulatory environment. There are 19 federal acts and 14 federal regulations related to the mining industry. They range from the specific, such as the British Columbia *Indian Reserves Mineral Resources Act*, to the general, including the *Income Tax Act* and the *Canada Labour Code*. In addition, there are dozens of provincial laws and regulations. For

Fact:

- There are some 30 US states that have an equivalent or greater coal-related GHG challenge than that faced by Canada's oil sands operations.

Figure 32: Canada and the United States: The GHG Challenge



Source: NRCan

example, 21 provincial acts and 12 regulations govern the mining industry in Ontario.

Canadian mining companies and domestic and foreign investors depend on governments for a clear understanding of information requirements, approval processes, timetables and responsibilities. Mining industry experience over recent years—for example, with respect to environmental legislation such as the *Canadian Environmental Assessment Act*—has been very uneven. This can have a negative effect on Canada's status as a destination for capital investment.

The mining industry was pleased with the announcement in federal Budget 2007 that $150 million would be allocated over five years toward the Regulatory Improvement Initiative. This Initiative includes the establishment of a Major Projects Management Office (MPMO) to coordinate the multiple agencies and departments involved in reviewing projects proposed by industry. The objective is to cut project review times in half—from four years to two. The government has made good progress on this issue during 2008 and 2009, although the ongoing economic recession and decreased number of projects in the pipeline makes it premature to gauge the actual level of improvement flowing from the MPMO.

While this regulatory initiative is positive, developments in the climate change and clean air regulatory areas may not offer similar promise. As noted, many industrial sectors fear that complicated, duplicative regulatory and reporting systems may emerge as the government develops federal regulations where provincial regulations already exist or are being developed. On the greenhouse gas front, industry needs clarity and certainty with respect to regulatory processes and mechanisms in order to make appropriate solution-oriented investments. With respect to evolving air pollutant targets and processes, it is important that the federal government not create inter-jurisdictional overlap, that it avoid a one-size-fits-all requirement, and that it focuses effort on those facilities and regions that will deliver actual environmental and health benefits.

International Market Activities and Developments

The two most common measures of international market activity—investment and trade—are mutually reinforcing. Companies that are active direct investors also tend to be active traders. In general, increased direct investment tends to lead to greater trade levels.

There are few industry sectors in Canada as internationally active as the mining industry. Canadian companies are global leaders; there are almost 1,000 Canadian exploration companies active in other countries and the industry accesses new capital, ideas and opportunities through high flows of inward and outward investment. Canadian stock exchanges have provided 31% of the world's mining equity and handled 81% of the world's financing transactions over the past five years. Canadian-listed firms have around 4600 mineral projects in varying states of development outside Canada.

Foreign Investment Statistics

As a "home grown" sector, the Canadian minerals and metals sector has historically had a significant global investment reach and invested more abroad than it has received in Canada. While the sector remains a large global investor, this characteristic has evolved in recent years.

Canadian direct investment abroad (CDIA) was valued at $637 billion in 2008 (**Figure 33**). The minerals and metals sector accounted for 10.5% of this figure; it has held steady at approximately 10% for the past five years, down from 15% in the 1990s. This decline was due to significant CDIA increases during the past decade from the energy and financial services sectors. CDIA stocks of the energy sector rose from $20 billion in 1999 to $40 billion in 2002 and $60 billion in 2007.

Canadian minerals and metals companies have an accumulated stock of $67 billion in CDIA invested abroad as of 2008. The CDIA is aimed primarily toward the United States and Latin America. This level of CDIA is very high relative to the overall size of the industry and is comparable to that of the energy sector. The Canadian finance/insurance industry has the largest stock of direct investment abroad, by a considerable margin.

The total stock of foreign direct investment in Canada (FDIC) in the metallic minerals and metal products sector grew dramatically in 2007 to a level of $59 billion and remained at this level in 2008. This represents around 12% of total FDIC stocks in Canada, up from 8.5% in 2006 and the 5–7% range of previous decades. These significant increases reflect the foreign acquisitions that occurred in Canada's minerals and metals sector in recent years. Other leading Canadian industries in terms of FDIC stocks include finance and insurance ($95 billion), energy ($113 billion), and services and retailing ($52 billion).

Figure 33: Metallic Minerals and Metal Products — Direct Investment Stocks, 1990–2008

($ BILLION)	CDIA	TOTAL	%	FDIC	TOTAL	%
1990	13.5	98.4	13.7	9.8	130.9	7.5
1995	24.5	161.2	15.2	9.6	168.2	5.7
2000	42.4	356.5	11.9	17.4	319.1	5.5
2002	43.1	433.3	9.9	20.7	354.1	5.8
2003	44.5	403.4	11.0	20.9	354.5	5.9
2004	47.7	445.1	10.7	22.6	365.7	6.2
2006	61.5	523.3	11.8	38.2	448.9	8.5
2007	55.8	515.4	10.8	59.1	491.3	12.0
2008	66.7	637.2	10.5	59.2	504.9	11.7

Source: Statistics Canada, Cansim Table 376-0038; 2008 figures are preliminary

International Trade Statistics

The data in annexes 11 and 12 reflect combined figures for all mining stages—from ores to refined and fabricated products. These annexes illustrate Canada's significant trade deficit in iron and steel and trade surpluses in copper, gold, aluminum and coal.

EXPORTS

There has been strong growth over the past five years in exports for the first three mining stages (**Figure 34**). This is due to significant metal price increases in recent years. Export of first-stage minerals grew from $11 billion in 2004 up to $29 billion in 2008, while refined product exports grew from $17 billion to $31 billion and semi-fabricated product exports from $14 billion to $20 billion. Cumulatively, exports of these three stages increased from $43 billion in 2004 to $80 billion in 2008. Exports of the fabricated product stage have remained level at around $14 billion annually over the past five years.

Canada generally has a large trade surplus in the first three stages and trade deficit in the fabricated products stage.

In total, as detailed in Annex 11, the Canadian mining industry exported $95 billion worth of metals, non-metals and coal in 2008, including $69 billion in metals, $19 billion in non-metals and $6 billion in coal. This $95 billion figure equates to 19% of total Canadian goods exports in 2008. Key exports in 2008 included aluminum, nickel, copper, gold, uranium, coal, potash, zinc, diamonds, iron and steel, and iron ore. Exports of these specific products ranged from $1.9 billion to $17 billion each.

Roughly 62% of Canada's total metal exports are to the United States, predominately iron and steel, aluminum, copper and nickel. In non-metals, nitrogen and potash are important export commodities to the US market. The European Union is an important destination for Canadian gold, nickel, iron ore, uranium and diamonds. The "other destinations" category, which includes China, receives significant exports of nickel, copper, gold, iron ore, sulphur and potash.

IMPORTS

The pattern of imports exhibited a similar trend to exports; the value of imports for the first three stages has increased over the past five years, while fourth-stage imports have remained stable.

Annex 12 details the Canadian industry imports of $57 billion in metals, $10 billion in non-metals and $2 billion in coal in 2008, for a total of $69 billion. This figure equates to about 16% of total Canadian goods imports in 2008. Key imports in 2008 included iron and steel, aluminum, copper, gold and coal.

Of Canada's total metals imports in 2008, around 57% originated from the United States and 29% from "other" origins, including South America, Russia and Africa. These countries are an important source of copper, gold, iron and steel, and aluminum for Canadian smelters and refineries.

International Developments in 2008

The mining industry is among the most global of all sectors. Mineral products have strategic importance to countries with large or growing infrastructure needs and manufacturing sectors—as well, many countries and governments gain important revenues from the industry. It is therefore not unusual for the state to play a central role in funding or controlling mineral resource development, and the global mining industry is directly affected by international trade and investment policy developments. The past year was particularly active on this front, with interesting developments in many areas.

A PAUSE IN MARKET DEMAND GROWTH

As detailed in Section 3.0, the demand for, and price of, many minerals fell significantly in late 2008. Several dozen mines in Canada and abroad were closed and numerous other project delays and cuts were implemented in the aim of bringing supply into line with demand.

Beyond these short-term adjustments though, the longer-term worldwide demand for metals and minerals is expected to remain high. China, India and Brazil are the first, second and fifth most populous countries in the world and rank among the 20 largest economies. As an annual average, these countries have grown approximately 9%, 6% and 3% respectively over the past decade. The result of this growth is being seen in higher incomes and a developing industrial base and middle class, which is driving a growing appetite for minerals and metals and the products they make possible. As noted earlier, despite growth of the past decade, the per capita usage of many metal-intensive products remains relatively low in these emerging markets. According to a recent World Economic Forum study, the economic growth projected in China in the 2020–2025 timeframe will still be in the range of 6–9% annually and that of India will average 6%. Many governments are also introducing stimulus spending packages—for infrastructure and other investments that could help spark economic activity. The US, for example, is implementing a US$767 billion package while China's amounts to around US$600 billion.

The Canadian dollar has climbed almost 50% in this decade in US dollar terms, driven in large part by growth in commodity prices and Canada's strength in these areas. For the Canadian mining industry, minerals are generally priced in US dollars, while labour and other costs are denominated in Canadian currency—a climbing currency therefore serves to reduce profitability. During the 2003 to 2008 period, the benefits to the industry of strengthened mineral prices exceeded or largely offset the costs of a strengthened currency.

INTERNATIONAL GOVERNMENTS SEEKING GREATER REVENUES

Given the strength of mineral prices during the 2003–2008 period, the governments of many countries endeavoured to obtain a larger share of the overall revenue streams. *Facts & Figures 2008* detailed the actions being proposed or taken in Ecuador, Mongolia, Zambia, Congo, Argentina, Venezuela, Uzbekistan and Russia in this regard. These actions can affect business profitability, share price and investment and the government decisions can also be taken in isolation without considering that costs for mining capital, labour and equipment also increased during these years. It is likely that these investment obstacles will diminish in light of the present economic downturn—policy makers will be more balanced in their policy formulation. Sub-national governments can also be of concern: an April 2009 article in *Mining Environmental Management* magazine discussed the issue of local communities and politicians being manipulated by interest groups to adopt an anti-mining platform, citing the example of Argentina.

Beyond these examples of weak investment regimes, there are countries that are actively aiming to attract investment to develop their natural resources. The country of Jamaica, for example, unveiled its first national minerals policy in May 2009—improving the investment climate for enhanced development of bauxite, base and precious metals,

Fact:

- Key exports in 2008 included aluminum, nickel, copper, gold, uranium, coal, potash, zinc, diamonds, iron and steel, and iron ore. Exports of these specific products ranged from $1.9 billion to $17 billion each.

Figure 34: Mineral and Mineral Product Imports and Exports, 2004–2008

($ MILLIONS)	2004	2005	2006	2007	2008	2008 PERCENTAGE OF CANADA'S TOTAL ECONOMY
TOTAL IMPORTS						
Stage I	5,264	5,558	7,128	7,803	9,158	2.1
Stage II	5,249	6,787	7,763	7,673	9,350	2.2
Stage III	16,102	18,155	19,922	19,534	21,983	5.1
Stage IV	25,838	26,353	27,284	27,886	28,821	6.6
STAGES I–IV	**52,453**	**56,853**	**62,097**	**62,896**	**69,312**	**16.0**
Metals	42,977	47,326	52,240	52,801	57,398	–
Non-metals	8,165	7,990	8,329	8,755	9,976	–
Coals & cokes	1,309	1,536	1,527	1,338	1,936	–
TOTAL ECONOMY IMPORTS	**355,886**	**380,858**	**396,773**	**406,988**	**433,431**	**–**
TOTAL EXPORTS						
Stage I	11,467	15,259	16,690	17,937	28,530	5.9
Stage II	17,176	18,705	25,315	32,570	31,120	6.4
Stage III	14,042	16,225	18,427	19,745	20,420	4.2
Stage IV	13,996	14,417	14,851	14,616	14,799	3.1
STAGES I–IV	**56,681**	**64,606**	**75,283**	**84,868**	**94,869**	**19.62**
Metals	43,549	48,979	60,204	69,173	69,102	–
Non-metals	11,191	12,144	11,641	12,521	19,288	–
Coals & cokes	1,941	3,482	3,437	3,173	6,478	–
TOTAL ECONOMY EXPORTS	**412,290**	**436,351**	**440,364**	**450,699**	**483,568**	**–**

Stage I Primary – involves the discovery of ore, ore extraction and processing to the concentrate stage.
Stage II Smelting and Refining – refers to the metallurgical extraction process, the product of which is a relatively pure mineral, a metal or an alloy.
Stage III Semi-Fabricated – involves the manufacturing or processing steps required to bring products to a semi-finished or semi-fabricated stage or form.
Stage IV Fabricated – includes products of Stage III that have undergone further processing.
Sources: Natural Resources Canada; Statistics Canada

and industrial minerals. Tanzania, Zambia, Colombia and others are looking to improve the investment climate for mineral exploration and development. Mongolia's recent election brought a pro-development president to power—this has provided some momentum behind development of the large Oyu Tolgoi copper-gold mine proposed by Ivanhoe Mines. Investment flows into and out of Canada are affected by the perceived attractiveness of the investment climate in other countries. The threat of resource nationalization that emerged in some Latin American, African and Asian countries in recent years could dampen investment in these regions, while making Canada relatively more attractive.

