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Environment Statistics Program

Environmental Protection Expenditures in the Business Sector 1995

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Environmental Protection Expenditures in the Business Sector
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Preface

This report presents the results of the *1995 Environmental Protection Expenditure Survey*. The survey, addressed to primary and manufacturing industries, was produced in order to fill significant gaps in the data regarding the cost to industry of environmental protection and the demand for associated environmental products and services. Very little information exists about the cost to industry of pollution prevention and abatement technologies, environmental management systems, environmental assessments, and so on, required in order to comply with environmental legislation or conventions. For the most part companies have started to use environmental cost accounting in their management decisions. Certain companies provide their shareholders with environmental performance reports that show how money is spent on environmental protection, in addition to indicators of the company's environmental performance.

The *1995 Environmental Protection Expenditure Survey* covered all expenditures made in response to, or in anticipation of, an environmental regulation or convention. 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, liquid effluents, solid waste, as well as the protection of wildlife and habitat (see Text Box 1.1).

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 (see Text Box 1.1).

This survey is part of a major project to develop a national statistics database on the “environment industry” under the Canadian Environment Industry Strategy, launched by the federal government in the fall of 1995. The database will provide information allowing the identification and measurement of the supply of goods, services and technologies that are produced by the environment industry, as well as the markets for Canadian companies active in the environment industry. Information on the demand for environmental protection goods and services will also include data on capital and repair expenditures for selected assets associated with pollution abatement and control, research and development expenditures for pollution abatement and control, as well as data on government expenditures on environmental protection.

Acknowledgments

This report was prepared by the Environment Statistics Program under the direction of Claude Simard, Director. Data collection for the survey was conducted by the Operations and Integration Division under the supervision of Colette Brassard, Maureen Publow and Paul Pignat.

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1 Environmental Protection Expenditures in the Business Sector in 1995

Introduction

This study examines capital and operating expenditures incurred in 1995 by primary and manufacturing industries in anticipating or complying with environmental regulations and conventions (see Text Box 1.1). A group of core industries (Logging, Mining, Crude Petroleum and Natural Gas, Electrical Power, Pipeline Transportation and Gas Distribution Systems, and selected manufacturing industries, see Text Box 2.1) was identified based on results from Statistics Canada's related surveys and from surveys being conducted in other countries. In addition, a random sample of the rest of the manufacturing sector was drawn in order to identify other potential industries that may have faced expenditures on environmental protection[1]. Therefore, estimations presented here constitute a lower threshold of environmental protection expenditures made by the business sector.

Not all expenditures with environmental benefits are included here. Certain companies cannot distinguish environmental protection expenditures from total expenditures (capital plus operating), when environmental protection is an additional benefit from an efficiency enhancement investment, even though an environmental regulation or a convention may apply.

Two new questions were introduced to the 1995 version of the survey. The first one asked for the percentage of total environmental protection expenditures that went to the purchase of environmental services (as opposed to the in-house provision of services). The second question asked respondents to indicate from a list what pollution abatement methods were used in 1995 and which ones were planned for the next two years.

Text Box 1.1
Environmental Protection Expenditures

Environmental protection expenditures are defined as all operating and capital expenditures incurred in order to comply with or anticipate environmental regulations or conventions that apply to Canada. Examples of environmental regulations include the Canada Fisheries Act Regulations on liquid effluents from the pulp and paper, metal mining and petroleum refining industries. Environmental conventions include any formal multi-party commitment to meet specific targets relating to habitat protection and waste and pollution abatement, such as the Canada-U.S. Air Quality Agreement, the National Packaging Protocol, the “Responsible Care” Program adopted by the Canadian Chemical Producers Association, etc.

Environmental protection expenditures consist of expenditures undertaken with the intention of preventing, reducing and remedying environmental degradation or preserving the environment. They include expenditures for pollution abatement and control (PAC) and expenditures for restoring wildlife and habitat, along with expenditures for environmental monitoring, environmental assessments and audits, and expenditures for reclamation and decommissioning of sites. Expenditures to improve employee health, workplace safety and site beautification are excluded.

Text Box 1.2
Categories of Expenditures on Environmental Protection

Environmental monitoring: includes expenditures related to equipment, supplies, labour and purchased services required for the monitoring of pollutant emissions that would affect air, water or soil quality.

Environmental assessments and audits: includes expenditures for reviews of current operations for compliance with regulations, and expenditures to evaluate the environmental impact of proposed projects.

Site reclamation and decommissioning: includes expenditures to clean up environmental damage and expenditures related to the closure of a site.

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

Purchase of waste management and sewerage services from a private contractor or a government body.

End-of-pipe PAC expenditures: Their sole purpose is to abate or to control undesirable substances emitted during normal production activities; end-of-pipe facilities and equipment do not affect the production process itself.

Process-integrated expenditures for PAC: These expenditures lead to a new or significantly modified production process in order to prevent or reduce emissions of pollutants and the amount of waste generated.

Environmental fees, fines and licences

Other environmental protection expenditures: the costs of administrating environmental projects, training, etc.

1.1 Total environmental protection expenditures

Environmental protection expenditures by canadian industry totalled $4.5 billion in 1995 (see Text Box 1.2 for a list of expenditure categories); this was 22.9% higher than the 1994 level, due mainly to the new industries surveyed. Capital expenditures on environmental projects were estimated at $2.1 billion or 1.8% of total business fixed capital forma-

1. See Chapter 2 for more information on survey methodology.

tion, almost twice the 1994 share (of total business investment). Operating expenditures on environmental protection totalled almost $2.4 billion or 53.3% of total environmental protection expenditures, a small decline in share compared with 1994.

With $1.1 billion of expenditures, the Pulp and Paper Industry was still responsible for the largest environmental protection expenditures in 1995, a 26.9% increase from 1994 level.

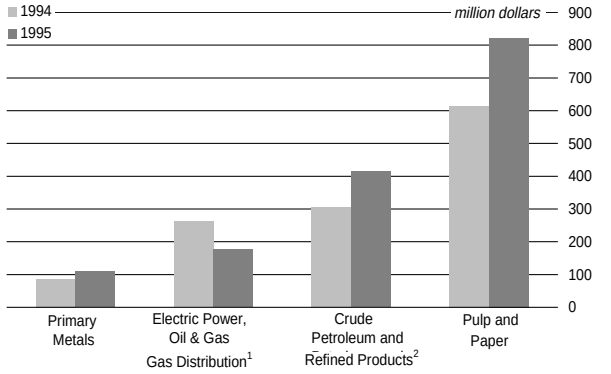
Almost three quarters of the Pulp and Paper Industry's environmental protection expenditures were capital expenditures. Two other industries spent significantly more on capital projects than on operating activities: Crude Petroleum and Natural Gas (62.6%) and Non-Metallic Mineral Products (59.5%). Other industries reported higher operating expenditures than capital expenditures on environmental protection as shown in Table A.1.

1.2 Capital expenditures on environmental protection

Industry details

In 1995, the Pulp and Paper Industry invested $822.3 million on capital projects for environmental protection, by far the largest amount of any surveyed Canadian industry (Table A.2). This amount represents a 34.1% increase from the 1994 level (Figure 1.1).

Figure 1.1
Capital Expenditures on Environmental Protection, Selected Industries, 1994 and 1995



Notes:
1. Includes the Gas Distribution Industry in 1994 and 1995. It also includes the Crude Oil and Natural Gas Pipeline Transport Industry in 1995.
2. Includes Crude Petroleum and Natural Gas and Refined Petroleum and Coal Products Industries.

Source:
Statistics Canada, Environment Statistics Program.

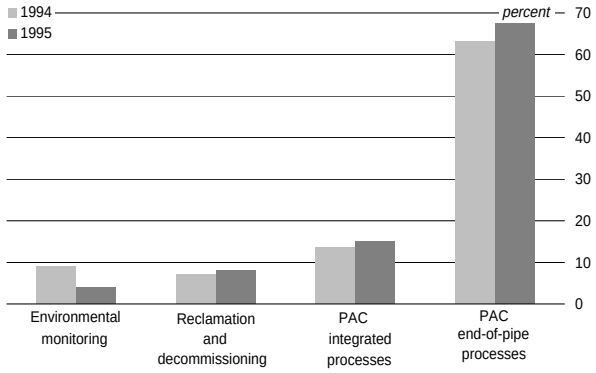
This continued major investment in pollution control projects was the consequence of emission standards coming into effect and of the influence of effluent regulations and voluntary initiatives such as the Accelerated Reduction/ Elimination of Toxics Program.

The group composed of Crude Petroleum and Natural Gas and Refined Petroleum and Coal Products made the second largest capital expenditure on environmental protection, spending $414.4 million or 19.8% of total for the surveyed industries. This represented a 35.5% increase compared with 1994 level. The “other manufacturing industries” group invested $308 million in environmental protection.

Activity details[1]

PAC projects[2] were responsible for 88.6% of investment in environmental protection in 1995 (Table A.2). As in the previous year, end-of-pipe construction and equipment continued to be the major PAC activity, making up more than two-thirds of total investment on environmental protection (excluding the “other manufacturing industries” group, Figure 1.2 and Table A.3). Investment in integrated processes increased by 24.4% but its share of total capital expenditures on environmental protection increased very little, as shown in Figure 1.2.

Figure 1.2
Distribution of Capital Expenditures on Environmental Protection, Selected Activities, 1994 and 1995



Source:
Statistics Canada, Environment Statistics Program.

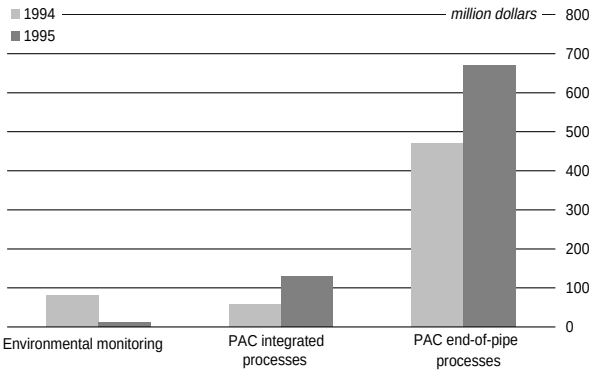
1. The discussion on capital expenditures by type of activity does not include expenditures made by the “other manufacturing industries” group because no detailed breakdown of expenditures was available, except for the following two categories: PAC expenditures; and other environmental protection expenditures.
2. Capital expenditures on pollution abatement and control include capital expenditures on end-of-pipe processes, integrated processes and environmental monitoring.

Among other changes in the environmental protection investment profile, capital expenditures on environmental monitoring dropped by almost 47% at $77.7 million, due to a significant reduction of expenditures in the Pulp and Paper Industry. Capital expenditures on reclamation and decommissioning increased by almost a third, their share of total equal to 8.1% in 1995.

Activity profile by industry

In the Pulp and Paper Industry, the bulk of capital expenditures was in the form of investment on PAC end-of-pipe projects ($670 million, Table A.3). Capital expenditures on end-of-pipe processes increased by 42.6% from the 1994 level. However, at the same time, pulp and paper companies reported a significant increase in their investment in integrated processes; that investment more than doubled since 1994 (Figure 1.3).

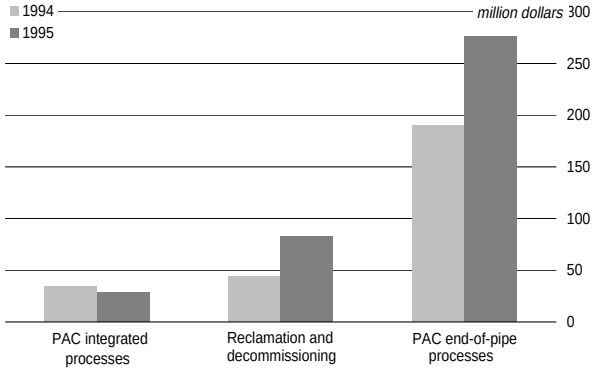
Figure 1.3
Pulp and Paper Industry:
Capital Expenditures on Selected Environmental Protection Activities, 1994 and 1995



Source:
Statistics Canada, Environment Statistics Program.

In the group composed of Crude Petroleum and Natural Gas and Refined Petroleum and Coal Products Industries, end-of-pipe investment on PAC accounted for about two thirds (or $276.2 million) of these industries' total capital expenditures on environmental protection. It increased by 45.5% from the 1994 level as shown in Figure 1.4. Investment in reclamation and decommissioning projects almost doubled ($82.4 million). PAC integrated processes represented a small portion of capital expenditures on environmental protection in those industries, in contrast to the situation occurring in the Pulp and Paper Industry. Further, capital expenditures relating to integrated processes declined by 16%.

Figure 1.4
Crude Petroleum and Natural Gas, and Refined Petroleum and Coal Products Industries:
Capital Expenditures on Selected Environmental Protection Activities, 1994 and 1995



Source:
Statistics Canada, Environment Statistics Program.

