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# CO2 Emissions from Energy Consumption by the Iron and Steel Industry NAICS 33111, 1998

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This Statistics Canada study is the first to examine the distribution of emissions within an industry based on establishment size, energy use, and related CO2 emission levels. This study is based on data for 1998 from the Industrial Consumption of Energy Survey and the Annual Survey of Manufactures.

The levels of emissions are not evenly distributed across establishments in the Iron and Steel Industry. To some extent such disparities can be attributed to factors such as product mix, opportunities for input substitution, age and types of process. Factors such as size of establishment and provincial distribution emphasise the importance of understanding how regulation could potentially impact differently on each establishment within an industry.

## The level of emissions varies by size of establishment

The Iron and Steel Industry is among the more energy intensive consuming manufacturing industries in Canada. In 1998, this industry produced 17,828 tonnes of direct and indirect CO2 equivalent emissions from energy consumption. Of these emissions, 15,714 tonnes resulted from direct energy consumption while the remaining 2,114 tonnes of indirect emissions attributed to the purchased electricity.

**Table 1**

**Iron and Steel Industry Production and Emission Levels by Quartile, 1998**

| | Quartile 1 | Quartile 2 | Quartile 3 | Quartile 4 | Industry Total |
|---|---|---|---|---|---|
| Production in $ Billions | 8 | 1.7 | 0.91 | 0.2 | 10.81 |
| Percentage of Total Production | 74.0 | 15.7 | 8.4 | 1.9 | 100.0 |
| Total Direct Emissions of CO2 Equivalents | 14 897 | 400 | 346 | 71 | 15 714 |
| Percentage of Total Direct Emissions | 94.8 | 2.5 | 2.2 | 0.5 | 100.0 |
| Total Indirect Emissions of CO2 Equivalents | 1 402 | 239 | 411 | 62 | 2 114 |
| Total Direct and Indirect Emissions of CO2 Equivalents | 16 299 | 639 | 757 | 133 | 17 828 |
| Percentage of Total Emissions | 91.4 | 3.6 | 4.2 | 0.7 | 100.0 |
| Average Tonnes of Direct CO2 Per $1000 of Output | 1.86 | 0.24 | 0.38 | 0.36 | 1.45 |
| Average Tonnes of CO2 Per $1000 of Output | 2.04 | 0.38 | 0.83 | 0.67 | 1.65 |

*Note: Emissions are in kilo-tonnes of CO2 Equivalents*



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If we consider direct emissions only, those establishments in quartile 1 account for 74% of production and almost 95% of direct emissions. This share decreases to less than 91% if we include both direct and indirect CO2 emissions. By reverse inference the remaining 20 establishments or facilities account for slightly more than a quarter of output in the industry and represent 5% of direct increasing to 8% if we include indirect emissions. Average emissions including direct and indirect sources range from a high of 2.04 tonnes of CO2 per $1000 of production for the largest six plants to an overall average of .55 tonnes of CO2 per $1000 of production for the remainder of the population.

**The level of emissions varies by province**

The Iron and Steel Industry operates in six provinces in Canada including Nova Scotia, Quebec, Ontario, Manitoba, Saskatchewan and Alberta. Provincially, production is highly concentrated in Central Canada with Ontario occupying the number one position with 50% of plants; 76% percent of production, 87% of CO2 emissions for the industry and average emissions of 1.89 tonnes of CO2 per $1000 of production. Quebec is a more distant second with 35% percent of plants, 17% of output, 7% of direct CO2 emissions and average emissions of .68 tonnes of CO2 per $1000 of output. By comparison iron and steel mills in Nova Scotia, Manitoba, Saskatchewan and Alberta produced emissions at the average rate of 1.42 tonnes per $1000 of output.

**Table 2**

**Iron and Steel Industry Production and Emission Levels by Province, 1998**

| | Ontario | Quebec | Other Provinces | Industry Total |
|---|---|---|---|---|
| Production in $ Billions | 8.18 | 1.82 | 0.81 | 10.81 |
| Percentage of Total Production | 75.7 | 16.8 | 7.5 | 100.0 |
| Total Direct Emissions of CO2 Equivalents | 14 167 | 1 218 | 329 | 15 714 |
| Percentage of Total Direct Emissions | 90.2 | 7.8 | 2.1 | 100.0 |
| Total Indirect Emissions of CO2 Equivalents | 1 269 | 27 | 818 | 2 114 |
| Total Direct and Indirect Emissions of CO2 Equivalents | 15 435 | 1 245 | 1 147 | 17 828 |
| Percentage of Total Emissions | 86.6 | 7.0 | 6.4 | 100.0 |
| Average Tonnes of Direct CO2 Per $1000 of Output | 1.73 | 0.67 | 0.41 | 1.45 |
| Average Tonnes of CO2 Per $1000 of Output | 1.89 | 0.68 | 1.42 | 1.65 |

*Note: Emissions are in kilo-tonnes of CO2 Equivalents*

## Note to readers

In 1998, the Iron and Steel Industry (NAICS 33111) was comprised of 26 establishments located in 6 provinces. It represented production of $10.8 billion (2.4% of Total Manufacturing) and contributed $3.5 billion in terms of Gross Domestic Product (in 1997 prices). The Iron and Steel Industry was chosen because of it's relatively high energy intensity and to illustrate important distributional characteristics of emissions by plant size that are otherwise masked in aggregate industry statistics due to the high level of concentration of production we find in this industry. The 1998 reference year data was chosen because of data availability. To protect respondent confidentiality, the information in this study has been broken down into four groups or quartiles sorted by level of production.

Statistics Canada has been producing emission estimates at the National Level for some time. At this perspective, it appears that all establishments within a high emitting industry have equal impact with Greenhouse Gases. It is not until we drill down to a finer level of detail that a truer picture of the spectral makeup is portrayed. The profile presented in this paper demonstrates the importance of understanding how a particular policy stance could impact establishments within a population. It is important to note that the distributions of emissions of other manufacturing industries will not necessarily display similar characteristics. To protect respondent confidentiality the information is presented by quartile ranked from the largest establishments to the smallest based on the production levels.

CO2 equivalent estimates were developed by the Environment Accounts and Statistics Division by applying CO2 coefficients obtained from Environment Canada. These coefficients were applied to the quantities of energy by type of energy from the survey of the Industrial Consumption of Energy. CO2 equivalent emissions are estimated for direct and indirect energy consumption. Indirect emissions referenced in this paper include only the emissions associated with purchased electricity. They do not include the emissions related to other inputs used by the Iron and Steel Industry (e.g. transportation services, iron ores and concentrates, etc). The level of indirect emissions will depend on the source of fuel used to generate the purchased electricity.

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