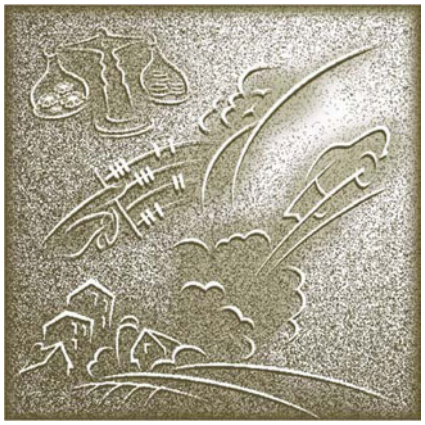
Catalogue no. 16F0006XIE

Environmental Protection Expenditures in the Business Sector

2002



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Environmental Protection Expenditures in the Business Sector

2002

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December 2004

Catalogue no. 16F0006XIE

Frequency: Biennial

ISSN 1701-6282

Ottawa

Version française de cette publication disponible sur demande (n^{o} 16F0006XIF au catalogue).

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Symbols

The symbols described in this document apply to all data published by Statistics Canada from all origins including surveys, censuses and administrative sources, as well as straight tabulations and all estimations.

.	not available for any reference period
..	not available for a specific reference period
...	not applicable
0	true zero or a value rounded to zero
0^{s}	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
p	preliminary
r	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
E	use with caution
F	too unreliable to be published

Preface

This publication presents estimates from the Survey of Environmental Protection Expenditures, 2002. The survey covers capital and operating expenditures made in 2002 by businesses in order to anticipate or to respond to environmental regulations, environmental conventions or voluntary agreements.

Environmental regulations, current and anticipated, play a major role in the evolution of industry spending on environmental protection. For the past decade, governments in Canada have imposed various environmental regulations regarding the prevention or reduction of air emissions, effluents, solid waste, as well as the protection of wildlife and habitat. However, industry spending on environmental protection may also be affected by environmental conventions and voluntary agreements between governments and industry representatives. These are increasingly important and include specific actions on pollution prevention or abatement.

The Survey of Environmental Protection Expenditures (SEPE) tries to fill gaps in the data regarding the cost to industry of environmental protection and the demand for associated environmental products and services. In addition to covering business expenditures on environmental protection, SEPE, since 1997, has been broadened to cover the adoption of environmental management practices, pollution prevention practices and environmental technologies. Beginning reference year 1998, SEPE has been changed from an annual to a biennial survey, partly in an effort to reduce respondent burden.

In 2002, SEPE introduced new material with the purpose of collecting data on industry's initiatives with respect to greenhouse gas emission reductions. The material was developed as part of a multi-departmental working group funded through the federal government's Action Plan 2000.

Acknowledgements

The cooperation of survey respondents was critical to the successful completion of this publication and is gratefully acknowledged.

This report was prepared by the Environment Accounts and Statistics Division under the direction of Rob Smith, Director, Peter Morrison, Assistant Director and Bruce Mitchell, Chief, Environmental Protection Accounts and Surveys. Data collection for this survey was conducted by the Operations and Integration Division (Mel Jones, Director) and the Environment Accounts and Statistics Division.

Jeffrey Fritzsche, Senior Analyst, Environment Protection Accounts and Surveys, managed the survey. Peter van Wesenbeeck was responsible for the compilation of the report.

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1 Highlights

- Canadian companies substantially increased their spending to protect the environment in 2002, with total expenditures reaching $6.8 billion, up 24% from 2000. Much of the increase resulted from responses to new environmental regulations and industry's effort to reduce air emissions such as greenhouse gases. While expanded survey coverage of the Oil and Gas Extraction Industry in 2002 was also partially responsible, other industries still experienced a 22% spending increase on environmental protection over 2000 levels.
- Business capital expenditures on environmental protection increased 35% from 2000 to 2002, to $2.9 billion. Most of this increase was due to large capital expenditures in the Petroleum and Coal Products Industry as establishments in this industry upgraded refineries to meet new sulphur reduction regulations.
- Environmental capital expenditures represented about 5% of total capital expenditures in the primary and manufacturing industries. The proportion of total capital expenditures that were made for environmental protection purposes has increased each survey year since 1998.
- Pollution prevention accounted for half (50%) of environmental capital expenditures in 2002, up from 46% in 2000. Pollution abatement and control constituted 32% of capital expenditures on environmental protection in 2002, compared to 43% in 2000.[1]
- Operating expenses related to protecting the environment increased to $3.8 billion, up 17% from 2000. Almost half (45%) of operating expenditures were directed at pollution abatement and control (end-of-pipe) processes, while pollution prevention processes accounted for about 15%.[1]
- Compared to all industry groups, the Oil and Gas Extraction Industry and the Petroleum and Coal Products Industry were the top two spenders on environmental protection, with each spending just over $1 billion in 2002.
- The Petroleum and Coal Products industry directed 77% ($811.3 million) of their total expenditures on the environment toward capital projects; 51% ($562.4 million) of total environmental protection expenditures made by the Oil and Gas Extraction Industry were capital investments. In both cases, the majority of capital expenditures were for pollution prevention projects.
- Capital expenditures made by the Electric Power Generation, Transmission and Distribution Industry increased from $182.4 million in 2000 to $511.9 million in 2002. The bulk of these expenditures were made as power generating companies invested in pollution abatement and control and pollution prevention processes in ongoing efforts to reduce emissions to air. The industry also increased investments in alternative energy sources (e.g., wind, solar, low-carbon fuels.)
- The Wood Products Industry experienced a significant drop in capital expenditures on environmental protection between 2000 and 2002, decreasing from $123.3 million to $62.7 million. This coincides with an overall decrease in capital expenditures in the industry during this time period.
- Businesses spent just over $1 billion in 2002 on technologies that reduced greenhouse gas emissions. The energy sector accounted for 48% of this, with the Oil and Gas Extraction and the Electric Power Generation, Transmission and Distribution industries accounting for most of the spending at $244.9 million and $203.7 million, respectively. The Pulp, Paper and Paperboard Mills industry spent $241.8 million on systems and equipment to reduce greenhouse gases in 2002.
- Companies in the Oil and Gas Extraction industry were most likely (65%) to have invested in new or significantly improved systems or equipment to reduce greenhouse gas emissions. Across all industries, sufficient return on investment was cited as the most compelling reason to invest in these technologies. The greatest obstacle to investment was the high cost of equipment.

1. Proportions do not include the 'other manufacturing' industry category.

- The majority (64%) of capital expenditures on pollution abatement and control (PAC) made in 2002 were directed towards the treatment of emissions to air. This continues a trend seen in previous survey cycles. The proportion of pollution prevention investments made to mitigate releases to air compared to other media (water, on-site releases to land, and noise, radiation and vibration) increased from 51% in 2000 to 67% in 2002. The majority of this increase is attributable to the Oil and Gas Extraction, the Petroleum and Coal Products and the Electric Power Generation, Transmission and Distribution industry groups.

- Use of pollution prevention practices remained popular among Canadian businesses, with almost nine out of ten establishments indicating use of at least one type. Most commonly employed were good operating practices or pollution prevention training (74%) and prevention of leaks and spills (70%).

- Reported use of energy conservation methods across all industries was 40% in 2002. Use of solar and wind energy systems increased from 2000 as companies continue to invest in alternative energy sources. Leading the way in wind energy were the Oil and Gas Extraction industry, where participation doubled from 4% to 8%, and the Electric Power Generation, Transmission and Distribution industry, in which 14% of establishments indicated generating energy from wind, compared to 10% in 2000.

- Overall, 35% of reporting establishments indicated cost savings after adopting pollution prevention or environmental management practices in 2002.

2 Concepts, Methodology and Data Quality

Introduction

The following information should be used to ensure a clear understanding of the basic concepts that define the data provided in this product, of the underlying methodology of the survey, and of key aspects of the data quality. This information will provide the user with a better understanding of the strengths and limitations of the data, and of how they can be effectively used and analysed. The information may be of particular importance when making comparisons with data from other surveys or sources of information, and in drawing conclusions regarding change over time.

Data presented in this report are derived from the Survey of Environmental Protection Expenditures (SEPE). The SEPE provides a measure of the cost to Canadian industry to comply with present or anticipated environmental regulations, conventions and voluntary agreements. The SEPE also collects information on environmental management practices and environmental technologies used by industry for the purpose of preventing, abating or controlling pollution.

The SEPE has been conducted on an annual basis since 1994. However, as of reference year 1998 this survey is conducted every two years.

2.1 Data sources and methodology

The SEPE does not cover the entire economy (agriculture, construction, distributive trades, service industries and the government sector are not surveyed). Rather, the survey targets industries in the primary and manufacturing sectors.

The data reported in this study are based upon a survey of 2 653 establishments in primary industries (resource extraction industries), manufacturing industries, the Electric Power Generation, Transmission, and Distribution Industry, the Pipeline Transportation Industry, the Oil and Gas Extraction Industry and the Natural Gas Distribution Industry. In order to be selected for inclusion in the survey, an establishment had to have more than 49 employees[1].

1. In some provinces and territories, in order to obtain minimum coverage, the employment thresholds were reduced.

Reference period

Respondents were given the option of reporting for a **12-month** period ending between April 1, 2002 to March 31, 2003. The results in this report, however, are simply presented as environmental protection expenditures made during 2002. No adjustment to the data is made for companies that do not report a fiscal year ending on December 31st.

2.1.1 General methodology

Survey frame

A list of establishments to be surveyed was produced using the frame from Statistics Canada's Annual Survey of Manufactures, the Business Register and other frames that contain establishments or businesses active in the following industries: Oil and Gas Extraction; Pipeline Transportation; Petroleum and Coal Products; Electric Power Generation, Transmission and Distribution; and Natural Gas Distribution. Metal and non-metal mining establishments were added based on Natural Resource Canada's Census of Mines.

Sample selection

Industry classification

In previous years, establishments were selected based on the 1980 Standard Industrial Classification System (SIC). However, beginning with reference year 1998, industry selection was based on the North American Industry Classification System (NAICS).

This new classification system was developed as a cooperative effort between the statistical agencies of Canada, Mexico and the United States. Created against the background of the North American Free Trade Agreement, it is designed to provide common definitions of the industrial structure of the three countries and a common statistical framework to facilitate the analysis of the three economies.[2]

The establishments that were surveyed in both 1997 and 1998 were compared to examine any differences in industry classification resulting from the switch to NAICS. It was found that an insignificant number of establishments were reclassified into different industry groups, thus allowing for comparisons with previous survey years.[3]

2. Statistics Canada, 1997, *North American Industry Classification System,* Catalogue no. 12-501-XPE, Ottawa.
3. For additional information on the impact of the conversion to a NAICS-based classification system from SIC80, please see: Statistics Canada, September 1999, *Private and Public Investment in Canada, Revised Intentions, 1999*, pp. 11-14, Catalogue no. 61-206-XIB.

Text Box 2.1.1
List of Selected Targeted Industries

- Logging (NAICS 113311, 113312)
- Oil and Gas Extraction (NAICS 211)
- Mining (NAICS 2121, 2122, 21239)
- Electric Power Generation, Transmission and Distribution (NAICS 2211)
- Natural Gas Distribution (NAICS 2212)
- Food (NAICS 311)
- Beverage and Tobacco Products (NAICS 312)
- Wood Products (NAICS 321)
- Pulp, Paper, and Paperboard Mills (NAICS 3221)
- Petroleum and Coal Products (NAICS 324)
- Chemicals (NAICS 325)
- Non-Metallic Mineral Products (NAICS 327)
- Primary Metals (NAICS 331)
- Fabricated Metal Products (NAICS 332)
- Transportation Equipment (NAICS 336)
- Pipeline Transportation (NAICS 4861, 4862, 4869)

Coverage and sample selection

The non-manufacturing (primary) and manufacturing sample was a stratified sample based on employment, from which a take-all portion and a take-some portion was identified.[1] The take-all strata included the following industries: Oil and Gas Extraction; Mining (excluding quarrying); Electric Power Generation, Transmission and Distribution; Natural Gas Distribution; Beverage and Tobacco Products; Pulp, Paper and Paperboard Mills; Petroleum and Coal Products; Primary Metals; and Pipeline Transportation. All establishments with over 49 employees in these primary and manufacturing industries received a more detailed (long) questionnaire.

The take-some industries included Logging (excluding contract logging), Food, Wood Products, Chemicals, Non-Metallic Mineral Products, Fabricated Metal Products, and Transportation Equipment. Establishments in these industries also received a long questionnaire. The take-all and take-some portions of the sample are determined based on a number of factors found in each industry, such as the average level of environmental protection expenditures per employee greater than $1 000 (at the 4, 5 or 6-digit NAICS level, depending on the industry) and the number of small and medium-sized establishments within the industry group.

A total of 16 industry groups were targeted for increased survey coverage and received the more detailed long questionnaire in 2002 based on 4, 5 and 6-digit NAICS industries (Text Box 2.1.1).

The remaining industries in the manufacturing sector were sampled at the 4-digit NAICS level and grouped into an 'other manufacturing' category. To minimize response burden, establishments (with more than 49 employees) in these industries received a less detailed (short) questionnaire. The industries comprising the 'other manufacturing' category are those with an average level of environmental protection expenditure per employee below $1 000.

Additional information, obtained from the annual reports of establishments where available, and Statistics Canada's annual Capital and Repair Expenditure Survey [2], was also used in the sample selection.

The take-some sample was stratified by ranking establishments within each 4, 5 or 6-digit NAICS (again depending on the industry group) by total employment. If there were 50 or more establishments in the NAICS category, the top 15% of establishments were selected to be surveyed. If there were between 15 and 49 establishments, the top 20% were selected. Where the total number of establishments fell below 15 in the 4, 5 or 6-digit NAICS group, all establishments were selected. In some provinces and territories, the employment threshold was reduced to improve coverage.[3] The sample selected the largest establishments in order to maximize the employment covered while minimizing the number of establishments surveyed.

Analysis has shown that there is no correlation between environmental expenditures per employee and establishment size. Therefore, it was assumed that no bias was introduced by sampling the largest establishments in an industry group.

1. The term “take-all” refers to the selection of all establishments within that NAICS industry that have more than 49 employees while “take-some” refers to the selection of a portion of the establishments that have more than 49 employees within the NAICS industry.

2. The Capital and Repair Expenditure Survey provided information on industries that had relatively high capital expenditures on assets associated with pollution abatement and control (PAC). In the past, information from surveys in other countries was also used to help determine target industries.

3. The employment threshold was reduced in the Territories and Prince Edward Island to increase their representative sample.

2.2 Concepts and variables measured

The survey questionnaire was designed in consultation with key public and private sector groups and by referencing the experiences from other countries who have conducted similar surveys. Environmental protection expenditures for the purposes of the survey are defined as those made to meet environmental regulations, conventions or voluntary agreements (see Text Box 2.2.1 and the questionnaire in Annex D for further explanation).

Sampled establishments in the 'other manufacturing' industries received a short version of the questionnaire. The short version of the questionnaire requests the breakdown of expenditures into capital (investment) expenditures and operating expenses for:

- pollution prevention, abatement and control;
- other environmental protection activities;
- purchase of environmental services;
- pollution prevention methods;
- environmental management practices.

Text Box 2.2.1
Environmental protection expenditures

Environmental protection expenditures are defined as all capital (investment) and operating (current) expenditures[1] incurred by businesses in order to comply with or to anticipate Canadian and international environmental regulations, conventions[2] or voluntary agreements.