The Electric Power Industry reported $146 million in capital expenditures on environmental protection, 32.5% ($47.4 million) of which went to end-of-pipe facilities and equipment and 42.9% to environmental assessments and audits, and wildlife and habitat protection (Table A.3). In 1994, in comparison, investment in end-of-pipe processes in the group composed of Electric Power and Gas Distribution[1] represented half of their capital expenditures on environmental protection.

Mining, Crude Petroleum and Natural Gas and Chemical Products Industries reported the largest investments in reclamation and decommissioning, due to the nature of their activities.

Provincial breakdown

The largest capital expenditures on environmental protection were reported for the provinces of Ontario ($598 million), Quebec ($553.2 million) and Alberta ($361.8 million), collectively making up nearly three quarters of the total for Canada (Table A.4). At least 80% of the environmental protection investment of each province was made for PAC projects, except for Saskatchewan and Prince Edward Island.

The Atlantic and Prairies provinces,[2] along with the Territories, nearly doubled their capital environmental protection expenditures in 1995 compared to 1994, partly because of the increased coverage of the manufacturing sector. Que-

1. The majority of environmental protection expenditures in that industry group were undertaken by the Electric Power Industry.
2. Atlantic provinces: Newfoundland, Prince Edward Island, Nova Scotia and New Brunswick.
   Prairies provinces: Manitoba, Saskatchewan and Alberta.

bec, Ontario and British Columbia reported more modest increases ranging from 13.7% to 29.5%. Ontario and Quebec each accounted for over one quarter of the expenditures (Table A.4), despite a decrease in share from the previous year.

For all provinces, the majority of PAC capital expenditures went to end-of-pipe facilities and equipment, followed generally by expenditures on integrated processes. The size of investment in all other environmental protection activities varied from one province to the next, depending on the type of industry and environmental regulations and conventions (Table A.5).

Capital expenditures by type of medium

PAC investment

In 1995, more than half of total capital PAC expenditures were aimed at reducing surface water pollutants, due largely to the Pulp and Paper Industry, which made 91.2% of its PAC investment to abate surface water pollution. The importance of such investment in secondary treatment facilities is the result of the industry complying with standards on emission levels by the end of 1995. In the Mining, the Beverage and the Food industries, investment in surface water protection accounted from half to three quarters of PAC investment (Table A.6).

In Newfoundland, Nova Scotia, Quebec, Manitoba, and British Columbia, more than 70% of PAC investment went to surface water protection, more than the average of 54.6% (Table A.7), due mainly to the Pulp and Paper Industry in these provinces.

Air pollution control accounted for 35.5% of capital expenditures on PAC projects. For a number of industries, however, air pollution reduction was the primary reason for their capital expenditures on PAC (Table A.6). The Crude Petroleum and Natural Gas industry, in particular, made most of its PAC investment on air pollution abatement (84.4%). Other industries with relatively large capital expenditures on air pollution abatement included Non-Metallic Mineral Products, Refined Petroleum and Coal Products and the “other manufacturing industries” group.

A look at PAC investment by province (Table A.7) reveals that in Alberta, the share of PAC capital expenditures related to air pollution abatement was significantly higher than the Canada average because of the Crude Petroleum and Natural Gas Industry's activity.

Some 8% of capital expenditures on PAC were made for the protection of soil and groundwater, with the Logging Industry spending the largest share of its PAC investment in this area. Noise and radiation protection accounted for a very small portion of capital PAC expenditures (1.9%) in 1995.

Investment in PAC end-of-pipe processes

More than half (58.1%) of reported capital expenditures on end-of-pipe processes in 1995 were aimed at protecting surface water (Tables A.8 and A.9), an increase in share from 51.5% in 1994. This increase is indicative of the continued emphasis that certain industries place on reducing surface water pollutants. The Pulp and Paper Industry, in particular, allocated 93.1% of its end-of-pipe capital expenditures toward improvements in various effluent treatment facilities (waste water treatment). Some of the most common effluent treatment systems reported by the Pulp and Paper Industry included activated sludge systems, aeration systems, aerobic lagoon and pond systems, bed filtration systems, primary clarification systems and neutralization systems[1].

The share of capital expenditures on end-of-pipe processes for air pollution control purposes increased slightly between 1994 and 1995, from 28.4% to 32.8%.The Crude Petroleum and Natural Gas Industry spent, however, 89.1% of its end-of-pipe capital expenditures on air emission control as shown in Table A.8. Because this industry is concentrated in Alberta, it explains why in that province about 80% of capital expenditures on end-of-pipe processes were associated with air pollution (Table A.9). As mentioned above, air pollution abatement was also of primary importance to the Non-Metallic Mineral Products and Refined Petroleum and Coal Products industries. Air filtration equipment, gravity settling systems (such as dust collectors), air scrubbers and flare systems were widely used by these industries in order to limit the release of air pollutants.

The share of capital expenditures on end-of-pipe processes that protect soil and groundwater was only 6.9% in 1995, down from 18.5% during the previous year. Industries such as Crude Petroleum and Natural Gas, Refined Petroleum and Coal Products and Electric Power, which allocated a significant portion of their end-of-pipe capital expenditures for soil and groundwater protection in 1994, reported considerably lower shares in 1995.

End-of-pipe capital PAC expenditures that limit noise and radiation remained fairly minimal (2.2%) in 1995, except in the Electric Power industry: such expenditures accounted for 29.6% of capital expenditures on PAC end-of-pipe processes in that industry.

Investment in PAC integrated processes

The composition of capital expenditures on PAC integrated processes changed radically between 1994 and 1995. In 1995, 53.6% of those expenditures were associated with protection of surface water (Tables A.10 and A.11), almost twice the 1994 share. In contrast, air pollution control represented 32.6% of PAC investment in integrated processes, down from 54% in 1994. One important factor that explains such changes is the important increase in capital expendi-

1. See Table A.12 for more examples of end-of-pipe processes.

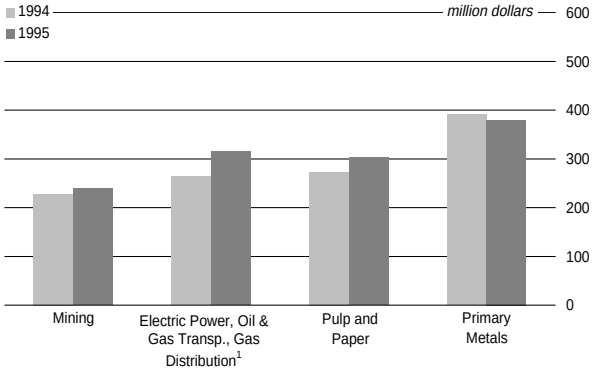
tures on integrated processes brought about by the Pulp and Paper Industry. These expenditures doubled between 1994 and 1995 and most of them went to integrated processes related to surface water such as water reuse systems[1].

1.3 Operating expenditures on environmental protection

Industry details

Operating expenditures on environmental protection totalled $2.4 billion in 1995. The Primary Metals Industry spent the largest amount in operating environmental protection projects (15.9% of total), as was the case in 1994. As shown in Figure 1.5 and Table A.14, the two other industries with relatively large operating expenditures on environmental protection were: Pulp and Paper (12.7%) and Electric Power and Gas Distribution Systems[2] (13.2%).

Figure 1.5
Operating Expenditures on Environmental Protection, Selected Industries, 1994 and 1995



Notes:
1. Includes the Gas Distribution Industry in 1994 and 1995. It also includes the Crude Oil and Natural Gas Pipeline Transport Industry in 1995.

Source:
Statistics Canada, Environment Statistics Program.

Operating expenditures on environmental protection in the "other manufacturing industries" group reached $466.6 million in 1995 or 19.6% of total. Most of the operating expenditures in that sector were equally shared between PAC projects (39.2%) and purchases of waste management and sewerage services (37.8%).

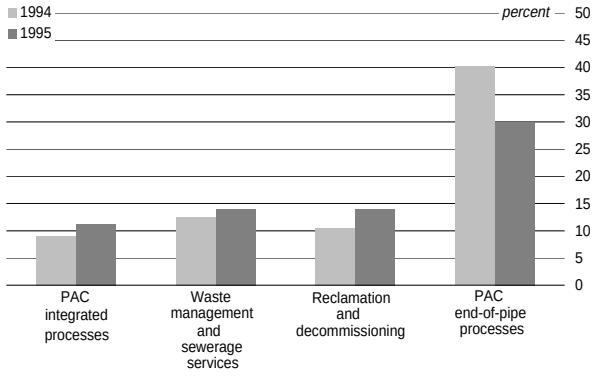
1. See Table A.13 for more examples of integrated processes.
2. Includes Oil and Gas Pipeline Transport Industry in 1995.

Activity details[3]

In 1995, operating expenditures on environmental protection increased by almost 16% compared with 1994. Only half of them were associated with PAC projects (Table A.14), down from over three-fifths during the previous year. The decline in the share of PAC projects was mostly attributed to lower operating expenditures on end-of-pipe processes. In 1995, they totalled $583.3 million for all surveyed industries (Table A.15), excluding the "other manufacturing industries" group, compared with $828.1 million in 1994. The resulting decline in the overall share is illustrated in Figure 1.6. Operating expenditures on environmental monitoring and environmental assessments and audits also dropped from their 1994 level (by 16.4% and 14.4%, respectively).

In contrast, operating expenditures on reclamation and decommissioning increased their share of total operating expenditures on environmental protection from 10.5% to 14.2% between 1994 and 1995. Purchases of waste and sewerage services and operating expenditures on PAC integrated processes also increased their share, by one to two percentage points (Figure 1.6).

Figure 1.6
Distribution of Operating Expenditures on Environmental Protection, Selected Activities, 1994 and 1995



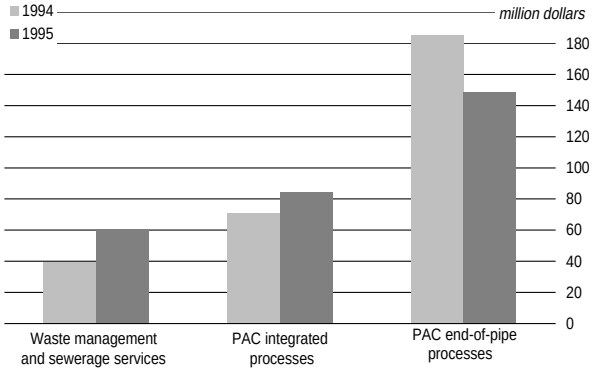
Source:
Statistics Canada, Environment Statistics Program.

3. The discussion on operating expenditures by type of activity does not include expenditures made by the "other manufacturing industries" group because no detailed breakdown of expenditures was available, except for the following three categories: PAC expenditures; purchase of waste management and sewerage services; and other environmental protection expenditures.

Activity profile by industry

Despite leading all other industries in total operating expenditures on environmental protection, the Primary Metals Industry registered a small decline in these expenditures compared with the previous year, from $390.6 million to $379.4 million, due to a reduction in expenditures on end-of-pipe processes (Figure 1.7 and Table A.15). However, the overall effect of the 19.9% decline in end-of-pipe operating expenditures (still the industry's major environmental protection activity) was partly compensated by a 53.9% increase in the purchase of waste management and sewerage services as well as a 18.1% increase in operating expenditures for PAC integrated processes.

Figure 1.7
Primary Metals Industry:
Operating Expenditures on Selected Environmental Protection Activities, 1994 and 1995

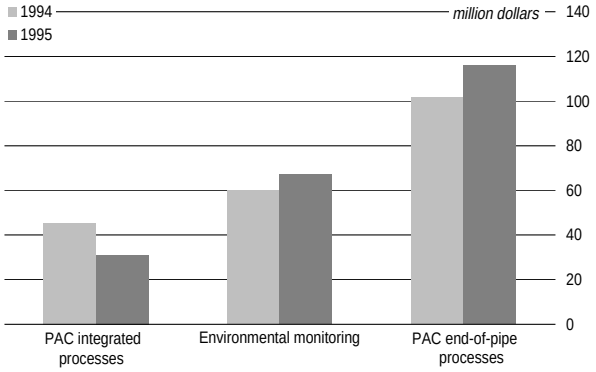


Source:
Statistics Canada, Environment Statistics Program.

The Pulp and Paper Industry spent $302.5 million in operating expenditures on environmental protection in 1995, a 10.7% increase compared to 1994. PAC end-of-pipe systems and environmental monitoring activities were responsible for that increase. In contrast, operating expenditures on PAC integrated processes declined by 31.2% in 1995 (Figure 1.8).

Operating expenditures on environmental protection in the Electric Power Industry were equal to $283.6 million in 1995. Compared with what happened in the Electric Power and Gas Distribution Industries in 1994, 1995 expenditures in the Electric Power Industry were characterised by lower amounts on PAC end-of-pipe processes, environmental monitoring, environmental assessments and audits and reclamation and decommissioning.

Figure 1.8
Pulp and Paper Industry:
Operating Expenditures on Selected Environmental Protection Activities, 1994 and 1995



Source:
Statistics Canada, Environment Statistics Program.

