GLOBAL CLIMATE CHANGE –

TAKING ACTION

"The mining industry is one of Canada's great economic strengths and can stand proud of its role as a world leader in mineral exploration and development. The challenge now facing the industry is to apply the same technological ingenuity to sustainable development and the sound environmental practices needed to help Canada address climate change. I am confident that the industry is up to the challenge."

The Right Honourable Jean Chrétien, Prime Minister of Canada

"We need to recognize that climate change is both a challenge and an opportunity—that our economic and environmental objectives must go hand-in-hand. We have to break down the long-standing correlation between economic growth and greenhouse gas emissions. In other words, we need to keep the economy growing, but without increasing the emissions normally associated with such growth."

The Hon. Ralph Goodale, Minister of Natural Resources Canada and Chair of the Cabinet Committee for the Economic Union

MAC members recognize that a credible response to climate change requires industry action and leadership.

As most Canadians now know, global climate change is an important environmental concern. Recognizing the need for concrete action, Canada is committed to taking a lead role in limiting the emissions that contribute to climate change. And we at The Mining Association of Canada are determined to be part of the solution.

We are therefore committing resources to produce innovations that will improve our use of energy and reduce our greenhouse gas emissions. We at MAC are confident that by pursuing this goal, we can reap the many benefits — both environmental and competitive — that come from taking global leadership in eco-efficiency and environmental stewardship in our sector.

OVERVIEW

In 1997, metal mining and non-ferrous metal smelting and refining (excluding aluminum and magnesium) accounted for about:

1. 6.3% of total industrial energy consumption
2. 5.7% of direct industrial CO_2 emissions
3. 9.9% of total industrial CO_2 emissions
4. 1.5% of total Canadian CO_2 emissions

Over the period 1990 to 1997, energy consumption declined by:

1. 10.1% in the metal mining sector
2. 4.6 % in the non-ferrous metal smelting and refining sector

Over the period 1990 to 1997, energy intensity (energy per unit of output) improved by approximately:

1. 11.0% in the metal mining sector (energy/concentrate)
2. 19.0% in the non-ferrous metal smelting and refining sector (energy/refinery output & matte export)

Over the period 1990 to 1997, total CO_2 emissions dropped:

1. 4.2% in the metal mining sector
2. 8.5% in the non-ferrous metal smelting and refining sector

Mining has long been an important part of Canada's economic backbone. The mining industry directly employs 368,000 people, or one out of every 40 working Canadians. It also supports the highest industrial wages in Canada, paying $4.5 billion annually to workers in the mining, smelting and refining sectors. In 1998, the estimated production of Canada's mining and mineral processing sector was $27 billion, or 4.0 percent of the nation's gross domestic product.

The mining industry also plays a crucial role in Canada's export economy. Roughly 80.0 percent of the sector's production is exported, amounting to $45 billion or 14.0 percent of total domestic exports. In the five years from 1993 to 1998, mineral and metal exports increased by a considerable 56.0 percent. Today, one in seven Canadian export dollars comes from mining.

Increased competition and rapid technological change over the years have put pressure on our industry to adapt. But this pressure has also presented us with excellent opportunities to improve our efficiency and sustain economic growth. In fact, the mining industry has become an economic and technological front-runner in Canada, investing billions in capital projects, leading Canadian industry in productivity growth, and contributing some $350 million annually to research and development. As well, the Canadian mining industry can claim four of the top 50 research and development companies in Canada. Such strong productivity growth in all aspects of mining has enabled Canada to remain internationally competitive and a world leader in mineral production.

The Mining Association of Canada

Today, member companies are working hard to achieve greater resource efficiencies and higher standards of environmental and social responsibility, and are strongly committed to continuous improvement.

The Mining Association of Canada is the national organization of the Canadian mining industry. Established in 1935, MAC represents 30 member companies and 22 associate members engaged in mineral exploration, mining, smelting, refining, semi-fabrication and professional services. MAC members account for the vast majority of Canada's base and precious metal production.

Improving our environmental, health and safety performance and strengthening our social responsibility are fundamental goals for all MAC members. Indeed, the Mining Association of Canada was the first national mining association in the world to implement an environmental policy. Today, member companies are working hard to achieve greater resource efficiencies and higher standards of environmental and social responsibility, and are strongly committed to continuous improvement. The industry's vision, one which will benefit all Canadians, is to establish itself as a world leader in responsible and competitive mineral production through commitment to excellence, accountability, honesty, loyalty, integrity and respect for individuals, the environment and society.

Climate Change: International and National Context

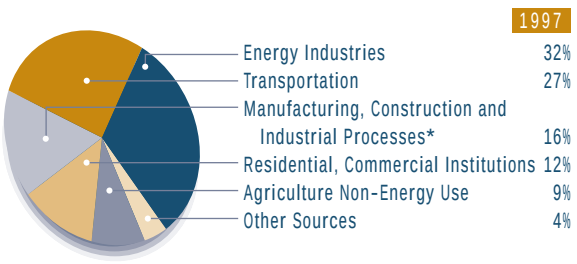
Canada is faced with lowering emissions by some 26.0 percent to meet the Kyoto target.

Climate change is a major global issue with profound implications for the way the world produces and consumes energy. There is growing international concern that human activity is accelerating global warming and is having a discernible influence on the world's climate.