The challenge in measuring expenditures made on environmental initiatives (e.g., projects to reduce energy consumption or waste generation) is to isolate them from expenditures made in order to reduce production costs. For this reason, the 1997 survey expanded the criterion of environmental protection to include any expenditure that ensures or anticipates compliance to environmental regulation or official voluntary agreement.[3] Environmental protection expenditures are classified as follows:

Environmental monitoring: expenditures for purchase of equipment, supplies, labour and services required to monitor pollutant emissions that would affect air, water or soil quality;

Environmental assessments and audits: expenditures made to review current operations' compliance with regulations and to evaluate the environmental impact of proposed projects;

Site reclamation and decommissioning: expenditures for clean-up of environmental damage and for closing a site;

Wildlife and habitat protection: expenditures made to protect wildlife and habitat from the effects of economic activity and to restore stocks that have been adversely affected by such activity;

Pollution abatement and control (end-of-pipe processes): expenditures related to funding of separately identifiable processes whose sole purpose is to abate or control undesirable substances emitted during normal production activities, without any incidence on the production process itself; expenditures on waste and sewage management and treatment;

Pollution prevention:[4] expenditures made to develop a new or significantly modified production process (integrated processes) in order to prevent or reduce pollutants and waste before they are generated; expenditures on leak and spill prevention; expenditures on energy and water conservation; expenditures on on-site recirculation, recovery, reuse and recycling of materials and substances;

Environmental fees, fines and licences: permits, fees, levies, fines, penalties or damage awards paid to government agencies or to individuals, or any other charges paid to regulating bodies, and;

Other environmental protection: expenditures for administration of environmental projects, for training, and for other initiatives not elsewhere specified.

Expenditures on environmental research and development are excluded, in principle, from the data on business expenditures. These data are collected through the Research and Development in Canadian Industry Survey[5].

1. *Capital expenditures* refer to all costs in 2002 (reporting year) for machinery and equipment and their installation and repair, as well as for the construction of non-residential facilities (by contractors or own employees). *Operating expenditures* refer to all cash expenses, rather than accruals, incurred during the 2002 reporting year for maintenance and repair (of existing environmental equipment), labour, fuel and electricity, materials and supplies, and purchased services.
2. Environmental conventions include any formal multiparty commitment to meet specific targets relating to habitat protection and waste and pollution abatement, such as the Canada–U.S. Air Quality Agreement, and the Responsible Care Program adopted by the Canadian Chemical Producers' Association.
3. Any voluntary agreement implemented by an establishment or the participation in any voluntary environmental program such as ARET (Accelerated Reduction/Elimination of Toxics).
4. Please note that previous *Environmental Protection Expenditures in the Business Sector* reports refer to pollution prevention as 'PAC integrated processes'. Integrated processes are a subset of pollution prevention.
5. Statistics Canada, 2000, *Research and Development in Canadian Industry Survey,* Catalogue no. 88-001-XIB, Ottawa.

The long questionnaire was sent to establishments in target industries and required a more detailed breakdown of expenditures. In addition to the information asked on the short form, the long form asked respondents to report their capital (investment) expenditures and operating expenses for:

- pollution prevention;
- pollution abatement and control (end-of-pipe);
- environmental monitoring;
- environmental assessments and audits;
- site reclamation and decommissioning;
- protection and restoration of wildlife and habitat;
- environmental charges;
- environmental processes and technologies.

Also included on both the short and long questionnaires were two qualitative questions related to pollution prevention and environmental management practices. Respondents could indicate which pollution prevention methods and environmental management practices were used at their establishment.

The questions related to solid waste management and site reclamation and decommissioning were removed from the long questionnaire for 2002.

A new feature on the 2002 SEPE long questionnaire was the revision and addition of questions related to environmental processes and technologies with a focus on greenhouse gas emissions. The questions were designed to measure whether businesses have reduced their greenhouse gas emissions, what processes and technologies were used, the impact on greenhouse gas emissions (large, medium or small) and what kinds of drivers and obstacles businesses encountered in adopting these technologies.

Both the long and short questionnaires included a question allowing respondents to indicate how long it took to complete the questionnaire (including the time required to gather necessary information). This information is used to help Statistics Canada track response burden.

2.3 Data accuracy

The mailout of the 2002 reference year Survey of Environmental Protection Expenditures took place in June 2003. This represents an earlier mail out date in comparison to previous survey years. The objective of mailing the survey earlier in the year was to establish an earlier data release date. Data collection took place from July 2003 to the end of the fourth quarter of 2003. Survey questionnaires were mailed to specific establishments identified by the sample and the responses were returned by mail. The surveys were addressed to a contact person who was either responsible for, or had knowledge of, the environmental operations of the company. In the case of some multi-establishment firms, the survey was mailed to the head office which either forwarded the questionnaire to the appropriate establishment or provided a combined report for all targeted establishments.

Follow-ups via fax and/or telephone were carried out after the due date to remind respondents to return their surveys.

Questionnaires were edited in two steps. First, validity edits were applied to ensure that responses to particular questions fell within a limited range of possible values. Second, consistency edits were applied. Cases where responses in one section of the questionnaire were inconsistent with those given in other sections were identified and edited. These edits were done on an ongoing basis throughout the data collection phase.

Additional follow-ups were carried out to collect missing data and to resolve inconsistencies.

Response rates

Table 2.3.1 shows the response rate for each industry and province and territory, according to both the number of reporting establishments and employment, as a percentage of the total number of survey establishments in scope.

For the 2002 reference year, there were 2 071 reports received for 2 653 surveyed establishments. The response rate for the 2002 survey was 78%, based on the number of reporting establishments, and 81% based on employment covered[1].

Response rates by industry ranged from 94% in the Natural Gas Distribution industry to 63% in the Non-Metallic Mineral Products industry. Response rates by province and territory ranged from 71% in Prince Edward Island to 86% in New Brunswick and Manitoba.

Qualitative data

The Survey of Environmental Protection Expenditures has a number of qualitative questions (7c, 12 and 13 on the long questionnaire and questions 7 and 8 on the short questionnaire). Currently, this information is collected, verified for data quality and released as reported values only. No estimation is done for non-response or for the non-surveyed portion of the sample[2]. Since the larger establishments (based on employment) are more likely to be sampled, they have the greatest impact on the qualitative results. Analysis indicates that the larger

1. This figure does not include employment from the Pipeline Transportation Industry.
2. Estimation for non-response and for the non-surveyed sample was done for questions 12f) and 12g) only.

Table 2.3.1
Response rates by industry and by province or territory, 2002

	According to number of reporting units			According to employment[1]		
Industry	Responses	**Total[2]**	Response as a percentage of total[2]	Number of employees	**Total[2]**	Response as a percentage of total[2]
Logging	68	84	81	9 283	11 085	84
Oil and Gas Extraction	78	98	80	32 804	34 835	94
Mining	115	136	85	32 991	38 093	87
Electric Power Generation, Transmission and Distribution	77	95	81	55 438	79 760	70
Natural Gas Distribution	16	17	94	13 333	13 364	100
Food	167	205	81	60 239	73 854	82
Beverage and Tobacco Products	61	75	81	15 508	17 023	91
Wood Products	159	211	75	32 557	41 757	78
Pulp, Paper and Paperboard Mills	124	142	87	46 260	51 876	89
Petroleum and Coal Products	37	41	90	8 159	8 522	96
Chemicals	224	262	85	42 595	48 056	89
Non-Metallic Mineral Products	75	120	63	10 242	15 113	68
Primary Metals	178	227	78	60 857	75 549	81
Fabricated Metal Products	82	127	65	25 347	35 981	70
Transportation Equipment	100	124	81	103 031	119 641	86
Pipeline Transportation	42	48	88	..	..	..
Other manufacturing	468	641	73	171 876	224 851	76
Total	**2 071**	**2 653**	**78**	**720 520**	**889 360**	**81**
Province/Territory	Responses	**Total[2]**	Response as a percentage of total[2]	Number of employees	**Total[2]**	Response as a percentage of total[2]
Newfoundland and Labrador	22	27	81	7 896	10 000	79
Prince Edward Island	10	14	71	2 279	3 350	68
Nova Scotia	43	59	73	14 959	18 527	81
New Brunswick	61	71	86	19 988	22 044	91
Quebec	521	699	75	166 588	231 801	72
Ontario	848	1 085	78	338 981	404 898	84
Manitoba	77	90	86	28 796	32 291	89
Saskatchewan	63	74	85	15 354	18 109	85
Alberta	233	285	82	74 949	82 894	90
British Columbia	181	234	77	49 259	62 953	78
Yukon Territory, Northwest Territories and Nunavut	12	15	80	1 471	2 493	59
Canada	**2 071**	**2 653**	**78**	**720 520**	**889 360**	**81**

Notes:
1. Employment is not available for the Pipeline Transportation industry. It has not been included in the provincial/territorial employment totals.
2. The total excludes out of scope establishments, mergers, closed and/or sold establishments, etc.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

establishments are generally more likely to use pollution prevention methods (Question 7c (long questionnaire) and 7 (short questionnaire)), environmental processes and technologies (Question 12) and environmental management practices (Question 13 (long questionnaire) and Question 8 (short questionnaire)). Users should note that the results likely over-estimate the use of these environmental methods, technologies and practices for industries comprising predominantly larger establishments.

Of the 2 653 long and short questionnaires sent to businesses, 1 957 provided responses to Question 7c. The overall response rate for this question was 74%. For the 2002 reference year, the question on environmental management practices was also included on the short form (Question 13 on the long questionnaire, Question 8 on the short questionnaire). Of the 2 653 long and short questionnaires sent to respondents, 2 027 provided answers to Question 13 and 8, representing a response rate of 76%.

Of the 2 012 long questionnaires sent to respondents[1], 1 566 establishments returned the questionnaire with at least one response to Question 12. This represents a response rate of 78%.

Verification, imputation and estimation

After data capture was complete, further validation of the data was performed to ensure that totals were correct and to verify that there were no outliers. The latter validation was performed by comparing figures with those from the previous year.

1. The 2002 Survey of Environmental Protection Expenditures short questionnaire did not include a question on environmental processes and technologies.

Imputation for non-response was performed in four stages.

First, all possible related information was assembled (e.g., information from the Capital and Repair Expenditure Survey, Business Register, *Pulp and Paper Canada*[1] and from company annual reports) and some establishments were re-contacted to help provide further indicators that would allocate expenditures by province or industry where this information was missing.

Second, when possible, the previous year's operating expenditure data were used to impute for 2002 operating expenditure data. An industry growth factor was calculated for establishments within the industry that responded for both years (2000 and 2002). The appropriate industry growth factor was then applied to impute operating expenditure data for records that were a non-response in the current cycle but responded in the previous cycle[2].

Third, total environmental protection expenditures were estimated on a per-employee basis. The mean of environmental expenditures per employee by industry (4-digit NAICS for 'other manufacturing' records) and province or region[3] was used to estimate for non-responding establishments. If there were not enough donors at the industry and province/region level, then imputation was based on the mean of the environmental expenditure per employee ratio for a more aggregated group of donors: 1) industry and Canada; 2) pooled (similar) industries and province/region; 3) pooled industry and Canada; or 4) total for Canada.

Finally, the missing components of environmental protection expenditures were estimated as a proportion of total expenditures using donors from the same industry.

Table 2.3.2 shows the proportion of imputed value over the total value of environmental protection expenditures (value for complete and partial responses + imputed value for non-

1. *Pulp and Paper Canada,* 103:1-10 (2002).
2. Regression analysis has shown that using the previous year's operating expenditures is a reasonable predictor of future operating expenditures.
3. The mean of environmental protection expenditures to employment ratio by region was used when there were not enough donors at the provincial level.

Table 2.3.2
Imputation for non-response as a share of total environmental protection expenditures by industry and by province or territory, 2002

Industry	Imputed value as a percentage of total value[1] (including the imputation value)
Logging	9.3
Oil and Gas Extraction	5.0
Mining	8.0
Electric Power Generation, Transmission and Distribution	14.4
Natural Gas Distribution	1.7
Food	19.1
Beverage and Tobacco Products	10.0
Wood Products	21.5
Pulp, Paper and Paperboard Mills	7.8
Petroleum and Coal Products	1.6
Chemicals	9.2
Non-Metallic Mineral Products	26.6
Primary Metals	15.9
Fabricated Metal Products	30.2
Transportation Equipment	12.5
Pipeline Transportation	4.4
Other manufacturing	21.9
Total	**9.3**

Province/Territory	Imputed value as a percentage of total value[1] (including the imputation value)
Newfoundland and Labrador	7.7
Prince Edward Island	52.0
Nova Scotia	3.9
New Brunswick	3.7
Quebec	20.8
Ontario	8.7
Manitoba	1.9
Saskatchewan	4.1
Alberta	4.8
British Columbia	14.0
Yukon Territory, Northwest Territories and Nunavut	16.0
Canada	**9.3**

Note:
1. This table does not include the estimated portion of the total environmental expenditures.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

response), by industry and by province and territory. Imputation rates by industry ranged from 30.2% in the Fabricated Metal Products Industry to 1.6% in the Petroleum and Coal Products Industry. Table 2.3.3 provides the same information by expenditure category. Imputation rates by expenditure category ranged from a high of 24.9% to a low of 5.3%.

Estimation was done for establishments that had more than 49 employees but were not surveyed. The mean of the environmental protection expenditures to employment ratio was used for estimation in a manner similar to that for imputation. No estimation or imputation was done for the qualitative information collected in questions 7c, 12 or 13.

Sampling and non-sampling errors

There are two general categories of error in surveys. The first, sampling error, arises from the fact that a sample or subset of the target population is used to represent the population. The size of sampling error is quantifiable. The second category is referred to as non-sampling error and is not as easily quantified. Non-sampling error refers to all the other kinds of error that arise in surveys. For example, incomplete or inaccurate lists of the general population, respondent misinterpretation of questions, provision of erroneous information, failure to respond, information processing errors and so on.

Typically the sampling error is measured by the expected variability of the estimate from the true value, expressed as a percentage of the estimate. This measure is referred to as the coefficient of variation or the standard deviation. However, in the case of the Survey of Environmental Protection Expenditures, the sample is not randomly chosen. Rather, a minimal sample number was calculated, and the establishments with the largest number of employees were sampled. This methodology was used in order to survey the largest proportion of employment in

Table 2.3.3
Imputation for non-response as a share of total environmental protection expenditures by category, 2002

Expenditure category excluding other manufacturing industries	Imputed value as a percentage of total value[1] (including the imputation value)
Environmental monitoring - Operating	11.1
Environmental monitoring - Capital	10.1
Environmental monitoring - Total	10.6
Environmental assessments and audits - Operating	21.2
Environmental assessments and audits - Capital	19.8
Environmental assessments and audits - Total	20.6
Site reclamation and decommissioning - Operating	6.7
Site reclamation and decommissioning - Capital	9.2
Site reclamation and decommissioning - Total	7.5
Protection and restoration of wildlife and habitat - Operating	12.7
Protection and restoration of wildlife and habitat - Capital	9.6
Protection and restoration of wildlife and habitat - Total	11.9
Pollution abatement and control (end-of-pipe processes) - Operating	10.8
Pollution abatement and control (end-of-pipe processes) - Capital	8.0
Pollution abatement and control (end-of-pipe processes) - Total	9.7
Pollution prevention - Operating	8.0
Pollution prevention - Capital	5.3
Pollution prevention - Total	6.0
Environmental fees, fines and licences - Operating	11.5
Other environmental protection expenditures - Operating	14.5
Total expenditures on environmental protection - Operating	**10.5**
Total expenditures on environmental protection - Capital	**7.2**
Total expenditures on environmental protection - Total	**9.0**
Systems and equipment to reduce greenhouse gas emissions - Operating	23.4
Systems and equipment to reduce greenhouse gas emissions - Capital	22.2
Total - Systems and equipment to reduce greenhouse gas emissions	**22.7**
Other manufacturing	
Pollution prevention, abatement and control expenditures - Operating	20.4
Pollution prevention, abatement and control expenditures - Capital	24.9
Pollution prevention, abatement and control expenditures - Total	21.6
Other environmental protection expenditures - Operating	23.7
Other environmental protection expenditures - Capital	23.5
Other environmental protection expenditures - Total	23.6
Total expenditures on environmental protection - Operating	**20.8**
Total expenditures on environmental protection - Capital	**24.8**
Total expenditures on environmental protection - Total	**21.9**

Note:
1. This table does not include the estimated portion of the total environmental expenditures.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

each target industry while keeping response burden to a minimum. Given the nature of the sampling process, no coefficient of variation was produced.