Provincial breakdown

As in the case of capital expenditures, the top three provinces with the highest operating expenditures on environmental protection, Ontario, Quebec and British Columbia, collectively made up over three quarters of total operating expenditures on environmental protection. Table A.16 illustrates that PAC activities in nearly all provinces required the largest expenditures on environmental protection. The only exceptions were in the provinces of British Columbia, Alberta and Nova Scotia, where "other" operating expenditures on environmental protection were higher than PAC expenditures (Table A.16). Significant operating expenditures on "other" environmental protection in those three provinces included, for example, expenditures on reclamation and decommissioning in Alberta and expenditures on wildlife and habitat protection in British Columbia (Table A.17).

Quebec's share of operating expenditures on environmental protection increased from 18.7% to 21.8% while Ontario's share declined from 42.2% to 39.3% between 1994 and 1995 (Table A.16). The Atlantic provinces registered a reduced amount of expenditures. In 1995, Ontario and British Columbia were the only regions to report operating expenditures higher than capital expenditures on environmental protection. This contrasts with the 1994 survey results, where all regions except Quebec reported higher operating expenditures than capital expenditures.

1.4 Purchase of environmental services

In 1995 respondents were asked how much of the total amount of environmental protection expenditures was associated with the purchase of environmental services (except for those respondents from the “other manufacturing industries” group). This question is an addition to the question on purchases of waste management and sewerage services, which was already in the 1994 survey.

An estimated $2 billion, or 44.7% of total environmental protection expenditures reported were derived from purchased services. The importance of purchased environmental services varied depending on the industry. In particular, in the Crude Petroleum and Natural Gas Industry almost three quarters of environmental protection expenditures were related to environmental services purchased, as shown in Table A.18. The reason for this high percentage lies in the nature of activities in the industry. Certain companies find it more profitable to hire contractors to do much of the work rather than to develop extensive in-house expertise since the activities tend to be very specialized and are only required occasionally. In the Refined Petroleum and Coal Products Industry, in contrast, only 29% of environmental protection expenditures were associated with the purchase of environmental services. In the Mining Industry that share was relatively low as well, with 28.1%.

Other industries with purchased services share higher than average included Pulp and Paper, Beverages, Oil and Gas Transport and Gas Distribution Systems. In each case, about half of environmental protection expenditures were derived from services purchased.

A provincial distribution also reveals differences in the share of purchased environmental services as shown in Table A.19. For example, in Alberta and Manitoba about two-thirds of environmental protection expenditures came from purchased environmental services whereas in Quebec these purchases represented a little more than one third of expenditures.

Purchase of waste management and sewerage services

Purchase of waste management and sewerage services equalled $438.4 million or 18.4% of total operating expenditures on environmental protection in 1995. The largest purchases were made in the Primary Metals Industry (after the “other manufacturing industries” group).

Tables A.20 and A.21 show that $219.4 million or 83.7% of such services were provided by the business sector, slightly down from the 84.9% share reported in 1994[1]. The importance of waste and sewerage services provided by the business sector is seen in all industries and provinces, with the exception of Prince Edward Island. However, the business sector's share of such services was significantly lower than average in the Food, Beverages and Electric Power Industries and in Nova Scotia and Manitoba.

1.5 Current and future pollution abatement methods

In order to improve the profile of business environment-related activities, respondents were asked what method(s) they used and expected to use to prevent or abate 1995 and future (in the next two years) waste and pollutant emissions. The list of practices included the following: end-product modification, end-of-pipe process, integrated production process change, improved control of operations, recycling, energy efficiency and material or solvent substitution. Some of these practices do not necessarily generate environmental protection expenditures. They may be adopted for efficiency reasons first.

Interestingly, recycling was the most favoured method reported to have been used to reduce waste in 1995, with 63.5% of total number of reports. Improved control of operations came second with half the total number of reports (Tables A.22 and A.23). However, in the Pulp and Paper Industry, the use of end-of-pipe processes was the most popular method reported (61.9 % of number of reports). In the Primary Metals Industry end-of-pipe processes were the second most favoured waste abatement method. A provincial distribution showed uniformity regarding the use of recycling and improved control of operations, except that in Manitoba, energy efficiency was the second most popular method of preventing or reducing waste.

With respect to future reductions of waste, i.e. in the next two years, recycling and improved control of operations continue to be the most favoured methods. Establishments expected a growing use of all waste abatement practices, except for recycling. Interestingly, end-product modification and energy efficiency saw their relative shares increase the most. In the Pulp and Paper Industry, even though end-of-pipe process remains one of the most popular methods used, other practices gain in importance such as improved control of operations, and material or solvent substitution (Table A.22). Examples of end-of-pipe and integrated processes for PAC purposes can be found in Tables A.12 and A.13.

1. A breakdown between services purchased from government and services contracted out to the business sector is not available for the “other manufacturing industries” group.

1.6 Concentration

Table 1.1 shows that about half of total environmental protection expenditures in 1995 were made by the top 100 survey units. However, the first 5 units were only responsible for 12.7% of such expenditures and the top 15 units accounted for 20.8% of environmental protection expenditures. Concentration of environmental protection expenditures is, without doubt, correlated with the degree of concentration in the surveyed industries.

Table 1.1
Concentration of Environmental Protection Expenditures, 1995

Respondents	Expenditures	Accumulated expenditures	Share of total
	million dollars		percent
Capital expenditures			
Top 5	331.3	331.3	15.8
Next 5	141.8	473.1	22.6
Next 5	110.6	583.7	27.9
Next 85	777.2	1 360.9	65.1
All	**2 090.3**	**2 090.3**	**100.0**
Operating expenditures			
Top 5	302.6	302.6	12.7
Next 5	120.5	423.1	17.7
Next 5	96.0	519.1	21.8
Next 85	619.9	1 139.0	47.7
All	**2 386.1**	**2 386.1**	**100.0**
Total			
Top 5	567.3	567.3	12.7
Next 5	214.5	781.8	17.5
Next 5	148.2	930.0	20.8
Next 85	1 348.9	2 278.9	50.9
All	**4 476.4**	**4 476.4**	**100.0**

Notes:
Figures may not add due to rounding.
Source:
Statistics Canada, Environment Statistics Program.

The top 15 survey units accounted for more than a quarter of capital expenditures on environmental protection while the first 100 units accounted for almost two thirds of such expenditures. In comparison, only 21.8 % of operating expenditures on environmental protection were made by the top 15 survey units while the first 100 units accounted for less than half of these operating expenditures. This means that there was more concentration of capital expenditures as opposed to operating expenditures on environmental protection.

There were quite a few differences on an industry by industry basis. In the Pulp and Paper Industry, which spent the most on environmental protection, as well as in the Primary Metals Industry, the top 100 survey units accounted for virtually all of environmental protection expenditures. In the Crude Petroleum and Natural Gas Industry, which is much more concentrated, all capital expenditures on environmental protection were made by 100 survey units, and 71% by 15 units. In the Electric Power Industry, virtually all environmental protection expenditures were made by 15 survey units (91% by 5 units).

1.7 Expenditures on environmental R&D

Estimates of expenditures on environment-related research and development (R&D) are not included, in principle, in this survey. They are produced through the *R&D in the Canadian Industry Survey*, under the direction of the Science and Technology Redesign Project at Statistics Canada. In that survey, firms were asked to report the percentage of total R&D expenditures attributable to prevention, treatment and reuse of pollutants and wastes. Estimates for 1995 have been released in the November edition of the *Service Bulletin* of Statistics Canada (Statistics Canada, 1997). Expenditures on environment-related R&D were estimated at $165.4 million.

Some caution is required in adding those figures to environmental protection expenditure figures. For one thing, the universe of that survey is different from the universe of the *Environmental Protection Expenditure Survey*. First, the R&D survey is a company survey, not an establishment-based survey and the selection criteria of the survey units are not the same. Second, the R&D survey covers not only companies but also industrial research institutes. Indeed in many instances, environmental R&D projects conducted by these institutes are specific to one particular industry and are funded through a joint effort by the industry, industry suppliers and government. Industrial research institutes accounted for $13.1 million of environment-related R&D or 7.3% of total environmental R&D expenditures reported in 1995.

Third, the R&D survey includes industries beyond the scope of the *Environmental Protection Expenditure Survey (EPES)* such as Engineering and Scientific Services (27% of total environment-related R&D expenditures). This industry covers companies whose main or secondary purpose is to provide environment-related R&D and services. Such companies are excluded from the EPES. In addition, the R&D survey covers non-manufacturing industries that are not surveyed in the EPES such as Agriculture, Wholesale Trade, Retail Trade, Construction and other services (13.4% of total environmental R&D expenditures are accounted for by all these industries that are not covered in the EPES).

Another difference in the scope of the two surveys rises from the fact that the *R&D in the Canadian Industry Survey* only covers intramural expenditures, that is expenditures performed within the firm. So, contrary to estimates from the EPES, services contracted out are excluded.

Table 1.2
Industrial R& D Expenditures for Environmental Protection by Selected Industries, 1995

Industry	1995
	million dollars
Mining	5.8
Crude Petroleum and Natural Gas	6.5
Food, Beverages and Tobacco	1.7
Paper and Allied Products	6.4
Primary Metals	10.3
Refined Petroleum and Coal Products	5.8
Chemical Products	12.1
Other manufacturing industries	31.7
Electricity, Gas and Other Utilities	4.9
Sub-total	**85.3**
Total from R&D survey	**165.4**

Notes:
Estimates are derived from Statistics Canada's *R&D in the Canadian Industry Survey.*
Sources:
Statistics Canada, Science and Technology Redesign Project, Environment Statistics Program.

Table 1.2 shows that intramural environment-related R&D expenditures for the industries covered in the EPES were estimated at $85.3 million dollars in 1995. This amount represented slightly more than half of total environment-related R&D expenditures reported in the R&D survey ($165.4 million). The Chemical Products Industry was responsible for 14.2% of the environment-related expenditures made by the industries covered in the EPES, while the Primary Metals Industry was responsible for 12.1%. The “other manufacturing industries” group represented 37.2% of environment-related R&D expenditures (made by industries covered in the EPES). More work remains to be done to improve estimates of environmental R&D expenditures in order to reflect those expenditures made by the units surveyed in the EPES. However, already it is clear that most of environment-related R&D performed internally is done by firms specialized in R&D or by main or secondary producers of environment-related products.

Conclusion

The *Environmental Protection Expenditure Survey, 1995* revealed that the Pulp and Paper industry was responsible for the largest investment in environmental protection in 1995, most of it being related to abating effluents, as was the case in 1994. End-of-pipe processes still generated the largest capital expenditures on environmental protection although there was some increase in investment in integrated processes. The survey also showed that operating expenditures on environmental protection were spread more evenly among several industries including Primary Metals, Pulp and Paper and Electric Power, compared with capital expenditures.

Although almost half of environmental protection expenditures were associated with purchased services, the importance of purchased environmental services varied according to the industry.

A first attempt to obtain information on the most preferred form of pollution abatement showed a preference for recycling and improved control of operations.

Other projects

The *Environmental Protection Expenditure Survey, 1996* was mailed out in the fall of 1997. The sample of the manufacturing sector was improved in order to increase industry and provincial coverage. Otherwise it is quite similar to the 1995 version except for an enhanced coverage of environmental services purchased. Estimates from the *R&D in the Canadian Industry Survey* for 1996 are in the process of being prepared.

Statistics Canada also collects data on government expenditures on environmental protection, based on public accounts data and financial reports from Municipal Affairs Departments[1]. In addition to collecting or estimating data on the demand-side of environmental protection activities, Statistics Canada produces data on the supply-side, i.e. on the production of goods and services for environmental uses (other than production for internal purposes). Information on revenues, exports, employment and related expenditures is developed, collected and estimated with respect to the waste management industry - through business and government sectors surveys-, consulting engineer firms, management consultants and scientific and technical service firms. Any other producer of environmental goods and services is surveyed now through the *Environment Industry Survey*.

The integration of demand-side and supply-side aspects of the production of environmental goods and services in a consolidated framework is the object of ongoing work. This integration provides a portrait of the “environment industry”.

1. The latest data on government expenditures are available in Statistics Canada, 1997a, Chapter 10.

2 Survey Methodology

2.1 Objective

The *Environmental Protection Expenditure Survey* provides information on capital and operating expenditures made by the industry in order to comply with or to anticipate compliance with forthcoming environmental regulations or conventions. This is the second time this survey has been conducted in its present form. This 1995 edition is somewhat different from the 1994 survey with respect to industry coverage and level of detail requested.

2.2 Coverage and data collection

The *1995 Environmental Protection Expenditure Survey* did not cover the whole economy (e.g. it did not cover agriculture, services or the government sector). Rather, it targeted a number of industries in which environmental protection spending constituted a relatively large proportion of total expenditures.

The data reported in this study are based upon a survey of 2,765 establishments in primary and manufacturing industries. All establishments with more than 49 employees in 13 target industries were selected and a sample of establishments (with more than 49 employees) in other, non-target, manufacturing industries was taken (Text Box 2.1). This is different from the 1994 survey, which covered specific industries only on a take-all basis (for establishments with 49 or more employees). The reason for the sampling of additional industries in 1995 was to identify other potential industries that might be making environmental protection expenditures.

