AN EVALUATION OF VOLUNTARY INSTRUMENTS FOR ENVIRONMENTAL MANAGEMENT

AN EVALUATION OF VOLUNTARY INSTRUMENTS FOR ENVIRONMENTAL MANAGEMENT: COMPARING THE REGULATION OF TOXIC SUBSTANCES IN CANADA AND THE UNITED STATES

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ABSTRACT

The use of "voluntary measures" as an alternative policy instrument by government agencies has increased across the world. Such initiatives are based on voluntary commitments by the private sector to improve their environmental performance beyond what the law demands. While there have been many studies which look at the implementation and design of such programs, few provide an empirical comparison of the effectiveness of voluntary measures to other policy instruments. This study provides a comparative analysis of the relative effectiveness of two voluntary measures (the ARET Program in Canada and the 33/50 Program in the United States) in reducing emissions of targeted toxic substances versus reductions under the mandatory regulatory system alone. Data were collected for two study populations, tracking trends in emissions of ten substances from 1988-2000: firms that were participants in the programs and non-participating firms (representing the business-as-usual scenario). These ten chemicals were common to the target lists of both programs. The Great Lakes Basin was used as the region of analysis as it is an area of high industrial activity and shared environmental policy between Canada and the United States. Data were also collected for each firm with regards to the following variables in order to evaluate how such firm characteristics affect both participation in and performance of the two programs: industrial sector; firm size; pollution prevention activities; region; compliance records; and participation in other voluntary programs.

The study concluded that, for this sample of firms, the ARET program was shown to be more successful in achieving emission reductions than the standard regulatory system alone. Firms participating in the ARET Program reduced their emissions of the ten substances by 44 percent during the tenure of the program, versus a reduction of 18 percent by non-participating firms. For this sample of participating firms, the criticism that a large proportion of reductions claimed under the program actually took place before the start of the program in 1994 is proven false. In contrast, the 33/50 Program in the United States was not as successful. For this sample, participating facilities reduced their emissions of the ten substances by 49 percent during the tenure of the program versus a 60 percent reduction by non-participating firms (representing achievements made under mandatory regulations alone). Regarding firm characteristics: larger firms were both more likely to participate in and perform better in the ARET case study; firms located in Quebec reduced emissions more than those in Ontario; and no correlation was found between firm compliance records and participation in other voluntary programs and greater emission reductions which may indicate that firms joined the two programs as a way to improve their "green image".

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LIST OF ABBREVIATIONS
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AChange/Ach	Absolute Change
ANOVA	Analysis of Variance
ARET	Accelerated Reduction/Elimination of Toxics Program
CAA	Clean Air Act
CAC	Command and Control
CAPMA	Canadian Automotive Parts Manufacturers Association
CCME	Canadian Council of Ministers of the Environment
CCPA	Canadian Chemical Producers Association
CEPA	Canadian Environmental Protection Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESARS	Chemical Evaluation Search and Retrieval System
CISE	Canadian Information System for the Environment
COA	Canada- Ontario Agreement
CPR	Common Property Resource
CWA	Clean Water Act
DSL	Domestic Substances List
ECHO	Enforcement and Compliance History Online
EMS	Environmental Management System
EPA	Environmental Protection Agency
EPAs	Environmental Performance Agreements
EPCRA	Emergency Planning and Community Right-to-Know Act
GAO	General Accounting Office
GLWQA	Great Lakes Water Quality Agreement
MOUs	Memorandums of Understanding
NAICS	North American Industrial Classification System
NDG	New Directions Group
NEPA	National Environmental Policy Act
NPDES	National Pollution Discharge Elimination System
NPRI	National Pollutant Release Inventory
OECD	Organization for Economic Cooperation and Development
P2	Pollution Prevention
Pchange/PCh	Percentage Change
PCPA	Pest Control Products Act
PSL1	Priority Substances List 1
PSL2	Priority Substances List 2
RCRA	Resource Conservation and Recovery Act
SIC	Standard Industrial Classification Code
SOP	Strategic Options Process

LIST OF ABBREVIATIONS (continued)

TRI	Toxic Release Inventory
TSCA	Toxic Substances Control Act
TSMP	Toxic Substances Management Policy
VCR	Voluntary Challenge Registry
VMs	Voluntary Measures

Introduction

Policy Context and the Policy Issue

The Policy Context

It is increasingly evident that the environmental consequences of industrial emissions and discharges to specific media (*i.e.*, air, land, water) are interrelated and rarely localized in one medium. In addition, the scale of environmental impacts is increasing. Although environmental impacts can be most evident at a local and/or regional level, the environmental problems stemming from industrial activity are influencing the global environment. There is also an increasing dispersion of environmental contaminants which might necessitate international cooperation, especially since the long lasting impacts are often not well known or understood.

Most countries have designed regulatory frameworks to control industrial operations in the form of emission standards. Environmental regulations and the corresponding compliance and enforcement schemes have often been designed to tackle a single-medium problem and fail to recognize that pollutants move from one medium to another. Emission standards with short-term objectives have also tended to be prescriptive in nature and have encouraged end-of-pipe controls such as treatment plants, filters, and scrubbers. These command-and-control (CAC) regulations have been used with varying degrees of success. The regulatory approach has tended to be highly formal, expensive to operate, fosters an adversarial relationship between government and industry, and has usually been difficult to develop and amend, as the legislative process is slow.

The search for innovative and cost-effective ways to improve industry's environmental performance is leading to the development of a wide array of environmental management tools. One such tool, voluntary measures (VMs), is becoming increasingly popular, both with government and within industry. Although these instruments are not new, the level of interest and actual use of such agreements has increased dramatically since the late 1980s. For example, voluntary partnerships aimed at implementing sustainable development proved to be an important complementary outcome of the 2002 World Summit on Sustainable Development in Johannesburg. In May 2003, the Commission for Sustainable Development reaffirmed that "...voluntary multi-stakeholder partnerships contribute to the implementation of intergovernmental commitments in Agenda 21, the Programme for the Further Implementation of Agenda 21, and the Johannesburg Plan of Implementation," recognizing that voluntary measures are a complement to, not a substitute for, intergovernmental commitments.[1] A 1999 Review of the use of voluntary measures by the Organization for Economic Cooperation and Development (OECD) found that forty-two voluntary measures have been implemented since 1988 by the United States Environmental Protection Agency and ninety-five such commitments were in place in Canada by 1998.[2] Similarly, a 1996

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[1] United Nations, Division for Sustainable Development. *CSD-11 Decision on Partnerships* (www.un.org/esa/sustdev/partnerships/csd11_partnerships_decision.html). 2003.

[2] Organization for Economic Cooperation and Development. *Voluntary Approaches for Environmental Policy: An Assessment* (Paris: OECD, 1999).

report by the European Environment Agency found that there were over 300 voluntary measures recognized by the countries of the European Union.[3]

Voluntary measures cover a large variety of different arrangements. This is reflected by a rich terminology, as many different definitions of what constitutes an environmental voluntary measure exist. Some of these include: self-regulation; voluntary initiatives; voluntary agreements; negotiated agreements; covenants; environmental agreements; voluntary approaches; and, negotiated environmental agreements. As well, many classification systems and typologies have been developed in an attempt to categorize the different forms of agreements. There has been considerable debate within the literature as to the potential advantages and disadvantages of voluntary measures. The main potential advantages of voluntary measures centre around their flexibility, lower costs (the taxpayer does not directly assume any costs and the administrative costs of implementation may be lower as the majority of responsibilities fall onto industry), potential for positive use of peer pressure and incentive mechanisms, potential to increase technological innovations to meet environmental objectives, and ability to promote a cooperative policy environment between government and industrial agents. Typical drawbacks of the use of voluntary measures as policy instruments include lower visibility and credibility, problems with free-riders, uncertain public accountability, and less likelihood of developing rigorous standards.

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[3] European Environment Agency *Environmental Agreements Environmental Effectiveness*, Environmental Issues Series No. 3, Volume 1, (www.eea.eu.int), 1997.

In spite of the recent interest in the use of voluntary measures for environmental protection, there has been little empirical analysis of this instrument compared with more traditional policy approaches. The following section outlines the state of research on the use, design, and performance of voluntary measures in the environmental policy field in Canada and the United States.

Voluntary Measures: State of Research

Proponents of voluntary measures argue that they are more efficient than regulations and will lead to significant environmental improvements while reducing corporate and government costs. At this point there is little solid evidence to prove this right or wrong. While there has been a substantial body of literature surrounding the necessary criteria for the development and implementation of a "successful" voluntary measure[4] (*e.g.*, role of government, clear objectives and targets, incentives to increase participation and limit free-riders), such guidelines do not convey conclusions as to the relative effectiveness of voluntary measures in comparison to other policy instruments[5].

The empirical literature on voluntary measures is relatively sparse, although much more so in regards to the Canadian experience than to evaluations of voluntary measures in the United States. This is reflective of fundamental challenges in evaluating such agreements. The increasing use of voluntary measures is a relatively new phenomenon making long-term evaluations difficult if not impossible. A related problem is

[4] See New Directions Group *Criteria and Principles for the Use of Voluntary Initiatives to Achieve Environmental Policy Objectives* (1997). Organization for Economic Cooperation and Development *Workshop on Non-Regulatory Initiatives for Chemical Risk Reduction* (Paris: OECD, 1996). Moffet, John and Francois Bregha. "Non-Regulatory Environmental Measures" in Robert Gibson (Ed). *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough. Broadview Press, 1999).

quantitative data limitations as many programs lack data collection and reporting requirements. Most important is the problem of the missing counterfactual, that is, comparing the effectiveness of a program to what would have happened under alternative methods. Similarly, problems arise in determining to what degree environmental benefits are attributable to the voluntary measure in question, as a firm's behaviour may be influenced by other factors such as market forces and concurrent or new regulatory standards. Thus, many of the empirical studies of voluntary measures deal with explaining why firms decide to participate in a program, the general characteristics of participating firms, and external factors that can influence both participation and performance in a program.

Arora and Cason (1995 and 1996) and Khanna and Damon (1999) examined the factors that influenced participation in the 33/50 Program[6]. Using a bivariate probit model, Arora and Cason (1995 and 1996) found that participation was more likely by large firms that had high toxic releases and operated in unconcentrated industries[7]. They concluded that public awareness played an important role in motivating participation in the program. The results of Khanna and Damon (1999) confirm this result. Using a sample of chemical firms, they found that firms that were consumer-product oriented were more likely to participate since they were more likely to feel pressure from

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[5] A full discussion of essential design criteria for voluntary measures is provided in chapter one.

[6] The 33/50 Program was a public voluntary program in the United States which targeted emission reductions for a group of 17 chemicals. The 33/50 Program is one of the voluntary measures which is examined in detail in this study and will be discussed in greater detail in subsequent chapters.

[7] Arora, Seema and T.N. Cason. "An Experiment in Voluntary Environmental Regulation: Participation in EPA's 33/50 Program", *Journal of Environmental Economics and Management*, Vol. 28:3, 1995: 271-286; Arora, Seema and T.N. Cason. "Why do Firms Volunteer to Exceed Environmental Regulations?

consumers to produce environmentally friendly products[8]. Similarly, Karamos (1998) found that larger investor-owned utilities were more likely to join the United States Climate Challenge Program[9] then their smaller counterparts[10].

Arora (1999) used study event methodology to measure the effect of environmental actions (related to the announcement of pollution prevention in the United States Toxics Release Inventory) on firm value for 612 publicly traded companies[11]. The results showed evidence that firms that engage in pollution prevention activities gain market value as opposed to firms that do not engage in such activities, as public announcements through the Toxics Release Inventory (TRI) are quickly reflected in a firm's stock prices. Hamilton (1995) found a similar result, demonstrating that firms that reported large TRI discharges were more likely to be mentioned in media reports, which in turn resulted in losses in the stock market[12]. Videras and Alberini (1999) also found

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Understanding Participation in EPA's 33/50 Program", *Land Economics*, Vol 72:4, 1996, 413-432.

[8] Khanna, M. and L. Damon, "EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms", *Journal of Environmental Economics and management*, Vol 37, 1999 1-25.

[9] The Climate Challenge Program is a joint voluntary initiative between the United States Department of Energy and the electric utility industry aimed at reducing greenhouse gases by identifying and implementing cost-effective energy solutions. More information on the Climate Challenge Program can be found at www.eere.energy.gov/climatechallenge

[10] Karamos, Panagiotis, *Voluntary Environmental Agreements for the Reduction of Greenhouse Gas Emissions: Incentives and Characteristics of Electric Utility Participation in the Climate Challenge Program*. Paper presented at the Western Economic Association Annual Meeting, San Diego, California, July 6-10, 1999

[11] Arora, Seema, *Green and Competitive? Evidence from the Stock Market*. Paper presented at the Western Economic Association Annual Meeting, San Diego, California, July 6-10, 1999

[12] Hamilton, James T., "Pollution as News: Media and Stock Marker Reactions to the Toxics Release Inventory Data", *Journal of Environmental Economics and Management*, Vol. 28, 1995 98-113

evidence that the decision to participate in the Wastewise Program[13] in the United States was influenced by external pressures from consumers, business peers, and suppliers.[14] As well, Grant and Downey (1995) and O'Toole (*et al.*, 1997) used data from the TRI to analyze the effectiveness of state right-to-know programs in reducing releases across the United States[15]. Results showed that states with programs that actively promoted access to information on toxic chemical releases were more successful in reducing releases than states without such programs.

Some studies have attempted to explain performance of voluntary measures in relation to external socio-economic factors. Maxwell (*et al.*, 1998) and Henriques and Sardosky (1996) examined the relationship between voluntary measures and the threat of environmental regulation[16]. These models found that implementation and success of a voluntary measure depended on the strength of the legislative threat in the background. Therefore a weak response is expected (in terms of both participation and goals achieved) to programs with looser regulatory backgrounds. Welch, Mazur and Bretschneider

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[13] The Wastewise Program is a voluntary program in the United States that encourages business and government partners to reduce municipal solid waste through waste prevention, recycling, and buying manufacturing products with recycled content, leading to benefits to both the environment and their bottom line. More information on the Wastewise Program can be found at www.epa.gov/parters/programs

[14] Videras, Julio and Anna Alberini. *EPA Voluntary Program: Which Firms Participate and Why? The Case of Wastewise.* Paper presented at the Western Economic Association Annual Meeting, San Diego, California, July 6-10, 1999.

[15] Grant, Don S. and Liam Downey, "Regulation Through Information: An Empirical Analysis of the Effects of State-sponsored Right-to-know Programs on Industrial Toxic Pollution", *Policy Studies Review*, Vol. 14:3, 1995: 339-352; O'Toole, Laurence *et al.*, "Reducing Toxic Chemical Releases and Transfers Explaining Outcomes for a Voluntary Program", *Policy Studies Journal*, Vol. 25:1, 1997, 11-26.

[16] Maxwell, John *et al.*, "Self-Regulation and Social Welfare: The Political Economy of Corporate Environmentalism", working paper, Indiana University School of Business, Bloomington, 1998; Henriques, Irene and Perry Sadosky, "The Determinants of an Environmentally Responsible Firm: An Empirical Approach", *Journal of Environmental Economics and Management*, Vol. 30:3, 1995, 359-381.

(2000) found that firms were more likely to participate in the Climate Challenge Program if they were located in states characterized by higher levels of environmentalism and if they were subject to higher levels of direct federal and state regulation[17]. Similarly, O'Toole (*et al.* 1997) found that stringency of state regulation, as ranked by national environmental groups, was one of the most important factors in accounting for state-level reductions of 33/50 chemicals[18]. As well, Khanna and Damon (1999) found that potential liability under the Federal Superfund law and anticipation of new hazardous air pollution regulations under the U.S. Clean Air Act were among the most significant factors in explaining firms' releases of 33/50 chemicals[19].

While the above analyses provide insights into the rationale for participating in voluntary measures and the general characteristics of firms who volunteer to join such programs, they do not provide conclusions as to the relative effectiveness of the voluntary programs. Bromley (2000) provides an analysis of reductions in greenhouse gas emissions from firms participating in the Voluntary Challenge Registry Program[20] in

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[17] Welch, Eric, Allan Mazur and Stuart Bretschneider. "Voluntary Behaviour by Electric Utilities: Levels of Adoption and Contribution of the Climate Challenge Program to the Reduction of Carbon Dioxide" *Journal of Policy Analysis and Management*. Vol. 19:3, 2000: 407-425

[18] O'Toole, Laurence *et al.*, "Reducing Toxic Chemical Releases and Transfers. Explaining Outcomes for a Voluntary Program", *Policy Studies Journal*, Vol. 25.1. 1997 11-26.

[19] Khanna, M. and L. Damon, "EPA's Voluntary 33 50 Program: Impact on Toxic Releases and Economic Performance of Firms", *Journal of Environmental Economics and management*, Vol. 37, 1999: 1-25

[20] The Voluntary Challenge Registry is a partnership between industry and government agencies in Canada addressing the issue of greenhouse gases and climate change. More information on the VCR Program can be found at www.vcr-mvr.ca

Canada[21]. Data were collected on a company-specific basis and showed trends in releases of greenhouse gases from 1990 to 1998. Results showed that between 1990 and 1998, far more companies experienced large increases in emissions than large decreases. Khanna and Damon (1999) examined the impact of 33/50 program participation on various components of 33/50 releases by medium[22]. They found that participation in the program had a significantly negative impact on emissions to all other major media (*e.g.*, air, land, water), reflecting the fact that the program goals were not media specific and hence did not provide incentives for cross-media substitution. However, these studies do not provide a comparative analysis of voluntary measures to other policy instruments.

There are some studies that attempt to make such comparisons. Yu (*et al.*, 1998) analyzed the extent to which different policy instruments (TRI information programs, enforcement actions, and direct regulation) explained toxic reductions among US states[23]. Using percentage change in releases from 1992 to 1993 and results from national surveys on information and enforcement policies of states, they used a regression analysis to show that the information tool mattered more than both authoritative tools in reducing toxic emissions. Foulon (*et al.*, 1999) provided a comparison of public disclosure programs and traditional enforcement mechanisms[24]. Their results suggest that the public

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[21] Bromley, Matthew. *Greenhouse Gas Emissions from Industrial Companies in Canada: 1998* (Drayton Valley, Alberta: Pembina Institute, 2000).

[22] Khanna, M. and L. Damon, "EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms", *Journal of Environmental Economics and Management*, Vol. 37, 1999: 1-25

[23] Yu, Chilik *et al.*, "Policy Instruments for Reducing Toxic Releases: The Effectiveness of State Information and Enforcement Actions" *Evaluation Review*, Vol. 22 5, 1998: 571-589

[24] Foulon, Jerome, Paul Lanoie and Benoit Laplante. *Incentives for Pollution Control: Regulation and/or Information* (Washington: World Bank, Development Research Group, 1999).

disclosure strategy adopted by the province of British Columbia had a larger impact on both emission levels and compliance status than orders, fines, and other penalties traditionally imposed by the Ministry of the Environment and the courts. As well, Krahn (1998) studied the compliance and enforcement program of Environment Canada's Pacific and Yukon regional office for 154 of the largest industries in British Columbia from 1983-1998[25]. Results showed that industrial sectors that relied solely on self-monitoring or voluntary compliance had a compliance rating of 60 percent versus the 94 percent average compliance rating for those industries that were subject to federal regulations combined with a consistent inspection program.

The above review of the comparative literature on voluntary measures in Canada and the United States demonstrates the need for quantitative studies of the *relative effectiveness* of voluntary programs to the standard regulatory structure. Most empirical studies in this area have focused on evaluating reasons for participation and general characteristics of firms that join voluntary programs. While some do provide an analysis of performance, none provide a comparative study of programs that focus on reducing emissions of toxic substances and none provide a comparative analysis of programs in Canada and the United States.

Outline of Study

This study provides a comparison of the relative effectiveness of two voluntary programs (the Accelerated Reduction/Elimination of Toxics Program in Canada and the

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[25] Krahn, Peter K. *Enforcement vs. Voluntary Compliance: An Examination of the Strategic Enforcement Initiatives Implemented by the Pacific Yukon Regional Office of Environment Canada.* Environment Canada, Inspections Division, Pacific and Yukon Region, 1998.

33/50 Program in the United States) in reducing emissions of toxic substances as compared to reductions made under the regulatory structure alone. The Accelerated Reduction/Elimination of Toxics (ARET) Program was launched in Canada in 1994 as a voluntary initiative targeting 117 toxic substances of concern to the environment. Firms which agreed to participate in the program were asked to develop action plans to achieve the ARET target goals by the year 2000. The 117 substances were organized into five groups with specific target goals: 90% reduction in emissions of persistent, bioaccumulative, and toxic substances as designated on the ARET A-1 list and 50% reduction for all other ARET toxic substances. Initiated in 1991, the 33/50 Program sought commitments from companies to reduce their releases of 17 high priority chemicals. The name of the program was reflected in its goals: reductions of 33 percent by 1992 and 50 percent by 1995. The hallmark of both programs is that participation was voluntary.

The basis of this analysis is a comparison of two study populations for each program – companies who are participants in the voluntary programs and non-participating companies (total of 250 firms in Canada and the United States). The focus of the evaluation is on emission reductions of ten substances that are common to the target lists of both programs, with available data collected for each firm from 1988-2000. The intent is to provide a comparison of reductions made through the voluntary programs for participating companies to reductions made by non-participating companies, representing reductions under the standard regulatory structure alone.

The study is comprised of seven chapters. Chapter One provides an outline of the policy process and policy instruments that are available to policymakers for the regulation of toxic substances. This includes a review of the decision-making process for policymakers in choosing an appropriate policy instrument as well as a characterization of the three main forms of instruments: regulations, market/economic instruments, and voluntary measures. The focus of this chapter is on the rising use of voluntary measures and how they fit into the regulatory framework, a description of competing definitions and typologies, and an overview of the main advantages, disadvantages, and core design criteria for such agreements. The second chapter provides a discussion of the theoretical framework used in this study and outlines the main research questions and general methodology. Since the procedures of data collection and analysis differ for each program country, a more detailed description of methodologies is provided in subsequent chapters that focus on each program respectively. Chapter Three provides an overview of environmental policymaking in Canada. The first section reviews the institutional framework, policy style, and key policy instruments (*i.e.*, regulatory and non-regulatory) that have been used in Canada to manage toxic substances with an emphasis on the Canadian government's use of voluntary measures. The second section provides an overview of the development and implementation of the ARET Program, reviews the successes and failures of the program, and examines the future of ARET beyond the year 2000. Chapter Four provides a similar review of environmental policymaking in the United States and the development and implementation of the 33/50 Program. Chapters Five and Six present the analysis of the ARET and 33/50 programs respectively. This includes a description of the data collection procedures and sources, a comparison of reductions made by participants and non-participants, an analysis of trends and other company-specific characteristics which play a role in performance (*e.g.*, company size and compliance records), and conclusions with regards to the relative effectiveness of the programs in comparison to the standard regulatory structure. The final chapter summarizes conclusions and provides a comparative analysis of the performance of ARET and 33/50 as well as the possible effect of the institutional and regulatory framework of each country on the use of such voluntary measures.

Chapter One

Dimensions of the Policy Issue: Regulating Toxic Substances Through Voluntary Instruments

Introduction

In any given policy area, policymakers have a range of instruments from which to choose to best meet designated objectives. For the management of toxic substances in Canada and the United States, we have seen an increased interest in the use of voluntary measures as an alternative way to attain environmental goals. The first part of this chapter provides an overview of the classification and principle features of instruments available to policymakers. The second part of this chapter focuses on the increased popularity of voluntary measures as alternate policy instruments. Why have voluntary measures become more pervasive? What are the potential advantages and disadvantages of voluntary measures? What are the core design features and how do voluntary measures fit into the existing regulatory framework?

Classification and Choice of Policy Instruments

Policy instruments can be generally defined as, "...the actual means or devices that governments have at their disposal for implementing policies, and from among which they must select."[1] The choice of policy instruments is a complex process where problems must first be identified and a need for action acknowledged before a review and selection of optional tools can begin. The policy process as a whole is characterized by

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[1] Howlett, Michael, and M. Ramesh, *Studying Public Policy: Cycles and Policy Subsystems* (Toronto: Oxford University Press, 1995) 80.

communication between the various actors involved – communication which is asymmetrical because the actors do not have the same economic, political, and technical resources which shape the framing of issues, the setting of goals, the formulation of strategies, the design and choice of policy instruments and their implementation. The task before government is to select an instrument or combination of instruments that is most appropriate for the task at hand, taking into account both the limitations and capabilities of each category of instrument, as well as the political and economical consequences of its use.