The balance of scientific evidence suggests a link between rising levels of greenhouse gas (GHG) emissions and climate change. In 1992, the world's nations, concerned that GHG emissions could lead to irreversible global warming, signed the United Nations' Framework Convention on Climate Change (FCCC). Under this convention, industrial nations agreed to reduce their greenhouse gas emissions to 1990 levels by the year 2000. However, without clear national strategies and action plans, few nations will even stabilize their emissions by 2000. In fact, current projections suggest that emissions from all countries will increase significantly in the future.

December 1997 saw the negotiation of the Kyoto Protocol, the successor treaty to the FCCC. Under Kyoto, Canada must reduce GHG emissions to 6.0 percent below 1990 levels during the period 2008–10. As a point of reference, in 1997, Canada's GHG emissions were 13.0 percent above 1990 levels. According to best estimates of future economic, population and export growth, if Canada continues with policy as usual, our emissions will increase to 20.0 percent above 1990 levels by 2010. This projection means that Canada is faced with lowering emissions by some 26.0 percent to meet the Kyoto target.

Sources of Greenhouse Gas Emissions



*Mining emissions are included in this category.

SOURCE: Environment Canada, Canada's Greenhouse Gas Inventory: 1997 Emissions and Removals with Trends, April 1999

Forging a Credible Response

We at the Mining Association of Canada want to be part of the climate change solution. We accept that prudent precautionary measures are necessary for a healthy environment and a healthy economy.

The challenges involved in satisfying the Kyoto Protocol are complex, and the potential costs—social, economic and environmental—of either meeting or failing to meet the requirements are high. Even so, Canada is determined to set a worldwide example in limiting emissions.

For Canada, meeting the Kyoto target could undoubtedly affect employment, investment, international competitiveness and our standard of living. But at the same time, many of the actions we take to reduce GHG emissions could present economic opportunities. For instance, lowering our energy consumption per unit of output means lowering our production costs, which will make us more competitive. Technologies we develop to reduce emissions may also boost our productivity and exports, again enhancing competitiveness.

We at the Mining Association of Canada want to be part of the climate change solution. We accept that prudent precautionary measures are necessary for a healthy environment and a healthy economy. Because our industry depends on trade, we need to take full advantage of all opportunities to reduce energy consumption and GHG emissions while remaining competitive.

We realize that a credible response to climate change requires action and leadership within our industry. To this end, MAC members will continue to improve energy efficiency, reduce production costs and contribute to Canada's global competitiveness.

To help guide our actions and shape our industry response, we have developed the following set of principles for addressing climate change.

1 **Prudent action to reduce GHG emissions is warranted by the existing body of scientific knowledge.**

2 **Energy can and should be used more efficiently to reduce the environmental impact of energy consumption.**

3 **Developing and adopting best practices and new technologies is a key strategy for reducing GHG emissions, improving productivity and contributing to a cleaner environment.**

4 **Targets must be realistic, achievable, cost-effective and consistent with other environmental imperatives. MAC supports the development of balanced climate change policies that do the following:**

- **efficiently improve environment quality**
- **deliver sustainable and predictable environmental, social and economic policy over the long term**
- **encourage and support early action by industry to reduce GHG emissions**
- **build on voluntary measures by industry**
- **maximize flexibility to minimize costs**
- **examine embodied emissions in trade**
- **encourage investment in better energy-efficient processes and the cost-effective replacement of capital stock**
- **recognize and encourage the growth of domestic industry**
- **support a productive and competitive economy**
- **maximize investment certainty for business**

5 **Engaging all stakeholders in the climate change debate is critical. All stakeholders (industry, transport, residential, commercial, etc.) and regions must work together to share the challenges of reducing GHG emissions.**

6 **Additional research is required to analyze the social, economic and environmental implications of GHG reduction strategies on global, national and regional economies.**

7 **A balanced and effective public outreach and education plan is needed to address the social, economic and environmental implications of reducing GHG emissions.**

8 **Climate change is a global issue requiring a global solution. All countries must work together for sustained reductions in global emissions.**

9 **Climate change is also about trade and competitiveness. Canada should ratify the Kyoto Protocol only when we have a workable national plan to reduce emissions and only when our largest trading partner, the United States, has also ratified it.**

Between 1990 and 1997, the mining sector cut energy consumption and reduced total CO_2 equivalent emissions across the board, making the industry a notable example of the concrete results that can come from taking action on climate change.

Energy Use and GHG Emissions

An important first step in responding to climate change is identifying the sources and levels of GHG emissions in the mining industry, as well as any emerging trends.

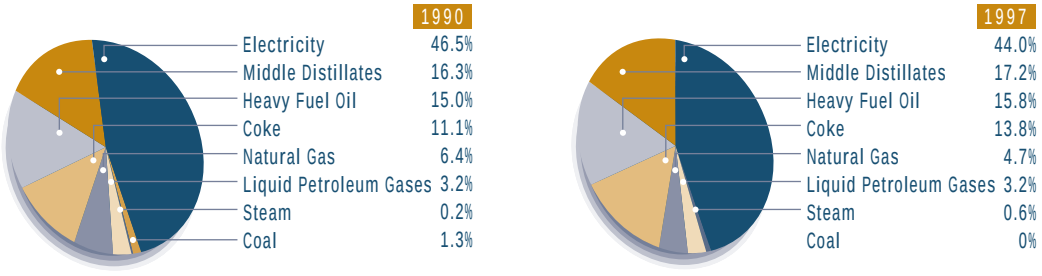
In the Canadian mining sector, GHG emissions are linked to energy use; they result from the consumption of energy during production processes. In 1997, the mining subsectors—metal mining and non-ferrous smelting and refining—together accounted for about 6.3 percent of total industrial energy consumed in Canada. They also accounted for about 5.7 percent of direct industrial CO_2 emissions. Adding indirect CO_2 emissions (that is, emissions from fuels used to generate the electricity consumed during operations) nearly doubles the emissions associated with the industry to 10 percent.