The Fraser Institute survey of mining executives from 658 companies, released in February 2009, rated Canadian jurisdictions among the world leaders for best policy environment for mining investment, with political stability and security being important variables in this regard. Quebec, Wyoming, Nevada, Alberta, Newfoundland and Labrador, New Brunswick, Manitoba, Chile, Saskatchewan and Ontario were the ten top-rated jurisdictions of the 71 captured in the survey. Issues such as the availability of water and energy are important variables—these have negatively affected the rankings of Chile and South Africa in past years. The lowest-ranked jurisdictions are Venezuela, Ecuador, Guatemala, Honduras, India, Bolivia, Zimbabwe, Kyrgyzstan, Congo and Indonesia.

It should be noted that even Canada, regarded as one of the world's safest regimes for investment, is not immune from negative developments. A new diamond royalty proposed by the Ontario government without advance consultation in its 2007 budget was viewed by industry as arbitrary and discriminatory, and coming on the eve of the opening of Ontario's first diamond mine, itself the culmination of a $1 billion, multiple-year investment. While this issue has been resolved to some extent, such proposals do send negative signals to the international mining investment community.

Some Canadian analysts are also concerned that lack of clarity and commitment in the land access area could negatively impact the future competitiveness of mining in Canada. Issues such as government proposals to protect large areas of land in the north and amendments to provincial mining legislation require the proper balance—imbalance in resolving these issues could serve to drive mineral exploration, development and operational investment to other jurisdictions.

TRADE AND INVESTMENT POLICY

The global trade policy front has been relatively quiet for several years, although WTO discussions have continued intermittently. In recent World Trade Organization negotiating sessions, there have been indications of a willingness to reduce export subsidies and the market access provisions are reportedly close to agreement—wherein countries would reduce tariffs according to a set formula. Under the proposed formula, China, for example, would move from a current average MFN rate of approximately 9% to a rate of around 5.7% and India from roughly 19% to 12%. Despite progress in this aspect, prospects for a culmination of the Doha negotiating round remain distant as of mid-2009 as countries focus on responding to the recession through stimulus packages and other measures. Agricultural issues also remain a key obstacle to any successful global negotiations.

Within this trade policy vacuum, some economic observers see signs of key countries becoming increasingly protective of their raw material supply:

- For example, China has a permit system for copper concentrate and applies an export duty on unwrought copper; both policies are aimed at protecting critically important raw material supplies for domestic use and keeping these raw material flows out of the global trading system. A similar effort is being seen in energy. It is also believed that China is considering imposing further export quotas on such alloys as molybdenum, over concerns regarding security of supply to the steel sector.
- China is implementing measures to increase the scale and self-sufficiency of its metal smelting operations. Under recently adopted regulations, new zinc smelters must exceed 100,000 t/y capacity and source at least 30% of concentrate from their own mine supplies. This will presumably force smelters to develop or buy into new mines. Similar objectives have also been established for lead and copper smelters.
- In May 2009, China's state committee announced its intent to consolidate the base metals industry and restrict new aluminum projects—both to cope with the international financial crisis and to accelerate industry restructuring. The government plans to set up three to five large metals producers by 2011 and to adjust industry structure such that the top ten producers control 90% of national copper output, 70% of aluminum, 60% of lead and 60% of zinc production. Outdated production and over-capacity will be eliminated over time.
- In recent months, China has expanded its strategic stockpiling efforts with significant purchases of iron ore, aluminum, copper, nickel, tin and zinc as well as crude oil. These purchases have supported the price increases seen in the second quarter of 2009, although there is debate among analysts as to whether the stockpiling is sustainable and its impact on mineral prices as economic growth resumes in the US, Europe and Japan.
- Twice in the past two years, Russia has arbitrarily halted energy exports to Belarus and Ukraine.
- India's government imposed a US$7 per tonne export tax in March 2007 aimed at cutting iron ore exports in half, over concerns that existing high-grade reserves may not meet domestic demand. India is the world's third-largest exporter of iron ore, mainly to steel companies in China, Japan and South Korea. It is worth noting that steel producers Pohang Iron and Steel and ArcelorMittal have recently agreed to build steel mills in India. India's steel output is expected to increase from 43 megatonnes per year at present to 200 megatonnes by 2020, a reality that helps explain its efforts to restrict iron ore exports.
- Countries such as Germany and Japan are themselves reliant upon raw material supply to feed large domestic manufacturing needs; they are increasingly concerned about raw material trade barriers. The OECD is examining this general issue in greater detail.
- A trade policy area that is gaining more mainstream discussion relates to carbon tariffs—wherein a given country could decide to apply a tariff against imports sourced from countries that allegedly have weaker CO_2 emission requirements. There have also been suggestions from environmental groups and some legislators in the US that higher carbon footprint fuels (oil from oil sands being the most frequent suggestion) should face import tariffs or bans. This type of trade policy issue could receive greater attention over the coming years.

In contrast to these examples, Canada continues to be among the world's most open countries in terms of trade and investment flows in mining. There are no noteworthy barriers in place, except for some foreign ownership restrictions in uranium. Even these

Fact:

- Some Canadian analysts are concerned that imbalance in resolving land access issues could hinder northern development and serve to drive mineral exploration, development and operational investment to other jurisdictions.

have been waived on occasion with respect to investment from Areva of France. As well, the report from the "Red Wilson Panel" studying federal competition and investment policy, provided to the government in June 2008, recommended that these remaining restrictions be loosened further under certain conditions. MAC is supportive of the recommendations in this report and of the government's general direction in this area.

Canada and the European Union announced the launch of negotiations toward a comprehensive economic agreement in May 2009. A background study estimated that trade liberalization could lead to a $12 billion increase in Canada's GDP and increase bilateral trade by 20%. This will be an extensive undertaking and the negotiations will face many challenges in meeting the targeted two-year timeframe.

The federal government has also moved toward further liberalization of Canadian relations with Peru and with Colombia. Legislation implementing a Canada-Peru FTA received Royal Assent in June 2009, while negotiations on a Canada-Colombia FTA have been completed and the agreement could be implemented during the coming year, depending on the level of political support.

Canada is also in varying phases of negotiation regarding potential or strengthened foreign investment protection agreements with Tanzania, Madagascar, Mongolia, Indonesia, Vietnam, Kuwait, India and China, among others. Some of these are of high relevance to the mining industry. FIPAs are bilateral agreements that place investment-treatment obligations on each country and that provide foreign investors with access to independent rules and arbitrators should disputes arise between the investor and host government. While the actual enforcement components are rarely used, the mere existence of a FIPA helps guide foreign governments with a set of rules and expectations of fairness and transparency. MAC and the mining industry support these directions and periodically provide input to Canadian policy makers and negotiators.

MERGERS AND ACQUISITIONS ACTIVITY AND INVESTMENT FLOWS

The price growth in most metals and minerals during the 2003 to 2008 period contributed to record company profits and increased merger and acquisition (M&A) activity.

The longer-term strategic business issue will remain valid after the resumption of economic growth in late 2009 and 2010. In particular, a handful of large companies are operating under the premise that a constrained base-metal mineral reserves situation combined with global economic growth and infrastructure development in China and India is a potent combination—an equation that means strong mineral prices for decades to come. In this view, the movement is toward a world with growing demand for municipal infrastructure, automobiles, medical equipment, housing and iPods—this means a need for more minerals. Acquiring resources through M&A is a quicker way to realize profits than through the more extended and uncertain process of bringing product to market through exploration and development.

The acquisitions of Inco and Falconbridge by CVRD (renamed Vale) and Xstrata respectively in 2006 and of Alcan by Rio Tinto in 2007 were driven by views on how best to take advantage of mounting prices, limited supplies and the Chinese reality. In the view of McCarthy Tetrault, as expressed in June 2008, Canadian mining companies continue to be viewed as relatively inexpensive long-term investments by countries needing a supply of the basic building blocks of copper and zinc. A 2009 analysis by Goldman Sachs included Vale Inco as the only mining company among its top ten long-term investments because of its low debt, its strong position in iron ore and nickel, and its capacity to benefit from worldwide stimulus spending.

As noted earlier, as an important indicator of global M&A activity, the amount of equity raised worldwide by the mining industry has increased dramatically in recent years, growing from US$3 billion in 2000 to US$10 billion in 2005, $26.5 billion in 2006 and $50 billion in 2007, before declining slightly to $47 billion in 2008. A more significant decline will be seen in 2009.

Sovereign wealth funds (SWFs), fuelled by record oil prices and earnings, have also become increasingly important funding sources. Russia's oil stabilization fund, restructured in early 2008, comprises a $131 billion reserve fund and a $34 billion wealth fund earmarked for riskier investments. Global Insight analysts estimate the combined value of global SWFs at $3.6 trillion in 2007 (equal to the established economies of Britain, France or Germany) and potentially rising to US$10 trillion within a decade. There are some 40 funds in place in 34 countries. It is estimated that the funds of the Gulf Arab states spent $60 billion on foreign assets in 2007, double the two previous years combined. There is considerable policy debate regarding the role of SWFs—concern over the opaqueness and political orientation of these funds mixed with support of their ability to provide liquidity and stability to the global economy.

It also seems evident that Chinese investment globally and in Canada's mining industry will grow over the coming years. China presently holds some US$1.8 trillion in foreign exchange reserves. While investment abroad was discouraged by Chinese authorities until a few years ago, this is no longer the case. As detailed below, China is investing actively in Africa and is increasingly seeking opportunities in Western countries, as well as closer oil supply relationships with Iraq, Iran and Venezuela. A Chinese company has made a modest investment in a Canadian oil sands project and in July 2009 China Investment Corp, the country's official SWF, invested $1.7 billion to acquire 17% of Teck Resources equity. From Teck's perspective, the strategic move provides the company with potential marketing help in China as well as the equity infusion.

There have been a number of interesting M&A activities and investment developments during the past two years, including the following:

- Vale's plans to potentially acquire Xstrata did not proceed, but Vale remains interested in potential acquisitions. In June 2009, Xstrata proposed a merger of equals with Anglo American in the aim of enhancing scale and synergy in coal, iron ore and platinum—this discussion is at the preliminary stage.
- BHP Billiton, the world's largest mining firm, made a bid for the second-largest firm, Rio Tinto, in 2008 although this did not move forward. Aluminum Corp of China (Chinalco) and Alcoa jointly bought a 12% Rio Tinto stake in 2008, thereby becoming engaged in any strategic developments that may emerge with BHP Billiton. Chinalco proposed to invest a further $20 billion in Rio Tinto in mid-2009, although this deal was subsequently abandoned by Rio Tinto in favour of a $15 billion rights offer and a $6 billion iron ore joint venture with BHP Billiton.
- On the China-Peru front, three major transactions occurred in 2007: Chinalco bought Minerva Peru Copper in June; Northern Peru Copper sold its Galeno copper-gold-molybdenum project to Minmetals and Jiangxi Copper in December; and Zijin Mining, China's biggest gold miner, and two other

Chinese partners bought Peru's second biggest copper mine, Monterrico, in April.