Figure 1.1
A Continuum of Policy Instruments

Level of State Involvement

Low → High

Voluntary Instruments	Mixed Instruments	Compulsory Instruments (*i.e.* regulations)

Figure 1.1 illustrates the three-point taxonomy used in this study to classify the range of policy instruments available to policymakers. This classification is based on the level of state involvement, reflecting the "carrots, sticks, and sermons" taxonomy often used to review environmental policy instruments[2]. Here, voluntary measures can be considered the "carrot," offering a variety of incentives to potential participants. On the

[2] See Howlett, Michael and M. Ramesh *Studying Public Policy: Policy Cycles and Policy Subsystems* (Toronto: Oxford University Press, 1995); Evert Vedung, "Policy Instruments: Typologies and Theories", in Bemelmans-Videc, Marie-Louise, Ray Rist, and Evert Vedung (Eds). *Carrots, Sticks, and Sermons: Policy Instruments and Their Evaluation* (New Jersey: Transaction Publishers, 1998)

other end of the spectrum are mandatory regulations that rely on the proverbial "stick" to induce compliance. Economic and market incentives represent the middle ground, relying on a mix of incentives and state coercion. The following section provides an overview of the key features (and drawbacks) of each of these three categories of policy instruments.

Regulations

Regulations are the traditional instrument of environmental governance. Generally, regulations can be defined as "...measures taken by governmental units to influence people by means of formulated rules and directives which mandate receivers to act in accordance with what is ordered in these rules and directives."[3] Thus, the defining feature of regulations is that the relationship is authoritative in that the controlled persons or groups are obligated to act in the way specified by the controllers. Generally the implementation of regulations follows the following format[4]. First, standards are issued specifying: the level of consumption or emission permitted and the technology to be employed, how and when compliance is to occur, and the consequences for failure to comply. Secondly, permits are needed to tailor these standards to individual facilities and their environmental circumstances. Thirdly, compliance of facilities with the conditions of their permits is monitored. Finally, regulatory programs employ a number of

[3] Bemelmans-Videc, "Policy Instrument Choice and Evaluation" in Bemelmans-Videc, Marie-Louise, Ray Rist, and Evert Vedung (eds), *Carrots, Sticks, and Sermons. Policy Instruments and Their Evaluation* (New Jersey: Transaction Publishers, 1998)

[4] For a discussion of the implementation of regulations see: Ibbotson, Brett and John David Phyper (Eds), *Environmental Management in Canada* (Toronto: McGraw Hill, 1996)

enforcement mechanisms to respond to violations of the operating permits, ranging from warnings to fines and prosecutions.

It is possible to distinguish two styles of the regulatory approach[5]. In one style, government sets the target in the form of performance standards and leaves the firm free to adopt whatever means it chooses to comply with the target. Another is design or prescriptive standards that typically define the technology, or at least the technological options, that must be installed to achieve compliance. Prescriptive requirements have usually focussed on "end of the pipe" pollution abatement technologies that are costly and seldom provide opportunities for savings. In contrast to regulatory management of environmental standards in the United States that most often uses prescriptive standards, Canadian regulators have tended to use performance standards[6]. This contrast is generally reflective of the management styles in which Canada is characterized as being more flexible and conciliatory in comparison to the more adversarial, legalistic regulatory environment in the United States.

Known as the command-and-control (CAC) approach, regulations have been criticized as suffering from the systemic limitation of being lengthy, expensive, and not encouraging of technological innovation[7]. Typically it requires government regulators

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[5] See Gibson, Robert. "Questions About a Gift Horse: Voluntary Corporate Initiatives for Environmental Improvement are Attractive, Worrisome, and Significant", in Robert Gibson (Ed). *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough, Broadview Press, 1999) 12

[6] Laplante, Benoit, "Environmental Regulation: Performance and Design Standards", in Bruce Doern (Ed) *Getting it Green* (Toronto: Howe Institute, 1990)

[7] See Wylynko, Bradley, "Beyond Command and Control: A New Environmental Strategy Links Voluntarism and Government Initiative", in Robert Gibson (Ed). *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999): 162-163; Lotspeich, Richard.

and company managers to engage in lengthy and detailed negotiations to arrive at legally enforceable discharge-specific standards. Once set and enforced, the standards keep pollution and its effects within a specified range, but the approach does nothing to encourage companies to go beyond minimal compliance. The closed-door nature of the negotiation and implementation process is also becoming increasingly criticized as public involvement in environmental matters continues to rise. This is exacerbated by the fact that the command-and-control approach has given rise to a large bureaucracy in order to formulate standards and issue licenses. However, in the last 15 years, government's regulatory control capacity has been seriously hindered by deficit-cutting measures. For example, from 1996 to 1998 Environment Canada cut its budget by 30 percent. Newfoundland, Quebec, Ontario, and Alberta followed suit with cuts of 65, 65, 44, and 37 percent respectively[8].

In relation to this, a major criticism of the command-and-control approach has been its spotty history of weak enforcement and compliance[9]. In their study of Canadian environmental policy, Hessing and Howlett describe the style of regulatory enforcement as "...conciliatory, characterized by bargaining between government and industry ...and

"Comparative Environmental Policy: Market Type Instruments in Industrialized Capitalist Countries", *Policy Studies Journal*, Vol 20.1, 1996:85-102

[8] Wylynko, Bradley, "Beyond Command and Control: A New Environmental Strategy Links Voluntarism and Government Initiative", in Robert Gibson (Ed) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999).

[9] See Makkai, Toni and John Braithwaite, "In and Out of the Revolving Door: Making Sense of Regulatory Capture", *Journal of Public Policy*, Vol 12.1, 1994: 61-78; United Nations Environment Program, *From Regulations to Industry Compliance: Building Industrial Capabilities* (Paris, UNEP, 1992).

the extent of non-compliance to be staggering."[10] However, compliance with regulations is the bottom line through which the environmental goals and targets of policy are achieved. As well, generally the command-and-control approach is designed to deal with specific pollution sources with local effects. However many of the current environmental protection challenges occur at the regional or global level and may involve cumulative effects from many sources which individually may be acceptable and in compliance with local standards[11]. Finally, regulations are reactive in nature. The formation of rules is a slow process and often lags behind new developments in society. Moreover, regulations are often an instrument that is implemented after the fact, subsequent to undesirable behaviour being detected.

Economic/ Market Instruments

Economic instruments generally attempt to use market signals to influence behaviour in a manner that is consistent with environmental goals[12]. Typically, economic instruments give the private sector a great deal of flexibility in how to achieve environmental objectives, encouraging the development of innovative and cost-effective solutions to reduce or eliminate pollution. There are two broad categories of economic instruments that can be distinguished. The first is non-tax instruments including such

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[10] Hessing, Melody and Michael Howlett *Canadian Natural Resource and Environmental Policy* (Vancouver: University of British Columbia Press, 1997): 185

[11] Wylynko, Bradley, "Beyond Command and Control: A New Environmental Strategy Links Voluntarism and Government Initiative", in Robert Gibson (Ed). *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999): 162.

[12] See Lotspeich, Richard. "Comparative Environmental Policy, Market Type Instruments in Industrialized Capitalist Countries", *Policy Studies Journal*, Vol.20:1,1996: 85-102; Environment Canada, *Reviewing CEPA: The Issues-Economic Incentives*,1994

things as tradable permits, user charges, and deposit refund systems. The second is tax instruments including environmental charges, tax incentives, and a combination of the two. The use of these different instruments depends, in practice, on the particular environmental problem being addressed.

The literature suggests that there are a number of advantages that can be gained through the use of economic instruments[13]. Central to this approach is the idea that markets are the single most important initiator of technological change. Essentially, it is argued that if industry is given the discretion to develop their own environmental management programs, there will be an incentive for them to produce the most cost-effective method of doing so. It is also becoming clear that technology that improves environmental protection can be more efficient and cost effective in the long run. Market mechanisms also allow great flexibility in designing responses to environmental aims. Industries can incorporate process change, technology development, and product modification into their environmental management programs. That is, economic instruments are not limited to mechanisms that charge firms to pollute. This may create conditions whereby companies can actually make money by exceeding certain standards or financially reward firms or individuals that undertake environmentally friendly activities. Companies are thus motivated by economic efficiency to seek out environmentally sound practices. The market-based approach also tends to be fast acting.

[13] See Lotspeich, Richard, "Comparative Environmental Policy, Market Type Instruments in Industrialized Capitalist Countries", *Policy Studies Journal*, Vol.20,1,1996 85-102; Environment Canada, *Reviewing CEPA The Issues-Economic Incentives* 1994

Simply put, actions oriented toward direct impacts on profit margins tend to initiate rapid responses.

Disadvantages associated with the market approach have also been identified in the literature. For example, the administration of market instruments can be quite complex, especially if their distribution has to be controlled across jurisdictions (*e.g.*, in the case of air emissions). Monitoring is difficult and the restriction of market competition through the domination of companies is a danger. Furthermore, economic instruments are usually implemented by regulation. Government must set basic desired levels of emission reductions that are consistent with regulatory standards and must also enforce these limits through the imposition of penalties. Richard Lotspeich examined the experiences of five industrialized capitalist countries (*i.e.*, United States, France, Japan, Germany, and the Netherlands) in using effluent charges, tradable permits, and subsidies as tools of environmental regulation[14]. He concludes that the real-world application of market instruments is actually quite different from that envisioned in economic theory. While subsidies are used quite frequently, they are limited to lump-sum transfers supporting investment in control equipment. As well, emission charge systems are instituted primarily to raise revenue for environmental programs rather than as incentive policies. Moreover, tradable permit systems, which were limited to use in the United States, often impose extensive constraints on trading, reducing their capacity to function as an economic instrument.

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[14] Lotspeich, Richard. "Comparative Environmental Policy: Market Type Instruments in Industrialized Capitalist Countries", *Policy Studies Journal*, Vol.20.1, 1996: 85-102

Voluntary Instruments

As yet, there is no standard terminology to designate the broad category of voluntary instruments and its subtypes, and different countries may even use the same term to describe quite different things. This absence of common terminology is a serious obstacle to a common understanding of the nature of these policy instruments. For the purposes of this study, the term *voluntary measures* or *voluntary agreement* will be used to describe this category of environmental policy instrument.

Generally, voluntary measures can be described as private-sector commitments to improve their environmental performance beyond what the law demands. The category of voluntary instruments covers a rich variety of arrangements that have been classified in a variety of schemes. However, it is possible to distinguish three main types, classified by the degree and type of government involvement[15].

Unilateral commitments consist of environmental improvement programs set by firms and communicated to their stakeholders (*e.g.*, employees, shareholders, and clients). The definition of the environmental targets, as well as the provisions governing compliance, are determined by the firms themselves, although firms may delegate monitoring and dispute resolution to a third party in order to strengthen the credibility and environmental effectiveness of the commitment. One example of such a unilateral arrangement is the Responsible Care initiative undertaken by the Canadian Chemical Producers Association. Started in 1984 in Canada, the program has now spread to over

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[15] The literature on voluntary measures offers a variety of classification schemes for the range of initiatives which fall under this category. This study used the three-category taxonomy which was outlined in the OECD study of the use of voluntary measures. Organization for Economic Cooperation and Development (OECD), *Voluntary Approaches for Environmental Policy: An Assessment* (Paris: OECD, 1999): 9-10.

30 countries worldwide. Characterized by ambitious targets and strict control procedures, the Responsible Care Program was a result of pressure the industry was confronted with in the beginning of the 1980s after a series of chemical disasters (*e.g.*, Sevesco in Italy and Love Canal in the United States)[16]. Participants are required to submit their plants to regular verification of compliance carried out by an external committee composed of industry experts and community representatives. The results of this monitoring are made public.

Negotiated agreements are contracts arrived at through bargaining between the public (local, national, federal, or regional) authorities and industry. They contain a target (*e.g.*, pollution abatement objectives) and a time schedule to achieve it. The public authority commitment generally consists of not introducing a new piece of legislation (*e.g.*, compulsory environmental standards) unless the voluntary action fails to meet the agreed target. They are frequently signed between an industry sector and a public authority, although agreements with individual firms are also possible, particularly at the local level. Negotiated agreements are the key instrument used in the Netherlands where they are called *covenants*.

Finally, in *public voluntary programmes* participating firms agree to standards (related to their performance, their technology, or their management) which have been developed by public bodies such as environmental agencies. The scheme defines the conditions of individual membership, the provisions to be complied with by the firms, the

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[16] Organization for Economic Cooperation and Development (OECD) *Voluntary Approaches for Environmental Policy: An Assessment* (Paris: OECD, 1999): 16

monitoring criteria, and the evaluation of results. Economic benefits in the form of research and development subsidies, technical assistance, and reputation (*e.g.*, public recognition of participation) can be provided by the public body. Since participation in the agreement is a choice left to individual companies, they are sometimes termed *optional regulations*. The 33/50 Program in the United States and the ARET Program in Canada are examples of such non-mandatory regulation.

Within this general classification there are many variations among voluntary measures[17]. They can be characterized as being individual or collective agreements. That is, they can be multi-sectoral, sectoral-specific (*e.g.*, Responsible Care), or company initiatives. Collective voluntary measures involve inter-firm cooperation, while individual agreements do not. This is a key distinction as it influences the costs of the agreement, particularly the costs of monitoring and sanctioning non-compliance to limit free-riding. Voluntary measures may also be optional in terms of participation or industry mandated. In terms of scale, they may be local or global in nature. Moreover, the legal form of the agreements is an important element: agreements may be binding or non-binding. Agreements are binding for both parties when they include sanctions in the case of non-compliance and are enforceable through a court's decision. Voluntary measures can also be characterized as being either target-based or implementation-based. The former refers to situations where the environmental objective is set by the parties

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[17] For a discussion of the range of voluntary measures and general features see: Gallon, Gary, *Voluntary Environmental Measures: The Canadian Experience* (Canadian Institute for Business and the Environment, 1997); Griss, Paul, "The New Directions Group Position", in Robert Gibson (Ed.), *Voluntary Initiatives and the New Politics of Corporate Greening* (Toronto: Broadview Press, 1999), 231; Moffet, John and Francois Bregna, "Non-Regulatory Environmental Measures", in Robert Gibson (Ed.), *Voluntary Initiatives and the New Politics of Corporate Greening* (Toronto: Broadview Press, 1999): 15-18

involved in the agreement. The latter refers to cases in which the target is set within the framework of the regular legislative process by government and the voluntary agreement consists only of selecting and implementing the measures to achieve it. This is important for the credibility of the agreement in relation to public opinion as it is often argued that objectives set by polluters will be lower than targets set by the government. Finally, voluntary measures can be differentiated by whether or not they have open or closed access to third parties.

Voluntary Measures: Moving Beyond the Regulatory Model

Voluntary measures offer a new approach for the management of the environment at a time when there is increasing criticism of the traditional command-and-control style of regulation. A report by the Organization for Economic Cooperation and Development found a pervasive use of voluntary agreements in OECD countries, including "...over 300 negotiated agreements in European Union countries, about 30, 000 local pollution control agreements in Japan and over 40 voluntary programs managed by the United States government at the federal level."[18] This section addresses this recent institutional development in the environmental policy sphere – the transfer of some environmental protection responsibilities from the public to the private sector by means of alternative policy instruments. Within the literature it is possible to identify three forces which have driven this move away from the traditional model of environmental management. These are: an increase in the role of the private sector; the poor performance of the regulatory

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[18] Organization for Economic Cooperation and Development (OECD) *Voluntary Approaches for Environmental Policy – An Assessment* (Paris: OECD, 1999) p. 9

model in achieving pollution prevention; and the role of ideas in promoting the importance of the link between the environment and the economy.

First, decision-makers and the general public have begun to question the respective roles of public and private institutions with respect to environmental protection[19]. What has been questioned in particular has been the assumption that government should clean up after industry and that looking after the commons is the responsibility of public institutions. Instead, it is now being argued that industry should assume responsibility for the entire life cycle of its products. Previously, government regulation of the private sector for the purpose of protecting the environment took a form that did not challenge the distinction between public and private institutions. The command-and-control approach acted to discover the polluting activities of industry, and then acted to limit these activities. However, now such terms as 'industry responsibility' and 'product stewardship' are being promoted. Furthermore, it is argued that firms have better access to, and information about, their operations than regulators do, so delegating implementation to them could lead to the realization of environmental goals with greater efficiency and reduced burden. Such principles are at the heart of the voluntary approach to pollution prevention. Programs are designed to facilitate a more active involvement by industry, increasing authority and flexibility for the private sector to design their own environmental management programs. The idea is that the delegation or subcontracting

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[19] See Van Nijnatten, Deborah, "The Day the NGOs Walked Out", in *Alternatives*, Vol 24:2, 1998: 10-15; Van Nijnatten, Deborah. *Voluntary Pollution Prevention Initiatives. Some Reflections on Government's Role in Ensuring Public Involvement*. Working Paper Series 97-2 (Environmental Policy Unit, School of Policy Studies, Queen's University, 1997); United Nations Environment Programme (UNEP), "Voluntary Initiatives for Responsible Entrepreneurship. A Question and Answer Guide", *Industry and Environment*, Vol 21:1-2 1998: 4-15.

of regulatory functions to the private-sector will likely be cheaper and more effective than the traditional regulatory structure.

This move towards new forms of management necessitates a cooperative relationship between involved stakeholders. The use of voluntary measures has opened up a new form of partnerships between government, industry, and other stakeholders that is changing the nature of the environmental policy community. Individual firms or industry organizations are elevated to a role as direct participants and are responsible for the implementation of the voluntary agreement. Often, the regulating agency has no legal authority to sanction non-compliance. The alternative service delivery literature offers a range of successful cases in which tasks formerly performed by government institutions have been placed on individual corporations or industry associations[20].

The use of voluntary measures is not meant to preclude the role of government. In fact, regulations are often complementary to such agreements and the credible threat of more regulation is one of the main drivers of voluntary measures. Essentially, the two policy instruments work best together to provide the most effective environmental management system. Voluntary measures improve the flexibility and cost effectiveness of the policy mix, and allow for potential savings in administrative costs. Reciprocally, regulatory mechanisms provide voluntary agreements with safeguards against their main shortcomings, namely weak enforcement provisions and the lack of credible and efficient

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[20] Ford, Robin and David Zussman. *Alternative Service Delivery* (Toronto. KPMG Centre for Government Foundation and the Institute of Public Administration of Canada, 1997). Aucoin, Peter. *The New Public Management* (Montreal. Institute for Research on Public Policy, 1995), Globerman, Steve and Aidan Vining, "Framework for Evaluating Government Contracting Out Decisions with an Application to Information Technology", *Public Administration Review*, Vol. 56:6, 1996: 577-586

monitoring and reporting requirements. Furthermore, governments maintain responsibility for fostering a policy framework within which the voluntary agreements can take place. That is, policy-makers must determine how to best integrate the regulatory and non-regulatory initiatives into a coherent environmental management system. For voluntary measures to be most effective, governments have a role to play in ensuring that all interests are involved in the process, that implementation is occurring, that measurements are correct, that appropriate targets are being set and met, and that a level playing field is created so as to penalize free riders. Moreover, only governments have the mechanisms for regulation creation and law enforcement, in the event the voluntary agreement fails.

Secondly, the literature highlights increasing criticisms of the traditional command and control approach. The more complex issues now on the environmental agenda require changes in the way we produce and consume and they appear less amenable to command and control approaches[21]. Thus, it is argued that the traditional regulatory approach is no longer adequate to deal with emerging environmental problems. As discussed previously, it suffers from being lengthy, expensive, rigid, and not encouraging of technological innovation. Critics have argued that the 'one size fits all' design of many regulations forces diverse firms operating in varied circumstances to meet

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[21] See Lotspeich, Richard, "Comparative Environmental Policy, Market Type Instruments in Industrialized Capitalist Countries", *Policy Studies Journal*, Vol.20:1,1996, 85-102; Wylynko, Bradley, "Beyond Command and Control: A New Environmental Strategy Links Voluntarism and Government Initiative", in Robert Gibson (Ed), *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999): 162-163.

the same standards and technology specifications[22]. As well, it may be easier for violators to avoid punishment under the traditional model. It has been suggested that, due to fiscal constraints, perhaps governments - especially provincial ones - are hesitant to enforce regulations which could inhibit industrial competitiveness or job creation.[23] This does not imply that regulations should be replaced, but rather that they may not always be the most appropriate tool. The increasing complexity of environmental problems necessitates more policy alternatives so that the appropriate mix of legislation, market, and incentives can be used to deal with any particular environmental objective.

Finally, the literature identifies an evolution in ideas concerning environmental management. Beginning in 1987 with the Report of the Brundtland Commission, the idea of Sustainable Development has promoted the linkage of environmental and economic values. It expresses the necessity of reconciling the goals of economic development and the environment to ensure that the needs of the present are met without compromising the ability of future generations to meet their needs[24]. This principle has become the cornerstone of much environmental management. Economic and environmental policies are being designed to reinforce each other so that environmental regulations help foster industrial innovation, employment, and sustainable growth. There has also been increasing recognition by the private sector of the relevance to its own future prosperity

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[22] Fiorino, Daniel, "Strategies for Regulatory Reform: Forward Compared to Backward Mapping", *Policy Studies Journal*, Vol. 25.2, 1997: 249-255

[23] Doern, Bruce and Thomas Conway. *The Greening of Canada: Federal Institutions and Decisions* (Toronto: University of Toronto Press, 1994).

[24] Information on Sustainable Development can be found at the United Nations Environment Program at www.unep.org

of the need to find ways of combining economic development with environmental protection and the sustainable use of resources. The World Business Council for Sustainable Development promotes the concept of eco-efficiency as "...the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity."[25] In accordance with this principle is an increasing reliance on particular market mechanisms and incentives in the development of environmental management. Such voluntary actions are meant to encourage the development of technology and product innovation resulting in both economic gain and environmental protection.

The voluntary approach offers many advantages over the current environmental management model. It is a fact that it is now necessary to combine environmental and economic concerns in the regulatory structure, due to both the fiscal environment and the nature of pollution problems. Agenda 21 is an international environmental plan adopted by 178 governments at the United Nations Conference on Environment and Development (UNCED) in 1992. It identifies voluntary measures as valuable additions to the environmental management system, stating that "...leaders in business and industry, including transnational corporations, are increasingly taking voluntary initiatives, promoting and implementing self-regulations and greater responsibilities in ensuring their activities have minimal impacts on human health and the environment" and that "...such

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[25] Peck, Steven and Robert Gibson. "Pushing the Revolution: Leading Companies are Seeking New Competitive Advantage Through Eco-Efficiency and Broader Sustainability Initiatives". *Alternatives*, Vol. 26.1, 2000, 20. Information on the World Business Council for Sustainable Development and the eco-efficiency concept can be found at www.wbcsd.ch.

self-regulatory approaches are said to represent a more effective and desirable alternative to achieving sustainability goals than the command-and-control approach of government regulations and enforcement."[26]

Evaluating Voluntary Measures: Advantages and Disadvantages

There is a significant body of literature that promotes voluntary measures as an alternative which offer a variety of advantages over the traditional styles of regulation. From *government's perspective*, the main argument for the use of voluntary agreements has been that, by taking advantage of business expertise, they can deliver significant environmental improvements.[27] That is, industry may be better suited to ascertain how to best achieve pollution prevention objectives within their own facilities. As well, voluntary agreements may lead to more rapid action compared to command-and-control instruments as there are fewer formal requirements for their design and implementation. Koppen argues that implementation will be easier and rates of compliance higher because firms have "bought in" to the voluntary agreement.[28] Moreover, it is argued that a core feature of voluntary agreements is that they are generally considered to go beyond compliance or beyond minimum requirements. As well, they have the potential to affect

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[26] Commission on Sustainable Development United Nations *Agenda 21 Chapter 30 Strengthening the Role of Business and Industry* (www.igc.apc.org/habitat/agenda21/ch-30.html), 2000

[27] See Moffet, John and Francois Bregna, "Non-Regulatory Environmental Measures", in Robert Gibson (ed) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough, Broadview Press, 1999): 23-25; United Nations Environment Programme (UNEP), "Voluntary Initiatives for Responsible Entrepreneurship: A Question and Answer Guide", *Industry and Environment*, Vol 21:1-2, 1998 4-15; Organization for Economic Cooperation and Development (OECD) *Workshop on Non-Regulatory Initiatives for Chemical Risk Reduction* (Paris, OECD, 1996)

[28] Koppen I., "Ecological Covenants: Regulatory Informality in Dutch Waste Reduction Policy", in G Teubner, L. Farmer and D. Murphy (Eds) *Environmental Law and Ecological Responsibility* (London, John Miley and Sons, 1994).

change across media and industry sectors, actions which would require dozens of regulations to achieve the same results.

