Environmental Policy Tools and Firm Level Management Practices in Canada

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EXECUTIVE SUMMARY

Canada is a federal state in which each of the ten provinces and three territories has considerable jurisdictional power. As the Canadian Constitution does not clearly spell out distinct jurisdictional responsibilities for each government, their responsibilities can overlap, causing potential uncertainty as to which level of government has the authority to regulate specific environmental problems and objectives. As a result, the division of powers regarding environmental policy between the various levels of government flows to a great extent from jurisdiction over natural resources. In general, natural resources are largely within the provincial or territorial domain giving them the authority to legislate with respect to both publicly and privately owned resources within their respective regions. Canadian environmental policy has traditionally emphasised command-and-control environmental regulations. Although not as stringent as U.S. policy, which prescribes mandatory quantity limits on emissions of pollutants or the use of specific abatement technology, Canadian command-and-control policy has primarily been enabling rather than mandatory, with an emphasis on achieving target or goals via cooperation and negotiation between specific polluters and government.

The purpose of this report is to provide a brief overview of some of the data collected from an industrial survey of the Canadian manufacturing sector exploring the links between public (government) environmental policies and private (facility and firm) environmental management investments, innovation and performance. This report is part of a larger international project involving research teams in seven countries (Canada, France, Germany, Norway, Hungary, Japan, and the United States), which looks to provide practical advice concerning the effectiveness and efficiency of alternative environmental policy measures.

Some highlights of this report include:

- In total, 256 facilities (out of 1033) with more than 50 employees in all manufacturing sectors responded to the postal survey, giving us a response rate of 25 %. Of the 256 respondents, 46.1 % had not implemented an EMS, 31.6% had implemented an EMS and 22.3% were in the process of implementing an EMS.

- Although, the majority of respondents (62.8%) had a written environmental policy and performed internal environmental audits (67.3%), only 19.9% of respondents used environmental criteria to evaluate and/or compensate employees and only 22.1% published public environmental reports.

- Of the 81 organisations that had implemented an EMS, 47 (58%) were ISO 14000 certified.

- Those facilities that had implemented an EMS were more likely to have integrated their environmental activities with other management systems (e.g., quality management systems, management accounting systems) relative to those who had not implemented an EMS.

- The majority of respondents regularly monitor the use of natural resources, solid waste generation, wastewater effluent and risk of severe accidents. In general, if a facility regularly monitors an environmental performance measure, some concrete actions to reduce the respective measure's impact on the natural environment is undertaken.

- The majority of respondents viewed their facility as primarily having undertaken changes in their production processes in dealing with environmental issues, rather than having invested in end-of-pipe technologies.

- Bivariate correlations between various firm characteristics and the associated facility's change in environmental impacts per unit of output in the last three years indicate that: i) having an environmental department decreases the environmental impact of solid waste generation, wastewater effluent, local air pollution, global pollution, soil contamination and the risk of severe accidents; ii) having an R&D budget specifically related to environmental matters is only correlated with improved environmental performance in the area of global pollution; and iii) larger organisations are more likely to reduce the negative environmental impacts of their operations.

- Our results suggest that both managerial motivations and the influence of stakeholders on decisions regarding facility level environmental practices are very important. The number one motivator is regulatory compliance, followed by the prevention or control of environmental incidents, the maintenance of their corporate profile/image and the achievement of cost savings. The critical stakeholders, in descending order, include public authorities, management employees, corporate headquarters, non-management employees and investors/shareholders. Given that the majority of our respondents' customers are either other manufacturing firms (48%) or wholesalers/retailers (44%), the fact that customers are not an important pressure source does not come as a surprise.

- Environmental market-based policies have rarely been used in Canada and our respondents have corroborated this conclusion. Our respondents' perceptions of Canadian environmental policy instruments suggest that liability for damages and direct regulation are the two most important policy instruments. Moreover, 70% of respondents do not believe that regulatory authorities have programmes that encourage the introduction of environmental management systems.

- The majority of respondents (54.3 %) found the environmental policy regime to which their facility is subject, to be moderately stringent while 29.6 % of respondents found the regime to be not particularly stringent. The latter should not come as a surprise given Canada's cooperative model of negotiation between the government regulator and the polluting party.

The above provides a brief overview of some summary results of the Canadian database. Future reports will use the international database to examine the relationships between facility characteristics, environmental management practices, environmental investments and public policy influences using multivariate techniques.

I. INTRODUCTION

Canadian environmental policy has traditionally emphasised command-and-control environmental regulations. Less stringent than U.S. policy, which prescribes mandatory quantity limits on emissions of pollutants or the use of specific abatement technology, Canadian command-and-control policy has primarily been enabling rather than mandatory, with an emphasis on achieving targets or goals via cooperation and negotiation between specific polluters and government. While these regulations have protected the environment, they tend to promote end-of-pipe pollution controls rather than pollution prevention and also tend to impose steep costs on both firms and regulators.

A growing belief in the need to provide flexibility to firms and lower the cost of environmental protection has led many governments to consider using programmes (and some to implement programmes[1]) that encourage voluntary actions to pollution control, as well as incentive-based instruments to alter behaviour vis-à-vis pollution control. In general, incentive-based policies and voluntary programmes have rarely been used in Canada. Some notable exceptions, however, do exist. In Canada, examples of national voluntary programmes include the Accelerated Reduction/Elimination of Toxics (ARET), Canadian Pesticide Container Management Programme, Recycling Programme for Rechargeable Batteries, Refrigerant Management Canada Programme and various sector specific Environmental Performance Agreements.[2] Examples of incentive based instruments include a small number of tradable permit systems (HCFCs, methyl bromide, NOx and VOC emissions - limited to power plants and large industry – and transferable fishing quotas), regional deposit-refund systems, and various transportation and transportation related taxes. The limited scope of these policies and programmes, as well as, their lack of integration with other policy instruments, has tended to reduce their effectiveness insofar as voluntary participation and costs are concerned.

The interest in promoting voluntary environmental action and pollution prevention has been accompanied by a growing number of business-initiated actions to change corporate culture and management practices via the introduction of environmental management systems (EMS), industry-level codes of environmental management and international EMS certification programmes such as the International Standards Organisation (ISO). EMS's represent an organisational change within corporations and an effort for self-regulation by defining a set of formal environmental policies, goals, strategies and administrative procedures for improving environmental performance (Coglianese and Nash, 2001).

The purpose of this report is to provide readers with an understanding of Canadian manufacturing firms' positions vis-à-vis their motivations (commercial and otherwise), their decision-making procedures and their organisational structures when designing and implementing environmental policies. It is only with a clear understanding of where organisations stand and an understanding of what has triggered some firms to move beyond environmental compliance, that policy-makers can design effective policies that move away from end-of-pipe solutions to policies that promote pollution prevention.

[1] Programmes in the United States, for example, include the Green Lights programme which encourages firms to voluntarily use energy efficient lighting in buildings and the 33/50 Programme which encourages firms to voluntarily reduce their emissions of 17 high priority toxic chemicals at the source.

[2] For more details on these and other environment-related economic instruments and voluntary programmes see the OECD Environment Directorate on environmental economic instruments at www1.oecd.org/scripts/env/ecoInst/index.htm.

The report is divided into eight sections. Section II provides readers with an overview of the Canadian sample followed by a brief discussion of the Canadian environmental policy context in section III. Section IV gives a broad overview of the prevalence of reported environmental management systems and tools in the sample, as well as the environmental measures undertaken by our respondents. The importance of motivations and influence of stakeholders are discussed in section V. Section VI looks at the role of public environmental policy from our respondents' perspective while section VII looks at the link between environmental practices and commercial performance. Section VII concludes this report.

Some of the questions we hope to address in this and future reports include:

- Is there a distinct role played by environmental management tools? (Section IV)
- Does a certified EMS matter? (Section IV)
- What are the most important stakeholders for the firm's implementation of environmental activities? (Section V)
- How do firms assess different environmental policy instruments? (Section VI)
- What environmental policies and programmes encourage the use of EMS? (Section VI)
- Are more innovative firms more likely to undertake EMS and other environmental initiatives? (Section VII)
- Is there a relation between economic and environmental performance? (Section VII)

II. OVERVIEW OF THE SAMPLE

The initial sample comprised 1033 manufacturing firms with at least 50 employees in Canada. The list of firms was taken from the Dunn & Bradstreet database, which listed manufacturing companies from all across Canada. These firms were sent a survey, in both French and English, in March 2003, and we received the last responses in October 2003. During this period, several follow-up mailings were also conducted in May and June 2003 to prompt responses. In total, 256 facilities responded, giving us a response rate of 25 %, which is excellent given the fact that i) we targeted organisations with at least 50 employees and ii) the survey was rather lengthy (10 pages). Titles of respondents included president, vice president, environmental, health and safety director, environmental administrator, vice president operations, plant manager, corporate financial officer, human resource manager and finance manager.

