CIEEDAC

Energy Use and Related Data: Canadian Mining and Metal Smelting and Refining Industries, 1990 to 2012

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Mining Association of Canada

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Executive Summary

The Canadian Industrial Energy End-use Data and Analysis Centre (CIEEDAC) is part of the School of Resource and Environmental Management at Simon Fraser University and houses extensive energy information relevant to Canada's industrial sectors. One of CIEEDAC's primary goals is to expand and improve the information on energy use and greenhouse gas (GHG) emissions by regularly collecting reliable data. Accordingly, this report provides information relevant to the metal and non-metal mining, metal smelting and refining industries for the Mining Association of Canada. It includes a national time series of energy use and greenhouse gas emissions from 1990 to 2012, and reviews data issues that may impact the analyses. The information available here is not exhaustive of all CIEEDAC's data on the industry; other breakdowns and information are available on request.

Each year, metal and non-metal mines, smelters, and refineries (exclusive of iron and aluminium smelting) consume a substantial amount of energy and release a significant volume of greenhouse gases (GHG). In 2012, the mining and non-ferrous metal smelting industries accounted for about 6.3% of total industrial energy use and about 6.5% of direct industrial GHG emissions in Canada. Changes in energy and GHG emissions between 1990 and 2012 in these industries are shown in Table 1.

Table 1: Changes in Energy Use and GHG Emissions, 1990 to 2012

Sector	Energy	GHG
Metal Mining (NAICS 212200)	-2.8%	-11.1%
Non-metal Mining (NAICS 212390 only)	19.0%	17.6%
Mining (NAICS 212200 and 212390)	3.4%	-1.0%
Metal Smelting and Refining (NAICS 331410)	-23.8%	-52.4%
Metal Mining and Smelting (NAICS 212200 and 331410)[1]	-16.3%	-55.2%

[1] Excludes iron mines because smelting excludes iron and steel smelting.

CIEEDAC calculates intensity indicators – energy or emissions per unit of production – to provide a more informative picture of energy and emission trends in the industry. However, these indicators must be used with caution. Changes in energy or emission intensity can result from either changes in energy efficiency (e.g., new technologies are adopted that reduce the amount of energy required to extract potash), or from structural shifts within an industry (e.g., an increase in the share of relatively energy-intensive potash mining towards relatively less energy-intensive salt mining). As such, CIEEDAC calculates "composite" indicators that distinguish between real intensity changes and structural changes. Composite indicators provide a more accurate picture of changes in intensity. Unfortunately, the data available to CIEEDAC does not allow composite GHG intensity indicators to be developed for the majority of industrial aggregations we examine in this report.

Depending on how the data are assessed, energy intensity and GHG intensity have declined in all sectors (Table 2). Non-metal mining exhibits the highest reductions in energy and smelting and refining GHG intensity (in part because of a reduction of SF_6 process emissions).

Table 2: Changes in Physical Intensity Indicators of Energy and GHG Emissions, 1990 to 2012

Sector	Energy	GHG
Metal Mining (NAICS 212200)	-9.5%[2]	-12.9%
Non-metal Mining (NAICS 212390 only)	-19.2%[3]	-10.3%
Mining (NAICS 212200 and 212390)	-12.7%[4]	-12.6%
Metal Smelting and Refining (NAICS 331410)	-17.6%	-48.6%
Metal Mining and Smelting (NAICS 212200 and 331410)[1]	-14.5%[5]	-27.5%[6]

1. Excludes iron mines.
2. Energy composite, based on tonne milled.
3. Energy composite, based on tonne throughput.
4. Energy composite, based on tonne concentrate.
5. Energy composite, based on tonne product.
6. GHG composite of metal mining and smelting (other GHG composites cannot be generated).

Statistics Canada updated their real GDP to a 2007 base year in 2013. This change was accompanied by a change in the methodology used to calculate GDP and resulted in the value of the GDP for the metal mining industry (and thus mining industry overall) being 4.5 times higher than what it was last year. This, of course, has the effect of reducing intensity per unit GDP from 26 TJ to generate 2002 $1 million GDP to 6 TJ / 2007 $million for 2011, the last year for which we have both earlier and updated estimates of GDP. This has little impact on the index of intensity (i.e, rate of change compared to 1990). The same can be said for changes in GHG intensity per unit GDP.

The same is true for the non-ferrous metal smelting sector where GDP values were, on average, 2.7 times higher than previously. The intensity difference for 2011 in this industry suggests that 44 TJ / 2002 $million is now 16 TJ / 2007 $million. Once again, since the changes for each year were quite uniform over the years, the changes in intensity (index, based on 1990 = 1) are little different than last year's analysis. As with the metal mining industry, the same can be said for changes in GHG intensity per unit GDP.

This report also presents other data and issues relevant to understanding energy and emission trends in the mining and associated industries. First, we review provincially-disaggregated data in terms of their availability and their resulting utility for analyses. Next we review data issues including errors in surveying and data processing, embodied energy and greenhouse gas emissions in exported products, issues pertaining to international comparison, and considerations in the development of indicators. Finally, we provide a number of recommendations to enhance knowledge about energy and greenhouse gas emissions in the mining and smelting industries.

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Canada

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1 Introduction

Canadian industry sees a need for accurate data on historic energy use to (1) determine trends in energy use within Canada to determine the impacts of changes in technology, processes, or attitudes about energy, (2) compare Canadian industrial performance to that of other countries to ensure competitiveness, and (3) monitor environmental impacts of energy use in industry, such as levels of greenhouse gas emissions. In order to draw accurate conclusions, the values must reflect reality as closely as possible.

This report is one of many reports prepared by the Canadian Industrial Energy End-use Data and Analysis Centre (CIEEDAC) to illustrate trends in energy use and greenhouse gas emissions in Canadian industry, and to initiate discussions between industry and government to improve energy and emissions data. In this year's report, the most up-to-date data are presented on energy use, greenhouse gas emissions, and related issues in the Canadian mining, metal smelting and refining industries from 1990 to 2012. The objectives of this report are to:

- demonstrate the quantity and quality of data available for Canadian mining, metal smelting and refining industries;
- identify trends within the industry with respect to energy use and greenhouse gas (CH_4, N_2O, direct and indirect CO_2, and process) emissions;
- identify weaknesses with respect to data collection, and their impact on CIEEDAC's ability to portray a consistent picture of the industry; and
- enhance discussion between the industry and the various data collection agencies about data collection issues.

2 Background

2.1 CIEEDAC

CIEEDAC focuses on energy information relevant to Canada's industrial sector. It provides a range of services to industry and government, including data retrieval and analysis based on requests from interested parties, and annual reporting on the latest energy and emissions data for the Canadian industrial sector. These reports include:

- Canada-wide historic trends in energy use and CO_2 emissions, 1990 – 2012;
- industry / region-specific reports – such as this one – to provide greater detail of energy use and greenhouse gas emission trends for industries and regions in Canada;
- annual updates of databases describing cogeneration facilities and renewable energy facilities in Canada; and
- annual reviews of sources of data on energy use in industry.

CIEEDAC regularly engages in discussion with relevant stakeholders on data issues in order to improve and enhance the understanding of Canadian industry energy use and emission trends.

2.2 NAICS Codes of the Canadian Mining, Metal Smelting and Refining Industries

The Canadian mining industry is divided into sub-sectors using the North American Industry Classification System (NAICS). This report includes disaggregated data for metal and non-metal mines that belong to NAICS 212 (Table 2.1). Uranium mining, NAICS 212291, has been included with Other Metal Mines (NAICS 212299) since 1998. Coal extraction (NAICS 2121) and oil and gas extraction and associated services (NAICS 213) are excluded from this analyses.

Table 2.1: Mining and Metal Smelting Industries Included in this Report

NAICS Code	Category Name	NAICS Code	Category Name
2122	Metal Mining	21239[1]	Non-Metal Mining[2]
21221	Iron	212392	Diamond
21222	Gold	212393	Salt
21223	Copper, Nickel, Lead, Zinc	212394	Asbestos
212231	Lead-Zinc	212395	Gypsum
212232	Nickel-Copper	212396	Potash
212233	Copper-Zinc	212397	Peat
21229	Other Metal Mines	212398	Other
212291	Uranium	331	Primary Metal Smelting
212299	All Other Metal Mines	33141	Non Ferrous Metals (except Aluminium

[1] NAICS 212390 series refers to the Canadian set of mines.
[2.] This is a subset of all Non-Metal Mining, 2123.

Since conversion to the NAICS system, non-metal mining (NAICS 2123) includes Stone Mining and Quarrying (NAICS 21231), and Sand, Gravel, Clay, and Ceramic and Refractory Minerals Mining and Quarrying (NAICS 21232). We do not include these two non-metal mining sectors in our assessment of non-metal mining, though data pertaining to these sectors are included in the data tables in Appendix B. The current NAICS system also aggregates NAICS 21231 and 21232 with NAICS 2123 (Non-metal Mines) for the provinces.

CIEEDAC uses the term “mining” in this document to include metal and non-metal mining establishments (NAICS 2122 and 2123, except for quarries, sand, gravel, clay, and ceramic minerals); therefore it is not directly comparable to “Mining” in Statistics Canada’s publication *Report on Energy Supply and Demand* (RESD), which includes:

- NAICS 211113/4: Conventional and non-conventional oil and gas extraction
- NAICS 212000: Mining (metal mines, non-metal mines, coal mines, and mining and quarrying of granite, limestone, marble, sandstone, sand, gravel and rock quarries)
- NAICS 213111/17: Oil and gas contract drilling and contract drilling (except oil and gas).

Also in this report, metal smelting and refining refers exclusively to non-ferrous metal smelters (excluding aluminium) and refineries (NAICS 33141), which is part of the primary metals industry (NAICS 331).

3 Data and Methods

3.1 Energy Data

CIEEDAC obtains its energy use data almost exclusively from Statistics Canada (STC) and Natural Resources Canada (NRCan). For mining, we rely almost completely on energy use data from the *Annual Census of Mines* (ACM), collected by NRCan in conjunction with the provinces. The ACM is considered a reliable and detailed source for these data. While STC actually collects data on mining via surveys, these data are not released in a disaggregated form and the STC mining universe represented in RESD differs from that in NRCan's ACM.

STC gathers energy use data from two separate sources, of which only one, the *Industrial Consumption of Energy* (ICE) survey, released mid-year for the previous year, provides specific detail on energy use in physical units. CIEEDAC supplements these data with historical data on physical energy use from another survey, the *Annual Survey of Manufacturers* (ASM) where necessary (e.g., to align mining and metal smelting data). The ASM no longer collect these data.

The ICE survey focuses primarily on energy and its data are considered dependable and useful for energy analysis. The benefits and drawbacks of ICE data are:

- the survey and data verification procedure is designed to reflect energy issues;
- ICE surveys a sample of industries but its coverage of the major energy-consuming industries is extensive enough to be a census for those industries;
- ICE includes data on non-purchased and atypical energy forms;
  - for example, ICE includes data on self-generated electricity, black liquor, and wood;
- ICE lacks disaggregate data;
  - provincial data are not provided to CIEEDAC and only a limited number of industries are covered at the five-digit NAICS level;
  - this level of aggregation has, however, provided a broad picture of energy use in Canada and, as a result, ICE data have been used as the primary input to STC's *Report on Energy Supply and Demand* (RESD);
- STC draws the survey frame for ICE data collection from the ASM sample; and
  - the energy data collected by ICE relate to the other ASM data, including financial data.

In 2003, STC released a new data set, disaggregated by industry (including non-ferrous metal smelting and refining), to reflect energy use for 1990 based on aggregate data found in the RESD, the ASM, and other sources.

In 2011, STC reviewed the relationship of ICE data to RESD and harmonized these as best they could. They also reviewed the allocation of refined petroleum products (RPPs) historically associated with the commercial sector. It was determine that the RPPs allocated to this sector were actually redistributed to other sectors and the energy associated with these fuels should have been allocated to these other sectors (i.e., the RPPs associated with commercial sector were actually associated with distributors who actually resold these fuels to other sectors).

When energy data are provided in physical unit values (i.e., tonnes of coal, '000 m^3 natural gas, litres of fuel, etc.), we convert them to terajoules (TJ) using coefficients obtained from STC. These coefficients, provided in Appendix A, do vary over time and are published in the RESD.

3.2 Production Data

Industrial production can be measured in both economic (monetary) and physical terms. In economic terms, output is measured by the industry's annual contribution to gross domestic product (GDP) and the industry's gross output.[1] In physical terms, the mining industry's output is measured in tonnes of metals and non-metals mined annually (tonnes milled/throughput), as well as tonnes or kilograms of concentrate from metal mines.

Economic production data are available from STC. In 2013, STC updated the base year for real GDP values from 2002 to 2007. Historically, gross output (GO) data were provided by Informetrica, Inc. who used the GDP and other data to develop GO values, but the company has closed its doors. With the update to a 2007 base year, CIEEDAC was unable to adjust historic GO values and, therefore, no GO data are available for use in analysis.

As part of the process of updating the real GDP base year, STC also revised their list of industries for which GDP is assessed as well as the methodology for assessing GDP levels. While availability of data for the various mining categories was not altered, the value of the GDP shows a 4.5 fold increase in quantity for metal mining. In discussions with STC, the comment received was "This level change is caused by rebasing to 2007 dollars and part of the explanation would be related to price movements, particularly in the mining, oil and gas industries. ... [F]or Metal ore mining, for example, this price movement did have a significant impact on the level between the 2 reference periods."[2]

Physical output data (e.g., product mined, product milled, and concentrate) are gathered from two sources. NRCan's ACM is considered the most reliable and detailed source for these data. While Statistics Canada (STC) collects these data on mining, the data are not released in a disaggregated form. Metal production data is gathered from NRCan's *Canadian Minerals Yearbook* (CMY); these are available as downloadable PDFs from their online site. The CMY also provides data on the quantities of metals (in the form of matte) exported, which is necessary to calculate intensity ratios and indicators.

CIEEDAC performs no in-depth analysis on output measures as it does on energy and GHG data.

3.3 Greenhouse Gas Emissions

With the exception of process emissions, CIEEDAC estimates greenhouse gas (GHG) emissions by multiplying the energy use of each fuel in physical units by the fuels' CO_2 emission factor. The emission factors, provided in Appendix A, were obtained from Environment Canada (EC

[1] An industry's GDP is equivalent to the value added by that industry to national GDP. Gross output is the total value of goods and services produced by an industry, a sum of the industry's inputs plus the change in value due to labour and capital investment.

[2] Discussions with Guillaume Dubé, STC, Dec 19, 2013.

2013). [3] Thus, insofar as the energy data permit, both aggregate and provincial CO_2 data are available (although data for some provinces are missing or confidential).

CIEEDAC has obtained fuel emission factors from EC for methane (CH_4) and nitrous oxide (N_2O) as published in their greenhouse gas inventory document (EC 2013). Emissions of these gases depends to a great extent on the technology used, but because CIEEDAC could not link the data available to the technologies in use in the mining and metal smelting industries, EC's fuel-based factors were simply applied to the energy data to obtain a surrogate for methane and nitrous oxide emissions. Consequently, while these GHGs compose a relatively small proportion of total GHGs in mining, there is greater uncertainty associated with these estimates than the estimates of CO_2 emissions. These data are presented in CO_2e.[4]

For the aggregate mining sector (NAICS 212200 and 212300), CIEEDAC calculated indirect emissions by examining the industries' electricity use in provinces and territories. Emissions characteristics differ among regions because each generates electricity using different combinations of hydro, coal, gas, etc. Indirect emissions were estimated by multiplying the electricity use of the mining industry in a province by the average CO_2 emissions factor of the electricity generation sector for that province for each year (Table 3.1 provides values for 2012; see CIEEDAC 2014c for details). Indirect emissions estimates were summed with direct and the other CO_2e emissions to provide total GHG emissions.

Table 3.1: CO_2 Emissions Per Unit Electricity (Utilities) by Region, 2012

Region	CO_2 Emissions (kg/MWh)	Notes
British Columbia	8	Primarily hydro
Alberta	741	Primarily coal
Saskatchewan	728	Primarily coal
Manitoba	3	Primarily hydro
Ontario	94	Significant variation exists: coal, nuclear, hydro, natural gas
Québec	4	Primarily hydro
New Brunswick	419	
Nova Scotia	682	
Prince Edward Is.	22	
Newfoundland	18	Primarily Labrador Hydro
Territories	179	
Canada	51.6	MAC value, used for mining and metal smelting calculations
Canada	149	

Source: CIEEDAC 2014c, calculated from RESD and EPGTD data from STC. Data for other years are available from CIEEDAC.

Unfortunately, data on mining production metal smelting (Metal Smelting and Refining sector NAICS 331410) disaggregated by province are unavailable. Consequently, the emission factors as seen in Table 3.1 are of limited utility; we estimated CO_2 emissions per unit of electricity

[3] For more information, see CIEEDAC's *Greenhouse Gas Intensity Indicators for Canadian Industry 1990-2012* (CIEEDAC 2014).

[4] The 100-year global warming potential of methane is 21 times that of CO_2 and of N_2O is 310 times that of CO_2.

using 51.6 kg/MWh[5] as recommended by the Mining Association of Canada (MAC) as a surrogate value for metal smelting and where applicable in the mining sector. The accuracy of indirect (and total) emissions presented in this report must be considered in light of these two methods (specific data for mining sectors where available, otherwise the surrogate value).

In the production of magnesium, SF_6 gas is used during the refining process and is released to the atmosphere. SF_6 is a potent GHG with 23,900 times the global warming potential of CO_2. The data on this GHG are obtained directly from EC (2013) and are included in the analysis.

Finally, some data on energy for NAICS 331410 are confidential and we estimated GHG emissions based on historic fuel mixes for the industry and aggregate data on energy use in NAICS 331, Primary Metals. The estimates, of course, are uncertain; these issues will be described in the appropriate sections below.

3.4 Intensities

Intensity ratios (energy or emissions divided by economic or physical output) indicate trends over time. Typically, indicators are based on economic output. However, despite their popular use, indicators based on economic output are poorer measures of technological or process innovations than those based on physical output because monetary units are affected by many factors not associated with or correlated to energy use, such as costs of labour or the selling price of the final product.[6]

Intensity indicators – even those based on physical measures of output – are faulty when used to examine trends in highly aggregated groupings of sub-sectors, industries, or sectors. At higher levels of aggregation, changes in the indicator may represent structural shifts among the various industries included in the category, rather than efficiency improvements in individual industries. For example, within an industrial category, if a low intensity part of the industry increases in size relative to a higher intensity part, the aggregate intensity indicator may decline even in the absence of real energy efficiency improvements. To remove the impact of structural change on energy and emissions intensity indicators, we calculate composite indicators.

Composite indicators measure the change in energy intensity using physical units as the denominator, but also weight the physical energy intensity of each sub-sector (e.g., gold mining, known as the Specific Energy Consumption [SEC] of gold mining) by its portion of the total mining industry's energy use, its throughput, or its production. The same process can be used for developing a CO_2 or composite GHG intensity indicator. Composite indicators distinguish structural shifts in industry from real efficiency changes and thus present a more accurate representation of the latter.

The choice of which factor to use to weight the composite index is open to question. We weighted our composite indices by energy in this report, but arguments for the use of

[5] MAC derived this value given that the bulk of metal smelting takes place in BC, Manitoba, Ontario and Quebec, all of which have low indirect CO_2 coefficients.

[6] See CIEEDAC (1993) for more information on physical vs. monetary units for calculating intensity.

production or throughput are also valid. Indicators generated using these other alternatives produce similar results to those using energy-based weightings.

Composite indices are given by the following equation:

$$CI_j = \Sigma \text{ (Index of } SEC_{ij} * (ES_{ij} / \Sigma\ ES_{ij}))$$

where CI_j = Composite Indicator in year *j*
SEC_{ij} = Specific Energy Consumption in mine type *i* in year *j* indexed to the base year
ES_{ij} = Energy Share of mine type *i* in year *j*

Instead of ES_{ij}, one could use PS_{ij} where the ratio is based on Production Share.

Sufficient data were available to develop a reasonable composite indicator for both metal and non-metal mining sectors. There are no disaggregated energy data on the various metals smelted, so while we have data on changes in production of smelted and refined metals, we cannot develop a composite indicator for smelting. Data are provided in Appendix B.

4 National Trends in Metal Mining (NAICS 2122), 1990-2012

The following section reports on changes in energy use, GHG emissions, and industry output from 1990 to 2012 for the metal mining sub-sectors. The detailed data tables in Appendix B contain time-series data of the use of energy and GHG emissions by fuel type.

4.1 Energy use and GHG emissions

Tables 4.1 and Table 4.2 compare levels of energy use and GHG emissions of metal mines to total industry and national levels.[7] The industry energy totals are derived from STC's RESD, and includes energy used by all mining industries as defined in this report (see Table 2.1), all manufacturing industries, and use of self-produced fuels in petroleum refining and biomass energy. Canada totals are the sum of all energy used in all sectors (residential, commercial, transportation, energy transformation, industry, agriculture, etc.) as defined in the RESD. Fuels used as feed stocks are excluded. Emissions data are from EC (2013) or obtained from NRCan's Comprehensive Energy Use Data Tables. Total GHGs include calculated indirect emissions.

Table 4.1: Energy in Metal Mining Compared to Canada and Industry Totals

PJ	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Canada (RESD)	9,608	10,163	11,276	11,862	11,724	12,059	11,782	11,224	11,449	11,428	11,500
Industry (NRCan)	2,710	3,017	3,167	3,361	3,356	3,484	3,337	3,179	3,272	3,328	3,279
Metal Mining	102	91	81	83	77	80	92	78	87	90	99
% of Canada	1.06	0.90	0.72	0.70	0.66	0.66	0.78	0.70	0.76	0.79	0.86
% of Industry	3.77	3.02	2.56	2.46	2.30	2.30	2.75	2.46	2.66	2.71	3.03

Note: Metal mining data includes gasoline consumption.
Sources: STC RESD, NRCan Energy Trends (data in grey box is estimated), NRCan ACM. Data for years not shown are available from CIEEDAC.

[7]Tables 4.1 and 4.3 include gasoline data because ACM provides these data. To maintain consistency with other industries, metal mining energy data in the tables in App. B (ICE data) *do not* include this fuel. Gasoline is excluded from industry in STC's ICE and RESD; it is allocated to transportation. The variation in total energy is small.

Table 4.2: GHGs in Metal Mining Compared to Canada and Industry Totals

Mt	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Canada	591	639	718	737	727	749	731	689	701	702	705
Industry, Dir.	101.1	107.5	111.5	117.1	119.0	130.4	125.7	121.8	128.2	131.3	129.4
Ind. Total	137.8	144.1	157.2	164.2	164.4	175.2	166.8	155.6	163.7	163.0	160.6
Metal Min., Dir.	3.92	3.55	3.25	3.30	3.41	3.50	3.84	3.11	3.62	3.74	4.02
MM Total	5.38	4.68	4.28	4.41	4.34	4.49	4.86	4.01	4.44	4.46	4.78
% Canada, Dir	0.66	0.56	0.45	0.45	0.47	0.47	0.53	0.45	0.52	0.53	0.57
% Total	0.91	0.73	0.60	0.60	0.60	0.60	0.66	0.58	0.63	0.63	0.68
% Industry, Dir	3.88	3.31	2.91	2.82	2.87	2.68	3.06	2.55	2.82	2.85	3.10
% Total	3.90	3.25	2.72	2.69	2.64	2.56	2.91	2.58	2.71	2.73	2.97

Note: "Total" includes direct (including process) and indirect emissions. Data are obtained from NRCan Trend Analysis oee.nrcan.gc.ca/corporate/statistics/neud/dpa/trends_agg_ca.cfm?attr=0. Data in grey boxes are estimated.
Sources: NRCan ACM, EC 2013, NRCan 2013. Data for years not shown are available from CIEEDAC.

Table 4.3 shows total energy use and GHG emissions for the Canadian metal mining industry (NAICS 2122) for 1990 to 2012. Overall, metal mining exhibited a 3% decline in energy use, and 11% decline in total GHGs (direct and indirect) between 1990 and 2012. Both values have risen from 2009, one of the years of the economic downturn, by 27% and 19% respectively.

Table 4.3: Energy and CO_2 Emissions in Metal Mining (NAICS 2122)

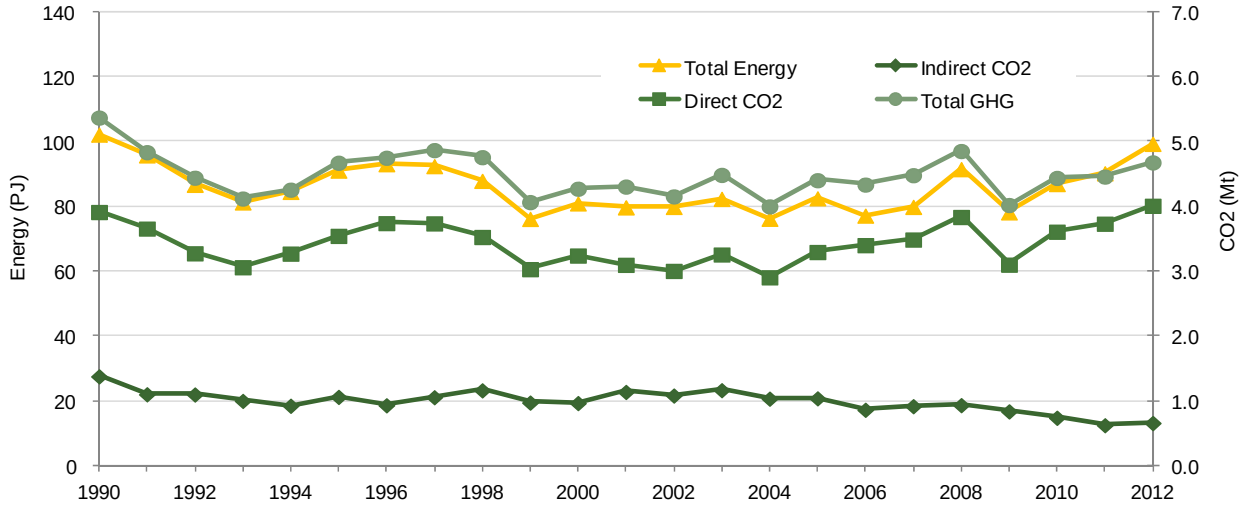
	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Energy (TJ)	102,258	93,151	81,068	82,624	77,290	79,983	91,642	78,288	87,027	90,348	99,435
Direct CO_2 (kt)	3,921	3,749	3,249	3,303	3,410	3,495	3,844	3,109	3,616	3,741	4,017
Indirect CO_2 (kt)	1,387	941	975	1,042	843	952	955	763	741	634	668
Other GHG (kt)	68	67	55	59	61	65	74	58	72	81	92
Total GHG (kt)	5,376	4,757	4,279	4,404	4,314	4,512	4,872	3,929	4,429	4,455	4,777

Notes: These data include gasoline. Data tables in appendix B exclude gasoline.
Sources: NRCan ACM, STC RESD, EC 2013. Data for years not shown are available from CIEEDAC.

The graph (Fig 4.1) indicates that energy use and GHG emissions vary over the period but the general trend is marginally downward until 2009. Direct emissions are more variable than indirect emissions and are somewhat dependant on the types of mines operating (i.e., structural change). Energy use and direct CO_2 emissions both fluctuated between 1999 and 2008. As noted, increased activity since 2009 has caused total energy and direct CO_2 emissions to rise.

As indicated in Section 3.3, indirect emissions for the metal mining sector were estimated by multiplying provincially-disaggregated electricity use by annual provincial emission factors for the electricity supply sector. However, electricity use in a few provinces and territories in earlier years of the study period was considered confidential and represented 4% - 11% of total national electricity use in the metal mining sector. To address this data gap, we applied weighted indirect emissions coefficients for CO_2/MWh, based on an evaluation of which provinces' data were kept confidential and the amount of activity found in those provinces. For 2011 and 2012, we also updated emissions coefficients for electricity to reflect EC's most recent release and data on fuel use in electricity from STC.

Figure 4.1: Energy Use and GHG Emissions in Metal Mining (NAICS 2122)

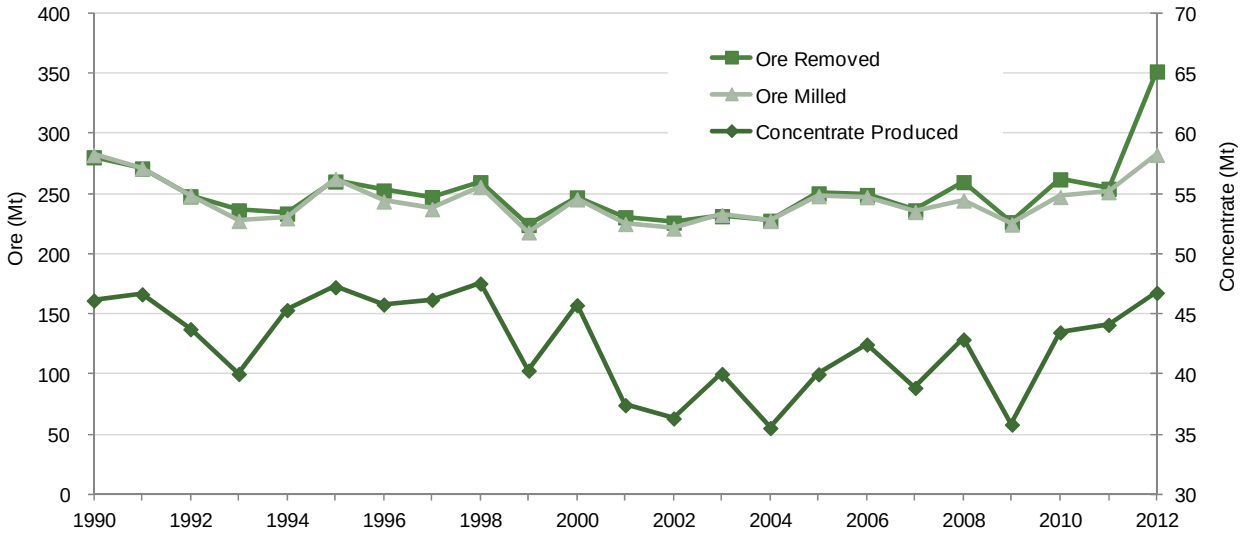


Note: Total includes other GHG emissions such as CH_4 and N_2O
Sources: NRCan ACM, EC 2013

4.2 Production

Figure 4.2 shows the physical output measures for the Canadian metal mining industry for 1990 to 2012. All three measures – ores mined, ores milled, and concentrate produced – decreased (although not smoothly) over the period until 2009. In 2012, ore removed jumped 38% from 2011 (much of it due to a 65% increase in iron ore removed). Ore milled, and concentrate produced are about what they were in 1990; the highest point since 1998. Concentrate data appear the most variable over time; intensity indicators using this value also tend to be erratic.