- On the China-Australia front in recent years: Minmetals bought Australia's OZ Minerals, a zinc mining company, in 2009; Wuhan Iron and Steel bought half of Australia's Centrex Metals in late 2008; and Sino Steel entered a controlling joint venture with the Australian mining company Midwest in 2005.
- In recent years, China has turned toward Africa as a potential source of raw materials. Africa has become China's leading source of imported oil, with Angola, Sudan, Nigeria and Gabon becoming major partners. In early 2007, the state-owned energy company CNOOC announced that it would invest US$2.3 billion in an offshore Nigerian oil field. China has provided Angola with a US$2 billion package of loans and aid that includes funds for Chinese companies to build railroads, schools, roads, bridges, hospitals and fibre-optic networks. In electricity, China has established linkages with South Africa's nuclear power program and has built power stations in Angola, Zambia and Zimbabwe. In minerals, Chinese firms have invested in mining operations in Zambia, including off-take agreements for concentrate from the Munali nickel mine and in the Democratic Republic of Congo, and have acquired the rights to mine gold and uranium in Zimbabwe. The DRC government stated in early 2008 that it planned to borrow $5 billion from China to invest in infrastructure and to help revive its mining industry. In July 2009, African Minerals Ltd. announced that its $2.5 billion iron ore project in Sierra Leone would be funded and built by Chinese construction companies in exchange for iron ore supply guarantees. The African-Chinese economic relationship will presumably continue to grow.
- In May 2009, Barrick Gold gave formal approval for construction of the Pascua-Lama gold project on the Chile-Argentina border after conclusion of a tax agreement between the two countries. The mine, aiming for a 2012 commissioning, is described as one of the world's best undeveloped gold projects and will have a 25-year life with pre-production construction costs in the US$3 billion range.
- The World Bank criticized the Middle East governments in an April 2009 document as being too focused on oil, having inappropriate fiscal and legal practices for the mining sector, and featuring governments that are overly interfering. There is felt to be mining potential in the region for those countries that can create a positive investment climate.
- The investment interest in Russia has cooled in recent years, a trend that will likely be reinforced through passage of its strategic deposits law in mid-2008. The number of exploration projects ongoing in Russia is limited, as is the number of successes. It seems likely that the Russian government will play a greater role in financing or bearing risks associated with mineral exploration projects.
- As an indication of India's emerging global investment presence, Essar Global, the controller of India's largest steel exporter, purchased Canada's Algoma Steel in April 2007.
- Teck Resources bought Global Copper and its principle asset of the Relincho copper molybdenum deposit in northern Chile in April 2008.
- Two US companies, Alpha and Foundation Coal, announced a $2 billion merger in mid-2009 to become the third-largest US coal producer. The entity will have 59 coal mines and 14 preparation plants.
- In the fertilizer sector, Calgary-based Agrium offered to buy CF Industries in February 2009 for $3.5 billion, on the condition that CF Industries retract its own $2.5 billion bid for Terra Industries. Agrium has grown significantly through acquisition in recent years—buying nine companies between 2005 and 2009.
- In diamonds, Kinross Gold purchased a 19.9% share of Harry Winston Diamonds, the 40% owner of Diavik, giving the company an effective 9% ownership of the Diavik diamond mine production.

As a general principle, the Canadian mining industry supports a free and open flow of investment. Foreign investment flows—inward and outward—enhance the access of Canadian businesses to new technologies and concepts and to larger markets and production chains. In this respect, government's main role should be to ensure the fairness and openness of two-way flows, to negotiate investment protection agreements, and to ensure that Canada maintains an attractive climate for investment.

The Canadian government's proposal to deny deductibility of interest payments in Canada on investments in operations abroad, as announced in Budget 2007, sent the wrong signal to Canada's global investment community as it could have served to discourage companies from extending their global reach through investment abroad. MAC and the mining industry were pleased that the government, in response to opposition, referred the issue to a technical committee for consultation and recommendations. The measure was subsequently repealed in Budget 2009.

CORPORATE SOCIAL RESPONSIBILITY

Representatives from MAC, along with the Prospectors and Developers Association of Canada and NGOs, participated in a federal advisory group in 2007 aimed at promoting good practices in the international activities of the extractive sectors. The consultation process culminated in recommendations conveyed jointly by industry and NGO representatives to the federal government in March 2007. In a much-delayed response, the federal government unveiled its approach in March 2009—the *Building the Canadian Advantage* plan proposes to establish an Extractive Sector CSR Counsellor, to promote CSR guidelines and to create a CSR Centre of Excellence, among other measures. MAC and the industry believe that this plan provides an effective complement to the CSR measures and requirements already contained in TSM and to the numerous CSR activities and investments made by Canadian mining companies internationally.

List of Annexes

Annex 1: Producing Mines in Canada, 2008[1]

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
NEWFOUNDLAND & LABRADOR				
Crew Gold Canada Ltd.	Nugget Pond	(C.)	Snook's Arm	Au
Teck Cominco Limited	Duck Pond	(U.)	Millertown	Cu, Zn
Vale Inco Limited	Voisey's Bay	(P., C.)	Voisey's Bay	Ni, Cu, Co
Iron Ore Company of Canada (IOC)	Carol Lake	(P.)	Labrador City	Fe
Iron Ore Company of Canada (IOC)	Plateau Dolomite	(P.)	Labrador City	Dolomite
Wabush Mines	Scully	(P., C.)	Wabush	Fe
Trinity Resources & Energy Ltd.	Manuels	(P.)	Manuels	Pyrophyllite
Atlantic Industrial Minerals Incorporated	Lower Cove	(P.)	Lower Cove	Limestone, dolomite
Galen Gypsum Mines Limited	Coal Brook	(P.)	St. George's Bay	Gypsum
Beaver Brook Antimony Mines Inc.	Beaver Brook	(U., C.)	Glenwood	Sb
Anaconda Mining Inc.	Pine Cove	(P., C.)	Baie Verte	Au
Atlantic Barite Ltd.	Buchans	(P., C.)	Buchans	Barite
Shabogamo Mining and Exploration Ltd.	Roy's Knob	(P.)	Labrador City	Silica
NOVA SCOTIA				
ScoZinc Ltd. (Acadian Mining Corporation)	Scotia	(P., C)	Gays River	Zn, Pb
Atlantic Industrial Minerals Incorporated	Glen Morrison	(P.)	Cape Breton	Limestone
CGC Inc.	Little Narrows	(P.)	Little Narrows	Gypsum
Georgia-Pacific Canada, Inc.	Melford	(P.)	Melford	Gypsum
Georgia-Pacific Canada, Inc.	Sugar Camp	(P.)	Melford	Gypsum
E-Z-EM Canada Inc. (Nystone Chemicals Ltd.)	Brookfield	(P., Plant)	Brookfield	Barium sulphate, barite
Lafarge Canada Inc.	Brookfield	(P., Plant)	Brookfield	Limestone
The Canadian Salt Company Limited	Pugwash	(U.)	Pugwash	Salt
National Gypsum (Canada) Ltd.	Milford	(P.)	Milford	Gypsum
Shaw Resources Ltd.	Nova Scotia Sand and Gravel	(P.)	Nine Mile River	Silica
Fundy Gypsum Company – USG Canadian Mining Ltd.	Wentworth and Miller Creek	(P.)	Wentworth	Gypsum
Sifto Canada Inc.	Nappan	(Solution Mining)	Nappan	Salt
Black Bull Resources Inc.	White Rock	(P.)	White Rock	Quartz
Pioneer Coal Ltd.	Stellarton	(P.)	Stellarton	Coal
Pioneer Coal Ltd.	Point Aconi	(P.)	Point Aconi	Coal
Mosher Limestone Company Limited	Upper Musquodoboit	(P.)	Upper Musquodoboit	Limestone
3061831 Nova Scotia Ltd.	Florence	(P.)	Big Pond	Coal
NEW BRUNSWICK				
Xstrata Zinc Canada	Brunswick	(U., C.)	Bathurst	Pb, Zn, Cu, Ag, Au
Sun Gro Horticulture Canada Ltd.	Maisonnette	(Bog, Plant)	Maisonnette	Perlite
Graymont Inc.	Havelock	(P., Plant)	Havelock	Lime, limestone
Potash Corporation of Saskatchewan Inc.	New Brunswick (Sussex)	(U., Plant)	Sussex	Potash, salt
Brookville Manufacturing Company	Brookville	(P., Plant)	Brookville	Dolomitic lime
Atlantic Silica Inc.	Poodiac	(P.)	Poodiac	Silica
Elmtree Resources Ltd.	Sormany	(P., Plant)	Sormany	Limestone

Annex 1: Producing Mines in Canada, 2008[1] *(continued)*

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
QUEBEC				
ArcelorMittal Mines Canada Inc.	Mont-Wright	(P., C.)	Fermont	Fe
IAMGOLD Corporation	Niobec	(U., C.)	Saint-Honoré-de-Chicoutimi	Nb, Ta
Xstrata Nickel Canada	Raglan	(P., U., C.)	Katinniq	Ni, Cu, Co, PGMs
Xstrata Zinc Canada	Perseverance	(U., C.)	Matagami	Zn, Cu, Au, Ag
Inmet Mining Corporation	Troilus	(P., C.)	Chibougamau	Au, Ag, Cu
Louvem Mines Inc./Richmond Mines Inc.	Beaufor	(U.)	Val-d'Or	Au, Ag
Wesdome Gold Mines Ltd.	Kiena	(U., C.)	Val-d'Or	Au, Ag
Richmont Mines Inc.	Camflo	(C.)	Malartic	Au, Ag
IAMGOLD Corporation	Doyon	(U., C.)	Cadillac	Au, Ag
IAMGOLD Corporation	Mouska	(U.)	Cadillac	Au, Ag, Cu
Agnico-Eagle Mines Limited	LaRonde and LaRonde II	(U., C.)	Cadillac	Zn, Cu, Au, Ag, Pb
Agnico-Eagle Mines Limited	Goldex	(U., C.)	Val-d'Or	Au, Ag
Aurizon Mines Ltd.	Casa Berardi	(U., C.)	Berardi Twp.	Au, Ag
First Metals Inc.	Fabie Bay	(P., U.)	Hébécourt	Cu, Zn, Au, Ag
The Canadian Salt Company Limited	Seleine	(U.)	Îles-de-la-Madeleine	Salt
QIT-Fer et Titane Inc.	Tio	(P.)	Hâvre Saint-Pierre	Ilmenite
LAB Chrysotile, Inc.	Bell Asbestos and Black Lake	(P., U., Plant)	Thetford Mines	Chrysotile
Graymont Inc.	Marbleton	(P., Plant)	Marbleton	Limestone, lime
Jeffrey Mine Inc.	Jeffrey	(P., Plant)	Asbestos	Chrysotile
Junex inc.	Bécancour	(Solution Mining)	Bécancour	Salt
Graymont Inc.	Bedford	(P., Plant)	Bedford	Limestone, lime
OMYA (Canada) Inc.	Saint-Armand	(P., Plant)	Saint-Armand	Calcium carbonate
St. Lawrence Cement Inc.	Joliette	(P.)	Joliette	Limestone
Graymont Inc.	Joliette	(P., Plant)	Joliette	Lime, limestone
La Compagnie Bon Sable Ltée	Ormstown	(P.)	Ormstown	Silica
La Compagnie Bon Sable Ltée	Saint-Joseph-du-Lac	(P.)	Saint-Joseph-du-Lac	Silica
Unimin Canada Ltd.	Saint-Canut	(P., Plant)	Saint-Canut	Silica
Unimin Canada Ltd.	Saint-Donat-de-Montcalm	(P., Plant)	Saint-Donat-de-Montcalm	Silica
Suzorite Mica Products Inc.	Letondal	(P.)	Suzor Twp.	Mica
Timcal Canada Inc.	Saint-Aimé-du-Lac-des-Îles	(P., Plant)	Saint-Aimé-du-Lac-des-Îles	Graphite
Temisca inc.	Saint-Bruno-de-Guigues	(P.)	Saint-Bruno-de-Guigues	Silica
Alexis Minerals Corporation	Lac Herbin	(U.)	Val-d'Or	Au, Ag
Metanor Resources Inc.	Bachelor Lake	(C.)	Desmaraisville	Au, Ag
Metanor Resources Inc.	Barry	(P.)	Barry Twp.	Au, Ag
Elkem Metal Canada Inc.	Sitec Inc.	(P.)	Petit-Lac-Malbaie	Silica, silicon carbide
9184-6808 Québec Inc. (LAB Chrysotile)	Black Lake	(P., Plant)	Thetford Mines	Chrysotile
Silco Sands Inc.	Saint-Clotilde	(P.)	Beauharnois	Silica, ferrosilicon