Sample

Manufacturing sample

The main criterion was to include all establishments with more than 49 employees in the following target industries (take-all): Selected Food, Beverage, Pulp and Paper, Primary Metals, Non-Metallic Mineral Products, Refined Petroleum and Coal Products, Chemicals, and to sample establishments with more than 49 employees in non-target manufacturing industries (take-some). Some industries relegated to the take-some category in 1995 were among the take-all group in 1994. Generally, any 3-digit Standard Industrial Classification (SIC) code that did not report more than $1,000 of environmental expenditures per employee in 1994 was moved to the take-some portion. However, in order to preserve comparability between years at the 2-digit level, the rule was modified slightly such that:

Text Box 2.1
List of Selected Industries

- Logging (SIC 041)
- Mining (SICs 061, 062, 063)
- Crude Petroleum and Natural Gas (SIC 071)
- Selected Food (SIC 101, 103-106, 109)
- Beverage (two digit SIC 11)
- Pulp and Paper (SIC 271)
- Primary Metals (two digit SIC 29)
- Non-Metallic Mineral Products (two digit SIC 35)
- Refined Petroleum and Coal Products (two digit SIC 36)
- Chemicals and Chemical Products (two digit SIC 37)
- Electric Power Systems (SIC 491)
- Oil and Gas Pipeline Transport (SIC 461)
- Gas Distribution Systems (SIC 492)
- Other manufacturing

- All 3 digit sectors in group 30 (Fabricated Metals) and group 32 (Transportation Equipment) were excluded from the target industry group.
- In group 10 (Food manufacturers), SICs 101, 103-106 and 109 were kept and the rest were dropped from the take-all portion.
- All other 2-digit groups surveyed in 1994 were retained in the take-all portion.

A sample of take-some establishments was selected in two steps. The first step selected establishments according to employment size, a probability of 1.0 being assigned to establishments with more than 1000 employees, 0.5 for those between 500 and 1000, down to 0.05 for those between 50 and 100 employees. The second step compensated for the uneven effect this procedure would have on the smaller provinces by ensuring that the proportion of employment covered in each province was equal to the Canadian average calculated in the first pass. The procedure selected about 10% of the establishments and these accounted for about 30% of the total employment. No industry stratification was performed because the purpose of this sample was to identify what portion of the manufacturing sector was missing from estimates of environmental protection expenditures.

Non-manufacturing frame

All establishments with more than 49 employees in Logging, Mining, Crude Petroleum and Natural Gas, Electric Power and Gas Distribution Systems and Oil and Gas Pipeline Transport were selected. They were, therefore, given a probability of 1.0 of being selected.

Target industries were selected for their relatively high levels of pollution abatement and control (PAC) expenditures, based upon last year's results and additional information from annual reports of companies and Statistics Canada's annual *Capital and Repair Expenditure Survey*. That survey provided information on industries that had relatively high capital expenditures on assets associated with pollution abatement and control. The *U.S. Pollution Abatement Costs and Expenditures Survey* provided guidance as to which industries had relatively high operating expenditures for PAC purposes. Other environmental protection expenditure surveys done in Australia and the Netherlands were also examined.

A list of establishments was produced using mailing lists from Statistics Canada's *Manufacturing Survey*, *Capital and Repair Expenditure Survey*, and other mailing lists of establishments or companies active in the following industries: Crude Petroleum and Natural Gas and Pipeline Transport, Coal, Electrical Power and Gas Distribution Systems. A list of Metal and non-Metal Mining establishments was produced, based on Natural Resource Canada's *Census of Mines*.

In 1995 the surveyed establishments represented almost 8% of total employment. However, the manufacturing establishments selected accounted for about 38% of total manufacturing employment. In the Primary Metals Industry, for instance, 89.5% of total employment was surveyed; in the Pulp and Paper Industry, 62% of employment was covered. In Mining, Electric Power and Oil and Gas Pipeline Transport Industries, virtually all employment was represented.[1]

Questionnaire

The scope of the survey is to include all expenditures that are required by environmental regulation or convention (See the questionnaire for further explanation). The mail out of the 1995 survey took place in October, 1996. To minimise response burden, establishments in the additional manufacturing industries sampled (as well as in the Transportation Equipment Industry, the Fabricated Metal Products industry, and certain Food Industries) received a shorter version of the questionnaire. In the short version, the expenditure breakdown requested included capital and operating PAC expenditures; capital and operating expenditures for other environmental protection activities; and purchase of waste and sewerage management services.

On the long form, an additional question was asked concerning the percentage of total expenditures on environmental protection related to the purchase of environmental services from private or public sector. This question was deemed necessary in order to distinguish the producer from the consumer of the activity.

Finally, both questionnaires included a section asking respondents to identify different pollution abatement techniques employed to reduce current and future emissions from the following list: end-of-pipe, integrated processes, product modification, recycling, energy efficiency, material or solvent substitution and improved control of operation.

A questionnaire was provided for each establishment no matter if several establishments belonged to the same firm. This procedure is different from the one adopted in the 1994 survey, when a multi-establishment company received one questionnaire per industry. This change was made once companies were used to the survey in order to provide a provincial breakdown of expenditures on environmental protection.

2.3 Response and data quality

The quality of the data depends, among other influences, upon the accuracy of the responses as well as the response rate. The accuracy of the responses to this survey is difficult to assess since there are very few possibilities to cross-check the data. Most Statistics Canada surveys collect financial data that can be compared to company financial statements.

These statements provide some control since the total expenditure is known and it is possible to judge the elements of expenditures in this context, using also environmental protection expenditure statements where they exist. However, accounting for environmental protection expenditures is still relatively new. Certainly, environmental protection expenditures must be less than total expenditures but there is no historical evidence by the business sector as to what could be used to set confidence intervals. This will be developed as the survey is repeated over time. However some partial information on capital expenditures for pollution abatement and control construction and equipment may be used as described above (see Section 2.1), based on the *Capital and Repair Expenditure Survey*[2], or based on published information from industry associations (e.g. *Pulp and Paper Canada* magazine) or certain companies.

1. Data on employment come from Manufacturing, Construction and Energy Division's various publications.

2. See Statistics Canada, 1997a, Chapter 9, 18-19 for more details on these types of assets.

Table 2.1
Response Rates by Industry and province, 1995

	According to number of reporting establishments			According to employment		
Industry	Responses	Total[1]	Response as a percentage of total[1]	Responses	Total[1]	Response as a percentage of total[1]
Logging	86	152	57	10 027	17 080	59
Mining	111	143	78	38 450	49 582	78
Crude Petroleum and Natural Gas	54	76	71	16 567	22 205	75
Food	368	580	63	65 265	95 020	69
Beverage	53	84	63	11 769	16 722	70
Pulp and Paper	88	144	61	39 110	63 738	61
Primary Metals	122	176	69	58 647	75 859	77
Non-Metallic Mineral Products	133	193	69	16 421	22 213	74
Refined Petroleum and Coal Products	31	39	80	7 197	8 137	88
Chemical Products	256	351	73	45 482	57 895	79
Oil and Gas Transport and Gas Distribution[2]	17	24	71	18 858	22 786	83
Electric Power	20	30	67	71 706	75 973	94
Other manufacturing	479	683	70	203 504	297 723	68
Total	**1 818**	**2 675**	**68**	**603 003**	**824 933**	**73**
Province/territory	Responses	Total[1]	Response as a percentage of total[1]	Responses	Total[1]	Response as a percentage of total[1]
Nfld.	15	29	52	4 271	6 957	61
P.E.I.	14	17	82	1 652	2 232	74
N.S.	46	60	77	14 163	16 702	85
N.B.	36	55	66	13 533	19 990	68
Que.	427	640	67	153 203	210 501	73
Ont.	738	1 059	70	274 825	368 084	75
Man.	61	90	68	19 826	25 895	77
Sask.	51	68	75	11 031	16 988	65
Alta.	198	298	66	52 717	76 351	69
B.C.	227	348	65	57 174	79 096	72
Yukon	1	3	33	168	321	52
N.W.T.	4	8	50	440	1 816	24
Canada	**1 818**	**2 675**	**68**	**603 003**	**824 933**	**73**

Notes:
1. The total excludes out of scope establishments, mergers, closed and/or sold establishments, etc.
2. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.

Source:
Statistics Canada, National Accounts and Environment Division.

Response rates

Table 2.1 shows the response rates obtained for each industry, according to both number of reporting establishments and employment, as a percentage of total number of survey establishments in scope. There were 1,818 reports received for 2,675 surveyed establishments.

The response rate for the 1995 survey was 68%, based on the number of reporting establishments, and 73% based on employment covered. This represents an improvement to the 1994 survey. This is a good result considering that the survey was still new and the questions were relatively difficult to answer.

Verification, imputation and estimation

A validation of the data was done first to ensure that totals added and that the proper establishments were used and to detect outliers.

Imputation for missing responses was performed in four stages. First, all possible related information was assembled (e.g. information from the *Capital and Repairs Expenditure Survey*, from *Pulp and Paper Canada*, from company annual reports) and some companies were re-contacted to provide further indicators to help allocate expenditures by province where this information was missing. Second, when it was possible, last year's data were used to impute for 1995 data by applying the appropriate industry growth factor associated with the establishments that did respond during both years. Third, total environmental protection expenditures were estimated on a per-employee basis. A linear regression was performed in order to determine an

unbiased estimator relating employment and environmental protection expenditures. This estimator, which was specific to province and industry, used employment of non-responding establishments. Finally, the missing components of environmental protection expenditures (for partial responses) were estimated as a proportion of total expenditures, using donors from the same industry and province where possible.

It could be argued that revenue is a better imputation variable than employment since there are considerable differences in per-employee revenues depending upon the degree of capitalization of a company. Although this may be true, these fluctuations are attenuated by segmenting the sample by province and industry for imputation purposes. Employment was the one variable that was readily available for most establishments but in subsequent years the use of revenue or expenditure will be investigated.

Table 2.2 shows the proportion of imputed value over the total value of environmental protection expenditures (value for complete and partial responses + imputed value for non response), by expenditure category and by industry.

Estimation was done for the “other manufacturing industries” sample portion (the take-some) using the ratio of environmental protection expenditures to employment. Province-specific ratios were used.

Sampling and non-sampling errors

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

Typically the sampling error is measured by the coefficient of variation, that is the standard deviation or expected variability of the estimate as a percentage of the estimate. In the case of this survey, the sample portion was a first attempt at identifying additional manufacturing industries that may face environmental protection expenditures. No stratification was done by industry; rather a sample for a single industry group, the “other manufacturing industries” group was drawn. Consequently, no coefficient of variation by industry was produced.

Every attempt was made to eliminate the non-sampling errors from the results of this survey. The returned questionnaires were verified and validated before data capture. The data were edited and tabulated automatically. Extensive follow-up was carried out for incomplete responses and for non-response. Instructions and definitions had been refined.

Table 2.2
Imputation for Non Response as a Share of Total Environmental Protection Expenditures, 1995

Industry	Imputed value as a percentage of total value (including imputation value)
Logging	51.3
Mining	24.1
Crude Petroleum and Natural Gas	27.6
Food	29.6
Beverage	32.3
Pulp and Paper	29.5
Primary Metals	26.4
Non-Metallic Mineral Products	23.9
Refined Petroleum and Coal Products	16.7
Chemical Products	16.1
Other manufacturing	27.6
Oil and Gas Transport and Gas Distribution[1]	21.3
Electric Power	6.5
Expenditure category excluding other manufacturing industries	Imputed value as a percentage of total value (including imputation value)
Environmental monitoring - Operating	28.7
Environmental monitoring - Capital	17.9
Environmental monitoring - Total	25.6
Environmental assessments and audits - Operating	22.9
Environmental assessments and audits - Capital	10.3
Environmental assessments and audits - Total	18.5
Reclamation and decommissioning - Operating	35.1
Reclamation and decommissioning - Capital	22.1
Reclamation and decommissioning - Total	30.6
Wildlife and habitat protection - Operating	31.1
Wildlife and habitat protection - Capital	9.5
Wildlife and habitat protection - Total	23.4
Waste management and sewerage services, private contractor	24.9
Waste management and sewerage services, government	30.4
Waste management and sewerage services - Total	25.8
PAC end-of-pipe processes - Operating	23.9
PAC end-of-pipe processes - Capital	34.9
PAC end-of-pipe processes - Total	31.3
PAC integrated processes - Operating	18.8
PAC integrated processes - Capital	23.5
PAC integrated processes - Total	21.4
Fees, fines and licences	21.9
Other	13.7
Other manufacturing	
PAC - Operating	31.2
PAC - Capital	23.1
PAC - Total	25.9
Waste management and sewerage services	29.4
Other environmental protection - Operating	33.1
Other environmental protection - Capital	32.8
Other environmental protection - Total	33.1

Note:
1. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.