Furthermore, it is argued that since industry bears the costs of monitoring and shares the costs of standards development, voluntary measures can result in lower costs for governments in achieving their environmental objectives[29]. This is especially appealing to government in light of continued budgetary pressures on environmental agencies. For example, self-identification by industry of who is complying with voluntary agreements and who is not can assist government in targeting inspection and investigation efforts. In the interests of maintaining a good public image, industry associations may even feel compelled to come forward with information concerning non-compliance within their sector.[30]

Finally, the literature argues that the cooperative approach of voluntary measures is an advantage itself, leading to improved relations between industry, government, and other stakeholders.[31] That is, in voluntary agreements actors "...leave their old castle of roles and behaviours in order to enter the policy arena under a new and different system

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[29] See Harrison, Kathryn, "Talking With the Donkey: Cooperative Approaches to Environmental Protection" *Journal of Industrial Ecology*, Vol. 2 3, 1998: 51-72. Organization for Economic Cooperation and Development (OECD) *Workshop on Non-Regulatory Initiatives for Chemical Risk Reduction* (Paris: OECD, 1996); Webb, Kernaghan, "Voluntary Initiatives and the Law", in Robert Gibson (Ed) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999): 34-15.

[30] Webb, Kernaghan, "Voluntary Initiatives and the Law", in Robert Gibson (Ed), *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999): 34-35.

[31] See Organization for Economic Cooperation and Development (OECD), *Voluntary Approaches for Environmental Policy: An Assessment* (Paris: OECD, 1999):24-28; Pesaro, Giulia *The Development of an Effective Cooperation Between Public and Economic Actors in Environmental Voluntary Agreements*. Paper presented at the CAVA Workshop: The Efficiency of Voluntary Approaches in Environmental Policy, October 1999. (www.akf.dk cava paper).

of goals, means, resources, and interaction forms."[32] Stakeholders such as environmental groups and trade unions are often eager to play a role in the development and implementation of voluntary agreements to ensure the proper achievement of environmental objectives. Furthermore, a workshop on voluntary approaches in Canada that included participants from industry, government, and NGOs concluded that voluntary agreements are consistent with maintaining harmonious federal-provincial relations.[33] The inherent emphasis on partnerships may be more compatible with the division of responsibilities between the two levels of government. Kernaghan Webb argues that within Canada it may be possible for a coalition of stakeholders to devise and implement a voluntary agreement relating to a specific topic (*e.g.*, protection of wildlife, emission reductions) that might have failed under a legislative instrument due to federal-provincial constitutional difficulties.[34]

The literature also identifies a variety of advantages of voluntary measures from *business's perspective*. First, it is argued that voluntary agreements allow greater operational flexibility leading to lower production and transaction costs.[35] That is, they

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[32] Pesaro, Giulia. *The Development of an Effective Cooperation Between Public and Economic Actors in Environmental Voluntary Agreements* Paper presented at the CAVA Workshop. The Efficiency of Voluntary Approaches in Environmental Policy, October 1999.(www.akf.dk cava paper): 3.

[33] New Directions Group. *Workshop on Voluntary Approaches to Environmental Management* (Conference Board of Canada, 1997).

[34] Webb, Kernaghan, "Voluntary Initiatives and the Law", in Robert Gibson (Ed). *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999) 40-44.

[35] See Droll, Peter, "Environmental Agreements. The European Commission's Policy and Programme", *Industry and Environment*. Vol 21:1-2, 1998: 10-12. Dauvergne,John. "Stakeholders Perspectives on Regulatory Reform: The ARET Process", in Michael Mehta (Ed). *Regulatory Efficiency and the Role of Risk Assessment*. Proceedings from the First Annual Policy Forum of the Eco-Research Program in Environmental Policy and the School of Policy Studies, Queen's University (Kingston, Queen's University,

can give freedom to industry, at a company level or the sectoral level, to decide how to best reach environmental targets, allowing cost-effective solutions adapted to the specific circumstances of the firm (*e.g.*, investment cycle). For firms, the most strategic options may involve the pursuit of eco-efficiencies. Since 1992, the World Business Council has promoted eco-efficiency as a key objective for businesses as a way to improve environmental performance of their operations, products, and services.[36] Corporations are beginning to recognize that better environmental performance can lead to enhanced competitive advantages. For example, reducing environmental risks and potential liabilities can lead to a lowering of borrowing and insurance costs.

Secondly, it is argued that flexibility on how to implement targets can also serve to encourage creative solutions and technological innovation.[37] In particular, small and medium-sized companies are likely to benefit from the potential transfer of technology and the sharing of information which may not have been available to individual firms with their more limited resources and expertise. For example, the Responsible Care Programme has fostered the sharing of technical information and management approaches among chemical companies for reducing their emissions of certain toxic substances. In

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1995); Barber, Jeffery, "Responsible Action or Public Relations? NGO Perspectives on Voluntary Initiatives", *Industry and Environment*, Vol. 21:1-2, 1998: 19-22.

[36] Information on the World Business Council for Sustainable Development and the eco-efficiency concept can be found at www.wbcsd.ch.

[37] See Organization for Economic Cooperation and Development (OECD), *Workshop on Non-Regulatory Initiatives for Chemical Risk Reduction* (Paris, OECD, 1996); Sunnevig, Kjell, "Voluntary Agreements and the Incentives for Innovation", *Environment and Planning*, Vol. 18, 2000: 555-574. Lyon, Thomas and John Maxwell, "Voluntary Approaches to Environmental Regulations: A Survey", in Maurizio Franzini and Antonio Nicita (Eds), *Environmental Economics: Past, Present, and Future* (Ashgate Publishing Ltd., 1999); Kemp, Rene, *Environmental Policy and Technical Change: A Comparison of the Technological Impact of Policy Instruments* (Cheltenham: Edward Elgar, 1997), 314-326

particular, large companies have helped smaller ones in establishing the necessary control systems to reduce emissions.[38] Kemp studied the effectiveness of different policy instruments in terms of their ability to stimulate technological innovation or diffusion. He found that incentive-based instruments provide a greater stimulus to innovation in pollution control technology than direct control in the form of uniform emission-reduction standards.[39] Furthermore, many companies have found that environmental improvements can be profitable. For example, a simple re-routing of a methanol transfer pipe at FMCO INC's hydrogen peroxide plant in British Columbia, enabled the company to recycle methanol rather than burn it, eliminating a hazardous source of pollution and realizing $200, 000 in annual savings.[40]

Evidence also suggests that environmental reputation matters for firms whose expected costs or revenues are affected by judgements of their environmental performance by customers.[41] That is, firms want to appeal to "green consumerism" and are willing to go above and beyond environmental targets required by regulations. Many voluntary agreements include mechanisms for public acknowledgement of good

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[38] Moffet, John and Francois Bregna, "Non-Regulatory Environmental Measures", in Robert Gibson (Ed) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999):73

[39] Kemp, Rene *Environmental Policy and Technical Change: A Comparison of the Technological Impact of Policy Instruments* (Cheltenham, Edward Elgar, 1997): 314-326.

[40] Gibson, Robert "Questions About a Gift Horse", in Robert Gibson (Ed) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999):5

[41] See Peck, Steven and Robert Gibson, "Pushing the Revolution: Leading Companies are Seeking Advantage Through Eco-Efficiency and Broader Sustainability Initiatives", *Alternatives*, Vol. 26:1, 2000: 20, Afsah, Shakeb, Benoit LaPlante, and David Wheeler *Controlling Industrial Pollution: A New Paradigm*, World Bank, Policy Research Department Environment, Infrastructure, and Agriculture Division (http: www.worldbank.org nipr work_paper 1672 index.htm), 1996

environmental performance through awards, press announcements, or the use of logos. Once environmental performance is known, consumers can opt to purchase green products and therefore the firm is rewarded by an increase in its market share. Improving reputation with regards to local communities is also crucial for polluting industries such as mining, chemical, or nuclear industries whose low reputation is associated with the "not in my backyard" syndrome. For example, plant operational costs are affected when a local community organizes demonstrations and reduces their ability to obtain operating permits. Studies by Arora and Cason and Khanna and Damon found that firms with a history of high toxic emissions were more likely to participate in the EPA's 33/50 programme.[42] As well, Maxwell (*et al.*, 2000) found that states with higher levels of toxic emissions and larger environmental group membership reduced toxic emissions more rapidly.[43]

Studies have also found that financial advisors and investors may use environmental performance as an indicator of investment potential, with investors reacting negatively to information regarding higher levels of toxic emissions. For example, James Hamilton found that the stock value of firms reporting TRI releases fell

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[42] Arora, Seema and Timothy Cason. "An Experiment in Voluntary Environmental Regulation Participation in EPA's 33/50 Program", *Journal of Environmental Economics and Management*. Vol 28, 1995,271-286. Arora, Seema and Timothy Cason. "Why do Firms Volunteer to Exceed Environmental Regulations? Understanding Participation in the EPA's 33/50 Program". *Land Economics*, Vol 72/4, 1996:413-432; Khanna, Madhu and Lisa Damon, "EPA's Voluntary 33/50 Program Impact on Toxic Releases and Economic Performance of Firms", *Journal of Environmental Economics and Management*, Vol 37, 1999: 1-25.

[43] Maxwell, John, Thomas Lyon, and Steven Hackett. "Self-Regulation and Social Welfare The Political Economy of Corporate Environmentalism", *Journal of Law and Economics*, Vol. 43, 2000 583-617

by $4.1 million on the day pollution data were first released.[44] Konar and Cohen found that firms that faced the largest stock price decline upon the initial release of the U.S. Toxic Release Inventory (TRI) to the public subsequently reduced their emissions more than their industry peers.[45] In contrast, firms may also be rewarded for superior environmental performance. Hart and Ahuja used various measures of financial returns (*e.g.*, returns on assets, sales, and investment) and found that reductions in TRI emissions hurt returns in the year reductions took place, but had a positive effect on returns in subsequent years.[46] As well, Khanna, Quimio, and Bojilova found that participation in the 33/50 Programme lowered chemical firms' current-period return on investment, but increased their market value.[47]

The literature argues that a commonly expected gain associated with voluntary measures is avoiding or pre-empting mandatory regulation. For example, in the wake of public outcry against the chemical industry after a series of environmental accidents in Europe, Asia, and North America, a key impetus to the creation of the Responsible Care Program was "...the spectre of more costly and intrusive government regulation."[48] The

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[44] Hamilton, James, "Pollution as News: Media and Stock Market Reactions to the Toxics Release Inventory Data", *Journal of Environmental Economics and Management*, Vol. 28, 1995:98-113.

[45] Konar, Shameek and Mark Cohen, "Information as Regulation: The Effect of Community Right to Know Laws on Toxic Emissions", *Journal of Environmental Economics and Management*, Vol. 32, 1997 109-124

[46] Hart, Stuart and Gautam Ahuji, "Does it Pay to be Green: An Empirical Examination of the Relationship Between Emission Reduction and Firm Performance", *Business Strategy and the Environment*, 1996:30-37

[47] Khanna, Madhu, Willma Rose H. Quimio, and Dora Bojilova, "Toxic Release Information: A Policy Tool for Environmental Protection", *Journal of Environmental Economics and Management*, Vol. 36, 1998:243-266.

[48] Moffet, John and Francois Bregna, "Responsible Care", in Robert Gibson (ed), *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999), 69

rational is that strategic-minded corporations can look ahead to the next wave of likely regulation and attempt to take proactive steps to shape future laws, rather than passively waiting for regulations to be imposed upon them. Furthermore, firms may be able to pre-empt future regulations altogether by self-regulating with just enough stringency to head off the demand for government regulation. Khanna and Damon found that large emitters of certain toxic chemicals slated for future regulation were more likely to join the 33/50 Programme.[49] As well, Maxwell and Decker argue that a firm may engage in voluntary agreements in order to commit to higher levels of compliance with existing regulations, and, in return, possibly win a lower monitoring rate or laxer permitting scrutiny from regulators.[50]

Finally, it is argued that voluntary measures can lead to long-term cultural changes in business management. That is, participation in agreements can lead to a higher degree of buy-in and changed behaviour on the part of business, and can result in employees and management having improved attitudes toward environmental performance and pollution prevention.[51] When employees perceive the reputation in

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[49] Khanna, Madhu and Lisa Damon, "EPA's Voluntary 33 50 Program: Impact on Toxic Releases and Economic Performance of Firms, *Journal of Environmental Economics and Management*, Vol 37, 1999 1-25.

[50] Maxwell, John and Christopher Decker, "Voluntary Environmental Investment and Regulatory Flexibility", Department of Economics and Public Policy, Kelley School of Business, Indiana University, 1998.

[51] See United Nations Environment Programme (UNEP), "Voluntary Initiatives for Responsible Entrepreneurship A Question and Answer Guide", *Industry and Environment*, Vol. 21:1-2, 1998: 4-15. Dauvergne,John, "Stakeholders Perspectives on Regulatory Reform: The ARET Process", in Michael Mehta (Ed). *Regulatory Efficiency and the Role of Risk Assessment* Proceedings from the First Annual Policy Forum of the Eco-Research Program in Environmental Policy and the School of Policy Studies, Queen's University (Kingston: Queen's University, 1995. New Directions Group *Workshop on Voluntary Approaches to Environmental Management* (The Conference Board of Canada, 1997)

environmental care of their company as being low, employee turnover and absenteeism may be high. Conversely, good environmental performance may increase the employees' motivation and trust towards their employer and, as a result, may lead to an increase in labour productivity. Moreover, better environmental care generally entails an improvement in the health and safety conditions of employees. Participants in Responsible Care cite the following impacts on corporate culture: increased safety; recognition of the value in consulting neighbouring communities and fostering a more consumer-oriented attitude; greater emphasis on pollution prevention; promotion of employee pride and satisfaction; acceptance of responsibility for products after they leave the plant; and a grudging acceptance of loss of sales to customers who did not meet Responsible Care standards.[52]

Critics of the voluntary approach view the foregoing arguments with skepticism. One of the main concerns is that of *free-ridership*.[53] Free riding may occur when firms either decline to participate in a voluntary agreement or participate but fail to adhere to their commitments. The temptation to free ride can be great if a firm can gain the benefits of participation, whether in the form of reduced regulations or improved public image.

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[52] Moffet, John and Francois Bregna. "Responsible Care", in Robert Gibson (Ed) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999), 75-76.

[53] The following authors use the public choice concept of "free-ridership" in relation to firm behaviour and the use of voluntary measures in environmental governance. See Harrison, Kathryn. "Voluntarism and Environmental Governance", in E.A. Parson (Ed), *Governing the Environment: Persistent Challenges, Uncertain* Solutions (Toronto: University of Toronto Press, 2001); Oikawa, Cathy, Hideo Kojima, and Alec Tedder. *Voluntary Measures for Environmental Protection* (The Conference Board of Canada, 1995); United Nations Environment Programme (UNEP). "Voluntary Initiatives for Responsible Entrepreneurship: A Question and Answer Guide", *Industry and Environment*, Vol. 21:1-2, 1998, 4-15.

simply by being in a participating sector regardless of whether it changes its own behavior. If free riders are responsible for a large proportion of the targeted pollution, the overall environmental benefit of the initiative will be negated. Furthermore, there are concerns that competitive advantages may accrue to non-participants.[54] A related concern is that the use of voluntary measures creates an uneven playing field for the regulated community.[55] Large companies with greater resources and access to government will have a significant advantage over smaller companies. In a study of the use of voluntary agreements in reducing pollution from small and medium-sized enterprises (SMEs) in Ontario, Canada, Erin Windatt found the participation rate of SMEs to be notoriously low compared to participation by larger firms.[56] Since smaller firms are less likely to have sufficient resources to meet voluntary agreement guidelines, there needs to be an effort made to help those who want to join.

Voluntary measures have also been criticized because they may not provide accountability mechanisms.[57] At a minimum, creating and maintaining public trust requires that the objectives of the initiative be clear and measurable and that it provides

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[54] See Droll, Peter, "Environmental Agreements: The European Commission's Policy and Programme", *Industry and Environment*, Vol. 21:1-2, 1998: 10-12. Lynes, Jennifer and Robert Gibson, "Voluntary Corporate Initiatives for Environmental Improvement", *Alternatives*, Vol. 24:2, 1998.

[55] Muldoon, Paul and Ramani Nadarajah, "A Sober Second Look" in Robert Gibson (Ed) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999) 58.

[56] Windatt, Erin, "Reluctant Followers", in Robert Gibson (Ed), *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999): 151-154

[57] See Muldoon, Paul and Ramani Nadarajah, "A Sober Second Look" in Robert Gibson (Ed) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough, Broadview Press, 1999) 59-60; Lynes, Jennifer and Robert Gibson, "Voluntary Corporate Initiatives for Environmental Improvement", *Alternatives*, Vol 24:2, 1998: 18-19

for regular reporting of results. It has been argued that the Achilles heal of the ARET program has been the absence of third party involvement to assign public legitimacy and convince people that environmental gains are being achieved.[58] A review of the ISO 14001 Program, an international program which provides public recognition of firms with internal environmental management systems, also identified lack of transparency, credibility, and accountability as critical issues.[59] While companies may conduct environmental performance reviews of themselves, these too often remain confidential or simply unavailable to the public. Thus, it is argued that when developing a voluntary agreement, the easiest way to establish its credibility may be to involve relevant stakeholders in the process and provide a mechanism for such third party verification of the performance of the agreement.[60]

A further concern expressed in the literature is that voluntary measures may lead to a "backroom approach" to environmental decision-making, one in which negotiations between government and industry without public involvement may ultimately lead to the acceptance of inadequate environmental objectives. Rennings (*et al.*, 1997) argue that, "...once the government commits itself to a corporatist style of environmental policy, the

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[58] Gallon, Gary, *Voluntary Environmental Measures: The Canadian Experience* (Canadian Institute for Business and the Environment, 1997); Van Nijnatten, Deborah, "The Day the NGOs Walked Out", in *Alternatives*, Vol. 24:2, 1998: 10-15

[59] Barber, Jeffrey, "Responsible Action or Public Relations? NGO Perspectives on Voluntary Initiatives", *Industry and Environment*, Vol. 21:1-2, 1998, 19-22

[60] Muldoon, Paul and Ramani Nadarajah, "A Sober Second Look" in Robert Gibson (ed), *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999), 59-60; Organization for Economic Cooperation and Development (OECD), *Voluntary Approaches for Environmental Policy: An Assessment* (Paris: OECD, 1999):134 ; Oikawa, Cathy, Hideo Kojima, and Alec Fedder, *Voluntary Measures for Environmental Protection* (The Conference Board of Canada, 1995)

other negotiating partner is granted a potential to delay and water down goals that should not be underestimated".[61] A review by the OECD argues that voluntary agreements provide industry with a monopoly power within the regulatory arena when the development of agreements is not open to third parties.[62] Thus, there is a danger that firms may participate in voluntary agreements to pre-empt regulation so as to avoid the cost of more stringent targets. They conclude that, when open access to third parties is not provided, the use of voluntary agreements increases the likelihood of regulatory capture.

Furthermore, the absence of enforcement mechanisms and sanctions is seen as making non-compliance an attractive option to firms. Thus, it is argued that it is important for voluntary agreements to have clear targets and monitoring systems in which the public can scrutinize the implementation of measures and exert effective pressures. The European Union member states have shifted from an informal to a more formal approach in their design of voluntary agreements, including sanctions such as fines and penalties and legally binding features to provide guarantees for compliance.[63]

Designing Voluntary Measures

The literature suggests acceptable voluntary agreements must both ensure effective results and engender public trust. This requires careful attention to design, particularly

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[61] Rennings, K., K. Ludwig Brockmann, and H. Bergmann, "Voluntary Agreements in Environmental Protection. Experiences in Germany and Future Perspectives", *Business Strategy and the Environment*, Vol. 6, 1997, 245-263: 253.

[62] Organization for Economic Cooperation and Development (OECD) *Voluntary Approaches for Environmental Policy – An Assessment* (Paris: OECD, 1999), 31-37.

where government is involved, either by sanctioning the initiative or by actually delegating responsibility for environmental management to industry. In particular, as non-regulatory (or extra-regulatory) mechanisms, these initiatives require effective accountability mechanisms, including clear verifiable objectives and public reporting of results. Problems in design can lead to a variety of difficulties for the implementation of the voluntary initiative.[64] Without clear targets and ground rules for developing the initiative, problems can arise in obtaining baseline data, in ensuring adequate public access to the process, and in ensuring adequate verification, and companies may fear that they will be subject to "moving targets" or increasingly higher expectations as the program progresses. As well, companies may harbor underlying suspicions of the process. This may include the fear that participation by one company will entail costs that are not borne by a competitor, the fear that reporting information will be used by government in enforcement proceedings, and the perception of inequality in the power among stakeholders.

Thus, there has been a substantial body of literature focusing on the necessary principles governing the design of voluntary initiatives in order to achieve environmental policy goals. Such analyses are based on evaluations of ongoing voluntary programs.

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[63] Droll, Peter, "Environmental Agreements. The European Commission's Policy and Programme", *Industry and Environment*, Vol. 21:1-2, 1998, 10-12

[64] See Organization for Economic Cooperation and Development (OECD). *Workshop on Non-Regulatory Initiatives for Chemical Risk Reduction* (Paris: OECD, 1996); New Directions Group, *Criteria and Principles for the Use of Voluntary Initiatives to Achieve Environmental Policy Objectives* (1997). Gallon, Gary, *Voluntary Environmental Measures: The Canadian Experience* (Canadian Institute for Business and the Environment, 1997).

Their accomplishments and failures offer insights into the necessary criteria for the development and implementation of a "successful" voluntary agreement.

To start with, it is argued that it is necessary for government agencies to provide a policy framework within which multi-stakeholder consultation can take place. This framework must be clear to the participants from the beginning so they know what is expected of them and how their activities fit into the larger environmental management system. This was identified as a problem with the ARET Program where the federal government assumed a low profile and the participants were unsure as to the goals and design of the program.[95] Related to this, it is argued that all interested and affected parties should be involved in the development and implementation of the voluntary initiative so as to ensure that the goals are independent of the self-interest of any one party. This was another problem identified with the ARET Program as environment and labor representatives withdrew from the development of the program because of disagreement over the goals of the program.[96]

The literature suggests that public participation in the development and implementation of the voluntary measure is a necessary element to ensure credibility. This includes transparency in the design and operation of the program and the inclusion of independent mechanisms for verifying participant performance. An example is the Responsible Care Program initiated in 1993, which uses a compliance verification process

[95] See Van Nijnatten, Deborah. *Voluntary Pollution Prevention Initiatives: Some Reflections on Government's Role in Ensuring Public Involvement*. Working Paper Series 97-2. (Environmental Policy Unit: School of Policy Studies, Queen's University, 1997).

[96] Van Nijnatten, Deborah, "The ARET Challenge", in Robert Gibson (Ed). *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999) 94

involving site inspection by a four-person team independent of the company.[67] In contrast, the ARET Program has been highly criticized for its lack of credible third party verification. Under the current ARET reporting procedures, a senior executive in industry signs the performance data report.[68] Since voluntary measures are an alternative or complement to regulatory instruments, the public needs to be confident that the initiative will result in the same or a better environmental protection outcome than would be achieved through the regulatory approach.

At the operational level, the literature identifies key requirements for effective program design. It is argued that voluntary measures should be performance based with clearly specified goals, measurable objectives, and milestones enabling progress to be monitored and evaluated. This includes an agreed-upon baseline from which to begin and verifiable performance data collection. The ARET Program's emission claims have been questioned due to disparate data collection methods and reporting timelines.[69] Data is generated in a number of ways (from direct periodic monitoring and sampling protocols to extrapolation), resulting in difficult to compare reduction estimates. Another confound is that not every participant in ARET is ascribed the same base year since firms are able

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[67] Moffet, John and Francois Bregha, "Responsible Care", in Robert Gibson (Ed) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough Broadview Press, 1999):82.

[68] Van Nijnatten, Deborah, "The Day the NGOs Walked Out", *Alternatives*, Vol 24:2, 1998: 10-15

[69] Van Nijnatten, Deborah, "The ARET Challenge", in Robert Gibson (Ed), *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999), 95

to choose their own base years any time after 1987.[70] Furthermore, it is argued that there should be prescribed monitoring and reporting requirements, including timetables for the attainment of objectives. This works to set clear expectations for participants and contributes to the transparency of the initiative, ultimately helping to ensure accountability. This was a problem with the Canadian Voluntary Challenge and Registry Program, which did not establish mandatory reporting requirements for participating companies, fearing that it would discourage participation.[71] As well, reviews of voluntary programs have shown that rewards for good performance and the consequences of not meeting objectives need to be clearly specified. For example, under the Voluntary Challenge and Registry Program the Canadian federal government presents "VCR awards" to highlight participant accomplishments.[72]

Voluntary measures are not meant to preclude the role of government. In fact, public agencies have a key role to play in ensuring the success of voluntary agreements. Regulations are often complementary to such programs and the credible threat of more regulation may be one of the main drivers of voluntary initiatives. Governments also have an important role to play in fostering participation in agreements. Government agencies can use economic instruments (*e.g.*, resource taxes, abatement subsidies, green procurement policies, and tradable emission permits) to foster participation. Most

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[70] Gallon, Gary, *Voluntary Environmental Measures: The Canadian Experience* (Canadian Institute for Business and the Environment, 1997)

[71] Hornung, Robert, "The VCR Doesn't Work", in Robert Gibson (Ed), *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999): 136.