Annex 1: Producing Mines in Canada, 2008[1] *(continued)*

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
ONTARIO				
Goldcorp Inc.	Dome	(U., C.)	Timmins	Au
Goldcorp Inc.	Hoyle Pond	(U.)	south of Porcupine	Au, Ag
Goldcorp Inc.	Musselwhite	(U., C.)	Thunder Bay	Au, Ag
Goldcorp Inc.	Campbell	(U., C.)	Balmertown	Au, Ag
Goldcorp Inc.	Red Lake	(U., C.)	Balmertown	Au, Ag
Kirkland Lake Gold Inc.	Macassa	(U., C.)	Kirkland Lake area	Au, Ag
Vale Inco Limited	Garson	(U.)	Sudbury	Ni, Cu, Co, PGMs, Au, Ag, Se, Te
Vale Inco Limited	Stobie	(U.)	Sudbury	Ni, Cu, Co, PGMs, Au, Ag, Se, Te
Vale Inco Limited	Clarabelle	(C.)	Sudbury	Ni, Cu, Co, PGMs, Au, Ag, Se, Te
Vale Inco Limited	Copper Cliff North	(U.)	Sudbury	Ni, Cu, Co, PGMs, Au, Ag, Se, Te
Vale Inco Limited	Copper Cliff South	(U.)	Sudbury	Ni, Cu, Co, PGMs, Au, Ag, Se, Te
Vale Inco Limited	Creighton	(U.)	Sudbury	Ni, Cu, Co, PGMs, Au, Ag, Se, Te
Vale Inco Limited	McCreedy East/Coleman	(U.)	Sudbury	Ni, Cu, Co, PGMs, Au, Ag, Se, Te
FNX Mining Company Inc.	McCreedy West	(U.)	Sudbury	Ni, Cu, Co, PGMs, Au, Ag, Se, Te
FNX Mining Company Inc.	Podolsky	(U.)	Norman Twp.	Ni, Cu, PM
Xstrata Nickel Canada	Fraser	(U.)	Sudbury	Ni, Cu, Co, PGMs
Xstrata Nickel Canada	Thayer-Lindsley	(U.)	Sudbury	Ni, Cu, Co, PGMs, Au, Ag, Se, Te
Xstrata Nickel Canada	Onaping/Craig	(U.)	Sudbury	Ni, Cu, Co, PGMs, Au, Ag, Se, Te
Xstrata Nickel Canada	Strathcona	(C.)	Sudbury	Ni, Cu, Co, PGMs, Au, Ag, Se, Te
Xstrata Zinc Canada	Kidd Creek	(U., C.)	Timmins	Cu, Zn, Ag, Se, Te, In, Cd
Xstrata Nickel Canada	Montcalm	(U.)	Timmins	Ni, Cu, Co, PGMs
Richmont Mines Inc.	Island Gold	(U.)	Dubreuilville	Au
Wesdome Gold Mines Ltd.	Eagle River	(U., C.)	Wawa	Au
Teck Cominco Limited	David Bell	(U., C.)	Marathon	Au
Teck Cominco Limited	Williams	(U., P., C.)	Marathon	Au
OMYA (Canada) Inc.	Tatlock	(P.)	Tatlock	Calcium carbonate
ESSROC Canada Inc.	Picton	(P.)	Picton	Limestone (cement)
I.K.O. Industries Ltd.	Madoc	(P.)	Madoc	Trap rock
Sherritt International Corporation	Madoc (Henderson)	(P., U.)	Madoc	Talc, dolomite
St. Lawrence Cement Inc.	Ogden Point	(P.)	Ogden Point	Limestone (cement)
Unimin Canada Ltd.	Blue Mountain	(P., Plant)	Blue Mountain	Nepheline syenite
Unimin Canada Ltd.	Badgeley Island	(P.)	Midland	Silica

Annex 1: Producing Mines in Canada, 2008[1] *(continued)*

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Regis Resources Inc.	Vermiculite	(P.)	Cavendish	Vermiculite
St. Marys CBM (Canada) Inc.	Bowmanville	(P.)	Bowmanville	Limestone
St. Marys CBM (Canada) Inc.	St. Mary's	(P.)	St.Mary's	Limestone (cement)
Hutcheson Sand & Gravel Ltd.	Huntsville	(P.)	Huntsville	Silica
Miller Minerals (division of Miller Paving Limited)	Bucke	(P.)	Bucke	Limestone
CGC Inc.	Hagersville	(U.)	Hagersville	Gypsum
E.C. King Contracting Ltd.	Sydenham	(P.)	Sydenham	Dolomitic lime
Lafarge Canada Inc.	Woodstock	(P.)	Woodstock	Limestone
Extender Minerals of Canada Limited	North Williams	(U.)	North Williams	Barite
Arriscraft International Inc.	Adair	(P.)	Albemarle	Dolomite, brick, stone, limestone
Great White Minerals Ltd.	Fripp	(P.)	Fripp	Silica
Sifto Canada Inc.	Goderich	(U.)	Goderich	Salt
Rio Tinto Group	Penhorwood	(P.)	Penhorwood	Talc
Agrium Inc.	Kapuskasing	(P.)	Kapuskasing	Phosphate
The Canadian Salt Company Limited	Ojibway	(U.)	Windsor	Salt
The Canadian Salt Company Limited	Windsor	(Solution Mining)	Windsor	Salt
Ontario Trap Rock Ltd.	Bruce	(P., Plant)	Bruce Mines	Trap rock
De Beers Canada Inc.	Victor	(P., Plant)	James Bay Lowlands	Diamonds
MANITOBA				
Tantalum Mining Corporation of Canada Limited	Bernic Lake	(U., C.)	Lac-du-Bonnet	Ta, Li, Cs, Rb
San Gold Corporation	Rice Lake	(U.)	Bissett	Au
San Gold Corporation	San Gold No. 1	(P.)	Bissett	Au
Vale Inco Limited	Birchtree	(U.)	Thompson	Ni, Cu, Co, PGMs
Vale Inco Limited	Thompson	(U., C.)	Thompson	Ni, Cu, Co, PGMs
HudBay Minerals Inc.	Chisel North	(U., C.)	Snow Lake	Cu, Zn
HudBay Minerals Inc.	Callinan/777	(U.)	Flin Flon	Cu, Zn, Au, Ag
HudBay Minerals Inc.	Trout Lake	(U.)	Flin Flon	Cu, Zn, Au, Ag
Sun Gro Horticulture Canada Ltd.	Elma	(Bog, Plant)	Elma	Perlite
Graymont Inc.	Faulkner	(P., Plant)	Faulkner	Limestone, lime
CertainTeed Gypsum Canada, Inc.	Amaranth	(P.)	Harcus	Gypsum
Lehigh Inland Cement Ltd.	Mafeking	(P.)	Mafeking	Limestone
Crowflight Minerals Inc.	Bucko	(U., C.)	Wabowden	Ni, Cu, Co, PGMs
SASKATCHEWAN				
Claude Resources Inc.	Seabee	(U., C.)	Saskatoon	Au, Ag
Cameco Corporation	Rabbit Lake	(U., C.)	Rabbit Lake	U
AREVA Resources Canada Inc.	McClean Lake	(P. C.)	Wollaston Lake	U
Cameco Corporation	McArthur River	(U.)	north of Key Lake	U
Cameco Corporation	Key Lake	(C.)	north of Highrock Lake	U
Potash Corporation of Saskatchewan Inc.	Rocanville	(U.)	Rocanville	Potash

Annex 1: Producing Mines in Canada, 2008[1] *(continued)*

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Potash Corporation of Saskatchewan Inc.	Lanigan	(U.)	Lanigan	Potash
Potash Corporation of Saskatchewan Inc.	Allan	(U., Plant)	Allan	Potash
Potash Corporation of Saskatchewan Inc.	Patience	(U.)	Blucher	Potash
Potash Corporation of Saskatchewan Inc.	Cory	(U.)	Saskatoon	Potash
The Mosaic Company	K-1 and K-2	(U., Plant)	Esterhazy	Potash, salt
The Mosaic Company	Belle Plaine	(U., Plant)	Belle-Plaine	Potash, salt
The Mosaic Company	Colonsay	(U., Plant)	Colonsay	Potash, salt
Winn Bay Sand Limited Partnership	Hanson Lake	(P., Plant)	Hanson Lake	Silica
Big Quill Resources Inc.	Wynyard	(P., U., Plant)	Wynyard	Potassium sulphate
Canadian Clay Products Inc.	Wilcox	(P.)	Wilcox	Clays, bentonite
Zeox Corporation	Palo	(P., Plant)	Whiteshore Lake	Sodium sulphate
Saskatchewan Minerals Inc.	Chaplin Lake	(P., Plant)	Chaplin Lake	Sodium sulphate
Agrium Inc.	Vanscoy	(U.)	Vanscoy	Potash, salt
Sifto Canada Inc.	Unity	(Solution Mining)	Unity	Salt
Prairie Mines & Royalty Limited	Bienfait	(P.)	Bienfait	Coal
Prairie Mines & Royalty Limited	Poplar River	(P.)	Coronach	Coal
Prairie Mines & Royalty Limited	Boundary Dam	(P.)	Estevan	Coal
ALBERTA				
The Canadian Salt Company Limited	Lindbergh	(Solution Mining)	Elk Point	Salt
Birch Mountain Resources Ltd.	Muskeg Valley	(P.)	north of Fort McMurray	Limestone
Birch Mountain Resources Ltd.	Steepbank	(P.)	north of Fort McMurray	Limestone
Graymont Inc.	Summit	(P., Plant)	Coleman	Limestone, lime
Graymont Inc.	Exshaw	(P., Plant)	Exshaw	Limestone, lime
Graymont Inc.	Fish Creek	(P., Plant)	Nordegg	Limestone
Sun Gro Horticulture Canada Ltd.	Seba Beach	(Bog, Plant)	Seba Beach	Perlite
Lafarge Canada Inc.	Exshaw	(P., Plant)	Exshaw	Limestone
Prairie Mines & Royalty Limited	Sheerness	(P.)	Hanna	Coal
Prairie Mines & Royalty Limited	Paintearth	(P.)	Forestburg	Coal
Prairie Mines & Royalty Limited	Genesee	(P.)	Warburg	Coal
Prairie Mines & Royalty Limited	Highvale	(P.)	Seba Beach	Coal
Prairie Mines & Royalty Limited	Whitewood	(P.)	Warburg	Coal
Sherritt International Corporation	Coal Valley	(P.)	Edson	Coal
Teck Cominco Limited	Cheviot Creek	(P.)	Hinton	Coal
Grande Cache Coal Corporation	Grande Cache Nos. 7-4 and 12S B2	(P., U.)	Grande Cache	Coal
Syncrude Canada Ltd.	Base and North	(P.)	Fort Mackay	Upgraded crude oil
Syncrude Canada Ltd.	Aurora	(P.)	Fort Mackay	Upgraded crude oil
Suncor Energy Inc.	Millennium	(P.)	Fort Mackay	Upgraded crude oil
Albion Sands Energy Inc.	Muskeg River	(P.)	Fort Mackay	Upgraded crude oil
Rio Petro Ltd.	Sunnynook	(Solution Mining)	Cessford	Salt