For a more detailed look at the sources and levels of CO_2 emissions in mining, it is useful to first examine the two main subsectors of the industry: (1) metal mining and (2) non-ferrous metal smelting and refining. (The second category excludes iron because iron falls into the ferrous metal—iron and steel—standard industrial classification category.) Combining these two subsectors provides a reasonably accurate picture of energy consumption and emissions in the mining industry as a whole.

As the following sections describe in detail, mining is already taking its place as part of the climate change solution. Between 1990 and 1997, the mining sector cut energy consumption and reduced total CO_2 equivalent emissions across the board, making the industry a notable example of the concrete results that can come from taking action on climate change.

Metal Mining

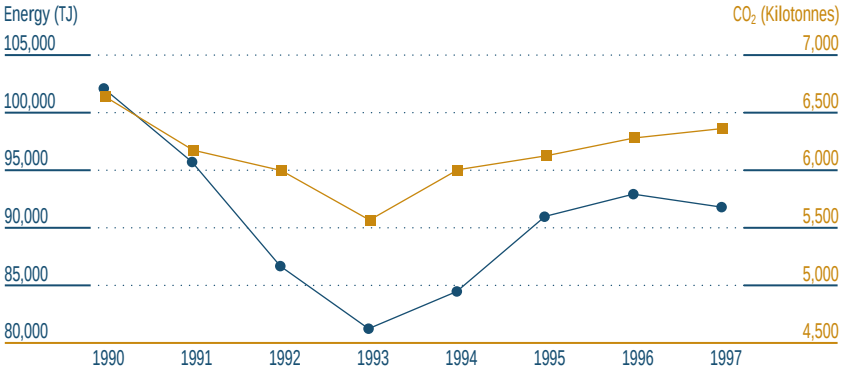
Energy Sources in Metal Mining (Terajoules)[a]



SOURCE: Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), 1999

a. Terajoule: A unit of energy—one terajoule (TJ) equals $1x10^{12}$ joules.

Energy Consumption and CO_2 Equivalent Emissions in Metal Mining



	1990	1991	1992	1993	1994	1995	1996	1997	90-97 (%)
Energy (TJ)[a]	102,081	95,692	86,649	81,214	84,448	90,968	92,899	91,772	-10.1
Direct CO_2[b] (kt)	3,936	3,680	3,295	3,078	3,288	3,563	3,767	3,722	-5.4
Indirect CO_2[c] (kt)	2,702	2,492	2,700	2,487	2,714	2,560	2,511	2,638	-2.4
Total CO_2 (kt)[d]	6,638	6,172	5,995	5,565	6,002	6,123	6,278	6,360	-4.2

SOURCE: CIEEDAC, 1999

a. Terajoule: A unit of energy—one terajoule (TJ) equals $1x10^{12}$ joules.

b. Direct CO_2: Direct emissions are those that are directly influenced by the sector's operations. This would include any on-site combustion process or fugitive emissions.

c. Indirect CO_2: Indirect emissions are those associated with an outside organization that supplies energy (e.g., electricity generation).

d. Kilotonne: One kilotonne (kt) is equal to one thousand metric tonnes.

In the period 1990–97, metal mining as a whole decreased its energy consumption by 10.1 percent and reduced total CO_2 emissions by 4.2 percent.

Direct and indirect CO_2 emissions associated with metal mining represent about 0.97 percent of total Canadian GHG emissions. Direct metal mining emissions, of which iron ore represents 61.0 percent, account for approximately 0.54 percent of total Canadian emissions. Nonetheless, it is notable that in the period 1990–97, metal mining as a whole decreased its energy consumption by 10.1 percent and reduced total CO_2 emissions by 4.2 percent. Energy intensity, or energy per unit of metal concentrate, improved 11.0 percent over the same time period.

As the above graphics illustrate, between 1990 and 1997, the metal mining sector experienced fluctuations in energy sources, consumption and emissions. Some of these variations can be linked to specific circumstances. For instance, the 21.0 percent decline in energy consumption from 1990 to 1993 was largely due to a sluggish economy; consumption rose again between 1994 and 1996 as economic conditions improved. As for the use of individual fuels, coal virtually disappeared as an energy source, mainly because of fuel switching and greater consumption of heavy fuel oil, middle distillates and liquefied petroleum gas.

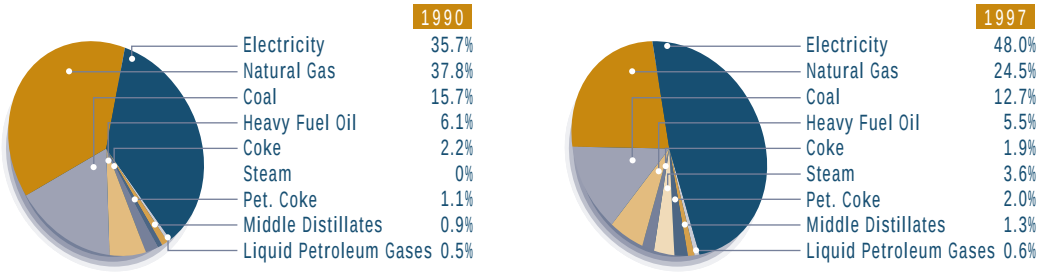
MAC is trying to get a better understanding of these fluctuations by working with the Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), an institute that collects information on energy use.