Every attempt was made to eliminate the non-sampling error. For example, establishments brought into the survey for the first time were researched and contact information was verified. Instructions and definitions were further refined to be more clear and straightforward. The returned questionnaires were verified and validated before data capture. The data was edited and tabulated automatically. Extensive follow-up was carried out for incomplete responses and for non-response. For the 2000 reference year, the Survey of Environmental Protection Expenditures was converted to a new capture and editing system that is being adopted across all Statistics Canada business surveys. The new capture and edit system brings new tools and efficiencies that will improve the quality of the data. The 2002 survey has benefited from further improvements to the system.

As 2002 represents the 7th time this survey has been conducted, many establishments have received it in the past and are now familiar with the concepts, and as a result their responses are quite accurate. In fact, in some cases, establishments have modified their accounting practices in order to provide, as accurately as possible, the information required by the survey.

The most common difficulty reported by respondents was the inability of their record-keeping systems to isolate the environmental protection component of their expenditures. Expenditures made either for capital investment or for current operations often provide a combination of benefits, such as increased efficiency and reduced waste. In these circumstances, it is difficult to determine what proportion of the expenditure to credit towards environmental protection. Consequently, respondents may over-estimate or under-estimate that proportion. Another example of such bias is the inclusion of health protection expenditures in the reported environmental protection expenditures, because of the respondent's inability to distinguish between the two sets of costs.

An additional difficulty encountered by respondents is the separation of expenditures on environmental protection made in response to environmental regulation, convention or voluntary agreement from those that benefit the environment beyond compliance. In some cases, respondents may have included expenditures on the environment that were beyond the context of the survey.

Annex A

Environmental Protection Expenditure Tables

Table A.1
Capital expenditures on environmental protection by industry, 2002

Industry	Pollution prevention, abatement and control expenditures (PPAC)[1]	Other environmental protection expenditures[2]	**Total**	Share of total
	million dollars			percent
Logging	x	x	**5.8**	0.2
Oil and Gas Extraction	440.9	121.6	**562.4**	19.1
Mining	70.0	27.3	**97.3**	3.3
Electric Power Generation, Transmission and Distribution	455.8	56.1	**511.9**	17.4
Natural Gas Distribution	x	x	**18.0**	0.6
Food	116.1	9.3	**125.4**	4.3
Beverage and Tobacco Products	8.9	3.4	**12.3**	0.4
Wood Products	61.6	1.2	**62.7**	2.1
Pulp, Paper and Paperboard Mills	214.1	1.2	**215.3**	7.3
Petroleum and Coal Products	757.3	54.0	**811.3**	27.5
Chemicals	x	x	**94.5**	3.2
Non-Metallic Mineral Products	64.6	4.4	**69.0**	2.3
Primary Metals	127.2	12.9	**140.1**	4.8
Fabricated Metal Products	x	x	**14.9**	0.5
Transportation Equipment	57.5	1.5	**58.9**	2.0
Pipeline Transportation	x	x	**49.7**	1.7
Capital expenditures, excluding 'other manufacturing'	**2 527.1**	**322.5**	**2 849.7**	**96.7**
Other manufacturing	90.8	6.2	**97.0**	3.3
Total	**2 617.9**	**328.7**	**2 946.6**	**100.0**

Notes:
Figures may not add up to totals due to rounding.
1. Capital expenditures on pollution prevention, abatement and control (PPAC) include capital expenditures on pollution abatement and control (PAC) processes (also referred to as end-of-pipe processes), pollution prevention processes and environmental monitoring.
2. Capital expenditures on other environmental protection include capital expenditures on environmental assessments and audits, site reclamation and decommissioning, and wildlife and habitat protection.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table A.2
Capital expenditures on environmental protection by province or territory, 2002

Province/Territory	Pollution prevention, abatement and control expenditures (PPAC)[1]	Other environmental protection expenditures[2]	**Total**	Share of total
	million dollars			percent
Newfoundland and Labrador	30.1	11.4	**41.4**	1.4
Prince Edward Island	x	x	**2.2**	0.1
Nova Scotia	x	x	**89.6**	3.0
New Brunswick	43.1	3.8	**47.0**	1.6
Quebec	401.0	43.6	**444.5**	15.1
Ontario	887.6	52.9	**940.5**	31.9
Manitoba	x	x	**106.7**	3.6
Saskatchewan	214.0	19.9	**233.9**	7.9
Alberta	737.3	145.3	**882.5**	30.0
British Columbia	132.2	17.6	**149.8**	5.1
Yukon Territory, Northwest Territories and Nunavut	6.6	1.8	**8.4**	0.3
Canada	**2 617.9**	**328.7**	**2 946.6**	**100.0**

Notes:
Figures may not add up to totals due to rounding.
This table includes the 'other manufacturing' industry category.
1. Capital expenditures on pollution prevention, abatement and control (PPAC) include capital expenditures on pollution abatement and control (PAC) processes (also referred to as end-of-pipe processes), pollution prevention processes and environmental monitoring.
2. Capital expenditures on other environmental protection include capital expenditures on environmental assessments and audits, site reclamation and decommissioning, and wildlife and habitat protection.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table A.3
Capital expenditures on environmental protection by type of activity and industry, 2002

Industry	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	Pollution abatement and control processes (end-of-pipe)	Pollution prevention processes	**Total**	Share of total
	million dollars							percent
Logging	0.0	0.0	0.1	x	x	0.6	**5.8**	0.2
Oil and Gas Extraction	111.3	23.7	92.4	5.5	85.9	243.7	**562.4**	19.1
Mining	2.5	3.9	21.8	1.6	36.3	31.1	**97.3**	3.3
Electric Power Generation, Transmission and Distribution	9.3	26.9	15.7	13.5	218.3	228.2	**511.9**	17.4
Natural Gas Distribution	x	x	0.8	x	x	x	**18.0**	0.6
Food	10.3	2.6	4.0	2.7	59.5	46.4	**125.4**	4.3
Beverage and Tobacco Products	0.7	0.1	3.3	0.0	1.9	6.4	**12.3**	0.4
Wood Products	x	0.4	0.2	0.6	x	29.0	**62.7**	2.1
Pulp, Paper and Paperboard Mills	3.8	0.1	0.8	0.3	57.4	152.9	**215.3**	7.3
Petroleum and Coal Products	30.7	7.2	39.8	7.0	226.7	499.9	**811.3**	27.5
Chemicals	x	x	10.7	x	26.4	x	**94.5**	3.2
Non-Metallic Mineral Products	1.5	0.1	1.1	3.2	38.7	24.4	**69.0**	2.3
Primary Metals	8.8	1.1	11.2	0.7	87.4	31.1	**140.1**	4.8
Fabricated Metal Products	x	x	0.2	x	x	x	**14.9**	0.5
Transportation Equipment	0.5	0.3	0.7	0.5	29.7	27.3	**58.9**	2.0
Pipeline Transportation	x	x	4.7	x	x	32.0	**49.7**	1.7
Capital expenditures, excluding 'other manufacturing'	**192.3**	**75.1**	**207.4**	**40.0**	**907.7**	**1 427.2**	**2 849.7**	**96.7**
Other manufacturing[1]	..	..	..	..	..	..	**97.0**	3.3
Total	**..**	**..**	**..**	**..**	**..**	**..**	**2 946.6**	**100.0**

Notes:
Figures may not add up to totals due to rounding.
1. Detail of the expenditure breakdown by type of environmental protection activity is only available for the listed industries.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table A.4
Capital expenditures on environmental protection by type of activity and province or territory, 2002

Province/Territory	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	Pollution abatement and control processes (end-of-pipe)	Pollution prevention processes	**Total**	Share of total
	million dollars							percent
Newfoundland and Labrador	x	x	4.0	x	x	11.7	**41.3**	1.5
Prince Edward Island	x	x	0.0	x	x	0.6	**2.2**	0.1
Nova Scotia	x	x	1.6	1.0	x	47.8	**88.0**	3.1
New Brunswick	1.9	2.7	0.5	0.6	17.9	22.5	**46.1**	1.6
Quebec	18.6	14.5	22.9	4.3	147.7	209.7	**417.6**	14.7
Ontario	26.4	12.4	29.2	7.9	393.6	416.4	**886.0**	31.1
Manitoba	1.1	x	11.1	x	x	70.0	**103.6**	3.6
Saskatchewan	2.5	2.2	17.0	0.7	38.3	172.5	**233.2**	8.2
Alberta	123.6	24.9	109.7	10.3	185.1	423.7	**877.4**	30.8
British Columbia	10.8	3.4	9.8	4.2	69.4	48.3	**145.9**	5.1
Yukon Territory, Northwest Territories and Nunavut	0.2	0.2	1.5	0.1	2.4	4.0	**8.4**	0.3
Canada	**192.3**	**75.1**	**207.4**	**40.0**	**907.7**	**1 427.2**	**2 849.7**	**100.0**

Notes:
Figures may not add up to totals due to rounding.
This table excludes the 'other manufacturing' industry category.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table A.5
Operating expenditures on environmental protection by industry, 2002

Industry	Pollution prevention, abatement and control expenditures (PPAC)[1]	Other environmental protection expenditures[2]	**Total**	Share of total
	million dollars			percent
Logging	15.3	120.3	**135.6**	3.5
Oil and Gas Extraction	263.3	276.2	**539.5**	14.1
Mining	153.3	124.8	**278.1**	7.3
Electric Power Generation, Transmission and Distribution	188.8	137.0	**325.8**	8.5
Natural Gas Distribution	5.2	4.7	**9.9**	0.3
Food	154.0	57.6	**211.6**	5.5
Beverage and Tobacco Products	11.6	8.0	**19.5**	0.5
Wood Products	61.3	64.6	**125.9**	3.3
Pulp, Paper and Paperboard Mills	375.9	45.9	**421.8**	11.0
Petroleum and Coal Products	155.1	89.2	**244.3**	6.4
Chemicals	244.0	58.5	**302.5**	7.9
Non-Metallic Mineral Products	38.4	38.4	**76.9**	2.0
Primary Metals	473.4	49.2	**522.5**	13.6
Fabricated Metal Products	66.8	17.7	**84.4**	2.2
Transportation Equipment	156.3	45.5	**201.9**	5.3
Pipeline Transportation	30.6	27.7	**58.3**	1.5
Operating expenditures, excluding 'other manufacturing'	**2 393.1**	**1 165.3**	**3 558.4**	**92.9**
Other manufacturing	240.5	33.1	**273.6**	7.1
Total	**2 633.5**	**1 198.5**	**3 832.0**	**100.0**

Notes:
Figures may not add up to totals due to rounding.
1. Operating expenditures on pollution prevention, abatement and control (PPAC) include operating expenditures on pollution abatement and control (PAC) processes (also referred to as end-of-pipe processes), pollution prevention processes, environmental monitoring, and purchase of waste management and sewerage services.
2. Operating expenditures on other environmental protection include operating expenditures on environmental assessments and audits, site reclamation and decommissioning, wildlife and habitat protection, fees, fines and licences, and other environmental activities.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table A.6
Operating expenditures on environmental protection by province or territory, 2002

Province/Territory	Pollution prevention, abatement and control expenditures (PPAC)[1]	Other environmental protection expenditures[2]	**Total**	Share of total
	million dollars			percent
Newfoundland and Labrador	67.4	12.4	**79.8**	2.1
Prince Edward Island	x	x	**15.4**	0.4
Nova Scotia	48.9	28.3	**77.2**	2.0
New Brunswick	x	x	**101.0**	2.6
Quebec	608.8	173.8	**782.6**	20.4
Ontario	1 025.6	312.3	**1 337.9**	34.9
Manitoba	52.8	29.7	**82.6**	2.2
Saskatchewan	x	x	**131.2**	3.4
Alberta	412.2	380.7	**793.0**	20.7
British Columbia	236.0	156.8	**392.8**	10.3
Yukon Territory, Northwest Territories and Nunavut	11.6	26.9	**38.4**	1.0
Canada	**2 633.5**	**1 198.5**	**3 832.0**	**100.0**

Notes:
Figures may not add up to totals due to rounding.
This table includes the 'other manufacturing' industry category.
1. Operating expenditures on pollution prevention, abatement and control (PPAC) include operating expenditures on pollution abatement and control (PAC) processes (also referred to as end-of-pipe processes), pollution prevention processes, environmental monitoring, and purchase of waste management and sewerage services.
2. Operating expenditures on other environmental protection include operating expenditures on environmental assessments and audits, site reclamation and decommissioning, wildlife and habitat protection, fees, fines and licences, and other environmental activities.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table A.7
Operating expenditures on environmental protection by type of activity and industry, 2002

Industry	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	Pollution abatement and control processes (end-of-pipe), waste management and sewerage services	Pollution prevention processes	Fees, fines and licences	Other	**Total**	Share of total
	million dollars									percentage
Logging	3.6	8.9	21.5	82.2	5.3	6.4	2.8	5.0	**135.6**	3.5
Oil and Gas Extraction	32.5	18.2	155.9	9.6	177.1	53.7	15.4	77.1	**539.5**	14.1
Mining	27.0	11.3	73.7	3.3	91.5	34.8	7.7	28.8	**278.1**	7.3
Electric Power Generation, Transmission and Distribution	17.1	20.7	28.6	12.0	83.7	88.1	10.3	65.3	**325.8**	8.5
Natural Gas Distribution	1.2	0.8	0.8	0.6	1.9	2.0	0.1	2.4	**9.9**	0.3
Food	22.9	12.5	19.5	0.6	97.3	33.8	17.1	7.9	**211.6**	5.5
Beverage and Tobacco Products	1.0	0.4	2.0	0.0	9.3	1.2	4.3	1.3	**19.5**	0.5
Wood Products	8.9	4.0	21.0	27.4	42.2	10.1	3.8	8.3	**125.9**	3.3
Pulp, Paper and Paperboard Mills	41.6	6.5	12.9	1.8	265.1	69.2	8.2	16.5	**421.8**	11.0
Petroleum and Coal Products	7.1	3.0	76.4	0.1	80.1	68.0	2.6	7.1	**244.3**	6.4
Chemicals	41.2	6.9	20.4	5.2	133.0	69.8	3.0	23.0	**302.5**	7.9
Non-Metallic Mineral Products	5.3	2.0	20.7	0.1	27.1	6.0	5.4	10.2	**76.9**	2.0
Primary Metals	38.1	11.1	11.2	5.6	366.1	69.2	5.1	16.2	**522.5**	13.6
Fabricated Metal Products	4.6	6.8	0.1	2.6	57.2	4.9	0.6	7.5	**84.4**	2.2
Transportation Equipment	7.4	4.5	11.9	0.1	134.2	14.8	0.8	28.3	**201.9**	5.3
Pipeline Transportation	3.1	3.9	13.0	1.6	17.1	10.3	1.5	7.6	**58.3**	1.5
Operating expenditures, excluding 'other manufacturing'	**262.8**	**121.7**	**489.8**	**152.8**	**1 588.0**	**542.3**	**88.6**	**312.4**	**3 558.4**	**92.9**
Other manufacturing[1]	..	..	..	..	..	..	..	..	**273.6**	7.1
Total	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**..**	**3 832.0**	**100.0**

Notes:
Figures may not add up to totals due to rounding.
1. Detail of the expenditure breakdown by type of environmental protection activity is only available for the listed industries.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table A.8
Operating expenditures on environmental protection by type of activity and province or territory, 2002

Province/Territory	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	Pollution abatement and control processes (end-of-pipe), waste management and sewerage services	Pollution prevention processes	Fees, fines and licences	Other	**Total**	Share of total
	million dollars									percent
Newfoundland and Labrador	5.1	1.8	2.6	0.3	30.1	31.8	2.5	5.2	**79.5**	2.2
Prince Edward Island	x	0.9	x	x	2.5	x	0.3	0.7	**15.3**	0.4
Nova Scotia	4.0	1.6	11.1	2.7	33.4	6.8	3.8	8.4	**71.9**	2.0
New Brunswick	x	2.4	x	x	46.5	x	3.4	7.2	**98.3**	2.8
Quebec	70.3	27.0	43.7	22.2	367.5	88.1	14.6	57.2	**690.5**	19.4
Ontario	70.8	39.2	114.7	36.3	603.1	231.9	20.8	83.4	**1 200.1**	33.7
Manitoba	5.2	2.3	8.2	5.3	25.6	14.7	6.6	6.0	**74.0**	2.1
Saskatchewan	x	4.6	x	x	53.5	x	6.1	7.7	**129.1**	3.6
Alberta	54.3	24.6	211.2	25.1	256.9	89.8	17.5	100.6	**780.0**	21.9
British Columbia	27.4	14.0	49.5	45.4	164.9	33.5	12.8	33.9	**381.4**	10.7
Yukon Territory, Northwest Territories and Nunavut	5.9	3.2	20.8	0.4	3.9	1.7	0.2	2.3	**38.4**	1.1
Canada	**262.8**	**121.7**	**489.8**	**152.8**	**1 588.0**	**542.3**	**88.6**	**312.4**	**3 558.4**	**100.0**