Annex 1: Producing Mines in Canada, 2008[1] *(continued)*

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Canexus Chemicals Canada Ltd.	Redwater	(Solution Mining)	Bruderheim	Salt
Ward Chemicals Inc.	Calling Lake	(Solution Mining)	north of Athabasca	Salt
Tiger Calcium Services Inc.	Mitsue	(Solution Mining)	Slave Lake	Salt
Prairie Creek Quarries Ltd.	Cougar Ridge	(P., Plant)	Rocky Mountain House	Limestone
Lehigh Inland Cement Limited	Mcleod	(P.)	Cadomin	Limestone
BRITISH COLUMBIA				
Forty Two Metals Inc. (Roca Mines Inc.)	MAX	(U., C.)	Trout Lake	Mo
Craigmont Mines Ltd.	Craigmont	(P., C.)	Merritt	Fe
Teck Cominco Limited	Highland Valley	(P., C.)	Logan Lake	Cu, Mo
Imperial Metals Corporation	Mount Polley	(P., C.)	northeast of Williams Lake	Au, Cu
Imperial Metals Corporation	Huckleberry	(P., C.)	Houston	Cu, Mo, Au
Cross Lake Minerals Ltd.	QR	(P., U., C.)	southeast of Quesnel	Au
Taseko Mines Limited	Gibraltar	(P. C.)	north of Williams Lake	Cu, Mo
Thompson Creek Mining Limited	Endako	(P., C.)	Fraser Lake	Mo
Northgate Minerals Corporation	Kemess	(P., C)	Smithers	Au, Cu
Georgia-Pacific Canada, Inc.	4J	(P.)	Canal Flats	Gypsum
Baymag Inc	Mount Brussilof	(P.)	Mount Brussilof	Magnesite (fused), magnesia (products)
CertainTeed Gypsum Canada, Inc.	Elkhorn	(P.)	Windermere	Gypsum
Imasco Minerals Inc.	Crawford Bay	(U.)	Crawford Bay	Dolomite, limestone
Imasco Minerals Inc.	Lost Creek	(U.)	Lost Creek	Limestone
Imasco Minerals Inc.	Benson Lake	(P.)	Benson Lake	Limestone
Heemskirk Canada Limited	Moberly	(P.)	Golden	Silica
Heemskirk Canada Limited	Bromley Creek/Zeo	(P.)	Bromley Creek	Zeolite
Mighty White Dolomite Ltd.	Rock Creek	(P., Plant)	Rock Creek	Dolomite
Lafarge Canada Inc.	Harper Ranch	(P., Plant)	Kamloops	Limestone
Absorbent Products Ltd.	Bud	(P.)	Princeton	Calcium, clay
Absorbent Products Ltd.	Red Lake	(P.)	Red Lake	Diatomite, bentonite, leonardite
Industrial Mineral Processors	Z-2	(P.)	Cache Creek	Zeolite
Graymont Inc.	Pavilion Lake	(P., Plant)	Pavilion Lake	Limestone, lime
Lightweight Advanced Volcanic Aggregates Inc.	Mount Meager	(P.)	Mount Meager	Pumice
Ash Grove Cement Company	Blubber Bay	(P.)	Texada Island	Limestone
Texada Quarrying Ltd. (Lafarge Canada Inc.)	Gillies Bay	(P.)	Texada Island	Limestone
Fireside Minerals Ltd.	Fireside	(P.)	Fireside	Barite
Teck Cominco Limited	Coal Mountain	(P.)	Sparwood	Coal
Teck Cominco Limited	Line Creek	(P.)	Sparwood	Coal
Teck Cominco Limited	Elkview	(P.)	Sparwood	Coal
Teck Cominco Limited	Fording River	(P.)	Elkford	Coal

Annex 1: Producing Mines in Canada, 2008[1] *(continued)*

COMPANY	MINE SITE	ACTIVITY TYPE	LOCATION	COMMODITY
Teck Cominco Limited	Greenhills	(P.)	Sparwood	Coal
Northern Energy and Mining Inc.	Trend	(P.)	Tumbler Ridge	Coal
Western Canadian Coal Corporation	Wolverine	(P., U.)	Tumbler Ridge	Coal (metallurgical)
Western Canadian Coal Corporation	Brule	(P.)	Tumbler Ridge	Coal
Hillsborough Resources Limited	Quinsam	(U.)	Campbell River	Coal
Merit Mining Corp.	Lexington-Grenoble	(U., C.)	Greenwood	Cu, Au
Imperial Limestone Co. Ltd.	Imperial Limestone	(P.)	Texada Island	Limestone
YUKON				
Capstone Mining Corporation	Minto	(P., C.)	Carmacks	Cu, Au
NORTHWEST TERRITORIES				
North American Tungsten Corporation Ltd.	CanTung	(U., C.)	Cantung	W
Diavik Diamond Mines Inc.	Diavik	(P., U., Plant)	Lac de Gras	Diamonds
BHP Billiton Diamonds Inc.	EKATI	(P., U., Plant)	Lac de Gras	Diamonds
De Beers Canada Inc.	Snap Lake	(U., Plant)	Snap Lake	Diamonds

(P.) Open-Pit (U.) Underground (C.) Concentrator
Excluded operations are clay products and most construction materials (stone, sand and gravel).
1 In production, as of December 31, 2008.
Data compiled by the Minerals and Metals Sector, Natural Resources Canada and the National Energy Board.

Annex 2: Mining Establishments in Canada, by Mineral, Province or Territory, 2008[1]

	NFL	PE	NS	NB	QC	ON	MB	SK	AB	BC	YT	NT	NV	TOTAL
Iron ore	2	–	–	–	2	–	–	–	–	–	–	–	–	**4**
Gold & silver ore	1	–	–	–	11	8	1	1	–	3	–	–	–	**25**
Lead-zinc ore	1	–	–	1	–	–	–	–	–	–	–	–	–	**2**
Nickel-copper ore	1	–	–	–	1	5	1	–	–	–	–	–	–	**8**
Copper, copper-zinc ore	1	–	–	–	4	1	1	–	–	4	1	–	–	**12**
Molybdenum	–	–	–	–	–	–	–	–	–	2	–	–	–	**2**
Uranium	–	–	–	–	–	–	–	3	–	–	–	–	–	**3**
Other metals	–	–	–	–	2	1	1	–	–	–		1	–	**5**
TOTAL METALS	**6**	**0**	**0**	**1**	**20**	**15**	**4**	**4**	**0**	**9**	**1**	**1**	**0**	**61**
Chrysotile	–	–	–	–	2	–	–	–	–	–	–	–	–	**2**
Diamonds	–	–	–	–	–	1	–	–	–	–	–	3	–	**4**
Gypsum	1	–	4	–	–	–	1	–	–	2	–	–	–	**8**
Peat	1	1	1	20	33	–	4	1	5	1	–	–	–	**67**
Potash	–	–	–	1	–	–	–	9	–	–	–	–	–	**10**
Salt	–	–	2	–	1	4	–	2	1	–	–	–	–	**10**
Sand and gravel	6	–	13	9	58	215	11	24	69	39	2	–	–	**446**
Stone	6	–	11	8	70	86	5	1	6	17	–	–	–	**210**
Stone clay and other refractory minerals	–	–	1	–	3	3	–	2	3	–	–	–	–	**12**
Other non-metals	–	–	–	–	3	3	–	2	–	3	–	–	–	**11**
TOTAL NON-METALS	**14**	**1**	**32**	**38**	**170**	**312**	**21**	**41**	**84**	**62**	**2**	**3**	**0**	**780**

– Nil
1 As of December 31, 2008.
Sources: Natural Resources Canada; Statistics Canada

Annex 3: Canadian Production of Leading Minerals, by Province and Territory, 2008[p]

	POTASH (K2O)		NICKEL		COPPER		COAL		GOLD	
	KILO-TONNES	$000	TONNES	$000	TONNES	$000	KILO-TONNES	$000	KILO-GRAMS	$000
Newfoundland	–	–	79,999	1,869,494	69,025	526,933	–	–	126	3,762
Prince Edward Island	–	–	–	–	–	–	–	–	–	–
Nova Scotia	–	–	–	–	–	–	x	x	–	–
New Brunswick	x	x	–	–	7,477	57,080	x	x	203	6,043
Quebec	–	–	24,920	582,360	33,102	252,704	–	–	28,099	836,745
Ontario	–	–	114,841	2,683,719	186,462	1,423,450	–	–	49,736	1,481,049
Manitoba	–	–	30,835	720,583	51,512	393,245	–	–	3,807	113,359
Saskatchewan	x	x	–	–	–	–	9,921	x	1,375	40,931
Alberta	–	–	–	–	–	–	31,535	x	56	1,667
British Columbia	–	–	–	–	216,254	1,650,881	26,590	3,043,413	9,173	273,145
Yukon	–	–	–	–	17,513	133,693	–	–	2,245	66,855
Northwest Territories	–	–	–	–	–	–	–	–	–	–
Nunavut	–	–	–	–	–	–	–	–	–	–
CANADA	**10,455**	**8,243,156**	**250,595**	**5,856,156**	**581,345**	**4,437,986**	**68,106**	**4,292,333**	**94,820**	**2,823,556**

	IRON ORE		DIAMONDS		SULPHUR ELEMENTAL		CEMENT		URANIUM	
	KILO-TONNES	$000	000 CARATS	$000	KILO-TONNES	$000	KILO-TONNES	$000	TONNES	$000
Newfoundland	18,668	1,452,852	–	–	x	x	–	–	–	–
Prince Edward Island	–	–	–	–	–	–	–	–	–	–
Nova Scotia	–	–	–	–	–	–	x	x	–	–
New Brunswick	–	–	–	–	–	–	–	–	–	–
Quebec	12,529	x	–	–	–	–	2,979	401,747	–	–
Ontario	–	–	730	306,852	x	x	5,675	635,366	–	–
Manitoba	–	–	–	–			–	–	–	–
Saskatchewan	–	–	–	–	163	56,200	–	–	8,702	1,488,235
Alberta	–	–	–	–	6,964	2,078,932	x	x	–	–
British Columbia	76	x	–	–	x	x	2,500	327,420	–	–
Yukon	–	–	–	–	–	–	–	–	–	–
Northwest Territories	–	–	13,955	2,084,047	–	–	–	–	–	–
Nunavut	–	–	118	12,654	-	-	-	-	-	-
CANADA	**31,273**	**2,426,763**	**14,803**	**2,403,554**	**7,971**	**2,388,537**	**14,028**	**1,792,110**	**8,702**	**1,488,235**

p Preliminary – Nil x Confidential
Sources: Natural Resources Canada; Statistics Canada