Source:
Statistics Canada, Environment Statistics Program.

The most common difficulty reported by respondents was the inability of their record-keeping systems to isolate the environmental protection component of their many expenditures. As noted earlier, 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, with the consequence that 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 both sets of costs separately.

Taking into account both sampling and non-sampling errors, a general measure of reliability was produced. Data on environmental protection expenditures from the 1995 survey are considered to be reliable according to class 2 (1 being very reliable and 3 being acceptable).

References

Statistics Canada, 1997a, *Econnections - Linking the Environment and the Economy: Indicators and Detailed Statistics 1997*, Catalogue no. 16-200-XKE, December, Ottawa.

Statistics Canada, 1997b, *Research and Development (R&D) Expenditures for Environmental Protection (EP) in Canadian Industry*, Service Bulletin, Science Statistics, Col. 21, No. 12, November, Ottawa.

Annex: Statistical Tables

Symbols

The following standard symbols are used in Statistics Canada publications:

.. figures not available

... figures not appropriate or not applicable

- nil or zero

-- amount too small to be expressed

x confidential to meet secrecy requirements of the *Statistics Act*

Table A.1

Distribution of Expenditures on Environmental Protection by Industry, 1995

Industry	Capital expenditures	Operating expenditures	Total
	percent		
Logging	7.3	92.7	100
Mining	26.1	73.9	100
Crude Petroleum and Natural Gas	62.6	37.4	100
Food	22.8	77.2	100
Beverage	29.1	70.9	100
Pulp and Paper	73.1	26.9	100
Primary Metals	22.4	77.6	100
Non-Metallic Mineral Products	59.5	40.5	100
Refined Petroleum and Coal Products	48.6	51.4	100
Chemical Products	34.9	65.1	100
Other manufacturing	39.8	60.2	100
Oil and Gas Transport and Gas Distribution[1]	48.8	51.2	100
Electric Power	34.0	66.0	100
Total	**46.7**	**53.3**	**100**

Notes:
Figures may not add due to rounding.
1. Includes the following industries: Crude Oil and Natural Gas Pipeline Transport Industries and Gas Distribution Systems Industry.
Source:
Statistics Canada, Environment Statistics Program.

Table A.2

Capital Expenditures on Environmental Protection by Industry, 1995

Industry	Pollution abatement and control expenditures[2]	Other environmental protection expenditures[3]	Total	Share of total
	million dollars			percent
Logging	4.0	3.8	7.9	0.4
Mining	62.0	22.5	84.5	4.0
Crude Petroleum and Natural Gas	228.8	89.1	317.9	15.2
Food	23.2	1.2	24.4	1.2
Beverage	6.7	0.8	7.5	0.4
Pulp and Paper	809.7	12.6	822.3	39.3
Primary Metals	108.6	0.9	109.5	5.2
Non-Metallic Mineral Products	51.4	1.5	52.8	2.5
Refined Petroleum and Coal Products	95.6	0.9	96.5	4.6
Chemical Products	65.5	17.8	83.3	4.0
Other manufacturing	301.9	6.1	308.0	14.7
Oil and Gas Transport and Gas Distribution[1]	21.7	8.0	29.7	1.4
Electric Power	72.9	73.1	146.0	7.0
Total	**1 852.0**	**238.3**	**2 090.3**	**100.0**

Notes:
Figures may not add due to rounding.
1. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.
2. Capital expenditures on pollution abatement and control include expenditures on PAC end-of-pipe construction and equipment, expenditures on PAC integrated processes and environmental monitoring expenditures.
3. Other capital expenditures on environmental protection include expenditures on environmental assessments and audits, on site reclamation and decommissioning, and expenditures on wildlife protection and habitat.

Source:
Statistics Canada, Environment Statistics Program.

Table A.3

Capital Expenditures on Environmental Protection by Industry and Type of Activity, 1995

Industry	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	PAC end-of-pipe processes	PAC integrated processes	Total	Share of total
	million dollars							percent
Logging	0.1	x	0.2	x	3.3	0.6	7.9	0.4
Mining	11.0	0.6	21.7	0.1	45.6	5.4	84.5	4.0
Crude Petroleum and Natural Gas	3.2	5.9	82.1	1.1	209.1	16.5	317.9	15.2
Food	2.4	x	0.8	x	13.1	7.8	24.4	1.2
Beverage	1.4	0.1	0.7	--	1.6	3.7	7.5	0.4
Pulp and Paper	11.3	2.2	6.6	3.8	670.0	128.5	822.3	39.3
Primary Metals	7.2	0.5	0.3	0.1	55.6	45.8	109.5	5.2
Non-Metallic Mineral Products	2.3	0.2	0.9	0.4	42.6	6.4	52.8	2.5
Refined Petroleum and Coal Products	16.1	0.5	0.3	-	67.1	12.4	96.5	4.6
Chemical Products	10.5	0.2	16.8	0.9	34.7	20.2	83.3	4.0
Other manufacturing	..	..	..	..	..	..	308.0	14.7
Oil and Gas Transport and Gas Distribution[1]	2.8	2.1	4.1	1.7	13.4	5.5	29.7	1.4
Electric Power	9.4	x	10.4	x	47.4	16.1	146.0	7.0
Total excluding other manufacturing	**77.7**	**38.0**	**144.9**	**49.3**	**1 203.5**	**268.9**	**1 782.3**	**85.3**
Total	**..**	**..**	**..**	**..**	**..**	**..**	**2 090.3**	**100.0**

Notes:
Figures may not add due to rounding.
1. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.

Source:
Statistics Canada, Environment Statistics Program.

Table A.4

Capital Expenditures on Environmental Protection by Province, 1995

Province/Territory	Pollution abatement and control expenditures[1]	Other environmental protection expenditures[2]	Total	Share of total
	million dollars			percent
Nfld.	44.0	2.2	46.2	2.2
P.E.I.	x	x	0.4	--
N.S.	36.7	1.2	37.9	1.8
N.B.	116.3	4.3	120.7	5.8
Que.	488.7	64.4	553.2	26.5
Ont.	557.9	40.2	598.0	28.6
Man.	56.5	5.7	62.1	3.0
Sask.	46.2	32.5	78.7	3.8
Alta.	293.6	68.2	361.8	17.3
B.C.	210.2	18.7	229.0	11.0
Yukon	x	x	x	x
N.W.T.	x	x	x	x
Canada	**1 852.0**	**238.3**	**2 090.3**	**100.0**

Notes:
Figures may not add due to rounding.
1. Capital expenditures on pollution abatement and control include expenditures on PAC end-of-pipe construction and equipment, expenditures on PAC integrated processes and environmental monitoring expenditures.
2. Other capital expenditures on environmental protection include expenditures on environmental assessments and audits, on site reclamation and decommissioning, and expenditures on wildlife protection and habitat.

Source:
Statistics Canada, Environment Statistics Program.

Table A.5

Capital Expenditures on Environmental Protection by Province and Type of Activity, 1995

Province/Territory	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	PAC end-of-pipe processes	PAC integrated processes	Total	Share of total
	million dollars							percent
Nfld.	0.3	x	1.2	x	x	0.1	45.3	2.5
P.E.I.	x	x	x	x	0.1	x	0.2	--
N.S.	4.3	0.2	0.4	0.4	26.7	2.3	34.4	1.9
N.B.	2.3	0.9	2.8	0.5	93.1	16.4	116.0	6.5
Que.	23.5	x	12.0	x	335.1	71.1	492.7	27.6
Ont.	13.1	8.7	26.8	1.4	271.2	77.1	398.3	22.3
Man.	0.5	x	x	x	31.5	18.6	56.1	3.1
Sask.	1.2	x	x	1.3	38.5	5.2	77.4	4.3
Alta.	14.5	6.5	57.5	3.9	233.8	37.0	353.2	19.8
B.C.	17.8	3.2	10.1	4.7	129.6	40.9	206.3	11.6
Yukon	x	x	x	x	x	x	x	x
N.W.T.	x	x	x	x	x	x	x	x
Canada[1]	**77.7**	**38.0**	**144.9**	**49.3**	**1 203.5**	**268.9**	**1 782.3**	**100.0**

Notes:
Figures may not add due to rounding.
1. Excludes the other manufacturing industries category.

Source:
Statistics Canada, Environment Statistics Program.

Table A.6

Distribution of Capital Expenditures for Pollution Abatement and Control by Medium and by Industry, 1995

Industry	Air	Surface water	Soil and groundwater	Noise and radiation	Total
		percent			
Logging	43.1	8.8	46.1	2.0	100
Mining	17.3	47.0	35.2	0.5	100
Crude Petroleum and Natural Gas	84.4	10.6	4.9	0.1	100
Food	39.1	50.6	10.1	0.3	100
Beverage	10.6	78.7	8.7	2.0	100
Pulp and Paper	6.7	91.2	2.1	-	100
Primary Metals	47.9	36.3	14.0	1.8	100
Non-Metallic Mineral Products	67.8	3.2	28.9	0.2	100
Refined Petroleum and Coal Products	61.7	31.2	3.3	3.8	100
Chemical Products	38.8	37.2	23.2	0.8	100
Other manufacturing	64.4	26.7	7.8	1.1	100
Oil and Gas Transport and Gas Distribution[1]	42.9	16.5	36.2	4.4	100
Electric Power	44.5	19.0	11.6	24.9	100
Total	**35.5**	**54.6**	**8.0**	**1.9**	**100**

Notes:
Figures may not add due to rounding.
The table includes reported data only. For all industries except the “other manufacturing industries” group, this table only includes expenditures on end-of-pipe and integrated processes.
1. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.
Source:
Statistics Canada, Environment Statistics Program.

Table A.7

Distribution of Capital Expenditures for Pollution Abatement and Control by Medium and by Province, 1995

Province/Territory	Air	Surface water	Soil and groundwater	Noise and radiation	Total
		percent			
Nfld.	1.9	98.1	-	-	100
P.E.I.	24.3	45.0	30.6	-	100
N.S.	9.0	86.1	4.6	0.3	100
N.B.	24.8	66.4	2.1	6.7	100
Que.	23.3	70.9	4.9	1.0	100
Ont.	41.0	45.9	9.3	3.8	100
Man.	19.9	74.9	5.2	-	100
Sask.	36.5	18.2	45.2	0.1	100
Alta.	71.9	19.4	8.0	0.7	100
B.C.	16.8	73.1	9.9	0.2	100
Yukon	x	x	x	x	x
N.W.T.	x	x	x	x	x
Canada	**35.5**	**54.6**	**8.0**	**1.9**	**100**

Notes:
Figures may not add due to rounding.
The table includes reported data only. For all industries except the “other manufacturing industries” group, this table only includes expenditures on end-of-pipe and integrated processes.
Source:
Statistics Canada, Environment Statistics Program.

Table A.8

Distribution of Capital Expenditures on End-of-Pipe Processes for Pollution Abatement and Control by Medium and Industry, 1995

Industry	Air	Surface water	Soil and groundwater	Noise and radiation	Total
			percent		
Logging	51.7	7.4	38.6	2.4	100
Mining	19.0	42.1	38.4	0.5	100
Crude Petroleum and Natural Gas	89.1	9.7	1.1	0.1	100
Food	41.4	45.1	13.0	0.5	100
Beverage	24.9	48.2	20.5	6.4	100
Pulp and Paper	4.8	93.1	2.1	-	100
Primary Metals	48.6	42.0	8.0	1.3	100
Non-Metallic Mineral Products	67.2	3.2	29.4	0.2	100
Refined Petroleum and Coal Products	54.7	37.0	3.9	4.5	100
Chemical Products	43.7	41.5	14.0	0.8	100
Oil and Gas Transport and Gas Distribution[1]	35.7	16.1	42.7	5.5	100
Electric Power	41.6	13.4	15.3	29.6	100
Total	**32.8**	**58.1**	**6.9**	**2.2**	**100**

Notes:
Figures may not add due to rounding.
The table includes reported data only and does not cover the rest of the manufacturing sector.
1. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.
Source:
Statistics Canada, Environment Statistics Program.

Table A.9

Distribution of Capital Expenditures on End-of-Pipe Processes for Pollution Abatement and Control by Medium and Province, 1995

Province/Territory	Air	Surface water	Soil and groundwater	Noise and radiation	Total
			percent		
Nfld.	x	x	-	-	100
P.E.I.	26.5	49.0	24.5	-	100
N.S.	9.1	85.9	4.7	0.3	100
N.B.	14.0	76.0	2.4	7.6	100
Que.	20.6	75.6	3.5	0.3	100
Ont.	32.2	52.2	9.7	5.8	100
Man.	4.8	93.9	1.2	-	100
Sask.	37.2	17.3	45.4	--	100
Alta.	79.9	14.5	4.9	0.7	100
B.C.	15.6	74.4	9.7	0.2	100
Yukon	x	x	x	x	x
N.W.T.	x	x	x	x	x
Canada	**32.8**	**58.1**	**6.9**	**2.2**	**100**

Notes:
Figures may not add due to rounding.
The table includes only reported data and does not cover the rest of the manufacturing sector.
Source:
Statistics Canada, Environment Statistics Program.