Figure 4.2: Trends in Physical Output in Metal Mining (NAICS 2122)

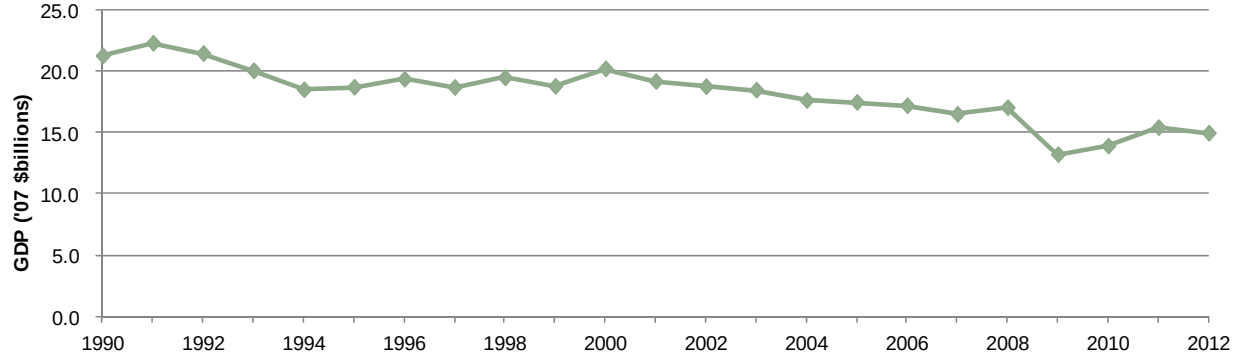


Source: NRCan ACM

Figure 4.3 shows GDP for Canadian metal mining from 1990 to 2012. After an initial rise in 1991, GDP fluctuated over time, but generally showed a declining trend to a level 30% below 1990 in 2012. Recall from section 3.2 that there were very large changes in GDP values when

the GDP data were updated to a new base year. However, because the values increase across the board by a factor of 4.5 times the old value, the index of intensity change (Fig. 4.4) did not vary from historical indices.

Figure 4.3: Trends in Economic Output in Metal Mining



Source: STC ASM data, updated GO provided by Informetrica, Ltd.

Comparing Figures 4.2 and 4.3 demonstrates that physical and economic measures of output do not always behave similarly. For example, from 2000 on, GDP has trended downward while production data are fairly flat or, at best, marginally downward to 2009.

4.3 Index of intensity indicators

Indices of energy and GHG intensity are plotted in Figures 4.4 and 4.5 respectively, and are based upon data presented in Table 4.4. These values are normalized to 1990 to demonstrate changes over time.

Table 4.4: Energy and GHG Intensity Indicators in Metal Mining (NAICS 2122, 1990 = 1)

1990 = 1	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Energy/Tonne Milled	0.959	0.912	0.919	0.863	0.940	1.034	0.963	0.971	0.992	0.972
Energy/Tonne Concentrate.	0.871	0.800	0.932	0.821	0.928	0.964	0.986	0.903	0.924	0.959
Energy/GO										
Energy/GDP	1.013	0.834	0.983	0.934	1.008	1.118	1.232	1.301	1.219	1.382
Energy Composite (tonne Milled)	0.943	0.863	0.878	0.810	0.891	0.983	0.902	0.903	0.920	0.905
Energy Composite (tonne Conc.)	0.959	0.881	1.080	1.013	1.106	1.156	1.211	1.183	1.208	1.298
GHG/Tonne Milled	0.937	0.915	0.933	0.922	1.003	1.044	0.942	0.944	0.933	0.871
GHG/Tonne Conc.	0.850	0.803	0.946	0.877	0.991	0.972	0.965	0.877	0.869	0.859
GHG/GO										
GHG/GDP	0.990	0.838	0.998	0.999	1.076	1.128	1.205	1.264	1.146	1.239

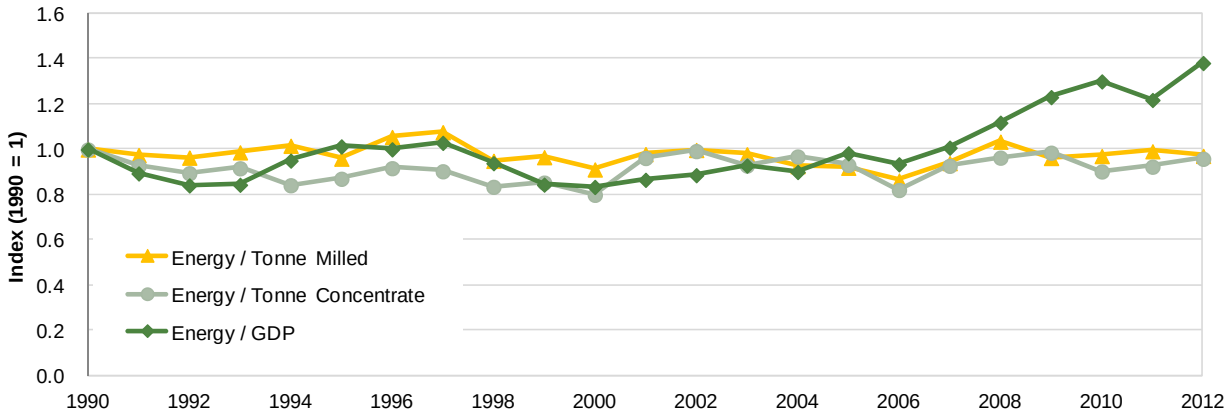
Note: See Appendix B, Metal Mining data table for indicators that exclude gasoline as part of fuel mix. Data for years not shown are available from CIEEDAC. Composite indicators are NOT included in Fig. 4.4. GO data are not available.

4.3.1 Energy intensity indicators

All energy intensity indicators exhibited variation throughout the study period (Figure 4.4). All indicators followed similar patterns until 2008, when the GDP indicator continued to rise. The figure illustrates the influence of the denominator on indicators. For example, physical- and economic-based indicators occasionally move in opposite directions; in the last few years, physical indicators were flat while economic ones rose. Most energy analysts are critical of the use of economic indicators as denominators in evaluating energy efficiency because GDP is influenced by factors that have little or nothing to do with energy.

We noted earlier that the value of real GDP adjusted to a 2007 base year changed considerably from previous years; they rose by a factor of 4.5. This means that, for 2011, it took about 26 TJ to generate $1 millon GDP using the old GDP values whereas, with this new GDP value, it is now down to 6 TJ / $million. This has little impact on the index of intensity as seen in Fig. 4.4 (rate of intensity change doesn't alter much because the change in GDP is consistent for all years).

Figure 4.4: Energy Intensity Indicators for Metal Mining



Source: CIEEDAC calculations using data from NRCan ACM.

A number of factors could explain why these indicators point in different directions. A shift in industry structure may be part of the reason for the differing trends, such as when production rates of a less energy intense but more valuable metal may be increasing relative to other metals. Similarly, changes in commodity prices, the exploitation of harder parent ores, deeper mines, or a higher concentration of metals in the ore may have an influence.

Some of these factors are largely beyond the influence of individual mines. For example, industry members respond to changes in world commodity prices, leading to structural shifts in the industry.

Other factors are within the control and/or decision-making scope of individual facilities. For example, the types of technology used, combined with the physical characteristics of a mine, determine the “extraction efficiency” of a mine. Physical mine characteristics, such as ore richness, ore hardness, and the depth of the mine (deeper mines tend to be more energy-intense) affect energy requirements. While firms cannot affect where minerals occur or how they occur, firms can choose where and how they mine for minerals.

To account for structural effects and improve the analysis, we calculated “composite” indicators to measure mine extraction efficiency and thus reflect industry-controlled efforts towards energy efficiency. These composite indicators weight physical energy intensity (energy / unit concentrate or unit milled) of each mine type (gold, uranium, iron, etc.) by the energy used by that mine type. Other weighting schemes exist using throughput or output. See Section 3.4 for a description of how composite indicators are calculated.

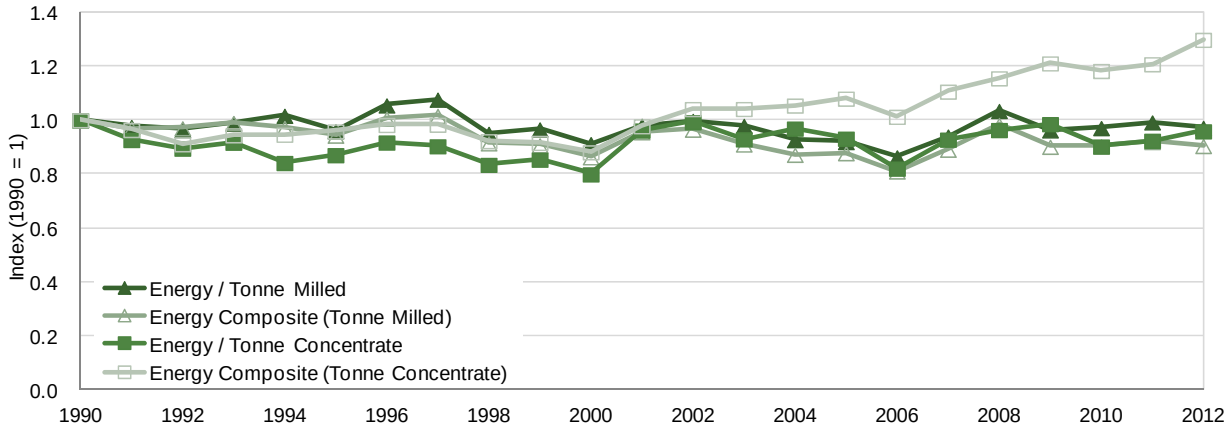
The development of composite indicators requires data disaggregated to the level of the sub-sectors under question. Where these data are not available, conventional indicators that do not differentiate the impact of structural change must be used. Over the course of the study period,

data sources have aggregated some sub-sectors with others. The aggregation of Uranium (historically NAICS 212298) with "Other Metal Mines" is an example of this; one can no longer determine if the change in efficiency in NAICS 212299, Other Metal Mining, is due to real efficiency improvements, or to changes in structure within this aggregation.

It is, however, possible to generate a composite indicator for the aggregate metal mining industry as the available data are sufficiently detailed. Fig. 4.5 compares the two composite indicators with conventional milled-product and concentrate-based indicators for metal mining. In this figure, output is normalized to 1990 to more clearly present efficiency change over time.

The two composite indicators shown in Fig. 4.5 lie close to each other until 2001. Both composite indicators show a decline in energy intensity from 1997 to 2000 and a rise in 2001. After 2001, the composite indicator based on concentrate rose above 1990 levels, indicating an overall trend of worsening efficiency. In contrast, the composite indicator based upon milled throughput declined, suggesting an improvement in efficiency over the period.

Figure 4.5: Composite and Output Intensity Indicators for Metal Mining



Source: CIEEDAC calculations using data from NRCan ACM.

The composite indicator based on milled ore follows a trend similar to the energy/product (milled) indicator but is generally lower, indicating that real improvements in energy efficiency have occurred (i.e., improvements beyond that caused by structural change on the industry). Over the time period, energy intensity as measured by the composite (milled) indicator decreased nearly 10% by 2012, in comparison, energy intensity as measured by the milled product indicator decreased by around 3% during the same period.

The composite indicator based on concentrate is generally higher than the energy/concentrate indicator, suggesting that structural change is responsible for much of the apparent changes in efficiency. Indeed, by the end of the study period the composite indicator based on concentrate was 30% higher than 1990 levels, suggesting a worsening of efficiency.

We consider the composite indicator based upon concentrate to be the most accurate measure of real efficiency change because concentrate includes an explanatory factor not included in the indicator based upon "milled throughput." Data on energy and milled products include the impact of deeper mines and harder rock, *but do not include* the impact of "concentration of metal in the ore." A further analysis of the data shows that, for example, metal concentrates in

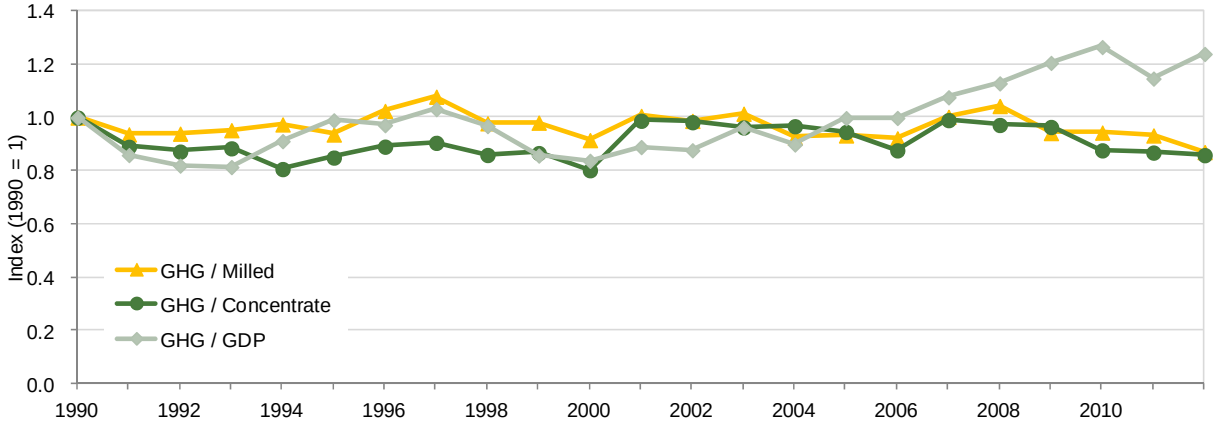
the ore rose dramatically for uranium and dropped for gold. These impacts significantly affect the composite value, as is evident in the worsening in efficiency by 2012 already discussed.

4.3.2 GHG intensity indicators

Greenhouse gas emission intensity, as measured by two physical- and an economic-based indicators show similar trends over the study period (Fig. 4.6). Each curve represents intensity based upon total GHG emissions, which includes direct, indirect, and other GHGs.

In general, the various GHG intensity indicators follow similar patterns. All indicators display dynamic behaviour over the study period, often, but not always moving similarly over time. The physical indicators behave in the same way over the period, while the GDP-based indicator exhibits a weaker correlation. All indicators reached a period low by 2000. From there, most indicators generally increased until 2008 with greater variation occurring after that year. Based on tonnes milled (yellow line), GHG emissions declined around 13% from 1990 values.

Figure 4.6: GHG Intensity Indicators for Metal Mining



Source: CIEEDAC calculations using data from NRCan ACM, STC RESD, EC 2013

Three factors are associated with the rises and falls in these indicators: 1) changes in electricity use, 2) changes in fossil fuel use, and 3) changes in output activity. Structural changes among the different sub-sectors are built in to these factors. Because data on electricity use by mine type are not disaggregated by province – one needs to determine the indirect CO_2 associated with each mine type – a *composite* indicator for CO_2 intensity could not be calculated. CIEEDAC did estimate a composite indicator based on weighted averages of mine type to total mines, but upon reviewing the outcomes and the assumptions required of the method used (that all mine types are distributed evenly across the country), the data were considered weak and are therefore not presented here.

Nonetheless, we did make several assumptions in calculating indirect CO_2 emissions. First, while we used CO_2 emission coefficients for electricity for each province and territory, the coefficients for some provinces and territories are poor because no accommodation is made for exports of electricity to other regions. Second, we calculated CO_2 coefficients for each year, calculated from STC data on electricity. This reduces uncertainty in the estimated indirect CO_2 emissions data from using a single average value. Finally, as the electricity use data for several provinces

are confidential, we estimated the emissions intensity of electricity generation for that portion of electricity use based on the intensities of the provinces deemed confidential.

As with energy intensity per unit GDP described above, GHG intensities also changed significantly. For 2011, GHG / 2002 $million was 1.3 Mt and, with the updated GDP, it dropped to 0.4 MT / 2007 $million.

5 Non-Metal Mining (NAICS 21239), National Trends 1990-2012

The following section reports on changes in energy use, CO_2 emissions, and industry output from 1990 to 2012 for the non-metal mining sub-sectors. Detailed data tables in Appendix B contain time-series data of the use of energy and GHG emissions by fuel type for 1990 to 2012 and include data for Stone Mining and Quarrying (NAICS 21231) and Sand, Gravel, Clay, and Ceramic and Refractory Minerals Mining and Quarrying (NAICS 21232). These additional data (e.g., NAICS 21231 and 21232) had not historically been part of this assessment because they were not included under the old SIC system, and these data were not historically received in time to generate this report. Consequently, these sub-sectors are not part of consumption in Table 5.1 and Table 5.2, which explains the difference in the values in these aforementioned tables and those that appear as the non-metal mining table in Appendix B.

5.1 Energy use and GHG emissions

Table 5.1 and Table 5.2 display energy use and GHG emissions of non-metal mines relative to total use in industry and in Canada. The industry energy totals are derived from STC's RESD, and includes energy used by all mining industries as defined in this report (see Table 2.1), all manufacturing industries, and use of self-produced fuels in petroleum refining and biomass energy. Canada totals are the sum of all energy used in all sectors (residential, commercial, transportation, energy transformation, industry, agriculture, etc.) as defined in the RESD. Any fuels used as feed stocks are excluded. Emissions data are based on EC (2013). "Total" GHGs include calculated indirect emissions.

Table 5.1: Energy in Non-Metal Mining Compared to Canada and Industry Totals

PJ	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Canada (RESD)	9,608	10,163	11,276	11,862	11,724	12,059	11,782	11,224	11,449	11,428	11,500
Industry (NRCan)	2,710	3,017	3,167	3,361	3,356	3,484	3,337	3,179	3,272	3,328	3,279
Non-metal Mining	40	44	42	42	47	48	48	31	36	52	48
Total, % of All	0.42	0.43	0.37	0.35	0.40	0.40	0.41	0.27	0.31	0.45	0.42
Total, % of Industry	1.49	1.44	1.32	1.25	1.41	1.39	1.44	0.96	1.09	1.56	1.46

Note: Non-metal mining data includes gasoline consumption.
Sources: STC RESD, NRCan Energy Trends (data in grey box is estimated), NRCan ACM.

Table 5.3 shows total energy use and GHG emissions for the Canadian non-metal mining industry as defined here (NAICS 21239) for 1990 to 2012. Generally, both energy use and GHG emissions follow the same pattern, showing a fairly consistent upward trend to 2008, decreasing markedly in 2009, up marginally in 2010 and 2011 and falling again in 2012 to a level 19% higher than in 1990. This was due to fairly large increase in natural gas use in potash mines in 2011 and again in 2012 (although not as high as 2011).

Table 5.2: GHGs in Non-Metal Mining Compared to Canada and Industry Totals

Mt	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Canada	591	639	718	737	727	749	731	689	701	702	705
Industry Direct	101.1	107.5	111.5	117.1	119.0	130.4	125.7	121.8	128.2	131.3	129.4
Industry Total	137.8	144.1	157.2	164.2	164.4	175.2	166.8	155.6	163.7	163.0	160.6
Non-Met. Mining Dir.	1.7	1.8	1.8	1.8	2.1	2.1	2.1	1.3	1.5	2.2	2.0
Non-Met. Mining Tot.	2.9	3.2	3.1	3.1	3.3	3.5	3.4	2.3	2.8	3.7	3.4
% of all Direct	0.3	0.3	0.2	0.2	0.3	0.3	0.3	0.2	0.2	0.3	0.3
% of all Total	0.5	0.5	0.4	0.4	0.5	0.5	0.5	0.3	0.4	0.5	0.5
% of Industry Direct	1.7	1.7	1.6	1.5	1.8	1.6	1.7	1.1	1.2	1.7	1.6
% of Industry Total	2.1	2.2	1.9	1.9	2.0	2.0	2.0	1.5	1.7	2.2	2.1

Note: "Total" includes direct (including process) and indirect emissions. . Data are obtained from NRCan Trend Analysis oee.nrcan.gc.ca/corporate/statistics/neud/dpa/trends_agg_ca.cfm?attr=0. Data in grey boxes are estimated.
Sources: NRCan ACM, EC 2013. Data for years not shown are available from CIEEDAC.

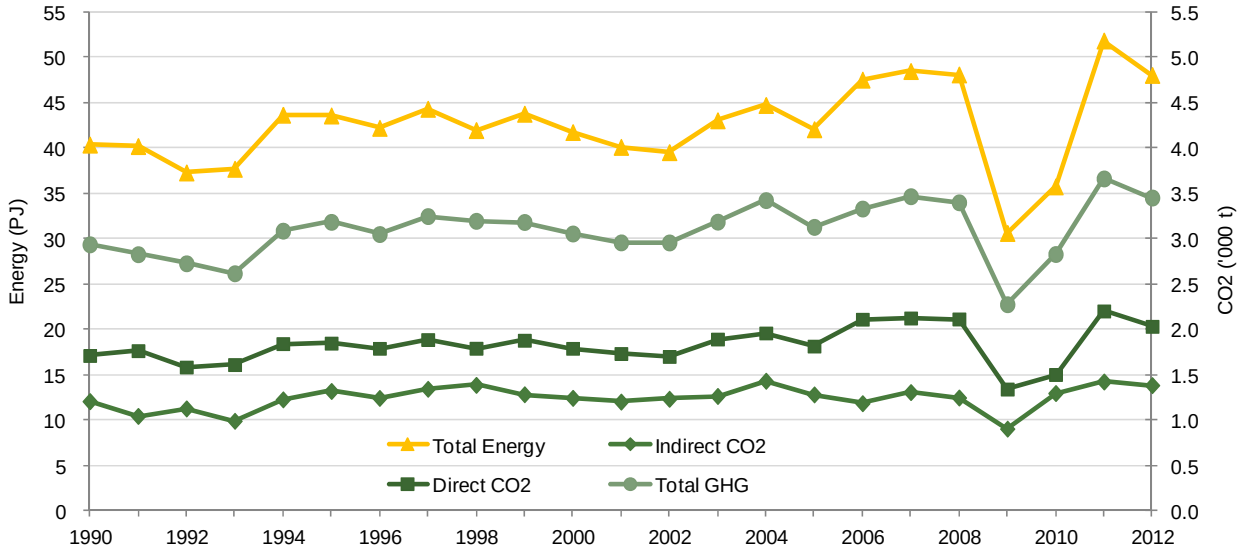
Table 5.3: Energy and GHG Emissions in Non-Metal Mining (NAICS 212390)

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Energy (TJ)	40,319	43,524	41,696	42,008	47,473	48,417	48,039	30,591	35,712	51,776	47,986
Direct CO_2 (kt)	1,709	1,846	1,788	1,813	2,109	2,123	2,112	1,340	1,500	2,200	2,031
Indirect CO_2 (kt)	1,206	1,319	1,243	1,281	1,184	1,307	1,247	904	1,296	1,423	1,383
Other GHG (kt)	18	17	22	32	35	35	38	30	31	37	35
Total GHG (kt)	2,934	3,181	3,053	3,126	3,328	3,464	3,396	2,274	2,827	3,659	3,449

Notes: These data include gasoline. Data tables in Appendix B exclude gasoline.
Sources: NRCan ACM, STC RESD, EC 2012. Data for years not shown are available from CIEEDAC.

In 2012, total energy use dropped 7% from 2011, was still 19% higher in 1990 and up 57% from 2009 (Fig 5.1). By 2012, natural gas use was up 21%, diesel 200% and electricity 9%; most of the other fuel types declined.

Figure 5.1: Energy Use and GHG Emissions, Non-Metal Mining (NAICS 212390)



Notes: This figure does not include quarrying, sand and gravel extraction and clay and refractory materials extraction. Total GHG includes other non-CO_2 GHGs.
Sources: NRCan ACM, EC 2013

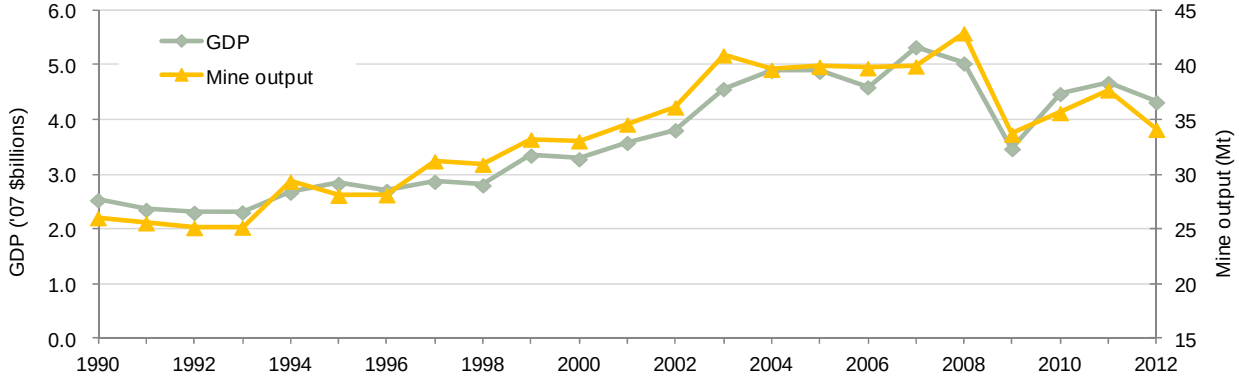
Energy use and all GHG emissions finished the period above 1990 levels although all dropped from 2011. Total GHG and direct CO_2 were 18% higher and indirect emissions 15% higher than 1990 levels. Other GHG's (CH_4, N_2O) increased by 92% between but are not included as a line in the graph because they account for only 1% of total GHGs.

At present, accurate estimation of indirect emissions from the non-metal mining industries is particularly difficult. In the recent switch to NAICS, provincial data on non-metal mining are aggregated with data from the Sand, Gravel and Stone Quarries (NAICS 212310 and 212323). Without disaggregated provincial data, it is very difficult to determine the quantity of indirect CO_2 associated with non-metal mines. For 2012, we updated emissions coefficients for electricity generation, altering them again slightly from previous years. Even so, CIEEDAC analysts believe that the indirect emissions data have large uncertainty associated with them.

5.2 Production

Fig. 5.2 shows physical and economic (GDP) output for the Canadian non-metal mining industry. The measures show similar patterns. Relative to 1990, GDP rose 71%.[8] Economic data are for all non-metal mining (NAICS 2123). Mine output, at over 34 million tonnes, is 31% higher than 1990 levels and down from 37 million tonnes in 2011. Mined material includes asbestos, gypsum, peat, potash, salt and other non-metallic materials.

Figure 5.2 Output Measures for Non-Metal Mining (NAICS 21239)



Sources: NRCan ACM data and STC ASM from CANSIM Table 379-0031.

5.3 Index of intensity indicators

Indices of energy and GHG intensity seen in Table 5.4 are plotted in Fig. 5.3 and 5.4. Intensity indicators are obtained by dividing energy use and GHG emissions by the output measures. The values in Fig. 5.3 and 5.4 are normalized to 1990 to demonstrate changes from the base line.

Table 5.4: Energy and GHGs Intensity Indicators, Non-Metal Mining (NAICS 21239, 1990 = 1).

1990 = 1	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Energy/Tonne product	1.001	0.814	0.680	0.771	0.784	0.723	0.587	0.647	0.887	0.908
Energy/GO										
Energy/GDP	0.995	0.798	0.541	0.649	0.571	0.600	0.554	0.502	0.696	0.698
Energy Composite	0.911	0.737	0.596	0.851	0.707	0.665	0.730	0.506	0.755	0.808
GHG/Tonne Product	1.005	0.819	0.696	0.743	0.771	0.702	0.599	0.704	0.861	0.897
GHG/GO										
GHG/GDP	0.969	0.803	0.553	0.625	0.562	0.583	0.566	0.546	0.676	0.689

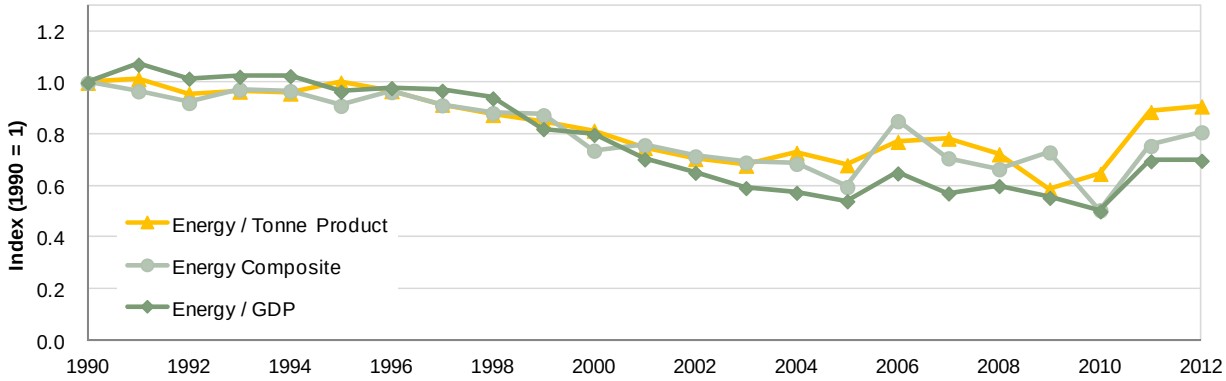
Notes: See Appendix B, Non-metal Mining data table for indicators that exclude gasoline as part of fuel mix. Data for years not shown are available from CIEEDAC. GO data are not available.

[8] In STC's GDP update, GDP for non-metal mining did not change as much as that of metal mining.

The composite indicator (Fig. 5.3) weights the intensity of the various non-metal mining sectors by its proportion of total energy use to compensate for structural change in the industry. Composite indicators are a better measure of actual changes in efficiency than other indicators, even though the value of the indicator in this case generally mimics the non-composite indicators. However, the composite indicator as presented in Fig. 5.3 is weakened by the fact that, since 1998, diamond mining has been aggregated with NAICS 212398, Miscellaneous Non-metal Mines. With the addition of yet another mine type – diamonds – to NAICS 212398 (asbestos was added in 1995), it would be constructive to do a composite calculation on NAICS 212398 because its component sub-sectors are far from uniform, and the impact of diamond mining has a significant impact on the weight of this category relative to the other non-metal mining sub-sectors. Unfortunately, data are lacking to carry out this type of analysis.

A second factor that has skewed the results of the composite calculation reflects some radical changes in the energy and production ratios of potash (NAICS 212396). The major anomalies seen in the composite line for 2005 and 2009 are due to skewed ratios in this mining industry.

Figure 5.3: Energy Intensity Indicators for Non-Metal Mining (NAICS 212390)



Source: CIEEDAC calculations using data from NRCan ACM and STC ASM.

Fig. 5.3 shows that the energy intensity per tonne of non-metal materials produced in Canada generally decreased from 1990 to 2010, jumping in 2011 and 2012, though not above 1990 levels. The rise in diamond mining has supported this trend, but not necessarily because it is an efficient form of mining. It is possible that the data are skewed by the large volume of diamond throughput (it is much larger than the other components of the non-metal mining group). Diamond production is reported in both carats and tonnes of throughput. Table 5.5 provides data on Canadian diamond production. Density of carats/t throughput varies significantly.