In order to verify that companies with environmental management systems were not the only respondents, we monitored the responses to one of the many questions regarding environmental management practices, namely, whether the company had implemented an environmental management system (EMS). We observed no significant bias in the pattern of responses. In fact, of our 256 respondents, 46.1 % had not implemented an EMS, 31.6% had implemented an EMS and 22.3% were in the process of implementing an EMS.

Tables 2.1 and 2.2 summarise the total sample, the number of non-responses, the number of completions and the number of bad samples by number of employees and industrial sector (using the two digit international standard industrial classification – denoted ISIC). From Table 2.1, we observe that the response rate was quite similar across firms of varying sizes with a slightly higher response rate from firms with more than 500 employees. Examining Table 2.2, we observe that response rates varied from a high of 50% (leather products) to a low of 0 % (tobacco). The most represented industries (in terms of number of respondents) in the survey were manufacturers of machinery and manufactures of fabricated metals followed by manufacturers of computers and equipment and manufacturers of food and beverages.

Table 2.1: Employee Size by Result Cross-tabulation

		RESULT			Total
Employee Size		Non- Response	Completions	Bad Sample	
50 - 99	Count	206	59		265
	% within EMPSIZE	77.7%	22.3%		100.0%
100 - 249	Count	196	55	4	255
	% within EMPSIZE	76.8%	21.6%	1.6%	100.0%
250 - 499	Count	197	56	5	258
	% within EMPSIZE	76.4%	21.7%	1.9%	100.0%
500+	Count	167	86	2	255
	% within EMPSIZE	65.4%	33.7%	.8%	100.0%
Total	Count	766	256	11	1033
	% within EMPSIZE	74.1%	24.8%	1.1%	100.0%

Table 2.2: ISIC by Result Cross-tabulation

Two Digit SIC		RESULT Non- Response	Completions	Bad Sample	Total
20 Food products & beverages	Count	86	23		109
	% within ISIC	78.9%	21.1%		100.0%
21 Tobacco products	Count	1			1
	% within ISIC	100.0%			100.0%
22 Textiles	Count	21	1		22
	% within ISIC	95.5%	4.5%		100.0%
23 Clothing	Count	42	6	2	50
	% within ISIC	84.0%	12.0%	4.0%	100.0%
24 Wood products	Count	71	21	1	93
	% within ISIC	76.3%	22.6%	1.1%	100.0%
25 Furniture	Count	43	12		55
	% within ISIC	78.2%	21.8%		100.0%
26 Paper	Count	38	13		51
	% within ISIC	74.5%	25.5%		100.0%
27 Printing	Count	46	9	2	57
	% within ISIC	80.7%	15.8%	3.5%	100.0%
28 Chemicals	Count	42	21		63
	% within ISIC	66.7%	33.3%		100.0%
29 Petroleum & coal	Count	4	3		7
	% within ISIC	57.1%	42.9%		100.0%
30 Plastics & rubber products	Count	45	12		57
	% within ISIC	78.9%	21.1%		100.0%
31 Leather products	Count	1	1		2
	% within ISIC	50.0%	50.0%		100.0%
32 Non-metallic mineral prod	Count	25	13	1	39
	% within ISIC	64.1%	33.3%	2.6%	100.0%
33 Primary metals	Count	27	11		38
	% within ISIC	71.1%	28.9%		100.0%
34 Fabricated metals	Count	75	29	1	105
	% within ISIC	71.4%	27.6%	1.0%	100.0%
35 Machinery	Count	76	29	1	106
	% within ISIC	71.7%	27.4%	0.9%	100.0%
36 Computers & Electronics	Count	60	26	2	88
	% within ISIC	68.2%	29.5%	2.3%	100.0%
37 Transportation equipment	Count	47	22	1	70
	% within ISIC	67.1%	31.4%	1.4%	100.0%
39 Miscellaneous	Count	16	4		20
	% within ISIC	80.0%	20.0%		100.0%
Total	Count	766	256	11	1033

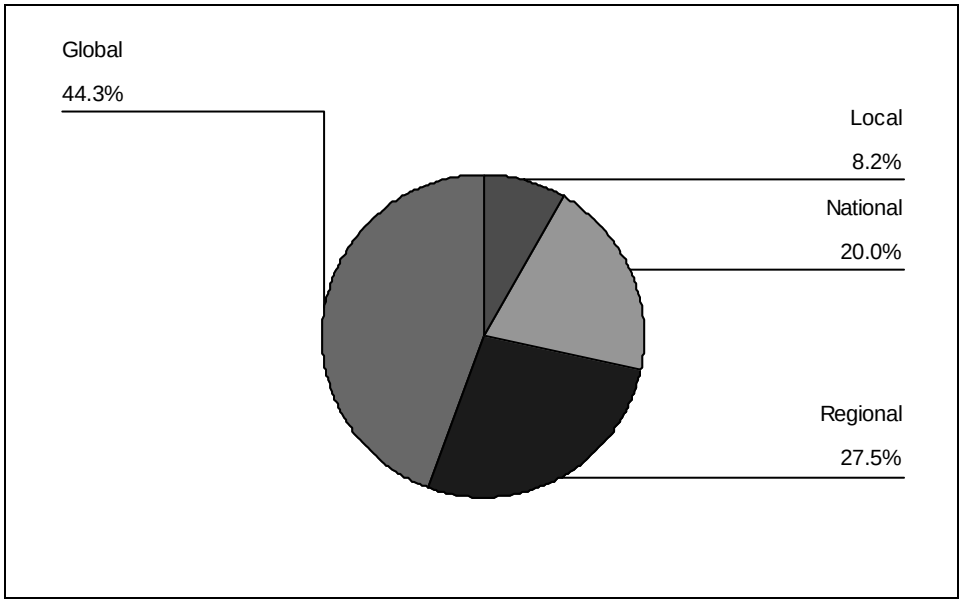
a) Firm and Facility Characteristics

The majority of respondents, 66.3%, are not listed on any stock exchange and have their head office located in Canada (66.7%). Not surprisingly, of those with head offices located in a foreign country, 61% are located in the United States. Table 2.3 indicates that the majority of respondents' primary customers are either other manufacturing firms (48%) or wholesalers/retailers (44%). Moreover, Figure 2.1 indicates that the majority of respondents' market is global in nature (44.3%) while only 8.2% characterised their most important market as local.

Table 2.3: Primary customers for Facility's Products

Primary Customers	Frequency	Percent	Valid Percent
Other manufacturing firms	119	46.5	48.0
Wholesalers or retailers	109	42.6	44.0
Households	13	5.1	5.2
Other facilities within your firm	7	2.7	2.8
Total	248	96.9	100.0
Missing	8	3.1	
	256	100.0	

Figure 1. Figure 2.1: The Spatial Scope of the Facility's Market



The competitive environment of respondents is reflected in the answer to the number of firms a respondent's facility competed with on the market. Using Table 2.4, the majority of respondents do business in a fairly competitive environment with over 70% having over 5 competitors. Interestingly, a cross-tabulation analysis of the number of competitors and the scope of a facility's market (not reported here) indicates that local and national producers appear to have the greatest number of competitors relative to regional and global facilities.

Table 2.4: Number of Firms with which your Facility Competes (last 3 years)

# Competitors	Frequency	Percent	Valid Percent
Less than 5	75	29.3	29.6
5-10	84	32.8	33.2
Greater than 10	94	36.7	37.2
Total	253	98.8	100.0
Missing	3	1.2	
Total	256	100.0	

Table 2.5 below summarises sample data on facility and firm size, sales and R&D statistics. The average facility had 425 employees with an estimated average annual sales value of $220 million (Can) and an estimated annual R&D expenditure of approximately $9 million (Can). The median facility, however, has 180 employees with an estimated annual sales value of $4 million (Can) and an estimated annual R&D expenditure of approximately $250,000 (Can).3 At the firm level, the average number of full time employees was 23,991 with an estimated annual sales value of $8.6 billion (Can) and an estimated R&D expenditure of $320 million (Can). Again, using the median, these values are lower. Note, however, that at the facility level only 10.3% of respondents had a budget for R&D specifically related to environmental matters while, at the firm level, 24.8% had a research and development budget specifically related to environmental matters.