Notes:
Figures may not add up to totals due to rounding.
This table excludes the 'other manufacturing' industry category.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table A.9
Total expenditures on pollution abatement and control and pollution prevention by region and industry, 2002

Industry	Atlantic Provinces[1]		Quebec		Ontario		Western Provinces and Territories[2]		British Columbia		Canada
	Pollution abatement and control	Pollution prevention	Pollution abatement and control	Pollution prevention	Pollution abatement and control	Pollution prevention	Pollution abatement and control	Pollution prevention	Pollution abatement and control	Pollution prevention	Total
	million dollars										
Logging	x	x	3.7	0.8	0.5	0.5	0.4	0.3	2.4	2.8	**x**
Oil and Gas Extraction	x	9.2	0.0	0.0	x	x	232.7	284.5	x	3.4	**560.4**
Mining	9.7	25.7	21.2	12.8	25.7	6.1	40.2	15.8	31.0	5.4	**193.7**
Electric Power Generation, Transmission and Distribution	x	x	17.2	x	199.0	x	60.2	108.9	x	5.2	**618.3**
Natural Gas Distribution	0.0	0.0	x	x	x	x	1.6	x	x	x	**18.0**
Food	22.0	7.1	34.0	19.1	69.9	x	17.1	x	13.8	x	**236.9**
Beverage and Tobacco Products	0.9	x	2.8	3.4	x	1.5	1.0	0.3	2.8	x	**18.8**
Wood Products	6.3	x	19.6	10.6	x	4.5	x	9.8	23.0	12.5	**x**
Pulp, Paper and Paperboard Mills	45.9	28.7	103.1	62.9	61.8	71.0	22.1	41.5	89.6	18.1	**544.6**
Petroleum and Coal Products	39.6	57.2	x	89.6	133.5	171.4	89.1	232.9	x	x	**874.7**
Chemicals	1.2	0.8	x	29.8	67.9	50.3	53.8	x	3.2	1.5	**x**
Non-Metallic Mineral Products	2.6	1.3	21.4	16.2	20.4	6.2	15.6	3.1	5.7	3.7	**96.2**
Primary Metals	x	x	181.9	x	244.7	62.2	x	6.6	11.7	1.8	**553.7**
Fabricated Metal Products	1.5	0.3	x	2.5	x	8.4	x	1.4	1.8	0.4	**74.6**
Transportation Equipment	2.0	0.5	29.1	7.0	119.0	31.2	7.5	1.8	6.3	1.6	**205.9**
Pipeline Transportation	x	x	0.0	1.4	0.3	x	2.9	30.8	x	1.0	**x**
Total	**x**	**x**	**515.2**	**297.8**	**996.7**	**648.4**	**x**	**x**	**234.3**	**81.8**	**4 465.2**

Notes:
Figures may not add up to totals due to rounding.
This table excludes the 'other manufacturing' industry category.
1. Includes Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick.
2. Includes Manitoba, Saskatchewan, Alberta, Yukon Territory, Northwest Territories and Nunavut.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table A.10
Distribution of capital expenditures on pollution abatement and control (end-of-pipe) by medium and industry, 2002

Industry	Air	Surface water	On-site contained solid and liquid waste	Noise, radiation and vibration	Total
	million dollars				
Logging	x	x	x	x	**x**
Oil and Gas Extraction	48.4	21.2	13.7	2.7	**85.9**
Mining	7.5	22.9	5.7	0.2	**36.3**
Electric Power Generation, Transmission and Distribution	166.8	36.5	14.9	0.3	**218.3**
Natural Gas Distribution	x	0.0	x	0.1	**x**
Food	15.0	37.6	x	x	**59.5**
Beverage and Tobacco Products	0.2	0.8	0.8	0.1	**1.9**
Wood Products	x	x	x	x	**x**
Pulp, Paper and Paperboard Mills	32.3	16.5	8.1	0.5	**57.4**
Petroleum and Coal Products	155.8	35.1	28.5	7.3	**226.7**
Chemicals	15.8	5.0	3.4	2.2	**26.4**
Non-Metallic Mineral Products	27.8	2.0	7.9	1.0	**38.7**
Primary Metals	66.1	13.9	7.2	0.2	**87.4**
Fabricated Metal Products	1.3	1.5	x	0.1	**x**
Transportation Equipment	x	x	4.4	0.1	**29.7**
Pipeline Transportation	x	0.1	x	x	**x**
Total	**580.6**	**203.3**	**104.8**	**18.9**	**907.7**

Notes:
Figures may not add up to totals due to rounding.
The distribution of capital expenditures on 'pollution abatement and control (end-of-pipe)' is not available for the 'other manufacturing' category.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table A.11
Distribution of capital expenditures on pollution abatement and control (end-of-pipe) by medium and province or territory, 2002

Province/Territory	Air	Surface water	On-site contained solid and liquid waste	Noise, radiation and vibration	**Total**
	million dollars				
Newfoundland and Labrador	4.3	x	x	x	**x**
Prince Edward Island	0.7	x	x	0.0	**x**
Nova Scotia	15.2	10.6	x	x	**x**
New Brunswick	6.7	10.4	0.7	0.1	**17.9**
Quebec	91.7	31.8	20.1	4.1	**147.7**
Ontario	311.3	53.6	23.6	5.1	**393.6**
Manitoba	2.2	3.4	x	x	**x**
Saskatchewan	16.1	9.0	12.7	0.4	**38.3**
Alberta	104.0	49.8	24.2	7.1	**185.1**
British Columbia	27.9	25.7	15.0	0.8	**69.4**
Yukon Territory, Northwest Territories and Nunavut	0.7	x	x	x	**2.4**
Canada	**580.6**	**203.3**	**104.8**	**18.9**	**907.7**

Notes:
Figures may not add up to totals due to rounding.
The distribution of capital expenditures on 'pollution abatement and control (end-of-pipe)' is not available for the 'other manufacturing' category.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table A.12
Distribution of capital expenditures on pollution prevention by medium and industry, 2002

Industry	Air	Surface water	On-site contained solid and liquid waste	Noise, radiation and vibration	Other	**Total**
	million dollars					
Logging	0.0	0.1	0.5	0.0	0.0	**0.6**
Oil and Gas Extraction	184.0	34.6	19.0	3.5	2.7	**243.7**
Mining	x	20.5	7.6	0.0	x	**31.1**
Electric Power Generation, Transmission and Distribution	164.9	27.7	x	x	x	**228.2**
Natural Gas Distribution	x	x	x	0.0	0.0	**x**
Food	23.8	9.4	4.3	0.0	8.8	**46.4**
Beverage and Tobacco Products	1.8	0.4	2.8	0.0	1.3	**6.4**
Wood Products	x	5.4	15.6	x	0.4	**29.0**
Pulp, Paper and Paperboard Mills	65.3	x	3.8	x	x	**152.9**
Petroleum and Coal Products	425.0	48.6	x	x	x	**499.9**
Chemicals	x	16.9	12.9	0.6	x	**x**
Non-Metallic Mineral Products	3.5	2.0	1.2	0.2	17.5	**24.4**
Primary Metals	15.5	7.2	7.2	0.0	1.2	**31.1**
Fabricated Metal Products	x	x	0.3	0.2	2.1	**x**
Transportation Equipment	18.5	3.5	3.9	0.2	1.3	**27.3**
Pipeline Transportation	5.3	x	20.5	x	x	**32.0**
Total	**950.5**	**224.7**	**138.3**	**12.9**	**100.8**	**1 427.2**

Notes:
Figures may not add up to totals due to rounding.
The distribution of capital expenditures on 'pollution prevention' is not available for the 'other manufacturing' category.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table A.13
Distribution of capital expenditures on pollution prevention by medium and province or territory, 2002

Province/Territory	Air	Surface water	On-site contained solid and liquid waste	Noise, radiation and vibration	Other	**Total**
	million dollars					
Newfoundland and Labrador	3.8	3.9	2.4	x	x	**11.7**
Prince Edward Island	0.2	0.2	0.1	0.0	0.1	**0.6**
Nova Scotia	x	10.0	6.4	x	x	**47.8**
New Brunswick	14.4	1.9	4.5	0.0	1.6	**22.5**
Quebec	105.6	26.0	17.5	2.1	58.5	**209.7**
Ontario	310.3	54.2	38.0	1.9	12.0	**416.4**
Manitoba	x	1.4	15.2	x	x	**70.0**
Saskatchewan	134.8	23.7	11.3	2.2	0.5	**172.5**
Alberta	288.3	91.2	32.9	5.7	5.6	**423.7**
British Columbia	24.3	10.4	8.5	0.3	4.8	**48.3**
Yukon Territory, Northwest Territories and Nunavut	0.6	1.6	1.3	x	x	**4.0**
Canada	**950.5**	**224.7**	**138.3**	**12.9**	**100.8**	**1 427.2**

Notes:
Figures may not add up to totals due to rounding.
The distribution of capital expenditures on 'pollution prevention' is not available for the 'other manufacturing' category.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Annex B

Environmental Management and Technology Tables

Table B.1
Use of environmental management practices by business, 2002

Environmental management practice	Establishments using the practice	Proportion of establishments using the practice[1]	Employment share of establishments using the practice[2]
	number	percent	
Environmental management system	1 115	56	70
Life cycle analysis	274	14	25
ISO 14000 certification	381	19	36
Environmental voluntary agreements	580	29	44
Green procurement policy	278	14	22
Eco-labelling of products	95	5	7
Annual environmental performance report	822	41	54
Other	69	9	8
Total	**1 449[3]**	**71[4]**	**83[4]**

Notes:
This table includes reported data only.
This table includes the 'other manufacturing' industry category, therefore, comparisons with previous survey years should be made with caution.
1. Number of establishments indicating they used the practice as a percentage of all establishments that provided a response.
2. Does not include the Pipeline Transportation industry as employment numbers were not available for this industry.
3. Number of establishments indicating they used at least one environmental practice.
4. Number of establishments indicating they used at least one environmental practice as a percentage of the total number of establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table B.2
Distribution of environmental management practices by industry, 2002

Industry	Environmental management system	Life cycle analysis	ISO 14000 certification	Environmental voluntary agreements	Green procurement policy	Eco-labelling of products	Annual environmental performance report	Other	**Total[2]**
	percent[1]								
Logging	82	11	66	23	20	24	48	4	**88**
Oil and Gas Extraction	90	34	5	81	23	4	81	16	**97**
Mining	75	19	9	53	19	0	72	23	**88**
Electric Power Generation, Transmission and Distribution	64	27	22	50	20	15	54	0	**72**
Natural Gas Distribution	92	36	18	92	27	0	92	25	**100**
Food	38	7	3	11	11	1	24	4	**53**
Beverage and Tobacco Products	36	5	3	20	5	0	29	9	**55**
Wood Products	48	7	18	23	18	15	40	9	**61**
Pulp, Paper and Paperboard Mills	75	10	38	43	8	6	76	18	**93**
Petroleum and Coal Products	73	38	19	50	9	22	67	0	**88**
Chemicals	61	19	11	37	12	3	45	11	**76**
Non-Metallic Mineral Products	40	15	13	21	14	4	24	8	**62**
Primary Metals	54	9	20	29	9	0	39	7	**67**
Fabricated Metal Products	54	6	23	13	13	0	23	0	**68**
Transportation Equipment	66	22	46	23	18	4	34	12	**75**
Pipeline Transportation	100	29	2	98	33	0	76	0	**100**
Total, excluding 'other manufacturing'	**61**	**15**	**23**	**35**	**14**	**5**	**47**	**9**	**74**
Other manufacturing	38	10	19	10	12	3	23	7	**63**
Total	**56**	**14**	**19**	**29**	**14**	**5**	**41**	**9**	**71**

Notes:
This table includes reported data only.
1. Number of establishments indicating they used the practice as a percentage of all establishments that provided a response.
2. Number of establishments indicating they used at least one environmental practice as a percentage of the total number of establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table B.3
Distribution of environmental management practices by province or territory, 2002

Province/Territory	Environmental management system	Life cycle analysis	ISO 14000 certification	Environmental voluntary agreements	Green procurement policy	Eco-labelling of products	Annual environmental performance report	Other	**Total[2]**
	percent[1]								
Newfoundland and Labrador	76	20	27	32	23	0	55	0	**82**
Prince Edward Island	30	10	0	10	0	10	20	0	**40**
Nova Scotia	64	10	10	36	11	0	56	11	**82**
New Brunswick	52	12	20	28	14	12	41	5	**73**
Quebec	46	11	17	21	8	3	29	8	**62**
Ontario	55	13	23	24	16	4	38	9	**74**
Manitoba	39	16	11	27	19	3	38	16	**63**
Saskatchewan	70	16	6	54	17	7	66	7	**82**
Alberta	71	25	8	52	16	5	52	10	**80**
British Columbia	66	7	32	35	17	14	62	11	**76**
Yukon Territory, Northwest Territories and Nunavut	73	36	0	64	9	0	73	0	**91**
Total	**56**	**14**	**19**	**29**	**14**	**5**	**41**	**9**	**71**

Notes:
This table includes reported data only.
This table includes the 'other manufacturing' industry category, therefore, comparisons with previous survey years should be made with caution.
1. Number of establishments indicating they used the practice as a percentage of all establishments that provided a response.
2. Number of establishments indicating they used at least one environmental practice as a percentage of the total number of establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table B.4
Distribution of environmental management practices by establishment size, 2002

Number of employees per establishment	Environmental management system	Life cycle analysis	ISO 14000 certification	Environmental voluntary agreements	Green procurement policy	Eco-labelling of products	Annual environment performance report	Other	**Percentage of total employees percent[2]**
	percent[1]								
<100	42	11	11	22	10	4	31	8	**62**
100 - 499	54	12	18	25	13	5	40	9	**74**
500 - 999	69	19	33	38	19	4	54	10	**86**
>999	84	30	45	61	26	9	63	10	**96**

Notes:
This table includes reported data only.
This table excludes the 'other manufacturing' and Pipeline Transportation industry categories.
1. Number of establishments indicating they used the practice as a percentage of all establishments that provided a response.
2. Employment of establishments indicating they used at least one environmental practice, as a percentage of total employment of establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table B.5
Pollution prevention methods by industry, 2002

Industry	Product design or reformulation	Equipment or process modifications	Recirculation, recovery, reuse or recycling	Materials, feedstock or solvent substitution	Improved management or purchasing techniques	Prevention of leaks and spills	Good operating practices or training	Other	**Total[2]**
	percent[1]								
Logging	5	25	61	9	34	84	85	19	**91**
Oil and Gas Extraction	30	77	71	42	48	92	91	16	**96**
Mining	9	35	77	32	39	82	79	34	**93**
Electric Power Generation, Transmission and Distribution	14	38	63	36	34	80	78	16	**85**
Natural Gas Distribution	11	44	82	22	82	100	100	33	**100**
Food	16	16	55	21	25	66	69	17	**84**
Beverage and Tobacco Products	8	31	40	15	17	46	50	9	**71**
Wood Products	16	40	63	19	37	63	74	22	**85**
Pulp, Paper and Paperboard Mills	10	70	81	30	30	85	90	21	**95**
Petroleum and Coal Products	39	63	72	47	43	85	84	0	**94**
Chemicals	16	40	63	25	35	78	79	13	**93**
Non-Metallic Mineral Products	23	49	64	29	30	54	62	16	**83**
Primary Metals	12	51	73	32	25	70	70	16	**87**
Fabricated Metal Products	14	49	64	33	41	66	73	10	**84**
Transportation Equipment	32	52	61	48	51	71	69	24	**85**
Pipeline Transportation	42	70	54	35	58	100	98	0	**100**
Total, excluding 'other manufacturing'	**20**	**50**	**66**	**29**	**35**	**74**	**76**	**17**	**88**
Other manufacturing	29	48	62	38	43	59	66	11	**88**
Total	**22**	**49**	**65**	**31**	**37**	**70**	**74**	**16**	**88**