Table 5.5: Diamond Production in Canada

	2000	2005	2006	2007	2008	2009	2010	2011	2012
Carats (10^3)	2,534	12,314	13,278	17,144	14,523	10,946	11,804	10,752	10,529
Throughput (10^3t)	3,190	6,770	8,008	8,258	10,302	9,782	11,029	10,933	10,708
Carats/Tonne	0.79	1.82	1.66	2.08	1.41	1.12	1.07	0.98	.098

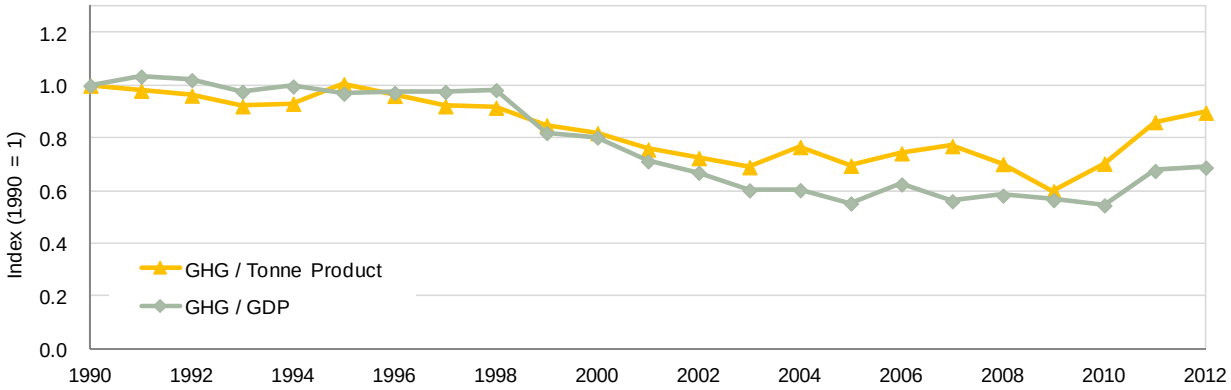
Sources: NRCan CMY

If the data for the various mining groups currently under NAICS 212398 were disaggregated, a more sound composite could be generated. As it is, the composite indicator shows that the industry's energy efficiency improved by 20% since 1990 (Table 5.4) but has risen significantly

from the low of 2010. Indicators based on GDP measures also decreased through 2012, ending 30% lower than 1990; the GDP indictor is also up significantly from 2009's low point.

GHG intensity declined at a similar rate as energy intensity (Fig. 5.4). This is, in part, due to the shift from fossil fuel use to electricity, which is generally less carbon-intensive. Overall, GHG emissions per unit of physical output fell 10% from 1990 levels while GHG emissions per unit of GDP 30%. As with energy, these are both up considerably from the 2009 / 2010 period. Again, the addition of diamond mining to the miscellaneous category in 1998 may be skewing the product-based GHG intensity indicator as occurred with the energy intensity indicator.

Figure 5.4: GHG Intensity Indicators for Non-Metal Mining (NAICS 212390)



Source: CIEEDAC calculations using data from NRCan ACM, STC ASM, and EC 2013.

As with emissions indicators for metal mining (see explanation in section 4.3.2), composite GHG emissions could not be generated due to the lack of provincial level data on electricity use by non-metal mine type.

6 Aggregate Mining Industry

The following section reports on changes in energy use, GHG emissions, and industry output from 1990 to 2012 for all mining sub-sectors in NAICS 2122 and 21239 (i.e., exclusive of NAICS 21231 and 21232). The detailed data tables in Appendix B contain time-series data of energy use, CO_2, and other GHG emissions by fuel type for 1990 to 2012 for all sectors, including NAICS 21231 and 21232.

6.1 Energy use and GHG emissions

Table 6.1 and Table 6.2 display energy use and GHG emissions of mining (metal and non-metal) relative to total use in industry and in Canada.[9] Industry energy totals are derived from STC's RESD and published by NRCan in their online energy use database; it includes energy used by mining industries as defined in this report (see Table 2.1), all manufacturing industries, use of self-produced fuels in petroleum refining, and biomass energy. Canada totals are the sum of all energy used in all sectors (residential, commercial, transportation, energy transformation, industry, agriculture, etc.) as defined in the RESD. Any fuels used as feed stocks are excluded. Emissions data are based on EC (2013). "Total" GHGs includes estimated indirect emissions.

[9] Table 6-1 and 6-3 include gasoline data; see footnote 7 for an explanation.

Table 6.1: Energy in Mining, Industry, and Canada

PJ	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Canada (RESD)	9,608	10,163	11,276	11,862	11,724	12,059	11,782	11,224	11,449	11,428	11,500
Industry (NRCan)	2,710	3,017	3,167	3,361	3,356	3,484	3,337	3,179	3,272	3,328	3,279
All Mining	143	135	123	125	125	128	140	109	123	142	147
Total, % of All	1.48	1.33	1.09	1.05	1.06	1.06	1.19	0.97	1.07	1.24	1.28
Total, % of Ind	5.26	4.46	3.88	3.71	3.72	3.69	4.19	3.42	3.75	4.27	4.50

Source: STC RESD, NRCan Energy Trends (data in grey box is estimated), NRCan ACM. Data for years not shown are available from CIEEDAC. The grey cell is estimated data.

Table 6.2: GHGs in Mining, Industry, and Canada

Mt	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Canada	591	639	718	737	727	749	731	689	701	702	705
Industry Direct	101.1	107.5	111.5	117.1	119.0	130.4	125.7	121.8	128.2	131.3	129.4
Industry Total	137.8	144.1	157.2	164.2	164.4	175.2	166.8	155.6	163.7	163.0	160.6
All Mining Direct	5.63	4.46	3.88	5.12	5.52	5.62	5.96	4.45	5.12	5.94	6.05
All Mining Total	8.31	7.86	7.33	7.54	7.67	7.95	8.26	6.29	7.26	8.11	8.23
% of all Direct	0.95	0.84	0.70	0.69	0.76	0.75	0.81	0.65	0.73	0.85	0.86
% of all Total	1.41	1.23	1.02	1.02	1.06	1.06	1.13	0.91	1.04	1.16	1.17
% of Industry Direct	5.57	5.02	4.52	4.37	4.64	4.31	4.74	3.65	3.99	4.52	4.67
% of Industry Total	6.03	5.45	4.66	4.59	4.67	4.54	4.95	4.04	4.44	4.98	5.12

Note: "Total" includes direct (including process) and indirect emissions. . Data are obtained from NRCan Trend Analysis oee.nrcan.gc.ca/corporate/statistics/neud/dpa/trends_agg_ca.cfm?attr=0. Data in grey boxes are estimated.
Sources: NRCan ACM, EC 2013. Data for years not shown are available from CIEEDAC.

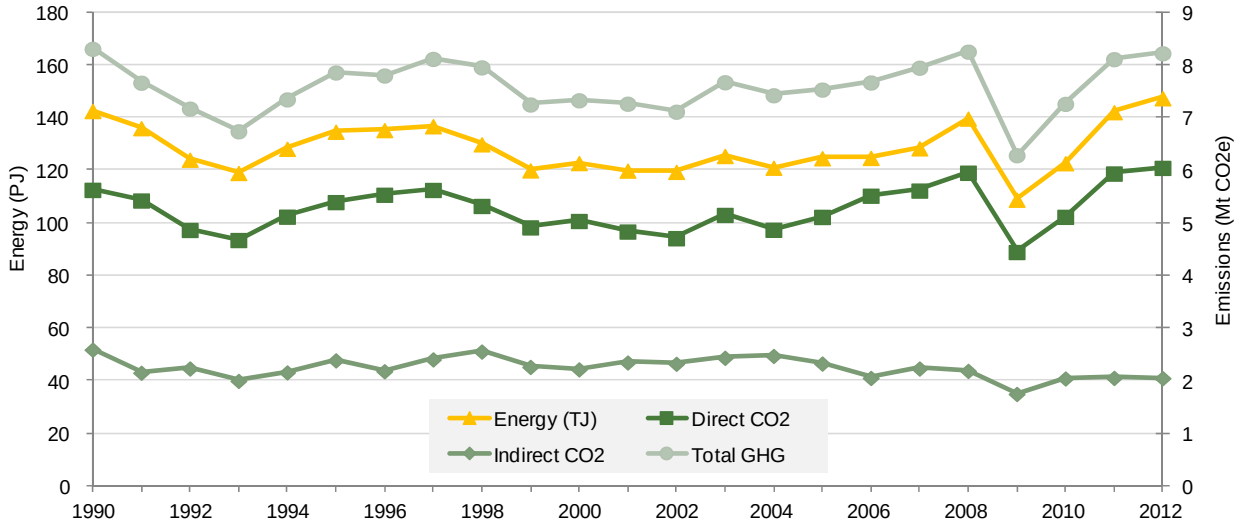
Table 6.3 and Fig. 6.1 show total energy use and GHG emissions in this sector. Energy and emissions are well correlated in this industry.

Table 6.3: Energy and GHG Emissions, Metal and Non-Metal Mining (NAICS 2122, 21239)

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Energy (TJ)	142,577	134,690	122,764	124,632	124,763	128,400	139,682	108,879	122,738	142,123	147,421
Direct CO_2 (kt)	5,630	5,398	5,038	5,116	5,519	5,618	5,956	4,449	5,116	5,940	6,048
Indirect CO_2 (kt)	2,594	2,390	2,218	2,329	2,056	2,235	2,190	1,752	2,045	2,057	2,051
Other GHG (kt)	86	74	77	91	96	99	111	88	103	117	127
Total GHG (kt)	8,310	7,861	7,332	7,536	7,671	7,952	8,257	6,288	7,264	8,114	8,226

Notes: These data include gasoline. Data tables in Appendix B exclude gasoline.
Sources: NRCan ACM, EC 2013, STC RESD. Data for years not shown are available from CIEEDAC.

Figure 6.1: Energy and GHG Emissions, Metal and Non-Metal Mining (NAICS 2122, 21239)



Sources: NRCan ACM, EC 2013

6.2 Intensity indicators

Indices of energy and GHG intensity are plotted in Fig. 6.2 and 6.3 respectively and are taken from Table 6.4 below. Intensity indicators are obtained by dividing energy use and GHG emissions by measures of output. The values in Fig. 6.2 and 6.3 are normalized to 1990 to demonstrate changes from the base line.

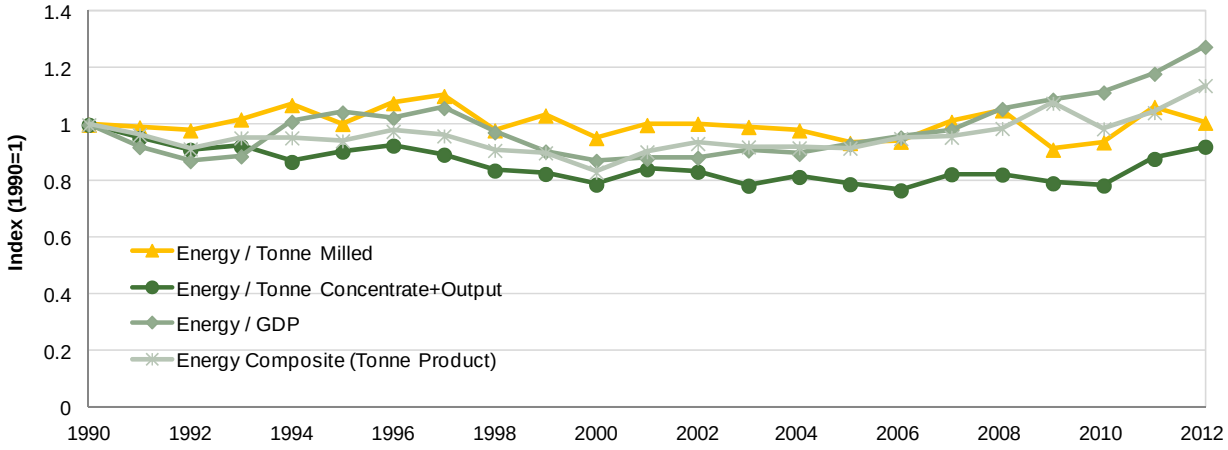
Table 6.4: Energy and GHGs Intensity Indicators in Metal and Non-Metal Mining (NAICS 2122, 21239).

1990 = 1	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Energy/Milled	1.003	0.953	0.936	0.940	1.010	1.051	0.912	0.938	1.063	1.007
Energy/Conc. + Output.	0.905	0.789	0.790	0.768	0.825	0.824	0.793	0.785	0.879	0.922
Energy/GO										
Energy/GDP	1.044	0.872	0.930	0.955	0.982	1.056	1.089	1.114	1.180	1.276
Energy Composite (Milled)	0.943	0.832	0.917	0.951	0.956	0.987	1.076	0.986	1.043	1.139
GHG/Milled + Produced	1.004	0.977	0.971	0.992	1.073	1.066	0.985	0.953	1.016	0.953
GHG/ Conc. + Produced	0.906	0.808	0.820	0.810	0.877	0.836	0.857	0.798	0.840	0.873
GHG/GO										
GHG/GDP	1.045	0.894	0.965	1.007	1.043	1.071	1.176	1.133	1.128	1.207

Note: See Appendix B, Mining data table for indicators that exclude gasoline as part of fuel mix.
Source GDP data from STC CANSIM Table 379-0031. Data for years not shown are available from CIEEDAC.

Fig. 6.2 displays a set of aggregate energy intensity indicators, as well as a composite indicator that accounts for structural shifts within the aggregation of NAICS 2122 and 21239. The various indicators vary as much as 36% in 2012. The composite indicator (based on production of concentrate and non-metallic products) suggests that overall energy intensity increased nearly 14% between 1990 and 2012. A composite index based on product milled and non-metallic products (not shown) suggests energy intensity declined about 13% by 2012.

Figure 6.2: Energy Intensity Indicators for Metal and Non-Metal Mining (NAICS 2122, 21239)

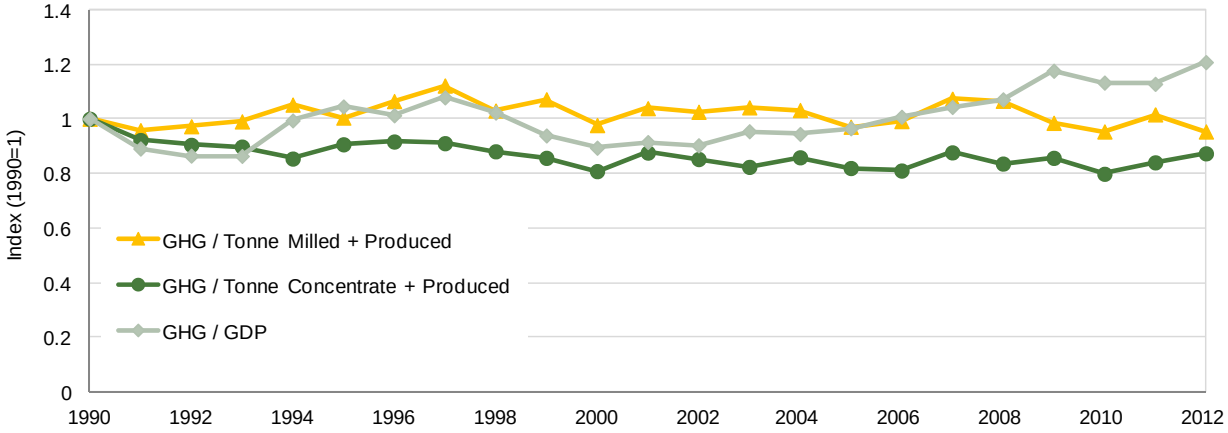


Source: CIEEDAC calculations using data from NRCan ACM and STC ASM.

Fig. 6.3 displays the change in GHG intensity over time. Like the index of energy indicators, the spread between high and low indices varies considerably from year to year. In 2012, the physical indicators were marginally below 1990 levels while the GDP indicator was 20% above.

As noted earlier, composite indicators of GHG emissions are not available; thus, the effects of structural change cannot be estimated. Additional data are available on the aggregate of mining industries in Appendix B. These data exclude gasoline use data and include energy use data on quarries, sand and gravel pits as well as the extraction of clay and refractory material.

Figure 6.3: GHG Intensity Indicators for Metal and Non-Metal Mining (NAICS 212200, 212390)



Source: CIEEDAC calculations using data from NRCan ACM, STC ASM, EC 2012.

7 Metal Smelting and Refining (except Aluminium; NAICS 33141), National Trends 1990-2012

The following section reports on changes in energy use, GHG emissions, and industry output from 1990 to 2012 for the Canadian metal smelting and refining sector. Detailed tables in Appendix B contain time series data on energy use, CO_2, and total GHG emissions by fuel type for 1990-2012.

Estimates of indirect CO_2 are particularly poor for this industry because data on electricity use by province are unavailable and coefficients of CO_2 per unit of electricity generated are only valid on a provincial basis. In order to calculate our estimates, we used the same value used for mining, 51.6 kg/MWh, as provided by MAC. Further to this, a review of confidentiality has rendered disaggregated GHG data on the industry unavailable. This issue is addressed below.

7.1 Energy use and GHG emissions

Table 7.1 and Table 7.2 present the levels of energy use and emissions in metal smelting relative to total use and emissions in industry and in Canada. Industry energy totals are derived from the RESD and include energy used by mining industries as defined in this report (see Table 2.1), all manufacturing industries, use of self produced fuels in petroleum refining, and biomass energy. Canada totals are the sum of all energy used in all sectors (residential, commercial, transportation, energy transformation, industry, agriculture, etc.) as defined in the RESD. Any fuels used as feed stocks are excluded. Emissions data, including process emissions, are based on EC (2013).

Table 7.1: Energy in Metal Smelting Compared to Canada and Industrial Totals

PJ	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Canada (RESD)	9,608	10,163	11,276	11,862	11,724	12,059	11,782	11,224	11,449	11,428	11,500
Industry (NRCan)	2,710	3,017	3,167	3,361	3,356	3,484	3,337	3,179	3,272	3,328	3,279
Metal Smelting	77	84	86	73	75	66	68	57	62	60	59
Total, % of All	0.80	0.82	0.76	0.62	0.64	0.55	0.58	0.51	0.54	0.52	0.51
Total, % of Ind	2.85	2.78	2.70	2.18	2.23	1.90	2.05	1.81	1.90	1.79	1.80

Sources: STC RESD, NRCan Energy Trends (data in grey box is estimated), NRCan ACM. Data for years not shown are available from CIEEDAC.

Table 7.2: GHGs in Metal Smelting Compared to Canada and Industrial Totals

Mt	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Canada	591	639	718	737	727	749	731	689	701	702	705
Industry Direct	101.1	107.5	111.5	117.1	119.0	130.4	125.7	121.8	128.2	131.3	129.4
Industry Total	137.8	144.1	157.2	164.2	164.4	175.2	166.8	155.6	163.7	163.0	160.6
Metal Smelting Direct	3.04	2.74	2.60	2.34	2.42	2.71	2.49	1.83	2.54	2.23	2.33
Metal Smelting Total	7.82	7.04	7.63	5.50	5.66	4.40	4.40	3.28	4.16	3.77	3.84
% of all Direct	0.51	0.43	0.36	0.32	0.33	0.36	0.34	0.27	0.36	0.32	0.33
% of all Total	1.32	1.10	1.06	0.75	0.78	0.59	0.60	0.48	0.59	0.54	0.54
% of Industry Direct	3.01	2.55	2.33	2.00	2.03	2.08	1.98	1.50	1.98	1.70	1.80
% of Industry Total	5.68	4.88	4.85	3.35	3.44	2.51	2.64	2.11	2.54	2.31	2.39

Note: "Total" includes direct (including process) and indirect missions. . Data are obtained from NRCan Trend Analysis oee.nrcan.gc.ca/corporate/statistics/neud/dpa/trends_agg_ca.cfm?attr=0. Data in grey boxes are estimated.
Sources: STC ICE, EC 2013. Data for years not shown are available from CIEEDAC.

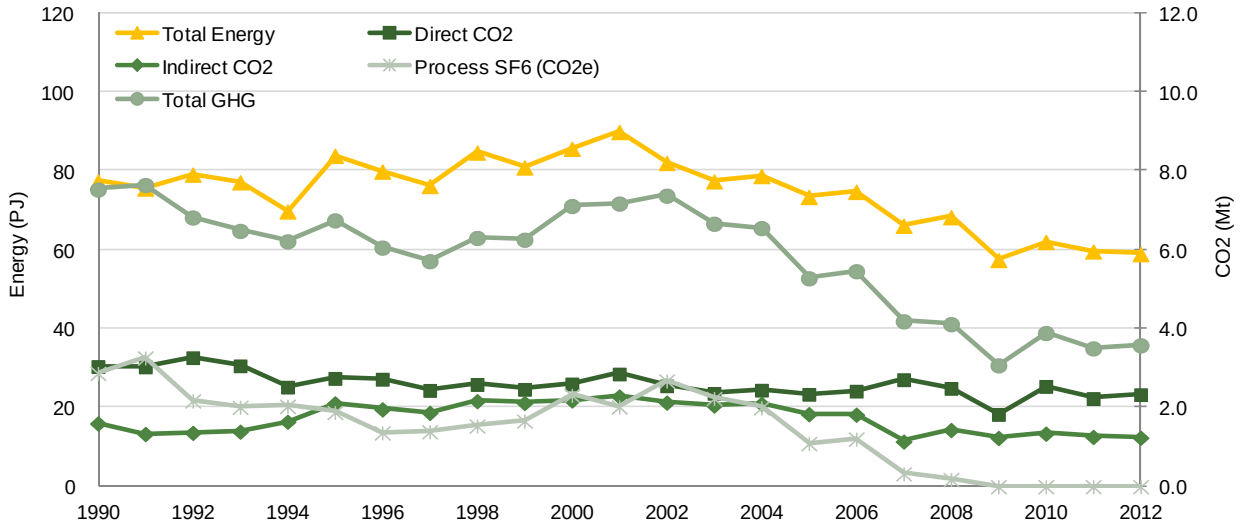
Table 7.3 and Figure 7.1 show total energy use and GHG emissions – including process emissions – for Canada's metal smelting and refining industry (NAICS 331410) for 1990 to 2012. Energy use and fuel-based GHG emissions followed the same general pattern diverging after 2004. Total energy use peaked in 2001, and has since declined to 24% below 1990 levels. The data show that total GHG emissions decreased over the study period, ending up 52% below 1990 levels due in part to a 100% decline in process emissions (SF_6) from the magnesium industry. Data for coal, coke and steam are deemed confidential after 2001; we estimated from historical data the ratio of total energy these fuels might have assumed in the context of total Primary Metals (NAICS 331) in order to estimate total emissions generated.

Table 7.3: Energy and CO_2 Emissions, Metal Smelting and Refining (NAICS 331410)

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Energy (TJ)	77,292	83,827	85,619	73,411	74,706	66,118	68,292	57,407	62,008	59,591	58,928
Direct CO_2 (kt)	3,042	2,744	2,601	2,341	2,421	2,711	2,491	1,832	2,540	2,233	2,332
Indirect CO_2 (kt)	1,602	2,111	2,184	1,836	1,823	1,142	1,435	1,234	1,342	1,260	1,240
Other GHG (kt)	14	13	12	11	11	12	11	8	10	10	10
Process (SF_6 kt CO_2e)	2,870	1,879	2,313	1,092	1,205	325	181				
Total GHG (kt)	7,529	6,747	7,111	5,280	5,459	4,190	4,118	3,074	3,892	3,503	3,581

Sources: STC ASM, ICE, and RESD, EC 2013. Data for years not shown are available from CIEEDAC.

Figure 7.1: Energy Use and CO_2 Emissions in Metal Smelting and Refining (NAICS 331410)



Sources: STC ASM and ICE, EC 2013.

Process emissions declined from a peak of 3,260 kt in 1991 to 0 in 2009 when magnesium smelting operations ceased. Data on process emissions were updated in the most recent EC release (EC 2013).[10] See Appendix B for the data.

A review of the data tables in Appendix B on Metal Smelting and Refining (NAICS 331410) shows that fuel mix changed over the period. Electricity played an increasingly dominant role in the industry until 2005, climbing from 40% in 1990 to levels hovering around 50% from 2000 to 2005. Electricity's share then declined again to 40% in 2012. The share of natural gas was 28%, while coal's share climbed to 21% (estimated – datum is confidential) in 2012.

As discussed earlier, the lack of provincially-disaggregated data on electricity use for the smelting and refining sector leads to high uncertainty over the accuracy of the estimate of indirect CO_2 emissions. For the metal smelting and refining sector, we multiplied national electricity use by an emissions coefficient for electricity generation of 51.6 kg CO_2/MWh. This value was received from the MAC and reflects the fact that regions with significant metal smelting have electricity generation sources which emit less CO_2 than the national average of about 150 kg CO_2/MWh.[11]

Table 7.4 and Fig. 7.2 show physical and economic output for the Canadian metal smelting and refining industry for 1990 to 2010. Physical measures are from the *Canadian Minerals Yearbook* and are limited to the major primary metals. Total refined production on Fig. 7.2 reflects the production of refined copper, zinc, nickel, magnesium, and lead. A second curve adds exported mattes of nickel and copper to total refined production. The second curve (which includes matte export) exhibits a similar pattern to the top curve – total production – evidencing a correlation between the production of the metal and the production of matte for export.

Table 7.4: Production Measures in Metal Smelting and Refining (NAICS 33141)

Metal (kt)	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Copper	515.8	572.6	551.4	515.2	500.2	453.5	442.1	335.9	319.6	273.8	276.0
Zinc	591.8	720.3	779.9	724.0	824.5	802.1	764.3	685.5	691.2	662.2	648.6
Nickel	134.7	121.5	134.2	139.7	153.7	162.6	167.7	116.9	105.4	142.4	139.8
Magnesium	25.3	48.1	64.0	45.0	45.0	11.3	9.8	0.0	0.0	0.0	0.0
Lead	183.6	281.4	284.3	229.4	250.5	236.7	259.1	258.9	272.9	282.6	278.1
Total, Refine	**1,451**	**1,744**	**1,814**	**1,653**	**1,774**	**1,666**	**1,643**	**1,397**	**1,389**	**1,361**	**1,342**
Copper Matte*	14.7	13.5	13.5	19.4	20.1	24.3	21.3	20.8	30.4	30.1	30.1
Nickel Matte*	68.1	69.5	41.1	59.7	56.6	73.9	76.9	69.0	70.1	73.7	73.7
Total, all	**1,534**	**1,827**	**1,868**	**1,732**	**1,851**	**1,764**	**1,741**	**1,487**	**1,490**	**1,465**	**1,446**
GO (07$million)											
GDP (07$million)	2,863	3,117	4,861	5,444	5,014	4,613	4,561	3,799	4,391	4,332	4,291

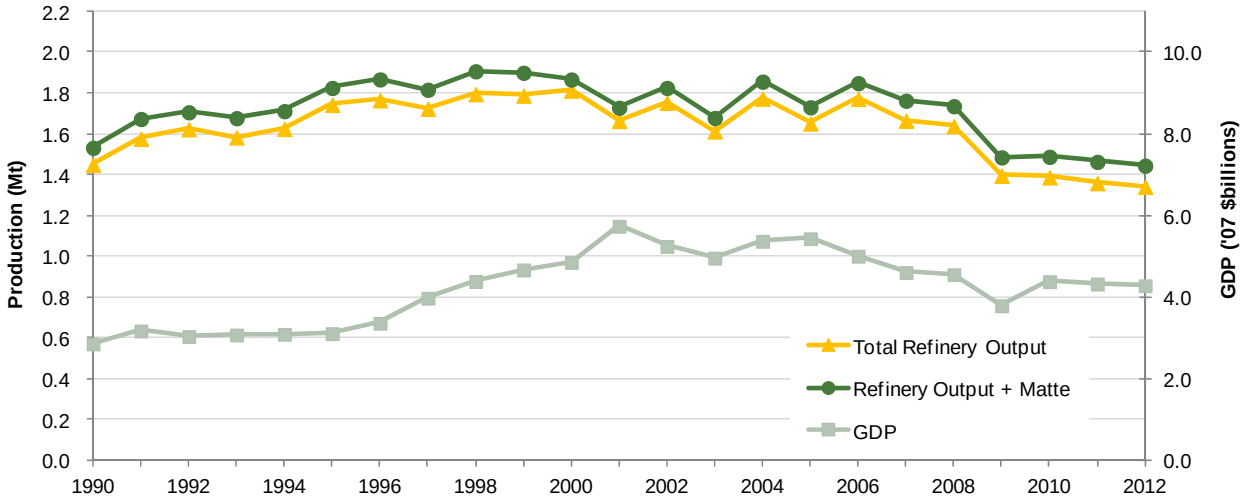
*Matte tonnages are nickel or copper content of the matte. No data are available on the grade of the matte.
Source: NRCan CMY. GDP CANSIM Table 379-0031. GO data not available. CIEEDAC has data for years not shown.

Both total refinery output and refinery output plus matte have been particularly dynamic since 2000. Between 2000 and 2009, all types of metal refining decreased, an overall drop of 26% by

[10] NIR shows a certain quantity of SF_6 generated from magnesium and aluminium foundries. Allocation is unclear (NAICS 33131 and 33141 or 33152).
[11] This value, representing 2012, varies over time. Data are from various STC CANSIM files. Data for other years are available from CIEEDAC.

2012. From the graph, no significant recovery is evident thereafter. Physical production in 2012 was 7.5% below 1990 levels.

Figure 7.2: Output Measures for Metal Smelting and Refining



Sources: NRCan CMY, STC ASM data as provided by Informetrica, Ltd.

GDP reached its peak in 2001 and has declined since then to a level currently 25% below that peak but still about 50% higher than GDP in 1990. With the STC update of GDP, we see values for GDP from this industry 2.7 times larger than they were. Like metal mining, this has some impact on the energy used per dollar product but, because the change is about the same in all years, the index of intensity change does not alter much from historical indices.

7.2 Intensity Indicators

Energy and GHG intensity indicators are plotted as indices in Fig. 7.3 and 7.4. Intensity indicators are obtained by dividing energy use and GHG emissions by physical output measures. Indicators are presented in the figures as indices normalized to 1990 in order to demonstrate changes from 1990.

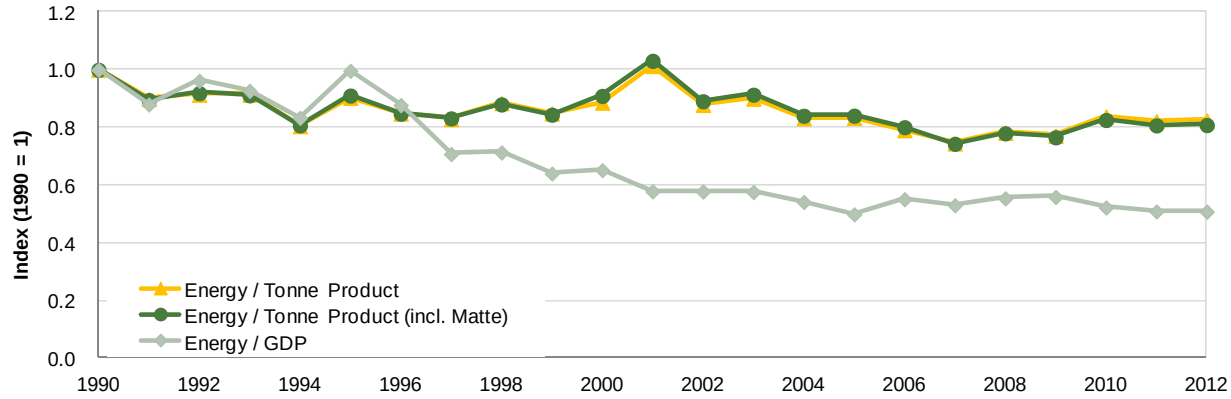
Fig. 7.3 demonstrates that energy intensity has improved overall. Energy intensity based on physical output rose to a peak in 2001, generally declining to 2007 and then relatively flat until 2012, 19% below 1990 levels. Economic indicators based on GDP generally declined to 2005, and then remained flat to finish the period 49% below 1990 levels. The substantial divergence between GDP and physical indicators is noted but, like the physical units, remains fairly flat for the last 6 years.