Table 2.5: Facility and Firm Size, Sales and R&D Statistics

	Variable	N	Minimum	Maximum	Mean (Median)	Standard error
Facility level	Number of people employed full time	252	6	7200	425 (180)	52
	Estimated average annual value of sales ($1,000)	196	3,000	9,000,000	220,000 (4,000)	55,036
	Estimated average annual R&D expenditures ($1,000)	172	0	500,000	9,074 (250)	3,991
Firm level	Number of people employed full time	152	20	315,889	23,991 (1,300)	4,743
	Estimated average annual value of sales ($1,000)	132	3,500	178,000,000	8,600,000 (560,000)	2,124,315
	Estimated average annual R&D expenditures ($1,000)	109	5,000	6,680,000	320,000 (5,000)	104,956

Before proceeding to a discussion of the results of our survey regarding respondents' perspectives and approaches to environmental matters, it is necessary to provide a brief public policy background so as to give readers an overview of the institutional framework the faced by the Canadian manufacturing sector.

[3] The median is the halfway point in the data when the data have been arranged in order of size. The median is less affected by a few extreme values than is the mean. However, the median is not as good an estimate as is the sample mean, in the sense that it does not draw the maximum information from the sample.

III. PUBLIC POLICY BACKGROUND

Canada is a federal state in which each of the ten provinces and three territories has considerable jurisdictional power. As the Canadian Constitution does not clearly spell out distinct jurisdictional responsibilities for each government, their responsibilities can overlap, causing potential uncertainty as to which level of government has the authority to regulate for specific environmental problems and objectives. As a result, the division of powers regarding environmental policy between the various levels of government flows to a great extent from jurisdiction over natural resources (Vourc'h, 2001). In general, natural resources are largely within the provincial or territorial domain giving them the authority to legislate with respect to both publicly and privately owned resources within their respective regions. Note, however, that the federal government has responsibility over some resources transcending provincial boundaries such as fish, as well as through its power over agriculture and navigation. Moreover, the federal government is responsible for the environmental assessment of projects for which it has decision-making authority.

a) The Role of Provincial Governments and Territories

Most environmental regulation is a provincial responsibility. Powers include the authority to legislate with respect to the management of public lands and resources, non-renewable natural resources, forestry, electricity generation, municipal institutions, property and civil rights and matters of a local or private nature. The limits to provincial authority are: 1) only matters within a province or territory can be regulated; 2) the Crown and its agents may not be subject to legislation of another level of government; and, 3) provinces are limited to direct taxation only. The importance of the limit to direct taxation in the environmental sphere arose in a challenge to the Nova Scotia waste regulations that impose a deposit on beverage containers that is then paid into a fund to support recycling and environmental awareness. The courts deemed the deposit valid because it was a charge that was part of a regulatory scheme, not a tax (Valiante, 2002). This limit suggests that provinces must be careful in designing regulatory schemes that provide economic incentives or deterrents.

b) The Role of the Federal Government: Canadian Environmental Protection Act (CEPA), 1999

The Canadian Environmental Protection Act (CEPA), 1999 operates under the sensitive arena of shared federal and provincial jurisdiction. One of the primary purposes of CEPA is the regulation of toxic substances. The objective of this section is not to describe the Act, but rather to highlight the expanded goals of the new Act.[4]

CEPA, 1999 contains expanded goals and objectives of the federal government including pollution prevention, virtual elimination of persistent and bio-accumulative toxic substances, an eco-system approach, the precautionary principle, cooperation with other governments and biodiversity (Valiante, 2002). It also introduces a new regulatory option, namely, the use of economic instruments and market-based approaches such as deposits, refunds and tradable permits. The statute, however, does not provide any guidance as to when such economic instruments would be appropriate for the control of toxic substances or what administrative controls would be necessary to ensure consistency and accountability. These are to be worked out in guidelines and regulations to be developed in the near future.

[4] For a complete discussion see Valiante (2002).

c) The Emerging Role of First Nations

Another very important player in the environmental public policy debate is First Nations. First Nations have gradually gained recognition of their constitutionally protected rights and have negotiated self-government and land claim agreements. As a result of the special status of First Nations constitutionally protected rights (e.g., fish, game and timber), the involvement of First Nations in decisions that affect these rights will be judged by a much higher standard than any other type of stakeholder consultation. Moreover, according to Valiente (2002), First Nations have finalised 14 comprehensive land claims and self-government agreements, with numerous others, primarily in northern Canada and British Columbia, at different stages of negotiations. These agreements are seen as "modern treaties" and therefore have constitutional status.

The Canadian Environmental Protection Act 1999, places aboriginal participation on par with federal ministers and the provinces in the National Advisory Committee. It does so by enabling the delegation of administration of the Act to a government or "an aboriginal people", and by requiring the application of traditional aboriginal knowledge to the identification and resolution of environmental problems.

Consequently, for many resource and environmental areas and issues, responsibility is shared between federal and provincial (or territorial) governments in consultation with affected aboriginal groups. The implication, of course, is that the two levels of government have to co-operate to act effectively. The shared nature of environmental jurisdiction has led all parties involved to use a stakeholder approach when dealing with environmental issues (Vourc'h, 2001). Various ministerial councils, such as the Canadian Council of Ministers of the Environment, have been established which use this approach. Although, the amount of public scrutiny of government decision making and setting environmental policy had been minimal until the 1990s, in recent years the stakeholder approach has implied a broader consultation with the private sector, individuals, environmental and other interest groups who may be affected.

d) Command-and-control Regulation

Between 1960-1990, the Canadian environmental policy implementation style was one of closed bargaining between government and business interests over the enactment of environmental standards, their implementation and the level of compliance expected of corporate actors (Howlett, 2002). Environmental legislation in Canada has been based on a co-operative model of negotiation between the government regulator and the polluting party (Vourc'h, 2001). There are many examples of contracts between specific polluters and government. More specifically, a memorandum of understanding is a commonly used agreement between governments and the private sector to achieve a particular goal such as the reduction of emissions. This allows governments to achieve pollution targets without passing specific regulations. On the other hand, if there is a memorandum of understanding, a company cannot be prosecuted for failure to comply if it has notified the government that it needs more time, for example, to install pollution abatement equipment or if adverse economic conditions prevent compliance. This may enable some companies to delay compliance (Field and Olewiler, 2002).

Environmental legislation in Canada has been primarily enabling rather than mandatory. Unlike the United States where regulations passed by Congress generally require implementation of specific policies, Canadian officials are authorised to develop regulations but rarely have the obligation to act (Field and Olewiler, 2002). In addition, lack of information on pollution sources and environmental science continues to be a handicap to policy-makers. While information flows are improving, there remains a reliance on polluting sources themselves for much information.

e) Incentive-based Policies and Voluntary Approaches

In the early 1990s several pilot studies involving a variety of proposals to replace regulation with market- and tax-based financial incentives were undertaken. Unfortunately, fiscal cutbacks led to the demise of these pilot studies. In the late 1990s, efforts were also made to promote industry self-regulation through a variety of cooperative and voluntary compliance arrangements. Examples included such programmes as the Canadian Industry Packaging Stewardship Initiative, the Voluntary Challenge and Registry Programme (created as part of Canada's response to the Kyoto Climate Change Convention) and the Accelerated Reduction/Elimination of Toxics (ARET), as well as sector specific arrangements such as eco-labelling and certification in the forest sector. Difficulties in assessing the efficacy and impact of these voluntary initiatives, as well as legal issues concerning the status of these initiatives vis-à-vis existing laws have led to few current efforts to expanding voluntary initiatives.

In general, incentive-based policies have rarely been used. There are a few examples of specific taxes and tax write-offs for investment in pollution abatement equipment, but all levels of government rely primarily on command-and-control policies. There has been, however, a reluctance to impose specific standards. Most regulation has been in the form of guidelines that suggest a range of pollution targets. Both ambient and emission guidelines and standards are used. Technology-based standards remain in wide use.

f) Future Challenges

Recently, Canada has ratified the Kyoto Protocol and is now attempting to establish a process to meet the targets mandated by this international agreement. A 2002 government document entitled "Climate Change Plan for Canada" presents the overall approach the government will be taking, which encompasses the principles suggested by provincial and territorial governments in their October 28, 2002 statement on climate change policy. The Plan proposes five key instruments[5]:

1. Emission reduction targets for large industrial emitters established through covenants with a regulatory or financial backstop that would create an incentive for firms to shift to lower-emissions technologies and energy sources, while providing flexibility for these emitters through emissions trading and access to domestic offsets and international permits;

2. A Partnership Fund that will cost-share emissions reductions in collaboration with provincial and territorial governments, as well as municipalities, Aboriginal communities, non-governmental organisations and the private sector to increase energy efficiency and reduce emissions;

3. Strategic infrastructure investments in innovative climate change proposals such as urban transit projects, inter-modal transportation facilities and a CO_2 pipeline;

4. A coordinated innovation strategy that allows Canada to benefit fully from the innovation possibilities of its climate change agenda and builds on pre-existing innovation programmes (e.g., Industrial Research Assistance Programme, Sustainable Development Technology Canada); and

5. Targeted measures including information, incentives, regulations and tax measures that will help achieve the climate change objectives in specific sectors and programme areas.