[72] Hornung, Robert, "The VCR Doesn't Work", in Robert Gibson (Ed),) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough, Broadview Press, 1999): 138.

importantly, governments maintain responsibility for fostering a policy framework within which voluntary measures can take place. that is. how to best integrate the regulatory and non-regulatory initiatives into a coherent environmental management system. As well. a primary motive for participation in voluntary initiatives may still be the threat of government regulation.

Thus. the regulatory system and voluntary agreements are intimately linked in a number of ways. Firms may develop and adhere to voluntary standards in an effort to decrease liability under existing regulations. In this way, voluntary measures work as supplements or reinforcements to the regulatory system. Voluntary agreements may be put in place by industry in an attempt to forestall new regulations being developed. For example. the Dofasco Memorandum of Understanding is based on the company's willingness to go beyond regulatory targets in return for relaxation of approval requirements.[73] Conversely. Robert Horning argues that the absence of a plausible threat of regulation underlies the disappointing performance of participants in the Climate Change Voluntary Challenge and Registry Program[74]. Similarly, Chang and MacDonald argue that the withdrawal of such a threat evidently crushed the Canadian Industry Packaging Stewardship Initiative.[75]

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[73] Lynda Lukasik. "The Dofasco Deal". in Robert Gibson (Ed) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press. 1999): 142-143.

[74] Hornung. Robert. "The VCR Doesn't Work", in Robert Gibson (Ed) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press. 1999): 134-138

[75] Chang. Elfrieda. Doug MacDonald. and Joanne Wolfson. "Who Killed CIPSI?". in Robert Gibson (Ed) *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough. Broadview Press. 1999). 129-130

Table 1.1 provides a summary of the main design features the literature argues are essential in the development and implementation of a successful voluntary measure.

Table 1.1
Voluntary Measures: Core Design Criteria

▪ developed by means of a transparent process
▪ stipulate clear, measurable targets
▪ provide incentives for participation
▪ provide for the monitoring of results (preferably by an independent third party) and the publication of the agreement and performance results
▪ positioned within a supportive policy framework that includes a credible legislative and regulatory backdrop
▪ provide penalties for non-compliance and rewards for good performance
▪ promote flexibility to encourage technological innovation

This chapter has provided a theoretical overview of the choice of voluntary measures as an alternative environmental management tool. This has included a synopsis of the main arguments within the literature surrounding the rationale for the use of voluntary measures, their potential advantages to industry, government, and the public, and essential design criteria which the literature argues are necessary to formulate and implement a successful voluntary measure. Such policy instruments are generally characterized by a low level of state coercion, voluntary participation, and flexible implementation strategies. They are the proverbial "carrot" offering incentives for business interests in the form of:

- recognition through awards and publicity
- legislative exemptions from regulatory requirements for participating parties
- reduced transaction costs as a result of less duplicative regulatory and reporting requirements

- improved "green image" appealing to environmentally conscious consumers, suppliers, and investors
- improved relations with government agencies and better linkage to government programs (*e.g.*, technical assistance)
- reduced costs and potential for technological innovations

The environmental problems we are now facing are complex in nature, requiring a less prescriptive and more flexible approach to management. Both federal and regional governments in Canada and the United States are being faced with reduced budgets and personnel in their environmental departments, necessitating an alternative way of regulating chemicals - one which utilizes the benefits of public-private partnerships. Finally, we have seen a general change in the political culture surrounding many policy issues. The focus is on a cooperative and multi-stakeholder approach to environmental management. Chapters three and four provide an in-depth look at how the institutional arrangements and policy style have shaped the management of toxic substances and policy instrument choice in Canada and the United States. The following chapter provides an outline of the theoretical framework and summarizes the main research questions, assumptions, and methodological structure that were the basis of this study.

Chapter Two

Theoretical Framework and Research Methodology

Introduction

Within the public choice literature environmental problems are often characterized as public/collective goods in that they exhibit the characteristics of non-excludability and subtractability. Take the example of a local emission into the air. Once the operating industrial plant produces it, people in the neighbourhood cannot avoid consuming the good (*i.e.* breathing) and this consumption does not affect the bad quality of air inhaled by other individuals in the vicinity[1]. In the literature it has often been argued that only public/government intervention can provide the necessary solutions to such problems. However, since the mid-1980s, public choice theories have found many examples of local governance that are more successful than government intervention. Voluntary measures are a new form of policy instrument that essentially change the public-private relationship, as industry representatives become active participants in policy formulation and implementation. Using the language of public choice theory, the use of voluntary measures for environmental management represents changes in institutional arrangements at the collective choice level (the negotiation of the voluntary program), resulting in changes at the operational level (the implementation of the program). This chapter is divided into two sections. The first outlines the essential assumptions and arguments of

[1] Leveque, Francois. "Externalities, Collective Goods and the Requirement of a State's Intervention in Pollution Prevention", in Carraro Carlo and Francois Leveque, *Voluntary Approaches in Environmental Policy* (Dordrecht, Netherlands: Kluwar Academic Publishers, 1999) 21

public choice theories in relation to the use of voluntary measures for the management of toxic substances. The second section outlines the general research questions and methodology that were used to assess the effectiveness of the ARET and 33/50 programs in reducing substance emissions as compared to the standard regulatory system.

Theoretical Approach

Public choice theories have contributed significantly to understanding the issues in environmental management by emphasizing the importance of the nature of the good and the rationale for collective action. Such theories offer insight into the extent that the "rules of the game" and institutions affect policy by shaping the goals, preferences (incentives), and strategies available to political actors. Environmental problems, from local to international levels, all exhibit the same structural problem of being beyond the ability of individual persons, communities, or governments to solve alone, and therefore require collective decisions and cooperative action[2]. There are three basic elements to the public choice framework: the nature of the good; the individual; and rules. Each of these will be examined and applied to the choice of voluntary measures as a policy instrument for the regulation of toxic substances.

Nature of the Good

Problem Definition: Toxic Substances

In order to study environmental policy, it is important to understand the nature of the problem, its characteristics, and how it is defined and perceived by actors in the policy field. Environmental policy problems are extremely variable in character, with specific

[2] McKean, Margaret, "Success in the Commons", *Journal of Theoretical Politics* Vol. 4, 1992 247-282

technical features complicating the policy process. The case of regulating toxic substances is one such area in which problem definition is crucial to understanding the difficulties of policy instrument choice and implementation. Problem definition, as defined by Hogwood and Dunn, consists of "...the processes by which an issue (*e.g.*, problem, opportunity, or trend) having being recognized as such and placed on the public policy agenda, is perceived by various interested parties; further explored, articulated, and possibly quantified; and in some but not all cases, given an authoritative or at least provisionally acceptable definition in terms of its likely causes, components, and consequences."[3] Thus, the way in which toxic substances are defined, including technical features and possible solutions, determines the way this policy area is designed and the regulatory structure best suited to deal with its complex issues.

Although there is no single universally accepted definition of what a toxic chemical is, there are general parameters that set these substances apart from conventional pollutants such as nutrients, suspended solids, and ammonia. The most significant characteristics of toxic chemicals are: persistence; bioaccumulation; biomagnification; and the propensity to cycle through the environment.[4] Environmental *persistence* refers to the length of time a substance resides in environmental media and is usually defined in terms of half-life: the time required for the concentration of a substance to diminish to half its original value. *Bioaccumulation* describes the process by which a

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[3] Hogwood, B.W. and L.A. Gunn, *Policy Analysis for the Real World* (London: Oxford University Press, 1984), 109.

[4] Environment Canada, *Towards a Toxic Substance Management Policy for Canada* 1994.

substance accumulates in a living organism, either from the surrounding medium or through food containing the substance. *Biomagnification* refers to the fact that as toxic substances tend to bioaccumulate in the fatty tissue of organisms, their concentration increases as smaller organisms are consumed by larger ones (*e.g.*, fish by humans). Additionally, since toxic substances cycle throughout the environment (*e.g.*, travel through air to water to land), a *cross media* approach to control is necessary.

Toxic substances can enter the environment either deliberately or accidentally through the following pathways.[5] First, *nonpoint* sources include such avenues as agricultural runoff from land, contaminated groundwater, and atmospheric fallout. Secondly, exposure may occur from *point sources* such as discharges from manufacturing plants, hazardous disposal sites, and municipal wastewater treatment plants. Toxic substances can enter the environment through a number of pathways pertaining to these sources and, as stated earlier, cross from one medium to another. It is thus necessary to stress the importance of multi-media and synergistic effects. Since pollutants cycle continuously among air, land, and water, humans are typically exposed to them through more than one medium at a time. Management strategies must also account for the potential synergistic effects of multiple agents working together. A report by the Commission for Environmental Cooperation stated that "the cumulative multi-media risk to human and ecological health can far surpass the risk associated with a single medium."[6]

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[5] See Rand, G.M. "Basic Toxicological Considerations", in Raymond Cote and Peter Wells *Controlling Chemical Hazards* (London: Unwin Hyman, 1991): 48.

[6] Commission for Environmental Cooperation, *Continental Pollutant Pathways* (Montreal: CEC, 1997), 17

There are many factors contributing to the complexity of toxic control problems that have significance to management practices.[7] The ability of toxic substances to persist and bioaccumulate in the environment means that sources of toxics are often difficult to identify when negative effects are discovered long after the original exposure occurred. This is exacerbated by the uncontrolled or accidental releases of toxics during production, storage, transport, use, and disposal. There is also difficulty in predicting how toxic substances disperse in the environment from one medium to another - that is, to determine transport pathways. As well, the diversity of physical, chemical, and biochemical properties of the toxic compounds makes regulation difficult. Furthermore, it is difficult to determine the synergistic effects of several pollutants together as most techniques focus on only one chemical at a time.

The aforementioned problems are exacerbated by the fact that the management of toxic substances occurs within an environment of scientific uncertainty.[8] Depending on their intended use, many chemicals are tested on animals prior to marketing. Nevertheless, there is always a level of uncertainty in extrapolating these results to effects in humans. Additionally, the effects expected in humans potentially exposed to low doses of a substance over long periods of time are usually estimated on the basis of effects seen in animals given large doses over a relatively short period of time. It is also difficult to

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[7] See Bishop, D.I., "Control Strategies and Techniques", in Raymond Cote and Peter Wells (*Eds*) *Controlling Chemical Hazards* (London: Unwin Hyman, 1991): 145; Rand, G.M. "Basic Toxicological Considerations", in Raymond Cote and Peter Wells *Controlling Chemical Hazards* (London, Unwin Hyman, 1991): 50

[8] See Bishop, D.I., "Control Strategies and Techniques", in Raymond Cote and Peter Wells (*Eds*) *Controlling Chemical Hazards* (London: Unwin Hyman, 1991): 145.

determine the causal agent of an adverse environmental effect because of limitations in data relating to long-past exposure and problems of eliminating the effects of related variables. For example, it is often not possible to differentiate between the effects of SO2, sulfates, sulfuric acid, and particulates, but only possible to discover the overall pattern of air pollution in which they all work together. Thus, it is often difficult to associate an adverse effect - whether to the environment or to human health - on a given pollutant or even a given source.

Thus, scientific judgments about the effects of toxic substance exposures on individual health and the environment are constrained by inadequate evidence, limited diagnostic techniques, and limited understanding of the mechanisms by which hazards may affect human health and the environment. Moreover, the uncertainty within which toxic substance management operates complicates the policymaking process.

Regulating Toxic Substances

In accordance with public choice theory, the nature of the good "...provides a set of constraints and opportunities that individuals and rules have to take into account in determining the range and diversity of policies available to the political actors and communities of interest."[9] The following discussion will examine how the regulatory framework for the management of toxic substances has changed over the last 50 years to deal with the pervasive uncertainty within which this policy field operates.

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[9] Sproule Jones, Mark, *Governments at Work: Canadian Parliamentary Federalism and Its Public Policy Effects* (Toronto: University of Toronto Press, 1993): 44.

Beginning in the 1950s, environmental matters jumped onto the policy agenda. In this first generation of laws, the regulatory system was based on cleanup laws with an emphasis on control. By definition, this meant that pollutants were managed after they were created. However, this method of regulation became outmoded for several reasons.[10] First the focus of understanding and concern shifted from highly visible and relatively straightforward pollution problems (*e.g.*, spewing smoke stacks) to infinitely more complex and potentially damaging environmental risks (*e.g.*, toxic substances). The first stage of controls have already been applied to the more manageable pollutants, making the costs of regulating the next more complex environmental problems much greater. Secondly, non-point sources of pollution now being identified are not amenable to traditional end-of-pipe solutions. Thirdly, there is awareness that a multimedia[11] approach is necessary. End-of-pipe controls are designed to regulate one pollutant in one environmental medium and often result in the contamination of another.

Thus, the *pollution prevention* approach seeks to eliminate the causes of pollution rather than treating the symptoms, reflecting a major shift from 'control' to 'prevent.' Such an approach is apparent in the Canadian Environmental Protection Act (CEPA) and the Pollution Prevention Act in the United States.[12] Peter Hall offers a useful theory to understand this change. In his model of social learning, he distinguishes three degrees of

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[10] Mehta, Michael *Regulatory Efficiency and the Role of Risk Assessment* (Kingston: Queen's University Press, 1996); Environment Canada, *Evolution of the Concept of Pollution Prevention* 1997: 34-38.

[11] This refers to the ability of toxic substances to cycle through various media (air, land, water). Thus, an approach which links the regulation of chemicals in all media is necessary, rather than simply issuing permits and controls for one medium in isolation.

policy change.[13] In a first order change, instrument settings are changed in response to new experiences and knowledge, while the overall goals and instruments of policy remain the same. In a second order change, instruments as well as their settings are altered with the overall goals remaining intact. A third order change reflects a "paradigm shift" in that it entails changes in all three components of policy: the instrument settings, the instruments themselves, and the hierarchy of goals behind policy. It is the argument of this author that such a paradigm shift is occurring in environmental policy for the control of toxic substances. As environmental problems have become increasingly complex and pervasive, the problem definition and policy instruments necessary to deal with the issues have changed as well. Under the old paradigm the mindset was react and cure with command-and-control regulations as the clear instrument of choice. The new paradigm is guided by two main principles: pollution prevention that aims to anticipate and prevent; and the precautionary principle that promotes precautionary action in the face of scientific uncertainty. As well, it is recognized that a broad array of policy instruments should make up the regulatory tool kit.

So, why has there been this change in approach to environmental management? First, governments, industry, and the public have expressed dissatisfaction with the traditional style of regulation. Under the old paradigm, the mindset was 'react and cure,' with command-and-control as the clear instrument of choice. Regulations prescribed

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[12] Environment Canada. *Pollution Prevention: A Federal Strategy For Action*. 1998; Environmental Protection Agency. *Pollution Prevention*. 1999.

[13] Hall, Peter, "Policy Paradigms, Social Learning, and the State", *Comparative Politics*, Vol. 25:3, 1993: 275-296.

technical solutions and inhibited innovation. However, this has been criticized as being lengthy, expensive, rigid, and not encouraging of technological innovation. Typically regulations require government regulators and company managers to engage in lengthy and detailed negotiations to arrive at legally enforceable, discharge-specific standards. Although the traditional approach requiring clean-up and control did lead to some initial beneficial results during the 1970s and 1980s, the more complex issues now on the environmental agenda require changes in the way we produce and consume and are not as amenable to command-and-control approaches.[14] Current environmental concerns center on difficult to detect and difficult to assess toxic substances, many of which pose problems at a regional or global level. This is complicated by rapidly changing technological innovations and scientific understandings. The command-and-control standard-setting approach was originally designed to deal with specific pollution sources with local effects.[15] Moreover, critics have argued that the "one size fits all" design of many regulations forces diverse firms operating in varied circumstances to meet the same standards and technological specifications.[16] As well, the legal mandate to maintain compliance offers little incentive for firms to move beyond minimal compliance. The

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[14] Ibbotson, Brett and John David Phyper (eds) *Environmental Management in Canada* (Toronto: McGraw Hill, 1996): 13; Van Nijnatten, Deborah. *Voluntary Pollution Prevention Initiatives: Some Reflections on Government's Role in Ensuring Public Involvement* Environmental Policy Unit, Queen's University (Kingston: Queen's University, 1997). Van Nijnatten, Deborah. "The Day the NGOs Walked Out", *Alternatives*, Vol 24:2,1998, 10-15

[15] Wylynko, Bradley, "Beyond Command and Control", in Robert Gibson (ed), *Voluntary Initiatives* (Peterborough: Broadview Press, 1999), 162-165; Gibson, Robert, "Questions About a Gift Horse", in Robert Gibson (ed) *Voluntary Initiatives* (Peterborough, Broadview Press, 1999): 10-11

[16] Fiorino, Daniel, "Strategies for Regulatory Reform: Forward Compared to Backward Mapping", *Policy Studies Journal*, 25.2, 1997:249-255

case of regulating toxic substances is an area in which problem definition is crucial to understanding the difficulties of policy formulation and implementation. Past regulations have tended to be media specific and fragmented. Controls based on single medium laws have led to inconsistencies among the standards governing chemicals, gaps in coverage, and different bases or criteria for regulation.[17] The use of voluntary measures offers an alternative approach to managing toxic substances, one which encourages flexibility and which harnesses the technical knowledge of industry to find the most cost-effective solutions.

Secondly, the institutional setting of environmental management has changed. In a period of budget cutbacks, governments have been dismantling the environmental regulatory framework.[18] Thus, tasks formerly performed by government institutions are increasingly being placed upon individual corporations and industry associations. This move towards new forms of management necessitates a cooperative relationship between involved stakeholders. The use of voluntary measures has opened up new forms of partnership between government, industry, the public, and non-government organizations that are changing the nature of the environmental policy community. Individual firms or industry associations are elevated to a role as direct participants and are responsible for the implementation of voluntary measures. Often, the regulatory agency has no legal authority to sanction non-compliance. The underlying assumption is that the private

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[17] International Joint Commission. *A Strategy for Virtual Elimination of Persistent Toxic Substances Volume 1*. (Canada 1993).

[18] Van Nijnatten, Deborah. *Voluntary Pollution Prevention Initiatives: Some Reflections on Government's Role in Ensuring Public Involvement* (Environmental Policy Unit, Queen's University, 1997).

sector offers stronger incentives to support and reward cost efficiencies and innovation. Some of the perceived benefits of public-private partnerships include: better management and allocation of risks; improved effectiveness; alternative revenue sources; access to economies of scale or scope; encouragement of multi-use infrastructure; and improved service responsiveness[19].

Several authors have studied the changing nature of institutional arrangements, offering insight into the role that voluntary measures can play in the policy framework of Canada and the United States. Kernaghan (1993) differentiates four forms of public-private partnerships: *collaborative partnerships* in which there is real power sharing, with each partner exercising power in the decision-making process; *operational partnerships* which share work only, rather than decision-making power; *contributory partnerships* in which one of the partners provides support (usually in the form of funding) for an activity in which it will have little or no operational involvement; and *consultative partnerships* in which a public organization receives advice in respect of a particular policy field[20]. Most voluntary measures would fall under the category of collaborative or operational partnerships, depending on the level of private sector involvement in the design of the program. Fikret Berkes (2001) argues that effective resource management requires partnerships to combine the strengths of government and local level intervention[21]. He

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[19] Allan, John R. *Public-Private Partnerships: A Review of Literature and Practice*. Public Policy Paper No. 4 (Saskatchewan, Saskatchewan Institute of Public Policy, 2002).

[20] Kernaghan, K. "Partnerships and Public Administration: Conceptual and Practical Consideration" *Canadian Public Administration* Vol. 36:1, 1993: 57-76.

[21] Berkes, Fikret. "Cross-Scale Institutional Linkages: Perspectives from the Bottom-Up", in Dietz, T. *et al.*, *The Drama of the Commons* (Washington: National Academy Press, 2001) 301

identifies a variety of cross-scale institutional arrangements which exemplify a diversity of "bottom-up" partnership arrangements - multi-stakeholder bodies, policy communities, and development, empowerment, and co-management arrangements, to name a few. Both Canada and the United States have recognized the need for a variety of policy instruments in achieving their environmental management goals, and explicitly indicate their adherence to a variety of techniques, including voluntary agreements.[22]

The Individual

In common property resource (CPR) problems, one person's use directly reduces the use or value of the common property to others. The term "common property" is thus used to describe a variety of situations including: property owned by government; property owned by no-one; and property owned and managed by a community of users.[23]

Traditionally, there have been three models which have been influential in understanding the problems inherent in common property: the Tragedy of the Commons, the Prisoner's Dilemma, and the logic of collective action. All focus on the difference between individual interests within a collectivity and that for the individual personally. That is, actors behave so as to maximize their own interests and it is difficult to get people to act in the collective interest, as it is often the case that individuals can benefit from the cooperative efforts of others without participating themselves.[24] This is known as the

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[22] Environment Canada, *Toxic Substances Management Policy* 1995; Environmental Protection Agency *Partners for the Environment: Catalogue of the Agency's Partnership Programs* 1998

[23] Schlager, Edella and Elinor Ostrom, "Property Rights Regimes and Natural Resources", *Land Economics*, Vol. 68, 1992: 249-262.

[24] Ostrom, Elinor. *Governing the Commons* (Cambridge: Cambridge University Press, 1990): 45-49

"free rider" problem. In the case of toxic substances management, why should one firm promote pollution prevention when they can simply do nothing and benefit from the environmental protection activities of others? Herein lies the dilemma of the regulatory approach. Problems with monitoring and enforcement lead to incentives for opportunism.

However, the CPR literature does offer hope for cooperation among individuals with a common interest. Writers such as J. Buchanan and G. Tullock, Mancur Olson, and Jayne Mansbridge have outlined theories on motivations of behavior and the conflict between self-interest and cooperation.[25] More specifically, Elinor Ostrom offers a theory of "bounded rationality" to explain the degree of cooperation reached among individuals who are given a chance to devise their own rules.[26] The Assurance Problem has also been proposed as an alternative theory to the Prisoner's Dilemma. The coordination game described by this theory suggests that there are "...incentives to develop and maintain institutions characterized by rules which make voluntary contributions to public goods a utility-maximizing strategy."[27] Furthermore, the theory of free market environmentalism has been introduced as a way to understand the role of incentives and motivations in relation to self-interested behavior.[28] At the heart of such literature is the notion that

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[25] See Buchanan, James and Gordon Tullock. *The Calculus of Consent* (Ann Arbor: University of Michigan Press, 1962); Olson, Mancur. *The Logic of Collective Action* (Cambridge: Harvard University Press, 1965); Mansbridge, Jayne. *Beyond Self Interest* (Chicago: University of Chicago Press, 1990).

[26] Ostrom, Elinor. *Governing the Commons* (Cambridge: Cambridge University Press, 1990), 38.

[27] Runge, Carlisle Ford. "Institutions and the Free Rider: The Assurance Problem in Collective Action" *The Journal of Politics*, 46 (1984): 154-181, 155.

[28] Anderson, Terry and Donald Leal. *Free Market Environmentalism* (Westview Press, 1991).

incentives matter and that individuals are more prone to act in a particular manner when it is in their best interest to do so.

Studies in economic theory have also addressed this issue. In a study of tradable permit systems in the United States, Svendsen proposes a solution to the problem of collective action. It is generally argued in the literature that large rational groups will not organize, if left alone, because of transaction costs and free rider problems. Svendsen argues that using individual rewards or punishments (selective incentives) can reduce these problems of organizing.[29] The incentives must be "selective" so that those who do not join or contribute to the attainment of the group's interest can be treated differently from those who do. A selective incentive can be either negative (*e.g.*, tax payments) or positive (*e.g.*, public recognition).

Voluntary measures directly appeal to this and offer incentives to both industry and government. Studies of voluntary programs have argued that industries support voluntary agreements in order to avoid stricter regulations, to improve their public image, and for flexibility and cost-effectiveness. They are also advantageous to government as firms bear the costs of implementation and monitoring.[30] In the formulation and implementation of voluntary measures, collective action can take place at several levels: between firms; between firms and public authorities; or between firms and industrial

[29] Svendsen, Gert Tinggaard, *Public Choice and Environmental Regulation: Tradable Permit Systems in the United States and CO2 Taxation in Europe* (Cheltenham: Edward Elgar, 1998), 20.