Table A.10

Distribution of Capital Expenditures on Integrated Processes for Pollution Abatement and Control by Medium and Industry, 1995

Industry	Air	Surface water	Soil and groundwater	Noise and radiation	Total
	percent				
Logging	-	16.0	84.0	-	100
Mining	3.5	88.4	8.0	--	100
Crude Petroleum and Natural Gas	24.5	21.2	53.5	0.8	100
Food	35.2	59.7	5.1	-	100
Beverage	4.5	91.7	3.7	0.1	100
Pulp and Paper	15.7	82.4	1.9	-	100
Primary Metals	47.1	29.2	21.4	2.3	100
Non-Metallic Mineral Products	71.7	3.0	25.3	-	100
Refined Petroleum and Coal Products	99.3	0.5	0.1	--	100
Chemical Products	30.3	29.7	39.2	0.8	100
Oil and Gas Transport and Gas Distribution[1]	62.2	17.7	18.8	1.3	100
Electric Power	52.9	35.5	0.8	10.8	100
Total	**32.6**	**53.6**	**12.5**	**1.4**	**100**

Notes:
Figures may not add due to rounding.
The table includes reported data only and does not cover the rest of the manufacturing sector.
1. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.
Source:
Statistics Canada, Environment Statistics Program.

Table A.11

Distribution of Capital Expenditures on Integrated Processes for Pollution Abatement and Control by Medium and Province, 1995

Province/Territory	Air	Surface water	Soil and groundwater	Noise and radiation	Total
	percent				
Nfld.	-	-	-	-	-
P.E.I.	x	x	x	x	x
N.S.	7.5	92.5	-	-	100
N.B.	98.4	1.6	-	-	100
Que.	31.1	56.5	9.1	3.3	100
Ont.	31.5	53.1	13.8	1.5	100
Man.	41.0	47.3	11.7	-	100
Sask.	28.5	26.8	43.5	1.1	100
Alta.	26.2	47.8	25.3	0.7	100
B.C.	19.7	74.5	5.9	-	100
Yukon	x	x	x	x	x
N.W.T.	x	x	x	x	x
Canada	**32.6**	**53.6**	**12.5**	**1.4**	**100**

Notes:
Figures may not add due to rounding.
The table includes only reported data and does not cover the rest of the manufacturing sector.
Source:
Statistics Canada, Environment Statistics Program.

Table A.12

Examples of End-of-Pipe Processes for Pollution Abatement and Control, 1995

Purpose of process by industry	Frequency as a percentage of cases reported by industry	Examples of end-of-pipe processes
Mining		
Air and noise emissions control	34	Air filtration equipment (bag houses)
		Gravity settling equipment (dust collectors)
		Air scrubbing systems
Land/resource management	30	Treatment and consolidation of tailings
		Containment facilities (such as storage tanks) and other barriers
Waste water treatment	21	Aerobic lagoons and pond systems
		General sewage/waste-water treatment systems
		Other (coagulation, flocculation and flotation, membrane filtration, neutralization systems)
Other	13	PCB decontamination methods
		Use of energy alternatives
Crude Petroleum and Natural Gas		
Air and noise emissions control	48	Flare systems
		Flue gas desulphurization
Land/resource management	25	Containment facilities (such as storage tanks) and other barriers
		Other (land farming methods, bio-remediation methods)
Waste water treatment	5	Aerobic lagoons and pond systems
		General sewage/waste water treatment systems
Other	22	Energy efficiency conversions (energy conservation)
		Clean fuel systems
		Sand and slop disposal/waste containers
Food		
Waste water treatment	46	Neutralization systems
		Coagulation, flocculation and flotation
		Activated sludge systems
		Aerobic lagoon and pond systems
		General sewage/waste water treatment systems
Air and noise emissions control	34	Air filtration equipment (bag houses)
		Gravity settling equipment (dust collectors)
		Noise and odour control systems
		Air scrubbing systems
		Ventilation systems
Land/resource management	11	Containment facilities (such as storage tanks) and other barriers
Other	7	Waste disposal and recycling facilities
Pulp and Paper		
Waste water treatment	61	Secondary effluent treatment facilities
		Activated sludge systems
		Aerobic lagoon and pond systems
		Bed filtration systems
		Primary clarification systems
Air and noise emissions control	23	Precipitation chambers
		Air scrubbing systems
		Electrostatic precipitators and separators
		Noise and odour control systems
Land/resource management	10	Landfill construction and modification
		Containment facilities (such as storage tanks) and other barriers

Table A.12
Examples of End-of-Pipe Processes for Pollution Abatement and Control, 1995 (Continued)

Purpose of process by industry	Frequency as a percentage of cases reported by industry	Examples of end-of-pipe processes
Other	3	Waste disposal and recycling facilities
Primary Metals		
Air and noise emissions control	48	Air filtration equipment (bag houses)
		Gravity settling equipment (dust collectors)
		Noise and odour control systems
		Electrostatic precipitators and separators
		Air scrubbing systems
Waste water treatment	35	General sewage/waste water treatment systems
		Oil/water separation
		Neutralization systems
		Other (coagulation, flocculation and flotation, membrane filtration)
Land/resource management	9	Containment facilities (such as storage tanks) and other barriers
Other	7	Waste disposal and recycling facilities
Non-Metallic Mineral Products		
Air and noise emissions control	68	Air filtration equipment (bag houses)
		Gravity settling equipment (dust collectors)
		Noise and odour control systems
		Tall stack systems
Waste water treatment	15	Membrane filtration
		Oil/water separation
		Primary clarification systems
Land/resource management	12	Containment facilities (such as storage tanks) and other barriers
Refined Petroleum and Coal Products		
Air and noise emissions control	50	Flare systems
		Flue gas desulphurization
		Noise and odour control systems
Waste water treatment	21	Aeration systems
		Aerobic lagoons and pond systems
		General sewage/waste water treatment systems
Land/resource management	21	Containment facilities (such as storage tanks) and other barriers
		Site restoration methods
Chemical products		
Air and noise emissions control	40	Air filtration equipment (bag houses)
		Gravity settling equipment (dust collectors)
		Air scrubbing systems
		Ventilation systems
		CFC control equipment
Land/resource management	30	Containment facilities (such as storage tanks) and other barriers
		Other (remediation using soil washing, pump and treat technologies)
Waste water treatment	21	Neutralization systems
		General sewage/waste water treatment systems
		Coagulation, flocculation and flotation
		Air strippers and other contacting systems
Other	4	Waste disposal and recycling facilities
Electric Power		
Air and noise emissions control	33	Tall stack systems
		Air scrubbing systems
		Air filtration equipment (bag houses)
		Gravity settling equipment (dust collectors)

Table A.12

Examples of End-of-Pipe Processes for Pollution Abatement and Control, 1995 (Continued)

Purpose of process by industry	Frequency as a percentage of cases reported by industry	Examples of end-of-pipe processes
Land/resource management	29	Containment facilities (such as storage tanks) and other barriers
		Landfill construction and modification
Waste water treatment	25	Neutralization systems
		Oil/water separation
Other	13	Asbestos remediation techniques
		PCB decontamination methods
Oil and Gas transport and Gas Distribution[1]		
Land/resource management	35	Containment facilities (such as storage tanks) and other barriers
		Other (bioremediation methods, land farming methods)
Air and noise emissions control	23	Combustion and incineration systems
		Other (flare systems, ventilation systems, noise and odour control)
Waste water treatment	15	Gravity settling ponds
		Other (aerobic lagoon and pond system, oil/water separation)
Other	16	Energy efficiency conversion

Notes:
1. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.
"Air and noise emissions control" includes odour control.
The "Other" category includes site decommissioning, energy conservation and solid waste management.
The sum of frequencies for each industry does not necessarily add to 100% since the table highlights only the most widely reported end-of-pipe processes.
Source:
Statistics Canada, Environment Statistics Program.

Table A.13

Examples of Integrated Processes for Pollution Abatement and Control, 1995

Purpose of process by industry	Frequency as a percentage of cases reported by industry	Examples of integrated processes
Mining		
Land/resource management	50	Internal scrap/chemical recovery systems Other
Prevention and treatment of waste water	20	Water use reduction and reuse Gravity settling systems
Air and noise emissions control	10	Air filtration equipment (bag houses) Gravity settling equipment (dust collectors)
Other	20	Fuel substitution Underground storage tanks handling
Crude Petroleum and Natural Gas		
Air and noise emissions control	38	Flare systems Flue gas desulphurization
Land/resource management	31	Containment facilities and other barriers against spills Other
Prevention and treatment of waste water	15	Chemical oxidation and reduction systems
Other	15	Fuel substitution Waste-to-energy systems
Food		
Prevention and treatment of waste water	28	Water use reduction and reuse Other (neutralization systems, primary clarification, screening and degritting)
Air and noise emissions control	23	Air filtration equipment (bag houses) Gravity settling equipment (dust collectors) Other (CFC control equipment, combustion and incineration systems, vapour condenser, ventilation systems)
Land/resource management	23	Internal scrap/chemical recovery systems Containment facilities and other barriers against spills Other
Other	15	Energy efficiency conversion Solid waste recycling facilities
Pulp and Paper		
Land/resource management	45	Internal scrap/chemical recovery systems Reuse of solvents, chemicals and/or solid waste in the production process Containment facilities and other barriers against spills Other
Prevention and treatment of waste water	34	Water use reduction and reuse Other (activated sludge systems, thin film evaporation, steam stripping)
Air and noise emissions control	13	Air filtration equipment (bag houses) Gravity settling equipment (dust collectors) Combustion and incineration systems
Other	8	Fuel substitution and waste-to-energy systems

Table A.13
Examples of Integrated Processes for Pollution Abatement and Control, 1995 (Continued)

Purpose of process by industry	Frequency as a percentage of cases reported by industry	Examples of integrated processes
Primary Metals		
Land/resource management	46	Internal scrap/chemical recovery systems
		Containment facilities and other barriers against spills
		Other
Air and noise emissions control	31	Ventilation systems
		Air filtration equipment (bag houses)
		Gravity settling equipment (dust collectors)
Prevention and treatment of waste water	23	Water use reduction and reuse
		Other (aeration systems, oil/water separation, precipitation chambers)
Non-Metallic Mineral Products		
Air and noise emissions control	64	Air filtration equipment (bag houses)
		Gravity settling equipment (dust collectors)
		Combustion and incineration systems
Prevention and treatment of waste water	14	Water use reduction and reuse
Other	21	Energy efficiency conversion
		Fuel substitution
Chemical products		
Land/resource management	36	Internal scrap/chemical recovery systems
		Reuse of solvents, chemicals and/or solid waste in the production process
		Other
Air and noise emissions control	30	Air filtration equipment (bag houses)
		Gravity settling equipment (dust collectors)
		Ventilation systems
		Air scrubbing systems
Prevention and treatment of waste water	23	Water use reduction and reuse
		Other (neutralization systems, oil/water separation)
Other	11	Raw material substitution (energy conservation)

Notes:
"Air and noise emissions control" includes odour control.
The "Other" category includes energy conservation and solid waste management.
The sum of frequencies for each industry does not necessarily add to 100% since the table highlights only the most widely reported integrated processes.
Source:
Statistics Canada, Environment Statistics Program.

Table A.14

Operating Expenditures on Environmental Protection by Industry, 1995

Industry	Pollution abatement and control expenditures[2]	Waste management and sewerage services	Other environmental protection expenditures[3]	Total	Share of total
	million dollars				percent
Logging	6.8	5.3	87.7	99.8	4.2
Mining	132.4	6.2	100.4	239.0	10.0
Crude Petroleum and Natural Gas	69.5	45.5	74.9	189.8	8.0
Food	29.6	41.6	11.1	82.3	3.4
Beverage	2.7	11.4	4.2	18.3	0.8
Pulp and Paper	217.7	27.7	57.2	302.5	12.7
Primary Metals	267.9	60.5	51.0	379.4	15.9
Non-Metallic Mineral Products	14.7	7.0	14.3	36.0	1.5
Refined Petroleum and Coal Products	x	7.7	x	102.1	4.3
Chemical Products	75.7	36.9	42.9	155.4	6.5
Other manufacturing	183.0	176.3	107.3	466.6	19.6
Oil and Gas Transport and Gas Distribution[1]	12.8	2.6	15.7	31.1	1.3
Electric Power	x	9.8	x	283.6	11.9
Total	**1 173.6**	**438.4**	**774.2**	**2 386.1**	**100.0**

Notes:
Figures may not add due to rounding.
1. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.
2. Operating expenditures on pollution abatement and control include expenditures on PAC end-of-pipe construction and equipment, expenditures on PAC integrated processes and environmental monitoring expenditures. Purchase of waste and sewerage management services is shown separately.
3. Other operating expenditures on environmental protection include expenditures on environmental assessments and audits, expenditures on site reclamation and decommissioning, expenditures on wildlife protection and habitat, etc.