Annex 4: Canada's World Role as a Producer of Certain Important Minerals, 2008

			RANK OF FIVE LEADING COUNTRIES				
		WORLD	1	2	3	4	5
			CANADA	Australia	Kazakhstan	Russia	Niger
Uranium (metal content)	t	41,306	**9,500**	8,603	6,642	3,413	3,154
(mine production)	% of world total		**23.0**	20.8	16.1	8.3	7.6
			CANADA	Russia	Belarus	Germany	Israel
Potash (K_2O equivalent)	000 t	33,000	**11,000**	6,300	5,400	3,700	2,000
(mine production)	% of world total		**33.3**	19.1	16.4	11.2	6.1
			Russia	**CANADA**	Indonesia	Australia	New Caledonia
Nickel (mine production)	000 t	1,599	300	**255**	188	185	125
	% of world total		18.8	**15.9**	11.8	11.6	7.8
			Congo, D.R.	**CANADA**	Australia	Zambia	Brazil
Cobalt (mine production)	t	62,292	25,300	**8,261**	5,900	4,425	4,300
	% of world total		40.6	**13.3**	9.5	7.1	6.9
			Australia	South Africa	**CANADA**	China	Norway
Titanium concentrate	000 t	5,600	1,340	1,060	**816**	500	380
(Ilmenite)	% of world total		23.9	18.9	**14.6**	8.9	6.8
			South Africa	Russia	**CANADA**	U.S.A.	Zimbabwe
Platinum group metals	kg	527,639	328,000	137,600	**23,042**	16,900	10,700
(metal content)	% of world total		62.2	26.1	**4.4**	3.2	2.0
			China	Russia	**CANADA**	U.S.A.	Australia
Aluminum (primary metal)	000 t	38,101	12,559	3,955	**3,083**	2,554	1,957
	% of world total		33.0	10.4	**8.1**	6.7	5.1
			U.S.A.	Spain	Iran	**CANADA**	Thailand
Gypsum (mine production)	000 t	127,000	22,000	13,200	13,000	**9,500**	8,400
	% of world total		17.3	10.4	10.2	**7.5**	6.6
			Russia	China/ Kazakhstan		Brazil	**CANADA**
Chrysotile (asbestos)	000 t	2,290	1,030	350	n.a.	230	**185**
(mine production)	% of world total		45.0	15.3		10.0	**8.1**
			China	Australia	Peru	U.S.A.	**CANADA**
Zinc (mine production)	000 t	11,041	2,950	1,514	1,444	803	**623**
	% of world total		26.7	13.7	13.1	7.3	5.6
			U.S.A.	China	Chile	Peru	**CANADA**
Molybdenum (Mo content)	t	186,091	59,400	46,000	41,100	17,500	**6,841**
(mine production)	% of world total		31.9	24.7	22.1	9.4	**3.7**
			China	U.S.A.	Germany	India	**CANADA**
Salt (mine production)	000 t	250,000	46,000	43,800	18,000	15,500	**15,000**
	% of world total		18.4	17.5	7.2	6.2	**6.0**
			China	South Korea	Japan	Kazakhstan	Mexico
Cadmium (metal)[1]	t	18,788	3,800	2,846	1,939	1,700	1,617
	% of world total		20.2	15.1	10.3	9.0	8.6
			China	U.S.A.	Russia	Israel	Kazakhstan
Magnesium (metal)[2]	000 t	872	659	113	33	29	21
	% of world total		75.6	13.0	3.8	3.3	2.4

Annex 4: Canada's World Role as a Producer of Certain Important Minerals, 2008 *(continued)*

			RANK OF FIVE LEADING COUNTRIES				
		WORLD	1	2	3	4	5
			China	Australia	U.S.A.	Peru	Mexico
Lead (mine production)[3]	000 t	3,617	1,360	641	434	329	137
	% of world total		37.6	17.7	12.0	9.1	3.8
			China	South Africa	Australia	U.S.A.	Peru
Gold (mine production)[4]	t	2,334	270	252	245	244	170
	% of world total		11.6	10.8	10.5	10.5	7.3
			Chile	Peru	U.S.A.	China	Australia
Copper (mine production)[5]	000 t	15,487	5,557	1,190	1,164	946	871
	% of world total		35.9	7.7	7.5	6.1	5.6
			Peru	Mexico	China	Chile	Australia
Silver[6]	t	21,050	3,494	3,135	2,700	1,929	1,888
	% of world total		16.6	14.9	12.8	9.2	8.9

1 Canada ranked 6th. 2 Canada ranked 6th. 3 Canada ranked 7th. 4 Canada ranked 8th. 5 Canada ranked 8th. 6 Canada ranked 9th.
n.a. Not applicable.
Sources: Natural Resources Canada, from World Nonferrous Statistics *and the* Canadian Minerals Yearbook; *U.S. Geological Survey (USGS)*

Annex 5: Mineral Production of Canada, 2006–2008

	UNIT	2006 (QUANTITY)	2006 ($000)	2007 (QUANTITY)	2007 ($000)	2008[p] (QUANTITY)	2008[p] ($000)
METALS							
Antimony	t	226	1,344	162	990	97	652
Bismuth	t	177	2,113	137	4,442	71	1,927
Cadmium	t	502	1,698	293	2,396	223	1,470
Calcium	t	–	–	–	–	–	–
Cesium	t	x	x	x	x	x	x
Cobalt	t	2,899	124,767	4,761	344,675	4,467	433,882
Columbium (niobium)	t	4,177	x	4,337	x	4,383	x
Copper	t	586,489	4,470,218	577,545	4,418,220	581,345	4,437,986
Gold	kg	103,513	2,280,913	102,211	2,460,623	94,820	2,823,555
Ilmenite	000 t	x	x	x	x	x	x
Indium	kg	x	x	x	x	x	x
Iron ore	000 t	33,543	2,530,298	32,774	2,502,500	31,273	2,426,763
Iron, remelt	000 t	x	x	x	x	x	x
Lead	t	79,171	115,748	68,851	193,626	68,936	189,851
Lithium	t	x	x	x	x	x	x
Magnesium	t	–	–	–	–	–	–
Molybdenum	t	7,117	x	6,819	x	7,724	x
Nickel	t	224,565	6,165,883	244,539	9,795,249	250,595	5,856,156
Platinum group	kg	23,170	498,187	21,925	530,932	21,177	591,696
Selenium	t	106	6,262	144	10,760	156	11,561
Silver	t	970	409,211	829	384,399	666	341,121
Tantalum	t	68	4,650	55	4,509	49	4,206
Tellurium	t	10	729	14	1,206	19	4,215
Tungsten	t	2,500	64,497	2,718	57,244	2,608	55,510
Uranium	t	9,781	1,430,561	9,100	2,525,775	8,702	1,488,235
Zinc	t	601,481	2,182,776	594,113	2,069,890	629,175	1,268,417
TOTAL METALS		**...**	**21,056,639**	**...**	**26,247,356**	**...**	**21,001,8283**
NON-METALS							
Barite	000 t	20	4,805	9	2,929	12	3,858
Carbonatite	000 t	x	x	x	x	x	x
Cement	000 t	14,586	1,673,192	14,462	1,785,293	14,028	1,792,110
Chrysotile	000 t	x	x	x	x	x	x
Clay products	000 t	...	223,779	...	208,136	...	187,768
Diamonds	000 ct	13,278	1,598,613	17,144	1,799,714	14,803	2,403,554
Gemstones	t	68	3,806	67	4,630	67	4,817
Graphite	000 t	x	x	x	x	x	x
Gypsum	000 t	9,036	127,006	7,562	111,650	5,797	76,371
Lime	000 t	2,189	267,015	2,134	273,418	2,069	273,576
Magnesitic dolomite	000 t	x	x	x	x	x	x
Marl	000 t	x	x	x	x	x	x
Mica	000 t	x	x	x	x	x	x

Annex 5: Mineral Production of Canada, 2006–2008 *(continued)*

	UNIT	2006 (QUANTITY)	2006 ($000)	2007 (QUANTITY)	2007 ($000)	2008p (QUANTITY)	2008p ($000)
Nepheline syenite	000 t	734	60,665	690	61,746	734	59,654
Peat	000 t	1,217	219,675	1,282	232,537	1,151	215,636
Phosphate	000 t	x	x	x	x	x	x
Potash (K2O)	000 t	8,518	2,240,660	11,085	2,814,563	10,455	8,243,156
Potassium sulphate	000 t	x	x	x	x	x	x
Pumice	000 t	x	x	x	x	x	x
Quartz	000 t	2,146	67,495	1,987	68,462	1,979	71,208
Salt	000 t	14,460	460,722	11,970	442,845	14,168	537,780
Sand and gravel	000 t	238,515	1,275,682	243,096	1,496,737	239,646	1,496,100
Serpentine	000 t	–	–	–	–	–	–
Soapstone, talc, pyrophyllite, etc.	000 t	72	24,206	79	26,480	70	24,600
Sodium sulphate	000 t	x	x	x	x	x	x
Stone	000 t	153,897	1,372,907	149 982	1,402,915	145,825	1,373,088
Sulphur, elemental	000 t	7,762	126,406	7,456	224,537	79,714	2,388,537
Sulphur, in smelter gas	000 t	676	34,283	696	31,345	704	192,865
Titanium dioxide	000 t	x	x	x	x	x	x
Tremolite	000 t	–	–	–	–	–	–
Zeolite	000 t	x	x	x	x	x	x
TOTAL NON-METALS		**...**	**10,290,286**	**...**	**11,588,310**	**...**	**19,983,627**
MINERAL FUELS							
Coal	000 t	65,895	2,886,182	69 131	2,735,202	68,106	4,292,333
TOTAL MINERAL FUELS		**65,895**	**2,886,182**	**69 131**	**2,735,202**	**68,106**	**4,292,333**
TOTAL MINERAL PRODUCTION		**...**	**34,233,107**	**...**	**40,570,868**	**...**	**45,277,787**

– Nil ... not available p Preliminary r Revised x Confidential
This table excludes petroleum and natural gas.
Sources: Natural Resources Canada; Statistics Canada, Catalogue 26-202 XIB

Annex 6: Canadian Reserves of Selected Major Metals, 1977–2007

Metal Contained in Proven and Probable Mineable Ore (1) in Operating Mines (2) and Deposits Committed to Production

YEAR	COPPER (000 T)	NICKEL (000 T)	LEAD (000 T)	ZINC (000 T)	MOLYBDENUM (000 T)	SILVER (T)	GOLD (3) (T)
1977	16,914	7,749	8,954	26,953	369	30,991	493
1978	16,184	7,843	8,930	26,721	464	30,995	505
1979	16,721	7,947	8,992	26,581	549	32,124	575
1980	16,714	8,348	9,637	27,742	551	33,804	826
1981	15,511	7,781	9,380	26,833	505	32,092	851
1982	16,889	7,546	9,139	26,216	469	31,204	833
1983	16,214	7,393	9,081	26,313	442	31,425	1,172
1984	15,530	7,191	9,180	26,000	361	30,757	1,208
1985	14,201	7,041	8,503	24,553	331	29,442	1,373
1986	12,918	6,780	7,599	22,936	312	25,914	1,507
1987	12,927	6,562	7,129	21,471	231	25,103	1,705
1988	12,485	6,286	6,811	20,710	208	26,122	1,801
1989	12,082	6,092	6,717	20,479	207	24,393	1,645
1990	11,261	5,776	5,643	17,847	198	20,102	1,542
1991	11,040	5,691	4,957	16,038	186	17,859	1,433
1992	10,755	5,605	4,328	14,584	163	15,974	1,345
1993	9,740	5,409	4,149	14,206	161	15,576	1,333
1994	9,533	5,334	3,861	14,514	148	19,146	1,513
1995	9,250	5,832	3,660	14,712	129	19,073	1,540
1996	9,667	5,623	3,450	13,660	144	18,911	1,724
1997	9,032	5,122	2,344	10,588	149	16,697	1,510
1998	8,402	5,683	1,845	10,159	121	15,738	1,415
1999	7,761	4,983	1,586	10,210	119	15,368	1,326
2000	7,419	4,782	1,315	8,876	97	13,919	1,142
2001	6,666	4,335	970	7,808	95	12,593	1,070
2002	6,774	4,920	872	6,871	82	11,230	1,023
2003	6,037	4,303	749	6,251	78	9,245	1,009
2004	5,546	3,846	667	5,299	80	6,568	801
2005	6,589	3,960	552	5,063	95	6,684	965
2006	6,923	3,940	737	6,055	101	6,873	1,032
2007	7,565	3,778	682	5,984	213	6,588	987

(1) No allowance is made for losses in milling, smelting and refining. Excludes material classified as "resources."
(2) Includes metal in mines where production has been suspended temporarily.
(3) Excludes metal in placer deposits because reserves data are generally unavailable.
Note: One tonne (t) = 1.1023113 short tons = 32 150.746 troy oz.
Source: Natural Resources Canada, based on company reports and the federal-provincial/territorial survey of mines and concentrators

Annex 7: Average Weekly Wages and Salaries in the Canadian Mining, Smelting and Refining Industries,[1] 1998–2008