[30] See Commission For Environmental Cooperation, *Voluntary Measures to Ensure Environmental Compliance* (Montreal: CEC, 1998); Gallon, Gary, *Voluntary Environmental Measures: The Canadian Experience* (Canadian Institute for Business and the Environment, 1997); Lynes, Jennifer and Robert Gibson, "Voluntary Corporate Initiatives for Environmental Improvement", *Alternatives*, 24:2, Spring 1998, 18-19.

associations (and possibly other environmental interest organizations). Furthermore, the development and implementation of voluntary programs offer opportunities for collective learning processes between firms, making it possible for them to share the costs of acquiring information on pollution abatement techniques and, thus, ultimately to reduce the costs of achieving environmental objectives. However, Delmas and Terlakk (2002) caution that the ability of industry for collective action in negotiating a voluntary program will depend on the level of organization within the industry sector[31]. A loosely organized industry sector, for example, may not have a strong body to represent its interests in the negotiation and implementation of a voluntary program.

Rules

Mark Sproule-Jones[32] outlines a hierarchy of rules that operate within government arrangements in the execution of policies. Ranging from lowest to highest, they include: operational rules; collective choice rules; and constitutional rules. Rules at the lowest level, operational rules, determine how policies are delivered. Next, collective choice rules determine which policies are selected by actors to achieve optimal outcomes. Finally, constitutional rules define which institutions are concerned with this governance. Different configurations of rules and the nature of the common pool resource will affect the incentives individuals face, the types of actions they take, and the ultimate outcomes

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[31] Delmas, Magali and Ann Terlakk, "Regulatory Commitment to Negotiated Agreements, Evidence from the United States, Germany, The Netherlands, and France", *Journal of Comparative Policy Analysis* Vol 4, 2002: 5-29.

[32] Sproule Jones, Mark *Governments At Work Canadian Parliamentary Federalism and Its Public Policy Effects* (Toronto University of Toronto Press, 1993), 46-50, Sproule-Jones, Mark, *Restoration of the Great Lakes Promises, Practices, Performances* (Vancouver: UBC Press, 2002): 69.

they achieve. Voluntary measures (VMs) illustrate how changes in institutional arrangements at the collective choice level (the negotiation and use of VMs) impact at the operational level (the implementation of VMs). Furthermore, voluntary measures offer a way for both industry and government to maximize their individual interests in a common strategy. Companies enter into a process of negotiation with public actors that allows them to participate directly in defining the objectives and implementation goals for a given voluntary program.

A common misunderstanding in the literature is that common property problems lend themselves to either enhancing private property rights or developing a more active role for state institutions to enforce compliance. Many studies have demonstrated that there are a wide range of governance alternatives and self-governing institutional arrangements that can overcome these problems.[33] Specifically, research on common pool resource problems has demonstrated that under some circumstances solutions worked out by those individuals directly affected prove more successful and enduring than management regimes imposed by political authorities.[34] For example, Rita Hilton studied three similar irrigation systems located in the same valley in Nepal.[35] Two of

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[33] See McKean, Margaret, "Success in the Commons", *Journal of Theoretical Politics*, Vol. 4, 1992: 247-282, Kearney, J.F., "Co-Management or Co-Optation?", in E. Pinkerton (Ed), *Cooperative Management in Local Fisheries* (Vancouver: University Of British Columbia Press, 1989): 85, Kernaghan, K., "Partnerships and Public Administration", *Canadian Public Administration*, Vol. 36 1, 1993: 57-76

[34] See McKean, Margaret, "Success in the Commons", *Journal of Theoretical Politics*, Vol. 4, 1992: 247-282, Ostrom, Elinor, "Reflections on the Commons", in Baden, John A. and Douglas Noonan (Eds), *Managing the Commons* Second Edition (Bloomington, Indiana University Press, 1998): 176-180

[35] Hilton, Rita, "Institutional Incentives for Resource Mobilization. An Analysis of Irrigation Systems in Nepal", *Journal of Theoretical Politics*, Vol. 4.3, 1992: 283-308.

these systems were built and governed by farmers. The other system was designed, built, and operated by a government agency. Her study concluded that both of the farmer-governed systems mobilized resources effectively to pay for the operation of their systems and to get water to each of the farmers served by these systems. The government-owned system was not able to do the same. This is one of the rationales behind the use of voluntary measures - that businesses (or individuals), if left to their own devices, are better able to respond effectively to environmental requirements by adopting such things as environmental management systems, structures for eco-efficiencies, and product stewardship mechanisms. Moreover, industry often has greater knowledge regarding technologies and implementation costs than their public counterparts.

Kearney provides a model of co-management based on a study of the Atlantic Fisheries.[36] He divides co-management into three categories: (1) a consultative process in which stakeholders provide advice to government officials who remain the sole decision makers; (2) the implementation and enforcement of accepted government policies by involved stakeholders; and (3) comprehensive participation of stakeholders in decision making at the levels of policy formulation, acceptance, and implementation. In this third category, stakeholders are actually involved at the collective choice level in developing rules for use at the operational level.

It is this third type of institutional arrangement that is the driving force behind voluntary measures. The voluntary approach essentially alters the public-private

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[36] Kearney, J.F., "Co-Management or Co-Optation?", in E. Pinkerton (ed). *Cooperative Management in Local Fisheries* (Vancouver: University Of British Columbia Press, 1989): 85.

relationship. Programs are designed to facilitate a more active involvement by industry, increasing authority and flexibility for the private sector to design and implement their own environmental management programs. The Institute of Local Government Studies in Denmark has been studying the use of voluntary measures as a policy tool and argues that the basic policy cycle is altered in the development and implementation of voluntary programs as "…government and different interest organizations negotiate about specific policy design."[37]

Sproule-Jones argues that it is possible to extend the logic of the role of the individual in CPR theory to situations where the stakeholders may be corporate and collective organizations. He offers a framework that focuses on the conditions (rules) through which changes are made (collective choice arrangements) and distinguishes between three different kinds of stakeholders: individual person; corporate person; non-corporate person[38]. Within this framework, situational variables allow for identification of major characteristics in problem definition, institutional variables include the constitutional and institutional context that provide the basis for the collective choice rules governing the policy context, and outcome variables which assess implementation process and effects.

An important contribution of the CPR approach is the assumption that no one best policy instrument exists. Rather, the specific nature of the problem is important in defining the policy context and choice of instrument. The historical debate of public

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[37] AKF, Institute of Local Government Studies, *Voluntary Agreements Implementation and Efficiency* (www.akf.dk vaie programme.htm), 2002: 4

versus private intervention for environmental management has been replaced by the practical realities of public-private partnerships and the advantages such arrangements offer. Furthermore, policy success is strongly linked to implementation strategies that allow individuals to cooperate to solve problems and which utilize the knowledge base of those closest to the policy problem. In this way, voluntary measures offer tremendous opportunities to harness the technological knowledge of industry as well as offering a variety of incentives to promote cooperation.

Study Design and Methodology

Based on the theoretical assumptions in this chapter and those outlined in chapter one regarding the rationale for the use of voluntary measures as an alternative policy instrument, the following general exploratory and evaluative questions will be used to frame the research design.

1. Are the voluntary programs, ARET and 33/50, more effective in reducing emissions of toxic substances than the standard regulatory framework alone?
2. How do participants and non-participants in the programs differ in terms of general firm characteristics (*e.g.*, company size, compliance records)?
3. How may such firm characteristics affect performance?
4. How can differences in the institutional framework and policy styles of Canada and the United States affect the use and performance of voluntary measures?

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[78] Sproule-Jones, Mark. *Restoration of the Great Lakes: Promises, Practices, Performances* (Vancouver: UBC Press, 2002): 71-72

A Canada-United States Comparison

A comparative case study approach was used at two levels of analysis. The first was the choice of Canada and the United States as countries of comparison. A broader focus of this study was on how differences in the institutional framework (*e.g.*, intergovernmental relations and degree of centralization in policy formulation and implementation) and the policy styles of Canada and the United States affect policy instrument choice, specifically the use of voluntary measures as a management tool for the regulation of toxic substances.

In the case of environmental issues, Canada and the United States offer a useful source of comparative analysis as they have a similar history concerning toxic substance management. That is, the evolution of environmental regulation in both countries has followed a similar path. However, while environmental problems have been defined similarly and with similar policy goals and outcomes, the institutional arrangements and implementation strategies have often differed. However, the two countries are bound together geographically and, in the case of environmental issues, the transboundary and multi-jurisdictional nature of most pollution issues necessitates close ties. This is seen in the multitude of bi-national agreements (*e.g.*, Great Lakes Water Quality Agreement, Bi-National Toxics Strategy) that have been developed to deal with the management of toxic pollution problems. Both countries are characterized by a federal structure that involves shared responsibility for environmental policy between national and regional governments, resulting in jurisdictional overlap and ambiguity. In both countries initial legislation and policy efforts were centered on the use of regulation as the primary policy instrument. Yet institutional differences that shape policy behaviour and outcomes exist.

Most of the comparative literature on Canadian and American environmental policy to date has centered around evaluating the impact of federalism and institutional arrangements on problem definition, policy implementation, and policy outcomes. First, with regards to intergovernmental relations, many authors have characterized the American system as having a high degree of horizontal fragmentation due to the constitutional division of powers which structures environmental policymaking[39]. The separation of powers and checks and balances principle in the American system ensures that both the executive and legislative branches are largely equally involved in policymaking. Further, the judiciary plays a more prominent role in the American policy process. Moreover, frequently the presidency may be controlled by one political party and the Congress by its rival, further complicating the policymaking process. Generally, Congress uses a conjoint approach in which states implement policies in accordance with federal standards or a cooperative approach in which state implementation is voluntary but stimulated by federal financial incentives[40]. However, Kincaid notes that this is

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[39] See Rabe, Barry G.and Janet B. Zimmerman, "Beyond Environmental Regulatory Fragmentation: Signs of Integration in the Case of the Great Lakes Basin", *Governance*, Vol 8:1, 1995: 58-77; Van Nijnatten, Deborah, "Environmental Governance in an Era of Participatory Decision-making: Canadian and American Approaches", *American Review of Canadian Studies*, Vol. 26:3, 1997 405-423; Rabe, Barry, "Federalism and Entrepreneurship: Explaining American and Canadian Innovation in Pollution Prevention and Regulatory Integration", *Policy Studies Journal*, Vol. 27:2, 1999, 288-306; Rabe, Barry G. and William R. Lowry, "Comparative Analysis of Canadian and American Environmental Policy", *Policy Studies Journal*, Vol 27:2, 1999: 263-266.

[40] Welborn, David, "Conjoint Federalism and Environmental Regulation in the United States", *Publius*, Vol 18, 1988, 27-43, Kincaid, John, "Intergovernmental Costs and Coordination in U.S. Environmental Protection", in Kenneth M. Holland, F.L. Morton and Brian Galligan, *Federalism and the Environment*

becoming less common as grants-in-aid to states and local governments continue to decline[41]. In comparison, the Canadian environmental policymaking situation is most often characterized as a decentralized federation that encourages a high degree of vertical fragmentation[42]. Barry Rabe notes that the widespread delegation of environmental functions to the provinces reveals little sub-national innovation. Instead most provinces adhere to pollution-control-oriented regulatory systems, provide minimal enforcement or monitoring, and appear eager to bend existing regulations to satisfy the overriding imperative of economic development[43]. As well, it has been noted that this fragmented system of environmental governance has often led to "buck-passing" tendencies, delays, and piecemeal solutions[44].

Many of these comparative studies have also addressed the question of policy styles of Canada and the United States. The American style is generally characterized as open, adversarial, formal, and legalistic in nature whereas the Canadian system is more

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Environmental Policymaking in Australia, Canada, and the United States (Westport: Greenwood Press, 1996): 86

[41] Kincaid, John, "Intergovernmental Costs and Coordination in U.S. Environmental Protection," in Kenneth M. Holland, F.L. Morton and Brian Galligan, *Federalism and the Environment: Environmental Policymaking in Australia, Canada, and the United States* (Westport: Greenwood Press, 1996): 91

[42] See Rabe, Barry G. and Janet B. Zimmerman, "Beyond Environmental Regulatory Fragmentation: Signs of Integration in the Case of the Great Lakes Basin", *Governance*, Vol. 8.1, 1995, 58-77; Van Nijnatten, Deborah, "Environmental Governance in an Era of Participatory Decision-making: Canadian and American Approaches", *American Review of Canadian Studies*, Vol. 26.3, 1997: 405-423; Rabe, Barry, "Federalism and Entrepreneurship: Explaining American and Canadian Innovation in Pollution Prevention and Regulatory Integration", *Policy Studies Journal*, Vol. 27:2, 1999: 288-306; Rabe, Barry G. and William R. Lowry, "Comparative Analysis of Canadian and American Environmental Policy", *Policy Studies Journal*, Vol. 27:2, 1999: 263-266.

[43] Rabe, Barry, "Federalism and Entrepreneurship: Explaining American and Canadian Innovation in Pollution Prevention and Regulatory Integration", *Policy Studies Journal*, Vol. 27:2, 1999: 288-306

closed, informal, and consensual[45]. Similarly, it is generally agreed that the Canadian environmental policy system provides far less opportunity than does the United States for advocacy groups to advance proposals for regulatory change[46]. Deborah Van Nijnatten (1997) and Harrison and Hoberg (1994) argue that the American system of separation of powers and checks and balances offers multiple access points for interest advocacy[47]. However, they note that the Canadian system is moving towards the use of "multi-stakeholder consultations" which is forging links between the government and societal actors.

There has also been some debate as to whether Canada is converging towards an American model of environmental policymaking. Hoberg (1991) analyzed American influence on Canada's environmental policy development in the areas of air pollution, water pollution, toxic substance regulation, pesticides, and environmental impact assessment[48]. He found that while there is evident a pattern of emulation which is driven by Canada's dependence on scientific information and the diffusion of knowledge

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[44] Harrison, Kathryn. *Passing the Buck: Federalism and Canadian Environmental Policy* (Vancouver, UBC Press, 1996): 20.

[45] See Kathryn and George Hoberg. *Risk, Science and Politics: Regulating Toxic Substances in Canada and the United States* (Montreal: McGill-Queen's University Press, 1994): 8; Howlett, Michael. "The Judicialization of Canadian Environmental Policy, 1980-1990: A Test of the Canada-United States Convergence Thesis", *Canadian Journal of Political Science* Vol. 27:1, 1994, 99-127

[46] Rabe, Barry G.and Janet B. Zimmerman, "Beyond Environmental Regulatory Fragmentation: Signs of Integration in the Case of the Great Lakes Basin", *Governance*, Vol. 8:1, 1995: 58-77;

[47] Var Nijnatten, Deborah, "Environmental Governance in an Era of Participatory Decision-making: Canadian and American Approaches", *American Review of Canadian Studies*, Vol. 26:3, 1997, Harrison, Kathryn and George Hoberg. *Risk, Science and Politics: Regulating Toxic Substances in Canada and the United States* (Montreal, McGill-Queen's University Press, 1994), 9.

[48] Hoberg, George, "Sleeping With an Elephant: The American Influence on Canadian Environmental regulation", *Journal Public Policy*, Vol. 11:1, 1991: 107-132.

through transnational policy communities, there remains a considerable amount of policy divergence on environmental issues. Michael Howlett also looked at the issue of convergence. He found no evidence of a pattern of convergence in Canada-United States environmental policy in terms of an increased legalization or judicialization of Canadian environmental processes[49]. However, in his analysis of policy instruments and implementation styles, he argues that the two systems appear to be growing closer to each other as the addition of multi-stakeholder processes brings Canada closer to the level of public involvement found in the U.S. system, while a move towards regulatory negotiation in the United States shifts the U.S. system away from legalism and closer to the traditional bargaining scheme found in Canada[50]. He notes that both countries are moving towards an implementation style of multilateral negotiation, characterized by the development of a significant number of voluntary initiatives developed and implemented by industry agents. This increase in the use of voluntary measures as an alternative policy instrument has also been the focus of research by the Organization of Economic Cooperation and Development and the Commission for Environmental Cooperation[51]. These studies examined how institutional differences affect a country's use of voluntary measures as well as influence performance outcomes. However, such qualitative analyses

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[49] Howlett, Michael. "The Judicialization of Canadian Environmental Policy, 1980-1990: A Test of the Canada-United States Convergence Thesis", *Canadian Journal of Political Science*, Vol. 27:1, 1994: 99-127

[50] Howlett, Michael. "Beyond Legalism? Policy Ideas, Implementation Styles and Emulation-Based Convergence in Canadian and U.S. Environmental Policy," *Journal of Public Policy*, Vol. 20:3, 2000: 305-329.

do not offer conclusions as to the effectiveness of voluntary programs in reducing emissions of designated substances.

Thus, we can conclude that much of the comparative research has focused on institutional differences, policy styles, and implementation strategies. There has been little comparative analysis of the use of different policy instruments and resulting outcomes, particularly in the area of toxic substance management.

Comparing Policy Instruments

The second (and primary) level of comparative analysis involved an evaluation of the relative effectiveness of the voluntary programs, ARET (Canada) and 33/50 (United States), in reducing emissions of toxic substances as compared to a "business-as-usual" scenario as represented by the standard regulatory structure. We have seen that a substantial body of literature argues that greater rates of compliance can be achieved by a cooperative and flexible approach to environmental management.

At this point there is little solid evidence to prove that voluntary measures are more or less effective than mandatory regulations alone. While there has been considerable development of guidelines for voluntary measures which offer useful pointers to enhance the effectiveness of their implementation, such criteria do not convey conclusions as to the relative effectiveness of voluntary measures in comparison to required regulations. As outlined in the introduction, most of the empirical studies to date on voluntary measures focus on *why* participants agree to join such programs. They

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[51] Commission for Environmental Cooperation *Voluntary Measures to Ensure Environmental Compliance A Review of North American Initiatives* (Montreal: CEC, 1998); Organization for Economic Cooperation and Development *Voluntary Approaches for Environmental Policy An Assessment* (Paris: OECD, 1999).

argue that such internal factors as company size, sector, and compliance records affect a firm's decision to participate. They also note that external factors such as public recognition of firm performance in reducing toxic releases, demand for "green" products, and investor pressures play a role, both in encouraging participation and in performance outcomes. However, it is clear from this review that the majority of empirical studies do not address the question of the relative effectiveness of voluntary measures but only examine the use and performance of voluntary measures (mainly in the United States). Studies by Arora and Cason (1995 and 1996), Khanna and Damon (1999) and O'Toole (*et al.*, 1997) focus on firm participation and performance for the 33/50 program in the United States[52]. Welch, Mazur and Bretschneider (2000) and Karamos (1998) both examined participation influences for the U.S. Climate Challenge Program and Videras and Alberini (1999) for the U.S. Wastewise program[53]. Several studies also provide an analysis of the effect of the U.S. Toxics Release Inventory on firm behaviour and its relationship to public reporting of releases and stringency in state regulations[54].

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[52] Arora, Seema and T.N. Cason, "An Experiment in Voluntary Environmental Regulation: Participation in EPA's 33/50 Program", *Journal of Environmental Economics and Management*, Vol. 28:3, 1995: 271-286; Arora, Seema and T.N. Cason, "Why do Firm's Volunteer to Exceed Environmental Regulations? Understanding Participation in EPA's 33/50 Program", *Land Economics*, Vol. 72.4, 1996: 413-432; Khanna, M. and L. Damon, "EPA's Voluntary 33/50 Program. Impact on Toxic Releases and Economic Performance of Firms", *Journal of Environmental Economics and Management*, Vol. 37, 1999: 1-25

[53] Welch, Eric, Allan Mazur and Stuart Bretschneider, "Voluntary Behaviour by Electric Utilities: Levels of Adoption and Contribution of the Climate Challenge Program", *Journal of Policy Analysis and Management*, Vol. 19:3, 2000. 407-425; Karamos, Panagotis. *Voluntary Environmental Agreements for the Reduction of Greenhouse Gas Emissions: Incentives and Characteristics of Electric Utility Participation in the Climate Challenge Program*. Paper presented at the Western Economic Association Annual Meeting, San Diego, California, July 6-10, 1999; Videras, Julio and Anna Alberini. *EPA Voluntary Program: Which Firms Participate and Why? The Case of Wastewise*. Paper presented at the Western Economic Association Annual Meeting, San Diego, California, July 6-10, 1999.

[54] See Grant, Don S. and Liam Downey, "Regulation Through Information: An Empirical Analysis of the Effects of State-Sponsored Right-to-Know Programs on Industrial Toxic Pollution", *Policy Studies Review*

These studies focused on voluntary measures only in the United States and did not provide a comparative analysis of program performance. In comparison, there are few empirical studies of voluntary measures in Canada. Bromley (2000) offers an analysis of performance in reducing emissions of greenhouse gases under the Voluntary Challenge Registry Program and both Krahn (1998) and Foulon (*et al.*, 1999) provided a comparison of the effectiveness of policy instruments regarding compliance and enforcement programs in the British Columbia region[55]. However, empirical analysis of the ARET program is scarce. While there has been some criticism of the ARET program, this analysis focuses on the design, implementation, and performance of the ARET Program without a quantitative comparison to other policy instruments.[56] There has been some qualitative analysis to understand why firms participated in the program as well as a program review by Environment Canada that looked at performance outcomes in terms of

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Vol. 14:3, 1995: 339-352; Hamilton, James T., " Pollution as News: Media and Stock Market Reactions to the Toxics Release Inventory Data", *Journal of Environmental Economics and Management* Vol. 28, 1995 98-113; Arora, Seema. *Green and Competitive? Evidence from the Stock Market*. Paper presented at the Western Economic Association Annual Meeting, San Diego, California, July 6-10, 1999

[55] Bromley, Matthew *Greenhouse Gas Emissions from Industrial Companies in Canada 1998* (Drayton Valley, Alberta: Pembina Institute, 2000). Krahn, Peter K. *Enforcement vs Voluntary Compliance: An Examination of the Strategic Enforcement Initiatives Implemented by the Pacific Yukon Regional Office of Environment Canada*. Environment Canada, Inspections Division, Pacific and Yukon Region, 1998; Foulon, Jerome, Paul Lanoie and Benoit Laplante. *Incentives for Pollution Control: Regulation and/or Information* (Washington: World bank, Development Research Group, 1999)

[56] See Harrison, Kathryn. "*Talking With The Donkey: Cooperative Approaches to Environmental Protection*", *Journal of Industrial Ecology*, Vol. 2, 1998: 51-72; Van Nijnatten, Deborah. "The Day the NGO's Walked Out". *Alternatives* Vol. 24:2, 1998: 10-15, Gallon, Gary, *Voluntary Environmental Measures: The Canadian Experience* (Canadian Institute for Business and the Environment, 1997); Environmental Policy Unit, Queen's University, *Lessons Learned from ARET: A Qualitative Survey of Perceptions of Stakeholders* Working paper series 96-4, 1996

reductions[57]. However, once again none of these studies provides a comparative analysis of the effectiveness of the ARET program to other policy instruments.

The above review of the literature on voluntary measures in Canada and the United States demonstrates the need for comparative analysis, both at the macro-level in terms of comparing the use and performance of programs in the two countries and at the micro-level to compare the relative effectiveness of voluntary measures to regulatory outcomes. The following section will outline the research design and major propositions guiding this analysis of the ARET and 33/50 programs' performance in reducing emissions of toxic substances.

Research Design and Major Propositions

This study provides a comparative analysis of the relative effectiveness of two voluntary measures, the ARET Program in Canada and the 33/50 Program in the United States, in reducing emissions of targeted substances as compared to reductions made under the standard regulatory system alone. Data were collected for firms participating in the programs and non-participating firms to track trends in emissions of ten substances from 1988-2000. The ten substances were common to the target lists of both programs. Data were also collected for each company with regards to the following variables: industrial sector; region; pollution prevention activities; company size; compliance records; and participation in other voluntary measures. All of these characteristics have

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[57] See Roewade, David *Voluntary Environmental Action: A Participants View of ARET*. A report prepared for Industry Canada, 1996; Anacapa Consulting Service Inc *Survey of Potential ARET Participants*. Prepared for ARET Secretariat, 1997; Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET)* Final Report, 2000

been shown to be potentially correlated with participation and performance in voluntary measures. The hypotheses for this study included the following:

Major Hypothesis.

- The voluntary programs, ARET and 33/50, will be more effective in reducing emissions of toxic substances than the standard regulatory system alone.