The inclusion of matte in the physical output indicator has only a slight effect. This observation suggests that it is not necessary to collect data on matte to develop an energy intensity indicator. However, to evaluate the embodied energy/CO_2 in exported semi-finished products, collection of these data should be continued.

Metal smelting is responsible for five types of GHGs: CO_2, CH_4 and N_2O from combustion (direct emissions), CO_2 from electricity (indirect), and process emissions of sulphur hexafloride (SF_6). SF_6 is released during the production of magnesium and is a powerful GHG with a global

warming potential (or carbon dioxide equivalent, CO_2e) 23,900 times that of CO_2. With the demise of magnesium smelting, this last GHG has diminished to 0.

Figure 7.3: Energy Intensity Indicators for Metal Smelting and Refining



Source: STC ASM and ICE, NRCan CMY.

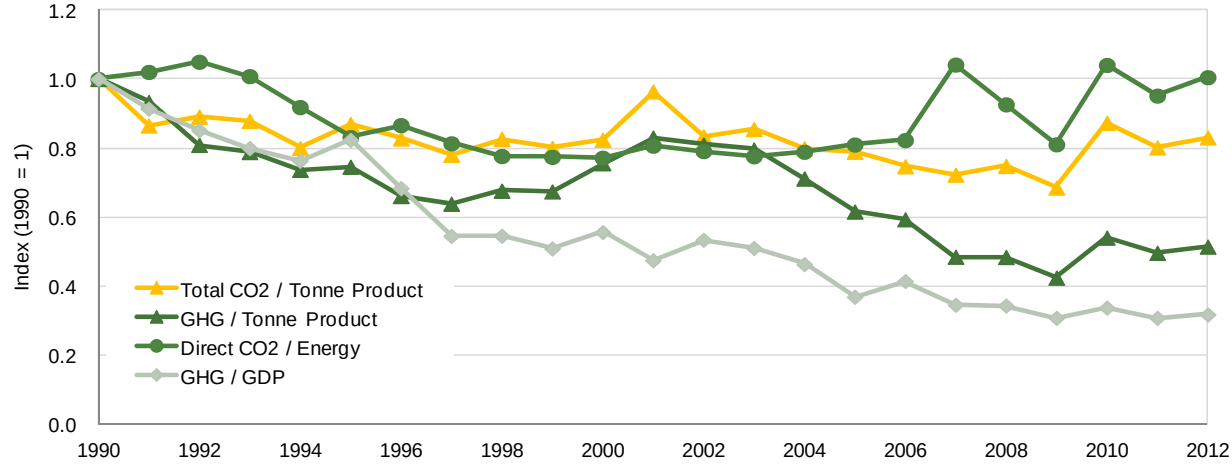
Table 7.5 and Fig. 7.4 show trends in GHG intensities. Emissions intensity declined significantly due to reduction in fuel use per unit output, and significant reductions in process emissions of SF_6. However, as noted earlier, our use of the average Canadian factor for electricity in this analysis may be erroneous if there have been substantial production increases over the study period in certain regions of the country, or if the base estimate for the average is in error.

Table 7.5: GHG and CO_2 Intensity Indicators in Metal Smelting, 1990 = 1

	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Total CO_2/Output	0.870	0.824	0.789	0.747	0.723	0.748	0.685	0.873	0.802	0.831
GHG/Output	0.746	0.756	0.616	0.593	0.485	0.484	0.424	0.540	0.496	0.514
GHG/Output (incl. Matte)	0.752	0.775	0.621	0.601	0.484	0.483	0.421	0.532	0.487	0.505
Direct CO_2/Energy	0.832	0.772	0.810	0.823	1.042	0.927	0.811	1.041	0.952	1.005
GHG/GO										
GHG/GDP	0.823	0.556	0.369	0.414	0.345	0.343	0.308	0.337	0.308	0.317

Note: Data for years not shown are available from CIEEDAC.

Figure 7.4: GHG Intensity Indicators for Metal Smelting and Refining

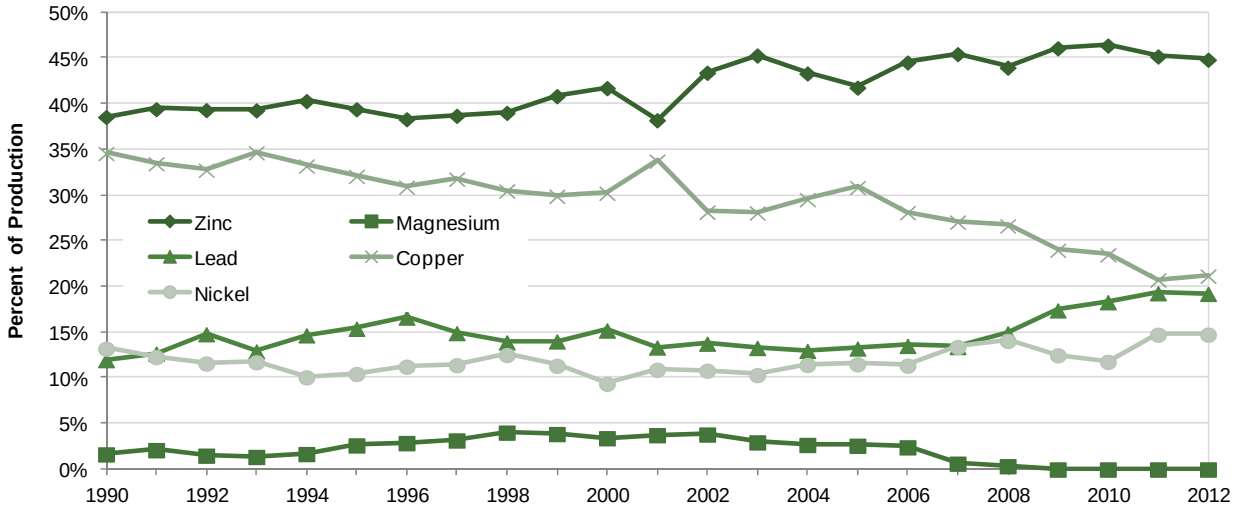


Sources: STC ASM and ICE, EC 2013.

The shift in fuel mix is quite evident in the indictor reflecting direct CO_2 emissions per unit of energy. The table shows details and the graph displays pictorially the rise in density due to a shift from electricity share to coal, HFO and natural gas shares since 2004. We note that, with much of the data confidential, estimations based on this industries historical use and in the context of the parent group, Primary Metals (NAICS 331), there are considerable margins of error around these data. In any case, GHG intensities generally have generally diminished over the period.

Structural shift within the industry may also affect both energy and electricity use. But, we are not able to accurately assess the existence of, or impact of, any structural shift within this industry. No data are published on the energy expended on the various metals refined in Canada; however, data are available on production levels of the various major smelted commodities; Fig. 7.5 illustrates the shifts in relative importance of the various metals smelted in Canada.

Figure 7.5: Structural Shifts in Metal Smelting and Refining in Canada



Source: NRCan CMY.

It is difficult from the data to make any definite conclusions regarding intensity changes due to structural shift; energy data associated with these specific metals are required to make accurate assessments. Nonetheless, zinc production as a proportion of total production increased, and the proportion of copper decreased. These changes have implications for the aggregate's energy and CO_2 intensity indicators (that we can't assess).

If energy use data were available for each of these metal products, analyses could be carried out on the impacts of these structural shifts. Possibly, one could then evaluate the embodied energy and GHGs of the commodities, and develop specific energy consumption (SEC) values for each and associate this with exports. At present, even the ASM – which is generally more detailed than ICE data – does not provide this level of detail of energy data for these specific metals.

As we noted for the metal mining sector, the large change in values for real GDP (2007 base year) means that, for the non-ferrous metal smelting sector where GDP values were 2.7 times

higher than previously, the intensity for 2011 dropped from 44 TJ / 2002 $million to 16 TJ / 2007 $million. Once again, since the changes for each year were quite uniform over the years, the changes in intensity (index, based on 1990 = 1) are little different than last year's analysis.

As with energy intensity per unit GDP described above, GHG intensities also changed significantly. For 2011, GHG / 2002 $million was 2.5 Mt and, with the updated GDP, it dropped to 0.9 MT / 2007 $million.

8 Combined Metal Mining and Metal Smelting and Refining

Many mining operations and smelting operations are found on the same site; the potential for double counting or inappropriate allocation of energy between the different NAICS categories exists. A review of their energy use and emissions in aggregate averts such errors.

The following section reports on trends in energy use, GHG emissions, and industry output nationally from 1990 to 2012 for an aggregation of metal mining (NAICS 2122) and metal smelting and refining, exclusive of aluminium (NAICS 33141).[12] In this case, iron mining is not included because all iron smelting is allocated to Iron and Steel Mills Manufacturing (NAICS 3311).

8.1 Energy use and GHG emissions

Table 8.1 and Table 8.2 compare energy use and emissions in metal mining and smelting to total use and emissions in all industry and to all sectors in Canada. Industry energy totals are derived from STC's RESD for the various years and include energy used by mining industries as defined in Table 2.1, all manufacturing industries, use of self-produced fuels in petroleum refining and biomass energy. Canada totals are the sum of all energy used in all sectors (residential, commercial, transportation, energy transformation, industry, agriculture, etc.) as defined in the RESD. Any fuels used as feed stocks are excluded. Emissions data are based on EC (2013). Emission "totals" include direct, indirect, and process emissions.

Table 8.1: Energy in Metal Mining (w/o Iron) and Smelting, Industry, and Canada

PJ	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Canada (RESD)	9,608	10,163	11,276	11,862	11,724	12,059	11,782	11,224	11,449	11,428	11,500
Industry (NRCan)	2,710	3,017	3,167	3,361	3,356	3,484	3,337	3,179	3,272	3,328	3,279
Metal Mine and Smelt	137	132	127	117	117	111	116	100	108	109	115
Total, % of All	1.43	1.30	1.12	0.99	1.00	0.92	0.99	0.89	0.94	0.95	1.00
Total, % of Ind	5.06	4.38	4.00	3.49	3.48	3.17	3.48	3.14	3.29	3.28	3.50

Source: STC RESD, NRCan Energy Trends (data in grey box is estimated), NRCan ACM. Data for years not shown are available from CIEEDAC.

This aggregate of the industry used about 1% of total energy used in Canada, about 3.5% of that used by industry and was responsible for about 0.6% of Canada's GHG emissions and just over 3% of industry sourced emissions.

[12] Data sources for mining and smelting are different (ACM and ICE); ICE data are available only for 1990, 1995 - 2012. In order to utilize the mining data, we have used ASM data for NAICS 331410 for years where ICE data were missing rather than not use ACM data for mining.

Table 8.2: GHGs in Metal Mining and Smelting (w/o Iron), Industry, and Canada

Mt	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Canada	591	639	718	737	727	749	731	689	701	702	705
Industry Direct	101.1	107.5	111.5	117.1	119.0	130.4	125.7	121.8	128.2	131.3	129.4
Industry Total	137.8	144.1	157.2	164.2	164.4	175.2	166.8	155.6	163.7	163.0	160.6
Metal & Smelting Dir.	4.68	4.05	3.78	3.59	3.61	4.02	3.93	3.01	3.93	3.81	4.12
Metal & Smelting Tot.	13.5	11.1	11.6	8.7	8.8	6.8	6.8	5.2	6.1	5.8	6.0
% of Can Direct	0.8	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.6	0.5	0.6
% Total / Can Direct	2.3	1.7	1.6	1.2	1.2	0.9	0.9	0.8	0.9	0.8	0.9
% Direct / Ind Direct	4.6	3.8	3.4	3.1	3.0	3.1	3.1	2.5	3.1	2.9	3.2
% Total / Ind Total	9.8	7.7	7.4	5.3	5.3	3.9	4.1	3.3	3.7	3.6	3.8

Note: "Total" includes direct (including process) and indirect emissions. Data are obtained from NRCan Trend Analysis oee.nrcan.gc.ca/corporate/statistics/neud/dpa/trends_agg_ca.cfm?attr=0. Data in grey boxes are estimated.
Sources: NRCan ACM, EC 2013, NRCan 2013. Data for years not shown are available from CIEEDAC.

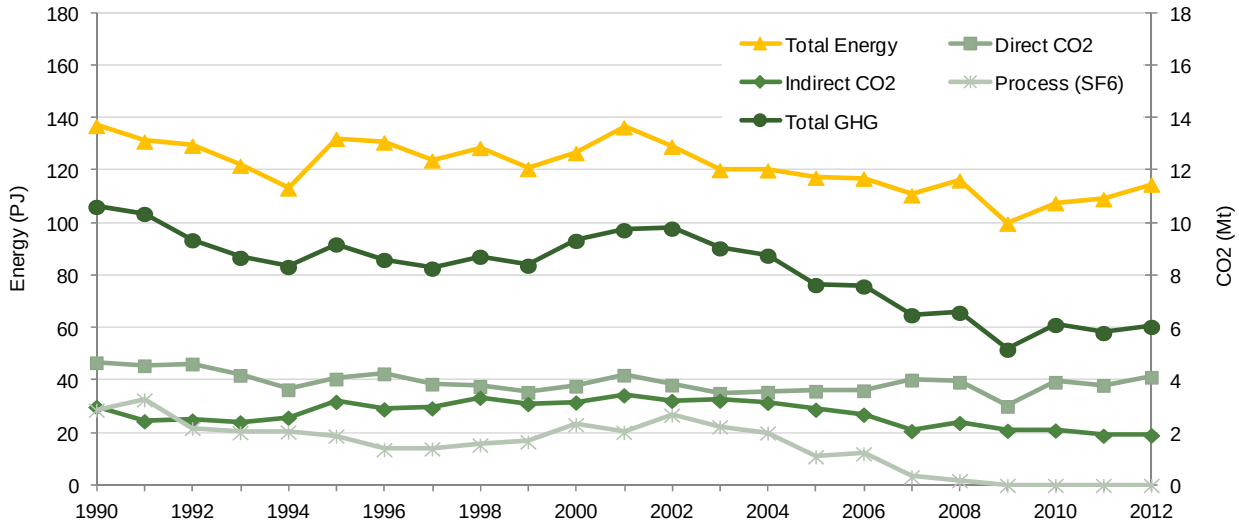
Table 8.3 and Fig. 8.1 show the total energy use and GHG emissions in this aggregation of industries. Energy use and GHG emissions are well correlated with intensity declining over time.

Table 8.3: Energy and CO_2 Emissions in Aggregation of Metal Mining (NAICS 212200, w/o Iron, NAICS 212210) and Metal Smelting and Refining (NAICS 33141)

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Energy (TJ)	137,047	132,095	126,692	117,286	116,928	110,585	116,224	99,771	107,600	109,124	114,658
Direct CO_2 (kt)	4,675	4,052	3,783	3,590	3,611	4,015	3,935	3,013	3,851	3,811	4,124
Indirect CO_2 (kt)	2,989	3,182	3,159	2,885	2,696	2,070	2,379	2,081	2,091	1,894	1,907
Other GHG (kt)	82	70	67	70	72	77	84	80	91	102	10
Process (SF_6)	2,870	1,879	2,313	1,092	1,205	325	181	0	0	0	0
Total GHG (kt)	13,487	11,063	11,635	8,728	8,788	6,812	6,760	5,174	6,115	5,807	6,041

Sources: NRCan ACM, STC RESD, EC 2012. Data for years not shown are available from CIEEDAC.

Figure 8.1: Aggregate Energy Use and GHG Emissions in Metal Mining (NAICS 2122 w/o Iron) and Metal Smelting and Refining (NAICS 33141)



Sources: NRCan ACM, STC ASM and ICE, EC 2013.

8.2 Intensity Indicators

Indices of energy and GHG intensity are plotted in Fig. 8.2 and are presented in Table 8.4 below. Intensity indicators are obtained by dividing energy use and GHG emissions by the various

output measures (economic or physical). The values in Fig. 8.2 are normalized to 1990 to demonstrate changes from the base line.

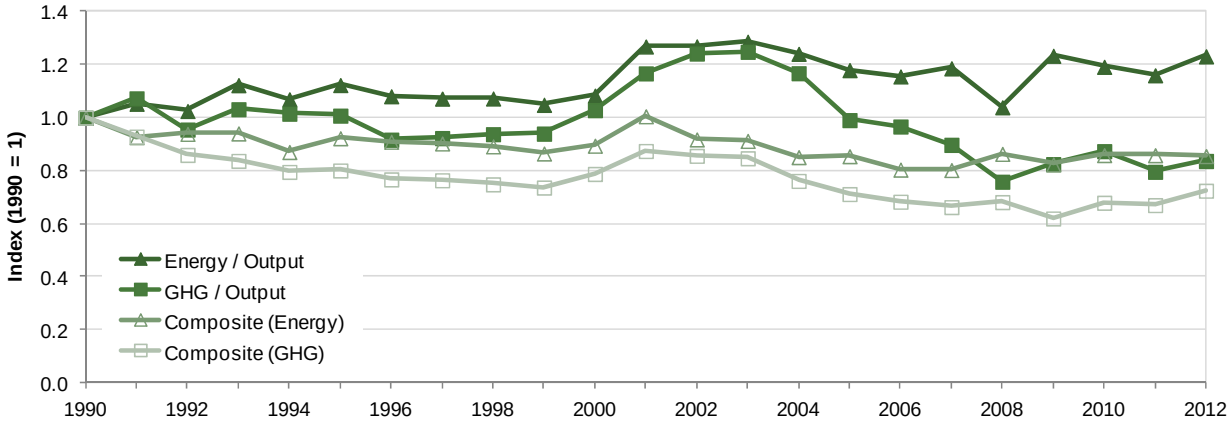
Fig. 8.2 shows energy and GHG intensity indicators using the sum of refined output including exported matte and the output of concentrate from metal mines as the denominator. The set of curves tell two different stories, based in great part on the methodology used to obtain them. The two upper lines show the impact of simply adding the energy use/GHG emission units for the numerator and the above defined production units (both in tonnes) to form the denominator. These curves suggest that intensity is above the intensity of the composite analysis. Energy intensity is rising and the combined industry is more intense than it was in 1990. GHG intensity shows an increase and begins to fall after 2003.

Table 8.4: Energy and GHGs Intensity Indicators in Metal Mining (NAICS 212200 w/o Iron) and Metal Smelting and Refining (NAICS 331410).

1990 = 1	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Energy/Output	1.123	1.083	1.179	1.155	1.185	1.039	1.233	1.191	1.159	1.231
Composite (Out)	0.922	0.894	0.855	0.804	0.803	0.864	0.824	0.859	0.859	0.855
GHG / Output	1.008	1.028	0.991	0.967	0.898	0.759	0.825	0.874	0.796	0.837
Composite (Out)	0.801	0.788	0.713	0.684	0.664	0.682	0.621	0.680	0.671	0.725

Sources: CIEEDAC calculations from STC sources. Composite based on output of product from the aggregated sectors. Data for years not listed are available from CIEEDAC. C

Figure 8.2: Aggregate Energy (Additive and Composite) and GHG Intensity Indices for Metal Mining (NAICS 212200 w/o Iron Mining NAICS 212210) and Metal Smelting and Refining (NAICS 331410)



Source: CIEEDAC calculations based on data from NRCan ACM, STC ASM and ICE.

However, weighting these data using the composite methodology shows that intensity is fairly steadily declining over time. One also notes that the composite indicator doesn't show the fluctuations seen in the other indicators.

In general, the indicators all show a relatively flat trend in energy and GHG intensity from 1994 to 1999, an increasing trend till about 2001, and a decreasing trend from there to 2008 after which time they diverge. The energy intensity composite indicator finished the period 15% lower than 1990 levels, and the GHG intensity composite indicator finished the period 28% lower than 1990 levels.

Changes in the energy intensity of the metal mining sector have a substantial influence on these indicators. In 1999, the energy and GHG intensity of the metal smelting sector increased

which drove the increase in the aggregate indicator from 1999 to 2000. From 2000 to 2008, the intensity of the metal mining industry was flat and metal smelting and refining sector decreased marginally, resulting in a decline in intensity in the indicators. After 2008, the energy and GHG intensity of both the metal smelting sector and metal mining sector were generally flat, with perhaps marginal increases in some years. The composite energy and GHG indicators reflect these changes better than the other two indicators.

9 Other Data

Both NRCan and STC collect data on a variety of aspects of the mining and smelting industries through various surveys. While these agencies also collect regionally-disaggregated data, the recent shift to NAICS has led to fewer regionally-disaggregated data available. The following sub-sections discuss these issues.

9.1 Provincial Mining Data

Data on energy use for most provinces are available for metal mining (NAICS 2122). Available GHG data include direct and indirect CO_2 as well as other GHGs. Detailed data are available upon request from CIEEDAC and are summarized in Table 9.1.

Table 9.1: Energy (TJ) and GHG Emissions (kt CO_2e) in Metal Mining

Province	Type	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
NF	Energy	22,033	21,320	20,719	23,347	15,891	16,441	24,243	18,281	21,720	19,939	19,251
	GHG	1,231	1,071	1,066	1,259	1,112	1,166	1,325	965	1,128	1,023	780
NB	Energy	0	0	0	0	0	0	0	0	0	0	0
	GHG	0	0	0	0	0	0	0	0	0	0	0
QC	Energy	25,686	27,717	27,084	23,375	26,752	27,953	28,972	25,971	27,909	31,580	25,464
	GHG	1,288	1,387	1,316	1,221	1,445	1,445	1,522	1,311	1,455	1,592	982
ON	Energy	23,113	15,645	10,685	14,905	13,179	13,561	13,970	10,639	12,410	14,118	14,985
	GHG	1,261	727	725	890	733	795	735	479	565	562	586
MB	Energy	4,179	2,927	3,896	3,015	2,976	3,173	3,676	3,275	3,341	3,396	3,397
	GHG	111	79	104	78	74	81	101	82	86	86	88
BC	Energy	15,129	13,816	8,499	8,498	8,607	8,378	8,827	8,612	8,853	7,672	8,999
	GHG	437	434	134	94	97	77	106	98	100	59	53
NWT/YK	Energy	6,375	0	1,758	0	0	0	0	0	0	0	2,699
	GHG	483	0	128	0	0	0	0	0	0	9	197
Other	Energy	5,743	9,742	8,427	9,484	9,884	10,478	11,955	11,510	12,794	13,642	24,639
	GHG	564	982	807	868	882	924	1,071	1,078	1,102	1,125	2,092

Sources: NRCan ACM, STC RESD, EC 2013. Some data exit for NB for years not shown here; they are available from CIEEDAC.

The energy used in Saskatchewan to mine uranium accounts for approximately 75% of energy used in the “Other” (i.e., regionally-unallocated) mines. The energy data for Saskatchewan, however, are considered confidential because, if released, data reflecting non-uranium metal mining industries could be determined (i.e., data on uranium mines are available; for most years, the bulk of uranium mining was in Saskatchewan).

These data show that the relationship between energy and GHG emissions is not consistent among provinces. The type of mine and the source of electricity can explain much of this observation; different mine types utilize different fuel mixes, and different regions are associated with different levels of emissions per unit of electricity.

9.2 Provincial Non-Metal Mining (NAICS 212300) Data

Table 9.2 displays data related to non-metal mines, including sand, gravel, and stone quarries. While once listed separately, these data have been aggregated in NAICS 2123. As a consequence, the "new" total is different than that described above (NAICS 21239).

9.3 Provincial Metal Smelting and Refining Data

For metal smelting and refining (NAICS 33141), CIEEDAC has ASM data disaggregated solely for Ontario and the Prairies for a limited number of years. Data for 1996 are the latest year for which data are available and can be obtained from CIEEDAC by request. The data show that Ontario and Prairie regions account for nearly half of the Canadian total. Further disaggregation is not possible from the data nor are more recent data available.

Table 9.2: Energy (TJ) and GHG Emissions (kt CO_2e) in Non-Metal Mining

Province	Type	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
NF	Energy	844	0	164	151	140	158	170	110	125	175	147
	GHG	53	0	11	10	9	10	10	7	7	10	9
NS	Energy	207	1,028	1,189	0	0	0	0	0	1,069	955	809
	GHG	19	113	128	0	0	0	0	0	127	106	88
PEI	Energy	0	59	22	0	0	0	0	0	0	0	0
	GHG	0	10	2	0	0	0	0	0	0	0	0
QC	Energy	5,934	5,904	4,374	3,722	3,736	3,644	4,039	3,357	3,370	3,362	3,283
	GHG	281	294	206	167	165	157	172	136	139	142	115
ON	Energy	4,402	4,773	8,072	7,734	7,259	6,692	7,989	7,036	7,303	6,922	6,922
	GHG	269	265	528	491	444	420	485	391	420	375	376
MB	Energy	280	355	356	435	322	274	281	263	180	270	270
	GHG	17	21	23	28	20	17	17	15	11	15	15
SK	Energy	27,751	32,054	30,960	28,683	34,202	35,264	33,473	18,799	23,332	35,585	35,585
	GHG	2,277	2,577	2,537	2,425	2,643	2,777	2,598	1,691	2,199	2,898	2,917
BC	Energy	1,616	888	967	1,108	1,131	1,055	1,202	1,029	908	1,379	1,187
	GHG	104	47	53	63	64	59	69	61	54	82	70
NWT	Energy	0	0	2,133	5,496	5,880	5,936	6,521	5,550	5,823	7,503	7,189
	GHG	0	0	149	384	411	415	456	388	407	493	476
Other	Energy	5,331	5,614	4,303	6,316	6,324	6,202	6,003	3,771	3,543	6,959	3,112
	GHG	432	465	354	571	568	561	570	378	351	491	268

Source: NRCan ACM. Data for years not shown are available from CIEEDAC.

10 Discussion and Conclusions

In past reports, we've introduced a number of issues regarding data sets and their application. Here we revisit issues surrounding the data and embodied energy and CO_2, and provide some suggestions on how the MAC can address these issues.

10.1 Data Issues

10.1.1 Sources of Data

There are primarily three sources of energy use and production data for the mining and associated industries in Canada: the ACM, ICE, and ASM surveys. The ACM is the product of an annual collaborative effort between federal and provincial agencies with interests in mining data. Among other things, the ACM collects data on energy use and production of mined ore, milled ore, concentrate, and metal production from smelters and refiners, including matte. The data are shared with STC and, in aggregate form, with MAC.

The quarterly ICE survey collects energy use data, though only for the largest of mining firms included in the NAICS categories found in section 2.2 above. These data are used to provide a comparison to the disposition survey data reported in STC's RESD.[13] The ICE survey collects no production data for metal, non-metal mines or sand / gravel / stone quarries.

The ASM collects data on energy expenditures / physical consumption and production for the metal smelting and refining sector. The ASM does not collect data for mining because mining is not considered a "manufacturing" industry. In terms of quality of energy use data, the ACM and ICE data are considered the highest quality.

Two other data sources are also valuable for examining the mining and associated industries. NRCan's *Canadian Minerals Yearbook* provides a variety of physical production data. Much of this is no longer published but data are available from CMY personnel or by special request online. Different firms also generate data on production for their own annual reports.

10.1.2 Weaknesses in the Data

While CIEEDAC generally performs no in-depth analysis on output data, we do note potential issues regarding how these data are collected and problems that may arise given multiple sources of overlapping data.

Members of the mining and associated industries are required to complete both NRCan's ACM and STC's ICE surveys. Both surveys collect energy use data and – depending upon the activities conducted by firms (as distinguished by NAICS categories) – can overlap in terms of the information being gathered. While both NRCan and STC check each other's data for consistency, this overlapping of effort can lead to errors in the data, such as double counting or misallocation of energy use.

For both NRCan's ACM and STC's ICE surveys, data are submitted by survey recipients to surveyors using a survey form. Little is known about the qualifications of the respondent(s) or the rigour with which the submitted data are reviewed before submission. While the data appear to be correct (i.e., lack double-counting or other problems), simplification of this method may improve the quality of the data. As we have recommended in the past, the Mining Association of Canada *may wish to review this situation*. Numerous other industry associations (e.g., pulp and paper, cement, petroleum refining, chemicals, etc.) have addressed the same issue in a variety of ways: having surveys performed by CIEEDAC, ensuring direct communication with representatives of firms, performing reviews in association with STC, and assigning members of the industry task force to address the issue.

10.1.3 Special Review of Production Data

Some years ago, CIEEDAC reviewed data available on production in mining and metal smelting by special request. The data are important for the establishment of energy and CO_2 intensity indicators and are required to address issues of embodied energy and CO_2 where information on the production of intermediate goods that are exported are also required. Outside of data collected by NRCan through its ACM survey, there is no other comprehensive source of

[13] Disposition data, from utilities and energy suppliers, reflect distribution of energy.

disaggregated physical production or energy data on mining and mined products. STC does collect data on GDP for some mining (sub)sectors, as presented in the data in the appendix. There are data available from various mining companies in their annual reports. We provide information on some of these reports below.

The bulk of our review assesses the availability of data useful in the various analyses proposed in this report. In essence, we need to be able to progressively track the stages of production and the end point of the products. These data are available primarily from two government sources, NRCan and STC. The stages (as defined by NRCan) have been assigned according to the degree of processing or manufacturing corresponding to the product classification code:

Stage I – Primary. Involves the discovery of ore, ore extraction and processing to the concentrate stage. Scrap material, ash and tailings have been placed in this category.

Stage II - Smelting & Refining. Refers to the metallurgical extraction process, the product of which is a relatively pure mineral, a metal, or an alloy. Some of the activities related to this stage are smelting and refining, roasting, calcining, direct reducing, and leaching. Products classified under this stage include powders, flakes, dusts, cathodes, ingots, pig, blocks, and plates.

Stage III - Semi-fabricated. Involves the manufacturing or processing steps required to bring products to a semi-finished or semi-fabricated stage or form, or to a state for use as input in other industries. Products related to Stage III include rods, plates, sheets, thin strips, pipes, rails, wires, metal-based structural forms, and a number of chemicals and compounds. Ingot moulds are also included.

Stage IV – Fabricated. Includes products of Stage III that have undergone further processing, such as elements produced by the metal framing industry, hardware items, tools, and cutlery. This stage includes products such as pipe fittings, forged and cast parts, grinding balls, and rail parts.

While information regarding the various stages exist and can be obtained from STC databases, the data are typically aggregated before release. See below for details.

Production data from annual reports and web sites:

A number of companies and organizations provide some detail on production and capacity for their firm's annual report. These are available from their annual reports or from their web sites. While they may be useful in directed and specified analyses, all data are not aggregated in any central location and the criteria under which they are collected are not necessarily consistent between firms. Their overall value in understanding the industry as a whole (mining and smelting) is limited.