[5] For more information see Environment Canada (2002), Climate Change Plan for Canada, www.climatechange.gc.ca

Addressing climate change issues presents Canada with both an important challenge and opportunity to experiment with a host of regulatory, market-based, incentive-based and voluntary initiatives to determine the best instruments to employ to achieve their goals. The intention of this study is to provide policy-makers with some important information as to the state of affairs in the manufacturing sector with respect to their environmental management systems, and the challenges and opportunities this sector faces insofar as firm level environmental policy tools and innovation are concerned.

IV. ENVIRONMENTAL MANAGEMENT AND PERFORMANCE

In the last decade, management of the natural environment has come to be one of the most important issues facing companies. These issues affect all levels of a company's operations (Buzzelli, 1991). Environmental management systems have been developed to help organisations deal with these many challenges and opportunities. EMSs represent an organisational change within corporations and an effort for self-regulation by defining a set of formal environmental policies, goals, strategies and administrative procedures for improving environmental performance (Coglianese and Nash, 2001). These environmental management initiatives undertaken by firms and the potential they hold for identifying cost-effective and self-enforcing approaches for pollution control have caught the attention of regulatory agencies and has led, for example, to a number of programmes in the U.S. to encourage greater adoption of EMSs (Rondinelli, 2001) such as offering technical assistance, recognition, financial and regulatory benefits to firms that implement an EMS (Crow, 2000).

The presumption is, of course, that EMSs improve environmental performance. Studies to date, however, are mixed (Khanna, 2001). Khanna and Damon (1999) find that participation in the 33/50 programme led to a statistically significant decline in releases of 33/50 chemicals. Dasgupta et al. (2000) find that adoption of ISO 14001 management practices led to a significant improvement in the compliance status of Mexican firms. King and Lenox (2000), however, find that the rate at which members of the Responsible Care Programme were improving their relative performance was no different from that of non-members. Consequently, the jury is still out on this issue suggesting that more research is needed. Our hope is that this study along with those of the other national teams (Japan, Germany, France, Norway, Hungary and the U.S.) will provide the much needed evidence to answer the question.

An EMS, however, is just one environmental practice a firm can undertake to achieve their environmental sustainability goals. Many companies have adopted a set of environmental practices aimed at integrating environmental considerations throughout the organisation. Many of these practices go beyond compliance and environmental impact reduction. The International Institute for Management Development (IMD), sponsored by companies who see environmental management as a source of competitive advantage, led an environmental management research project called MIBE to ascertain the practices used by environmentally proactive firms (Ramus, 2002). Table 4.1 contains the list that this group developed. The 13 environmental practices listed not only cut across departments and managerial responsibilities, they also aim to move organisations toward environmental sustainability goals.

Table 4.1: List of Environmental Practices used by Environmentally Proactive Firms

Practices
1. Written environmental policy
2. Specific target for improving environmental performance
3. Publication of an environmental (sustainability) report
4. Adoption of an EMS
5. Environmental purchasing policy
6. Environmental training and education
7. Employee responsibility for environmental performance
8. Life cycle analysis
9. Management understands sustainable development
10. Fossil fuel reduction policy
11. Toxic chemical reduction policy
12. Policy of reducing use of unsustainable products
13. Same environmental policy standards at home and abroad

a) Environmental Management Systems and Tools

71% of respondents (n=181) had a person with explicit responsibility for environmental concerns. Table 4.2 lists the institutional location of this individual. 77% of respondents with persons with explicit responsibilities were either persons in senior management, specialised environmental department or production/operations.

Table 4.2: Location of Individual Within Facility Designated as Responsible for Environmental Matters

Position	Frequency	Percent	Valid Percent
Senior Management	57	22.3	31.5
Production/operations	39	15.2	21.5
Special environmental department	44	17.2	24.3
Marketing/sales	1	0.4	0.6
Purchasing	3	1.2	1.7
Human resources	13	5.1	7.2
Product Development	2	0.8	1.1
Other	22	8.6	12.2
Total	181	70.7	100.0
Missing	75	29.3	
	256	100.0	

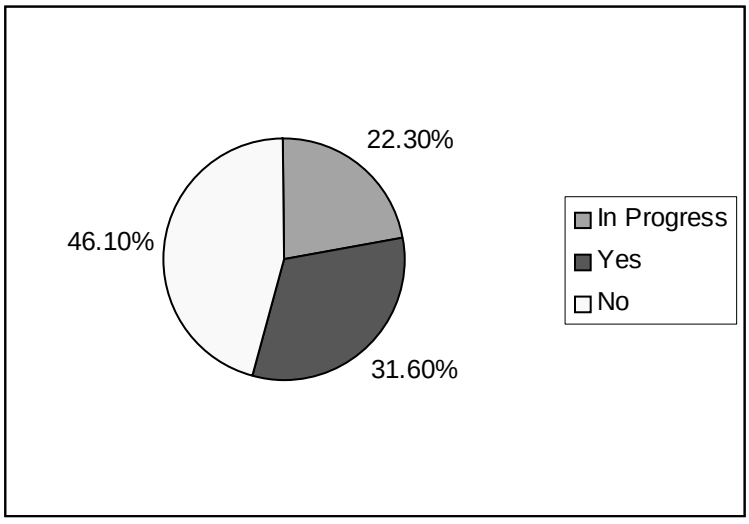
Various environmental management practices were established in respondents' facilities (Table 4.3). The majority, 62.8 %, had a written environmental policy, however, only 19.9% used environmental criteria to evaluate and/or compensate employees. Facilities were evenly split on the use of environmental training programmes for employees. Internal audits were more prevalent (67.3%) than external audits (44.5%). The use of benchmarking to evaluate environmental performance was undertaken by 40.7% of respondents while only 25% of respondents employed environmental accounting procedures. Although the majority of respondents (77.9%) did not produce a public environmental report, nearly half (48.3%) made use of environmental performance indicators or goals.

Table 4.3 : Implementation of Environmental Practices

Environmental practices	No	Yes
Written environmental policy	91 37.2%	155 62.8%
Environmental criteria used to evaluate & compensate employees	193 80.1%	48 19.9%
Environmental training programme for employees	119 48.6%	126 51.4%
External environmental audits	136 55.5%	109 44.5%
Internal environmental audits	81 32.7%	167 67.3%
Benchmark environmental performance	144 59.3%	99 40.7%
Environmental accounting	177 75.0%	59 25.0%
Public environmental report	187 77.9%	53 22.1%
Environmental performance indicators/goals	125 51.7%	117 48.3%

According to our survey, approximately 61% of respondents considered introducing an environmental management system (EMS), with the principal reasons for doing so being to prevent or control pollution (75.2%), to improve efforts to achieve regulatory compliance (73.2%), to create cost savings in terms of waste management (61.1%) and to better identify future environmental liabilities (57.7%).

Figure 4.1: Implementation of an EMS



From Figure 4.1, it can be seen that 31.6% of respondents have implemented an EMS while 22.3% are in the process of doing so and the remainder, 46.1%, have not. Of the 81 organisations that have implemented an EMS, 58 % (n=47) had acquired ISO 14001 certification. Note that no respondent had EMAS certification. According to the latest ISO survey of ISO 9000 and ISO 14000 certificates (tenth cycle), approximately 475 facilities in Canada had been ISO 14000 certified by 2000. Most of the respondents in our survey that had ISO 14000 certification (53.4%), however, had only received certification in the last three years. Consequently, we are unable to use the ISO data to determine whether our sample approximates the total population of ISO certifiers and non-certifiers.

Although few facilities have implemented an EMS and even fewer had a certified EMS, the majority of respondents had implemented a host of other management practices. Table 4.4 summarizes the other management systems used by respondents with the majority of respondents having a health and safety management system to only 52.8% using full-cost/activity based accounting practices.