Sub Hypotheses:

- Participants in the voluntary programs will have better "green records"[58] then non-participants, as indicated through their participation in other voluntary programs and their compliance records. Firms which have a better "green record" will perform better in reducing emissions of the target substances.
- Larger companies are more likely to participate in the voluntary programs and will perform better than smaller companies.
- Performance in reducing emissions of the target substances will differ by industrial sector. It is expected that firms in the Chemical Manufacturing sector will perform better as they have a history of participation in voluntary measures through mandatory membership in the Responsible Care Program.
- Performance in reducing emissions may differ by region.

[58] The term "green record" is used to indicate the environmental history of firms. That is, some firms may have a greater propensity to be environmentally conscious. Two measures are used to indicate the level of "environmental greenness" of firms: past compliance with mandatory regulations; and participation in other voluntary programs. The first provides an indication of how willing firms are to meet their environmental obligations through compliance with regulatory standards. The assumption with regards to the second measure is that firms who participate in many voluntary programs are more environmentally conscious.

- A tradition of cooperative policymaking between government and industry may lead to better performance. Thus, it is expected that the ARET Program in Canada will be more successful than the 33/50 Program in the United States.
- Participants in the voluntary programs will have higher levels of pollution prevention activities. These firms will also perform better in reducing emissions of the target substances.

Research Design.

Evaluating performance of a voluntary program is a difficult task for many reasons: voluntary measures as alternative policy instruments are a relatively new phenomenon and for many programs it is simply too early to perform an evaluation: voluntary measures rarely operate in isolation from other policy instruments, making it difficult to separate the influences of the voluntary program from other factors: and voluntary measures often have multiple objectives and the effectiveness of any given program is influenced by a range of political, social, and economic factors. Within the literature, a set of criteria for evaluating policy instruments has been developed. While these guidelines differ somewhat, they generally identify the following as core evaluative criteria:[59]

[59] See Russell, Clifford and Peter Bohm, "Comparative Analysis of Alternative Policy Instruments" in Kneese, Allan V. and James L. Sweeney (Ed.) *Handbook of Natural Resource and Energy Economics Volume I* (North Holland, El Sevier Science Publishers, 1985): 395-401; Cabugeira, Manuel L.M. *The Voluntary Agreement as an Environmental Policy Instrument: Evaluation Criteria* CAVA Working Paper No. 99/10/12 (Denmark, Institute of Local Government Studies, 1999): 13. European Environment Agency *Environmental Agreements: Environmental Effectiveness*, Environmental Issues Series No. 3, Volume 1 (www.eea.eu.int), 1997. Krarup, Signe. *The Efficiency of Voluntary Approaches*. CAVA Working Paper Series No. 99/08/2 (Denmark: Institute of Local Government Studies, 1999): 4. Organization for Economic Cooperation and Development. *Voluntary Approaches for Environmental Policy: An Assessment* (Paris: OECD, 1999): 99.

- Environmental effectiveness
- Economic efficiency
- Administration and compliance costs
- Wider economic effects
- Dynamic effects and innovation
- Soft effects (*e.g.*, changes in attitude)

This study focused on *environmental effectiveness* as the main criterion for success of the ARET and 33/50 programs. For many voluntary measures, a common measure of performance is to monitor the extent to which the targets are being met. However, for this to have any meaning, it is necessary to establish the significance of the targets compared to previous behaviour. One way to do this is to compare the targets or commitments of the voluntary program with a business-as-usual (BAU) baseline scenario. Doing so asks the question to what extent the reductions achieved under the voluntary program differ from what would be expected to happen in the absence of the program. One way of identifying reductions attributable solely to the voluntary program is to compare reductions of the targeted substances for firms who are participants in the program to reductions by non-participating firms. The non-participants represent the BAU scenario of reductions made under the standard regulatory system alone.

This analysis used a set of four study populations - participating and non-participating firms for each program. Thus, for the ARET program, the study population was comprised of 111 firms: 64 participants and 47 non-participants. For the

33/50 program there was a total of 140 firms: 70 participants and 70 non-participants. Firms were selected based on their having reported releases of at least two of the targeted substances. The number of cases is lower in the Canadian case because fewer companies met the selection criteria. That is, the firms in the study were the only ones that had releases of at least two of the target substances. It was decided that firms that had releases of only one of the substances would not provide enough data for comparison. In the case of the United States, all companies with reported releases of at least two of the substances were selected and from these 70 firms for each study population were randomly selected using a selection interval technique[60].

The primary level of analysis was total releases for the ten chemicals that were common to the target lists of both the ARET and 33/50 Programs. Since both countries collect data on releases on a chemical-by-chemical basis, this approach to analysis was considered the best alternative. As well, the program goals of both voluntary measures were expressed at the substance level so this method of data collection allowed for an examination of performance at the substance level. This allowed for an examination of whether performance differed according to the nature of the good. The ten substances studied are listed in Table 2.1.

[60] The process for selecting cases is described in greater detail in subsequent chapters: details on the selection of ARET and 33/50 participants and non-participants are provided in chapter 5 and chapter 6 respectively.

Table 2.1
Substances: Matched Dataset

Substance	
Benzene	Chromium (and its compounds)
Chloroform	Cyanide (and its compounds)
Carbon Tetrachloride	Lead (and its compounds)
Methyl Isobutyl Ketone	Mercury (and its compounds)
Cadmium (and its compounds)	Nickel (and its compounds)

In the case of the ARET program, data for participating firms were collected from the ARET Secretariat database and for non-participants from the National Pollutant Release Inventory. This was necessary as the NPRI began reporting releases only in 1994 while the ARET Secretariat database had information submitted by the firms for releases as far back as 1988. In the case of participating firms, it was important to have data on emissions *before* the start of ARET in 1994. In the case of the 33/50 program, data for both participating and non-participating firms were collected from the Toxics Release Inventory which has reported releases from 1988 to present[61].

It was important for year-to-year comparisons to be based on a consistent set of chemicals to ensure that changes in total releases did not simply reflect the addition, deletion, or change in definition of reportable chemicals from one year to another. Both the NPRI and TRI have specified reporting thresholds and requirements that may change from year to year. Appendix 2.1 provides a comparison of the reporting requirements for the year 2000. It was necessary for the matched dataset to include only those chemicals and industrial sectors for which data was reported in the same way

[61] The TRI collects data for chemical categories separately. The NPRI collects data for the chemical group as a whole. For the matched dataset, the TRI substances have been added together and reported under a single name (e.g., lead and its compounds).

under both systems. This study used the "Taking Stock 2000" document as a guide to ensure that the reporting requirements for the ten target substances were comparable over the time period of analysis. The Commission for Environmental Cooperation has released a report entitled "Taking Stock" for the last seven years[62]. The report provides a comparison of releases under the pollutant release inventories of Canada, the United States, and Mexico. In Taking Stock 2000, it identifies three different matched datasets for comparing TRI and NPRI releases: the 2000 matched set of chemicals and industries; the 1998-2000 matched dataset which is used to look at changes from 1998-2000; and the 1995-2000 matched dataset which is used for analyses of six-year trends from 1995-2000. In the case of the matched dataset for this study, the only substance that has undergone changes is mercury under the Canadian NPRI. Mercury (and its compounds) has been on the NPRI substance list since the program's inception, with a reporting threshold of 10 tonnes per year. In the year 2000, the NPRI reporting threshold for mercury was reduced to five kilograms[63]. Essentially this means that firms with lower releases of mercury would have now had to submit reports for the 2000 reporting year. However, this was not a problem for this dataset as we only included firms that had reported releases of any given substance over several years (allowing for an analysis of emission changes over time). Moreover, for the purposes of this analysis, such problems with data comparison between Canada and the United States were not of crucial importance. The effectiveness of the voluntary programs was analyzed primarily

[62] See Commission for Environmental Cooperation, *Taking Stock* (www.cec.org).

[63] Environment Canada, *National Pollutant Release Inventory 2000 Annual Report*, 2001

at the country level. Subsequent analysis involving country/program comparisons focused on contrasting the *performance* of each program, rather than overall releases.

It is important to note some data limitations of the NPRI and TRI inventories (the same can be said for the ARET Secretariat database)[64]. Foremost, facilities prepare their own reports with minimal oversight from regulators and facilities are not required to measure discharges but rather to estimate them using a variety of techniques which may change over time. Not all pollutants of interest are included in the inventories and some industries are excluded from reporting. For example, under the Canadian NPRI, primary industries such as forestry and agriculture are exempt from reporting except under specific conditions. Furthermore, the focus of the inventories is on "toxic" substances released in significant quantities, excluding high-volume, low-toxicity pollutants, as well as highly toxic chemicals released in small concentrations. Harrison and Antweiler note that, since facilities below a certain size are exempt from reporting, only about seven percent of the roughly 32 000 manufacturing facilities identified by Statistics Canada are required to report to the NPRI[65]. However, while such data limitations do exist and the validity of reported emissions from industries may be

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[64] See Commission for Environmental Cooperation *Taking Stock 2000 Summary* (Montreal, CEC, 2003), Environment Canada, *National Pollutant Release Inventory 2000 Annual Report*, 2001, Commission for Environmental Cooperation, *Putting the Pieces Together The Status of Pollutant Release and Transfer Registers in North America* (Montreal: CEC, 1996); Loenardelli, Sandro *Industrial Releases Within the Great Lakes Basin An Evaluation of NPRI and TRI Data*, Environment Canada, Ontario Region, 1995, Harrison, Kathryn and Werner Antweiler, "Incentives for Pollution Abatement: Regulation, Regulatory Threats, and Non-governmental Pressures", *Journal of Policy Analysis*, Vol 22:3, 2003: 361-382.

[65] Harrison, Kathryn and Werner Antweiler, "Incentives for Pollution Abatement, Regulation, Regulatory Threats, and Non-governmental Pressures", *Journal of Policy Analysis*, Vol. 22:3, 2003: 361-382

suspect, such databases are the only source of publicly available data on releases of toxic substances.

Dependent Variables:

As noted, the primary level of analysis focused on evaluating environmental effectiveness of the voluntary programs by comparing reductions of participating and non-participating firms. This analysis operationalized the dependent variable in three ways: percentage change in emissions; absolute change in emissions; and yearly releases of the ten substances. First, performance was measured as the percentage change (PChange) from Year X to Year Y in total reported releases. This measure assessed the amount of reductions made since the *start* of the ARET and 33/50 programs. This is an important distinction since a major criticism of both programs was that success had been calculated from base-years before the initiation of the programs. Thus, percentage change was represented by the formula:

$$\textbf{PChange} = \frac{\textbf{Year X} - \textbf{Year Y}}{\textbf{Year Y}} \times \textbf{100}$$

In this formula Year Y represents total releases in the year before the start of the programs and Year X represents total reported releases for the last year of the program. A similar percentage change value was calculated to compare emission reductions made before and after the programs were in place. Secondly, the dependent variable was measured by absolute change (AChange). Absolute change measures the difference in total reported releases in terms of real weight/volume. Thus, absolute change was represented by the formula:

$$\textbf{AChange} = \textbf{Year X} - \textbf{Year Y.}$$

While absolute and percentage change values were the primary indicators of performance (in terms of reducing emissions of the target substances), a third measure (yearly releases of all ten substances) was used to evaluate general trends over time. Additionally, average total release by substance for participating versus non-participating firms was measured and used to analyze general descriptive characteristics of the facilities. Absolute change provides a measure of the actual amount of substances that were released (or reduced) into the environment, providing an evaluation of impact on the environment. Percentage change calculates the level of reductions/increases in releases by firms. This provides a better indication of the effect of the programs on emissions as it reflects changes in firms' production or output levels. It is often the case that a small absolute change in emissions may be reflected by a large percentage change in output (or vice versa). An example of such a case would be a small company which has overall low releases of chemicals to the environment. Here, a small absolute change in emissions to the environment may actually reflect a very large change in the firm's production levels. Conversely, a larger company with overall higher emissions may reduce the absolute amount of emissions to the environment by a large amount (*i.e.*, tonnes), but this may only reflect a very small change in their production or output levels (percentage change).

Independent Variables:

As noted, data for each company was collected for the following variables: company size (number of employees); region; industrial sector; compliance records; participation in other voluntary programs; and pollution prevention activities. These variables were used to ascertain general characteristics of the participating and non-participating study groups for each program as well as to make possible an analysis of how these firm characteristics affected performance. In terms of region, the focus of this study was on the Great Lakes Basin. This incorporates two provinces in Canada and eight states in the United States. This area was chosen as it represents a region with a high level of industrial activity in both countries. Furthermore, it is an area that shares a high degree of environmental policy due to the transboundary nature of air and water pollution (four of the five lakes are shared by Canada and the United States). It provides a useful unit of analysis as it has been the focus of many bi-national policies since the signing of the Boundary Water Treaty in 1909[66]. The subsequent Great Lakes Water Quality Agreement (signed in 1972 and amended in 1978 and 1987 Protocols) has formed the basis of bi-national commitments to restore, preserve, and protect the Great Lakes. The 1972 Great Lakes Water Quality Agreement (GLWQA) established the commitment by both countries to restore and enhance water quality in the lakes and basic objectives to reduce the discharge of toxic substances into the Basin. The 1978 amendments included the introduction of the ecosystem approach and listed a group of chemicals for priority

[66] The International Joint Commission (www.ijc.org) provides links to national and regional governments involved in matters concerning the Great Lakes Basin. This organization is an independent body which oversees the Great Lakes Water Quality Agreement and related bi-national issues

action and/or virtual elimination.[67] The 1987 Protocol introduced Remedial Action Plans for 43 identified Areas of Concern on both sides of the border as well as Lakewide Management Plans for each of the lakes individually. The GLWQA has also formed the basis for many subsequent regulations on both sides of the border. Examples include, the Canada-Ontario Agreement Respecting the Great Lakes (first signed in 1971 and renewed four times, most recently in 2002), the Great Lakes Bi-National Toxics Strategy (1997), the Canada-United States Air Quality Agreement (1991) and the subsequent Ozone Annex to the Air Quality Agreement (2000), the Niagara River Toxics Management Plan (1987), and the Joint Federal/State Great Lakes Strategy (signed 1992 and renewed 2002) in the United States. This also reduces the number of confounding variables which may impact the performance of the two programs.

Data Collection and Procedures:

Chapters Five and Six provide the analysis of the ARET and 33/50 programs respectively. Information on data sources, data collection, and methodology are provided for each program separately at the beginning of these chapters. While the main source of data for each program was the national pollutant release inventory, collection of information on the independent variables differed for each country/program. As well, the analysis of the two programs differed somewhat. Mainly, the 33/50 program ended in 1995, allowing for a pre-and post-program analysis.

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[67] This list of substances has been incorporated into commitments under the Canada-Ontario Agreement and

Research Stages:

The remainder of the study follows three essential research stages. The first stage involved an historical/institutional exploration of the policy problem in each country. This provides a macro-analysis of Canada and the United States with regards to the evolution of the problem (toxic substances), the regulatory structure and policy style which has dominated the management of toxic substances, and the use of voluntary measures as a policy instrument. This stage also outlines the development, implementation, and perceived success of the ARET and 33/50 programs. The Canadian case is presented in chapter three and the American case in chapter four. The intent was to: (1) provide the descriptive background of the voluntary programs and the institutional settings within which they operate; and (2) provide the basis for analysis of how the institutional framework and policy style of each country may affect performance of the programs.

The second stage of research involved the quantitative comparison of environmental effectiveness of the two policy instruments - the voluntary programs (ARET and 33/50) and the standard regulatory system (the business-as-usual scenario). Chapters five and six provide details on the collection of data for the ARET and 33/50 program case studies respectively as well as provide an analysis of reductions in releases between participating and non-participating firms. This was a microanalysis of performance for each program separately, with the focus on comparisons to reductions made under the regulatory system alone. As outlined previously, this also included an

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the Great Lakes Bi-national Toxics Strategy analysis of firm characteristics that may have been factors in participation and performance in the voluntary programs. This analysis was based primarily on a descriptive evaluation of performance (using absolute change, percentage change, and yearly releases). Efforts to conduct inferential statistics on the database were not very successful due to the following problems: empty data points; extreme standard deviation scores; and high variance in the number of cases within each variable group (*e.g.*, trying to compare emission changes for three cases in Minnesota to 26 cases in Ohio). Analyses of variance were performed for a multitude of variable combinations. Absolute and percentage change measures for various time periods (tenure of programs and post program) as well as yearly releases of all ten substances were used as the dependent variables. As the main focus of this study was the effectiveness of the two programs and the primary unit of analysis was comparing reductions in emissions by participating and non-participating firms, participation in the programs was always included as an independent variable. All other possible combinations of firm characteristics were included as independent variables. It was not possible to conduct ANOVAs using more than two independent variables at any given time as this resulted in too few cases on which to base the analysis.

The third stage of research involved a comparative analysis of the two programs. Which program, ARET or the 33/50, was more successful? How do institutional factors and policy styles (as outlined in stage one) influence program outcomes? It was hypothesized that the Canadian case would be more successful because of the more cooperative policy style and tradition of close relations between business and government. Or do pressures from the public and investors typical in the more adversarial and litigious American system provide more of an incentive for program success? Chapter seven provides this comparative analysis as well as the final conclusions of the study.

Appendix 2.1
Comparison of Reporting in NPRI and TRI, 2000

Major Data Elements	U.S. Toxics Release Inventory	Canadian National Pollutant Release Inventory
Identification:		
Type of facility reporting	Manufacturing and federal facilities. Electric Utilities, mining, hazardous waste treatment, solvent recovery, chemical wholesalers, petroleum bulk terminals, beginning in 1998	Any facility manufacturing or using a listed chemical, except research, repair and retail sales. Agriculture, mining, well drilling also exempt, except if processing or otherwise using the substance
Industry classification	All U.S. SIC codes applicable to facility operations	One primary SIC code per facility. Facility reports both Canadian and U.S. SIC Code
List of chemicals	Chemicals manufactured or processed or used in manufacturing (648 substances with 30 chemical categories)	Chemicals used or manufactured in sufficient quantities (267 substances with 17 categories)
Reporting Threshold:		
Number of employees	10 or more	10 or more (no threshold for certain activities for substances with lower reporting thresholds)
Activity/use of chemical	Manufacture/process more than 25 000 pounds (11 338 kg) or use more than 10 000 pounds (4535 kg)	Manufacture, process, or use 10 tonnes (10 000kg) or more
Concentration of chemicals in mixtures	Concentrations equal to or greater than 1 percent (0.1 percent for carcinogens) count toward activity/use threshold	Concentrations equal to or greater than 1 percent plus total weight of by-products count toward activity/use threshold
Type of data reported (units)	Pounds reported (based on estimates)	Tonnes reported (based on estimates)
Small quantity reporting	Amounts of releases/transfers less than 1000 pounds (502 kg) may be reported by range code: no amounts need be reported if total production-related waste does not exceed 500 pounds (227 kg) and manufacture, process or use does not exceed 1 million (502 tonnes)	Total releases less than 1 tonne (1000 kg) reported as total releases only. Releases to each medium less than 1 tonne (1000 kg) reported by range code

Source: Commission for Environmental Cooperation. *Taking Stock 2000 Summary* (Montreal: CEC, 2003).

Chapter Three

Environmental Policymaking in Canada

Introduction

Environmental policymaking in Canada is a complex process involving many levels of governmental authority, industry, environmental organizations, and public interests, a plethora of legislative and policy guidelines, and a mix of policy instruments used to manage the risks of toxic substances. This chapter will provide a macro-analysis of the policymaking environment for the regulation of toxic substances in Canada. The first section will focus on the institutional structure of the Canadian federal system, the evolution of Canada's policy style for the formulation and implementation of environmental policies, the management structure in terms of the types of policy instruments being employed to control and reduce releases of toxic substances, and a review of Canada's performance in managing toxics, with particular emphasis on the use of voluntary measures in this endeavor. The second section will focus on one voluntary measure in particular -- the Accelerated Reduction/Elimination of Toxics (ARET) Program. This will include an overview of the development and implementation of the program, a review of the successes, failures, and design flaws of ARET, and an outline of measures being taken to develop a successor program to ARET.

Institutional Structure, Policy Style and Policy Instruments For Managing Toxic Substances

Canada: Institutional Framework

Since there is no specific reference to the environment in the Canadian constitution, jurisdiction over environmental matters and the control of toxic substances in particular is a joint federal-provincial effort[1]. Section 91 of the Constitution gives the federal government jurisdiction in 29 areas as well as the residual power to act in matters that have not been granted to one of the two levels of government. Most often the federal government has relied on its exclusive jurisdiction over navigation and shipping, seacoast and inland fisheries, criminal law, the regulation of trade and commerce, the spending power, and the residual power as the basis for environmental regulation. For example, the federal power over "seacoast and inland fisheries" has been used as the basis for the Federal Fisheries Act. The 1988 Canadian Environmental Protection Act (CEPA) was challenged in *R v Hydro Quebec* in which Hydro Quebec was prosecuted for failing to report discharges of PCBs to the St. Maurice River. However, the Supreme Court upheld CEPA stating that the controls over toxic substances were valid under the federal criminal law power[2]. Marcia Valiante warns, however, that the move away from the command-

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[1] For an overview of federal and provincial powers in relation to environmental policy see: Library of Parliament, Canada, *Toxic Substances Federal-Provincial Control* 1996; Commission for Environmental Cooperation, *Summary of Environmental Law in Canada* (Montreal CEC, 1995); Morton, F L., "The Constitutional Division of Powers with Respect to the Environment in Canada", in Holland, Kenneth et al (Eds), *Federalism and the Environment Environmental Policymaking in Australia Canada, and the United States* (Westport: Greenwood Press, 1996)

[2] Valiante, Marcia, Deborah, "Legal Foundations of Canadian Environmental Policy: Underlining Our Values in a Shifting Landscape" in Boardman, Robert and Deborah Van Nijnatten (Eds), *Canadian Environmental Policy Context and Cases* Second Edition (Toronto: Oxford University Press, 2002): 6

and-control model of management towards alternative policy instruments (*e.g.*, economic and voluntary instruments) may be an unsuitable match with federal authority under criminal jurisdiction[3]. Finally, the federal Peace, Order, and Good Government (P.O.G.G) power has formed the basis for a number of environmental statutes, most notably those arguably necessitating national standards, as in the case of air pollution. Sections 92 and 93 of the Constitution Act outline 17 areas through which the provinces can act to manage the environment. Generally, provincial[4] jurisdiction is derived from the authority to legislate in regards to property and civil rights, local works and undertakings, and all matters of a local or private nature. As well, because of their power over natural resources and municipal governments, the provinces have control over the development, conservation, and management of natural resources in their region and are responsible for developing and enforcing industrial and municipal pollution regulations as well as regulating the transport, discharge, and disposal of wastes in their territory.

The Canadian environmental policy regime can be described as federal in theory but often provincial in practice. Moreover, the considerable overlap between federal and provincial jurisdiction over environmental matters has produced a complex and confusing context for the implementation of environmental policies. Deborah Van Nijnatten has noted that such a decentralized federation encourages a high degree of vertical fragmentation as authority is split among a variety of departments across several levels of

[3] Ibid., 7.

[4] The term provincial will be used to encompass both the provinces and territories

government[5]. There has also been a growing consensus within the literature that the Canadian structure of federalism accentuates the "buck-passing" tendencies of such a system[6]. That is, everyone wants to take credit for popular or successful measures, yet it is easy to avoid blame in less successful situations. Despite this, a relatively harmonious division of responsibility between the two levels generally characterizes the traditional pattern that has developed in federal-provincial relations. For example, the Canadian Council of Ministers of the Environment (CCME)[7] was created in 1988 to promote cooperation between federal and provincial authorities in environmental matters.

The CCME, through its *Statement of Inter-Jurisdictional Cooperation on Environmental Matters*, is the principal vehicle for inter-jurisdictional cooperation on environmental issues of national and international concern[8]. The council consists of environment ministers from 14 member jurisdictions, including ten provinces, three territories, and the federal government. The CCME has several main objectives: the adoption of standards and national objectives: the adoption of uniform strategies in order to face environmental problems at the national, international, and global level: the

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[5] Van Nijnatten, Deborah, "Environmental Governance in an Era of Participatory Decision-Making Canadian and American Approaches", *American Review of Canadian Studies*, Vol. 26 3, 1997, 405-423.

[6] See Skogstad, Grace, "Intergovernmental Relations and the Politics of Environmental Protection in Canada", in K M Holland et al (eds), *Federalism and the Environment Environmental Policymaking in Australia, Canada, and the United States* (Westport: Greenwood Press, 1996); Rabe, Barry, "Federalism and Entrepreneurship: Explaining American and Canadian Innovation in Pollution Prevention and Regulatory Integration", *Policy Studies Journal*, Vol. 27:2, 1999, 288-306, Harrison, Kathryn, *Passing the Buck Federalism and Canadian Environmental Policy* (Vancouver: University of British Columbia Press, 1996).