Production data from government agencies

Data from NRCan and STC are available in great detail and include a significant degree of disaggregation for the mining and smelting sectors. All CANSIM data are now free of charge and available on line (www5.statcan.gc.ca/cansim/home-accueil?lang=eng&p2=50). Other

economic data, compiled in a useful format, are available from Industry Canada (www.ic.gc.ca/eic/site/cis-sic.nsf/eng/home).

Data on mined material are comprehensive to mine type. Available online and published in the *Canadian Minerals Yearbook* (CMY) and STC publications, they contain information on physical and monetary production of mined material (mined, milled, concentrates, value of production and value added).[14] CIEEDAC receives GDP data from STC's CANSIM database (Table 379-0031). In many cases, production data are available by region for metals and non-metals. The definition of the data in report tables is not always clear but, when one compares data between STC and NRCan publications, a more precise picture of the data set emerges.

Data related to production at various stages of the process are not generally available. There may be more data collected on intermediate products than are accessible to the general public; some of these data can be purchased from STC. For example, while matte data for some metals (such as copper) exist, they refer primarily to exported quantities, usually in dollar values. Data on total matte production in physical quantities do not seem to be available. CMY does publish data on matte exports but does not provide data on total production of matte. Budget cutbacks in 2008 have resulted in a reduced number of reports on the various metal-based industries covering both mining and smelting.

In all, with diligent effort to determine material flows, one may be able to derive quantities and, in some cases, energy intensities of a commodity from start to finish, if one wishes to trace energy end-use, embodied energy and embodied CO_2. The issue is complicated by the fact that some of the data are in dollars, while others are in tonnes and that energy intensities of intermediate products are not known.

In summary, for most of the basic metals (aluminium, copper, gold, iron, lead, nickel, silver, uranium, zinc), one can find:

- physical data on each of the four stages described above,
- data on exports and imports,
- both economic and physical units of production,
- regional production of many of the stages,
- monthly data,
- data going back to at least 1994, and for some minerals, much earlier (late 1800s!).

The data are not centrally-located and are scattered over a number of documents. While the data values are consistent with each other, they are not consistently defined in the tables or associated paragraphs found in the various sources. Through STC and NRCan cooperation, both the scattered data problem and the inconsistency of definition issue can be overcome.

[14] For information on particular minerals, see www.nrcan.gc.ca/mining-materials/markets/commodity-reviews/8360 or www.nrcan.gc.ca/mining-materials/statistics/8848. Publications have been discontinued by historic ones can still be obtained: Catalogue no. 26-201, -202, -223 to -226)

10.1.4 Aggregation of Energy Data

As noted numerous times throughout this report, without provincially and sectorally disaggregated data, it is not possible to make complete, high-quality assessments of trends in energy use and GHG emissions. For example, ACM data are published by STC on a national basis, as well as by region or by mining sub-sector, but they are not available by both region and mining sub-sector (ostensibly due to confidentiality restrictions). It is not clear if the participating provincial mining ministries/agencies receive what would otherwise be confidential data since some provincial agencies collect data for NRCan.

Similarly, STC does not publish nationally-disaggregated mining data, with minor exceptions (e.g., iron mines were historically listed separately in the RESD, but this was discontinued in 1998). Likewise, there are no regionally-disaggregated data available for NAICS 33141 through the ICE or the RESD (metal smelting data in the RESD include aluminium). ASM data are not consistent in that, for some years, they combine both NAICS 331331 (Aluminium metal smelting) and NAICS 331410(Other Non-ferrous Metal Smelting) into a surrogate rather than under separate categories, and the data are not well disaggregated by region.

MAC, in association with STC and NRCan may wish to review these matters. Without regionally and sectorally disaggregated data, neither CIEEDAC nor any others can conduct an accurate assessment of indirect emissions of the industry.

10.1.5 Indicators

Sound indicators account for, distinguish, or isolate:

- structural factors, e.g., less uranium, more gold, agglomerated vs. sintered iron ore, etc.
- explanatory factors, e.g., deeper mines, poorer ores, harder rock, magnetite vs. hematite in iron ore, etc.

Generally speaking, sufficient data on mining are available to achieve these ends. These data are sometimes unavailable because of confidentiality constraints.

The best indicators are those that are based upon physical measures of output and that are composites. The former quality ensures that factors unrelated to energy use are kept free from influencing the indicators. The latter quality distinguishes structural change within sectors. Both qualities are necessary to provide the highest quality analysis.

In situations where one doubts the integrity of the data (i.e., if double counting or misallocation of energy is suspected), a more aggregated approach to the analysis can be taken. For example, one could sum metal mining and metal smelting industrial sub-sectors to develop indicators of energy and CO_2 emissions, as was done in section 8. However, a number of factors suggest that one should take care not to use the resulting outcomes of analyses of aggregations improperly. Generally speaking,

- structural phenomena are caught up in the indicator such that one can make no conclusions about improved energy efficiency (see, for example, Fig. 8.2 where the composite indicators generate index lines show different trends than the other indicators; a second example: the

aggregation of different types of mines under one "miscellaneous" heading such as NAICS 212299 and NAICS 212398);

- a mixture of incomplete energy data sets reduces reliability (i.e., disaggregated data are not available for all sub-sectors or for all regions);
- incomplete data on production, especially shipments of intermediate products, and GDP for the smelting industry as defined here (NAICS 33141)[15], leads one to question the indicators developed as being unrepresentative because energy used in the production of intermediate products sold is often allocated to the final product (this over estimates the intensity of that product); and
- while there is no evidence that there has been misallocation or double counting in the provided data sets, such possibilities exist and the data and resultant indicators would be erroneous.

In tune with these concerns, we know of no other analyses of the mining industry published nationally or internationally that provides indicators for mining, except for reports generated by individual companies on their own levels of intensity/efficiency. Some companies provide such information in their annual reports, but the background data are usually not presented and the input data are often not defined.

10.2 Embodied Energy Lost to Exports (Intermediate Products)

Today, given the existence of national and international policy concerning energy and GHG emissions, exporting industries are interested in the amount of energy and GHG emissions entrained in their products. Data describing energy and GHG emissions embodied in products are also important for the purposes of defining product quality. To determine embodied energy and emissions, data characterizing production of exported commodities (quantity of metals, mattes, concentrates, etc.) and the energy/emissions intensity of these products is necessary.

However, data on exports of intermediate products such as concentrates and refined metals are often limited. CMY publishes some data on export quantities, and STC provides average world prices for metals but these are on finished metals, not matte and other intermediate products. In some cases, these data are listed in monetary values rather than physical units. In sum, the data are not disaggregated in a way that permits us to allocate energy used to most of these intermediate products, including those that are subsequently exported, and thus to determine their energy intensity. *These issues may warrant further examination by the MAC if knowledge of embodied energy or GHGs is considered important.*

10.3 Conclusions

This report defines and disaggregates energy demand and GHG emissions to industrial sub-sectors in Canada involved with the extraction of minerals and their further processing.

Table 10.1 provides a brief summary of energy and GHG trends of the mining and associated industries as of 2012. Compared to the 1990 benchmark, energy use in 2012 was nearly 3%

[15] CIEEDAC derived GDP for this sector based on GDP for NAICS 3314.

lower in metal mining and 19% higher in non-metal mining. Energy use in the metal smelting and refining industries was 24% lower in 2012 than in 1990. If one considers solely metal mining and smelting (exclusive of iron mining and steel production), energy use is 16% lower in 2012 than in 1990. Absolute quantities of GHG emissions dropped from 1990 in non-metal mining and metal smelting; in non-metal mining, they are 18% higher, primarily due to a large increase in natural gas use in potash mines.

Table 10.1: Changes in Energy Use and GHG Emissions, 1990-2012

Sector	Energy	GHG
Metal Mining (NAICS 2122)	-2.8%	-11.1%
Non-metal Mining (NAICS 2123)	19.0%	17.6%
Mining (NAICS 2122 and 2123)	3.4%	-1.0%
Metal Smelting and Refining (NAICS 33141)	-23.8%	-52.4%
Metal Mining and Smelting (NAICS 2122 and 33141)[1]	-16.3%	-55.2%

1. Excludes iron mines because smelting excludes iron and steel smelting.

Energy efficiency is improving in metal mining, nearly 10% better than 1990 levels (Table 10.2). Non-metal mining also shows a substantial energy efficiency improvement of 19% relative to 1990. The mining aggregation composite indicator for the two mining sub-sectors (NAICS 2122, 2123) suggests a decreasing intensity of 12.7%. While output data are limited, metal smelting indicators suggest a decline in energy intensity of 18% from 1990, and 15% when combined with metal mining. Rates of decline of GHG emissions are somewhat commensurate with changes in energy intensity. The rate of decline in Metal Smelting and Refining is higher because of the decline of process emissions (SF_6).

Table 10.2: Changes in Physical Intensity Indicators of Energy and GHG Emissions, 1990-2012

Sector	Energy	GHG
Metal Mining (NAICS 212200)	-9.5%[2]	-12.9%
Non-metal Mining (NAICS 2123)	-19.2%[3]	-10.3%
Mining (NAICS 2122 and 2123)	-12.7%[4]	-12.6%
Metal Smelting and Refining (NAICS 331410)	-17.6%	-48.6%
Metal Mining and Smelting (NAICS 212200 and 331410)[1]	-14.5%[5]	-27.5%[6]

1. Excludes iron mines.
2. Energy composite, based on tonne milled.
3. Energy composite, based on tonne throughput.
4. Energy composite, based on tonne concentrate.
5. Energy composite, based on tonne product.
6. GHG composite of metal mining and smelting (other GHG composites cannot be generated).

A proper critique of the data requires an analysis of structural shifts in mine types and smelting types. While we have been able to do this for mines, insufficient data prevented this type of analysis for smelting. More detailed data are also required for assessments on a provincial level. Acquiring such data would permit a composite indicator value to be generated for GHG emissions. Unfortunately, the number of specific mining operations by region may not be sufficient to permit such disaggregation and still maintain confidentiality.

Given adequate data, it is possible to estimate intensity indicators that include exports. Preliminary analysis of energy and GHG emissions associated with exports do not seem to have an effect on indices of energy intensity indicators. However, unless improved data become available, we cannot comprehensively determine levels of embodied energy or CO_2 in the whole line of mining industry exports. Without these analyses, the mining industry will likely be

hard-pressed to effectively negotiate its position(s) in a carbon-constrained international marketplace.

10.4 What Can the MAC Do?

One of the objectives of this report is to provide information that will stimulate activity and discourse to improve the data picture. This report will be made available to all interested parties, but here we focus specifically on what the Mining Association of Canada can do to improve the data set on the mining and smelting sectors. The points below reiterate portions of the text above and are not listed in order of priority. We have provided these points in the past; they are repeated here for the MAC's consideration.

1) Review and define what qualifications/characteristics are required of those who are designated to complete data surveys. In cooperation with STC and NRCan, such a review could substantially improve the reliability and accuracy of both production and energy use data.
2) In light of overlapping surveys and the potential for double counting, MAC should seek out evidence for (or perhaps specific examples of) possible misallocation of energy data. For example, are smelting values included in mining values by some respondents?
3) Determine the data requirements and logistics that would permit review/critique/analysis/ recommendations regarding embodied energy. Considerations may include:
    - a list of exported commodities;
    - production of these commodities (are these data reported and suppressed, not requested, available from individual companies, not available at all?); and
    - an analysis of energy required to generate these commodities
        - this "intensity factor" could be collected by STC (or CIEEDAC) to develop an aggregate intensity factor;
        - some in-house analyses to establish a method of obtaining the intensity factor would be required, followed by a willingness of all producers of that commodity (for export or otherwise) to calculate such an intensity; and
        - each firm would report the intensity factor annually.
4) Define the indicator of choice and reason for that choice, paying attention to both structural and explanatory factors (there are a set of possible composite and non-composite indicators available).

11 Reference List

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12 APPENDICES: Coefficients and Data Tables

Appendix A

- Table 1: Energy coefficients, GJ / physical unit
- Table 2: CO_2 Emissions coefficients, tonnes / physical unit
- Table 3: CH_4 Emissions coefficients, kg / physical unit
- Table 4: N_2O Emissions coefficients, kg / physical unit
- Table 5: Other GHG process emissions, not accounted for in other tables, tonnes CO_2e / physical unit

Appendix B

The tables in appendix B are generated from CIEEDAC's master database on all industry in Canada. This database excludes energy consumed as gasoline, typically less than 1% of the total.

- Mining, Metal Smelting Energy Use, Production and Energy Intensity Indicators
- Mining, Metal Smelting GHG Emissions and Emission Intensity Indicators
  - Carbon Dioxide Emissions and Indicators
  - Methane Emissions and Indicators
  - Nitrogen Dioxide Emissions and Indicators
  - GHG Aggregate Emissions and Indicators

NOTE: In the data pages, space prevents the display of each year for which data are available in tables. These data are available on line from CIEEDAC in CSV format that can be downloaded for spreadsheets:

See: www.cieedac.sfu.ca/CIEEDACweb/mod.php?mod=NAICSPublic&menu=1602

Appendix A: Coefficients

Table 1: Energy coefficients, GJ / physical unit

Fuel	Units	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Coal, Undefined	tonne	29.05	29.30	27.65	28.64	28.38	27.50	26.44	26.07	26.13	25.53	25.72	25.72	25.72	25.72	25.72
Canadian Bitumen	tonne	30.45	30.36	26.00	26.02	25.93	27.28	27.28	27.28	27.28	27.28	27.28	27.28	27.28	27.28	27.28
Canadian Lignite	tonne	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00
Foreign Bitumen	tonne	29.00	29.78	29.82	28.72	29.82	27.45	27.45	27.45	27.45	27.45	27.45	27.45	27.45	27.45	27.45
Foreign Anthracite	tonne	27.75	27.70	27.70	28.13	27.70	27.87	27.87	27.87	27.87	27.87	27.87	27.87	27.87	27.87	27.87
Coal Coke	tonne	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83	28.83
HFO	m^3	41.73	41.73	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50	42.50
Middle Distillates	m^3	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68	38.68
Propane	m^3	25.53	25.53	25.31	25.31	25.31	25.31	25.31	25.31	25.31	25.31	25.31	25.31	25.31	25.31	25.31
LPG	m^3	27.12	27.12	27.12	27.12	27.12	27.12	27.12	27.12	27.12	27.12	27.12	27.12	27.12	27.12	27.12
Natural Gas	000 m^3	37.78	38.06	37.99	38.09	38.09	38.20	38.21	38.26	38.26	38.11	38.41	38.43	38.53	38.56	38.56
Wood	tonne	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00
Steam	GJ	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Electricity	MWh	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60

Source: STC, RESD.

Note: Canadian Bituminous coal is a weighted average of coal by province as provided by STC to CIEEDAC.

Table 2: CO_2 Emissions coefficients, tonnes / physical unit

Fuel or Product	Units	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Coal, Undefined	tonne	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48
Canadian Bitumen	tonne	1.80	1.88	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92
Canadian Lignite	tonne	1.36	1.41	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44	1.44
Foreign Bitumen	tonne	2.50	2.46	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43
Foreign Anthracite	tonne	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39
Coal Coke	tonne	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48	2.48
HFO	m^3	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12	3.12
Middle Dist	m^3	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83	2.83
Propane	m^3	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51
LPG	m^3	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51
Natural Gas	000 m^3	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89	1.89
Wood	tonne	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95

* Note: Biomass (wood and spent pulping liquor) is assumed to be CO_2 neutral.
Source: EC 2013. Anode value calculated Common Reporting Format Tables of the Inventory.

Table 3: CH_4 Emissions coefficients, kg / physical unit

Fuel	Units	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	
Coal, Undefined	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Canadian Bitumen	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Canadian Lignite	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Foreign Bitumen	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Foreign Anthracite	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Coal Coke	tonne	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
HFO	m^3	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Middle Distillates	m^3	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Propane	m^3	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
LPG	m^3	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024
Natural Gas	000 m^3	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037
Wood	tonne	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

Source: EC 2013.

Table 4: N_2O Emissions coefficients, kg / physical unit

Fuel or Product	Units	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Coal, Undefined	Tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Canadian Bitumen	Tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Canadian Lignite	Tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Foreign Bitumen	Tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Foreign Anthracite	Tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Coal Coke	Tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
HFO	m^3	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064	0.064
Middle Dist	m^3	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031
Propane	m^3	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108
LPG	m^3	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108	0.108
Natural Gas	000 m^3	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033
Wood	Tonne	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02

Source: EC 2013.

Table 5: Other GHG Process Emissions, Not Accounted for in Other Tables, tonnes CO_2e/physical unit

Product	Units	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2009	2010	2011	2012
Magnesium (SF6)	tonne	0.125	0.045	0.044	0.037	0.043	0.051	0.044	0.029	0.031	0.047	0.047	0.046				

Note: Coefficients for 2012 are estimated.

Source: Calculated from EC 2013, Common Reporting Format Tables. These coefficients have no meaning in themselves and are used to associate emissions with production.

Appendix B: Data Tables for Mining (NAICS 212), Metal Smelting (NAICS 33141)

1) **NAICS Energy Use Report**: Energy use, industry production, intensity indicators and index are provided for each industry in NAICS sequence. Conversion coefficients from energy in physical units to TeraJoules (TJ) come from Statistics Canada Cat No: 57-003 XPB. See appendix A for details.
2) **NAICS Carbon Dioxide Report**: CO_2 emissions, industry production, intensity indicators and index are provided for each industry in NAICS sequence. Conversion coefficients from energy in physical units to CO_2 come from EC 2013. See appendix A for details.
3) **NAICS Methane Report**: CH_4 emissions, industry production, intensity indicators and index are provided for each industry in NAICS sequence. Conversion coefficients from energy in physical units to CH_4 come from EC 2013. See appendix A for details.
4) **NAICS Nitrous Oxide Report**: N_2O emissions, industry production, intensity indicators and index are provided for each industry in NAICS sequence. Conversion coefficients from energy in physical units to N_2O come from EC 2013. See appendix A for details.
5) **NAICS Total GHG Report**: Sum of all GHG emissions, industry production, intensity indicators and index are provided for each industry in NAICS sequence. Conversion coefficients from energy in physical units to carbon dioxide equivalents (CO_2e) come from EC 2010. Data on process emissions come from the Common Reporting Format Tables in EC 2013. See appendix A for details.

NOTE: In the data pages, space prevents the display of each year for which data are available. These data are available on line from CIEEDAC in CSV format for spreadsheets: www.cieedac.sfu.ca/CIEEDACweb/mod.php?mod=NAICSPublic&menu=1602

Energy Consumption and Energy Intensity Indicators

NAICS 212000 Mining (not Oil, Gas and Coal)

Notes: Sum of metals, non metals for energy, GDP and GO, excludes Oil and Gas extraction and Coal Mining 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	146,863	131,889	129,127	127,900	133,996	130,788	134,815	135,053	137,917	149,971	116,951	131,350	152,055	156,355
Electricity	57,381	46,527	45,518	47,573	47,588	46,745	48,395	41,715	43,642	50,144	44,173	47,775	51,175	54,943
Natural Gas	31,157	31,643	32,676	29,744	30,831	31,527	27,963	33,173	33,567	32,227	18,000	21,835	35,835	33,482
Heavy Fuel Oil	17,625	13,194	12,482	12,359	13,865	11,649	13,027	13,051	12,347	14,155	10,836	13,252	12,365	12,411
Middle Distillates	24,133	24,081	24,726	24,303	24,960	25,680	29,159	30,268	30,564	34,712	27,788	32,000	36,542	39,047
Propane	3,397	3,876	4,108	4,180	4,065	4,145	3,736	3,357	3,867	4,525	4,070	4,029	3,949	4,123
Coal	1,318												3.22	3.96
Coal Coke	11,269	12,306	9,396	9,542	12,478	10,837	12,353	13,332	13,671	13,956	11,834	12,213	11,923	11,834
Steam	583.18	262.24	222.53	198.39	207.93	204.74	181.74	156.76	260.10	252.91	248.17	245.74	264.04	510.63

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	308,518	278,086	259,286	257,066	273,001	266,601	287,511	286,556	274,385	287,136	257,714	282,574	288,712	310,399
Gross Output														
GDP	23,749	23,441	22,708	22,527	22,990	22,484	22,319	21,762	21,788	22,035	16,660	18,353	20,055	19,251

Product: mineral ores. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	0.476	0.474	0.498	0.498	0.491	0.491	0.469	0.471	0.503	0.522	0.454	0.465	0.527	0.504
Energy (TJ) / Output														
Energy (TJ) / GDP	6.184	5.626	5.686	5.678	5.828	5.817	6.040	6.206	6.330	6.806	7.020	7.157	7.582	8.122

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.996	1.046	1.045	1.031	1.031	0.985	0.990	1.056	1.097	0.953	0.976	1.106	1.058
Output														
GDP	1.000	0.910	0.920	0.918	0.943	0.941	0.977	1.004	1.024	1.101	1.135	1.157	1.226	1.313

Energy Consumption and Energy Intensity Indicators

CIEEDAC

NAICS 212200 Metal Ore Mining

Notes: Sum of all metal mining. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	101,230	80,189	79,118	79,152	81,746	75,602	81,816	76,643	79,262	90,866	77,437	86,150	89,380	98,292
Electricity	47,151	36,126	35,741	37,571	37,454	35,975	37,231	30,767	32,131	38,723	35,495	36,988	38,368	43,372
Natural Gas	6,518	3,407	5,221	3,911	3,246	2,809	2,592	2,288	2,443	2,671	2,210	2,877	3,012	3,239
Heavy Fuel Oil	15,185	11,890	11,224	11,211	12,792	10,668	12,103	12,195	11,475	13,195	10,228	12,591	11,676	12,105
Middle Distillates	16,491	12,863	13,792	13,096	12,068	11,534	14,101	14,948	15,948	18,064	13,894	17,824	20,786	23,991
Propane	3,028	3,528	3,744	3,821	3,708	3,779	3,437	3,112	3,595	4,258	3,776	3,657	3,612	3,761
Coal	1,318												3.22	3.96
Coal Coke	11,269	12,306	9,396	9,542	12,478	10,837	12,353	13,332	13,671	13,956	11,834	12,213	11,923	11,821
Steam	270.66	70.05												

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	282,475	245,015	224,678	220,899	232,087	227,004	247,636	246,806	234,484	244,208	224,038	246,928	251,002	276,130
Gross Output														
GDP	21,213	20,155	19,125	18,713	18,423	17,585	17,434	17,162	16,456	16,999	13,187	13,876	15,377	14,925

Product: metal ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	0.358	0.327	0.352	0.358	0.352	0.333	0.330	0.311	0.338	0.372	0.346	0.349	0.356	0.356
Energy (TJ) / Output														
Energy (TJ) / GDP	4.772	3.979	4.137	4.230	4.437	4.299	4.693	4.466	4.817	5.345	5.872	6.209	5.813	6.586

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.913	0.983	1.000	0.983	0.929	0.922	0.867	0.943	1.038	0.964	0.974	0.994	0.993
Output														
GDP	1.000	0.834	0.867	0.886	0.930	0.901	0.983	0.936	1.009	1.120	1.231	1.301	1.218	1.380

Energy Consumption and Energy Intensity Indicators

NAICS 212210 Metal Ore Mining , Iron Ore Mining

Notes: 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	42,352	39,862	33,107	32,780	39,542	34,905	38,634	34,940	35,400	43,609	35,819	41,314	40,680	43,526
Electricity	13,110	13,777	10,741	10,617	12,764	12,171	12,749	6,938	7,842	13,194	11,530	13,018	13,159	15,151
Natural Gas	648.95										1.54	1.77	1.54	1.39
Heavy Fuel Oil	13,879	10,849	10,057	10,083	11,590	9,528	10,977	11,168	10,589	12,314	9,323	11,849	10,830	11,246
Middle Distillates	3,438	2,911	2,900	2,508	2,666	2,335	2,505	3,455	3,258	4,107	3,094	4,177	4,718	5,250
Propane	6.70	18.82	13.42	29.66	44.42	32.80	50.37	46.22	41.16	38.22	36.54	54.81	48.14	57.76
Coal Coke	11,269	12,306	9,396	9,542	12,478	10,837	12,353	13,332	13,671	13,956	11,834	12,213	11,923	11,821

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	91,035	93,956	75,054	74,791	86,180	78,603	86,467	91,712	84,243	93,714	83,991	102,067	104,615	108,506
Gross Output														
GDP	2,086	1,975	1,319	1,305	1,665	1,402	1,484	1,627	1,470	1,427	1,335	1,587	1,442	1,503

Product: iron ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	0.465	0.424	0.441	0.438	0.459	0.444	0.447	0.381	0.420	0.465	0.426	0.405	0.389	0.401
Energy (TJ) / Output														
Energy (TJ) / GDP	20.305	20.183	25.100	25.118	23.749	24.896	26.033	21.475	24.082	30.560	26.830	26.033	28.211	28.959

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.912	0.948	0.942	0.986	0.955	0.960	0.819	0.903	1.000	0.917	0.870	0.836	0.862
Output														
GDP	1.000	0.994	1.236	1.237	1.170	1.226	1.282	1.058	1.186	1.505	1.321	1.282	1.389	1.426

Energy Consumption and Energy Intensity Indicators

CIEEDAC

NAICS 212220 Metal Ore Mining , Gold Mines

Notes: 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	13,071	12,485	13,592	14,281	13,937	13,448	12,862	12,500	12,772	12,920	13,837	14,436	16,070	18,126
Electricity	7,810	7,498	8,134	8,787	8,650	8,468	8,171	8,312	8,223	8,432	10,102	8,661	9,012	9,899
Natural Gas	363.90	519.21	504.39	530.67	530.89	496.51	538.59	480.38	581.56	595.55	609.69	599.41	889.58	979.77
Heavy Fuel Oil	272.29	121.29	110.01	116.78	124.75	91.77	95.04	68.26	33.68	46.57	67.81			
Middle Distillates	3,415	3,338	3,961	3,823	3,616	3,399	3,190	3,080	3,201	3,010	2,330	4,281	5,197	6,232
Propane	1,165	1,009	883.29	1,025	1,015	992.97	867.95	559.30	731.93	835.80	727.69	894.39	968.08	1,011
Coal	1.92												3.22	3.96
Steam	42.63													

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	23,637	41,164	41,367	41,692	42,816	41,763	40,465	41,051	39,625	38,182	41,715	43,059	34,655	36,902
Gross Output														
GDP	3,745	3,279	3,523	3,174	3,074	2,606	2,475	1,962	1,764	1,716	1,845	1,813	1,792	1,791

Product: gold ore milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	0.553	0.303	0.329	0.343	0.326	0.322	0.318	0.305	0.322	0.338	0.332	0.335	0.464	0.491
Energy (TJ) / Output														
Energy (TJ) / GDP	3.491	3.808	3.858	4.500	4.534	5.160	5.197	6.371	7.240	7.529	7.500	7.963	8.968	10.121

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.548	0.594	0.619	0.589	0.582	0.575	0.551	0.583	0.612	0.600	0.606	0.839	0.888
Output														
GDP	1.000	1.091	1.105	1.289	1.299	1.478	1.489	1.825	2.074	2.157	2.149	2.281	2.569	2.899

Energy Consumption and Energy Intensity Indicators

NAICS 212230 Metal Ore Mining , Lead-Zinc, Nickel-Copper-Zinc Ore Mining

Notes: 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	36,773	22,936	24,202	21,778	20,842	21,001	23,815	22,533	24,234	27,145	22,102	24,777	26,206	29,416
Electricity	22,061	12,952	13,446	12,286	12,253	12,127	13,102	12,665	13,090	14,164	11,757	12,942	13,507	14,971
Natural Gas	3,099	2,772	3,029	2,112	2,228	2,162	1,902	1,658	1,705	1,908	1,447	2,116	2,037	2,152
Heavy Fuel Oil	1,024	919.61	1,057	1,012	1,076	1,048	1,031	959.22	847.43	834.27	837.56	742.82	846.61	859.25
Middle Distillates	7,757	5,269	5,549	5,286	4,301	4,607	6,853	6,408	7,589	8,832	6,909	7,944	8,823	10,477
Propane	1,289	952.77	1,121	1,082	983.67	1,056	926.06	843.33	1,002	1,407	1,152	1,031	991.38	956.60
Coal	1,316													
Steam	228.03	70.05												

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	145,575	97,889	94,357	87,646	83,141	87,384	101,303	94,413	90,324	95,028	85,688	88,263	96,313	110,672
Gross Output														
GDP	12,725	12,027	11,871	10,714	10,006	10,829	10,963	11,529	11,671	12,337	8,309	8,748	10,483	9,916

Product: lead, copper, nickel & zinc ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	0.253	0.234	0.256	0.248	0.251	0.240	0.235	0.239	0.268	0.286	0.258	0.281	0.272	0.266
Energy (TJ) / Output														
Energy (TJ) / GDP	2.890	1.907	2.039	2.033	2.083	1.939	2.172	1.954	2.076	2.200	2.660	2.832	2.500	2.967

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.928	1.015	0.984	0.992	0.951	0.931	0.945	1.062	1.131	1.021	1.111	1.077	1.052
Output														
GDP	1.000	0.660	0.706	0.703	0.721	0.671	0.752	0.676	0.719	0.761	0.921	0.980	0.865	1.027

Energy Consumption and Energy Intensity Indicators

CIEEDAC

NAICS 212231 Metal Ore Mining , Lead-Zinc Ore Mining

Notes: Data discontinued in 2003, merged as 212230. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Total	9,089	7,968	8,362	5,297	4,850	5,985	6,776	5,888	5,463	4,874	4,392	4,460	3,096	
Electricity	3,544	2,857	2,904	1,862	1,870	2,233	2,627	2,344	2,303	1,998	1,687	1,724	1,165	
Natural Gas	326.31	469.39	432.74	363.30	356.70	340.14	391.02	360.20	360.02	323.69	299.93	385.70		
Heavy Fuel Oil	896.78	889.24	1,256	1,153	1,076	1,081	1,015	1,075	993.06	898.50	880.34	993.01	954.13	
Middle Distillates	2,715	2,334	2,339	1,508	1,336	1,748	2,271	1,721	1,554	1,459	1,357	1,273	869.59	
Propane	232.13	126.73	131.60	103.38	112.93	141.39	343.92	284.72	166.47	119.16	97.63	84.01	108.03	
Coal	1,316	1,195	1,209	224.82		348.67	33.08	9.55	2.38					
Steam	58.97	97.43	89.55	82.09	98.01	93.26	94.78	94.29	83.69	75.32	70.05			

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Physical Units (kilotonne)	12,693	12,764	13,368	8,009	7,430	9,626	11,891	9,491	8,816	7,772	6,960	6,707	4,670	
Gross Output														
GDP														

Product: silver, lead & zinc ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Energy (TJ) / Unit (kilotonne)	0.716	0.624	0.626	0.661	0.653	0.622	0.570	0.620	0.620	0.627	0.631	0.665	0.663	
Energy (TJ) / Output														
Energy (TJ) / GDP														

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Physical Units	1.000	0.872	0.874	0.924	0.912	0.868	0.796	0.866	0.865	0.876	0.881	0.929	0.926	
Output														
GDP														