Many other factors have influenced the variations in energy consumption and emissions in metal mining. These include, to name a few, mine openings and closings, more northern locations (with limited access to fuel sources), changes in aggregate production levels, new technologies and deeper mines. MAC is trying to get a better understanding of these fluctuations by working with the Canadian Industrial Energy End-Use Data and Analysis Centre (CIEEDAC), an institute that collects information on energy use. Nonetheless, it is clear that factors such as economic conditions and mine characteristics have an important role to play in energy efficiency and GHG emissions in the sector.

Non-Ferrous Metal Smelting and Refining

Energy sources in Non-Ferrous* Metal Smelting and Refining**

(Terajoules)



*Iron smelting falls into a separate statistical identification category.

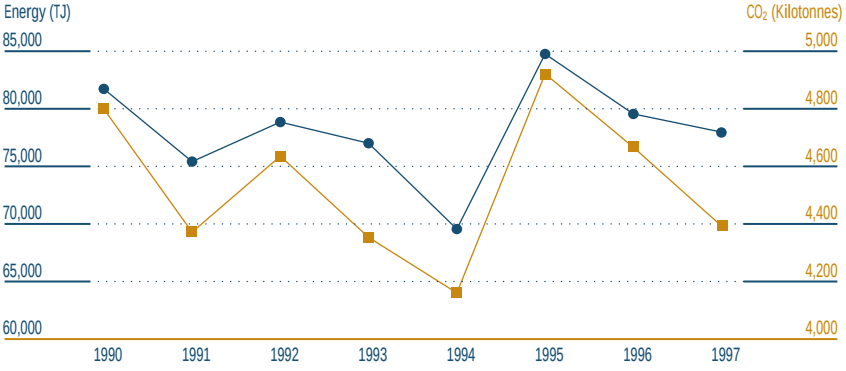
**Excluding primary aluminum and magnesium

SOURCE: CIEEDAC, 1999

a. Terajoule: A unit of energy—one terajoule (TJ) equals $1x10^{12}$ joules.

Non-ferrous metal smelting and refining (excluding primary aluminum and magnesium) as a category accounts for approximately 0.64 percent of total Canadian GHG emissions.

Energy Consumption and CO_2 Equivalent Emissions in Non-Ferrous* Metal Smelting and Refining**



*Iron smelting falls into a separate statistical identification category.

**Excluding primary aluminum and magnesium

	1990	1991	1992	1993	1994	1995	1996	1997	90-97 (%)
Energy (TJ)[a]	81,695	75,379	78,813	76,974	69,521	84,726	79,519	77,938	-4.6
Direct CO_2[b] (kt)	3,293	3,037	3,271	2,958	2,514	2,809	2,706	2,458	-25.4
Indirect CO_2[c] (kt)	1,505	1,333	1,363	1,394	1,645	2,111	1,959	1,933	28.4
Total CO_2 (kt)[d]	4,798	4,370	4,634	4,352	4,159	4,920	4,665	4,391	-8.5

SOURCE: CIEEDAC, 1999

a. Terajoule: A unit of energy—one terajoule (TJ) equals $1x10^{12}$ joules.

b. Direct CO_2: Direct emissions are those that are directly influenced by the sector's operations. This would include any on-site combustion process or fugitive emissions.

c. Indirect CO_2: Indirect emissions are those associated with an outside organization that supplies energy (e.g., electricity generation).

d. Kilotonne: One kilotonne (kt) is equal to one thousand metric tonnes.

Over the period 1990–97, energy consumption in smelting and refining fell by 4.6 percent, with a corresponding decrease in total CO_2 emissions of 8.5 percent.

Non-ferrous metal smelting and refining (excluding primary aluminum and magnesium) as a category accounts for approximately 0.64 percent of total Canadian GHG emissions. (Note: iron smelting is included in ferrous metals—iron and steel—production.) In 1997, energy use in non-ferrous metal smelting and refining represented 2.9 percent of Canada's total industrial energy consumption.

In this sector, as in metal mining, there is a distinct correlation between energy use and total CO_2 emissions. Over the period 1990–97, energy consumption in smelting and refining fell by 4.6 percent, with a corresponding decrease in total CO_2 emissions of 8.5 percent. Energy intensity or energy per unit of refinery output plus matte export improved by 19.0 percent over the same time period.