[7] Formerly the Canadian Council of Resource and Environment Ministers (CCREM)

[8] Canadian Council of Ministers of the Environment *Statement of Inter-Jurisdictional Cooperation on Environmental Matters* (Winnipeg, CCME, 1990).

improvement of links between national and international policies and programs; and the conciliation of environmental assessment procedures. Multi-bureaucratic cooperation is evident in the Canada-Wide Accord on Environmental Harmonization that provides for sub-agreements to be developed in areas of environmental management requiring coordinated government action[9]. Sub-agreements have been signed with most provinces dealing with inspections, environmental standards, and environmental assessments. A key element of the agreements is a "one-window approach" of management in which government roles are assumed by the agency/jurisdiction best situated to deal with the circumstances, thus avoiding unnecessary overlap or duplication of responsibilities.

Managing Toxic Substances: A Changing Policy Style

In Canada, the majority of environmental "rules" have taken the form of regulations. Perhaps the most central problem of regulation has been the pattern of a negotiative relationship between government and industry in setting standards and scheduling compliance, from which other stakeholders have traditionally been excluded[10]. Economic factors (*i.e.*, employment and profit) are often primary considerations guiding the regulatory process, especially in regions where the threat of large-scale industrial unemployment from plant closures may be invoked to counter or postpone efforts at more

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[9] Canadian Council of Ministers of the Environment, *Guide to the Canada-Wide Accord on Environmental Harmonization*, Environment Canada, 1998 (www.ccme.ca).

[10] See Hessing, Melody and Michael Howlett *Canadian Natural Resource and Environmental Policy* (Vancouver: UBC Press, 1997): 185; Environmental Commissioner of Ontario, *The Ontario Regulation and Policymaking Process In a Comparative Context: Exploring the Possibilities for Reform* 1996, Howlett, Michael, "Beyond Legalism? Policy Ideas, Implementation Styles and Emulation-Based Convergence in Canadian and U.S. Environmental Policy", *Journal of Public Policy*, Vol. 20:3, 2000: 301-329; Rabe, Barry and Janet Zimmerman, "Beyond Environmental Regulatory Fragmentation, Signs of Integration in the Case of the Great Lakes Basin", *Governance*, Vol 8:1, 1995, 58-77

stringent regulatory processes[11]. Furthermore, the implementation of environmental policy has operated largely as a closed bi-lateral bargaining process between government and industry. Industry has provided much of the baseline data, technical information concerning abatement technology, and cost-benefit analysis for production and pollution abatement from which many regulatory standards have been set[12]. The relatively closed nature of this Canadian environmental policy system has provided little opportunity for advocacy groups to advance their positions on environmental issues[13].

However, over the last twenty to thirty years the broad character of environmental stresses in Canada has shifted, in a manner similar to changes in all industrialized countries. There has been a shift in the underlying principles guiding the regulatory framework – away from closed and coercive end-of-pipe measures to policies that promote pollution prevention, the precautionary principle, and more open and cooperative policy processes[14]. In Canada, we are seeing an increasing use of multi-stakeholder consultations designed to foster consensus among relevant interests as well as an increasing use of voluntary measures as a policy instrument of choice.

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[11] Hessing, Melody and Michael Howlett *Canadian Natural Resource and Environmental Policy* (Vancouver: UBC Press, 1997), 180

[12] See Hessing, Melody and Michael Howlett, *Canadian Natural Resource and Environmental Policy* (Vancouver, UBC Press, 1997): 192; Howlett, Michael, "Beyond Legalism? Policy Ideas, Implementation Styles and Emulation-Based Convergence in Canadian and U.S. Environmental Policy", *Journal of Public Policy*, Vol 20:3 2000, 305-329.

[13] See Hessing, Melody and Michael Howlett, *Canadian Natural Resource and Environmental Policy* (Vancouver: UBC Press, 1997): 137; Rabe, Barry and Janet Zimmerman, "Beyond Environmental Regulatory Fragmentation: Signs of Integration in the Case of the Great Lakes Basin", *Governance*, Vol 8:1, 1995: 58-77.

[14] See Environment Canada, *Pollution Prevention, A New Way of Doing Business*, 2000; Parson, Edward, "Environmental Trends and Environmental Governance in Canada", *Canadian Public Policy*, Vol. 26.2, 2000: S123-S143.

There have been a number of studies examining changes in Canada's policy style in relation to environmental management. Kathryn Harrison and George Hoberg compared patterns of policymaking for a number of environmental issues[15]. They found that the traditional policymaking style, in which Canada's regulatory processes tended to be closed, informal and consensual, was changing. They noted that Canada has opened its regulatory process to more public scrutiny. Both levels of government have begun to provide more opportunities for consultation and tend to justify their actions in greater detail. Melody Hessing and Michael Howlett found that within the larger policy community surrounding environmental management in Canada, a smaller triadic policy network has evolved in which environmental groups have managed to disturb the old pattern of bi-lateral government-industry relations[16]. While this new policy subsystem marks a significant change in the policy community, the authors note that the impact of these new actors remains weak in comparison to the government-industry bargaining unit that continues to dominate the policy process. Finally, Michael Howlett has conducted a series of studies to ascertain whether Canadian environmental policy is converging towards that found in the United States. In a study of the role of the judiciary, Howlett notes that there has not been an increase in the number of environmental lawsuits in Canada, nor have Canadian judges become more interventionist. The Canadian judiciary

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[15] Harrison, Kathryn and George Hoberg. *Risk, Science and Politics: Regulating Toxic Substances in Canada and the United States* (Montreal: McGill-Queen's University Press, 1994): 169

[16] Hessing, Melody and Michael Howlett. *Canadian Natural Resource and Environmental Policy* (Vancouver: UBC Press, 1997); See also Van Nijnatten, Deborah. "Environmental Governance in an Era of Participatory Decision-Making: Canadian and American Approaches". *American Review of Canadian Studies*, Vol. 26:3, 1997: 405-423.

continues to play a minor role with regards to environmental management.[17] In a subsequent study, Howlett outlines the evolution of policy instrument choice and implementation in Canada. He notes that since the mid-1980s Canada's environmental policy regime has evolved from the traditional closed, bi-lateral bargaining system to one with an increased emphasis on self-regulation and voluntary initiatives and increased multi-stakeholder consultation[18].

The following section will look in greater detail at this change in policy instrument choice and implementation style in Canada. It will outline the environmental management framework used in Canada to address the issue of toxic substances, providing an overview of the various policy instruments being employed by both the federal and provincial governments. Particularly, it will provide insight into the use of voluntary measures within Canada's regulatory structure.

Policy Instruments for Managing Toxic Substances

As noted earlier, internationally governments have moved away from end-of-pipe pollution management techniques to approaches that utilize a variety of policy instruments. It is now widely recognized that when addressing the problem of toxic substances, there is no "one size fits all" solution. To deal with the increasing

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[17] Howlett, Michael, "The Judicialization of Canadian Environmental Policy, 1980-1990: A Test of the Canada-United States Convergence Thesis", *Canadian Journal of Political Science*, Vol. 27:1, 1994: 99-127; See also Knopff, Rainer and J.E. Glenn, "Courts, Tribunals, and the Environment in Canada", in Kenneth Holland et al (Eds). *Federalism and the Environment: Environmental Policymaking in Canada, Australia, and the United States* (Westport: Greenwood Press, 1996).

[18] Howlett, Michael, "Beyond Legalism? Policy Ideas, Implementation Styles and Emulation-Based Convergence in Canadian and U.S. Environmental Policy", *Journal of Public Policy*, Vol. 20:3, 2000: 305-329.

complexities of managing toxic substances, federal and provincial governments in Canada have developed a management structure that encompasses a mix of both regulatory and non-regulatory instruments. This includes national policies and programs, legislation and regulations, guidelines and codes of practice, monitoring programs, and a range of voluntary initiatives. The following discussion will highlight some of the key instruments that are currently playing a role in environmental management in Canada.

National Policies:

Two of the main principles governing the management of toxic substances in Canada (and internationally) are the precautionary principle and pollution prevention. At the 1992 United Nations Conference on Environment and Development (UNCED), governments worldwide agreed to subscribe to Principle 15 of the Rio Declaration. Known as the "precautionary principle" it states, "...where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation."[19] Pollution prevention has also been a guiding principle behind many initiatives in Canada - both regulatory and non-regulatory. In 1993 the Canadian Council of Ministers of the Environment (CCME) released its National Commitment to Pollution Prevention, emphasizing that, "...voluntary action, regulation, and economic instruments all have important and often complementary roles to play in pollution prevention."[20] In 1995 the

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[19] Office of the Auditor General of Canada. *Report of the Commissioner of the Environment and Sustainable Development to the House of Commons: Chapter 3: Understanding the Risks from Toxic Substances*. 1999: 5.

[20] Environment Canada. *Reviewing CEPA: The Issues-Pollution Prevention*. 1994: 22.

federal government released the federal policy on pollution prevention entitled "Pollution Prevention: A Federal Strategy for Action"[21]. At its core is a fundamental shift from control measures to prevention, reflecting a major change in the way government manages toxic substances. Moreover, the principle of pollution prevention encourages the kinds of changes that will lead to lower production costs, increased efficiencies, and more effective environmental protection-in accordance with the Sustainable Development approach. Traditionally, waste has been managed through treatment, recycling, or landfill – all of which are costly. Pollution prevention looks at where waste is generated and how best to reduce or eliminate it at source. The Canadian Office of Pollution Prevention lists the following common practices to implement the pollution prevention principles: materials or feedstock substitutions; product design or reformulation; equipment or process modifications; spill and leak prevention; on-site re-use, recycling or recovery; improved inventory management or purchasing techniques; and good operating practices or training[22].

A central component of the federal environmental management structure is the Toxic Substances Management Policy (TSMP). Established in 1995, the policy is a preventative and precautionary approach to dealing with substances that pose a danger to human health or the environment. The policy uses a science-based framework for the

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[21] Environment Canada. *Pollution Prevention: A Federal Strategy for Action*. 1998.

[22] National Office of Pollution Prevention. *Pollution Prevention Fact Sheet: The Nuts and Bolts of Pollution Prevention (P2)*. Environment Canada. 2002.

management of toxics based on a two-track approach[23]. Track-1 substances meet all four criteria set out in the TSMP - persistence, bioaccumulation, toxicity, and resulting predominantly from human activity. The goal for these substances is virtual elimination. Track-2 encompasses the management of all other toxic substances and substances of concern throughout their entire lifecycles to prevent or minimize their release into the environment (cradle-to-grave management).

These national policies are supplemented by regional and joint federal-provincial initiatives that are required to be consistent with national guidelines. Some examples include: Saint Laurent Vision 2000; Fraser River Action Plan; Arctic Environment Strategy; Federal-Provincial Task Force on Dioxins and Furans; and the Canada-Ontario Agreement[24].

Legislation and Regulatory Instruments:

The Canadian Environmental Protection Act (CEPA) is the federal government's framework for regulating and controlling toxic substances[25]. Established in 1988 and updated in 1999, CEPA enables the federal government to take action, including making regulations, relating to the quantity or concentration of a toxic substance that may be released to the environment. There are three main classes of substances outlined in the

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[23] Environment Canada. *Towards a Toxic Substances Management Policy For Canada. A Discussion Document for Consultation Purposes*. 1994; Environment Canada. *Toxic Substances Management Policy*. 1996.

[24] Environment Canada. *Towards a Toxic Substances Management Policy For Canada. A Discussion Document for Consultation Purposes*. 1994; Environment Canada. *Toxic Substances Management Policy*. 1996.

[25] See Environment Canada. *Canadian Environmental Protection Act. Annual Report April 1999 to March 2000*. 2000; Environment Canada. *Toxic Substances Management Policy*. 1996.

act: the Domestic Substance List (DSL)[26]; the Priority Substance List (PSL)[27]; and new chemical substances[28]. Since the start of CEPA, 23,000 substances have been placed on the DSL. Of these, 44 were designated as priority substances and placed on the PSL-1 List in 1989. Of these, 25 were designated as "toxic" under Section 64 of CEPA 1999, 5 were not considered to be toxic, and 14 had insufficient data to make a final conclusion. The PSL-2 List was published in 1995 and lists another 25 substances currently under assessment. Furthermore, CEPA 1999 requires the categorization of all 23,000 substances on the DSL by the year 2006. Then, if required, a screening-level risk assessment will be conducted to determine if they are "CEPA toxic[29]" and should be placed on the Priority Substance List for more in-depth assessment. Substances found to be toxic based on the PSL assessments are subject to the Strategic Options Process (SOP) to determine how best to reduce or eliminate the risk they pose[30]. The SOP is a multi-stakeholder process that uses a two-track approach to develop management plans for the

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[26] The DSL includes substances that were, between January 1, 1984 and December 31, 1986, in Canadian commerce, used for manufacturing purposes, or manufactured in or imported into Canada in a quantity of 100kg or more in any calendar year. It has been amended periodically following assessments under the New Substances Notification Regulations.

[27] PSL substances must undergo risk assessments to determine whether they are toxic, as defined under CEPA.

[28] CEPA requires any person or company that intends to manufacture or import new substances (i.e. not on the DSL) to provide information to assess the potential environmental and health effects associated with its use.

[29] Under CEPA, a substance is toxic if it is entering or may enter the environment in a quantity or concentration or under conditions that: (a) have or may have an immediate or long-term effect on the environment or its biological diversity; (b) constitute or may constitute a danger to the environment on which life depends; or (c) constitute or may constitute a danger in Canada to human life or health.

[30] Environment Canada. *Strategic Options Process*. 1999; Environment Canada. *Canadian Environmental Protection Act. Annual Report April 1999 to March 2000*. 2000; Environment Canada. *Toxic Substances Management Policy*. 1996.

designated toxics. A *sector approach* is used when a substance is released with other toxic substances during an industrial operation. A *substance approach* is used when the substance is released during the manufacture or use of a commercial product.

Additional important pieces of legislation to note include the Transportation of Dangerous Goods Act, the Pest Control Products Act, and the Fisheries Act which allows the federal government to regulate any activity which is deleterious to fish or fish habitat. Additionally, there are a number of provincial environmental acts and statutes that apply at the regional level[31]. Acts and statutes are typically general in nature in terms of requirements and have broad policy perspectives.

Regulations are made pursuant to authority set out in an act and provide more specific operational details. Permits, certificates of approval, certificates of authorization, and licenses are issued to specific parties by federal and provincial agencies (mainly provincial) as required under regulations[32]. For example, in Ontario most certificates fall under the authority of the Environmental Protection Act and the Ontario Resources Act. Certificates include information on the type of waste and the amount generated on site, removed, or transferred, and the process utilized. As well, specifications are included concerning the standards to be met, criteria for the identification of wastes on site, and

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[31] For a listing of key environmental regulations in Canada See: Harrison, Kathryn and George Hoberg. *Risk, Science and Politics: Regulating Toxic Substances in Canada and the United States* (Montreal: McGill-Queen's University Press, 1994): 11; Phyper, J.D. and Brett Ibbotson, "Regulatory Framework" in John David Phyper and Brett Ibbotson (Eds). *Environmental Management in Canada* (Toronto: McGraw-Hill Ryerson, 1996): 15.

[32] For an overview of the regulatory framework in Canada see: Phyper, J.D. and Brett Ibbotson, "Regulatory Framework" in John David Phyper and Brett Ibbotson (Eds.). *Environmental Management in Canada* (Toronto: McGraw-Hill Ryerson, 1996): 18.

plans for emergencies, operations, and maintenance. Additionally, control orders (stop, clean-up, prevention or control orders) are issued to parties by federal or provincial authorities, usually in response to failure by a party to comply with an act or regulation.

Monitoring Pollutants:

The National Pollutant Release Inventory (NPRI), established in 1993, is the only legislated, nation-wide, publicly accessible inventory of pollutant releases and transfers in Canada[33]. It requires industry to report annually on releases and transfers of a list of substances. The NPRI has established a permanent process for modifying the inventory, with respect to reporting thresholds and criteria, as well as the list of substances to be tracked. There are currently 268 substances listed in the inventory, 67 of which have been declared toxic under CEPA or are designated carcinogens. Companies which meet the following criteria for each substance are required to report to the NPRI: have employees working a total of 20 000 hours or more during the year; and the substance was manufactured, processed or otherwise used in a quantity of 10 tonnes or more during the year and the concentration of the substance was greater than or equal to one percent by weight.

However, NPRI data represents only a portion of all chemical releases and transfers to the Canadian environment. Other substances, such as greenhouse gases, many pesticides, and other pollutants, are not part of the inventory (although they may be reported or managed through other programs, *e.g.* ARET program). As well, facilities

[33] Environment Canada. *Overview of the NPRI*. 2000; Environment Canada. *Guide for Reporting to the National Pollutant Release Inventory*. 2000; Environment Canada. *National Pollutant Release Inventory. National Overview 1999*. 1999.

that do not meet the reporting thresholds either because of their size (due to the number of employees or quantity of substance used) or are exempt, such as gas stations, are not tracked. However, such sources (*e.g.* many small and medium-sized companies) may account for a large portion of releases of some pollutants.

Non-Regulatory Instruments:

Non-regulatory instruments have become an important part of the management framework for toxic substances in Canada. A 1999 Report of the Commissioner of the Environment and Sustainable Development states, "…the federal government relies increasingly on voluntary programs instead of regulations to reduce releases of toxic substances."[34] The following discussion will outline some of the major categories of voluntary measures currently in use in Canada. This will include a discussion of: compliance agreements; ISO 14000; Memorandums of Understanding; and voluntary challenge programs.

First, codes of practice, policies, and guidelines are used by federal and provincial governments to address many environmental issues. For example, in the case of enforcement, compliance agreements are widely used as an alternative or precursor to regulatory action. Compliance agreements are agreements made by a regulated business to the regulating agency, describing its plan for resolving a problem of non-compliance[35].

[34] Office of the Auditor General of Canada. *Report of the Commissioner of the Environment and Sustainable Development to the House of Commons: Chapter 4: Managing the Risks of Toxic Substances.* 1999: 19.

[35] For an overview of the use of compliance agreements in Canada see: Phyper, J.D. and Brett Ibbotson, "Regulatory Framework" in John David Phyper and Brett Ibbotson (Eds). *Environmental Management in Canada* (Toronto: McGraw-Hill Ryerson, 1996): 19; Commission for Environmental Cooperation.

Essentially the goal of these negotiated agreements is to increase compliance and decrease the need to prosecute or seek injunctions. They are made after the company has been found to be out of compliance. Compliance agreements are used as a tool by provincial governments across the country; however only the Yukon, Nova Scotia, and Ontario have specific statutory authority for such agreements. Environment Canada emphasizes that compliance agreements are most effective when offered to those regulated businesses that are out of compliance but are "well intentioned" (*e.g.* are inadvertently out of compliance). In such cases, voluntary compliance agreements can achieve an acceptable level of compliance at a lower cost to the regulator than if they were prosecuted. However, it is important to maintain a credible and aggressive threat of enforcement for repeat offenders.

ISO 14000 is an important international program that is widely subscribed to by Canadian companies. ISO 14000 is a set of international voluntary standards covering a wide range of issues, including environmental management systems (EMSs), performance evaluations, eco-labeling, and lifecycle assessment. It contains a core document, ISO 14001, which requires companies to have a coherent framework for setting and reviewing environmental objectives and for regularly measuring progress. ISO 14001 does not set environmental performance goals, such as specific emission standards, and does not measure compliance. ISO standards are meant to complement regulations, not replace them. The theory is that environmental impacts will be reduced

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Voluntary Measures to Ensure Environmental Compliance: A Review and Analysis of North American Initiatives (Montreal: CEC, 1998).

through good management. Studies have shown that companies with a sophisticated EMS are increasingly rare among those convicted of environmental offences[36].

Many jurisdictions within Canada have begun to experiment with the use of memoranda of understanding (MOUs) to promote environmental improvements. These may take the form of arrangements with specific companies, provincial-municipal agreements, provincial-industrial sector MOUs, or provincial-federal MOUs with large industry sectors[37]. An example of a sector-wide initiative is the 1992 Canadian Automotive Manufacturing Pollution Prevention Project, signed with Environment Canada and the Ontario government[38]. It commits members of the Canadian Vehicle Manufacturers Association to reducing, eliminating, and preventing the use, generation, and release of more than thirty substances of concern from automotive operations. An example of a single company MOU is that made between Dofasco and the Ontario government[39]. In the eight-year agreement Dofasco commits to go beyond regulatory targets for benzene and polycyclic aromatic hydrocarbons (PAHs). However, such agreements have been criticized as they grant concessions to individual companies or

[36] Commission for Environmental Cooperation. *Voluntary Measures to Ensure Environmental Compliance: A Review and Analysis of North American Initiatives* (Montreal: CEC, 1998).

[37] Commission for Environmental Cooperation. *Voluntary Measures to Ensure Environmental Compliance: A Review and Analysis of North American Initiatives* (Montreal: CEC,1998).

[38] Commission for Environmental Cooperation. *Voluntary Measures to Ensure Environmental Compliance: A Review and Analysis of North American Initiatives* (Montreal: CEC, 1998); Environment Canada. *Canadian Environmental Protection Act. Annual Report April 1999 to March 2000*. 2000.

[39] Lukasik, Lynda, "The Dofasco Deal" in Robert Gibson (Ed). *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999); Lukasik, Lynda, "Dofasco Deal Cuts Pollution and Controls", *Alternatives*, Vol. 24:2, 1998: 8-9.

sectors, creating an uneven playing field. As well, most MOUs lack any form of public accountability as they are most often negotiated behind closed doors.

Finally, there are several voluntary challenge programs that aim to control and reduce releases of toxic substances. The most prominent of these are the Responsible Care Program, the Voluntary Challenge and Registry (VCR), and the ARET Program. Responsible Care is a sector-based program in which the Canadian Chemical Producers Association (CCPA) requires participation as a condition of membership[40]. It was initiated in Canada in 1984 in anticipation of new regulations following a series of chemical accidents in the United States (Love Canal) and abroad (Bhopal, India). Today, organizations of the Responsible Care Program have been implemented in over 40 countries worldwide. The VCR is a private-public partnership, established in 1997, which challenges companies to reduce their greenhouse gas emissions and maintains a registry to record contributions and achievements[41]. However, the program has been criticized for a number of design flaws such as the lack of mandatory reporting requirements and lack of incentives for action. ARET is a multi-stakeholder initiative and is the leading voluntary initiative for managing toxic substances in Canada. As the focus of this study, the ARET Program will be looked at in greater detail in a following section.

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[40] Green, Reg, "The Chemical Industry's Responsible Care Program Viewed from an International Trade Union Perspective", *Industry and Environment*, Vol. 21:1-2, 1998: 54-56; Lever, Hugo, "Responsible Care in Action", *Industry and Environment*, Vol. 21:1-2, 1998: 49-53.

[41] Hornung, Robert, "The VCR Doesn't Work", in Robert Gibson (Ed). *Voluntary Initiatives and the New Politics of Corporate Greening* (Peterborough: Broadview Press, 1999).

A 1999 study of the use and role of voluntary measures across OECD countries found a total of 95 voluntary agreements in place in Canada[42]. Table 3.1 provides a summary of these, illustrating the types of voluntary measures in use in Canada. It is clear from this table that negotiated agreements (*e.g.* MOUs) are the preferred type, perhaps reflecting the more cooperative industry-government relationship that is prevalent in Canada.

Table 3.1
Voluntary Measures in Use in Canada

Category of Voluntary Measure	Number of Programs
Public Voluntary Programs	2
Unilateral Commitments	30
Negotiated Agreements	63

Canada's Performance in Managing Toxic Substances

In Canada a complicated infrastructure of scientific research and monitoring, regulations, policies, and voluntary programs has been established to protect the health of Canadians and their environment from the risks associated with toxic substances. In 1999, the Commissioner of the Environment and Sustainable Development released a report evaluating the management of toxic substances in Canada[43]. The audit examined activities in six key federal departments - Environment Canada, Health Canada, Department of Fisheries and Oceans, Agriculture and Agri-Food Canada, Natural

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[42] Organization for Economic Cooperation and Development. *Voluntary Approaches for Environmental Policy: An Assessment* (Paris: OECD, 1999).

[43] See Office of the Auditor General of Canada. *Report of the Commissioner of the Environment and Sustainable Development to the House of Commons: Chapter 3: Understanding the Risks from Toxic Substances*. 1999; Office of the Auditor General of Canada. *Report of the Commissioner of the Environment and Sustainable Development to the House of Commons: Chapter 4: Managing the Risks of Toxic Substances*. 1999.