Energy Consumption and Energy Intensity Indicators

CIEEDAC

NAICS 212232 Metal Ore Mining , Nickel-Copper Ore Mining

Notes: Sum of 212232, Nickel-Copper and 212233, Copper-Zinc. Data discontinued in 2003, merged as 212230. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Total	27,684	27,313	24,474	23,004	21,448	23,601	22,758	21,493	21,166	16,689	18,544	19,742	18,681	
Electricity	18,517	18,223	16,505	15,597	13,926	15,366	14,066	13,388	13,235	9,994	11,265	11,722	11,121	
Natural Gas	2,772	3,043	2,963	2,785	2,713	2,843	3,197	3,185	2,796	2,323	2,472	2,644	2,112	
Heavy Fuel Oil	126.93	106.94	87.24	107.45	111.89	83.86	47.41	51.60		10.47	39.27	63.99	57.39	
Middle Distillates	5,042	4,889	4,252	3,924	3,547	4,072	4,037	3,667	4,060	3,453	3,912	4,276	4,417	
Propane	1,057	1,052	667.27	590.26	632.90	807.91	1,068	789.62	663.03	557.61	855.14	1,037	974.26	
Steam	169.06				517.31	428.52	342.52	411.72	412.00	351.74				

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Physical Units (kilotonne)	132,882	123,191	117,840	109,428	94,796	119,994	98,300	93,040	103,675	72,090	90,929	87,651	82,975	
Gross Output														
GDP														

Product: nickel, copper & zinc ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Energy (TJ) / Unit (kilotonne)	0.208	0.222	0.208	0.210	0.226	0.197	0.232	0.231	0.204	0.232	0.204	0.225	0.225	
Energy (TJ) / Output														
Energy (TJ) / GDP														

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Physical Units	1.000	1.064	0.997	1.009	1.086	0.944	1.111	1.109	0.980	1.111	0.979	1.081	1.081	
Output														
GDP														

Energy Consumption and Energy Intensity Indicators

NAICS 212291 Metal Ore Mining , Uranium Mines

Notes: Data discontinued in 1997, aggregated with Other Metal Mines, NAICS 212299. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated.
All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	7,083	4,479	3,731	3,101	3,472	3,424	3,310	2,843						
Electricity	2,947	1,532	1,469	1,114	1,187	1,122	990.32	848.52						
Natural Gas	2,290	1,140	775.86	507.97	682.64	504.68	280.23							
Middle Distillates	1,348	1,285	775.20	726.04	751.53	826.34	958.85	869.78						
Propane	497.82	522.06	627.92	752.39	851.15	971.42	1,081	1,124						
Steam			82.62											

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	5,131	2,284	2,023	1,732	1,510	1,647	1,377	1,008	656	522	649	636	577	587
Gross Output														
GDP														

Product: uranium ore milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	1.380	1.961	1.844	1.791	2.299	2.079	2.404	2.821						
Energy (TJ) / Output														
Energy (TJ) / GDP														

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.421	1.336	1.297	1.666	1.506	1.742	2.043						
Output														
GDP														

Energy Consumption and Energy Intensity Indicators

CIEEDAC

NAICS 212298 Metal Ore Mining , Other Metal Mines

Notes: Was NAICS 212299, discontinued in 1997 and aggregated with Uranium, NAICS 212291. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	1,952	1,985	1,514	1,362	1,814	2,074	2,186	2,105						
Electricity	1,223	1,268	938.15	792.00	910.98	988.03	946.91	828.09						
Natural Gas	116.51	119.92	115.53	134.94	163.76	134.92	137.31	119.47						
Heavy Fuel Oil	9.29	9.17	6.74	3.40	3.72	2.26	4.51	3.80						
Middle Distillates	533.34	517.94	403.16	391.85	694.56	890.75	1,023	1,085						
Propane	69.29	70.19	49.96	39.48	40.80	58.39	73.77	69.08						

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	17,098	16,360	13,353	12,811	12,803	12,996	11,871	11,165						
Gross Output														
GDP	1,596	1,669	1,551	1,371	1,181	1,204	1,330	1,274						

Product: other metal ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	0.114	0.121	0.113	0.106	0.142	0.160	0.184	0.189						
Energy (TJ) / Output														
Energy (TJ) / GDP	1.223	1.189	0.976	0.994	1.536	1.723	1.644	1.652						

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.063	0.993	0.931	1.241	1.398	1.613	1.652						
Output														
GDP	1.000	0.972	0.798	0.812	1.256	1.408	1.344	1.351						

Energy Consumption and Energy Intensity Indicators

CIEEDAC

NAICS 212299 Metal Ore Mining , Other Metal Mines

Notes: Data includes Uranium, NAICS 212291. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	9,034	4,906	8,217	10,313	7,425	6,248	6,506	6,670	6,856	7,191	5,679	5,624	6,424	7,224
Electricity	4,170	1,898	3,421	5,881	3,787	3,208	3,209	2,852	2,975	2,933	2,106	2,367	2,689	3,351
Natural Gas	2,407	116.29	1,687	1,269	488.04	150.20	151.43	149.18	156.40	167.08	151.88	159.28	83.56	105.31
Heavy Fuel Oil	9.29								5.72					
Middle Distillates	1,881	1,344	1,383	1,479	1,485	1,193	1,553	2,005	1,900	2,115	1,562	1,421	2,047	2,031
Propane	567.11	1,548	1,726	1,684	1,665	1,697	1,592	1,664	1,819	1,977	1,860	1,677	1,605	1,736

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	22,229	12,006	13,900	16,770	19,950	19,254	19,400	19,631	20,291	17,284	12,644	13,538	15,419	20,050
Gross Output														
GDP	1,596	2,308	2,029	2,883	2,693	2,299	2,044	1,867	1,551	1,519	1,698	1,728	1,660	1,715

Product: other metal ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	0.406	0.409	0.591	0.615	0.372	0.324	0.335	0.340	0.338	0.416	0.449	0.415	0.417	0.360
Energy (TJ) / Output														
Energy (TJ) / GDP	5.661	2.126	4.050	3.577	2.757	2.718	3.183	3.573	4.420	4.734	3.344	3.255	3.870	4.212

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.005	1.455	1.513	0.916	0.798	0.825	0.836	0.831	1.024	1.105	1.022	1.025	0.886
Output														
GDP	1.000	0.375	0.715	0.632	0.487	0.480	0.562	0.631	0.781	0.836	0.591	0.575	0.684	0.744

Energy Consumption and Energy Intensity Indicators

NAICS 212300 Non-Metal Min. Mining and Quarrying

Notes: Sum of all non-metal mining. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	45,632	51,700	50,009	48,748	52,249	55,186	52,999	58,410	58,655	59,105	39,514	45,199	62,675	58,063
Electricity	10,230	10,402	9,777	10,003	10,134	10,770	11,164	10,948	11,511	11,421	8,678	10,787	12,807	11,572
Natural Gas	24,639	28,236	27,455	25,833	27,585	28,718	25,371	30,885	31,124	29,556	15,790	18,959	32,823	30,243
Heavy Fuel Oil	2,440	1,305	1,258	1,148	1,074	981.44	923.97	856.48	871.28	960.29	608.42	660.61	688.43	305.33
Middle Distillates	7,642	11,218	10,933	11,207	12,892	14,146	15,058	15,319	14,617	16,648	13,894	14,176	15,756	15,057
Propane	369.29	347.78	363.63	359.39	357.07	366.55	298.89	244.33	271.87	267.25	294.86	371.37	336.59	362.61
Coal Coke														13.03
Steam	312.52	192.19	222.53	198.39	207.93	204.74	181.74	156.76	260.10	252.91	248.17	245.74	264.04	510.63

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	26,043	33,071	34,607	36,166	40,914	39,596	39,875	39,749	39,901	42,928	33,676	35,646	37,710	34,269
Gross Output														
GDP	2,536	3,286	3,583	3,814	4,567	4,899	4,885	4,600	5,332	5,036	3,473	4,477	4,678	4,326

Product: non-metal ores. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	1.752	1.563	1.445	1.348	1.277	1.394	1.329	1.469	1.470	1.377	1.173	1.268	1.662	1.694
Energy (TJ) / Output														
Energy (TJ) / GDP	17.994	15.733	13.957	12.781	11.441	11.265	10.849	12.698	11.001	11.737	11.377	10.096	13.398	13.422

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.892	0.825	0.769	0.729	0.795	0.759	0.839	0.839	0.786	0.670	0.724	0.949	0.967
Output														
GDP	1.000	0.874	0.776	0.710	0.636	0.626	0.603	0.706	0.611	0.652	0.632	0.561	0.745	0.746

Energy Consumption and Energy Intensity Indicators

NAICS 212310 Non-Metal Min. Mining and Quarrying , Stone Quarries

Notes: 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	2,967	4,687	4,787	4,382	4,305	4,889	4,620	4,615	4,360	4,674	3,981	4,325	4,652	3,892
Electricity	958.55	1,414	1,469	1,479	1,342	1,586	1,560	1,694	1,652	1,511	1,320	1,537	1,539	1,194
Natural Gas	95.21	524.79	672.78	467.02	540.95	505.17	323.64	345.37	270.35	356.56	276.58	258.85	311.14	349.55
Heavy Fuel Oil	43.52	5.95	6.11	6.18	6.19	11.13	11.70	16.39	24.74	6.38	6.25	6.25	6.61	21.73
Middle Distillates	1,833	2,686	2,585	2,369	2,369	2,746	2,696	2,538	2,386	2,767	2,357	2,459	2,769	2,292
Propane	36.74	56.24	53.96	61.34	47.57	40.11	28.28	21.01	25.70	32.67	21.82	64.43	27.01	34.46

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	111,352	97,071	100,290	99,990	101,361	112,782	114,641	116,496	115,821	104,564	100,698	113,607	114,656	
Gross Output														
GDP	564	664	742	682	674	730	742	805	815	824	772	996	1,013	980

Product: stone produced. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	0.027	0.048	0.048	0.044	0.042	0.043	0.040	0.040	0.038	0.045	0.040	0.038	0.041	
Energy (TJ) / Output														
Energy (TJ) / GDP	5.262	7.059	6.451	6.426	6.388	6.697	6.227	5.733	5.349	5.672	5.157	4.342	4.593	3.972

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.812	1.791	1.645	1.594	1.627	1.513	1.487	1.413	1.678	1.484	1.429	1.523	
Output														
GDP	1.000	1.342	1.226	1.221	1.214	1.273	1.183	1.089	1.017	1.078	0.980	0.825	0.873	0.755

Energy Consumption and Energy Intensity Indicators

NAICS 212323 Non-Metal Min. Mining and Quarrying , Sand & Gravel Mining & Quarrying

Notes: 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	2,540	5,088	4,924	4,711	4,708	5,364	6,063	6,057	5,554	6,079	4,682	4,869	5,980	5,945
Electricity	481.88	666.42	638.33	636.16	718.50	721.96	731.34	725.98	683.07	654.57	500.42	559.92	627.94	602.62
Natural Gas	265.74	661.75	638.69	411.71	257.32	327.15	508.48	538.39	517.53	422.59	301.64	298.11	465.42	492.95
Heavy Fuel Oil	6.12	108.54	73.20	90.97	61.87	119.03	75.54	35.43	39.52	44.12	1.67	25.45	26.62	37.61
Middle Distillates	1,736	3,626	3,546	3,540	3,623	4,139	4,705	4,714	4,252	4,900	3,855	3,969	4,827	4,739
Propane	50.60	26.17	27.73	31.62	46.76	56.37	43.08	43.01	61.85	58.00	23.59	16.81	33.20	59.67
Coal Coke														13.03

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	244,316	238,901	236,486	238,120	245,532	250,067	243,440	238,521	240,723	239,646				
Gross Output														
GDP	734	739	772	762	759	807	924	892	795	896	693	721	758	759

Product: sand & gravel (inc. silica). **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	0.010	0.021	0.021	0.020	0.019	0.021	0.025	0.025	0.023	0.025				
Energy (TJ) / Output														
Energy (TJ) / GDP	3.463	6.886	6.378	6.182	6.203	6.646	6.562	6.790	6.986	6.785	6.756	6.753	7.889	7.833

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	2.048	2.002	1.903	1.844	2.063	2.395	2.442	2.219	2.440				
Output														
GDP	1.000	1.988	1.842	1.785	1.791	1.919	1.895	1.961	2.017	1.959	1.951	1.950	2.278	2.262

Energy Consumption and Energy Intensity Indicators

NAICS 212326 Non-Metal Min. Mining and Quarrying , Shale, Clay & Refractory Mineral Mining & Quarrying

Notes: 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total		357.91	344.66	283.13	353.92	371.20	419.28	389.75	441.83	453.83	383.12	417.63	397.73	373.68
Electricity		162.64	162.89	131.54	161.38	182.71	211.17	202.06	215.28	224.87	236.58	204.54	206.76	194.71
Natural Gas		20.13	15.39	9.41	10.12	9.50	10.25	13.08	15.09	14.94	5.80	9.59	4.43	2.43
Middle Distillates		175.13	164.44	140.52	181.06	177.38	196.21	172.76	209.52	211.97	66.44	62.65	63.88	93.72
Propane			1.94	1.66	1.36	1.62	1.65	1.85	1.94	2.04	74.30	140.85	122.65	82.83

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)														
Gross Output														
GDP	734	739	772	762	759	807	924	892	795	896	693	721	758	759

Product: shale, clay & other refractory min. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)														
Energy (TJ) / Output														
Energy (TJ) / GDP		0.484	0.446	0.372	0.466	0.460	0.454	0.437	0.556	0.507	0.553	0.579	0.525	0.492

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units														
Output														
GDP														

Energy Consumption and Energy Intensity Indicators

NAICS 212393 Non-Metal Min. Mining and Quarrying , Salt Mines

Notes: 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	3,309	2,753	2,738	2,554	2,676	2,524	2,636	2,623	2,592	2,673	2,502	2,336	2,371	2,627
Electricity	472.83	546.04	615.95	606.54	648.83	655.11	639.54	620.96	610.16	649.54	603.66	608.08	627.10	572.58
Natural Gas	1,960	1,494	1,356	1,235	1,342	1,163	1,315	1,329	1,207	1,242	1,110	1,022	1,026	1,139
Heavy Fuel Oil	369.25	357.82	351.37	340.40	304.17	291.62	299.90	325.35	320.33	310.89	311.56	302.84	256.85	237.49
Middle Distillates	185.41	154.63	184.18	167.07	165.86	202.41	192.56	183.65	187.73	212.24	222.85	152.12	187.74	154.34
Propane	8.18	7.81	8.14	7.09	7.51	7.30	7.23	6.77	6.04	5.61	5.96	5.37	9.47	13.06
Steam	312.52	192.19	222.53	198.39	207.93	204.74	181.74	156.76	260.10	252.91	248.17	245.74	264.04	510.63

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	7,828	9,092	11,213	10,372	11,511	11,375	11,088	11,884	10,186	12,708	13,018	9,233	11,023	9,433
Gross Output														
GDP	201	257	278	248	281	269	264	286	244	314	290	234	281	250

Product: salt. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	0.423	0.303	0.244	0.246	0.232	0.222	0.238	0.221	0.254	0.210	0.192	0.253	0.215	0.278
Energy (TJ) / Output														
Energy (TJ) / GDP	16.487	10.695	9.855	10.312	9.521	9.374	9.991	9.156	10.602	8.526	8.635	9.993	8.445	10.513

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.716	0.578	0.583	0.550	0.525	0.562	0.522	0.602	0.498	0.455	0.599	0.509	0.659
Output														
GDP	1.000	0.649	0.598	0.625	0.578	0.569	0.606	0.555	0.643	0.517	0.524	0.606	0.512	0.638

Energy Consumption and Energy Intensity Indicators

NAICS 212394 Non-Metal Min. Mining and Quarrying , Asbestos Mines

Notes: Data not released after 1994, all years included in 212398. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**1991**	**1992**	**1993**	**1994**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	4,911	4,790	3,993	3,908	3,630									
Electricity	1,407	1,251	1,373	1,265	1,250									
Heavy Fuel Oil	1,823	1,973	1,365	1,491	1,288									
Middle Distillates	1,613	1,517	1,194	1,086	1,053									
Propane	67.25	48.09	61.85	66.45	38.88									

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	725	639	591	517	524									
Gross Output														
GDP														

Product: asbestos produced. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	6.777	7.495	6.761	7.565	6.934									
Energy (TJ) / Output														
Energy (TJ) / GDP														

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.106	0.998	1.116	1.023									
Output														
GDP														

Energy Consumption and Energy Intensity Indicators

CIEEDAC

NAICS 212395 Non-Metal Min. Mining and Quarrying , Gypsum Mines

Notes: 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	582.40	554.76	555.39	508.74	449.55	505.57	480.92	547.48	481.98	406.92	253.55	230.69	193.34	130.75
Electricity	199.34	167.29	188.12	144.92	82.49	87.79	80.24	95.67	90.27	87.02	71.25	56.03	28.37	25.80
Natural Gas		5.51	7.73	4.00										
Middle Distillates	378.75	380.00	357.64	357.15	364.18	415.11	398.91	451.38	391.28	319.47	181.80	174.32	164.49	104.56
Propane	4.32	1.95	1.90	2.68	2.89	2.67	1.76	0.44	0.44	0.44	0.50	0.33	0.48	0.39

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	8,532	8,949	8,403	8,997	8,002	9,142	8,604	9,216	8,070	6,694	3,753	3,196	2,760	2,281
Gross Output														
GDP														

Product: gypsum. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	0.068	0.062	0.066	0.057	0.056	0.055	0.056	0.059	0.060	0.061	0.068	0.072	0.070	0.057
Energy (TJ) / Output														
Energy (TJ) / GDP														

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.908	0.968	0.828	0.823	0.810	0.819	0.870	0.875	0.891	0.990	1.057	1.026	0.840
Output														
GDP														

Energy Consumption and Energy Intensity Indicators

NAICS 212396 Non-Metal Min. Mining and Quarrying , Potash Mines

Notes: 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	27,393	29,654	28,461	28,250	29,906	31,710	28,583	34,052	35,391	33,430	17,987	23,146	38,695	35,655
Electricity	6,090	6,022	5,430	5,839	6,121	6,507	6,854	6,546	7,208	7,160	4,887	6,753	8,419	8,115
Natural Gas	19,746	22,596	22,157	21,482	23,173	24,876	21,383	27,213	27,838	25,988	12,872	16,211	29,924	27,224
Middle Distillates	1,465	987.66	823.77	877.34	556.66	280.91	304.49	275.13	318.90	262.68	204.74	172.40	344.62	307.70
Propane	91.34	49.11	49.80	51.84	55.92	45.06	41.35	18.37	26.14	20.15	22.51	9.54	6.91	7.52

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	6,989	9,202	8,181	8,515	9,093	10,109	10,594	8,369	10,891	10,549	4,424	9,514	10,830	9,285
Gross Output														
GDP	782	1,217	1,021	1,074	1,235	1,417	1,405	1,032	1,727	1,379	349	1,185	1,336	1,146

Product: potash, in K2O equiv.. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	3.919	3.223	3.479	3.318	3.289	3.137	2.698	4.069	3.250	3.169	4.066	2.433	3.573	3.840
Energy (TJ) / Output														
Energy (TJ) / GDP	35.021	24.361	27.867	26.297	24.223	22.372	20.350	32.994	20.498	24.234	51.509	19.529	28.958	31.109

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.822	0.888	0.846	0.839	0.800	0.688	1.038	0.829	0.809	1.037	0.621	0.912	0.980
Output														
GDP	1.000	0.696	0.796	0.751	0.692	0.639	0.581	0.942	0.585	0.692	1.471	0.558	0.827	0.888

Energy Consumption and Energy Intensity Indicators

NAICS 212397 Non-Metal Min. Mining and Quarrying , Peat Industry

Notes: 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	652.82	873.81	837.98	830.31	1,058	1,181	1,152	1,067	1,082	1,038	763.01	638.29	617.61	689.58
Electricity	104.25	169.50	176.53	172.79	175.53	210.11	171.96	173.42	182.54	171.26	169.67	151.10	141.87	120.70
Natural Gas	304.96	229.92	202.60	216.12	458.48	421.00	449.36	331.98	429.16	352.60	102.19	85.36	127.75	66.48
Heavy Fuel Oil	4.40										4.22	7.51	6.59	
Middle Distillates	176.31	338.69	331.59	319.00	309.12	398.07	416.06	467.49	382.70	420.09	378.92	311.19	269.33	413.96
Propane	62.92	135.71	127.25	122.39	114.59	151.91	114.19	94.43	87.12	93.56	108.01	83.12	72.06	88.44

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	679	1,213	1,277	1,355	1,081	1,254	1,292	1,197	1,302	1,172	1,271	1,276	834	1,194
Gross Output														
GDP														

Product: peat. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	0.961	0.720	0.656	0.613	0.978	0.942	0.892	0.891	0.830	0.885	0.600	0.500	0.741	0.578
Energy (TJ) / Output														
Energy (TJ) / GDP														

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.749	0.683	0.638	1.018	0.980	0.928	0.928	0.864	0.921	0.625	0.521	0.771	0.601
Output														
GDP														

Energy Consumption and Energy Intensity Indicators

NAICS 212398 Non-Metal Min. Mining and Quarrying , All Other Non-Metallic Mineral Mining & Quarrying

Notes: Includes diamond mines (NAICS 212392) which began in 1998, and 212394 for all years. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	8,188	7,731	7,361	7,228	8,793	8,642	9,045	9,058	8,754	10,351	8,962	9,237	9,768	8,750
Electricity	1,923	1,254	1,096	993.21	885.14	818.73	915.60	890.17	869.55	962.61	889.68	917.98	1,217	745.75
Natural Gas	2,266	2,704	2,405	2,007	1,803	1,416	1,382	1,114	846.65	1,180	1,121	1,074	963.67	968.94
Heavy Fuel Oil	2,017	832.35	826.91	710.43	701.66	559.66	536.82	479.31	486.69	598.91	284.72	318.56	391.76	8.50
Middle Distillates	1,867	2,870	2,941	3,436	5,323	5,786	6,149	6,517	6,488	7,554	6,628	6,876	7,131	6,951
Propane	115.19	70.78	92.90	80.77	80.47	61.51	61.36	58.46	62.64	54.78	38.17	50.91	64.80	76.24

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	2,014	4,616	5,533	6,928	11,227	7,716	8,298	9,083	9,453	11,805	11,210	12,427	12,264	12,076
Gross Output														
GDP	205	476	679	857	1,350	1,422	1,318	1,334	1,751	1,623	1,369	1,341	1,290	1,191

Product: asbestos, diamond ores and other non-metals. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	4.065	1.675	1.330	1.043	0.783	1.120	1.090	0.997	0.926	0.877	0.799	0.743	0.796	0.725
Energy (TJ) / Output														
Energy (TJ) / GDP	39.923	16.239	10.836	8.433	6.516	6.077	6.863	6.789	4.999	6.377	6.546	6.888	7.572	7.347

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.412	0.327	0.257	0.193	0.276	0.268	0.245	0.228	0.216	0.197	0.183	0.196	0.178
Output														
GDP	1.000	0.407	0.271	0.211	0.163	0.152	0.172	0.170	0.125	0.160	0.164	0.173	0.190	0.184

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Energy Consumption and Energy Intensity Indicators

CIEEDAC

NAICS 331410 Primary Metal Manuf. , Non-Ferrous Metal (except Aluminium) Smelting & Refining

Notes: 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in terajoules (TJ). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: TJ	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	77,292	85,619	89,855	82,040	77,350	78,715	73,411	74,706	66,118	68,292	57,407	62,008	59,591	58,928
Electricity	31,040	42,322	44,294	41,264	39,816	40,675	35,590	35,337	22,137	27,817	23,907	26,004	24,422	24,025
Natural Gas	22,732	22,063	23,234	21,976	18,418	18,030	18,402	18,528	18,052	14,913	12,886	16,576	17,595	16,584
Heavy Fuel Oil	5,778	3,757	3,821	2,848	2,567	2,980	XX	XX	XX	XX	XX	XX	XX	XX
Middle Distillates	XX	946.27	1,647	652.42	754.26	800.29	831.12	975.78	1,233	XX	1,093	1,180	XX	XX
Propane	468.22	447.40	426.09	444.75	367.17	412.91	615.69	646.59	726.78	XX	706.17	629.86	XX	XX
Petroleum Coke	1,663	1,128	1,712	1,531	XX	1,898	1,617	1,990	XX	XX	XX	3,295	XX	XX
Coal	12,567	10,731	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Coal Coke	1,784	1,368	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Steam	XX	2,856	XX	XX	XX	XX	XX	XX	XX	XX	XX		XX	XX
Wood Waste												XX		
Confidential	1,259		14,721	13,325	15,428	13,919	16,355	17,229	23,969	25,562	18,815	14,323	17,574	18,318

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	1,534	1,868	1,730	1,827	1,680	1,858	1,732	1,851	1,764	1,741	1,487	1,490	1,465	1,446
Gross Output														
GDP	2,863	4,861	5,747	5,252	4,968	5,378	5,444	5,014	4,613	4,561	3,799	4,391	4,332	4,291

Product: nickel, copper, zinc, lead, magnesium. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Energy (TJ) / Unit (kilotonne)	50.385	45.826	51.944	44.898	46.041	42.362	42.374	40.368	37.473	39.220	38.607	41.624	40.682	40.743
Energy (TJ) / Output														
Energy (TJ) / GDP	26.992	17.612	15.635	15.622	15.571	14.638	13.485	14.900	14.332	14.972	15.112	14.122	13.758	13.733

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.910	1.031	0.891	0.914	0.841	0.841	0.801	0.744	0.778	0.766	0.826	0.807	0.809
Output														
GDP	1.000	0.652	0.579	0.579	0.577	0.542	0.500	0.552	0.531	0.555	0.560	0.523	0.510	0.509

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

NAICS 212000 Mining (not Oil, Gas and Coal)

Notes: Sum of metals, non metals for energy, GDP and GO, excludes Oil and Gas extraction and Coal Mining Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	5,837	5,516	5,318	5,151	5,601	5,385	5,656	6,054	6,108	6,514	4,877	5,564	6,471	6,536
Natural Gas	1,559	1,575	1,622	1,477	1,526	1,560	1,382	1,640	1,666	1,587	885.73	1,072	1,757	1,642
Heavy Fuel Oil	1,319	969.85	917.50	908.48	1,019	856.30	957.56	959.36	907.55	1,040	796.54	974.10	908.89	912.25
Middle Distillates	1,673	1,681	1,725	1,695	1,740	1,789	2,030	2,108	2,128	2,417	1,934	2,227	2,543	2,718
Propane	200.93	231.22	245.06	249.40	242.52	247.31	222.87	200.27	230.69	269.97	242.84	240.34	235.59	246.00
Coal	115.28												0.31	0.37
Coal Coke	969.42	1,059	808.24	820.83	1,073	932.22	1,063	1,147	1,176	1,201	1,018	1,051	1,026	1,018

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	308,518	278,086	259,286	257,066	273,001	266,601	287,511	286,556	274,385	287,136	257,714	282,574	288,712	310,399
Gross Output														
GDP	23,749	23,441	22,708	22,527	22,990	22,484	22,319	21,762	21,788	22,035	16,660	18,353	20,055	19,251

Product: mineral ores. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.019	0.020	0.021	0.020	0.021	0.020	0.020	0.021	0.022	0.023	0.019	0.020	0.022	0.021
CO_2 (kt) / Output														
CO_2 (kt) / GDP	0.246	0.235	0.234	0.229	0.244	0.239	0.253	0.278	0.280	0.296	0.293	0.303	0.323	0.340

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.048	1.084	1.059	1.084	1.068	1.040	1.117	1.176	1.199	1.000	1.041	1.185	1.113
Output														
GDP	1.000	0.957	0.953	0.930	0.991	0.974	1.031	1.132	1.141	1.203	1.191	1.233	1.313	1.381

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

CIEEDAC

NAICS 212200 Metal Ore Mining

Notes: Sum of all metal mining. Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	3,866	3,208	3,076	2,979	3,236	2,884	3,266	3,382	3,465	3,813	3,071	3,576	3,694	3,960
Natural Gas	326.25	169.60	259.20	194.17	160.71	139.02	128.10	113.06	121.21	131.48	108.76	141.23	147.71	158.83
Heavy Fuel Oil	1,137	873.95	825.06	824.09	940.25	784.15	889.64	896.40	843.51	969.88	751.81	925.54	858.29	889.81
Middle Distillates	1,139	895.92	960.28	911.62	840.05	802.67	981.03	1,040	1,110	1,257	966.91	1,241	1,447	1,670
Propane	179.09	210.47	223.36	227.95	221.22	225.44	205.04	185.69	214.47	254.02	225.25	218.19	215.51	224.36
Coal	115.28												0.31	0.37
Coal Coke	969.42	1,059	808.24	820.83	1,073	932.22	1,063	1,147	1,176	1,201	1,018	1,051	1,026	1,017

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	282,475	245,015	224,678	220,899	232,087	227,004	247,636	246,806	234,484	244,208	224,038	246,928	251,002	276,130
Gross Output														
GDP	21,213	20,155	19,125	18,713	18,423	17,585	17,434	17,162	16,456	16,999	13,187	13,876	15,377	14,925

Product: metal ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.014	0.013	0.014	0.013	0.014	0.013	0.013	0.014	0.015	0.016	0.014	0.014	0.015	0.014
CO_2 (kt) / Output														
CO_2 (kt) / GDP	0.182	0.159	0.161	0.159	0.176	0.164	0.187	0.197	0.211	0.224	0.233	0.258	0.240	0.265

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.957	1.000	0.985	1.019	0.928	0.964	1.001	1.080	1.141	1.002	1.058	1.075	1.048
Output														
GDP	1.000	0.874	0.883	0.873	0.964	0.900	1.028	1.081	1.155	1.231	1.278	1.414	1.318	1.456

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

CIEEDAC

NAICS 212210 Metal Ore Mining , Iron Ore Mining

Notes: Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	2,279	2,060	1,750	1,738	2,114	1,797	2,047	2,211	2,184	2,394	1,921	2,216	2,154	2,213
Natural Gas	32.48										0.08	0.09	0.08	0.07
Heavy Fuel Oil	1,039	797.44	739.27	741.16	851.96	700.38	806.84	820.88	778.32	905.13	685.26	870.94	796.06	826.65
Middle Distillates	237.27	202.62	201.82	174.53	185.53	162.54	174.41	240.46	226.76	285.79	215.37	291.05	329.01	366.22
Propane	0.40	1.12	0.80	1.77	2.65	1.96	3.01	2.76	2.46	2.28	2.18	3.27	2.87	3.45
Coal Coke	969.42	1,059	808.24	820.83	1,073	932.22	1,063	1,147	1,176	1,201	1,018	1,051	1,026	1,017

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	91,035	93,956	75,054	74,791	86,180	78,603	86,467	91,712	84,243	93,714	83,991	102,067	104,615	108,506
Gross Output														
GDP	2,086	1,975	1,319	1,305	1,665	1,402	1,484	1,627	1,470	1,427	1,335	1,587	1,442	1,503

Product: iron ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.025	0.022	0.023	0.023	0.025	0.023	0.024	0.024	0.026	0.026	0.023	0.022	0.021	0.020
CO_2 (kt) / Output														
CO_2 (kt) / GDP	1.092	1.043	1.327	1.332	1.269	1.282	1.379	1.359	1.485	1.677	1.439	1.396	1.493	1.473