	NUMBER OF EMPLOYEES[2] (000)	AVERAGE WEEKLY EARNINGS ($)	TOTAL WEEKLY WAGES FOR GROUP ($)
METAL MINES			
1998	32.35	1,127.77	36,487,871
1999	29.56	1,123.25	33,197,654
2000	29.47	1,168.98	34,447,503
2001	25.56[r]	1,180.02[r]	30,166,031
2002	22.59[r]	1,140.29[r]	25,753,450
2003	21.81[r]	1,194.46[r]	26,051,173
2004	21.37[r]	1,244.41[r]	26,598,019
2005	21.20[r]	1,240.90[r]	26,302,116
2006	22.01[r]	1,262.54[r]	27,784,718
2007	23.85[r]	1,362.87[r]	32,504,450
2008	**28.07**	**1,428.19**	**40,095,006**
NON-METAL MINES			
1998	19.43	893.33	17,358,295
1999	19.99	882.64	17,641,326
2000	20.03	944.20	18,913,270
2001	19.52	976.88[r]	19,072,605
2002	19.50[r]	907.65[r]	17,696,452
2003	20.22[r]	1,000.39[r]	20,231,887
2004	19.91[r]	1,040.27[r]	20,708,655
2005	20.46[r]	1,067.16[r]	21,829,825
2006	21.49[r]	1,023.00[r]	21,981,201
2007	23.18[r]	1,203.68[r]	27,904,913
2008	**23.99**	**1246.76**	**29,907,279**
COAL MINES			
1998	8.30	1,138.11	9,450,865
1999	7.81	1,126.95	8,803,733
2000	7.20	1,204.74	8,672,923
2001	6.03	1,159.56[r]	6,992,147
2002	5.70	1,104.33[r]	6,294,681
2003	4.84	1,193.05[r]	5,775,555
2004	4.54	1,294.43[r]	5,880,595
2005	5.04	1,291.55[r]	6,505,537
2006	5.34	1,269.39[r]	6,773,465
2007	5.84	1,427.52[r]	8,342,427
2008	**6.44**	**x**	**x**

Annex 7: Average Weekly Wages and Salaries in the Canadian Mining, Smelting and Refining Industries,[1] 1998–2008 *(continued)*

	NUMBER OF EMPLOYEES[2] (000)	AVERAGE WEEKLY EARNINGS ($)	TOTAL WEEKLY WAGES FOR GROUP ($)
SMELTING & REFINING			
1998	21.27	1,015.67	21,599,238
1999	21.42	1,033.71	22,136,900
2000	23.09	1,035.31	23,902,202
2001	19.60	1,054.75[r]	19,878,873
2002	16.70	1,095.92[r]	18,301,864
2003	14.72	1,128.16[r]	16,608,772
2004	14.30	1,201.95[r]	17,185,481
2005	14.43	1,204.58[r]	17,379,680
2006	16.22	1,158.34[r]	18,789,433
2007	16.85	1,274.35[r]	21,472,798
2008	**13.17**	**1,299.66**	**17,112,623**
TOTAL MINING, SMELTING AND REFINING			
1998	81.35	1,043.53	84,896,269
1999	78.78	1,038.22	81,779,612
2000	79.79	1,077.09	85,935,898
2001	70.71	1,087.82	76,109,656
2002	64.49	1,055.28	68,046,447
2003	61.59	1,114.78	68,667,387
2004	60.12	1,170.50	70,372,751
2005	61.13	1,178.35	72,017,159
2006	65.06	1,158.01	75,328,817
2007	69.72	1,293.97	90,224,587
2008	**71.67**	**x**	**x**

r Revised x Confidential

1 Number of employees is based on the North American Industry Classification System (NAICS); 2122 Metal Ore Mining, 2123 Non-Metallic Mineral Mining and Quarrying, 2121 Coal Mining, 3314 Non-Ferrous Metal (except Aluminum) Production and Processing.

Source: Statistics Canada

Annex 8: Average Weekly Earnings, by Canadian Industrial Sector, 1994–2008

($)	FORESTRY	MINING, SMELTING AND REFINING[1]	MANUFACTURING	CONSTRUCTION	FINANCE & INSURANCE
1994	700.01	938.13	704.81	733.95	701.24
1995	697.64	980.13	711.97	748.83	719.52
1996	745.69	1,007.19	733.06	767.56	769.49
1997	786.46	1,003.95	751.95	786.91	801.64
1998	766.36	1,043.64	770.47	781.44	820.45
1999	773.42	1,038.14	781.99	782.63	824.82
2000	810.15	1,077.08	796.25	808.06	845.54
2001	815.52[r]	1,087.83[r]	799.39[r]	790.11[r]	x
2002	809.81[r]	1,055.28[r]	818.56[r]	819.64[r]	852[r]
2003	847.06[r]	1,114.78[r]	838.23[r]	847.87[r]	877.34[r]
2004	894.01[r]	1,170.50[r]	862.60[r]	846.38[r]	887[r]
2005	883.89[r]	1,178.35[r]	896.35[r]	877.34[r]	921.01[r]
2006	902.28[r]	1,157.99[r]	904.69[r]	900.32[r]	951.25[r]
2007	907.41[r]	1,293.98[r]	940.67[r]	961.16[r]	997.59[r]
2008	**935.84**	**1,346.72**	**949.54**	**1,014.51**	**1,000.76**

r Revised x Confidential

1 Includes Mining (except Oil and Gas) and Non-Ferrous Metal (except Aluminum) Smelting and Refining, North American Industry Classification System (NAICS) codes 212 and 3314.

Source: Statistics Canada

Annex 9: Canada, Number of Strikes and Lockouts, by Industry, 2006–2008

	2006			2007			2008[p]		
	STRIKES AND LOCKOUTS	WORKERS INVOLVED	DURATION IN PERSON-DAYS	STRIKES AND LOCKOUTS	WORKERS INVOLVED	DURATION IN PERSON-DAYS	STRIKES AND LOCKOUTS	WORKERS INVOLVED	DURATION IN PERSON-DAYS
Agriculture	–	–	–	–	–	–	–	–	–
Logging and forestry	1	198	29,110	–	–	–	–	–	–
Fishing and trapping	–	–	–	–	–	–	–	–	–
Mining	3	857	45,400	6	1,433	45,580	2	1,122	51,270
Utilities				3	187	3,120	3	347	5,070
Oil and gas extraction	–	–	–	–	–	–	1	27	640
Construction	1	18	2,550	16	16,329	222,282	4	60	1,930
Manufacturing	61	10,978	339,303	46	11,930	652,015	54	5,881	281,590
Wholesale and retail trade	14	977	43,250	10	749	19,630	35	1,818	77,280
Transportation and warehousing	13	9,510	33,780	24	10,313	158,380	11	14,287	114,820
Information and culture	4	219	16,080	7	1,801	105,670	5	1,039	56,870
Finance, insurance and real estate	6	265	12,540	7	462	13,240	6	187	14,350
Education, health and social sciences	19	11,475	160,880	49	12,218	173,160	27	12,264	118,560
Entertainment and hospitality	18	3,024	77,490	28	3,124	88,380	30	3,214	133,350
Public administration	11	4,793	31,370	10	7,006	289,250	9	1,048	20,310
TOTAL, ALL INDUSTRIES	**151**	**42,314**	**791,753**	**206**	**65,552**	**1,770,707**	**187**	**41,294**	**876,040**

p Preliminary – Nil

Source: Human Resources and Social Development Canada, Workplace Information Directorate

Annex 10: Strikes and Lockouts in the Canadian Mining and Mineral Manufacturing Industry, 2005–2007

	2006			2007			2008[p]		
	STRIKES AND LOCKOUTS	WORKERS INVOLVED	DURATION IN PERSON-DAYS	STRIKES AND LOCKOUTS	WORKERS INVOLVED	DURATION IN PERSON-DAYS	STRIKES AND LOCKOUTS	WORKERS INVOLVED	DURATION IN PERSON-DAYS
MINING	**3**	**857**	**45,400**	**6**	**1,433**	**45,580**	**2**	**1,122**	**51,270**
Metals	1	117	5,240	4	1,313	40,910	1	635	17,240
Non-metals	2	740	40,160	–	–	–	1	487	34,030
Mineral fuels	–	–	–	–	–	–	–	–	–
Support activities	–	–	–	2	120	4,670	–	–	–
MINERAL MANUFACTURING	**11**	**1,406**	**32,862**	**9**	**1,217**	**53,070**	**14**	**1,507**	**47,960**
Primary metals	7	1,099	29,800	6	1,013	39,770	8	959	21,150
Non-metallic mineral products	4	307	3,062	3	204	13,300	6	548	26,810

p Preliminary – Nil

Source: Human Resources and Social Development Canada, Workplace Information Directorate

Annex 11: Total Exports of Minerals and Mineral Products, by Commodity and Destination, 2008

($000)	U.S.A.	EUROPEAN UNION (EU-27)	JAPAN	MEXICO	OTHER COUNTRIES	TOTAL
METALS						
Aluminum	9,939,729	772,629	501,132	148,056	484,580	11,846,126
Antimony	458	60	–	19	6,104	6,641
Barium	75	–	–	–	–	75
Beryllium	615	–	–	–	11	626
Bismuth	518	20	4	–	1,729	2,271
Cadmium	4,553	6,685	–	–	2,734	13,972
Calcium metals	2,973	91	54	1	1,715	4,834
Chromium	15,543	29	–	441	348	16,361
Cobalt	101,279	111,719	206,564	30	346,400	765,992
Copper	4,124,572	781,300	685,279	3,591	988,496	6,583,238
Gallium	–	–	–	–	–	–
Germanium	–	–	–	–	–	–
Gold	3,494,777	4,423,257	36,864	175	1,013,765	8,968,838
Hafnium	–	–	–	–	–	–
Indium	–	–	–	–	–	–
Iron and steel	14,273,345	613,984	36,106	496,525	1,583,266	17,003,226
Iron ore	693,967	1,454,456	158,202	12,886	766,675	3,086,186
Lead	562,429	37,140	9,333	47	43,944	652,893
Lithium	2,009	76	1,883	–	2	3,970
Magnesium and magnesium compounds	81,361	3,246	110	–	2,012	86,729
Manganese	30,899	15	89	–	726	31,729
Mercury	142	1	–	–	350	493
Molybdenum	185,703	147,820	137,586	70,504	18,525	560,138
Nickel	1,691,025	1,544,368	252,348	99	3,980,871	7,468,711
Niobium	20,612	75,525	8,505	–	29,277	133,919
Platinum group metals	121,807	63,404	170	84	5,647	191,112
Rare earth metals	1,568	247	–	–	127	1,942
Rhenium	–	–	–	–	–	–
Selenium	9,900	10,223	15	–	8,823	28,961
Silicon	105,376	84,780	1,572	732	68,679	261,139
Silver	670,658	71,648	19,312	15	44,647	806,280
Strontium	–	–	–	–	–	–
Tantalum	336	15	3	–	96	450
Tellurium	2,833	6,036	73	–	1,358	10,300
Thallium	–	–	–	–	–	–
Tin	44,609	1,014	784	11	1,001	47,419
Titanium metal	90,697	3,466	–	539	7,868	102,570
Tungsten	28,276	4,632	965	–	39,020	72,893
Uranium and thorium	634,681	1,215,567	52,396	2,552	132,451	2,037,647
Vanadium	94,087	3,501	–	–	3,924	101,512
Zinc	1,449,394	212,463	16,739	1,347	205,123	1,885,066
Zirconium	5,525	8,111	1,131	6	14,040	28,813
Other metals	4,037,457	1,164,951	65,153	63,878	764,540	6,095,979
TOTAL METALS	**42,523,788**	**12,822,479**	**2,192,372**	**801,538**	**10,568,874**	**68,909,051**
NON-METALS						
Abrasives	229,216	18,580	10,214	1,173	20,694	279,877
Arsenic	–	–	–	–	–	–
Barite and witherite	242	–	–	8	–	250

Annex 11: Total Exports of Minerals and Mineral Products, by Commodity and Destination, 2008 *(continued)*