Notes:
This table includes reported data only.
1. Number of establishments indicating they used the pollution prevention method as a percentage of all establishments that provided a response.
2. Number of establishments that indicated they used at least one pollution prevention method as a percentage of the total number of establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table B.6
Pollution prevention methods by province or territory, 2002

Province/Territory	Product design or reformulation	Equipment or process modifications	Recirculation, recovery, reuse or recycling	Materials, feedstock or solvent substitution	Improved management or purchasing techniques	Prevention of leaks and spills	Good operating practices or training	Other	**Total[2]**
	percent[1]								
Newfoundland and Labrador	12	47	65	53	39	84	74	22	**91**
Prince Edward Island	22	44	44	0	44	70	70	29	**90**
Nova Scotia	25	66	81	41	36	65	70	5	**90**
New Brunswick	11	55	71	22	26	74	73	28	**84**
Quebec	15	38	63	30	36	61	64	14	**85**
Ontario	27	52	64	34	39	71	76	16	**88**
Manitoba	32	50	57	37	28	69	78	13	**88**
Saskatchewan	21	46	72	29	33	83	77	9	**92**
Alberta	24	64	68	27	39	81	82	17	**92**
British Columbia	17	49	67	22	35	76	79	21	**91**
Yukon Territory, Northwest Territories and Nunavut	20	40	70	30	30	82	82	33	**91**
Total	**22**	**49**	**65**	**31**	**37**	**70**	**74**	**16**	**88**

Notes:
This table includes reported data only.
This table includes the 'other manufacturing' industry category, therefore, comparisons with previous survey years should be made with caution.
1. Number of establishments indicating they used the pollution prevention method as a percentage of all establishments that provided a response.
2. Number of establishments that indicated they used at least one pollution prevention method as a percentage of the total number of establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table B.7
Distribution of pollution prevention methods by establishment size, 2002

Number of employees per establishment	Product design or reformulation	Equipment or process modifications	Recirculation, recovery, reuse or recycling	Materials, feedstock or solvent substitution	Improved management or purchasing techniques	Prevention of leaks and spills	Good operating practices or training	Other	**Percentage of total employees**
	percent[1]								**percent[2]**
<100	18	38	56	20	27	60	65	13	**82**
100 - 499	20	50	67	32	40	70	74	17	**91**
500 - 999	27	61	69	40	37	82	84	18	**93**
>999	36	66	76	55	50	84	85	20	**95**

Notes:
This table includes reported data only.
This table excludes the 'other manufacturing' and Pipeline Transportation industry categories.
1. Number of establishments indicating they used the pollution prevention method as a percentage of all establishments that provided a response.
2. Employment of establishments indicating they used at least one pollution prevention method, as a percentage of total employment of establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table B.8
Distribution of environmental technology use, 2002

Technology	Number of establishments	Proportion of establishments that used each technology
	number	percent[1]
Energy conservation and efficiency		
Cogeneration	130	9
Small, mini, or micro-hydroelectric facility	49	3
Solar energy systems or equipment	86	6
Wind energy systems or equipment	17	1
Waste-to-energy systems or equipment	209	14
Other renewable energy systems or equipment	59	4
Alternative fuel systems or equipment	70	5
Fuel substitution	120	8
Other	309	22
Total - energy conservation and efficiency	**621[2]**	**40[3]**
Biological treatment		
Microbiologically enhanced recovery of material(s)	44	3
Phytoremediation	34	2
Bioremediation	144	9
Biofiltration	26	2
Natural or constructed wetland	46	3
Bioleaching	6	0
Bio-pulping	2	0
Bio-bleaching	6	0
Biodesulphurization	2	0
Other	84	5
Total - biological treatment	**287[2]**	**19[3]**

Notes:
This table includes reported data only.
This table excludes the 'other manufacturing' industry category.
1. Number of establishments that indicated they used the energy conservation process or biotechnology as a percentage of all establishments that provided a response.
2. Number of establishments that indicated they used at least one of the energy conservation processes or biotechnologies.
3. Number of establishments that indicated they used at least one of the energy conservation processes or biotechnologies as a percentage of the total number of establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table B.9
Distribution of companies that reported cost savings as a result of adopting environmental management practices by establishment size, 2002

Number of employees per establishment	Establishments reporting cost savings
	percent[1]
<100	23
100 - 499	34
500 - 999	46
>999	68
Total	**35**

Notes:
This table includes reported data only.
This table excludes the Pipeline Transportation Industry.
1. Number of establishments indicating they experienced cost savings as a percentage of all establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Annex C

Greenhouse Gas Emission Reduction Technology Tables

Table C.1
Proportion of establishments in fossil-fuel related industries that reported greenhouse gas emissions reductions, 2002

Industry	Reduced fugitive or vented greenhouse gas emissions	Reduced other sources of greenhouse gas emissions
	percent[1]	
Oil and Gas Extraction	90	76
Natural Gas Distribution	92	67
Pipeline Transportation	95	67
Petroleum and Coal Products	58	89
Total	**87**	**74**

Notes:
This table includes reported data only.
1. Number of establishments that reported the use of systems or equipment to reduce greenhouse gas emissions as a percentage of establishments that reported extracting, refining, transporting, or distributing fossil fuels in 2002.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table C.2
Adoption and impact of new or significantly improved systems or equipment to reduce greenhouse gas emissions by industry[1]

Industry	Introduced new or significantly improved systems or equipment		Impact on emissions[2]		
	Yes	No	Small	Medium	Large
	percent				
Logging	11	89	71	29	0
Oil and Gas Extraction	65	35	31	57	12
Mining	18	82	70	30	0
Electric Power Generation, Transmission and Distribution	29	71	45	23	32
Natural Gas Distribution	58	42	0	71	29
Food	10	90	59	41	0
Beverage and Tobacco Products	16	84	60	40	0
Wood Products	14	86	50	36	14
Pulp, Paper and Paperboard Mills	35	65	40	36	24
Petroleum and Coal Products	39	61	62	38	0
Chemicals	18	82	55	33	13
Non-Metallic Mineral Products	18	82	46	31	23
Primary Metals	21	79	30	51	19
Fabricated Metal Products	18	82	43	50	7
Transportation Equipment	23	77	59	32	9
Pipeline Transportation	71	29	17	80	3
Total	**24**	**76**	**44**	**44**	**13**

Notes:
This table includes reported data only.
Figures may not add up to totals due to rounding.
1. Adoption of new or significantly improved systems or equipment within a three year period, 2000-2002.
2. Respondents who answered Yes to the adoption of new or significantly improved systems or equipment were asked to rank the impact on greenhouse gas emission reductions as being small, medium or large.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table C.3
Adoption and impact of new or significantly improved systems or equipment to reduce greenhouse gas emissions by province or territory[1]

Province/Territory	Introduced new or significantly improved systems or equipment		Impact on emissions[2]		
	Yes	No	Small	Medium	Large
	percent				
Newfoundland and Labrador	14	86	100	0	0
Prince Edward Island	10	90	100	0	0
Nova Scotia	27	73	63	25	13
New Brunswick	21	79	33	50	17
Quebec	20	80	43	43	14
Ontario	20	80	52	36	12
Manitoba	36	64	29	38	33
Saskatchewan	41	59	40	52	8
Alberta	34	66	36	54	10
British Columbia	22	78	37	51	11
Yukon Territory, Northwest Territories and Nunavut	30	70	33	67	0
Total	**24**	**76**	**44**	**44**	**13**

Notes:
This table includes reported data only.
Figures may not add up to totals due to rounding.
1. Adoption of new or significantly improved systems or equipment within a three year period, 2000-2002.
2. Respondents who answered Yes to the adoption of new or significantly improved systems or equipment were asked to rank the impact on greenhouse gas emission reductions as being small, medium or large.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table C.4
Total operating and capital expenditures on environmental processes and technologies to reduce greenhouse gas emissions by industry, 2002

Industry	Operating expenditures	Capital expenditures	**Total**
	million dollars		
Logging	15.4	3.0	**18.4**
Oil and Gas Extraction	13.9	230.9	**244.9**
Mining	14.4	7.3	**21.7**
Electric Power Generation, Transmission and Distribution	104.9	98.8	**203.7**
Natural Gas Distribution	5.5	6.8	**12.3**
Food	11.6	10.4	**22.0**
Beverage and Tobacco Products	1.0	3.3	**4.3**
Wood Products	84.0	19.3	**103.3**
Pulp, Paper and Paperboard Mills	175.9	65.8	**241.8**
Petroleum and Coal Products	2.5	25.7	**28.2**
Chemicals	40.8	6.4	**47.2**
Non-Metallic Mineral Products	2.8	31.0	**33.8**
Primary Metals	7.8	33.8	**41.6**
Fabricated Metal Products	6.6	1.4	**8.0**
Transportation Equipment	26.3	7.2	**33.4**
Pipeline Transportation	9.6	32.0	**41.6**
Total	**523.0**	**583.3**	**1 106.3**

Notes:
Figures may not add up to totals due to rounding.
Expenditures on greenhouse gas emission reduction technologies are not available for the 'other manufacturing' category.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table C.5
Total operating and capital expenditures on environmental processes and technologies to reduce greenhouse gas emissions by province or territory, 2002

Province/Territory	Operating expenditures	Capital expenditures	**Total**
	million dollars		
Newfoundland and Labrador	4.9	28.3	**33.2**
Prince Edward Island	1.2	0.6	**1.8**
Nova Scotia	22.3	9.0	**31.4**
New Brunswick	18.7	14.6	**33.3**
Quebec	74.2	77.8	**152.0**
Ontario	123.5	125.2	**248.7**
Manitoba	22.6	15.4	**37.9**
Saskatchewan	15.1	22.8	**37.9**
Alberta	68.2	255.2	**323.4**
British Columbia	170.1	32.7	**202.8**
Yukon Territory, Northwest Territories and Nunavut	2.2	1.6	**3.8**
Total	**523.0**	**583.3**	**1 106.3**

Notes:
Figures may not add up to totals due to rounding.
This table excludes the 'other manufacturing' industries category.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table C.6
Obstacles to the adoption of technologies to reduce greenhouse gas emissions by industry: Innovators versus Non-innovators[1]

	Lack of information or knowledge		Lack of available technology		Lack of skilled personnel		High cost of equipment		Lack of financing		Regulatory/ policy barriers		Other	
Industry	Innovator	Non-innovator	Innovator	Non-innovator	Innovator	Non-innovator	Innovator	Non-innovator	Innovator	Non-innovator	Innovator	Non-innovator	Innovator	Non-innovator
	percent[2]													
Logging	43	38	57	43	14	10	71	43	29	33	0	5	14	5
Oil and Gas Extraction	35	20	35	40	10	5	88	50	52	5	48	20	21	30
Mining	10	29	20	38	5	11	50	52	30	35	20	9	20	20
Electric Power Generation, Transmission and Distribution	25	32	35	55	5	5	65	68	25	27	50	9	10	14
Natural Gas Distribution	33	0	50	33	0	0	83	33	50	0	67	33	17	33
Food	27	41	33	28	7	13	73	71	60	46	7	5	27	4
Beverage and Tobacco Products	40	56	10	19	30	19	80	59	30	56	0	3	0	16
Wood Products	10	36	38	24	5	14	62	62	38	43	33	11	5	11
Pulp, Paper and Paperboard Mills	14	24	14	22	5	10	76	68	49	59	24	19	5	8
Petroleum and Coal Products	67	50	25	38	0	13	83	38	50	25	50	25	42	0
Chemicals	11	32	20	35	20	9	69	61	43	40	3	17	6	11
Non-Metallic Mineral Products	17	37	25	46	8	9	58	51	25	34	33	26	8	11
Primary Metals	17	45	17	28	11	20	58	67	64	49	8	10	8	5
Fabricated Metal Products	15	41	31	21	23	18	77	82	62	46	8	10	8	8
Transportation Equipment	23	50	18	26	9	14	86	55	59	40	0	7	9	14
Pipeline Transportation	7	0	79	73	3	0	66	73	10	45	3	9	0	27
Total	**21**	**36**	**30**	**31**	**10**	**12**	**71**	**62**	**44**	**42**	**22**	**12**	**11**	**11**

Notes:
This table includes reported data only.
1. Establishments who answered 'yes' to adopting new or significantly improved systems or equipment to reduce greenhouse gases during the period 2000-2002 are considered 'innovators.'
2. Number of establishments that indicated encountering the obstacle as a percentage of all establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table C.7
Drivers to the adoption of technologies to reduce greenhouse gas emissions by industry: Innovators versus Non-innovators[1]

	Sufficient return on investment		Regulations		Voluntary agreement		Public relations		Corporate policy/ culture/awareness		Other	
Industry	Innovator	Non-innovator	Innovator	Non-innovator	Innovator	Non-innovator	Innovator	Non-innovator	Innovator	Non-innovator	Innovator	Non-innovator
	percent[2]											
Logging	57	33	86	20	43	5	43	23	43	30	0	0
Oil and Gas Extraction	88	55	80	55	76	30	78	30	86	45	2	5
Mining	55	44	35	27	35	14	40	20	50	40	15	3
Electric Power Generation, Transmission and Distribution	67	27	67	39	62	20	81	32	86	32	5	2
Natural Gas Distribution	57	67	29	33	71	67	57	33	100	33	29	0
Food	53	38	53	37	47	8	41	16	76	34	6	0
Beverage and Tobacco Products	80	40	70	24	20	12	0	14	70	36	10	7
Wood Products	65	47	40	34	45	11	40	20	70	29	0	2
Pulp, Paper and Paperboard Mills	87	67	38	61	26	24	33	24	54	53	13	6
Petroleum and Coal Products	83	53	67	41	83	41	50	24	67	35	0	0
Chemicals	66	43	49	44	29	22	29	22	57	39	6	5
Non-Metallic Mineral Products	62	45	23	37	15	20	31	20	38	31	8	4
Primary Metals	67	55	39	39	50	25	31	21	64	38	8	1
Fabricated Metal Products	79	45	36	36	7	13	14	22	43	24	0	5
Transportation Equipment	86	42	41	31	27	7	27	11	59	25	18	4
Pipeline Transportation	87	90	53	10	80	50	83	0	87	70	7	0
Total	**74**	**46**	**51**	**37**	**47**	**17**	**46**	**20**	**67**	**35**	**7**	**3**

Notes:
This table includes reported data only.
1. Establishments who answered 'yes' to adopting new or significantly improved systems or equipment to reduce greenhouse gases during the period 2000-2002 are considered 'innovators.'
2. Number of establishments that indicated the driver as a percentage of all establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table C.8
Energy conservation processes and technologies by industry, 2002

Industry	Cogeneration	Small, mini, or micro-hydroelectric facility	Solar energy systems or equipment	Wind energy systems or equipment	Waste-to-energy systems or equipment	Other renewable energy systems or equipment	Alternative fuel systems or equipment	Fuel substitution	Other	**Total[1]**
	percent[2]									
Logging	2	6	3	0	19	2	6	6	10	**36**
Oil and Gas Extraction	19	11	49	8	12	6	13	11	34	**75**
Mining	3	6	17	0	9	6	4	8	24	**48**
Electric Power Generation, Transmission and Distribution	22	24	11	14	15	13	12	14	31	**58**
Natural Gas Distribution	10	0	27	0	10	0	40	42	33	**69**
Food	2	0	0	0	5	1	2	5	18	**20**
Beverage and Tobacco Products	2	0	0	0	3	0	0	2	17	**21**
Wood Products	8	0	1	0	41	8	3	11	16	**52**
Pulp, Paper and Paperboard Mills	32	9	0	0	58	16	10	18	29	**81**
Petroleum and Coal Products	12	0	3	0	9	3	3	22	32	**53**
Chemicals	12	0	0	0	5	2	4	6	15	**26**
Non-Metallic Mineral Products	0	0	0	0	7	1	3	8	13	**8**
Primary Metals	2	2	0	0	4	1	4	4	25	**32**
Fabricated Metal Products	3	0	0	1	1	0	0	0	7	**10**
Transportation Equipment	2	0	3	0	1	1	1	5	34	**33**
Pipeline Transportation	10	0	29	0	5	2	8	8	48	**74**
Total	**9**	**3**	**6**	**1**	**14**	**4**	**5**	**8**	**22**	**40**