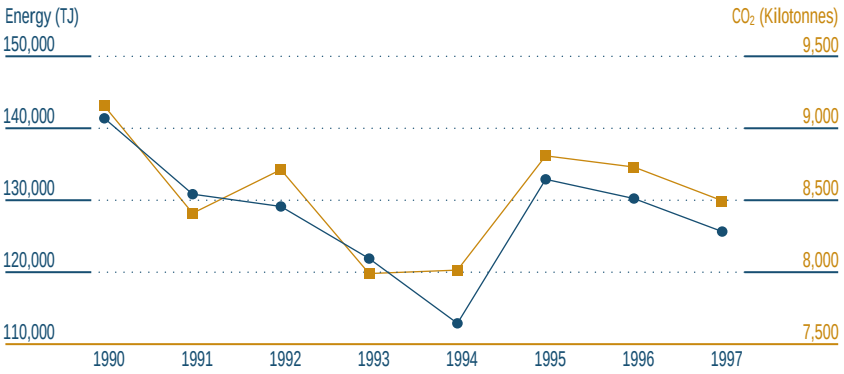
Statistics for 1990–97 show that electricity grew as an energy source in the sector, from 35.7 percent in 1990 to 48.0 percent in 1997. This trend almost certainly accounts for some of the decrease in emissions over the period. The use of natural gas is also a factor in lower emissions. Although natural gas consumption in the sector declined overall between 1990 and 1997, more detailed statistics show that its most dramatic drop occurred in 1994. Since then, natural gas has in fact been growing steadily as an energy source—a trend that may well continue if cost and availability remain favourable. If natural gas displaces other fossil fuels, as it is projected to do in New Brunswick, for instance, when Sable Island gas comes on-stream, emissions in the sector should continue to drop.

Increasingly, waste heat is being captured and converted into steam, a clean and efficient source of energy.

Another important source of emissions reduction in the smelting and refining sector has been the use of steam as an energy source. Increasingly, waste heat is being captured and converted into steam, a clean and efficient source of energy. Steam consumption in the sector rose from 0 percent of total energy in 1990 to 3.6 percent in 1997, growing by almost 900 percent between 1995 and 1997.

Combined Metal Mining and Non-Ferrous Smelting and Refining

Energy Consumption and CO_2 Equivalent Emissions in Combined Metal Mining* and Non-Ferrous Metal Smelting and Refining**



*Iron ore mining is excluded from these figures to reflect the exclusion of iron smelting, which falls into the ferrous metal (iron and steel) standard of industrial classification.

**Excluding primary aluminum and magnesium

	1990	1991	1992	1993	1994	1995	1996	1997	90-97 (%)
Energy (TJ)[a]	141,273	130,729	129,021	121,782	112,782	132,795	130,125	125,535	-11.1
Direct CO_2[b] (kt)	4,203	3,821	4,059	3,877	4,355	4,667	4,465	4,566	8.6
Indirect CO_2[c] (kt)	4,946	4,583	4,648	4,108	3,654	4,136	4,260	3,925	-20.6
Total CO_2 (kt)[d]	9,149	8,404	8,707	7,985	8,009	8,803	8,725	8,491	-7.2

SOURCE: CIEEDAC, 1999

a. Terajoule: A unit of energy—one terajoule (TJ) equals $1x10^{12}$ joules.

b. Direct CO_2: Direct emissions are those that are directly influenced by the sector's operations. This would include any on-site combustion process or fugitive emissions.

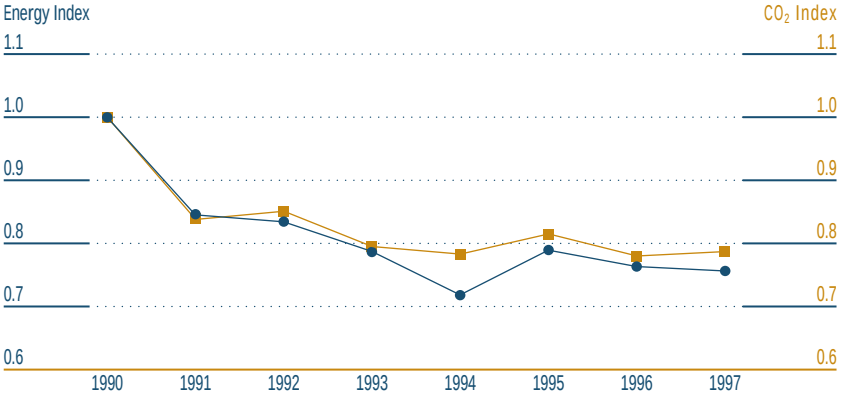
c. Indirect CO_2: Indirect emissions are those associated with an outside organization that supplies energy (e.g., electricity generation).

d. Kilotonne: One kilotonne (kt) is equal to one thousand metric tonnes.

The above table illustrates that in the mining industry as a whole, just as in the industry's subsectors, there is an obvious correlation between energy consumption and total emissions. The following graphics demonstrate that energy consumption and total CO_2 emissions per unit of output decreased over the period 1990–97, placing the mining industry on the right track toward better energy efficiency and emissions reduction. Energy intensity or energy per unit of metal mining plus refinery output and matte export improved 24.0 percent over the 1990-97 timeframe.

Energy consumption and total CO_2 emissions per unit of output decreased over the period 1990–97, placing the mining industry on the right track toward better energy efficiency and emissions reduction.

Aggregate Energy and CO_2 Equivalent Intensity Indices for Metal Mining* and Non-Ferrous Smelting and Refining** (1990=1)



*Iron ore mining is excluded from these figures to reflect the exclusion of iron smelting, which falls into the ferrous metal (iron and steel) standard of industrial classification.

**Excluding primary aluminum and magnesium

SOURCE: Adapted from CIEEDAC, 1999

Note [a]: Energy and CO_2 intensity indicators use refinery output plus exported matte as the measure of output.

a. Energy Intensity Indicator is a ratio equal to the energy intensity (energy consumption per unit of output) in a particular year divided by the energy intensity for the base year. The energy intensity indicator for the base year equals 1.0.