Table 4.4 : Use of Other Management Practices

Management Practices	No	Yes
Quality management system	70 27.8%	182 72.2%
Health/safety management system	22 8.8%	229 91.2%
Full-cost/activity-based accounting	113 47.3%	126 52.7%
Management accounting system	58 23.8%	186 76.2%
Process or job control system	54 21.9%	193 78.1%
Inventory/materials requirement planning	43 17.2%	207 82.8%

Table 4.5 provides a more interesting look at the level of integration of environmental activities with facility's other management systems by dividing respondents into three groups: those that had not implemented an EMS, those that had implemented an EMS and those who were in the process of implementing an EMS. For example, non-EMS facilities tended not to integrate their environmental activities with other management systems including their full-cost accounting systems (58.1%), management accounting systems (61.2%), process or job control systems (50%) inventory/materials requirement planning systems (49.2%) and quality management systems (39.7%).

In general, those facilities that had implemented an EMS were more likely to have integrated their environmental activities with other management systems relative to those who had not. Moreover, those in the process of implementing an EMS were also more able to integrate environmental activities into existing management systems. This would suggest that the implementation of an EMS allows organisations to observe and take advantage of synergies that may exist across other management systems – in other words, it can break down the "green wall" via its integrative features.

Table 4.5: Level of Integration of Environmental Activities with Other Management Systems by EMS Implementation

	Environmental Activities Integrated with	Not at all	Partially	Fully	N/A
No EMS	Quality management system	39.7%	26.7%	11.2%	22.4%
	Health/safety management system	17.9%	49.6%	26.5%	6.0%
	Full-cost/activity-based accounting	58.1%	17.9%	5.1%	18.8%
	Management accounting system	61.2%	15.5%	7.8%	15.5%
	Process or job control system	50.0%	25.4%	11.9%	12.7%
	Inventory/materials requirement planning	49.2%	23.7%	12.7%	14.4%
EMS	Quality management system	10.0%	45.0%	40.0%	5.0%
	Health/safety management system	2.5%	48.1%	48.1%	1.2%
	Full-cost/activity-based accounting	31.2%	35.1%	18.2%	15.6%
	Management accounting system	31.5%	31.5%	27.4%	9.6%
	Process or job control system	19.5%	27.3%	45.5%	7.8%
	Inventory/materials requirement planning	28.6%	33.8%	32.5%	5.2%
In progress	Quality management system	12.5%	39.3%	32.1%	16.1%
	Health/safety management system	8.8%	36.8%	52.6%	1.8%
	Full-cost/activity-based accounting	30.4%	35.7%	14.3%	19.6%
	Management accounting system	24.6%	36.8%	24.6%	14.0%
	Process or job control system	19.3%	31.6%	36.8%	12.3%
	Inventory/materials requirement planning	19.3%	33.3%	31.6%	15.8%

b) Environmental Measures, Innovation and Performance

What environmental measures do Canadian manufacturing firms employ? What types of environmental innovations do these firms use – end-of-pipe or changes in production technologies? How effective have these measures been in reducing environmental impacts? These are the questions that will be addressed in this section.

Some manufacturing sectors are more affected by a number of negative environmental impacts than others. For example, respondents from the coke, refined petroleum products and nuclear fuel sector stated that every one of the environmental impacts listed in our survey had a moderate to a very negative impact on their facility's products or production processes. These impacts included the environmental impact of the use of natural resources, solid waste generation, wastewater effluent, local/regional air pollution, global pollutants, aesthetic effects, soil contamination and risk of severe accidents. Other sectors such as manufacturers of basic metals, paper and paper products and transportation equipment were affected by six of the eight environmental impacts, while manufacturers of electrical machinery were mostly affected by environmental impacts associated with the use of natural resources and solid waste generation.

In order to assess an organisation's performance regarding each of these environmental impacts, we asked whether they were regularly monitored. Table 4.6 suggests that a majority of respondents regularly monitor the use of natural resources, solid waste generation, wastewater effluent and risk of severe accidents.

Table 4.6: Environmental Performance Monitoring

Monitoring of:	No	Yes	N/A
Use of natural resources	48 19.3%	185 74.3%	16 6.4%
Solid waste generation	45 17.9%	188 74.6%	19 7.5%
Wastewater effluent	62 24.5%	136 53.8%	55 22.7%
Local/regional air pollution	97 38.3%	108 42.7%	48 19.0%
Global pollutants	118 47.4%	68 27.3%	63 25.3%
Aesthetic effects	91 35.8%	123 48.4%	40 15.7%
Soil contamination	90 36.0%	92 36.8%	68 27.2%
Risk of severe accidents	60 23.8%	160 63.5%	32 12.7%

We then asked whether facilities had taken concrete actions to reduce the negative environmental impacts associated with each measure. Table 4.7 summarises the results. In general, if a facility regularly monitors an environmental performance measure, some concrete actions to reduce the respective measure's impact on the environment had been undertaken. This result was supported by positive and significant bivariate correlations between the monitoring of each measure and the respective actions taken to reduce the environmental impacts.

Table 4.7 : Measures Undertaken to Reduce Environmental Impacts

Reduce environmental impact of:	No	Yes	N/A
Use of natural resources	68 27.0%	166 65.9%	18 7.1%
Solid waste generation	53 21.1%	182 72.5%	16 6.4%
Wastewater effluent	56 22.0%	138 54.3%	60 23.6%
Local/regional air pollution	79 31.2%	119 47.0%	55 22.7%
Global pollutants	114 45.6%	71 28.4%	65 26.0%
Aesthetic effects	72 28.5%	136 53.8%	45 17.8%
Soil contamination	60 23.7%	116 45.8%	77 30.4%
Risk of severe contamination	50 19.8%	162 64.3%	40 15.9%

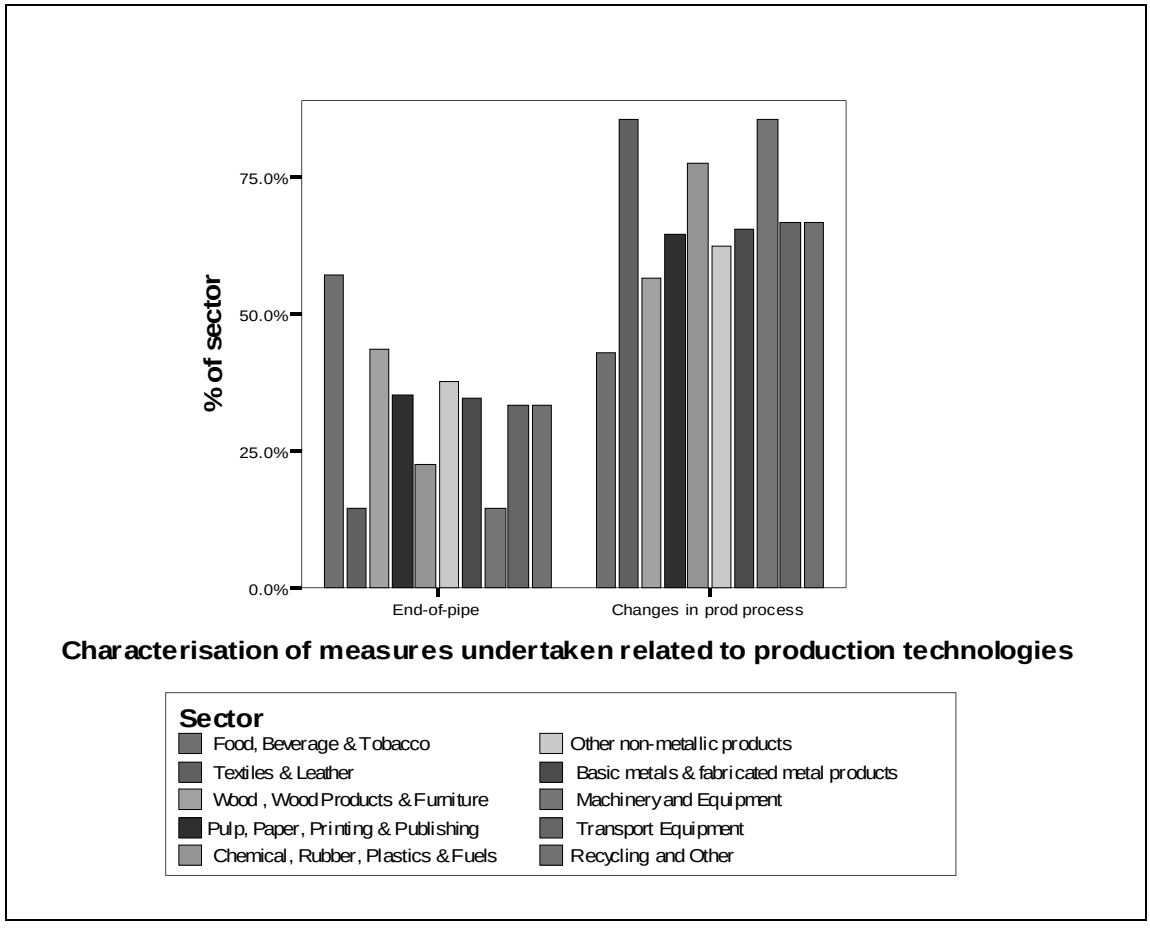
In order to get a sense of the nature of the measures employed and the nature of the actions underttaken, we asked respondents to indicate which of the two statements listed in Tables 4.8 and 4.9 most closely characterises their organisation. The majority of respondents viewed their organisation as having primarily undertaken changes in their production processes rather than having used end-of-pipe technologies.