Source:
Statistics Canada, Environment Statistics Program.

Table A.15

Operating Expenditures on Environmental Protection by Industry and Type of Activity, 1995

Industry	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	Waste management and sewerage services	PAC end-of-pipe processes	PAC integrated processes	Fees, fines and licences	Other	Total	Share of total
	million dollars										percent
Logging	3.2	10.8	21.2	44.4	5.3	3.4	0.2	8.8	2.6	99.8	4.2
Mining	23.5	8.8	68.3	7.4	6.2	99.4	9.5	3.8	12.2	239.0	10.0
Crude Petroleum and Natural Gas	7.9	4.1	47.7	1.1	45.5	52.1	9.5	2.3	19.7	189.8	8.0
Food	7.6	3.2	2.0	0.5	41.6	19.7	2.3	3.4	2.0	82.3	3.4
Beverage	1.1	0.5	0.9	-	11.4	1.3	0.2	0.8	2.0	18.3	0.8
Pulp and Paper	68.9	7.5	8.0	6.1	27.7	117.4	31.3	12.3	23.3	302.5	12.7
Primary Metals	35.5	4.1	27.6	4.0	60.5	148.3	84.1	4.5	10.8	379.4	15.9
Non-Metallic Mineral Products	4.1	1.3	9.0	0.3	7.0	6.6	3.9	1.5	2.3	36.0	1.5
Refined Petroleum and Coal Products	4.4	0.6	34.7	x	7.7	50.3	x	x	3.8	102.1	4.3
Chemical Products	26.6	7.7	23.4	0.7	36.9	43.4	5.7	1.4	9.8	155.4	6.5
Other manufacturing	..	..	..	..	176.3	..	..	..	..	466.6	19.6
Oil and Gas Transport and Gas Distribution[1]	5.5	1.9	3.4	0.3	2.6	6.2	1.1	1.6	8.5	31.1	1.3
Electric Power	8.7	19.3	25.7	x	9.8	35.2	x	x	79.8	283.6	11.9
Total excluding other manufacturing	**197.1**	**69.6**	**271.7**	**88.5**	**262.1**	**583.3**	**210.1**	**60.1**	**176.9**	**1 919.5**	**80.4**
Total	**..**	**..**	**..**	**..**	**438.4**	**..**	**..**	**..**	**..**	**2 386.1**	**100.0**

Notes:
Figures may not add due to rounding.
1. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.

Source:
Statistics Canada, Environment Statistics Program.

Table A.16

Operating Expenditures on Environmental Protection by Province, 1995

Province/Territory	Pollution abatement and control expenditures[1]	Waste management and sewerage services	Other environmental protection expenditures[2]	Total	Share of total
	million dollars				percent
Nfld.	3.1	1.9	2.8	7.8	0.3
P.E.I.	x	0.7	x	1.8	0.1
N.S.	10.3	4.9	11.0	26.1	1.1
N.B.	38.8	10.2	15.8	64.8	2.7
Que.	262.8	103.6	153.8	520.2	21.8
Ont.	491.2	197.1	248.7	936.9	39.3
Man.	16.2	8.7	11.4	36.3	1.5
Sask.	66.8	22.6	38.5	127.9	5.4
Alta.	130.4	53.6	132.6	316.5	13.3
B.C.	149.2	35.0	156.5	340.7	14.3
Yukon	x	x	x	x	x
N.W.T.	x	x	x	x	x
Canada	**1 173.6**	**438.4**	**774.2**	**2 386.1**	**100.0**

Notes:
Figures may not add due to rounding.
1. Operating expenditures on pollution abatement and control include expenditures on PAC end-of-pipe construction and equipment, expenditures on PAC integrated processes and environmental monitoring expenditures. Purchase of waste and sewerage management services is shown separately.
2. Other operating expenditures on environmental protection include expenditures on environmental assessments and audits, expenditures on site reclamation and decommissioning, expenditures on wildlife protection and habitat, etc.

Source:
Statistics Canada, Environment Statistics Program.

Table A.17

Operating Expenditures on Environmental Protection by Province and Type of Activity, 1995

Province/Territory	Environmental monitoring	Environmental assessments and audits	Reclamation and decommissioning	Wildlife and habitat protection	Waste management and sewerage services	PAC end-of-pipe processes	PAC integrated processes	Fees, fines and licences	Other	Total	Share of total
	million dollars										percent
Nfld.	0.6	0.3	0.9	0.4	1.0	1.6	0.1	0.1	0.9	5.9	0.3
P.E.I.	0.1	x	x	x	0.5	0.6	0.1	x	x	1.3	0.1
N.S.	2.0	0.5	3.5	2.0	1.7	5.5	0.2	0.7	3.0	19.1	1.0
N.B.	7.0	1.3	3.9	3.2	7.0	26.0	2.0	1.1	3.6	55.1	2.9
Que.	72.5	14.4	48.0	17.1	60.9	110.0	34.5	18.6	30.4	406.4	21.2
Ont.	55.9	28.5	76.2	9.3	96.7	217.2	121.7	9.9	78.8	694.2	36.2
Man.	3.0	1.1	1.4	0.9	4.7	5.8	3.9	4.6	1.1	26.4	1.4
Sask.	7.2	1.5	28.1	1.2	21.2	50.5	7.8	1.4	5.6	124.6	6.5
Alta.	25.3	11.0	73.8	4.9	47.3	86.4	11.8	4.3	33.1	297.8	15.5
B.C.	22.8	10.7	34.1	49.4	20.9	76.9	27.7	19.4	19.8	281.7	14.7
Yukon	x	x	x	x	x	x	x	x	x	x	x
N.W.T.	x	x	x	x	x	x	x	x	x	x	x
Canada[1]	**197.1**	**69.6**	**271.7**	**88.5**	**262.1**	**583.3**	**210.1**	**60.1**	**176.9**	**1 919.5**	**100.0**

Notes:
Figures may not add due to rounding.
1. Excludes the other manufacturing industries category.

Source:
Statistics Canada, Environment Statistics Program.

Table A.18

Purchase of Environmental Services by Industry, 1995

Industry	Purchase of environmental services as a percentage of total environmental protection expenditures
Logging	42.1
Mining	28.1
Crude Petroleum and Natural Gas	72.0
Food	48.3
Beverage	51.3
Pulp and Paper	49.0
Primary Metals	36.5
Non-Metallic Mineral Products	49.0
Refined Petroleum and Coal Products	29.0
Chemical Products	34.9
Oil and Gas Transport and Gas Distribution[1]	50.1
Electric Power	36.7
Total	**44.7**

Notes:
Figures may not add due to rounding.
This table includes data reported only and does not cover the rest of the manufacturing sector.
1. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.
Source:
Statistics Canada, Environment Statistics Program.

Table A.19

Purchase of Environmental Services by Province, 1995

Province/Territory	Purchase of environmental services as a percentage of total environmental protection expenditures
Nfld.	49.7
P.E.I.	33.7
N.S.	50.4
N.B.	29.0
Que.	34.5
Ont.	40.0
Man.	65.6
Sask.	38.6
Alta.	66.6
B.C.	48.9
Yukon	x
N.W.T.	x
Canada	**44.7**

Notes:
Figures may not add due to rounding.
This table includes data reported only and does not cover the rest of the manufacturing sector.
Source:
Statistics Canada, Environment Statistics Program.

Table A.20

Purchase of Waste Management and Sewerage Services by Industry, 1995

Industry	Private contractor	Government	Total	Share of total
	million dollars			percent
Logging	5.1	0.2	5.3	1.2
Mining	5.5	0.6	6.2	1.4
Crude Petroleum and Natural Gas	45.4	0.1	45.5	10.4
Food	19.6	22.0	41.6	9.5
Beverage	6.1	5.3	11.4	2.6
Pulp and Paper	24.9	2.8	27.7	6.3
Primary Metals	57.9	2.6	60.5	13.8
Non-Metallic Mineral Products	5.6	1.4	7.0	1.6
Refined Petroleum and Coal Products	7.2	0.5	7.7	1.8
Chemical Products	33.7	3.2	36.9	8.4
Other manufacturing	..	..	176.3	40.2
Oil and Gas Transport and Gas Distribution[1]	2.6	0.0	2.6	0.6
Electric Power	5.9	4.0	9.8	2.2
Total excluding other manufacturing	**219.4**	**42.7**	**262.1**	**59.8**
Total	**..**	**..**	**438.4**	**100.0**

Notes:
Figures may not add due to rounding.
1. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.
Source:
Statistics Canada, Environment Statistics Program.

Table A.21

Purchase of Waste Management and Sewerage Services by Province, 1995

Province/Territory	Private contractor[1]	Government[1]	Total excluding other manufacturing	Total, Other manufacturing	Total	Share of total
			million dollars			percent
Nfld.	0.9	0.1	1.0	0.9	1.9	0.4
P.E.I.	0.2	0.3	0.5	0.2	0.7	0.2
N.S.	1.2	0.5	1.7	3.2	4.9	1.1
N.B.	6.5	0.5	7.0	3.2	10.2	2.3
Que.	51.4	9.5	60.9	42.7	103.6	23.6
Ont.	79.0	17.7	96.7	100.4	197.1	45.0
Man.	2.8	1.9	4.7	4.0	8.7	2.0
Sask.	19.7	1.5	21.2	1.4	22.6	5.2
Alta.	41.0	6.3	47.3	6.2	53.6	12.2
B.C.	16.4	4.4	20.9	14.1	35.0	8.0
Yukon	x	x	x	x	x	x
N.W.T.	x	x	x	x	x	x
Canada	**219.4**	**42.7**	**262.1**	**176.3**	**438.4**	**100.0**

Notes:
Figures may not add due to rounding.
1. Excludes other manufacturing industries.
Source:
Statistics Canada, Environment Statistics Program.

Table A.22

Frequency of Methods Used to Reduce Waste and Pollutants by Industry, 1995

	1995 waste and pollutant reductions							
Industry	End product modification	End-of-pipe process	Integrated production process change	Improved control of operations	Recycling	Energy efficiency	Material or solvent substitution	Other
	percent of total number declared							
Logging	-	18.8	25.0	37.5	31.3	18.8	6.3	6.3
Mining	4.5	38.6	25.0	59.1	50.0	38.6	36.4	6.8
Crude Petroleum and Natural Gas	6.5	48.4	38.7	71.0	48.4	77.4	41.9	9.7
Food	3.9	31.0	25.6	51.2	69.0	33.3	13.2	0.8
Beverage	12.5	41.7	33.3	33.3	75.0	45.8	16.7	4.2
Pulp and Paper	11.1	61.9	46.0	54.0	44.4	25.4	15.9	3.2
Primary Metals	8.8	61.4	50.9	42.1	64.9	36.8	42.1	7.0
Non-Metallic Mineral Products	19.1	42.6	23.4	48.9	68.1	38.3	34.0	8.5
Refined Petroleum and Coal Products	7.7	46.2	-	53.8	38.5	46.2	15.4	-
Chemical Products	19.5	26.6	36.7	58.6	68.8	29.7	41.4	7.8
Other manufacturing	7.3	22.9	28.3	42.4	68.8	35.6	42.9	2.9
Oil and Gas Transport and Gas Distribution[1]	7.7	38.5	23.1	69.2	61.5	76.9	38.5	-
Electric Power	18.2	36.4	27.3	45.5	72.7	72.7	81.8	18.2
Total	**9.9**	**35.2**	**31.8**	**50.2**	**63.5**	**36.9**	**33.0**	**4.7**
	Future[2] waste and pollutant reductions							
Industry	End product modification	End-of-pipe process	Integrated production process change	Improved control of operations	Recycling	Energy efficiency	Material or solvent substitution	Other
	percent of total number declared							
Logging	13.6	13.6	13.6	54.5	40.9	27.3	27.3	22.7
Mining	5.3	40.4	35.1	63.2	50.9	42.1	28.1	7.0
Crude Petroleum, Natural Gas	16.7	52.8	52.8	63.9	52.8	77.8	38.9	13.9
Food	10.0	44.7	36.5	58.2	61.8	47.1	18.2	4.7
Beverage	11.5	50.0	38.5	38.5	61.5	88.5	7.7	3.8
Pulp and Paper	15.9	60.3	57.1	61.9	50.8	38.1	31.7	3.2
Primary Metals	8.9	59.5	50.6	49.4	64.6	46.8	41.8	12.7
Non-metallic mineral products	9.8	43.1	29.4	47.1	66.7	49.0	43.1	9.8
Refined Petroleum and Coal Products	14.3	57.1	50.0	92.9	64.3	71.4	21.4	-
Chemical Products	23.8	38.8	43.5	66.7	68.0	44.9	46.9	10.2
Other manufacturing	13.2	22.9	32.2	44.9	66.1	47.6	48.9	7.9
Oil and Gas Transport and Gas Distribution[1]	14.3	42.9	21.4	64.3	57.1	85.7	50.0	7.1
Electric Power	23.1	38.5	23.1	53.8	61.5	76.9	69.2	30.8
Total	**13.7**	**40.2**	**38.6**	**55.6**	**62.0**	**49.3**	**37.3**	**8.5**

Notes:
Figures may not add due to rounding.
This table includes data reported only.
1. Includes the two following industries: Crude Oil and Natural Gas Pipeline Transport, Gas Distribution Systems.
2. Future pollutant and waste reductions planned in the next two years.
Source:
Statistics Canada, Environment Statistics Program.