($000)	U.S.A.	EUROPEAN UNION (EU-27)	JAPAN	MEXICO	OTHER COUNTRIES	TOTAL
Boron	1,511	236	–	13	1,021	2,781
Bromine	21	–	–	–	1	22
Calcium (industrial minerals)	–	–	–	–	–	–
Cement	670,999	16,490	1,006	95	15,219	703,809
Chlorine and chlorine compounds	192,310	9,137	–	15	24,137	225,599
Chrysotile (asbestos)	9,228	1,017	1,388	3,593	103,314	118,540
Clay and clay products	64,042	26,303	282	470	7,747	98,844
Diamonds	184,614	2,530,286	–	20,955	67,414	2,803,269
Dolomite	25,882	–	–	1	11,452	37,335
Feldspar	207	70	–	–	–	276
Fluorspar	75,027	507	–	–	3,366	78,900
Glass and glassware products	824,923	44,117	2,326	3,350	42,382	917,098
Granite	46,251	1,205	142	–	10,267	57,865
Graphite	123,579	11,914	439	4,127	36,886	176,945
Gypsum	136,721	2,938	91	5	8,616	148,371
Iodine	7,331	751	–	–	342	8,424
Lime	33,415	1	–	–	46	33,462
Limestone flux and other limestone	16,132	7	81	–	1,917	18,137
Marble, travertine and other calcareous stones	43,501	389	2	–	1,569	45,461
Mica	5,998	1,000	2,829	101	1,811	11,739
Mineral pigments	133,748	3,645	2,364	380	14,805	154,942
Nepheline syenite	48,346	6,935	1,667	–	3,735	60,683
Nitrogen	2,137,521	2,427	429	342	41,052	2,181,771
Olivine	–	–	–	–	–	–
Pearls	3,240	67	6	–	223	3,536
Peat	257,047	2,086	13,534	1,037	19,751	293,455
Perlite	–	–	–	–	–	–
Phosphate and phosphate compounds	21,549	243	1,010	–	1,312	24,114
Potash and potassium compounds	3,383,093	21,838	12,159	66,546	2,829,786	6,313,422
Salt and sodium compounds	503,919	6,305	40,966	1,993	29,340	582,523
Sand and gravel	57,773	94	23	–	3,168	61,058
Sandstone	163	–	–	–	–	163
Silica and silica compounds	88,985	3,243	114	188	8,542	101,072
Slate	7,229	18,665	–	–	391	26,285
Sulphur and sulphur compounds	720,140	135	–	49,856	1,903,189	2,673,320
Talc, soapstone and pyrophyllite	20,201	2	–	1	27	20,231
Titanium oxides	187,417	1,879	33	3	1,211	190,543
Vermiculite	–	–	–	–	–	–
Other non-metals	467,965	33,042	1,353	4,617	42,719	549,696
Other structurals	168,823	7,066	176	1,037	15,233	192,335
TOTAL NON-METALS	**10,898,309**	**2,772,620**	**92,634**	**159,906**	**5,272,685**	**19,196,153**
FUELS						
Coal	410,086	1,137,184	2,277,104	148,750	2,434,823	6,407,947
Coke	70,348	–	–	–	286	70,634
TOTAL COAL AND COKE	**480,434**	**1,137,184**	**2,277,104**	**148,750**	**2,435,109**	**6,478,581**
TOTAL MINING EXPORTS	**53,902,531**	**16,732,283**	**4,562,110**	**1,110,194**	**18,276,668**	**94,583,785**

– Nil … Amount too small to be expressed

Sources: Natural Resources Canada; Statistics Canada, May 2008

Annex 12: Total Imports of Minerals and Mineral Products, by Commodity and Origin, 2008

($000)	U.S.A.	EUROPEAN UNION (EU-27)	JAPAN	MEXICO	OTHER COUNTRIES	TOTAL
METALS						
Aluminum	3,632,723	250,839	10,345	19,680	2,238,961	6,152,548
Antimony	897	727	15	2,343	9,657	13,639
Barium	594	2,305	393	–	4,201	7,493
Beryllium	865	10	–	–	66	941
Bismuth	909	545	–	–	921	2,375
Cadmium	313	112	1	154	110	690
Calcium metals	47,964	4,086	66	–	2,175	54,291
Chromium	19,674	7,522	20	839	84,136	112,191
Cobalt	26,252	20,661	1,037	–	39,625	87,575
Copper	2,207,053	189,915	10,475	50,260	1,168,329	3,626,032
Gallium	30	237	13	–	7	287
Germanium	10,586	1,587	–	–	404	12,577
Gold	2,631,763	173,425	42	329,267	3,107,310	6,241,807
Hafnium	49	565	–	–	–	614
Indium	1,974	217	3	–	1,513	3,707
Iron and steel	14,442,343	2,350,390	700,237	568,711	4,741,186	22,802,867
Iron ore	1,067,680	5,059	1	785	319	1,073,844
Lead	448,147	20,039	3,710	21,004	86,868	579,768
Lithium	25,773	7,825	10,883	54	33,978	78,513
Magnesium and magnesium compounds	52,821	11,689	1,466	1,089	233,750	300,815
Manganese	168,065	5,394	2,248	7,276	388,099	571,082
Mercury	1,285	124	5	–	1,327	2,741
Molybdenum	218,340	1,404	19	235	19,353	239,351
Nickel	267,968	170,081	32,850	255	95,586	566,740
Niobium	8,239	2,181	–	–	43,568	53,988
Platinum group metals	196,300	112,256	55	17	188,430	497,058
Rare earth metals	519	82	861	–	752	2,214
Rhenium	49	2	–	–	–	51
Selenium	181	4,564	1,729	82	618	7,174
Silicon	28,422	1,069	78	4	160,271	189,844
Silver	393,773	75,175	728	28,907	274,296	772,879
Strontium	125	617	–	203	6	951
Tantalum	796	50	–	–	98	944
Tellurium	492	3,359	1,308	–	15,845	21,004
Thallium	3	–	–	–	–	3
Tin	26,967	2,083	716	2,518	60,840	93,124
Titanium metal	107,007	17,228	1,794	1,261	18,196	145,486
Tungsten	11,745	4,619	46	–	4,716	21,126
Uranium and thorium	61,183	21,913	–	–	565,467	648,563
Vanadium	11,129	1,339	–	–	64,076	76,544
Zinc	345,370	11,556	449	8,281	94,121	459,777
Zirconium	43,898	3,739	878	2	7,745	56,262
Other metals	6,180,885	1,290,070	495,211	944,183	2,742,382	11,652,731
TOTAL METALS	**32,691,151**	**4,776,660**	**1,277,682**	**1,987,410**	**16,499,308**	**57,232,211**
NON-METALS						
Abrasives	184,498	95,014	10,552	5,799	95,354	391,217
Arsenic	32	–	13	–	158	203
Barite and witherite	9,029	419	–	–	10,984	20,432
Boron	22,318	565	180	3	4,918	27,984

Annex 12: Total Imports of Minerals and Mineral Products, by Commodity and Origin, 2008 *(continued)*

($000)	U.S.A.	EUROPEAN UNION (EU-27)	JAPAN	MEXICO	OTHER COUNTRIES	TOTAL
Bromine	5,766	–	–	–	144	5,910
Calcium (industrial minerals)	7,172	3	–	–	416	7,591
Cement	319,867	16,769	1,013	1,984	62,043	401,676
Chlorine and chlorine compounds	58,687	3,772	717	1,002	6,149	70,327
Chrysotile (asbestos)	88,107	3,550	4,483	5,589	22,541	124,270
Clay and clay products	339,306	264,953	23,280	46,218	490,826	1,164,583
Diamonds	127,421	85,716	131	58	678,740	892,066
Dolomite	11,611	15	–	10	19	11,655
Feldspar	452	2	–	–	–	454
Fluorspar	18,288	3,500	50	7,987	46,664	76,489
Glass and glassware products	1,638,723	240,789	17,870	69,399	386,485	2,353,266
Granite	16,360	29,515	–	342	126,191	172,408
Graphite	269,877	79,169	36,754	4,768	122,216	512,784
Gypsum	157,283	828	22	733	924	159,790
Iodine	4,551	840	2,967	3	8,806	17,167
Lime	13,648	79	9	–	21	13,757
Limestone flux and other limestone	24,247	774	–	–	546	25,567
Marble, travertine and other calcareous stones	17,429	42,514	–	1,614	79,467	141,024
Mica	7,924	1,344	278	–	820	10,366
Mineral pigments	128,596	11,212	2,661	2,577	11,252	156,298
Nepheline syenite	98	–	–	–	–	98
Nitrogen	168,800	77,011	162	100	368,768	614,841
Olivine	683	–	–	–	3	686
Pearls	6,225	1,398	2,304	5,433	15,473	30,833
Peat	2,459	1,326	–	–	627	4,412
Perlite	11,472	2,660	–	2	–	14,134
Phosphate and phosphate compounds	570,162	14,248	61	1,654	9,254	595,379
Potash and potassium compounds	49,418	4,609	424	124	13,491	68,066
Salt and sodium compounds	298,108	32,251	9,121	10,940	162,721	513,141
Sand and gravel	16,591	99	1	39	941	17,671
Sandstone	2,684	273	–	–	2,515	5,472
Silica and silica compounds	119,683	18,238	7,748	716	16,158	162,543
Slate	1,953	193	38	–	13,644	15,828
Sulphur and sulphur compounds	65,602	7,137	18	1,150	273	74,180
Talc, soapstone and pyrophyllite	12,911	260	168	–	590	13,929
Titanium oxides	135,485	15,123	2,687	14,947	9,226	177,468
Vermiculite	4,735	128	–	–	1,784	6,647
Other nonmetals	627,665	50,937	7,975	9,947	102,199	798,723
Other structurals	63,575	14,112	3,000	415	23,714	104,816
TOTAL NON-METALS	**5,629,501**	**1,121,345**	**134,687**	**193,553**	**2,897,065**	**9,976,151**
FUELS						
Coal	1,169,215	2,729	154	57	276,071	1,448,226
Coke	97,242	96,088	–	–	294,914	488,244
TOTAL COAL AND COKE	**1,266,457**	**98,817**	**154**	**57**	**570,985**	**1,936,470**
TOTAL MINING IMPORTS	**39,587,109**	**5,996,822**	**1,412,523**	**2,181,020**	**19,967,358**	**69,144,832**

– Nil … Amount too small to be expressed

Sources: Natural Resouces Canada; Statistics Canada, May 2009

List of Figures

The Canadian Mining Industry at a Glance

	2003	2004	2005	2006	2007	2008
Mining Industry GDP ($ billion)	39.0	39.5	40.0	40.0	41.9	40.3
Percentage of Total Canadian GDP (%)	3.9	3.8	3.8	3.7	3.4	3.3
Value of Mineral Production ($ billion)	20.1	24.3	27.4	34.2	40.4	45.3
Synthetic Crude Production Value ($ billion)	6.8	8.6	9.2	14.8	13.5	n.a.
Synthetic Crude Production (million cubic metres)	25.0	26.7	21.9	30.1	29.8	n.a.
Number of Mining Establishments	808	757	859	801	766	841
Mineral Extraction Employment (thousand)	46	45	46	47	51	59
Total Mining Industry Employment (thousand)	368	357	356	367	363	351
Average Employee Weekly Earnings ($)	1,115	1,171	1,178	1,158	1,294	1,347
Metal Prices – Copper (cents per pound)	81	129	168	309	322	313
Metal Prices – Gold ($ per ounce)	364	409	445	604	697	872
Mineral Exploration/Appraisal Spending ($ million)	687	1,178	1,305	1,912	2,560	2,800
Mining Industry Capital Expenditures ($ billion)	4.8	7.2	7.4	8.3	10.1	11.3
Oil Sands Capital Expenditures ($ billion)	5.2	6.3	9.8	12.2	16.8	19.2
Mining Industry Payments to Governments ($ billion)	4.0	4.7	5.5	8.2	9.9	11.5
Stock of Foreign Direct Investment ($ billion)	20.7	20.9	22.6	38.2	59.1	59.2
Stock of Canadian Direct Investment Abroad ($ billion)	43.1	44.5	47.7	61.5	55.8	66.7

n.a. Not available

The Mining Association of Canada
L'Association minière du Canada

350 Sparks Street
Suite 1105
Ottawa ON K1R 7S8

Telephone: 613-233-9391
Fax: 613-233-8897
Website: www.mining.ca