Table 4.8: Characterisation of Measures Undertaken Related to Production Technologies

Characterisation	Frequency	Percent	Valid Percent
End-of-pipe tech which reduce pollution or allow resource recovery	62	24.2	31.8
Changes in prod process to reduce pollution/resource use	133	52.0	68.2
Total	195	76.2	100.0
Missing	61	23.8	
	256	100.0	

Figure 4.2 provides us with a look at the environmental measures undertaken related to production technologies by sector. Relative to the other manufacturing sectors, the food and beverage sector is more likely to employ end-of-pipe technologies, while both the textiles and leather and the machinery and equipment sectors are more likely to employ changes in their production processes to meet environmental targets.

Figure 4.2: Characterisation of Environmental Measures Undertaken Related to Production Technologies by Sector



Moreover, from Table 4.9, any significant technical changes to reduce environmental impacts were primarily due to changes in production technologies rather than changes in product characteristics.

Table 4.9: Significant Technical Measures undertaken to Reduce Environmental Impacts

Technical measures	Frequency	Percent	Valid Percent
Changes in product characteristics	31	12.1	16.0
Changes in production technologies	163	63.7	84.0
Total	194	75.8	100.0
Missing	62	24.2	
	256	100.0	

These actions, of course, require resources. Although the majority of respondents stated that their facility had undertaken technical changes to their production technologies, only 10.3% of respondents had a budget for R&D specifically related to environmental matters while, at the firm level, 24.8% had a research and development budget specifically related to environmental matters.

Finally, how successful were our respondents in reducing the environmental impacts per unit of output in the last three years? The answer to this question is summarised in Table 4.10.

Table 4.10: Change in Environmental Impacts per unit of Output of Various Environmental Measures

Change in the environmental impacts per unit of output of:	Significant decrease	Decrease	No change	Increase	Significant increase	N/A
Use of natural resources	6.8%	32.5%	41.0%	8.8%	1.2%	9.6%
Solid waste generation	12.9%	37.3%	33.7%	5.6%	1.2%	9.2%
Wastewater effluent	8.1%	30.6%	31.3%	1.6%	0.8%	26.6%
Local or regional air pollution	8.2%	21.7%	41.8%	3.7%	0.4%	24.2%
Global pollution	4.1%	17.6%	41.4%	2.9%		34.0%
Aesthetic effects	8.5%	19.4%	43.3%	4.5%	0.8%	23.5%
Soil contamination	6.0%	16.9%	37.5%		0.8%	38.7%
Risk of severe accidents	8.2%	25.8%	38.5%	2.9%	0.8%	23.8%

The greatest impact was observed in the reduction of solid waste followed by reductions in the use of natural resources, wastewater effluent and risk of severe accidents.

Table 4.11 reports bivariate correlations between various firm characteristics and the associated facility's ability to change its environmental impacts per unit of output. Our results indicate that having an environmental department is negatively and significantly associated with changes in solid waste generation, wastewater effluent, local or regional air pollution, global pollution, soil contamination and risk of severe accidents. The number of facilities only appears to have an impact on the environmental performance of local or regional air pollution. Surprisingly, having a budget for R&D specifically related to environmental matters is only correlated with improved environmental performance with respect to global pollution. We find that larger organisations (as measured by number of employees) are more likely to reduce the negative impacts per unit of output in their use of natural resources, solid waste generation, wastewater effluent, local or regional air pollution, global pollution and risk of severe accidents.[6] Finally, being listed on the stock exchange increases the likelihood (negative and significant coefficients) of wastewater effluent and global pollution.

[6] The questions regarding changes in the environmental impacts per unit output were such that 1 denoted a significant decrease, 2 a decrease, 3 no change, 4 an increase and 5 a significant increase. Consequently, a bivariate correlation that shows a negative and significant coefficient, say for example, between firm size and impact of use of natural resources, implies that larger organisations are more successful in controlling negative impacts.

Other results not reported in Table 4.11, which may be of interest, suggest that having a greater number of facilities, having a R&D budget specifically related to environmental matters, having a greater firm size (as measured by the total number of employees), and being listed on the stock exchange was each positively and significantly associated with having an environmental department.

Table 4.11: Bivariate correlations between firm characteristics and change in impacts

		Firm has an environmental department?	Number of different production facilities	R&D budget specifically related to env matters?	Size of Company	Firm listed on a stock exchange?
Use of natural resources	Pears. Corr.	-.075	.001	-.050	-.224**	-.106
	Sig. (2-tailed)	.240	.983	.550	.000	.095
	N	249	248	144	249	247
Solid waste generation	Pears. Corr.	-.169**	-.057	-.134	-.228**	-.106
	Sig. (2-tailed)	.008	.369	.105	.000	.095
	N	249	248	144	249	247
Wastewater effluent	Pears. Corr.	-.155*	-.085	-.104	-.254**	-.175**
	Sig. (2-tailed)	.014	.183	.219	.000	.006
	N	248	246	142	248	246
Local or regional air pollution	Pears. Corr.	-.140*	-.137*	-.128	-.240**	-.092
	Sig. (2-tailed)	.029	.032	.132	.000	.152
	N	244	243	140	244	242
Global pollution	Pears. Corr.	-.140*	-.102	-.232**	-.242**	-.150*
	Sig. (2-tailed)	.029	.113	.005	.000	.019
	N	244	243	142	244	242
Aesthetic effects	Pears. Corr.	-.064	-.008	-.006	-.125	.070
	Sig. (2-tailed)	.318	.902	.945	.050	.278
	N	247	246	143	247	245
Soil contamination	Pears. Corr.	-.155*	-.073	-.010	-.125	-.039
	Sig. (2-tailed)	.014	.255	.906	.050	.546
	N	247	247	144	248	246
Risk of severe accidents	Pears. Corr.	-.128*	-.024	.010	-.184**	-.082
	Sig. (2-tailed)	.046	.715	.907	.004	.205
	N	244	243	141	244	242

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

V. IMPORTANCE OF MOTIVATIONS AND INFLUENCE OF STAKEHOLDERS

Henriques and Sadorsky (1999) showed that managerial perceptions of the importance of stakeholder pressures were associated with a more proactive stance toward environmental commitment by Canadian firms. The stakeholder literature argues that organisational strategies are influenced by stakeholders who are important and primary (Clarkson, 1995; Freeman, 1984), or by those who are considered salient by managers in terms of power, legitimacy and urgency (Mitchell, Agle and Wood, 1997). Stakeholder influences can be direct or indirect based on the resource dependence (Pfeffer and Salancik, 1978) between the focal firm and the stakeholder (Frooman, 1999), or based on the position of the focal firm in the stakeholder network (Rowley, 1997).

Sharma (2000) noted that voluntary environmental strategies involve the search for and the adoption of innovative technologies that add complexity to production or delivery of processes (Russo and Fouts, 1997). Some managers who view the unpredictability of new technologies as threats to their jobs or to their company's operations will attempt to minimise their loss, while other managers who view this unpredictability as an opportunity will attempt to maximise their gains (Kahneman and Tversky, 1979). The former are unlikely to search for innovative environmental technologies or processes because they can disrupt the current production and operating systems while the latter view such changes as necessary and vital to their operations survival. Consequently, managerial interpretations of environmental issues matter.

This section summarises the responses relating to the importance of managerial motivations and influence of stakeholders on decisions regarding facility level environmental practices. Table 5.1 reports on the influence of stakeholders on facility level environmental practices. Using the "very important" column, it can be seen that public authorities, management employees, corporate headquarters, non-management employees and shareholders/investors have the greatest influence. With the exception of public authorities, all these stakeholders can be categorised as internal to the firm in that they each have a stake in the firm's survival (for example, employees – their job and investors – their investment). Note that insofar as the "product chain stakeholders" are concerned, household consumers were not perceived as having a great influence. Future research will determine whether other stakeholders, who may not have an economic stake in the organisation per se, play a role in influencing environmental decision-making when factors such as industry and firm size are controlled for.