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.876	0.932	0.929	0.980	0.913	0.946	0.963	1.036	1.020	0.914	0.867	0.822	0.815
Output														
GDP	1.000	0.955	1.215	1.219	1.162	1.173	1.263	1.244	1.360	1.535	1.317	1.278	1.367	1.348

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

CIEEDAC

NAICS 212220 Metal Ore Mining , Gold Mines

Notes: Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	343.65	327.58	361.63	362.22	347.71	326.98	307.18	276.28	297.74	292.13	240.67	380.71	463.36	542.13
Natural Gas	18.21	25.84	25.04	26.35	26.28	24.57	26.62	23.74	28.86	29.32	30.00	29.43	43.63	48.05
Heavy Fuel Oil	20.38	8.92	8.09	8.58	9.17	6.75	6.99	5.02	2.48	3.42	4.98			
Middle Distillates	235.98	232.65	275.80	266.16	251.72	236.43	221.79	214.15	222.74	209.52	162.27	297.93	361.67	433.41
Propane	68.91	60.17	52.70	61.13	60.54	59.24	51.78	33.37	43.67	49.86	43.41	53.36	57.76	60.30
Coal	0.17												0.31	0.37

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	23,637	41,164	41,367	41,692	42,816	41,763	40,465	41,051	39,625	38,182	41,715	43,059	34,655	36,902
Gross Output														
GDP	3,745	3,279	3,523	3,174	3,074	2,606	2,475	1,962	1,764	1,716	1,845	1,813	1,792	1,791

Product: gold ore milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.015	0.008	0.009	0.009	0.008	0.008	0.008	0.007	0.008	0.008	0.006	0.009	0.013	0.015
CO_2 (kt) / Output														
CO_2 (kt) / GDP	0.092	0.100	0.103	0.114	0.113	0.125	0.124	0.141	0.169	0.170	0.130	0.210	0.259	0.303

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.547	0.601	0.598	0.559	0.539	0.522	0.463	0.517	0.526	0.397	0.608	0.920	1.010
Output														
GDP	1.000	1.089	1.119	1.244	1.233	1.367	1.352	1.534	1.839	1.855	1.421	2.288	2.818	3.298

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

NAICS 212230 Metal Ore Mining , Lead-Zinc, Nickel-Copper-Zinc Ore Mining

Notes: Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	958.55	629.13	681.03	611.53	547.31	567.54	701.54	648.33	734.39	853.29	681.96	772.58	834.96	954.46
Natural Gas	155.10	137.97	150.40	104.85	110.27	107.02	94.00	81.95	84.60	93.93	71.21	103.89	99.91	105.55
Heavy Fuel Oil	76.64	67.60	77.70	74.35	79.12	77.03	75.82	70.51	62.29	61.32	61.57	54.60	62.23	63.16
Middle Distillates	535.46	366.72	386.05	367.76	299.23	320.48	476.48	445.56	527.70	614.09	480.47	552.55	613.66	728.68
Propane	76.24	56.84	66.89	64.57	58.69	63.01	55.25	50.31	59.80	83.94	68.71	61.53	59.15	57.07
Coal	115.11													

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	145,575	97,889	94,357	87,646	83,141	87,384	101,303	94,413	90,324	95,028	85,688	88,263	96,313	110,672
Gross Output														
GDP	12,725	12,027	11,871	10,714	10,006	10,829	10,963	11,529	11,671	12,337	8,309	8,748	10,483	9,916

Product: lead, copper, nickel & zinc ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.007	0.006	0.007	0.007	0.007	0.006	0.007	0.007	0.008	0.009	0.008	0.009	0.009	0.009
CO_2 (kt) / Output														
CO_2 (kt) / GDP	0.075	0.052	0.057	0.057	0.055	0.052	0.064	0.056	0.063	0.069	0.082	0.088	0.080	0.096

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.976	1.096	1.060	1.000	0.986	1.052	1.043	1.235	1.364	1.209	1.329	1.317	1.310
Output														
GDP	1.000	0.694	0.762	0.758	0.726	0.696	0.850	0.747	0.835	0.918	1.090	1.172	1.057	1.278

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

CIEEDAC

NAICS 212231 Metal Ore Mining , Lead-Zinc Ore Mining

Notes: Data discontinued in 2003, merged as 212230. Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Total	400.07	362.32	389.85	234.10	196.91	257.28	275.52	234.87	209.40	190.95	179.84	185.69	137.04	
Natural Gas	16.33	23.46	21.60	18.07	17.50	16.90	19.41	17.87	17.84	16.05	14.93	19.15		
Heavy Fuel Oil	67.14	66.57	94.03	86.33	80.55	80.92	76.00	80.45	73.00	66.05	64.71	72.99	70.13	
Middle Distillates	187.76	161.19	161.54	104.08	92.18	120.86	156.91	118.89	108.41	101.75	94.38	88.53	60.46	
Propane	13.73	7.50	7.78	6.11	6.68	8.36	20.34	16.84	9.93	7.11	5.82	5.01	6.45	
Coal	115.11	103.60	104.88	19.50		30.24	2.87	0.83	0.22					

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Physical Units (kilotonne)	12,693	12,764	13,368	8,009	7,430	9,626	11,891	9,491	8,816	7,772	6,960	6,707	4,670	
Gross Output														
GDP														

Product: silver, lead & zinc ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.032	0.028	0.029	0.029	0.027	0.027	0.023	0.025	0.024	0.025	0.026	0.028	0.029	
CO_2 (kt) / Output														
CO_2 (kt) / GDP														

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Physical Units	1.000	0.901	0.925	0.927	0.841	0.848	0.735	0.785	0.754	0.779	0.820	0.878	0.931	
Output														
GDP														

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

CIEEDAC

NAICS 212232 Metal Ore Mining , Nickel-Copper Ore Mining

Notes: Sum of 212232, Nickel-Copper and 212233, Copper-Zinc. Data discontinued in 2003, merged as 212230. Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Total	558.48	559.59	487.43	452.64	424.29	476.91	504.73	461.53	460.64	389.55	449.29	495.35	474.48	
Natural Gas	138.77	152.11	147.92	138.54	133.07	141.26	158.69	158.00	138.51	115.21	123.04	131.25	104.85	
Heavy Fuel Oil	9.50	8.01	6.53	8.04	8.38	6.28	3.55	3.86		0.77	2.89	4.70	4.22	
Middle Distillates	347.70	337.26	293.51	271.14	245.41	281.59	279.32	252.96	282.57	240.31	272.34	297.52	307.30	
Propane	62.51	62.21	39.47	34.91	37.43	47.78	63.17	46.70	39.56	33.27	51.02	61.88	58.12	

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Physical Units (kilotonne)	132,882	123,191	117,840	109,428	94,796	119,994	98,300	93,040	103,675	72,090	90,929	87,651	82,975	
Gross Output														
GDP														

Product: nickel, copper & zinc ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.004	0.005	0.004	0.004	0.004	0.004	0.005	0.005	0.004	0.005	0.005	0.006	0.006	
CO_2 (kt) / Output														
CO_2 (kt) / GDP														

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Physical Units	1.000	1.081	0.984	0.984	1.065	0.946	1.222	1.180	1.057	1.286	1.176	1.345	1.361	
Output														
GDP														

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

CIEEDAC

NAICS 212291 Metal Ore Mining , Uranium Mines

Notes: Data discontinued in 1997, aggregated with Other Metal Mines, NAICS 212299. Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	236.86	176.30	129.30	119.76	135.57	139.42	143.85	126.39						
Natural Gas	114.62	56.97	38.73	25.27	33.49	25.07	13.91							
Middle Distillates	92.80	88.46	53.43	49.99	51.74	56.89	66.01	59.88						
Propane	29.44	30.88	37.14	44.50	50.34	57.46	63.92	66.51						

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	5,131	2,284	2,023	1,732	1,510	1,647	1,377	1,008	656	522	649	636	577	587
Gross Output														
GDP														

Product: uranium ore milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.046	0.077	0.064	0.069	0.090	0.085	0.104	0.125						
CO_2 (kt) / Output														
CO_2 (kt) / GDP														

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.672	1.385	1.498	1.945	1.834	2.263	2.717						
Output														
GDP														

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

CIEEDAC

NAICS 212298 Metal Ore Mining , Other Metal Mines

Notes: Was NAICS 212299, discontinued in 1997 and aggregated with Uranium, NAICS 212291. Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	48.09	47.13	37.46	36.69	59.05	72.17	82.55	85.60						
Natural Gas	5.83	5.99	5.77	6.71	8.03	6.70	6.82	5.93						
Heavy Fuel Oil	0.70	0.69	0.50	0.25	0.28	0.17	0.34	0.28						
Middle Distillates	37.47	36.29	28.24	27.38	48.33	61.85	71.03	75.30						
Propane	4.10	4.15	2.95	2.34	2.41	3.45	4.36	4.09						

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	17,098	16,360	13,353	12,811	12,803	12,996	11,871	11,165						
Gross Output														
GDP	1,596	1,669	1,551	1,371	1,181	1,204	1,330	1,274						

Product: other metal ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.003	0.003	0.003	0.003	0.005	0.006	0.007	0.008						
CO_2 (kt) / Output														
CO_2 (kt) / GDP	0.030	0.028	0.024	0.027	0.050	0.060	0.062	0.067						

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.024	0.997	1.018	1.640	1.974	2.472	2.726						
Output														
GDP	1.000	0.937	0.802	0.888	1.659	1.989	2.060	2.229						

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

CIEEDAC

NAICS 212299 Metal Ore Mining , Other Metal Mines

Notes: Data includes Uranium, NAICS 212291. Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	284.96	192.06	283.35	266.63	227.07	191.89	210.84	246.63	249.10	273.54	227.21	206.92	242.43	250.20
Natural Gas	120.45	5.79	83.77	62.98	24.16	7.43	7.48	7.37	7.76	8.23	7.47	7.82	4.10	5.16
Heavy Fuel Oil	0.70								0.42					
Middle Distillates	130.27	93.94	96.61	103.17	103.57	83.22	108.35	140.00	132.37	147.38	108.79	99.08	142.60	141.49
Propane	33.54	92.34	102.98	100.49	99.34	101.24	95.00	99.25	108.54	117.94	110.95	100.02	95.74	103.55

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	22,229	12,006	13,900	16,770	19,950	19,254	19,400	19,631	20,291	17,284	12,644	13,538	15,419	20,050
Gross Output														
GDP	1,596	2,308	2,029	2,883	2,693	2,299	2,044	1,867	1,551	1,519	1,698	1,728	1,660	1,715

Product: other metal ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.013	0.016	0.020	0.016	0.011	0.010	0.011	0.013	0.012	0.016	0.018	0.015	0.016	0.012
CO_2 (kt) / Output														
CO_2 (kt) / GDP	0.179	0.083	0.140	0.092	0.084	0.083	0.103	0.132	0.161	0.180	0.134	0.120	0.146	0.146

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.248	1.590	1.240	0.888	0.777	0.848	0.980	0.958	1.235	1.402	1.192	1.227	0.973
Output														
GDP	1.000	0.466	0.782	0.518	0.472	0.467	0.578	0.740	0.899	1.008	0.749	0.671	0.818	0.817

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

CIEEDAC

NAICS 212300 Non-Metal Min. Mining and Quarrying

Notes: Sum of all non-metal mining. Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	1,972	2,307	2,242	2,172	2,366	2,501	2,389	2,671	2,643	2,702	1,807	1,988	2,777	2,576
Natural Gas	1,233	1,405	1,363	1,282	1,366	1,421	1,254	1,526	1,544	1,455	776.97	930.70	1,610	1,483
Heavy Fuel Oil	182.66	95.90	92.44	84.38	78.94	72.14	67.92	62.96	64.04	70.59	44.72	48.56	50.60	22.44
Middle Distillates	533.88	785.13	765.03	783.86	899.80	986.01	1,049	1,067	1,018	1,160	967.33	986.59	1,096	1,048
Propane	21.84	20.75	21.69	21.44	21.30	21.87	17.83	14.58	16.22	15.94	17.59	22.16	20.08	21.63
Coal Coke														1.12

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	26,043	33,071	34,607	36,166	40,914	39,596	39,875	39,749	39,901	42,928	33,676	35,646	37,710	34,269
Gross Output														
GDP	2,536	3,286	3,583	3,814	4,567	4,899	4,885	4,600	5,332	5,036	3,473	4,477	4,678	4,326

Product: non-metal ores. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.076	0.070	0.065	0.060	0.058	0.063	0.060	0.067	0.066	0.063	0.054	0.056	0.074	0.075
CO_2 (kt) / Output														
CO_2 (kt) / GDP	0.777	0.702	0.626	0.570	0.518	0.511	0.489	0.581	0.496	0.536	0.520	0.444	0.594	0.596

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.922	0.856	0.793	0.764	0.834	0.791	0.888	0.875	0.831	0.709	0.737	0.973	0.993
Output														
GDP	1.000	0.903	0.805	0.733	0.666	0.657	0.629	0.747	0.638	0.690	0.669	0.571	0.763	0.766

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

CIEEDAC

NAICS 212310 Non-Metal Min. Mining and Quarrying , Stone Quarries

Notes: Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	136.96	217.23	217.32	192.61	195.42	219.74	206.52	196.44	182.89	212.81	179.63	188.25	210.20	180.54
Natural Gas	4.77	26.12	33.40	23.19	26.78	25.00	16.00	17.07	13.41	17.55	13.61	12.71	15.26	17.14
Heavy Fuel Oil	3.26	0.44	0.45	0.45	0.45	0.82	0.86	1.20	1.82	0.47	0.46	0.46	0.49	1.60
Middle Distillates	126.76	187.31	180.25	165.31	165.35	191.53	187.97	176.91	166.12	192.84	164.26	171.24	192.85	159.74
Propane	2.17	3.36	3.22	3.66	2.84	2.39	1.69	1.25	1.53	1.95	1.30	3.84	1.61	2.06

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	111,352	97,071	100,290	99,990	101,361	112,782	114,641	116,496	115,821	104,564	100,698	113,607	114,656	
Gross Output														
GDP	564	664	742	682	674	730	742	805	815	824	772	996	1,013	980

Product: stone produced. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	
CO_2 (kt) / Output														
CO_2 (kt) / GDP	0.243	0.327	0.293	0.282	0.290	0.301	0.278	0.244	0.224	0.258	0.233	0.189	0.208	0.184

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.819	1.762	1.566	1.568	1.584	1.465	1.371	1.284	1.655	1.450	1.347	1.491	
Output														
GDP	1.000	1.347	1.206	1.163	1.194	1.239	1.146	1.005	0.924	1.063	0.958	0.778	0.854	0.758

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

NAICS 212323 Non-Metal Min. Mining and Quarrying , Sand & Gravel Mining & Quarrying

Notes: Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	137.04	295.45	286.43	276.07	272.65	316.82	360.95	360.26	328.38	368.91	284.74	293.81	362.52	361.31
Natural Gas	13.30	32.94	31.71	20.44	12.74	16.19	25.13	26.61	25.68	20.80	14.84	14.63	22.82	24.17
Heavy Fuel Oil	0.46	7.98	5.38	6.69	4.55	8.75	5.55	2.60	2.91	3.24	0.12	1.87	1.96	2.76
Middle Distillates	120.29	252.97	247.69	247.06	252.57	288.51	327.69	328.48	296.10	341.40	268.37	276.30	335.76	329.69
Propane	2.99	1.56	1.65	1.89	2.79	3.36	2.57	2.57	3.69	3.46	1.41	1.00	1.98	3.56
Coal Coke														1.12

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	244,316	238,901	236,486	238,120	245,532	250,067	243,440	238,521	240,723	239,646				
Gross Output														
GDP	734	739	772	762	759	807	924	892	795	896	693	721	758	759

Product: sand & gravel (inc. silica). **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.002				
CO_2 (kt) / Output														
CO_2 (kt) / GDP	0.187	0.400	0.371	0.362	0.359	0.393	0.391	0.404	0.413	0.412	0.411	0.408	0.478	0.476

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	2.205	2.159	2.067	1.980	2.259	2.643	2.693	2.432	2.744				
Output														
GDP	1.000	2.140	1.986	1.939	1.923	2.101	2.091	2.162	2.211	2.204	2.199	2.181	2.560	2.548

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

NAICS 212326 Non-Metal Min. Mining and Quarrying , Shale, Clay & Refractory Mineral Mining & Quarrying

Notes: Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total		13.60	12.71	10.63	13.63	13.32	14.72	13.21	15.97	16.12	9.42	13.24	12.00	11.59
Natural Gas		1.00	0.76	0.47	0.50	0.47	0.51	0.65	0.75	0.74	0.29	0.47	0.22	0.12
Middle Distillates		12.60	11.83	10.07	13.05	12.75	14.11	12.45	15.11	15.26	4.70	4.37	4.46	6.53
Propane			0.12	0.10	0.08	0.10	0.10	0.11	0.12	0.12	4.43	8.40	7.32	4.94

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)														
Gross Output														
GDP	734	739	772	762	759	807	924	892	795	896	693	721	758	759

Product: shale, clay & other refractory min. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)														
CO_2 (kt) / Output														
CO_2 (kt) / GDP		0.018	0.016	0.014	0.018	0.017	0.016	0.015	0.020	0.018	0.014	0.018	0.016	0.015

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units														
Output														
GDP														

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

NAICS 212393 Non-Metal Min. Mining and Quarrying , Salt Mines

Notes: Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	139.11	111.93	106.47	98.39	100.80	93.52	100.89	102.82	96.89	99.11	93.40	83.35	82.84	84.83
Natural Gas	98.13	74.39	67.32	61.31	66.43	57.55	65.00	65.71	59.91	61.14	54.63	50.17	50.32	55.84
Heavy Fuel Oil	27.64	26.30	25.83	25.02	22.36	21.44	22.04	23.92	23.55	22.85	22.90	22.26	18.88	17.46
Middle Distillates	12.86	10.78	12.83	11.64	11.56	14.10	13.42	12.79	13.07	14.78	15.52	10.60	13.07	10.75
Propane	0.48	0.47	0.49	0.42	0.45	0.44	0.43	0.40	0.36	0.33	0.36	0.32	0.57	0.78

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	7,828	9,092	11,213	10,372	11,511	11,375	11,088	11,884	10,186	12,708	13,018	9,233	11,023	9,433
Gross Output														
GDP	201	257	278	248	281	269	264	286	244	314	290	234	281	250

Product: salt. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.018	0.012	0.009	0.009	0.009	0.008	0.009	0.009	0.010	0.008	0.007	0.009	0.008	0.009
CO_2 (kt) / Output														
CO_2 (kt) / GDP	0.693	0.435	0.383	0.397	0.359	0.347	0.382	0.359	0.396	0.316	0.322	0.357	0.295	0.339

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.693	0.534	0.534	0.493	0.463	0.512	0.487	0.535	0.439	0.404	0.508	0.423	0.506
Output														
GDP	1.000	0.627	0.553	0.573	0.517	0.501	0.552	0.518	0.572	0.456	0.465	0.514	0.426	0.490

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

NAICS 212394 Non-Metal Min. Mining and Quarrying , Asbestos Mines

Notes: Data not released after 1994, all years included in 212398. Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**1991**	**1992**	**1993**	**1994**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	251.65	255.23	188.13	190.44	171.34									
Heavy Fuel Oil	136.49	147.73	102.17	111.64	96.46									
Middle Distillates	111.18	104.65	82.30	74.87	72.59									
Propane	3.98	2.84	3.66	3.93	2.30									

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	725	639	591	517	524									
Gross Output														
GDP														

Product: asbestos produced. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.347	0.399	0.319	0.369	0.327									
CO_2 (kt) / Output														
CO_2 (kt) / GDP														

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.150	0.917	1.061	0.942									
Output														
GDP														

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

NAICS 212395 Non-Metal Min. Mining and Quarrying , Gypsum Mines

Notes: Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	26.38	26.84	25.38	25.21	25.53	29.04	27.85	31.43	27.25	22.25	12.68	12.16	11.48	7.31
Natural Gas		0.27	0.38	0.20										
Middle Distillates	26.13	26.44	24.89	24.86	25.35	28.88	27.75	31.41	27.23	22.23	12.65	12.14	11.45	7.28
Propane	0.26	0.12	0.11	0.16	0.17	0.16	0.10	0.03	0.03	0.03	0.03	0.02	0.03	0.02

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	8,532	8,949	8,403	8,997	8,002	9,142	8,604	9,216	8,070	6,694	3,753	3,196	2,760	2,281
Gross Output														
GDP														

Product: gypsum. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.003
CO_2 (kt) / Output														
CO_2 (kt) / GDP														

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.970	0.977	0.906	1.032	1.027	1.047	1.103	1.092	1.075	1.093	1.230	1.345	1.036
Output														
GDP														

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

NAICS 212396 Non-Metal Min. Mining and Quarrying , Potash Mines

Notes: Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	1,100	1,199	1,163	1,133	1,191	1,254	1,081	1,366	1,406	1,299	649.31	808.49	1,492	1,357
Natural Gas	988.36	1,125	1,100	1,066	1,147	1,231	1,057	1,345	1,381	1,279	633.40	795.83	1,467	1,335
Middle Distillates	106.32	71.75	59.83	63.71	40.23	20.11	21.80	19.67	22.83	18.75	14.57	12.09	24.00	21.77
Propane	5.40	2.93	2.97	3.09	3.34	2.69	2.47	1.10	1.56	1.20	1.34	0.57	0.41	0.45

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	6,989	9,202	8,181	8,515	9,093	10,109	10,594	8,369	10,891	10,549	4,424	9,514	10,830	9,285
Gross Output														
GDP	782	1,217	1,021	1,074	1,235	1,417	1,405	1,032	1,727	1,379	349	1,185	1,336	1,146

Product: potash, in K2O equiv.. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.157	0.130	0.142	0.133	0.131	0.124	0.102	0.163	0.129	0.123	0.147	0.085	0.138	0.146
CO_2 (kt) / Output														
CO_2 (kt) / GDP	1.406	0.985	1.139	1.055	0.964	0.885	0.770	1.323	0.814	0.942	1.859	0.682	1.117	1.184

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.828	0.903	0.846	0.832	0.788	0.648	1.037	0.820	0.783	0.933	0.540	0.875	0.929
Output														
GDP	1.000	0.701	0.810	0.750	0.686	0.629	0.547	0.941	0.579	0.670	1.322	0.485	0.794	0.842

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

NAICS 212397 Non-Metal Min. Mining and Quarrying , Peat Industry

Notes: Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	31.46	43.10	40.71	40.23	51.04	57.59	57.96	54.56	53.12	52.17	38.16	31.36	29.79	37.33
Natural Gas	15.26	11.44	10.06	10.73	22.70	20.84	22.21	16.41	21.29	17.36	5.03	4.19	6.26	3.26
Heavy Fuel Oil	0.33										0.31	0.55	0.48	
Middle Distillates	12.15	23.55	23.06	22.20	21.51	27.69	28.94	32.51	26.62	29.23	26.37	21.65	18.74	28.79
Propane	3.72	8.10	7.59	7.30	6.84	9.06	6.81	5.63	5.20	5.58	6.44	4.96	4.30	5.28

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	679	1,213	1,277	1,355	1,081	1,254	1,292	1,197	1,302	1,172	1,271	1,276	834	1,194
Gross Output														
GDP														

Product: peat. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.046	0.036	0.032	0.030	0.047	0.046	0.045	0.046	0.041	0.045	0.030	0.025	0.036	0.031
CO_2 (kt) / Output														
CO_2 (kt) / GDP														

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.767	0.688	0.641	1.019	0.991	0.969	0.984	0.881	0.961	0.648	0.531	0.771	0.675
Output														
GDP														

Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

NAICS 212398 Non-Metal Min. Mining and Quarrying , All Other Non-Metallic Mineral Mining & Quarrying

Notes: Includes diamond mines (NAICS 212392) which began in 1998, and 212394 for all years. Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	400.59	399.72	390.36	395.73	515.84	517.31	539.08	546.98	532.76	630.78	539.27	557.34	575.82	536.09
Natural Gas	113.43	134.59	119.38	99.65	89.28	70.07	68.29	55.04	42.01	58.09	55.18	52.70	47.26	47.52
Heavy Fuel Oil	150.97	61.18	60.78	52.22	51.58	41.14	39.46	35.23	35.77	44.02	20.93	23.42	28.80	0.62
Middle Distillates	129.38	199.72	204.66	239.04	370.19	402.43	427.67	453.22	451.24	525.40	460.88	478.19	495.90	483.40
Propane	6.81	4.22	5.54	4.82	4.80	3.67	3.66	3.49	3.74	3.27	2.28	3.04	3.87	4.55

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	2,014	4,616	5,533	6,928	11,227	7,716	8,298	9,083	9,453	11,805	11,210	12,427	12,264	12,076
Gross Output														
GDP	205	476	679	857	1,350	1,422	1,318	1,334	1,751	1,623	1,369	1,341	1,290	1,191

Product: asbestos, diamond ores and other non-metals. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	0.199	0.087	0.071	0.057	0.046	0.067	0.065	0.060	0.056	0.053	0.048	0.045	0.047	0.044
CO_2 (kt) / Output														
CO_2 (kt) / GDP	1.953	0.840	0.575	0.462	0.382	0.364	0.409	0.410	0.304	0.389	0.394	0.416	0.446	0.450

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.435	0.355	0.287	0.231	0.337	0.327	0.303	0.283	0.269	0.242	0.226	0.236	0.223
Output														
GDP	1.000	0.430	0.294	0.236	0.196	0.186	0.209	0.210	0.156	0.199	0.202	0.213	0.229	0.230

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Carbon Dioxide Emissions and Carbon Dioxide Intensity Indicators

CIEEDAC

NAICS 331410 Primary Metal Manuf. , Non-Ferrous Metal (except Aluminium) Smelting & Refining

Notes: Negative confidential value for 1990 includes coal correction; coal data not available to CIEEDAC. Confidential data for 2001-12 estimated. Process emissions and biomass emissions are excluded from Total CO2. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	2,952	2,602	1,727	2,555	2,363	2,445	2,341	2,420	2,711	2,491	1,832	2,540	2,233	2,332
Natural Gas	1,138	1,098	1,153	1,091	911.72	892.32	909.54	915.72	895.73	734.21	634.09	813.75	862.87	813.30
Heavy Fuel Oil	432.58	276.19	280.87	209.31	188.66	219.02	XX	XX	XX	XX	XX	XX	XX	XX
Middle Distillates	XX	69.23	120.50	47.73	55.19	58.55	60.81	71.39	90.22	XX	79.97	86.35	XX	XX
Propane	27.69	26.69	25.42	26.53	21.91	24.63	36.73	38.58	43.36	XX	42.13	37.58	XX	XX
Petroleum Coke	140.79	90.18	139.07	125.97	XX	155.69	133.04	163.74	XX	XX	XX	271.94	XX	XX
Coal	1,083	923.43	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Coal Coke	153.46	117.70	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Wood Waste												XX		
Confidential	-23.15		7.16	1,054	1,186	1,095	1,201	1,231	1,682	1,757	1,076	1,331	1,370	1,518

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	1,534	1,868	1,730	1,827	1,680	1,858	1,732	1,851	1,764	1,741	1,487	1,490	1,465	1,446
Gross Output														
GDP	2,863	4,861	5,747	5,252	4,968	5,378	5,444	5,014	4,613	4,561	3,799	4,391	4,332	4,291

Product: nickel, copper, zinc, lead, magnesium. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2 (kt) / Unit (kilotonne)	1.924	1.392	0.998	1.398	1.407	1.316	1.351	1.308	1.537	1.430	1.232	1.705	1.524	1.612
CO_2 (kt) / Output														
CO_2 (kt) / GDP	1.031	0.535	0.300	0.486	0.476	0.455	0.430	0.483	0.588	0.546	0.482	0.579	0.515	0.543

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.724	0.519	0.726	0.731	0.684	0.702	0.680	0.798	0.743	0.640	0.886	0.792	0.838
Output														
GDP	1.000	0.519	0.291	0.472	0.462	0.441	0.417	0.468	0.570	0.530	0.468	0.561	0.500	0.527

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

NAICS 212000 Mining (not Oil, Gas and Coal)

Notes: Sum of metals, non metals for energy, GDP and GO, excludes Oil and Gas extraction and Coal Mining Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	5,935	5,614	5,419	5,249	5,705	5,490	5,772	6,175	6,231	6,653	4,987	5,690	6,615	6,688
Natural Gas	1,569	1,584	1,632	1,485	1,535	1,569	1,390	1,649	1,675	1,596	890.89	1,078	1,768	1,652
Heavy Fuel Oil	1,329	976.79	924.06	914.98	1,026	862.42	964.41	966.23	914.05	1,048	802.24	981.07	915.40	918.78
Middle Distillates	1,744	1,755	1,802	1,771	1,819	1,871	2,124	2,205	2,227	2,529	2,024	2,331	2,662	2,845
Propane	205.45	236.43	250.57	255.01	247.98	252.88	227.89	204.77	235.88	276.04	248.31	245.75	240.89	251.53
Coal	115.59												0.31	0.37
Coal Coke	972.09	1,061	810.47	823.09	1,076	934.79	1,066	1,150	1,179	1,204	1,021	1,054	1,028	1,021

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	308,518	278,086	259,286	257,066	273,001	266,601	287,511	286,556	274,385	287,136	257,714	282,574	288,712	310,399
Gross Output														
GDP	23,749	23,441	22,708	22,527	22,990	22,484	22,319	21,762	21,788	22,035	16,660	18,353	20,055	19,251

Product: mineral ores. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.019	0.020	0.021	0.020	0.021	0.021	0.020	0.022	0.023	0.023	0.019	0.020	0.023	0.022
CO_2e (kt) / Output														
CO_2e (kt) / GDP	0.250	0.239	0.239	0.233	0.248	0.244	0.259	0.284	0.286	0.302	0.299	0.310	0.330	0.347

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.050	1.086	1.062	1.086	1.071	1.044	1.120	1.181	1.204	1.006	1.047	1.191	1.120
Output														
GDP	1.000	0.958	0.955	0.933	0.993	0.977	1.035	1.136	1.145	1.208	1.198	1.241	1.320	1.390

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212200 Metal Ore Mining

Notes: Sum of all metal mining Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	3,934	3,265	3,135	3,036	3,290	2,935	3,327	3,445	3,532	3,889	3,130	3,649	3,776	4,053
Natural Gas	328.15	170.59	260.71	195.30	161.65	139.83	128.85	113.72	121.92	132.24	109.39	142.05	148.57	159.76
Heavy Fuel Oil	1,145	880.21	830.96	829.99	946.98	789.77	896.01	902.82	849.55	976.82	757.20	932.16	864.43	896.18
Middle Distillates	1,190	937.18	1,005	954.09	879.21	840.28	1,027	1,089	1,162	1,316	1,012	1,299	1,514	1,748
Propane	183.12	215.21	228.39	233.08	226.20	230.52	209.66	189.87	219.30	259.74	230.32	223.10	220.36	229.41
Coal	115.59												0.31	0.37
Coal Coke	972.09	1,061	810.47	823.09	1,076	934.79	1,066	1,150	1,179	1,204	1,021	1,054	1,028	1,020