Trends in GHG Emissions—The Mining Challenge

Despite declining energy requirements per unit of output and its favourable emissions record throughout the 1990s, the mining industry is still faced with a challenge: as the industry grows, its energy consumption and GHG emissions are projected to grow.

Despite declining energy requirements per unit of output and its favourable emissions record throughout the 1990s, the mining industry is still faced with a challenge: as the industry grows, its energy consumption and GHG emissions are projected to grow. An expanding mining industry means higher production, more ore processed and greater related energy requirements.

Assuming a 1.0 percent annual growth rate applied to 1997 data (the most recent available), and assuming no change in the way the industry does business, we can project the following trends for 2000 and 2010:

- Total CO_2 emissions from metal mining will be 1.3 percent lower in 2000 and 9.1 percent higher in 2010, compared to 1990.
- Total CO_2 emissions from non-ferrous metal smelting and refining (excluding primary aluminum and magnesium) will be 5.7 percent lower in 2000 and 4.2 percent higher in 2010, compared to 1990.
- Total CO_2 emissions from combined metal mining (excluding iron ore) and non-ferrous smelting and refining (excluding primary aluminum and magnesium) will be 4.4 percent lower in 2000 and 5.6 percent higher in 2010, compared to 1990.

It is important to note that these projections are based on 1.0 percent annual growth in the industry. They do not reflect the many opportunities on the horizon for reducing GHG emissions—opportunities like advanced technology, fuel switching, energy efficiency improvements and enhanced productivity. Nor do they reflect other emerging measures for reducing net GHG emissions, including carbon offsets and emissions trading. MAC is confident that the mining industry will continue to take advantage of such opportunities as they arise, adopting new technologies and best practices to ensure that, as was the case in the 1990s, emissions growth is curtailed to the greatest extent possible.

What is MAC Doing About Climate Change?

We are managing our GHG emissions:

MAC encourages members to integrate energy management policies into their business plans.

• The mining industry has a long history of improving energy efficiency. In 1996, MAC established the Mining Energy Task Force, whose objectives are to monitor energy performance in the industry and to encourage continuous improvement in energy efficiency.

• For over 25 years, MAC has participated in the Canadian Industry Program for Energy Conservation (CIPEC), an initiative to promote energy efficiency within industry. It was under the auspices of CIPEC that MAC set up the Mining Energy Task Force.

• MAC is part of Canada's Voluntary Challenge and Registry Program (VCR), an initiative to promote emissions reduction in industry. MAC actively encourages Canadian mining organizations (both members and non-members of MAC) to develop and document VCR action plans for reducing emissions. By December 1999, 13 of MAC's 30 members—representing the majority share of energy consumption in the mining sector—had submitted VCR action plans; 10 of these had also submitted progress reports.

• MAC is represented on the advisory board of the Office of Energy Efficiency and is also an active participant on several federal-provincial climate change issue tables, working on policy options for Canada's National Climate Change Strategy.

• MAC encourages members to integrate energy management policies into their business plans. For example, Noranda formed an internal task force to develop a more accurate GHG inventory and to identify ways of cutting energy consumption. At Falconbridge, all divisions incorporate energy consumption and reduction plans into their overall business strategies.

The mining sector established an annual target of 1.0 percent reduction in energy consumption per unit of output over the period 1995 to the year 2005.

• The mining sector established an annual target of 1.0 percent reduction in energy consumption per unit of output over the period 1995–2000, and exceeded its short-term goal of stabilizing GHG emissions at 1990 levels by the year 2000. In 1999, the mining sector extended this annual 1.0 percent reduction target to the year 2005.

• MAC promotes other emissions reduction measures, including domestic and international offsets and GHG emissions trading, as important and cost-effective elements of corporate climate change strategies.

Mining's "Energy Champion"

Warren Holmes, Senior Vice-President, Canadian Mine Operations at Falconbridge Limited, also bears the title of "energy champion" for the mining sector. In this capacity, he represents the mining industry on CIPEC's Executive Council and on the VCR Board of Directors. Since 1998, Mr. Holmes and his energy champion predecessor Dr. Michael Sopko, Chairman of Inco Limited, have tirelessly contacted the CEOs of most operating mines in Canada, encouraging them to register in the VCR program and to develop a progressive VCR action plan. These efforts have persuaded 19 mining companies, both inside and outside MAC, to submit action plans, with more submissions in the offing.

Warren Holmes

MAC has hired two environmental consulting firms, the Pembina Institute and Resource Futures International, to create a guide to assist companies in developing climate change strategies that support the mining industry's long-term GHG reduction efforts.

We are educating and communicating:

• MAC's Mining Energy Task Force meets regularly with company representatives to share best practices and encourage energy conservation.

• MAC's Energy Managers Internet Chat-line helps industry representatives solve their energy problems by sharing information and strategies (www.mining.ca/HyperNews/get.cgi/energy.html).

• MAC has published the Mining Energy Efficiency Planning Guide to help organizations develop and carry out their long-term energy efficiency plans. The guide sets out general planning principles, management practices and communication techniques.

• MAC has produced a VCR workbook to help mining industry participants prepare their VCR action plans and report on their energy efficiency improvements.

• MAC has hired two environmental consulting firms, the Pembina Institute and Resource Futures International, to create a guide to assist companies in developing climate change strategies that support the mining industry's long-term GHG reduction efforts. Key elements of the guide include GHG emissions goals; GHG measurement and reporting; GHG emissions trading, flexibility and offset mechanisms; procurement policies; and employee involvement and motivation.