Table 5.1: Influence of Groups on the Environmental Practices of Facilities

Influence on the environmental practices of your facility by:	Not important	Moderately important	Very important	N/A
Regulatory Authorities				
Public authorities (federal, provincial, municipal)	.8%	27.1%	69.8%	2.4%
Head Office				
Corporate headquarters	7.1%	25.3%	50.6%	17.0%
Product Chain Stakeholders				
Household consumers	36.6%	26.0%	14.2%	23.2%
Commercial buyers	28.5%	36.4%	24.8%	10.3%
Suppliers of goods and services	39.0%	42.1%	12.2%	6.7%
Investors				
Shareholders and investment funds	20.3%	27.9%	29.9%	21.9%
Banks and other lenders	23.7%	33.6%	27.7%	15.0%
Employees				
Management employees	5.5%	34.4%	56.5%	3.6%
Non-management employees	11.0%	42.5%	40.9%	5.5%
External Stakeholders				
Environmental groups or organisations	21.3%	51.4%	21.3%	6.0%
Industry or trade associations	28.3%	41.4%	16.3%	13.9%
Labor unions	23.8%	20.6%	12.7%	42.9%
Neighborhood/community groups	18.7%	41.0%	26.7%	13.5%

Table 5.2 summarises respondents' motivations for undertaking environmental practices. The number one motivation (using the 'very important' column) is regulatory compliance followed by the prevention or control of environmental incidents, corporate profile/image and cost savings. New technology or product development and the fact that similar facilities are adopting similar practices were not critical motivators. From a managerial perspective, the latter should be of concern if such activities are not being undertaken or viewed as important because managers view such activities as threats rather than opportunities.

Table 5.2: Motivations to undertake environmental practices at facility

Motivations	Not important	Moderately important	Very important	N/A
Prevent or control environmental incidents	5.1%	16.9%	72.2%	5.9%
Regulatory compliance	1.2%	14.1%	82.0%	2.7%
Corporate profile/image	3.5%	25.5%	66.3%	4.7%
Cost savings	11.5%	31.6%	51.8%	5.1%
New technology development	17.8%	44.3%	29.6%	8.3%
New product development	20.9%	37.9%	30.4%	10.7%
Similar facilities adopting similar practices	29.5%	43.0%	14.7%	12.7%

The results cited above tell us that regulatory authorities play a very important role in motivating facilities to undertake environmental practices. The next section builds on this result by suggesting the possible expansion of public environmental policy to programmes that encourage the development of environmental management systems.

VI. THE ROLE OF PUBLIC ENVIRONMENTAL POLICY

Management literature examines the processes that determine the events and information that managers pay attention to and those which they ignore (Daft and Weick, 1984; Dutton, Fahey and Narayanan, 1983). These interpretations, in turn, influence the actions an organisation takes (Dutton and Jackson, 1987; Jackson and Dutton, 1988) and the environmental strategy it chooses. Social phenomena like societal expectations are ambiguous and require interpretative categorisation by managers (Dutton and Jackson, 1987; Tversky and Hemenway, 1983). Responding to stakeholder concerns for environmental preservation is an activity that managers clearly now face. Managers face a great deal of ambiguity in understanding and dealing with these issues. If managers view these issues as threats, they will be unlikely to search for innovative environmental technologies because of the possible operational disruptions they may cause. If, on the other hand, managers view these issues as opportunities, the search and adoption of innovative environmental technologies are more likely to be viewed as profit-enhancing.

Public environmental policy sets the stage on which firms operate. The role of public environmental policy, as discussed in the previous section, is extremely important. Consequently, if policy can encourage managers to view environmental issues as opportunities rather than threats, this will not only help managers reduce the ambiguity and unpredictability surrounding environmental technologies and information, it may also encourage the transmission of this view throughout the organisation (Sharma, 2000).

We shall now summarise our respondents' perceptions of Canadian environmental policy instruments (programmes and policies). Table 6.1 provides a summary of the importance of a host of policy instruments on a facility's production activities. The most important environmental policy instrument was the potential that the facility would be liable for environmental damages - an economic instrument - followed by performance-based standards – a direct regulation. Moderately important environmental policy instruments included input taxes, supply information measures and technical assistance programmes. As discussed in section III, incentive-based policies have rarely been used in Canada and our respondents have corroborated this conclusion.

Table 6.1: Assessment of Environmental Policy Instruments on Facility's Production Activities

Environmental policy instruments	Not important	Moderately important	Very important	N/A
Direct Regulation				
Input bans	21.5%	27.2%	23.2%	28.0%
Tech-based standards	18.7%	39.4%	26.8%	15.0%
Performance-based standards	9.2%	34.8%	45.6%	10.4%
Economic Instruments				
Input taxes	13.1%	49.8%	24.1%	13.1%
Emission/effluent taxes/charges	23.7%	29.8%	22.4%	24.1%
Tradable emission permits or credits	31.6%	21.5%	15.0%	32.0%
Liability for environmental damages	5.2%	27.4%	60.5%	6.9%
Information Measures				
Demand information measures	35.7%	33.2%	8.2%	23.0%
Supply information measures	29.1%	42.2%	10.2%	18.4%
Voluntary				
Voluntary/negotiated agreements	26.1%	39.0%	14.5%	20.5%
Subsidies				
Subsidies/tax preferences	26.1%	36.9%	16.1%	20.9%
Technical assistance programmes	23.2%	41.1%	13.8%	22.0%

With respect to measures targeted directly at the introduction of EMS's, according to Table 6.2, over 70% of respondents did not believe that regulatory authorities have programmes in place that encourage the introduction of environmental management systems.

Table 6.2 : Do regulatory authorities have programmes to encourage EMS ?

Regulatory authorities have programmes that encourage EMS?	Frequency	Percent	Valid Percent
No	180	70.3	71.1
Yes	73	28.5	28.9
Total	253	98.8	100.0
Missing	3	1.2	
	256	100.0	

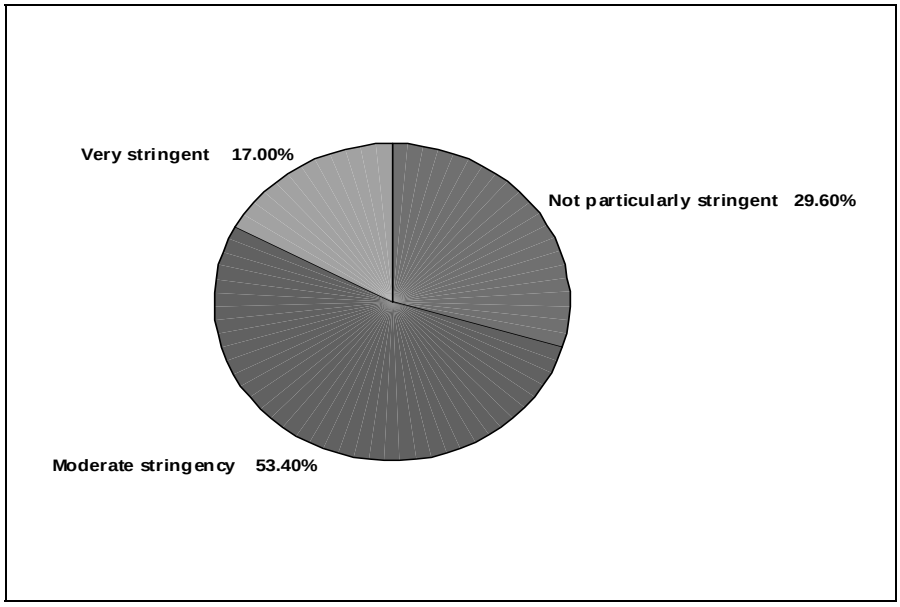
Of those who stated that regulatory authorities did have programmes that encouraged the use of EMS, the means by which they were encouraged (Table 6.3) included providing technical assistance, providing information about the value of EMSs, reducing the frequency of inspections and the expedition of environmental permits. Providing financial support, reducing the stringency of regulatory thresholds, waiving environmental regulations and providing preference for public procurement were, generally, not used.

Table 6.3 : Programmes and Policies used to Encourage Facility to use an EMS

Programmes and policies	No	Yes
Reduced frequency of inspections	32	37
	46.4%	53.6%
Expediting environmental permits	35	35
	50.0%	50.0%
Consolidating environmental permits	41	29
	58.6%	41.4%
Waiving environmental regulations	57	12
	82.6%	17.4%
Reducing stringency of regulatory thresholds	49	20
	71.0%	29.0%
Providing technical assistance	22	47
	31.9%	68.1%
Providing financial support	51	18
	73.9%	26.1%
Providing special recognition or award	36	34
	51.4%	48.6%
Providing preferences for public procurement	55	14
	79.7%	20.3%
Providing information about value of such systems	30	38
	44.1%	55.9%

The majority of respondents perceived the environmental policy regime in which they work to be moderately stringent (Figure 6.1). The latter should not come as a surprise given Canada's co-operative model of negotiation between the government regulator and the polluting party (See section III).