Notes:
This table includes reported data only.
This table excludes the 'other manufacturing' industry category.
1. Number of establishments that indicated they used at least one energy conservation process or technology as a percentage of the total number of establishments that provided a response.
2. Number of establishments indicating they used the process or technology as a percentage of all establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table C.9
Energy conservation processes and technologies by province or territory, 2002

Province/Territory	Cogeneration	Small, mini, or micro-hydroelectric facility	Solar energy systems or equipment	Wind energy systems or equipment	Waste-to-energy systems or equipment	Other renewable energy systems or equipment	Alternative fuel systems or equipment	Fuel substitution	Other	**Total[1]**
	percent[2]									
Newfoundland and Labrador	5	9	0	0	14	5	0	5	24	**36**
Prince Edward Island	10	0	0	0	20	0	0	20	40	**50**
Nova Scotia	13	7	0	3	23	4	7	10	19	**43**
New Brunswick	11	5	2	0	31	10	2	12	23	**50**
Quebec	5	1	2	0	14	5	3	9	17	**34**
Ontario	7	3	2	1	7	2	3	5	22	**33**
Manitoba	5	0	5	0	15	7	11	13	24	**39**
Saskatchewan	8	2	20	3	10	3	7	14	27	**51**
Alberta	16	4	19	3	16	5	8	8	27	**55**
British Columbia	13	5	8	1	31	5	8	12	20	**50**
Yukon Territory, Northwest Territories and Nunavut	10	30	20	0	0	30	11	11	33	**70**
Total	**9**	**3**	**6**	**1**	**14**	**4**	**5**	**8**	**22**	**40**

Notes:
This table includes reported data only.
This table excludes the 'other manufacturing' industry category.
1. Number of establishments that indicated they used at least one energy conservation process or technology as a percentage of the total number of establishments that provided a response.
2. Number of establishments indicating they used the process or technology as a percentage of all establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Table C.10
Distribution of energy conservation processes and technologies by establishment size, 2002

Number of employees per establishment	Cogeneration	Small, mini, or micro-hydroelectric facility	Solar energy systems or equipment	Wind energy systems or equipment	Waste-to-energy systems or equipment	Other renewable energy systems or equipment	Alternative fuel systems or equipment	Fuel substitution	Other	**Percentage of total employees percent[2]**
	percent[1]									
<100	5	2	5	1	8	2	3	4	14	**28**
100 - 499	9	3	4	1	16	4	5	9	20	**43**
500 - 999	10	6	6	1	19	6	6	10	27	**51**
>999	16	10	10	9	13	10	10	20	53	**74**

Notes:
This table includes reported data only.
This table excludes the 'other manufacturing' and Pipeline Transportation industry categories.
1. Number of establishments indicating they used the process or technology as a percentage of all establishments that provided a response.
2. Employment of establishments indicating they used at least one energy conservation process or technology, as a percentage of total employment of establishments that provided a response.
Source:
Statistics Canada, Environment Accounts and Statistics Division.

Annex D

Questionnaires

Environment Accounts and Statistics Division

Survey of Environmental Protection Expenditures, 2002

Confidential when completed

Collected under the authority of the *Statistics Act*, Revised Statutes of Canada, 1985, Chapter S19.

Si vous préférez ce questionnaire en français, veuillez cocher ☐

Correct as required

Company name

Establishment name

C / O

Address

City

Province/Territory Postal code

Please read before completing

PURPOSE OF THE SURVEY

This survey provides a measure of the expenditures made by industry for environmental protection in Canada in response to Canadian and international environmental regulations, conventions and voluntary agreements. The survey also aims at identifying environmental management practices and technologies used in Canadian industry for the purpose of preventing or abating pollution. These data will be aggregated with information from other sources to produce official estimates of enviromental protection expenditures.

The results of this survey will be published in the Statistics Canada publication *Environmental Protection Expenditures in the Business Sector, 2002,* Catalogue No. 16F0006XIE.

CONFIDENTIALITY

Statistics Canada is **prohibited by law** from publishing any statistics which would divulge information obtained from this survey that relates to any identifiable respondent, without the previous written consent of that respondent. The data reported will be treated in strict confidence, used for statistical purposes and published in aggregate form only. The confidentiality provisions of the *Statistics Act* are not affected by either the *Access to Information Act* or any other legislation.

AUTHORITY

This survey is conducted under the authority of the *Statistics Act*, Revised Statutes of Canada, 1985, Chapter S19. **COMPLETION OF THIS QUESTIONNAIRE IS A LEGAL REQUIREMENT UNDER THE *STATISTICS ACT*.**

INQUIRIES

If you require assistance in completing this questionnaire or if you have any questions or comments regarding this survey, please refer to the *Guide to Definitions and Classification Details* or contact:

Operations and Integration Division
Statistics Canada
Ottawa, ON, Canada, K1A 0T6

Telephone (toll-free): **1-800-255-7726**
Fax: **1-800-755-5514**
Email: **enviro.oid.exp@statcan.ca**

The questionnaire is available in an electronic spreadsheet format. Please contact the Operations and Integration Division if you prefer to use this reporting option.

In all correspondence concerning this questionnaire, please quote the identification number that appears on the address label.

Important : Please read the *Guide to Definitions and Classification Details* included with this form before answering. If your response for an item is zero, please write "0" in the corresponding box rather than leaving the cell blank.

Please return this questionnaire within 30 days of receipt.

If you are unable to do so, kindly inform the Operations and Integration Division of the expected completion date.

For Statistics Canada use only

Rec. D	M	Y	Ed. D	M	Y	Kyd. D	M	Y	Bat.	Coll.	FSC

4-2300-2.1: 2002-11-15 STC / NAD - 475-04244

Statistics Canada Statistique Canada

Canada

Please report in thousands of Canadian dollars

1. Reporting year

Report must cover your most recent fiscal year that ended at any time between **April 1, 2002 and March 31, 2003.**

	Day	Month	Year		Day	Month	Year
From	010	020	030	to	040	050	060

2. Environmental monitoring

If the expenditure is zero, please write "0" in corresponding box.

Include

- Expenditures related to equipment, supplies, labour and purchased services required for monitoring pollutants emitted by this establishment. Expenditures associated with participation in the National Pollutant Release Inventory (NPRI) and other similar programs are to be included

Operating expenses		Capital expenditures		Total
$ 000		$ 000		$ 000
100	+	110	=	120

3. Environmental assessment and audits

If the expenditure is zero, please write "0" in corresponding box.

Include

- Expenditures for reviews of current operations for compliance with regulations (audits)
- Expenditures to evaluate the environmental impact of proposed programs or projects (assessments)
- Expenditures for associated legal and consulting costs

Operating expenses		Capital expenditures		Total
$ 000		$ 000		$ 000
130	+	140	=	150

4. Site reclamation and decommissioning

If the expenditure is zero, please write "0" in corresponding box.

a) Expenditures on site reclamation made during the fiscal year 2002 for any active site belonging to your establishment

Operating expenses		Capital expenditures		Total
$ 000		$ 000		$ 000
161	+	171	=	181

b) Expenditures on site decommissioning made during the fiscal year 2002 following the closing down of a site (even if closing occurred before 2002)

Operating expenses		Capital expenditures		Total
$ 000		$ 000		$ 000
162	+	172	=	182

Exclude

- Fines or compensation for environmental damage (this is to be reported in Question 8)
- Provisions for future environmental liability

Please report in thousands of Canadian dollars

5. Protection and restoration of wildlife and habitat

If the expenditure is zero, please write "0" in corresponding box.

Include

- Expenditures made to protect or restore wildlife and habitat that could be or have been adversely affected by this establishment's operations

Exclude

- Expenditures for site reclamation and decommissioning which are already reported in Question 4
- Expenditures for aesthetic purposes

Operating expenses $ 000		Capital expenditures $ 000		Total $ 000
190	+	200	=	210

6. Pollution abatement and control (end-of-pipe processes) and waste management

Abatement and control of pollution are performed using end-of-pipe equipment or installations. **These end-of-pipe processes are not an integral part of production**; their sole purpose is to abate or to control undesirable substances resulting from normal production. ***Refer to page 3 of the Guide.***

a) Pollution abatement and control and waste management expenditures

If the expenditure is zero, please write "0" in corresponding box.

Include

- Expenditures for equipment or facilities that are separately identifiable and that have been installed exclusively to reduce or eliminate pollutants resulting from production
- Expenditures related to waste collection, removal and treatment done by your establishment's or company's employees not already reported in Question 4 or 5
- Purchases of waste services not already reported in Question 4 or 5. Any sewerage management services or any other purchase of services reported in Question 11

Exclude

- Expenditures specific to workers' health and safety
- Expenditures on waste management or services reported in Question 4 or 5
- Expenditures for on-site recycling (Question 7)

Operating expenses $ 000		Capital expenditures $ 000		Total $ 000
250	+	260	=	270

b) Did you report capital expenditures in Question 6a (cell 260)?

◯ Yes ◯ No 275 ▶ *Go to Question 7*

▼

1. What proportion of capital expenditures reported in cell 260 was spent on reducing or abating each of the following? Refer to page 3 of the **Guide**.

Substances released to air %		Substances released to surface waters %		On-site releases to land/ underground injection %		Noise, vibration or radiation %	
280	+	290	+	300	+	310	= 100%

Please report in thousands of Canadian dollars

7. Pollution prevention

"Pollution prevention is the use of processes, practices, materials, products or energy that avoid or minimize the creation of pollutants and waste, and reduce overall risk to human health or the environment."

Pollution Prevention - A Federal Strategy for Action, Government of Canada (1995)

This question identifies expenditures and methods used for the purpose of preventing or minimizing pollution and waste, or promoting resource conservation. ***Refer to page 3 of the Guide.***

a) Expenditures on pollution prevention

If the expenditure is zero, please write "0" in corresponding box.

Include

- Expenditures for equipment or facilities integrated to a production process that avoid or minimize the production of pollutants and waste
- Expenditures for equipment or facilities related to leak and spill prevention. They may include expenditures on the following: spill containments; dyke extentions; and accessories (valves, pumps)
- Expenditures for equipment or facilities used for conserving energy or water
- Expenditures for equipment or facilities associated with recirculation, recovery, reuse and **on-site** recycling of materials or substances

Exclude

- Expenditures specific to worker's health and safety
- Expenditures already included in Questions 2 to 6

Operating expenses		Capital expenditures		Total
$ 000		$ 000		$ 000
500	+	510	=	520

b) Did you report capital expenditures in Question 7a (cell 510)?

◯ Yes ▼ ◯ No 525 ► *Go to Question 7c*

1. What proportion of capital expenditures reported in cell 510 was spent on preventing or minimizing each of the following? Refer to Question 6b, page 3 of the ***Guide***.

Substances released to air		Substances released to surface waters		On-site releases to land/ underground injection		Noise, vibration or radiation		Other	
%		%		%		%		%	
530	+	540	+	550	+	560	+	570	= 100 %

Please report in thousands of Canadian dollars

7. Pollution prevention *(Concluded)*

c) Pollution prevention methods

If you have prevented or reduced waste, pollutants or conserved resources in fiscal year 2002, please indicate how it was achieved by checking the appropriate box(es). Please include all projects regardless of whether they are required by regulation, convention or voluntary agreement. Refer to pages 3 and 4 of the ***Guide*** for a description of each method.

		Yes	No
Product design or reformulation	810	☐	☐
Equipment or process modifications (integrated process)	830	☐	☐
Recirculation, on-site recycling or reuse or recovery of materials or substances	850	☐	☐
Materials or feedstock substitution, solvent reduction, elimination or substitution	870	☐	☐
Improved inventory management or purchasing techniques	875	☐	☐
Prevention of leaks and spills	880	☐	☐
Good operating practices or pollution prevention training	885	☐	☐
Other (*Please specify*)	890	☐	☐

_____

_____

_____

8. Environmental charges

If the expenditure is zero, please write "0" in corresponding box.

$ 000

760 _____

Include

- Permits, fees, levies, special assessment and related fees
- Any fines, penalties, or damage awards paid to government agencies or to individuals
- Other charges paid to regulating bodies in order to allow operations to take place at this establishment

9. Other environmental protection expenditures

If the expenditure is zero, please write "0" in corresponding box.

Include

$ 000

770 _____

- The operating costs of administrating your environmental program
- Environmental training and information programs
- Any other additional expenditures that are required to comply with environmental regulations, conventions or voluntary agreements

Exclude

- Research and development expenditures

Please report in thousands of Canadian dollars

10. Total expenditures on environmental protection

If the expenditure is zero, please write "0" in corresponding box.

Cell 801: includes total from operating expenses reported in questions 2 to 9.
Cell 802: includes total from capital expenditures reported in questions 2 to 7.
They should also include all data for which breakdowns were not available.

Operating expenses		Capital expenditures		Total
$ 000		$ 000		$ 000
801	+	802	=	803

11. Purchase of environmental services

Of the total operating expenses and capital expenditures on environmental protection reported in Question 10, what proportions were purchased from a private contractor or government? Your best estimate is acceptable. *If the proportion is zero, please write "0" in corresponding box.*

Include

- All expenditures associated with the use of waste collection and treatment service or a sewerage service provided by a private contractor or a federal, provincial/territorial or local government
- Any other purchase of environmental services provided by a private contractor or a federal, provincial/territorial or local government (examples include the purchase of environmental monitoring services; environmental assessment and audit services; construction and engineering services associated with the installation, repair or maintenance of pollution prevention, abatement and control infrastructure or equipment)

Exclude

- Any expenditures for environmental services provided by your establishment's or company's employees (own-account work)
- Expenditures for on-site recycling

% of total operating expenses	% of total capital expenditures
301 %	502 %

12. Environmental Processes and Technologies

a) Did this establishment extract, refine, transport or distribute fossil fuels (coal, bitumen, crude oil or natural gas) in fiscal year 2002?

Yes ☐ *Go to Question 12b* No ☐ 2000 *Go to Question 12c*

b) Did this establishment use systems or equipment to reduce fugitive or vented greenhouse gas emissions in fiscal year 2002? Refer to page 4 of the ***Guide*** for definition of fugitive greenhouse gas emissions and related technologies.

Yes ☐ No ☐ 2001

Did this establishment use systems or equipment to reduce greenhouse gas emissions other than fugitive or vented emissions (e.g. from the combustion of fossil fuels)?

Yes ☐ No ☐ 2002

c) Did this establishment use systems or equipment to reduce greenhouse gas emissions from the generation of electricity in fiscal year 2002? Refer to pages 4 and 5 of the ***Guide*** for examples and the definition of fugitive greenhouse gas emissions and related technologies.

Yes ☐ No ☐ 2003

Please report in thousands of Canadian dollars

12. Environmental Processes and Technologies *(Continued)*

d) Did you use one or more of the following systems or equipment in fiscal year 2002? *Please check the appropriate boxes.*

Refer to pages 5 and 6 of the ***Guide*** for a description of each technology or process.

		Yes	No
1. Cogeneration	1282	☐	☐
2. Small, mini and micro-hydroelectric facility	2004	☐	☐
3. Solar energy systems or equipment	1288	☐	☐
4. Wind energy systems or equipment	1289	☐	☐
5. Waste-to-energy systems or equipment	1285	☐	☐
6. Other renewable energy systems or equipment	2005	☐	☐

Please specify most important

_____

_____

_____

7. Alternative fuel systems or equipment	2006	☐	☐
8. Fuel substitution	1284	☐	☐
9. Other systems, equipment or employee training that improved energy efficiency	1292	☐	☐

Please specify most important

_____

_____

_____

e) Did you answer "Yes" to any part of Questions, 12b, 12c or 12d?