• Beginning in 2000, MAC will schedule workshops for member companies to look at how to formulate corporate climate change policies that fit within a sustainable business strategy.

Beginning in 2000, MAC will schedule workshops for member companies to look at how to formulate corporate climate change policies that fit within a sustainable business strategy.

We are measuring and reporting:

• MAC sponsors the CIEEDAC. Housed at Simon Fraser University, the CIEEDAC is an important vehicle for expanding existing knowledge about energy consumption within the mining industry.

• MAC hired the Pembina Institute and Resource Futures International to prepare a guide that helps companies inventory, measure and report on GHG reduction actions.

• MAC reports to government and the general public on energy management initiatives through the MAC Environmental Progress Report, CIPEC and VCR annual reports and other publications.

• To measure and compare energy performance within the industry, MAC has launched an energy bench-marking strategy. Beginning with underground bulk mining operations, the strategy will provide tools for measuring an organization's energy performance. This will help identify where improvements and better practices can be adopted.

We are conducting research:

• MAC is assessing a range of technology options to determine their impact on direct and indirect emissions, their associated costs and their overall cost-effectiveness.

• MAC is working on other ways of improving energy efficiency in mining, including conducting energy bench-marking, evaluating case studies and investigating process efficiency alternatives.

• In partnership with the federal government, MAC is studying the economic implications of Canada's Kyoto target and is attempting to quantify the competitive impacts of various emissions reduction scenarios.

GHG Success Stories from Selected Members

Cominco Limited

In 1998, Trail achieved a total GHG emissions reduction of 40.0 percent from 1990 levels. Over the period 1990–98, Trail reduced its carbon energy consumed per tonne of metal by 26.0 percent and cut CO_2 emissions per tonne of metal by 33.0 percent.

Cominco is an integrated mining and metals company whose principal activities include mineral exploration, mining (primarily lead and zinc), smelting and refining.

Energy management and environmental responsibility are an integral part of doing business at Cominco's operations in Trail, B.C. In 1998, Trail achieved a total GHG emissions reduction of 40.0 percent from 1990 levels. Over the period 1990–98, Trail reduced its carbon energy consumed per tonne of metal by 26.0 percent and cut CO_2 emissions per tonne of metal by 33.0 percent.

Steam management initiatives begun in the mid-1990s have netted the company annual savings and reduced GHG emissions. To monitor progress and investigate further opportunities for waste-heat recovery and co-generation, Trail operations installed a $170,000 computerized steam management system to help balance supply and demand between steam producers and consumers. The steam management system, which came on line in 1996, has brought two significant improvements. First, it allows the operator at the auxiliary steam plant to make efficient, timely decisions about steam and energy conservation and plant operations. As a result, the plant, which is powered by fossil fuels, produces 5.0 percent less steam on a monthly basis and was able to save $97,000 during the system's first two years of operation. Second, the consistent supply of steam has made temperature control more reliable in the metallurgical production process, thus boosting zinc production.

As well, the addition of a new steam line has provided a steady supply of steam, eliminating the need to vent steam (and thus waste it) and also reducing the need to run the auxiliary steam plant during winter and summer months. The steam line modification cost the company nearly $950,000, but has yielded savings of $300,000 a year. The savings result from better management of the steam produced by waste-heat boilers, which lessens the need for more expensive steam produced by gas or electricity.

Teck Corporation

Teck expects to exceed its stabilization objectives by decreasing total GHG emissions to 8.0 percent below the 1990 baseline by the year 2000.

Teck is a mine development and operating company with a working interest in nine mines across Canada. The company produces a wide range of minerals, the most important being gold, copper, zinc and metallurgical coal.

Teck has developed a strong commitment to reducing energy consumption, a direct result of which is the reduction of GHG emissions. Through its recent reduction initiatives, the company is in a position to stabilize emissions at 1990 levels by the year 2000.

Teck is introducing performance improvements in all of its operating mines that focus on energy management in transporting materials, in process applications and in heating and ventilation. With the improvements planned and already implemented, Teck expects to exceed its stabilization objectives by decreasing total GHG emissions to 8.0 percent below the 1990 baseline by the year 2000. As well, Teck's emissions record is expected to improve by 21.0 percent by the year 2000 despite a projected 16.0 percent increase in the amount of material to be mined relative to 1990. Teck's achievements are particularly significant given that some 20.0 percent of the company's total emissions are natural releases of methane from coal operations and are therefore beyond the company's control.

These positive results only partly reflect Teck's overall commitment to energy efficiency. The company is also improving energy consumption at its surface mining operations in B.C. and Quebec, where electricity is generated by hydroelectric plants with zero emissions. Although these improvements will not show up as GHG reductions, they do illustrate Teck's active and responsible approach to energy management.

Falconbridge Limited

Divisions were able to improve their energy intensity (energy consumption per unit of output) by 14.0 percent and their carbon intensity (CO_2 emitted per unit of output) by 3.0 percent over the period from 1990 to 1998.

Falconbridge is an international, integrated base metals company involved in exploration, development, mining, smelting and refining. The company's primary production includes nickel, copper, zinc and cobalt.

Over the period 1990–98, Falconbridge's Canadian divisions saw absolute equivalent CO_2 emissions increase by 10.0 percent, mainly because of the 1998 opening of the Raglan mine in northern Quebec. Nevertheless, the divisions were able to improve their energy intensity (energy consumption per unit of output) by 14.0 percent and their carbon intensity (CO_2 emitted per unit of output) by 3.0 percent over the period.