Table A.23

Frequency of Methods Used to Reduce Waste and Pollutants by Province, 1995

	1995 waste and pollutant reductions							
Province/Territory	End product modification	End-of-pipe process	Integrated production process change	Improved control of operations	Recycling	Energy efficiency	Material or solvent substitution	Other
	percent of total number declared							
Nfld.	x	x	x	x	x	x	x	x
P.E.I.	-	25.0	25.0	75.0	50.0	25.0	-	-
N.S.	4.8	47.6	38.1	57.1	42.9	42.9	19.0	4.8
N.B.	21.7	39.1	34.8	52.2	65.2	52.2	30.4	-
Que.	9.2	37.6	34.7	45.1	56.6	31.2	33.5	4.0
Ont.	11.5	32.2	30.2	49.7	73.0	35.9	35.9	3.4
Man.	8.7	30.4	30.4	39.1	69.6	60.9	21.7	8.7
Sask.	5.0	35.0	30.0	55.0	50.0	45.0	35.0	5.0
Alta.	7.4	35.8	33.3	58.0	56.8	49.4	39.5	7.4
B.C.	7.2	38.6	31.3	56.6	53.0	26.5	22.9	6.0
Yukon	x	x	x	x	x	x	x	x
N.W.T.	x	x	x	x	x	x	x	x
Canada	**9.9**	**35.2**	**31.8**	**50.2**	**63.5**	**36.9**	**33.0**	**4.7**
	Future[1] waste and pollutant reductions							
Province/Territory	End product modification	End-of-pipe process	Integrated production process change	Improved control of operations	Recycling	Energy efficiency	Material or solvent substitution	Other
	percent of total number declared							
Nfld.	-	33.3	-	33.3	66.7	66.7	33.3	66.7
P.E.I.	25.0	50.0	25.0	50.0	25.0	50.0	-	-
N.S.	7.7	38.5	19.2	42.3	53.8	46.2	19.2	-
N.B.	x	x	x	x	x	x	x	x
Que.	11.2	39.5	42.9	47.8	56.6	35.1	34.1	8.3
Ont.	15.5	38.9	37.9	57.9	69.5	52.9	42.9	6.1
Man.	10.7	21.4	32.1	39.3	67.9	60.7	35.7	7.1
Sask.	12.9	54.8	48.4	54.8	48.4	61.3	35.5	6.5
Alta.	11.0	43.1	39.4	66.1	54.1	57.8	36.7	13.8
B.C.	14.8	42.6	32.4	54.6	59.3	43.5	32.4	14.8
Yukon	x	x	x	x	x	x	x	x
N.W.T.	x	x	x	x	x	x	x	x
Canada	**13.7**	**40.2**	**38.6**	**55.6**	**62.0**	**49.3**	**37.3**	**8.5**

Notes:
Figures may not add due to rounding.
This table includes data reported only.
1. Future pollutant and waste reductions planned in the next two years.
Source:
Statistics Canada, Environment Statistics Program.

National Accounts and Environment Division

Survey of Environmental Protection Expenditures, 1995

Confidential when completed

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

Français au verso

Correct as required

Establishment name

Operating name

C / O

Address

City

Province Postal code

SURVEY OBJECTIVE

This survey measures the cost imposed on industry by environmental protection in Canada through Canadian regulations and conventions.

The results of this survey will be combined with government and household expenditures to form a complete accounting of the costs of environmental protection for Canadians.

CONFIDENTIALITY

Statistics Canada is prohibited by law from publishing any statistics which would divulge information obtained from this survey that relates to any identifiable business, without the previous written consent of that business. 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.

INFORMATION

Important: please read the definitions and instructions provided at the end of the questionnaire before answering.

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, Canada
K1A 0T6

Telephone (toll-free): **1-800-255-7726**
Fax: **1-613-951-0709**

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.

Please return this questionnaire within 20 days of receipt.

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

1. Reporting year.

Report must cover your most recent financial year ending between **April 1, 1995** and **March 31, 1996**.

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

For Statistics Canada use only

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

4-2200-2: 1996-07-23 STC / CDN - 475-04244

Statistics Canada Statistique Canada

Canada

Please report expenditures in thousands of Canadian dollars

2. Environmental monitoring. *If response is none, please write "0" in corresponding box.*

Include

- all costs related to equipment, supplies, labour and purchased services that are used in response to or in anticipation of regulation or conventions requiring the monitoring of pollutants emitted by this establishment.

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

3. Environmental assessment and audits. *If response is none, 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);
- associated legal and consulting costs.

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

4. Site reclamation and decommissioning. *If response is none, please write "0" in corresponding box.*

Include

- expenditures to clean up environmental damage resulting from this establishment's operations;
- decommissioning expenditures;
- expenditures made during the year, that are associated with the closing down of an establishment (even if closing occurred before 1995).

Exclude

- any fine or compensation for environmental damage (this is to be reported in Question 13);
- any provision for future environmental liability.

Operating expenditures		Capital expenditures		Total expenditures
$ 000		$ 000		$ 000
160	+	170	=	180

5. Protection and restoration of wildlife and habitat. *If response is none, please write "0" in corresponding box.*

Include

- expenditures made in compliance with regulations or conventions 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.

Exclude

- expenditures for site reclamation and decommissioning which are already reported in Question 4;
- expenditures for aesthetic purposes.

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

6. Purchased waste collection and disposal services and purchased sewerage services provided by a private contractor or by a government. *If response is none, please write "0" in corresponding box.*

Include

- all expenditures related to the use of a waste collection and disposal service provided by a private contractor or a federal, provincial or local government body;
- all expenditures related to the use of a sewerage service provided by a federal, provincial or local government body.

Exclude

- any expenditure for waste management activities done by your establishment's employees (to be included in Question 7);
- any expenditure already included in Questions 2 to 5.

Services provided by:

Private contractors(s)		Government(s)		Total
$ 000		$ 000		$ 000
220	+	230	=	240

End-of-Pipe Pollution Abatement and Control (PAC) Expenditures

7. End-of-Pipe PAC expenditures.

End-of-pipe PAC construction and equipment are not an integral part of production. Their sole purpose is to abate or to control undesirable substances emitted during normal production activities.

If response is none, please write "0" in corresponding box.

Include

- any capital or operating expenditure for equipment or facilities which are separately identifiable and which have been installed exclusively to prevent or to reduce emissions of pollutants;
- any expenditure related to waste collection & treatment done by your establishment's employees.

Exclude

- any expenditure already included in Questions 2 to 6;
- any waste recycling expenditure if that activity is integrated into a production process (Question 10).

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

8. Did you report capital expenditures in Question 7?

1 ◯ Yes 2 ◯ No ▶ *Go to Question 10*

▼

What percentage of this amount was spent on preventing or abating each of the following?

Substances emitted to air		Substances released to surface waters		Substances released to soil or groundwater		Noise or radiation		
%		%		%		%		
280	+	290	+	300	+	310	=	**100%**

9. Please provide a brief description of your main end-of-pipe PAC projects.
Refer to page 7 for examples.

Process-integrated PAC Expenditures

10. Process-integrated PAC expenditures. *If response is none, please write "0" in corresponding box.*

Include

- all expenditures for new or significantly modified production processes that are mainly required by environmental regulations or conventions in order to prevent or to reduce emissions of pollutants and the amount of waste generated. Examples are process modifications to allow for material substitution, use of improved catalysts, and reuse of waste or water in the production system.

Exclude

- expenditures already reported in Questions 2 through 7.

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

11. Did you report capital expenditures in Question 10?

1 ◯ Yes 2 ◯ No ▶ *Go to Question 13*

▼

What percentage of this amount was spent on abating or controlling each of the following?

Substances emitted to air		Substances released to surface waters		Substances released to soil or groundwater		Noise or radiation		
%		%		%		%		
530	+	540	+	550	+	560	=	**100%**

12. Please provide a brief description of your main process-integrated PAC projects.
Refer to page 7 for examples.

13. Environmental charges. *If response is none, please write "0" in corresponding box.*

Include

- permits, fees, levies, special assessments;
- other charges paid to regulating bodies in order to allow operations to take place at this establishment;
- any fines, penalties, or damage awards paid to government agencies or to individuals.

$ 000

760

14. Other environmental protection expenditures. *If response is none, please write "0" in corresponding box.*

Include

- the costs of administration for an environmental affairs division;
- training and information programs;
- any other additional expenditures that are required to comply with environmental regulations or conventions.

Exclude

- research and development expenditures.

$ 000

770

15. From the total amount of environmental protection expenditures reported, what percentage was related to contracted environmental services?

Include

- the purchase of waste collection and disposal services and the purchase of sewerage services reported in Question 6;
- the purchase of environmental monitoring services;
- the purchase of environmental assessment and audit services;
- the purchases of construction and engineering services associated with the installation or maintenance of PAC infrastructure or equipment;
- all other purchases of environmental services.

%

800 ☐

Reduction of waste and pollution

16. If you have reduced your waste and pollution emissions in 1995 or if you are planning to reduce them in the next 2 years, please indicate how these reductions were/will be achieved, by checking the appropriate boxe(s):

PAC method	1995 emissions reductions	Future emissions reductions
End product modification	810 ☐	815 ☐
End-of-pipe installation	820 ☐	825 ☐
Integrated production process change	830 ☐	835 ☐
Improved control of operations	840 ☐	845 ☐
Recycling	850 ☐	855 ☐
Energy efficiency	860 ☐	865 ☐
Material substitution, solvent reduction, elimination or substitution	870 ☐	875 ☐
Other	880 ☐	885 ☐

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.

Comments *(Add a page if needed)*

Thank you for your cooperation

SELECTED ENVIRONMENTAL TECHNOLOGIES - Reference: Capital Projects, Questions 9 and 12.

Air and Water Treatment Systems

Absorption and adsorption systems
Activated sludge systems
Aeration systems
Aerobic lagoon and pond systems
Air filtration equipment
Air stripping
Anaerobic contact systems
Bed filtration systems
Biological polishing
Catalytic oxydation and reduction systems
CFC control equipment
Chemical oxidation and reduction systems
Chlorination
Coagulation, flocculation and flotation
Combustion and incineration systems
Electrostatic precipitators and separators
Flare systems
Flue gas desulphurization
Gravity settling systems
Inertial separator
Ion exchanger
Membrane filtration
Neutralization systems
Nitrification and denitrification
Noise and odour control
Oil/water separation
Ozonation
Precipitation chambers
Primary clarification
Screening and degritting
Steam stripping
Tall stack systems
Thermal oxidation systems
Ultravoilet photolysis systems
Vapour condenser
Ventilation systems
Wet oxidation systems
Wet scrubbing systems

Land Management

Aeration/vapour extraction systems
Bioremediation methods
Injection grouting technology
Landfarming methods
Pozzalanic treatment methods
Pump and treat technologies
Remediation using soil washing
Solvent extraction technology
Thermal desorption technology

Site Decommissioning

Asbestos remediation technologies
Lead clean up methods
PCB decontamination methods
Plant decommissioning
Site clean up methods
Underground storage tanks handling

Resource Management

Acid mine drainage control
Composting technology
Ecological landscaping methods
Geophysical methods
Geotechnical methods
Renaturalization methods
Site restoration methods

Energy Conservation

Clean fuel systems
Cogeneration
Energy efficiency conversions
Fuel substitution
Waste-to-energy systems

DEFINITIONS AND CONCEPTS

Environmental protection expenditures are defined in this survey as all operating expenses and capital expenditures that are incurred in order to comply with environmental regulations or conventions which apply to Canada. They consist of expenditures for pollution abatement and control and expenditures for restoring wildlife and habitat, along with associated expenditures for environmental monitoring, environmental assessments and audits, and reclamation and decommissioning of sites. Expenditures to improve employee health, workplace safety and site beautification are excluded.

Environmental conventions 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 are the National Packaging Protocol reduction of packaging by 50 percent by the year 2000; the Montreal Protocole (elimination of CFCs by 1998); the Canada-U.S. Air Quality Agreement; the "Responsible Care" program from the Canadian Chemical Producers Association.

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

Pollution abatement and control (PAC) 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 PAC equipment for sale are excluded, as are expenditures for research and development, since the latter are reported in Statistics Canada's Survey on Research and Development in Canadian Industry.

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

Report expenditures made during the 1995 fiscal year.

Include all outlays for machinery and equipment 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 cash expenses, rather than accruals, incurred during your 1995 fiscal year for labour, fuel and electricity, materials and supplies, and purchased services.

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 that reduce the allowable harvest.

FOR MINING ACTIVITIES

Use Question 7 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. Use Question 14 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.