Yes ☐ *Go to Question 12f* No ☐ 2007 *Go to Question 12h*

f) What were your operating expenses and capital expenditures in fiscal year 2002 on the systems or equipment reported in Question 12b, 12c or 12d? *(Please report in thousands of Canadian dollars. If the expenditure is zero, please write "0" in the corresponding box).* Your best estimate is acceptable. Please exclude fuel costs.

Operating expenses $ 000		Capital expenditures $ 000		Total $ 000
2008	+	2009	=	2010

g) What proportion of your capital expenditures in fiscal year 2002 on machinery and equipment that reduced your greenhouse gas emissions was manufactured in Canada? *(If the proportion is zero, please write "0" in the corresponding box)* Your best estimate is acceptable.

2011 %

12. Environmental Processes and Technologies *(Continued)*

h) During the last three years, 2000 to 2002, did this establishment put into operation new or significantly improved systems or equipment that reduced greenhouse gas emissions? Refer to page 6 of the ***Guide*** for a description of "new or significantly improved".

Yes ☐ No ☐ 2012 *Go to Question 12i*

Rank the overall impact of these new or significantly improved systems or equipment to reduce greenhouse gas emissions. *(Please check the appropriate box)*

2013 ☐ Small

2014 ☐ Medium

2015 ☐ Large

---

i) Obstacles and drivers

During the last three years, 2000 to 2002, which of the following factors were obstacles or drivers to the adoption of new or significantly improved systems or equipment to reduce greenhouse gas emissions? Refer to page 6 of the ***Guide***.

Please check all that apply

Possible obstacles

1. Lack of information or knowledge related to new or significantly improved systems or equipment . . 2016 ☐
2. Lack of available new or significantly improved systems or equipment. . . . . 2017 ☐
3. Lack of skilled personnel to put new or significantly improved systems or equipment into operation . . . . . 2018 ☐
4. High cost of equipment . . . . . 2019 ☐
5. Lack of financing (internal, private or government) . . . . . 2020 ☐
6. Regulatory/policy barriers . . . . . 2021 ☐
7. Other *(Please specify)* _____ 2022 ☐
8. **None** . . . . . 2023 ☐

Possible drivers

1. Sufficient return of investment . . . . . 2024 ☐
2. Regulations . . . . . 2025 ☐
3. Voluntary agreement . . . . . 2026 ☐
4. Public relations . . . . . 2027 ☐
5. Corporate policy/culture/awareness . . . . . 2028 ☐
6. Other (*Please specify)* _____ 2029 ☐
7. **None** . . . . . 2030 ☐

12. Environmental Processes and Technologies *(Concluded)*

j) Environmental biological treatment

Did you use biotechnology to abate, prevent or manage pollution or waste resulting from normal production in fiscal year 2002? Refer to pages 6 and 7 of the ***Guide.***

Yes ☐ No ☐ 1400 Go to Question 13

If yes, please indicate which biotechnology was used by checking the appropriate box(es).

Microbiologically enhanced recovery of material(s)	1401	☐
Phytoremediation	1402	☐
Bioremediation	1403	☐
Biofiltration	1404	☐
Natural or constructed wetland	1405	☐
Bioleaching	1406	☐
Bio-pulping	1407	☐
Bio-bleaching	1408	☐
Biodesulphurization	1409	☐

Other *(Please specify)* _____ 1410 ☐

13. Environmental Management Practices

Please indicate the environmental management practices adopted or utilized by this establishment in fiscal year 2002 to avoid or minimize pollution or to conserve resources. Refer to pages 7 and 8 of the ***Guide*** for a description of each practice.

		Yes	No
a) Did this establishment use an environmental management system?	951	☐	☐
b) Did this establishment use Life Cycle Management, Life Cycle Assessment or Design for Environment for decision making?	965	☐	☐
c) Was this establishment ISO 14000 certified?	953	☐	☐
d) Did this establishment implement any environmental voluntary agreement, or did it participate in any voluntary environmental program? Examples include Accelerated Reduction/Elimination of Toxics (ARET) or Voluntary Challenge and Registry (VCR). If yes, please list programs, accords or agreements.	955	☐	☐

_____

_____

_____

_____

_____

13. Environmental Management Practices *(Concluded)*

		Yes	No
e)	Did this establishment have a "green" procurement policy?	957 ☐	☐
f)	Were any of the goods produced by this establishment certified by an environmental program, such as the "Enviro Choice Program" operated by Terrachoice Inc.?	959 ☐	☐
g)	Did this establishment publish or contribute to annual or other reports on its environmental performance or sustainable development ?	963 ☐	☐
h)	Did this establishment experience any cost savings as a result of implementing any of the environmental management practices outlined in this question or environmental technologies outlined in Question 12 or pollution prevention methods outlined in Question 7?	969 ☐	☐
i)	**Other** (*Please specify*)	967 ☐	☐

_____

_____

_____

_____

Certification

I certify that, to the best of my knowledge, the information provided in this questionnaire is correct and complete.

900	Signature X	Date (D / M / Y)	910	Title	
905	Name of person completing this questionnaire (type or print)		915	Telephone No.	920 Fax No.
925	Email address		930	Web site address	

Approximately how long did it take to collect the data and to complete this survey? 935 _____ hours

Comments

Please provide any comments you may have about this survey (e.g., length, ease of completion, suggestions for future questions, suggestions about the format). Also, please use this space if you wish to provide additional information about your environmental protection activities.

_____

_____

_____

_____

_____

If you have any questions, please contact us.
Telephone (toll free) 1-800-255-7726
Fax: 1-800-755-5514
Email: enviro.oid.exp@statcan.ca

PLEASE RETURN THIS QUESTIONNAIRE IN THE ENVELOPE PROVIDED

Thank you for your cooperation

Environment Accounts and Statistics Division

Survey of Environmental Protection Expenditures, 2002

Confidential when completed

Collected under the authority of the *Statistics Act,* Revised Statutes of Canada, 1985, Chapter S19.

Français au verso

Correct as required

Company name

Establishment name

C / O

Address

City

Province/Territory Postal code

Please read before completing

PURPOSE OF THE SURVEY

This survey provides a measure of the expenditures made by industry for environmental protection in Canada in reponse to Canadian and international environmental regulations, conventions and voluntary agreements. The survey also aims at identifying environmental management practices and technologies used in Canadian industry for the purpose of preventing or abating pollution. These data will be aggregated with information from other sources to produce official estimates of enviromental protection expenditures.

The results of this survey will be published in the Statistics Canada publication *Environmental Protection Expenditures in the Business Sector, 2002,* Catalogue No. 16F0006XIE.

CONFIDENTIALITY

Statistics Canada is **prohibited by law** from publishing any statistics which would divulge information obtained from this survey that relates to any identifiable respondent, without the previous written consent of that respondent. The data reported will be treated in strict confidence, used for statistical purposes and published in aggregate form only. The confidentiality provisions of the *Statistics Act* are not affected by either the *Access to Information Act* or any other legislation.

AUTHORITY

This survey is conducted under the authority of the *Statistics Act,* Revised Statutes of Canada, 1985, Chapter S19. **COMPLETION OF THIS QUESTIONNAIRE IS A LEGAL REQUIREMENT UNDER THE *STATISTICS ACT.***

INQUIRIES

If you require assistance in completing this questionnaire or if you have any questions or comments regarding this survey, please contact:

Operations and Integration Division
Statistics Canada
Ottawa, ON, Canada, K1A 0T6

Telephone (toll-free): **1-800-255-7726**
Fax: **1-800-755-5514**
Email: **enviro.oid.exp@statcan.ca**

The questionnaire is available in an electronic spreadsheet format. Please contact the Operations and Integration Division if you prefer to use this reporting option.

In all correspondence concerning this questionnaire, please quote the identification number that appears on the address label.

Important : Please read the Definitions and concepts on page 6 before answering. If your response for an item is zero, please write "0" in the corresponding box rather than leaving the cell blank.

Please return this questionnaire within 30 days of receipt.
If you are unable to do so, kindly inform the Operations and Integration Division of the expected completion date.

Statistics Canada use only

Rec. D M Y	Ed. D M Y	Kyd. D M Y	Bat.	Coll.	FSC

4-2300-58: 2002-11-15 STC/NAD-475-04244

Statistics Canada Statistique Canada

Canada

1. Reporting year

Report must cover your most recent fiscal year that ended at any time between **April 1, 2002 and March 31, 2003.**

	Day	Month	Year
From	010	020	030
to	040	050	060

Please report in thousands of Canadian dollars

2. Pollution prevention, abatement and control expenditures. *If the expenditure is zero, please write "0" in the corresponding box.*

Include

- Expenditures for end-of-pipe pollution abatement and control facilities and equipment
- Expenditures for pollution prevention equipment or facilities integrated to a production process, that prevent or minimize the creation of pollutants and waste
- Expenditures for equipment or facilities related to leak and spill prevention. They may include expenditures on the following: spill containments, dyke extension, accessories (valves, pumps) or emission detection equipment
- Expenditures for equipment or facilities used for conserving energy or water
- Expenditures for equipment or facilities associated with recirculation, recovery, reuse and recycling of materials or substances
- Pollution monitoring expenditures
- Expenditures for waste collection, disposal, treatment and recycling done by your employees
- Purchases of waste and sewerage management services or any other purchase of services reported in Question 6

Exclude

- Expenditures specific to workers' health and safety
- Site reclamation and decommissioning expenditures (Question 4)
- Research and development expenditures associated with pollution prevention, abatement and control

Operating expenses		Capital expenditures		Total
$ 000		$ 000		$ 000
101	+	102	=	103

3. From the amount of capital expenditures reported in cell 102, what percentage was spent on preventing or abating each of the following?

Substances released to air		Substances released to surface waters		On-site releases to land/underground injection		Noise, vibration or radiation		Other		
201 %	+	202 %	+	203 %	+	204 %	+	205 %	=	100%

4. Other environmental protection expenditures. *If the expenditure is zero, please write "0" in the corresponding box.*

Include

- Expenditures for site reclamation and decommissioning
- Expenditures for protection and restoration of wildlife and habitat
- Expenditures for environmental audits and assessments
- Expenditures for training on environmental matters
- Administration costs directly associated with environmental protection projects
- Other expenditures required to comply with environmental regulations, conventions, or voluntary agreements

Exclude

- Environment-related research and development expenditures

Operating expenses		Capital expenditures		Total
$ 000		$ 000		$ 000
401	+	402	=	403

Please report in thousands of Canadian dollars

5. Total expenditures on environmental protection. *If the expenditure is zero, please write "0" in the corresponding box.*

This question is the sum of Questions 2 and 4

Operating expenses $ 000		Capital expenditures $ 000		Total $ 000
410	+	411	=	412

6. Purchase of environmental services

Of the total operating expenses and capital expenditures on environmental protection reported in Question 5, what proportions were purchased from a private contractor or government? Your best estimate is acceptable. *If the proportion is zero, please write "0" in the corresponding box.*

Include

- All expenditures associated with the use of a waste collection and treatment service or a sewerage service provided by a private contractor or a federal, provincial/territorial or local government
- Any purchase of environmental services provided by a private contractor or a federal, provincial/territorial or local government (examples include the purchase of environmental monitoring services; environmental assessment and audit services; construction and engineering services associated with the installation, repair or maintenance of pollution prevention, abatement and control infrastructure or equipment)

Exclude

- Any expenditures for environmental services provided by your establishment's or company's employees (own account work)
- Expenditures for on-site recycling

% of total operating expenses	% of total capital expenditures
301 %	502 %

7. Pollution prevention methods

If you have prevented or reduced waste, pollutants or conserved resources in fiscal year 2002, please indicate how it was achieved by checking the appropriate box(es). Please include all projects regardless of whether they are required by regulation, convention or voluntary agreement.

Pollution prevention method		Yes	No
Product design or reformulation	810	☐	☐
Equipment or process modifications (integrated process)	830	☐	☐
Recirculation, on-site recycling, reuse or recovery of materials or substances [1]	850	☐	☐
Energy conservation and efficiency	860	☐	☐
Materials or feedstock substitution, solvent reduction, elimination or substitution	870	☐	☐
Improved inventory management or purchasing techniques	875	☐	☐
Prevention of leaks and spills	880	☐	☐
Good operating practices or pollution prevention training	885	☐	☐
Other (*Please specify*)	890	☐	☐

_____

_____

_____

1. Recirculation, recovery, reuse or recycling: recirculation, reuse, recovery or recycling of water, materials or substances generated during production, **excluding materials transferred or recycled off-site.**
Examples: vapour recovery, recovery of sludge, water recirculation, reuse of water for refrigeration condenser operation.

8. Environmental management practices

Please indicate the environmental management practices adopted or utilized by this establishment in fiscal year 2002 to avoid or minimize pollution, or to conserve resources.

		Yes	No
a) Did this establishment use an environmental management system?	951	☐	☐
b) Did this establishment use Life Cycle Management, Life Cycle Assessment or Design for Environment for decision making?	965	☐	☐
c) Was this establishment ISO 14000 certified?	953	☐	☐
d) Did this establishment have a "green" procurement policy?	957	☐	☐
e) Did this establishment implement any environmental voluntary agreement, or did it participate in any voluntary environmental program? Examples include Accelerated Reduction/Elimination of Toxics (ARET) or Voluntary Challenge and Registry (VCR). If yes, please list programs, accords or agreements.	955	☐	☐

_____

_____

_____

_____

8. Environmental management practices - concluded

		Yes	No
f)	Were any of the goods produced by this establishment certified by an environmental program, such as the "Enviro Choice Program" operated by Terrachoice Inc.?	959 ☐	☐
g)	Did this establishment publish or contribute to annual or other reports on its environmental performance or sustainable development?	963 ☐	☐
h)	Did this establishment experience any cost savings as a result of implementing any of the environmental management practices outlined in this question or Question 7?	969 ☐	☐
i)	**Other** (*Please specify*)	967 ☐	☐

Certification

I certify that, to the best of my knowledge, the information provided in this questionnaire is correct and complete.

900	Signature X	Date (D / M / Y)	910	Title	
905	Name of person completing this questionnaire (type or print)		915	Telephone No.	920 Fax No.
925	Email address		930	Web site address	

Approximately how long did it take to collect the data and to complete this survey? 935 ____ hours

Comments

Please provide any comments you may have about this survey (e.g., length, ease of completion, suggestions for future questions, suggestions about the format). Also, please use this space if you wish to provide additional information about your environmental protection activities.

If you have any questions, please contact us.
Telephone (toll free): 1-800-255-7726
Fax: 1-800-755-5514
Email: enviro.oid.exp@statcan.ca

PLEASE RETURN THIS QUESTIONNAIRE IN THE ENVELOPE PROVIDED

Thank you for your cooperation

Definitions and concepts

Environmental protection expenditures are defined in this survey as all operating expenses and capital and repair expenditures that are incurred in order to anticipate or comply with Canadian or international environmental regulations, conventions and voluntary agreements. They consist of expenditures for pollution prevention, and abatement and control expenditures for protecting and restoring wildlife and habitat, expenditures for environmental monitoring, environmental assessments and audits, and expenditures for reclamation and decommissioning of sites. Environmental protection expenditures incurred that *are not* in response to current or anticipated Canadian or international regulations, conventions or voluntary agreements *should be excluded.* In addition, expenditures to improve employee health, workplace safety and site beautification *should also be excluded.*

Environmental conventions or voluntary agreements refer to any formal, multi-party commitment by an industry, an industry association or other body, to meet specific targets in terms of habitat protection, waste reduction, or the elimination or reduction of specific materials that are considered to be harmful or toxic to the natural environment in Canada. Examples include the following: the National Packaging Protocol (reduction of packaging by 50 percent by the year 2000); the Montreal Protocol (elimination of CFCs by 1998); the Canada-U.S. Air Quality Agreement; the "Responsible Care" program from the Canadian Chemical Producers Association; the Accelerated Reduction/Elimination of Toxics (ARET) Program; the Voluntary Challenge and Registry (VCR) Program on climate change, etc.

Environmental regulations refer to any current Canadian federal, provincial, or municipal law or international legislation that is intended to protect or to restore the environment in Canada. Expenditures related to anticipated legislation may be included as long as its provisions are known.