In 1998, the company's Sudbury division completed 14 energy conservation projects that focused on modifying system and process technology as well as on changing operating practices. Based on preliminary results, these improvements are expected to show positive annual results: a decrease in energy consumption of 9 gigawatt hours, a reduction in GHG emissions of 1.7 kilotonnes and savings of $495,000.

One major energy management initiative at the Sudbury division is the mine ventilation automation project, which began in 1998. This project uses sophisticated underground communications and control technologies to regulate main and auxiliary ventilation fans and to monitor air quality and vehicle location. The first two phases of the project concentrate on identifying and optimizing ventilation usage. The potential decrease in energy consumption as a result of these two phases is 25 gigawatt hours, which equals a 4.7 kilotonne reduction in indirect GHG emissions and annualized savings of $1.4 million. There will also be a 0.72 kilotonne reduction in direct GHG emissions because the more efficient system will reduce the amount of natural gas needed to heat mine air.

The final phase of the Sudbury project focuses on providing ventilation on demand. However, before this phase can unfold, comprehensive test work on air quality must be carried out by third parties such as CANMET. As well, provincial regulators must get involved to change regulations governing air flow requirements in underground mines.

Syncrude Canada Limited[1]

In February 1999, Syncrude was honoured by the Canadian VCR program with a Leadership Award for extraordinary commitment, action and leadership in voluntarily reducing GHG emissions.

Syncrude Canada operates an oil sands mine, a utilities plant, a bitumen extraction facility and an upgrader that processes bitumen and produces (value-added) high-quality, light, sweet crude oil.

In February 1999, Syncrude was honoured by the Canadian VCR program with a Leadership Award for extraordinary commitment, action and leadership in voluntarily reducing GHG emissions. The company was recognized for such initiatives as installing waste-heat recovery systems on gas turbine generators, reducing steam usage in the bitumen extraction process, and improving overall yield, which has cut the amount of energy required to produce a barrel of crude oil. New technologies and processes will further reduce Syncrude's energy use by almost one third per unit of production over the period 1990–2008.

Syncrude has a long history of energy management. Between 1990 and 1997, the company reduced the energy required to produce a barrel of synthetic crude oil by 9.0 percent, with a corresponding decrease in CO_2 emissions of 11.0 percent. This represents an average energy efficiency improvement of 1.6 percent per year.

By 2008, through new technologies and processes, Syncrude will have reduced CO_2 emissions by 35.0 percent per barrel from 1990 levels—an average annual improvement of over 1.7 percent.

Over the next 10 years, Syncrude will invest more than $1 billion in energy efficiency improvements. By 2008, through new technologies and processes, Syncrude will have reduced CO_2 emissions by 35.0 percent per barrel from 1990 levels—an average annual improvement of over 1.7 percent. These new technologies include a low-energy mining and extraction process at the Aurora Mine in Alberta, which will use 40.0 percent less energy than the current process. As well, the company will replace all draglines and bucketwheels with energy-efficient trucks and shovels.

[1] Syncrude Canada Limited is an active member of MAC. The energy consumption and related GHG emissions from Syncrude operations are allocated to the oil and gas sector, and are not included with the metal mining data contained in this document.

CONCLUSION

MAC is proud of the many accomplishments the Canadian mining industry has already attained to improve energy efficiency and protect the environment. But MAC members recognize that to respond fully and responsibly to global climate change, we cannot rest on our record to date. We must continue, and indeed intensify, our efforts to encourage the entire minerals industry to adopt technologies and innovations that make us more energy efficient and reduce our GHG emissions.

We at MAC believe that pursuing this goal will bring us untold benefits—benefits that come from being world leaders in eco-efficiency and environmental stewardship in our sector, and benefits that come from being leaner competitors in an increasingly global industry.

For more information on MAC's approach to global climate change, please contact:

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"One of the most dangerous attitudes towards climate change is that because there is still scientific uncertainty about climate change, we should not begin any major measures. This attitude is dangerous because it appeals to our human instinct to procrastinate and put off difficult choices and wraps it in the mantle of scientific respectability."

The Hon. David Anderson, Minister of Environment Canada

CLIMATE CHANGE

"One mining company cannot solve the complex global issue of climate change alone. But the Canadian mining industry through its member companies, and industry association, can take proactive steps to improve environmental performance. At Falconbridge, we view global climate change as a risk and an opportunity. We are responding to the risk with responsible environmental management programs, which minimize risk, reduce greenhouse gas emission, improve our energy intensity, and provide the opportunity to achieve our goals of improved environmental and economic performance." Warren Holmes, Senior Vice-President, Canadian Mine Operations, Falconbridge Limited

"Humanity has created three threats to planetary survival. The risk of two – nuclear war and ozone depletion – has been reduced by sanity and international agreements. The risk of the third, global climate change, is still subject only to rhetorical commitments. The problem and the threat continue to worsen." Elizabeth May, Executive Director, Sierra Club of Canada

"Climate change is the greatest environmental challenge facing humanity as we enter the 21st century. Fortunately, action to address climate change can reduce costs, improve competitiveness, and provide a host of other environmental and public health benefits. Companies that reduce their greenhouse gas intensity will be winners in the 21st-century economy."

Robert Hornung, Climate Change Program Director, Pembina Institute