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	282,475	245,015	224,678	220,899	232,087	227,004	247,636	246,806	234,484	244,208	224,038	246,928	251,002	276,130
Gross Output														
GDP	21,213	20,155	19,125	18,713	18,423	17,585	17,434	17,162	16,456	16,999	13,187	13,876	15,377	14,925

Product: metal ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.014	0.013	0.014	0.014	0.014	0.013	0.013	0.014	0.015	0.016	0.014	0.015	0.015	0.015
CO_2e (kt) / Output														
CO_2e (kt) / GDP	0.185	0.162	0.164	0.162	0.179	0.167	0.191	0.201	0.215	0.229	0.237	0.263	0.246	0.272

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.957	1.002	0.987	1.018	0.928	0.965	1.002	1.081	1.143	1.003	1.061	1.080	1.054
Output														
GDP	1.000	0.873	0.884	0.875	0.963	0.900	1.029	1.082	1.157	1.233	1.280	1.418	1.324	1.464

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212210 Metal Ore Mining , Iron Ore Mining

Notes: Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	2,300	2,078	1,767	1,754	2,131	1,812	2,064	2,231	2,203	2,417	1,939	2,238	2,177	2,238
Natural Gas	32.67										0.08	0.09	0.08	0.07
Heavy Fuel Oil	1,046	803.15	744.57	746.46	858.06	705.39	812.61	826.75	783.89	911.61	690.17	877.17	801.76	832.57
Middle Distillates	248.12	212.10	211.25	182.68	194.19	170.14	182.49	251.71	237.33	299.18	225.39	304.37	343.84	382.58
Propane	0.40	1.15	0.82	1.81	2.71	2.00	3.07	2.82	2.51	2.33	2.23	3.34	2.94	3.52
Coal Coke	972.09	1,061	810.47	823.09	1,076	934.79	1,066	1,150	1,179	1,204	1,021	1,054	1,028	1,020

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	91,035	93,956	75,054	74,791	86,180	78,603	86,467	91,712	84,243	93,714	83,991	102,067	104,615	108,506
Gross Output														
GDP	2,086	1,975	1,319	1,305	1,665	1,402	1,484	1,627	1,470	1,427	1,335	1,587	1,442	1,503

Product: iron ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.025	0.022	0.024	0.023	0.025	0.023	0.024	0.024	0.026	0.026	0.023	0.022	0.021	0.021
CO_2e (kt) / Output														
CO_2e (kt) / GDP	1.103	1.052	1.340	1.344	1.280	1.293	1.391	1.371	1.499	1.694	1.452	1.411	1.510	1.489

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.875	0.932	0.928	0.979	0.913	0.945	0.963	1.035	1.021	0.914	0.868	0.824	0.817
Output														
GDP	1.000	0.954	1.215	1.219	1.161	1.172	1.261	1.244	1.359	1.536	1.317	1.279	1.369	1.351

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

NAICS 212220 Metal Ore Mining , Gold Mines

Notes: Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	356.07	339.71	375.77	376.16	361.04	339.66	319.10	287.40	309.37	303.24	249.33	396.05	481.86	564.34
Natural Gas	18.32	25.99	25.19	26.50	26.43	24.71	26.77	23.88	29.02	29.49	30.18	29.60	43.88	48.33
Heavy Fuel Oil	20.53	8.98	8.14	8.65	9.24	6.79	7.04	5.05	2.49	3.45	5.02			
Middle Distillates	246.59	243.21	288.56	278.52	263.47	247.57	232.34	224.34	233.21	219.31	169.74	311.89	378.61	453.99
Propane	70.46	61.52	53.88	62.50	61.90	60.57	52.95	34.12	44.65	50.99	44.39	54.56	59.06	61.65
Coal	0.17												0.31	0.37

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	23,637	41,164	41,367	41,692	42,816	41,763	40,465	41,051	39,625	38,182	41,715	43,059	34,655	36,902
Gross Output														
GDP	3,745	3,279	3,523	3,174	3,074	2,606	2,475	1,962	1,764	1,716	1,845	1,813	1,792	1,791

Product: gold ore milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.015	0.008	0.009	0.009	0.008	0.008	0.008	0.007	0.008	0.008	0.006	0.009	0.014	0.015
CO_2e (kt) / Output														
CO_2e (kt) / GDP	0.095	0.104	0.107	0.119	0.117	0.130	0.129	0.146	0.175	0.177	0.135	0.218	0.269	0.315

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.548	0.603	0.599	0.560	0.540	0.523	0.465	0.518	0.527	0.397	0.611	0.923	1.015
Output														
GDP	1.000	1.090	1.122	1.246	1.235	1.371	1.356	1.541	1.845	1.858	1.421	2.297	2.828	3.314

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

NAICS 212230 Metal Ore Mining , Lead-Zinc, Nickel-Copper-Zinc Ore Mining

Notes: Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	986.44	648.86	702.14	631.44	563.94	585.27	726.56	671.65	761.79	885.40	707.16	801.12	866.38	991.33
Natural Gas	156.00	138.77	151.27	105.46	110.91	107.64	94.54	82.43	85.09	94.48	71.63	104.50	100.50	106.17
Heavy Fuel Oil	77.19	68.08	78.25	74.88	79.69	77.58	76.36	71.01	62.74	61.76	62.01	54.99	62.68	63.61
Middle Distillates	559.88	383.88	404.22	385.08	313.33	335.63	499.16	466.77	552.82	643.33	503.27	578.71	642.73	763.19
Propane	77.96	58.12	68.40	66.02	60.01	64.42	56.49	51.45	61.15	85.83	70.26	62.92	60.48	58.36
Coal	115.42													

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	145,575	97,889	94,357	87,646	83,141	87,384	101,303	94,413	90,324	95,028	85,688	88,263	96,313	110,672
Gross Output														
GDP	12,725	12,027	11,871	10,714	10,006	10,829	10,963	11,529	11,671	12,337	8,309	8,748	10,483	9,916

Product: lead, copper, nickel & zinc ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.009	0.008	0.009	0.009	0.009
CO_2e (kt) / Output														
CO_2e (kt) / GDP	0.078	0.054	0.059	0.059	0.056	0.054	0.066	0.058	0.065	0.072	0.085	0.092	0.083	0.100

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.978	1.098	1.063	1.001	0.988	1.058	1.050	1.245	1.375	1.218	1.339	1.328	1.322
Output														
GDP	1.000	0.696	0.763	0.760	0.727	0.697	0.855	0.752	0.842	0.926	1.098	1.181	1.066	1.290

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212231 Metal Ore Mining , Lead-Zinc Ore Mining

Notes: Data discontinued in 2003, merged as 212230. Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Total	409.56	370.67	398.41	239.78	202.00	263.60	283.69	241.28	215.11	196.27	184.99	190.65	140.57	
Natural Gas	16.43	23.60	21.73	18.18	17.60	17.00	19.52	17.97	17.94	16.15	15.02	19.26		
Heavy Fuel Oil	67.62	67.05	94.71	86.95	81.13	81.50	76.54	81.03	73.52	66.52	65.17	73.51	70.64	
Middle Distillates	196.06	168.48	168.85	108.85	96.44	126.23	163.95	124.23	113.27	106.33	98.85	92.75	63.34	
Propane	14.04	7.66	7.96	6.25	6.83	8.55	20.80	17.22	10.16	7.27	5.96	5.12	6.59	
Coal	115.42	103.88	105.16	19.55		30.32	2.88	0.83	0.22					

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Physical Units (kilotonne)	12,693	12,764	13,368	8,009	7,430	9,626	11,891	9,491	8,816	7,772	6,960	6,707	4,670	
Gross Output														
GDP														

Product: silver, lead & zinc ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.032	0.029	0.030	0.030	0.027	0.027	0.024	0.025	0.024	0.025	0.027	0.028	0.030	
CO_2e (kt) / Output														
CO_2e (kt) / GDP														

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Physical Units	1.000	0.900	0.924	0.928	0.843	0.849	0.739	0.788	0.756	0.783	0.824	0.881	0.933	
Output														
GDP														

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212232 Metal Ore Mining , Nickel-Copper Ore Mining

Notes: Sum of 212232, Nickel-Copper and 212233, Copper-Zinc. Data discontinued in 2003, merged as 212230. Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Total	576.88	577.47	502.62	466.48	436.76	491.33	519.35	475.21	475.53	402.19	463.87	511.49	490.87	
Natural Gas	139.57	152.99	148.78	139.35	133.85	142.08	159.62	158.92	139.31	115.88	123.76	132.01	105.46	
Heavy Fuel Oil	9.57	8.06	6.58	8.10	8.44	6.32	3.57	3.89		0.78	2.91	4.74	4.25	
Middle Distillates	363.81	352.80	306.91	283.33	256.20	294.07	291.57	264.65	295.77	251.52	285.04	311.47	321.74	
Propane	63.92	63.61	40.35	35.70	38.28	48.86	64.59	47.75	40.45	34.02	52.17	63.27	59.43	

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Physical Units (kilotonne)	132,882	123,191	117,840	109,428	94,796	119,994	98,300	93,040	103,675	72,090	90,929	87,651	82,975	
Gross Output														
GDP														

Product: nickel, copper & zinc ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.004	0.005	0.004	0.004	0.005	0.004	0.005	0.005	0.005	0.006	0.005	0.006	0.006	
CO_2e (kt) / Output														
CO_2e (kt) / GDP														

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2012**
Physical Units	1.000	1.080	0.982	0.982	1.061	0.943	1.217	1.177	1.057	1.285	1.175	1.344	1.363	
Output														
GDP														

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212291 Metal Ore Mining , Uranium Mines

Notes: Data discontinued in 1997, aggregated with Other Metal Mines, NAICS 212299. Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	242.61	181.54	132.86	123.29	139.36	143.57	148.51	130.74						
Natural Gas	115.29	57.30	38.96	25.42	33.68	25.22	13.99							
Middle Distillates	97.22	92.67	55.93	52.37	54.20	59.60	69.16	62.73						
Propane	30.11	31.57	37.97	45.50	51.48	58.75	65.36	68.00						

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	5,131	2,284	2,023	1,732	1,510	1,647	1,377	1,008	656	522	649	636	577	587
Gross Output														
GDP														

Product: uranium ore milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.047	0.079	0.066	0.071	0.092	0.087	0.108	0.130						
CO_2e (kt) / Output														
CO_2e (kt) / GDP														

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.681	1.389	1.506	1.952	1.844	2.281	2.744						
Output														
GDP														

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212298 Metal Ore Mining , Other Metal Mines

Notes: Was NAICS 212299, discontinued in 1997 and aggregated with Uranium, NAICS 212291. Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	49.45	48.51	38.55	37.78	61.08	74.85	85.63	88.85						
Natural Gas	5.87	6.03	5.80	6.75	8.08	6.74	6.85	5.96						
Heavy Fuel Oil	0.70	0.69	0.51	0.26	0.28	0.17	0.34	0.29						
Middle Distillates	38.69	37.55	29.22	28.38	50.25	64.40	73.98	78.43						
Propane	4.19	4.24	3.02	2.39	2.47	3.53	4.46	4.18						

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	17,098	16,360	13,353	12,811	12,803	12,996	11,871	11,165						
Gross Output														
GDP	1,596	1,669	1,551	1,371	1,181	1,204	1,330	1,274						

Product: other metal ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.003	0.003	0.003	0.003	0.005	0.006	0.007	0.008						
CO_2e (kt) / Output														
CO_2e (kt) / GDP	0.031	0.029	0.025	0.028	0.052	0.062	0.064	0.070						

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.025	0.998	1.020	1.650	1.991	2.494	2.752						
Output														
GDP	1.000	0.938	0.802	0.890	1.669	2.006	2.078	2.251						

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212299 Metal Ore Mining , Other Metal Mines

Notes: Data includes Uranium, NAICS 212291. Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	292.06	198.23	290.35	273.90	234.10	197.93	217.88	255.06	257.62	282.95	234.74	213.70	251.17	259.07
Natural Gas	121.15	5.82	84.25	63.34	24.30	7.48	7.53	7.42	7.81	8.27	7.52	7.86	4.12	5.19
Heavy Fuel Oil	0.70								0.42					
Middle Distillates	135.91	97.99	100.80	107.81	108.22	86.94	113.21	146.16	138.41	154.08	113.78	103.56	149.16	148.00
Propane	34.30	94.42	105.29	102.75	101.58	103.52	97.14	101.48	110.98	120.59	113.44	102.27	97.89	105.88

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	22,229	12,006	13,900	16,770	19,950	19,254	19,400	19,631	20,291	17,284	12,644	13,538	15,419	20,050
Gross Output														
GDP	1,596	2,308	2,029	2,883	2,693	2,299	2,044	1,867	1,551	1,519	1,698	1,728	1,660	1,715

Product: other metal ores milled. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.013	0.017	0.021	0.016	0.012	0.010	0.011	0.013	0.013	0.016	0.019	0.016	0.016	0.013
CO_2e (kt) / Output														
CO_2e (kt) / GDP	0.183	0.086	0.143	0.095	0.087	0.086	0.107	0.137	0.166	0.186	0.138	0.124	0.151	0.151

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.257	1.590	1.243	0.893	0.782	0.855	0.989	0.966	1.246	1.413	1.201	1.240	0.983
Output														
GDP	1.000	0.469	0.782	0.519	0.475	0.470	0.582	0.746	0.908	1.018	0.755	0.676	0.827	0.825

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212300 Non-Metal Min. Mining and Quarrying

Notes: Sum of all non-metal mining. Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	2,000	2,349	2,283	2,214	2,414	2,555	2,445	2,730	2,699	2,764	1,857	2,040	2,838	2,635
Natural Gas	1,240	1,414	1,371	1,290	1,373	1,430	1,261	1,535	1,553	1,464	781.49	936.12	1,619	1,492
Heavy Fuel Oil	183.97	96.59	93.10	84.99	79.50	72.66	68.40	63.41	64.50	71.09	45.04	48.91	50.97	22.60
Middle Distillates	553.49	817.93	797.16	817.05	939.57	1,031	1,097	1,116	1,065	1,213	1,012	1,033	1,148	1,097
Propane	22.33	21.22	22.18	21.92	21.78	22.36	18.23	14.90	16.58	16.30	17.99	22.65	20.53	22.12
Coal Coke														1.12

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	26,043	33,071	34,607	36,166	40,914	39,596	39,875	39,749	39,901	42,928	33,676	35,646	37,710	34,269
Gross Output														
GDP	2,536	3,286	3,583	3,814	4,567	4,899	4,885	4,600	5,332	5,036	3,473	4,477	4,678	4,326

Product: non-metal ores. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.077	0.071	0.066	0.061	0.059	0.065	0.061	0.069	0.068	0.064	0.055	0.057	0.075	0.077
CO_2e (kt) / Output														
CO_2e (kt) / GDP	0.789	0.715	0.637	0.580	0.529	0.522	0.501	0.593	0.506	0.549	0.535	0.456	0.607	0.609

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.925	0.859	0.797	0.768	0.840	0.798	0.894	0.881	0.838	0.718	0.745	0.980	1.001
Output														
GDP	1.000	0.906	0.808	0.736	0.670	0.661	0.635	0.752	0.642	0.696	0.678	0.578	0.769	0.772

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

NAICS 212310 Non-Metal Min. Mining and Quarrying , Stone Quarries

Notes: Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	142.65	225.90	225.69	200.18	202.94	228.56	215.16	204.61	190.76	221.74	187.22	196.31	219.21	187.98
Natural Gas	4.79	26.27	33.60	23.32	26.93	25.15	16.09	17.17	13.49	17.66	13.69	12.78	15.35	17.24
Heavy Fuel Oil	3.28	0.44	0.45	0.46	0.46	0.82	0.87	1.21	1.83	0.47	0.46	0.46	0.49	1.61
Middle Distillates	132.36	195.76	188.35	172.66	172.65	200.14	196.48	184.94	173.86	201.62	171.74	179.14	201.72	167.03
Propane	2.22	3.43	3.29	3.74	2.90	2.45	1.73	1.28	1.57	1.99	1.33	3.93	1.65	2.10

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	111,352	97,071	100,290	99,990	101,361	112,782	114,641	116,496	115,821	104,564	100,698	113,607	114,656	
Gross Output														
GDP	564	664	742	682	674	730	742	805	815	824	772	996	1,013	980

Product: stone produced. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	
CO_2e (kt) / Output														
CO_2e (kt) / GDP	0.253	0.340	0.304	0.294	0.301	0.313	0.290	0.254	0.234	0.269	0.243	0.197	0.216	0.192

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.817	1.757	1.563	1.563	1.582	1.465	1.371	1.286	1.655	1.451	1.349	1.492	
Output														
GDP	1.000	1.345	1.202	1.160	1.190	1.237	1.146	1.005	0.925	1.064	0.958	0.779	0.855	0.758

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

NAICS 212323 Non-Metal Min. Mining and Quarrying , Sand & Gravel Mining & Quarrying

Notes: Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	142.35	306.99	297.48	287.25	284.27	330.14	376.28	375.50	342.31	384.75	297.32	306.76	378.56	377.09
Natural Gas	13.38	33.13	31.89	20.56	12.81	16.28	25.28	26.77	25.83	20.93	14.93	14.72	22.96	24.32
Heavy Fuel Oil	0.46	8.04	5.42	6.73	4.58	8.81	5.59	2.62	2.93	3.27	0.12	1.88	1.97	2.78
Middle Distillates	125.45	264.23	258.47	258.03	264.02	301.60	342.78	343.49	309.78	357.02	280.83	289.14	351.61	345.23
Propane	3.06	1.60	1.69	1.93	2.85	3.44	2.63	2.62	3.77	3.54	1.44	1.03	2.03	3.64
Coal Coke														1.12

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	244,316	238,901	236,486	238,120	245,532	250,067	243,440	238,521	240,723	239,646				
Gross Output														
GDP	734	739	772	762	759	807	924	892	795	896	693	721	758	759

Product: sand & gravel (inc. silica). **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.002				
CO_2e (kt) / Output														
CO_2e (kt) / GDP	0.194	0.415	0.385	0.377	0.375	0.409	0.407	0.421	0.431	0.429	0.429	0.425	0.499	0.497

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	2.206	2.159	2.070	1.987	2.266	2.653	2.702	2.441	2.756				
Output														
GDP	1.000	2.141	1.986	1.943	1.930	2.108	2.098	2.169	2.219	2.213	2.211	2.192	2.574	2.560

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

NAICS 212326 Non-Metal Min. Mining and Quarrying , Shale, Clay & Refractory Mineral Mining & Quarrying

Notes: Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total		13.83	12.93	10.85	13.85	13.56	14.98	13.42	16.22	16.39	9.67	13.63	12.36	12.00
Natural Gas		1.01	0.77	0.47	0.50	0.47	0.51	0.65	0.75	0.74	0.29	0.47	0.22	0.12
Middle Distillates		12.82	12.04	10.28	13.26	12.99	14.37	12.65	15.35	15.52	4.85	4.57	4.66	6.83
Propane			0.12	0.10	0.08	0.10	0.10	0.11	0.12	0.12	4.53	8.59	7.48	5.05

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)														
Gross Output														
GDP	734	739	772	762	759	807	924	892	795	896	693	721	758	759

Product: shale, clay & other refractory min. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)														
CO_2e (kt) / Output														
CO_2e (kt) / GDP		0.019	0.017	0.014	0.018	0.017	0.016	0.015	0.020	0.018	0.014	0.019	0.016	0.016

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units														
Output														
GDP														

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212393 Non-Metal Min. Mining and Quarrying , Salt Mines

Notes: Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	140.44	113.05	107.64	99.47	101.88	94.66	102.05	103.97	98.02	100.32	94.61	84.29	83.88	85.79
Natural Gas	98.70	74.82	67.72	61.66	66.82	57.88	65.38	66.09	60.26	61.50	54.95	50.46	50.61	56.17
Heavy Fuel Oil	27.84	26.49	26.01	25.20	22.52	21.59	22.20	24.09	23.71	23.02	23.07	22.42	19.01	17.58
Middle Distillates	13.40	11.27	13.42	12.17	12.09	14.75	14.03	13.38	13.68	15.46	16.24	11.08	13.68	11.24
Propane	0.49	0.48	0.50	0.43	0.46	0.45	0.44	0.41	0.37	0.34	0.36	0.33	0.58	0.80

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	7,828	9,092	11,213	10,372	11,511	11,375	11,088	11,884	10,186	12,708	13,018	9,233	11,023	9,433
Gross Output														
GDP	201	257	278	248	281	269	264	286	244	314	290	234	281	250

Product: salt. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.018	0.012	0.010	0.010	0.009	0.008	0.009	0.009	0.010	0.008	0.007	0.009	0.008	0.009
CO_2e (kt) / Output														
CO_2e (kt) / GDP	0.700	0.439	0.387	0.402	0.362	0.352	0.387	0.363	0.401	0.320	0.326	0.361	0.299	0.343

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.693	0.535	0.535	0.493	0.464	0.513	0.488	0.536	0.440	0.405	0.509	0.424	0.507
Output														
GDP	1.000	0.628	0.554	0.574	0.518	0.502	0.553	0.519	0.573	0.457	0.467	0.515	0.427	0.491

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212394 Non-Metal Min. Mining and Quarrying , Asbestos Mines

Notes: Data not released after 1994, all years included in 212398. Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**1991**	**1992**	**1993**	**1994**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	257.91	261.17	192.78	194.80	175.47									
Heavy Fuel Oil	137.47	148.79	102.90	112.43	97.15									
Middle Distillates	116.37	109.47	86.13	78.35	75.97									
Propane	4.07	2.91	3.74	4.02	2.35									

Activity Data	**1990**	**1991**	**1992**	**1993**	**1994**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	725	639	591	517	524									
Gross Output														
GDP														

Product: asbestos produced. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**1991**	**1992**	**1993**	**1994**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.356	0.409	0.326	0.377	0.335									
CO_2e (kt) / Output														
CO_2e (kt) / GDP														

Index (1990=1) based on:	**1990**	**1991**	**1992**	**1993**	**1994**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	1.148	0.917	1.059	0.942									
Output														
GDP														

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212395 Non-Metal Min. Mining and Quarrying , Gypsum Mines

Notes: Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	27.59	28.08	26.56	26.38	26.71	30.40	29.17	32.91	28.53	23.30	13.27	12.72	12.01	7.64
Natural Gas		0.28	0.39	0.20										
Middle Distillates	27.33	27.68	26.05	26.02	26.53	30.24	29.06	32.88	28.50	23.27	13.24	12.70	11.98	7.62
Propane	0.26	0.12	0.12	0.16	0.18	0.16	0.11	0.03	0.03	0.03	0.03	0.02	0.03	0.02

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	8,532	8,949	8,403	8,997	8,002	9,142	8,604	9,216	8,070	6,694	3,753	3,196	2,760	2,281
Gross Output														
GDP														

Product: gypsum. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.004	0.003	0.004	0.004	0.004	0.003
CO_2e (kt) / Output														
CO_2e (kt) / GDP														

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.970	0.977	0.907	1.032	1.028	1.048	1.104	1.093	1.076	1.094	1.231	1.346	1.036
Output														
GDP														

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212396 Non-Metal Min. Mining and Quarrying , Potash Mines

Notes: Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	1,107	1,207	1,170	1,140	1,198	1,262	1,088	1,374	1,414	1,307	653.42	813.62	1,502	1,366
Natural Gas	994.11	1,131	1,106	1,073	1,154	1,238	1,063	1,353	1,389	1,287	637.08	800.46	1,476	1,343
Middle Distillates	107.31	72.43	60.41	64.33	40.79	20.55	22.28	20.13	23.33	19.21	14.97	12.57	25.11	22.47
Propane	5.52	3.00	3.04	3.16	3.41	2.75	2.52	1.12	1.59	1.23	1.37	0.58	0.42	0.46

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	6,989	9,202	8,181	8,515	9,093	10,109	10,594	8,369	10,891	10,549	4,424	9,514	10,830	9,285
Gross Output														
GDP	782	1,217	1,021	1,074	1,235	1,417	1,405	1,032	1,727	1,379	349	1,185	1,336	1,146

Product: potash, in K2O equiv.. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.158	0.131	0.143	0.134	0.132	0.125	0.103	0.164	0.130	0.124	0.148	0.086	0.139	0.147
CO_2e (kt) / Output														
CO_2e (kt) / GDP	1.415	0.991	1.145	1.061	0.970	0.890	0.774	1.331	0.819	0.948	1.871	0.686	1.124	1.192

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.828	0.903	0.845	0.832	0.788	0.648	1.037	0.820	0.783	0.933	0.540	0.875	0.929
Output														
GDP	1.000	0.700	0.809	0.750	0.686	0.629	0.547	0.941	0.579	0.670	1.322	0.485	0.794	0.842

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212397 Non-Metal Min. Mining and Quarrying , Peat Industry

Notes: Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	32.21	44.46	42.03	41.50	52.34	59.22	59.61	56.32	54.61	53.77	39.56	32.51	30.81	38.83
Natural Gas	15.35	11.51	10.12	10.79	22.83	20.96	22.34	16.50	21.42	17.46	5.06	4.21	6.30	3.28
Heavy Fuel Oil	0.33										0.31	0.56	0.49	
Middle Distillates	12.72	24.67	24.15	23.24	22.52	29.00	30.31	34.05	27.88	30.60	27.61	22.67	19.62	30.15
Propane	3.81	8.28	7.76	7.47	6.99	9.27	6.97	5.76	5.31	5.71	6.59	5.07	4.40	5.40

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	679	1,213	1,277	1,355	1,081	1,254	1,292	1,197	1,302	1,172	1,271	1,276	834	1,194
Gross Output														
GDP														

Product: peat. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.047	0.037	0.033	0.031	0.048	0.047	0.046	0.047	0.042	0.046	0.031	0.025	0.037	0.033
CO_2e (kt) / Output														
CO_2e (kt) / GDP														

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.773	0.694	0.646	1.021	0.996	0.973	0.992	0.884	0.968	0.657	0.537	0.779	0.686
Output														
GDP														

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 212398 Non-Metal Min. Mining and Quarrying , All Other Non-Metallic Mineral Mining & Quarrying

Notes: Includes diamond mines (NAICS 212392) which began in 1998, and 212394 for all years. Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	408.04	410.39	401.21	408.07	534.37	537.15	560.10	569.12	554.73	656.40	561.70	580.55	599.90	559.40
Natural Gas	114.09	135.38	120.07	100.23	89.80	70.48	68.68	55.36	42.25	58.42	55.50	53.01	47.53	47.79
Heavy Fuel Oil	152.05	61.62	61.22	52.59	51.95	41.43	39.74	35.48	36.03	44.34	21.08	23.58	29.00	0.63
Middle Distillates	134.93	209.07	214.25	250.32	387.72	421.49	447.94	474.71	472.62	550.29	482.79	500.85	519.41	506.32
Propane	6.97	4.32	5.67	4.93	4.91	3.75	3.74	3.57	3.82	3.34	2.33	3.11	3.95	4.65

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	2,014	4,616	5,533	6,928	11,227	7,716	8,298	9,083	9,453	11,805	11,210	12,427	12,264	12,076
Gross Output														
GDP	205	476	679	857	1,350	1,422	1,318	1,334	1,751	1,623	1,369	1,341	1,290	1,191

Product: asbestos, diamond ores and other non-metals. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	0.203	0.089	0.073	0.059	0.048	0.070	0.068	0.063	0.059	0.056	0.050	0.047	0.049	0.046
CO_2e (kt) / Output														
CO_2e (kt) / GDP	1.990	0.862	0.591	0.476	0.396	0.378	0.425	0.427	0.317	0.404	0.410	0.433	0.465	0.470

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.439	0.358	0.291	0.235	0.344	0.333	0.309	0.290	0.275	0.247	0.231	0.241	0.229
Output														
GDP	1.000	0.433	0.297	0.239	0.199	0.190	0.214	0.214	0.159	0.203	0.206	0.218	0.234	0.236

Created on 2014-03-03

Greenhouse Gas Emissions and Greenhouse Gas Intensity Indicators

CIEEDAC

NAICS 331410 Primary Metal Manuf. , Non-Ferrous Metal (except Aluminium) Smelting & Refining

Notes: Process Emissions includes SF6 in CO_2e from Magnesium production. Negative confidential value for 1990 includes coal correction; coal data not available to CIEEDAC. Confidential data for 2001-12 estimated. Emissions from waste fuels are not included in the Total GHG Emissions. Process emissions are included in Totals. 'XX' refers to confidential values, the sum of which appears on the 'Confidential' line if such data could be estimated. All units are in kilotonnes (kt CO_2e). Numbers in *ITALICS* are in THOUSANDS. PDF reports can only display 14 years of data. Some of the selected years will not be displayed.

Units: kt CO_2e	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total	6,132	5,446	4,145	5,583	4,928	4,675	3,662	3,839	3,258	2,967	1,840	2,551	2,242	2,342
Natural Gas	1,144	1,105	1,160	1,097	917.03	897.51	914.83	921.05	900.94	738.48	637.78	818.49	867.90	818.03
Heavy Fuel Oil	435.68	278.17	282.88	210.81	190.01	220.59	XX	XX	XX	XX	XX	XX	XX	XX
Middle Distillates	XX	69.47	120.92	47.90	55.37	58.75	61.02	71.64	90.53	XX	80.25	86.65	XX	XX
Propane	28.32	27.29	25.99	27.13	22.40	25.19	37.56	39.44	44.34	XX	43.08	38.42	XX	XX
Petroleum Coke	141.18	90.44	139.47	126.32	XX	156.13	133.41	164.20	XX	XX	XX	272.70	XX	XX
Coal	1,086	926.11	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Coal Coke	153.89	118.02	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX
Wood Waste												XX		
Confidential	-22.92		10.22	1,057	1,189	1,098	1,205	1,235	1,687	1,763	1,079	1,334	1,375	1,524
Process - Magnesium	3,165	2,832	2,405	3,016	2,554	2,219	1,310	1,408	534.77	465.31				

Activity Data	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units (kilotonne)	1,534	1,868	1,730	1,827	1,680	1,858	1,732	1,851	1,764	1,741	1,487	1,490	1,465	1,446
Gross Output														
GDP	2,863	4,861	5,747	5,252	4,968	5,378	5,444	5,014	4,613	4,561	3,799	4,391	4,332	4,291

Product: nickel, copper, zinc, lead, magnesium. **Note:** Gross Output not available, GDP in $2007 million.

Intensity	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
CO_2e (kt) / Unit (kilotonne)	3.997	2.915	2.396	3.055	2.933	2.516	2.114	2.074	1.846	1.704	1.237	1.712	1.531	1.619
CO_2e (kt) / Output														
CO_2e (kt) / GDP	2.141	1.120	0.721	1.063	0.992	0.869	0.673	0.766	0.706	0.650	0.484	0.581	0.518	0.546

Index (1990=1) based on:	**1990**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Physical Units	1.000	0.729	0.599	0.764	0.734	0.629	0.529	0.519	0.462	0.426	0.310	0.428	0.383	0.405
Output														
GDP	1.000	0.523	0.337	0.496	0.463	0.406	0.314	0.358	0.330	0.304	0.226	0.271	0.242	0.255