Pollution prevention, abatement and control (PPAC) expenditures include all outlays for the primary purpose of preventing, abating or controlling the release of pollutants and generation of waste resulting from the operations of this establishment. Expenditures to produce PPAC equipment for sale are excluded as they would appear twice in the expenditure data produced by Statistics Canada. Expenditures for environment - related research and development are also excluded since they are collected elsewhere in Statistics Canada.

Pollution abatement and control (end-of-pipe) expenditures relate to expenditures on an equipment or a facility not integrated to production. Their sole purpose is to abate or control undesirable substances emitted during normal production activities. These expenditures also include waste management expenditures.

Pollution prevention expenditures include all expenditures for new or significantly modified integrated production processes that prevent or minimize emissions of pollutants and the amount of waste generated.

Environmental monitoring expenditures include all costs related to equipment, supplies, labour and purchased services that are required for the monitoring of pollutants emitted by this establishment (e.g. under the National Pollutant Release Inventory).

Environmental assessments and audits expenditures include expenditures for reviews of current operations for compliance with regulations (audits); expenditures to evaluate the environmental impact of proposed programs or projects (assessments); associated legal and consulting costs.

Site reclamation and decommissioning expenditures include expenditures to clean up environmental damage resulting from this establishment's operations; decommissioning expenditures made during the year that are associated with the closing down of an establishment or site (even if closing occurred before 2002).

Expenditures for protection and restoration of wildlife and habitat include expenditures made to protect wildlife and habitat from the effects of this establishment's operations or to restore stocks that have been adversely affected by such operations. They exclude expenditures for aesthetic purposes.

How to report

Please report expenditures in **thousands of Canadian dollars.** If, for certain categories, no expenditures have been incurred, **please write "0" in the corresponding box.**

Where precise data are not available, your best estimate is acceptable. If additional information is available in an annual report or an environmental performance report, **please include a copy** when you return the questionnaire.

TO REPORT CAPITAL EXPENDITURES

Include all relevant outlays in 2002 (fiscal year) for machinery and equipment and their installation and repair, as well as for the construction of non-residential facilities (by contractors or own employees). For construction, include all costs associated with demolition, planning and design (such as engineering and construction fees), any materials supplied to construction contractors for installation and any costs associated with the purchase of land that are neither amortised nor depreciated.

Exclude any provisions for future environmental liability.

TO REPORT OPERATING EXPENSES

Include expenses in 2002 (fiscal year) related to environmental protection incurred for labour, materials and supplies, maintenance and repair and purchased services (include fuel and electricity expenses for machinery and equipment whose sole purpose was to protect the environment).

Environment Accounts and Statistics Division

Survey of Environmental Protection Expenditures, 2002

Guide to Definitions and Classification Details

Definitions

Establishment

An establishment is defined as the most homogeneous unit of production for which a business maintains accounting records. From these accounting records, it is possible to assemble all the data elements required to compile the total sales or shipments, inventories, cost of materials and services, labour and capital used in production.

Environmental protection expenditures

Environmental protection expenditures are defined as all operating expenses and capital and repair expenditures that are incurred in order to anticipate or to comply with Canadian or international environmental regulations, conventions or voluntary agreements. They consist of expenditures for pollution prevention, abatement and control and expenditures for restoring wildlife and habitat, expenditures for environmental monitoring, environmental assessments and audits, and expenditures for reclamation and decommissioning of sites. **Environmental protection expenditures incurred that *are not* in response to current or anticipated Canadian or international regulations, conventions or voluntary agreements *should be excluded*. In addition, expenditures to improve employee health, workplace safety and site beautification *should also be excluded*.**

Expenditures to produce pollution prevention, abatement and control equipment for sale are also excluded as they would appear twice in the expenditure data produced by Statistics Canada. Expenditures for environment-related research and development are also excluded since they are collected elsewhere in Statistics Canada.

Environmental conventions or voluntary agreements refer to any formal, multi-party commitment by an industry or an industry association for instance, to meet specific targets in terms of habitat protection, waste reduction, or the elimination or reduction of specific materials that are considered to be harmful or toxic to the natural environment in Canada. Examples include the following: the Montreal Protocol (elimination of CFCs by 1998); the Canada-U.S. Air Quality Agreement; the “Responsible Care” program from the Canadian Chemical Producers Association; the Accelerated Reduction/Elimination of Toxics (ARET) Program; the Voluntary Challenge and Registry (VCR) Program on climate change; etc.

4-2300-2.3: 2002-11-22 STC/NAD-291-75084

Statistics Canada Statistique Canada

Canada

Environmental regulations refer to any current Canadian federal, provincial, municipal law or international legislation that is intended to protect or to restore the environment in Canada. Expenditures related to anticipated legislation may be included as long as its provisions are known.

How to report

Please report expenditures in **thousands of Canadian dollars for your 2002 fiscal year.** If, for certain categories, no expenditures have been incurred, **please write "0" in the corresponding box**.

Where precise data are not available, your best estimate is acceptable. If additional information is available in an annual report or an environmental performance report, **please include a copy** when you return the questionnaire.

To report capital expenditures

Include all relevant outlays for machinery and equipment and their installation and repair that have been capitalized, as well as for the construction of non-residential facilities (contractors or own employees). For construction, include all costs associated with demolition, planning and design (such as engineering and construction fees), any materials supplied to construction contractors for installation and any costs associated with the purchase of land that are neither amortized nor depreciated.

Exclude any provisions for future environmental liability.

To report operating expenses

Include all expenses related to environmental protection incurred for labour, materials and supplies, maintenance and repair, and purchased services (include fuel and electricity expenses for machinery and equipment whose sole purpose is to protect the environment).

For logging activities

Use Question 5 to report additional expenditures for logging caused by environmental regulation or convention. **Include** the extra cost of any practice that would not otherwise be followed in the absence of environmental regulation or convention. **Exclude** the foregone revenues resulting from regulations or conventions that reduce the allowable harvest.

For mining activities

Use Question 6 or 11 to report any expenditures that are related to the handling and treatment of mine tailings and that are required by environmental regulation. Even if some of these activities are now considered to be "standard practice", include related expenditures if they are required by regulation or convention. Use Question 9 to report imputed interest on funds held in trust against future environmental liabilities. Report only actual expenditures.

For petroleum operations

Please report separately, if possible, environmental protection expenditures associated with different petroleum operations: exploration, refining, chemical products, pipeline transportation.

Question 6) Pollution abatement and control and waste management expenditures

6a)

Pollution abatement and control (end-of-pipe processes) can be described as equipment and processes that treat pollution and wastes *after* they have been created. Examples of these types of equipment or processes include scrubbers at the end of emission stacks, biological and chemical systems for treating water (such as a water treatment plant), filtration systems, cyclones or other barrier systems. These end-of-pipe processes are not an integral part of production; their sole purpose is to abate or to control undesirable substances resulting from normal production.

6b)

Substances released to air – emissions of pollutants (including greenhouse gases) to the atmosphere.

Substances released to surface waters – releases of pollutants to water bodies.

On-site releases to land/underground injection – releases of pollutants to land and/or injected into the ground within the boundaries of your establishment.

Noise, vibration or radiation – control of noise, vibration or radiation.

Question 7) Pollution prevention

Pollution prevention is technologies, equipment or processes that reduce or eliminate pollution at the source instead of at the end-of-pipe or stack. Examples include the installation of more efficient processes that consume less energy or inputs, the redesign or reformulation of the production process to reduce pollution or emissions, re-use, recirculation or recycling of materials on-site (does not include materials sent off-site for recycling).

7c) Pollution prevention methods

Examples are listed for each category of pollution prevention. *Note:* lists are not exhaustive.

Product design or reformulation – changing product specifications to reduce or eliminate the use of toxic substances; modifying product design or composition to make them more environmentally friendly; modify packaging.

Equipment or process modifications (integrated process) – instituting recycling within a process; switching from the use of solvents to mechanical paint-stripping devices; modified or installed rinse systems; improved rinse equipment design; improved rinse equipment operation; modifying equipment, layout or piping; use of a different process catalyst; institute better controls on operating bulk containers or changing from small volume containers to bulk containers to minimize discarding of empty containers.

Recirculation, on-site recycling or reuse or recovery of materials or substances generated during production – such as using a small distillation unit to reclaim solvents on-site; vapour recovery; recovery of sludge; water recirculation; reuse of water for refrigeration condenser operation. *Excludes materials transferred or recycled off-site.*

Materials or feedstock substitution, solvent reduction, elimination or substitution – the use of aqueous-based rather than solvent-based cleaners; increased purity of raw materials; substituted raw materials; other raw material modifications.

Improved inventory management or purchasing techniques – avoiding the unnecessary generation of waste by ensuring that materials do not stay in inventory beyond shelf life; eliminate shelf-life requirements for stable materials; instituting better labelling procedures; instituting a clearinghouse to exchange materials that would otherwise be discarded.

Prevention of leaks and spills – taking measures to prevent releases such as installing splash guards and drip trays around equipment; modified containment procedures for cleaning units; improved draining procedures; improved storage or stacking procedures; improved procedures for loading, unloading and transfer operations; installed overflow alarms or automatic shut-off valves; installed vapour recovery systems; implemented inspection or monitoring program of potential spill or leak sources.

Good operating practices or pollution prevention training – changing production schedules to minimize equipment and feedstock changeovers; improved maintenance scheduling, record keeping or procedures; training staff to recognize and implement pollution prevention opportunities.

Other, *specify* – please specify your pollution prevention activities if they are not listed in the preceding categories.

Question 12) Environmental processes and technologies

Examples are listed for each of the technologies and processes found in Question 12. *Note:* lists are not exhaustive.

Greenhouse gases: The group of chemical compounds that are responsible for the so-called 'greenhouse effect.' The most important greenhouse gases produced by economic activity are *carbon dioxide* (CO_2), *methane* (CH_4), *nitrous oxide* (N_2O), *chlorofluorocarbons* (CFCs), *hydrofluorocarbons* (HFCs), *perfluorocarbons* (PFCs) and *sulphur hexafluoride* (SF_6).

Fugitive or vented greenhouse gas emissions from fossil fuels: Intentional or unintentional releases of greenhouse gases from the production, processing, transmission, storage and delivery of fossil fuels. Released gas that is combusted before disposal (e.g., flaring of natural gases at oil and gas production facilities).

12a) *Transportation* refers to the transport of fossil fuels from the field or processing plant to the local distribution centre.

Distribution refers to the distribution of natural gas or oil to the individual consumer.

12b) Examples of systems or equipment to reduce fugitive or vented greenhouse gas emissions from the extraction, refining, transportation or distribution of fossil fuels – high efficiency flares; lower emission pneumatic valves; flash tank separators; floating roof tanks; leak detection and repair programs.

Examples of systems or equipment to reduce greenhouse gas emissions *other than fugitive or vented emissions* – enhanced recovery technologies; high efficiency motors or engines; energy management systems; maintenance planning; drag reducing agents; electric micro turbines; energy recovery systems such as waste heat recovery; cogeneration; renewable energy sources; switching to lower or zero-carbon energy sources; CO_2 capture or disposal.

12c) Examples of systems or equipment to reduce greenhouse gas emissions from the *generation of electricity* – high efficiency motors or engines; energy management systems; maintenance planning; drag reducing agents; electric micro turbines; energy recovery systems such as waste heat recovery; cogeneration; renewable energy sources; switching to lower or zero-carbon energy sources; CO_2 capture or disposal.

12d) Description of the systems and equipment listed in Question 12d:

1. **Cogeneration** – systems and equipment used to produce both heat and electricity from biomass (organic matter from forest and agricultural sources), waste and industrial residues, and other fuel sources.
2. **Small, mini- or micro-hydroelectric facility** – Micro-hydro = less than 100 kW; Mini-hydro = 100 kW to 1000 kW (1MW); Small hydro = 1 MW to 25 MW (50 MW in British Columbia).
3. **Solar energy systems or equipment** – active and passive solar systems; photovoltaics; solar thermal generators; solar water and space heating systems.
4. **Wind energy systems or equipment** – horizontal and vertical axis turbines; towers and other types of equipment used to generate energy and electricity.
5. **Waste-to-energy systems or equipment** – systems and equipment (turbines, boilers, process equipment) that use organic matter such as forest and agricultural residues, to produce electricity, steam, or heat.

6. **Other renewable energy systems or equipment** – please specify your renewable energy systems and equipment if they are not listed in the preceding categories, such as systems and equipment for energy production from wave, tidal, ocean thermal energy conversion systems, and geothermal energy.

7. **Alternative fuel systems or equipment** – process equipment for production or use of biofuels (ethanol, biodiesel); clean fuel systems (reformulated fuel and oxygenated fuels); fuel cell technologies; hydrogen (production, storage, distribution and use, infrastructure); and advanced batteries. Also included are industrial equipment and engine systems that use alternative fuels.

8. **Fuel Substitution** – switching from a carbon fuel such as coal or petroleum to a lower carbon (such as natural gas) or carbon-free fuel.

9. **Other systems, equipment or employee training that improved energy efficiency** – please specify any other equipment or systems not listed in Question 12d that improved energy efficiency or energy conservation. Examples include energy management equipment or systems; installation of more efficient process equipment such as boilers, turbines and furnaces; process control equipment; energy efficient engines and motors; low NO_x burners.

12f) Your best estimate is acceptable. Please exclude fuel costs.

12h) New or significantly improved systems or equipment to reduce greenhouse gas emissions: A *new system or piece of equipment* is one that is new to the establishment, whose characteristics or intended uses differ significantly from those systems or equipment previously used by the establishment. *A significantly improved system or piece of equipment* is an existing system or piece of equipment whose performance has been significantly enhanced or upgraded. Excludes maintenance, repair and replacement in kind.

12i) Please indicate what were the obstacles or drivers to the adoption of new or significantly improved systems or equipment to reduce greenhouse gas emissions.

Indicate the obstacles regardless of whether or not the system or equipment was adopted.

12j) Environmental biological treatment

Microbiologically enhanced recovery of materials – the use of living organisms to recover petroleum-based substances from soil.

Phytoremediation – the use of plants to clean up soil, sediment and contaminated water.

Bioremediation – the use of living organisms to reduce or eliminate environmental hazards in soil and waste water resulting from the accumulation of toxic chemicals.

Biofiltration – a control technology used in the treatment of gas streams contaminated with biologically degradable compounds. Biofilters are 100-130 cm deep and contain packing material such as compost, soil, peat moss, granular activated carbon (GAC), or other porous media capable of adsorbing gaseous compounds and supporting biological growth. Waste gases are purified by passage through the biologically active material.

Natural or constructed wetland – provide a natural filtering process for wastewater.

Bioleaching –the extraction of specific metals from ores though the use of bacteria.

Bio-pulping – the treatment of wood chips with lignin-degrading fungi prior to pulping.

Bio-bleaching – the treatment of wood pulp using enzymes in place of chloride.

Biodesulphurization – a process that involves a microbial system that removes organically bound sulphur from fuels.

Question 13) Environmental management practices

a) An **environmental management system** is a management structure that allows an organization to assess and control the environmental impact of its activities.

b) **Life Cycle Management, Life Cycle Assessment** refer to tools that identify and measure direct and indirect environmental, energy and resource impacts associated with a product, process or service through its design, production, usage and final disposal. *Design for Environment* is the integration of environmental considerations into the design, production, distribution, use and end-of-life of products.

c) **ISO 14000** is an internationally recognized set of standards and guidelines primarily concerned with environmental management systems developed by the International Organization for Standardization.

d) **Voluntary actions** include codes of environmental practice, guidelines, emission and waste reduction targets, as well as agreements with governments.

e) **Green procurement** describes the procurement of goods and services that minimize environmental impacts compared with goods and services with similar performance requirements. The costs and environmental impacts of a product at various stages of its life cycle are taken into consideration, such as the process used to manufacture the product (including raw materials), transportation, storing, handling and operating and disposal of the product.

f) **Eco-labelling programs** such as Enviro Choice (operated by TerraChoice Environmental Services Inc. for Environment Canada) are designed to encourage manufacturers and suppliers to develop environmentally

preferable products and services. These eco-labelling programs are meant to help consumers identify products and services that are less harmful to the environment.

g) Your establishment can either publish its own **environmental report** or be a contributor to the parent company's environmental report, or annual report that includes a section dealing with its environmental performance or sustainable development.