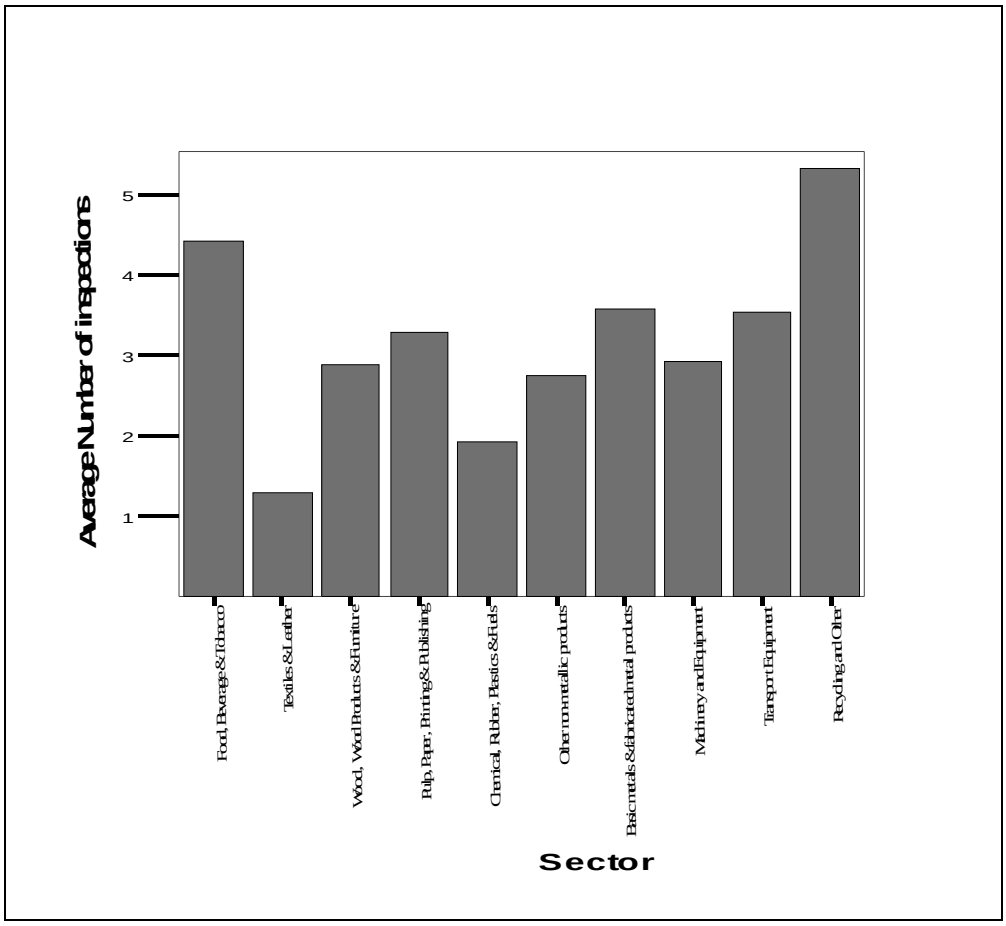
Figure 6.1 : Description of Environmental Policy Regime



A less subjective indicator of the stringency of an environmental policy regime is the number of times a facility has been inspected. Figure 6.2 provides a summary of these results by sector. On average across all sectors, facilities are inspected by regulatory officials at least once a year (with the overall average

being 3 inspections over three years). The industries with the greatest number of inspections in descending order were the "recycling and other" sector (5 inspections) followed by food, beverages and tobacco (4 inspections) and basic metals and fabricated metal products (3 inspections). We must note, however, that 75 facilities (31.8%) stated that their facility had never been inspected over this three year period. Moreover, every sector had facilities (ranging from 19% to 74% of respondents within a given sector) that had never been inspected.

Figure 6.2: Average Number of times Facility has been Inspected in the Last Three Years



VII. ENVIRONMENTAL PRACTICES AND COMMERCIAL PERFORMANCE

The link between environmental practices and commercial performance is an elusive one (Hart and Ahuja, 1996; Klassen and McLaughlin, 1996; Hamilton, 1995). One reason may be the fact that benefits from undertaking specific environmental practices take time to materialise and, as such, cannot be observed in the year the practice was instituted. Another may be that the benefits that occur do not necessarily accrue to the company itself but rather to society at large (e.g., cleaner air). Consequently, it may be the case that certain practices relating to specific environmental concerns may have an immediate impact on a firm's commercial performance while others may not.

To address the above, it may be useful to compare the commercial performance of "green" firms - those that have an EMS, with those of "laggards" - those who do not have an EMS. Using a simple cross-tabulation of whether the facility has implemented an EMS and their commercial performance as measured by whether the sales have decreased, stayed the same or increased, we observe that there appears to be no significant difference in commercial performance between "laggards" and "green" firms7 (Table 7.1).

Table 7.1: Relationship between Environmental Practices and Commercial Performance

Has facility actually implemented an environmental management system?					
Change in Value of Shipments in last 3 Years		**No** ***Laggards***	**Yes** ***Green***	**In Progress**	**Total**
significantly decreased	Count	5	4	1	10
	% within EMS	4.3%	5.1%	1.8%	4.0%
decreased	Count	14	15	10	39
	% within EMS	12.2%	19.2%	18.2%	15.7%
stayed about the same	Count	30	22	19	71
	% within EMS	26.1%	28.2%	34.5%	28.6%
increased	Count	48	34	20	102
	% within EMS	41.7%	43.6%	36.4%	41.1%
Significantly increased	Count	18	3	5	26
	% within EMS	15.7%	3.8%	9.1%	10.5%
Total	Count	115	78	55	248
	% within EMS	100.0	100.0	100.0	100.0

Table 7.2 goes a step further by comparing whether facilities have an EMS with the overall economic performance of their organisation. Again there appears to be no discernable difference between laggards and green facilities. Surprisingly, however, facilities that are in the process of implementing an EMS appear to have positive overall business/economic performance. This is something we shall examine in future reports using more sophisticated empirical techniques.

[7] This will, of course, have to be tested more rigorously in future reports.

Table 7.2: Relationship between Environmental Practices and Economic Performance

Has facility actually implemented an environmental management system?						
Responses			**No** ***Laggards***	**Yes** ***Green***	**In progress**	**Total**
Assessment of overall business performance	**Revenue has been so low as to produce large losses**	Count % within EMS	2 1.7%	1 1.3%		3 1.2%
	Revenue has been insufficient to cover costs	Count % within EMS	7 6.1%	9 11.7%	4 7.8%	20 8.2%
	Revenue has allowed us to break even	Count % within EMS	11 9.6%	7 9.1%	2 3.9%	20 8.2%
	Revenue has been sufficient to cover costs	Count % within EMS	63 54.8%	36 46.8%	35 68.6%	131 55.1%
	Revenue has been well in excess of costs	Count % within EMS	32 27.8%	24 31.2%	10 19.6%	65 27.2%
Total		Count % within EMS	115 100.0	77 100.0	51 100.0	243 100.0

VIII. CONCLUSIONS

The objective of this first report was to provide a descriptive analysis of the Canadian manufacturing sector insofar as environmental policy tools and firm level management practices are concerned. Canadian manufacturing firms have only begun to consider implementing EMS and only a few have recently certified their EMS (ISO 14000). Therefore, there exists an opportunity to discover how policies and programmes can complement regulatory regimes via the use of economic incentives and voluntary approaches to achieve environmental targets. Some interesting findings/questions that need further analysis using more sophisticated empirical techniques using the international database (Canada, France, Germany, Hungary, Japan, Norway and the U.S.) include:

1. Are more innovative firms more likely to undertake EMS and other environmental initiatives?

2. Is the implementation of an EMS more "successful" when other management systems are in place? And if so, which ones?

3. Is there relationship between economic performance and environmental performance?

4. Do firms who are in the process of implementing an EMS achieve greater economic performance relative to those who have already implemented an EMS? (that is, do they take advantage of "low hanging fruit", addressing the easiest and most cost effective environmental issues first.)

5. What role do stakeholders have in motivating facilities to undertake concrete environmental actions?

6. Of those facilities that have taken advantage of public policies and programmes that encourage environmental management systems, what incentive mechanisms or stakeholder pressures differentiated them from those that did not take advantage of public policies?

7. What role does the general environmental policy regime have on environmental management, innovation and performance?

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