Resources Canada, and Industry Canada - and reviewed key pieces of legislation in the federal framework for managing toxic substances. The results of this audit were not promising and the audit left the government with 27 important recommendations for action. The following section will outline some of the key findings that have significance for this study.

According to Canada's Domestic Substances List (DSL), there are approximately 23,000 chemical substances in industrial and commercial use in Canada. A variety of factors make it difficult to isolate the effect of any individual toxic substance from the effects of other substances and influences. The audit identified many weaknesses in the federal government's collection and use of scientific information on toxic substances. They found weaknesses in interdepartmental coordination of research efforts, incomplete monitoring networks, a lack of re-evaluation of pesticides, conflicting departmental agendas and priorities, and a growing gap between the demands placed on departments and the availability of resources to meet these obligations. Specifically, they found that ambient monitoring[44] was inconsistent and incomplete, even for priority substances. Similarly, effects monitoring was a patchwork of various regional initiatives that are disorganized and unfocused. Additionally, there has been a decline in resources devoted to overall scientific investigation in the federal government. For example, from 1994-1998 four key science-based departments - Environment Canada, Health Canada, Department of Fisheries and Oceans, and Natural Resources Canada - reduced their total

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[44] Ambient monitoring deals with conditions in the air, land or aquatic environment where the material being measured is well mixed into the surrounding environment. By contrast, effluent (discharge) monitoring involves sampling and analysis of material at the point source.

scientific personnel by seventeen percent[45]. As well, Table 3.2 illustrates the overall reductions in total pollution abatement and control expenditures from 1995 to 2000 throughout Canada.

Table 3.2
Canada: Government Pollution Abatement and Control Expenditures ($ thousands)

	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000
Canada	1 093 786	935 763	884 960	845 976	882 307
Newfoundland	14 177	10 008	28 208	26 310	22 954
Prince Edward Island	5680	5694	6484	6659	17 171
Nova Scotia	28 965	21 817	24 945	28 120	31 883
New Brunswick	67 174	55 579	52 434	54 537	56 383
Quebec	154 711	149 957	172 772	192 190	202 288
Ontario	328 785	211 920	172 789	201 036	210 860
Manitoba	15 754	25 783	36 912	40 610	43 383
Saskatchewan	55 235	75 740	50 455	70 135	57 743
Alberta	240 827	198 787	176 487	112 424	135 265
British Columbia	166 451	169 332	150 259	97 027	101 674
Yukon	5295	1276	2543	2479	1819
Northwest Territories	10 746	9875	10 681	14 594	1135
Nunavut	--	--	--	--	0

Source: Statistics Canada. 2003

Moreover, even while existing demands are not being met, departments are being asked to respond to emerging issues. CEPA 1999 calls for the categorization of the 23 000 substances on the Domestic Substances List to identify those substances that pose the greatest threat to Canadians and the environment, a task that will take many years to complete. Furthermore, risk management programs are fragmented according to departmental mandates and legislative responsibilities. Individual chemicals are subject to different legislative and regulatory requirements, decision-making processes, policy

[45] Office of the Auditor General of Canada. *Report of the Commissioner of the Environment and Sustainable Development to the House of Commons: Chapter 3: Understanding the Risks from Toxic*

instruments, and reporting mechanisms. For example, the Fisheries Act is based on "zero tolerance" - no deleterious substance may be deposited in waters frequented by fish unless under conditions authorized by legislation. However, the Pest Control Products Act (PCPA) allows for some level of acceptable risk associated with the use of pesticides. Thus, while a pesticide may be legally registered for use under PCPA, its use in waters frequented by fish would be in contravention of the Fisheries Act[46]. The diverse legislative and policy perspectives of numerous departments result in a complex, and often conflictual, policy environment.

The audit also identified problems with the tracking of releases of toxic substances. The National Pollutant Release Inventory is Canada's only national mandatory pollutant release inventory. Under NPRI, regulated companies must report releases of 268 pollutants (this is for the 2000 reporting year; there were 163 substances tracked for the 1999 reporting year.), 67 of which are designated as toxic substances. There is no collection of data on releases of pesticides. Since releases are tracked only on companies that meet the reporting requirements of the NPRI, releases from many small and medium-sized companies are not reported. The audit also criticized the NPRI with regards to limitations in the number of substances covered in the inventory. As of 2000, the NPRI tracked releases of 268 pollutants, as compared to the American Toxics Release Inventory that includes 648 substances.

Substances. 1999.

[46] Office of the Auditor General of Canada. *Report of the Commissioner of the Environment and Sustainable Development to the House of Commons: Chapter 4: Managing the Risks of Toxic Substances*. 1999.

The audit notes that voluntary measures are being used as a core element of the federal management strategy to achieve reductions in toxic substances. In Canada, 160 chemicals have been identified as toxic, 84 of which are considered to be "high priority" substances. The audit found that the majority of these substances are managed through initiatives like ARET and Memorandums of Understanding[47]. The audit reviewed nine existing MOUs and the ARET program based on design criteria they identified as necessary for a successful voluntary initiative. Table 3.3 illustrates the results of this analysis. In the opinion of the audit neither ARET nor any of the MOUs are sufficient to be used as the only tool for achieving and measuring reductions of substances and it was recommended that the government develop a framework for the use and integration of voluntary measures that includes these key components.

Table 3.3
Important Criteria for Success of Voluntary Initiatives

Criteria	Number of Voluntary Initiatives meeting Criteria
Clear program goals and targets	2
Standardized performance measures	1
Clearly defined roles and responsibilities	1
Consequences if performance objectives not met	0
Regular reporting on meeting objectives and credible verification of results (*e.g.* third party audits)	1
Continual improvement: corrective actions to be taken where performance objectives have clearly not been met	0

Source: Office of the Auditor General of Canada. *Report of the Commissioner of the Environment and Sustainable Development to the House of Commons: Chapter 4: Managing the Risks of Toxic Substances.* 1999.

[47] For a complete list of substances managed by Environment Canada and their associated management tools see Office of the Auditor General of Canada. *Report of the Commissioner of the Environment and Sustainable Development to the House of Commons: Chapter 4: Managing the Risks of Toxic Substances.* 1999. Appendix.

In 2002 the Commissioner of the Environment and Sustainable Development released a follow-up report to the 1999 audit, to assess progress made in implementing their 27 recommendations[48]. This subsequent report identified some limited progress in the areas outlined above. First, the audit found improved consultation and coordination among departments with regards to scientific research efforts. This has been due, in large part, to activities under the Toxics Substances Research Initiative. However, they found little improvement in measuring the presence and effects of toxic substances. This will, perhaps, improve since the Minister of the Environment has created the Task Force on the Canadian Information System for the Environment (CISE) to provide advice on the design and implementation of an environmental information system[49]. In the last decade, government-sponsored environmental monitoring programs have been significantly reduced and the data that does exist is often inconsistent in the indicators chosen between regions of Canada. Furthermore, according to the 2001 Environmental Sustainability Index, Canada ranks 25th in the world in the availability of environmental information[50]. The focus of the CISE is upon the collection, management, assessment, and communication of environmental knowledge to provide the basis for sound environmental policies in Canada.

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[48] Office of the Auditor General of Canada. *Report of the Commissioner of the Environment and Sustainable Development to the House of Commons. Chapter 1: Toxics Substances Revisited.* 2002.

[49] An overview of the CISE program's mandate, objectives, and projects can be obtained at www.ec.gc.ca/cise.

[50] Environment Canada. *Task Force on the Canadian Information System for the Environment.* (www.ec.gc.ca/cise) 2002

The audit also found that tracking of key toxic substances has been improved through additions to the NPRI. Since the 1999 review, 105 substances have been added to the inventory and thresholds for some substances have been lowered. The additions include many substances that have been declared toxic under CEPA. However, there are many substances still to be managed in the future. CEPA 1999 requires that all 23 000 substances on the Domestic Substances List be categorized by September 2006. Those substances that have been identified as having the greatest potential exposure to Canadians or that are persistent, bioaccumulative, and inherently toxic will then undergo an assessment or screening[51]. It is projected that this process could take decades to complete.

Finally, the 1999 audit recommended that Environment Canada develop a policy framework outlining the conditions under which voluntary measures could be used within the existing regulatory framework. The result of this recommendation was the development of a consultation document "Policy Framework on Environmental Performance Agreements" which outlines the design criteria and implementation strategy for the use of such voluntary measures as a key policy instrument in the regulation of toxic substances in Canada. The framework defines an Environmental Performance Agreement (EPA) as, " …an agreement with core design criteria negotiated among parties to achieve specified environmental results. Environment Canada may negotiate an EPA with a single company, multiple companies, regional industry associations, a sector

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[51] Office of the Auditor General of Canada. *Report of the Commissioner of the Environment and Sustainable Development to the House of Commons. Chapter 1: Toxics Substances Revisited.* 2002.

association or a number of sector associations."[52] The document makes it clear that EPAs are not meant to replace the regulatory framework but rather that they represent an additional tool that can be used in the management of the environment. Their selection as a policy tool will depend on factors such as the nature of the problem to be managed and the performance history of companies being considered for the agreement. Two of the major industry associations in Canada have already signed EPAs. The Canadian Chemical Producers Association signed an agreement with Environment Canada, Health Canada, Industry Canada, Alberta, and Saskatchewan to reduce pollution from chemical production. As well, an EPA with Environment Canada and Industry Canada has replaced the existing Memorandum of Understanding with the Canadian Automotive Parts Manufacturers Association (CAPMA). The EPA will extend to the year 2007 and commits the CAPMA to reductions of volatile organic compounds and carbon dioxide emissions[53].

The Policy Framework outlines four guiding principles to be used by Environment Canada in negotiating agreements:

- *Effectiveness* – Performance Agreements must achieve measurable environmental results.
- *Credibility* – the public must have confidence in the approach and in the parties' capacity to deliver on their commitments

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[52] Environment Canada. *Policy Framework for Environmental Performance Agreements*. 2001.

[53] Environment Canada. *Industry/Community P2 Initiatives*. www.on.ec.gc.ca/pollution/fpd/prevention/6001-e.html), 2003.

- *Transparency and accountability* – all parties to an EPA must be publicly accountable for their performance
- *Efficiency* – EPAs should be no more expensive to the parties than alternatives for equivalent environmental results.

To ensure that these principles are entrenched in negotiated agreements, Environment Canada outlines core design criteria that will be necessary components of any signed commitments. These criteria incorporate many of the recommendations made for a new ARET program. The core design criteria include: senior-level commitment from participants; clear environmental objectives and measurable results; clearly defined roles and responsibilities; consultation with affected and interested stakeholders; public reporting; verification of results; continual improvement; and incentives and consequences.

The Policy Framework outlines the role that Environment Canada will play and the criteria to determine when to use a Performance Agreement. First, Environment Canada will *monitor performance* by reviewing progress made under individual performance agreements to ensure that they are on track, and take action when necessary to ensure environmental results are achieved. This leads to the second role - if agreements do not achieve the reduction limits or other performance standards within the negotiated timelines, Environment Canada will *take action with regards to non-performers*. Measures to be taken include rescinding the performance agreement and using alternative tools such as regulation and pollution prevention planning to achieve the environmental objectives. Thirdly, Environment Canada will need to *provide support* *and develop capacity* by establishing information databases, facilitating information exchange, coordinating reporting, and providing scientific and technical expertise. The final role outlined is for Environment Canada to *provide incentives* to support industry action where appropriate. Incentive measures could include public recognition from the government for achievements made under EPAs, technical assistance for participants in need, and economic instruments such as deposit/refund schemes and tradable permits. Such economic incentives are authorized under the Canada Environmental Protection Act 1999.

A final incentive that may be applied is statutory discretion. That is, when Environment Canada decides to impose regulations in an area that is the subject of an Environmental Performance Agreement, "…it will seek to do so in a way that minimizes the burden on companies meeting the requirements of the agreement."[54] There has already been some critique of such measures. On behalf of a group of 21 environmental organizations across Canada, The Canadian Institute for Environmental Law and Policy submitted a response to the Policy Framework outlining their problems with the use of EPAs[55]. Specifically, they note that such agreements limit public involvement as they tend to be negotiated behind closed doors. More importantly, they object to the fact that such agreements may lead to concessions from government to industry. In particular, they are in opposition to the idea that participation in an EPA will be a consideration

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[54] Environment Canada. *Policy Framework for Environmental Performance Agreements*. 2001:8.

[55] See Canadian Institute for Environmental Law and Policy. *Submission to Environment Canada Regarding the Policy Framework on Environmental Performance Agreements*. Prepared for the Canadian Environmental Network, Toxics Caucus. 2000.

when Environment Canada is determining such matters as "…whether and how to regulate, what reporting requirements to impose and how frequently to inspect a regulated facility."[56] They state that such "deals" essentially lead to government "…signing away regulatory and enforcement rights in return for industry doing something it should be doing anyway and at the further cost of delaying regulatory action."[57]

Finally, the Policy Framework outlines the factors that Environment Canada will consider when determining whether to use an EPA. These factors include:

- *Cost-effectiveness* – the potential of a performance agreement to secure comparable results at a lower cost
- *Supportive policy and regulatory framework* – depending on the circumstances, Environment Canada will use performance agreements as a complement to regulations, a precursor to regulations, or as an alternative to new regulations
- *Capacity of participants* – to meet obligations under an EPA, companies need to be able to identify appropriate measures, as well as track, analyze, and report on performance
- *Appropriateness* – Environment Canada will consider such issues as the scope of the problem to be addressed, the level of risk posed by the issue, the environmental track record of companies/sectors, and the likelihood of support from stakeholders when determining when to use a performance agreement.

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[56] Environment Canada. *Policy Framework for Environmental Performance Agreements*. 2001: 7.

[57] Canadian Institute for Environmental Law and Policy. *Submission to Environment Canada Regarding the Policy Framework on Environmental Performance Agreements*. Prepared for the Canadian Environmental Network, Toxics Caucus. 2000: 3.

Environment Canada has recognized that voluntary initiatives such as memorandums of understanding and challenge programs have become an important element in the government's management framework for toxic substances. The environmental problems Canada is now facing pose greater challenges to processes of assessment, decision-making and implementation than those we have faced in the past. This necessitates detailed coordination across levels of authority and policy areas and has meant a shift away from coercive regulations towards voluntary and cooperative measures and increased citizen involvement in environmental decision-making.

The above discussion has outlined the institutional framework for managing toxic substances in Canada, changes to policy style, and the range of policy instruments being used to achieve environmental objectives. As well, it has provided an assessment of Canada's performance in managing toxics, outlining the role that voluntary measures will play in this endeavor (based mainly on written documentation as there is an absence of systematic performance data). The following section will focus on the development and implementation of one such voluntary measure - the Accelerated Reduction and Elimination of Toxics Program.

The Accelerated Reduction/Elimination of Toxics Program

In the early 1990s, the concept of voluntary measures was an uncharted territory in Canada. The Accelerated Reduction/Elimination of Toxics (ARET) program, begun in 1994, is the longest running multi-sectoral voluntary program in Canada. There was no model when ARET was developed and it was considered to be a leading-edge initiative. It was not meant to be a replacement for the regulatory process, but rather an adjunct to it.

In 1997 Environment Minister Sergio Marchi stated, "...voluntary initiatives like ARET are a valuable and cost-effective complement to mandatory regulations."[58]

The mission statement for the ARET program states that it is:

> a multi-stakeholder pollution prevention and abatement initiative involving industry, health and professional organizations, as well as governments across Canada. Its purpose is to decrease the adverse effects of toxic substances on human health and the environment by accelerating the reduction or elimination of toxic substance emissions, including those that persist in the environment and may bioaccumulate in living organisms. The ARET initiative promotes cooperation among industry, governments, and other stakeholders, and provides participants the opportunity to gain credibility, public trust and support while improving their environmental performance. ARET participants voluntarily set emission reduction targets, thereby creating an open and non-prescriptive approach to the prevention of toxic pollution.[59]

This description of the ARET program is divided into two sections. The first provides an overview of the ARET Program in Canada. This includes a description of the history and development of ARET, an overview of the objectives and principles guiding the program, and a critical review of the current successes, failures, and limitations of the program. The second section focuses on the development of a successor program to ARET beyond the year 2000. This includes a review of the official evaluations of the program, their findings, and their suggestions for the future of ARET.

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[58] Pole, Kenneth, "Sergio Marchi Takes Aggressive Compliance Stance: ARET Program, *Environment, Policy, and Law*, Vol. 7:11: 487.

[59] Environment Canada. *Environmental Leaders 3: ARET Update*. 2000

Formulation and Implementation of the ARET Program

History of ARET

The origins of the ARET program can be traced back to the New Directions Group (NDG). The NDG, formed in late 1990, is an independent voluntary network of individuals from industry, environmental groups, and non-governmental organizations. The goal was to establish a forum that used cooperative methods of identifying and providing leadership in addressing significant issues for the integration of environmental and economic factors. The first problem that the group chose to address was toxic substance emissions. In September of 1991, the New Directions Group called upon the federal government to sponsor a cooperative approach to identifying then reducing and/or eliminating the most problematic toxic substances. The federal Minister of the Environment responded by launching a group that became known as the "ARET Stakeholder Committee."[60]

Comprised of representatives from industry, health, and professional associations, federal and provincial governments, and environmental and labour groups, the ARET Stakeholder Committee had three main objectives: to establish criteria for defining toxicity; to compile a list of target substances; and to devise a means by which industry could address its emissions. Thus, the first task for the Committee was evaluating the toxicity of 2000 substances and ranking them

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[60] Van Nijnatten, Deborah. *Voluntary Pollution Prevention Initiatives: Some Reflections on Government's Role in Ensuring Public Involvement* (Environmental Policy Unit, Queen's University, 1997); Environment Canada. *Environmental Leaders 3: ARET Update*. 2000; Versteeg, Hajo. *Final Report: Summary of Proceedings: Future of ARET Workshop.* Workshop held in Ottawa, Ontario, December 11, 1997. 1998.

according to their persistence, bioaccumulation, and toxicity[61]. By late 1993 the ARET Committee managed to achieve multi-stakeholder consensus on the criteria for defining toxicity and the categorization of target substances into five lists. However, they could not reach consensus on the issue of eliminating toxics as opposed to reducing toxics and on regulatory versus voluntary means of achieving these targets. As a result, a number of organizations withdrew from the process including: Pollution Probe; the Canadian Labour Congress; Toxics Watch Society of Alberta; West Coast Environmental Law Association; Great Lakes United; and Union Quebecois Pour La Conservation de la Nature.

Deborah Van Nijnatten conducted a survey of the ARET Committee members and found some additional concerns in terms of the actual committee process[62]. First, many described the mandate of the ARET Committee as "fuzzy" and "unclear", resulting in divided opinions on the reduction versus elimination and voluntary versus regulatory issues. Some members felt strongly that elimination of toxics was the only alternative. As well, opinion was divided on the role regulation should play in a voluntary program: no role at all; as a backdrop to set minimum standards and ensure a level playing field; or as a proactive framework with extensive reporting requirements. As well, there was considerable concern that the

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[61] Van Nijnatten, Deborah. *Lessons Learned from ARET: A Qualitative Survey of Perceptions of Stakeholders* (Environmental Policy Unit, Queen's University, 1996); Van Nijnatten, Debora. *Voluntary Pollution Prevention Initiatives: Some Reflections on Government's Role in Ensuring Public Involvement* (Environmental Policy Unit, Queen's University, 1997); Environment Canada. *Environmental Leaders 3: ARET Update*. 2000

[62] Van Nijnatten, Deborah. *Lessons Learned from ARET: A Qualitative Survey of Perceptions of Stakeholders* (Environmental Policy Unit, Queen's University, 1996)

provinces should have been better represented within the committee since industry operations most often interact with provincial officials. Additionally, many felt that Environment Canada should have played a stronger leadership role rather than simply acting as just another stakeholder. Also, since there were no clear rules as to how decisions were to be made, the various represented interests often forged consensus among themselves within caucuses. Finally, some committee members were disappointed that the other stakeholders did not address the issue of workplace pollution and worker protection.

In 1994, the remaining members of the ARET Stakeholder Committee[63] issued the ARET Challenge[64]. The Challenge was designed as a national program to reduce toxic substance emissions across eight industry sectors: mining and smelting; pulp and paper; chemical and chemical specialties; aluminum; oil, gas, and petroleum products; electric utilities; some manufacturing; and some federal departments. Companies were asked to voluntarily reduce and/or eliminate their emissions of ARET substances to achieve specific targets by the year 2000. Participants were asked to choose a base-year after 1987 from which they would make their reductions and to outline their commitments in a publicly accessible action plan.

The ARET Secretariat has provided publicly available progress reports to highlight achievements of the program. These reports include: Environmental

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[63] See Appendix 3.1 for a list of the ARET Stakeholder Committee.

[64] Versteeg, Hajo. *Final Report: Summary of Proceedings: Future of ARET Workshop*. Workshop held in Ottawa, Ontario, December 11, 1997. 1998; Environment Canada. *Environmental Leaders 3: ARET Update*. 2000; ARET Secretariat. *ARET Participation Guide: Voluntary Action on Toxic Substances*. 1994.

Leaders 1 (January, 1995); Environmental Leaders 2 (January, 1997); Update to Environmental Leaders 2 (January, 1998); Environmental Leaders 3 (May, 1999); and Update to Environmental Leaders 3 (May, 2000).

The following section will outline in more detail the guiding principles of the ARET Program, the substance selection process and target lists, and the objectives and goals of the program. This will be followed by an evaluation of the ARET Program, including its successes, failures, and design flaws.

The ARET Challenge: Guiding Principles

Companies who joined the ARET Challenge were expected to act in accordance with the six "ARET Principles" established by the ARET Stakeholder Committee[65]. The guiding principles included:

(1) *Sound Science and Common Sense*

Focus was to be given to what factual and quantifiable data was currently available and to recognize the weight of evidence in making decisions. The ARET Committee recognized that there would be emitter-specific, sectoral, and geographical differences for each substance and that this would generate the need to flexibly accommodate these differences while balancing the needs and concerns of all environmental stakeholders.

(2) *Pollution Prevention*

ARET encouraged pollution prevention as a preferred strategy, arguing that it could result in reduced costs, improved productivity, enhanced competitiveness, and local community support.

(3) *Life Cycle*

ARET participants were asked to consider the cumulative effects of all forms of a substance's emissions throughout all life cycle stages as a product, by-product, or waste.

(4) *Multi-Media*

ARET action plans were to avoid shifting problems from one medium to another (*i.e.* shifting an emission from air to water or soil).

(5) *Sustainable Development*

Organizations were instructed to establish their own voluntary toxic emission reduction goals that would have the quickest positive impact coupled with the least disruption to the organization's fiscal well being.

(6) *Open, Transparent, Consultative Approach*

The ARET Stakeholder Committee would keep the public informed of participant progress through bi-annual reports entitled "Environmental Leaders."

The ARET Substance List and Reduction Target Goals

The substances were selected from the Chemical Evaluation Search and Retrieval System (CESARS) database - a database of substances found in the Great Lakes Basin. The ARET Committee placed highest priority for action on substances that are toxic, bioaccumulative, and persistent. Accordingly these were the criteria used to select and prioritize a list of substances to become the focus of the ARET Program[66]. Out of

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[65] ARET Secretariat. *ARET Participation Guide: Voluntary Action on Toxic Substances*. 1994; Environment Canada. *Environmental Leaders2: ARET Update*. 1998.

[66] See Appendix 3.2 for an overview of the selection criteria.

approximately 2000 substances in the CESARS database, about one-quarter had sufficient data on toxicity, persistence, and bioaccumulation to be screened for selection[67]. The final ARET Substance List included 117 toxic substances categorized into five critical groups[68]. These groups and their reduction targets are summarized in Figure 3.1, below.

Figure 3.1
ARET Substance List and Reduction Targets

List A-1 (30 substances)	-are persistent, bioaccumulative, and toxic -target is 90% reduction by 2000
List A-2 (2 substances)	-no agreement about which criteria are met -target is "best effort" by 2000
List B-1 (8 substances)	-are toxic and bioaccumulative -target is 50% reduction by 2000
List B-2 (33 substances)	-are toxic and persistent -target is 50% reduction by 2000
List B-3 (44 substances)	-are toxic -target is 50% reduction by 2000

Source: Environment Canada. *Environmental Leaders 2: ARET Update*. 1998.

The ARET vision for the above substance lists was twofold. First, the short-term goal of the ARET program was to significantly reduce discharge of all 117 substances, based on the above target objectives. Secondly, in the long-term ARET sought: the virtual elimination of discharges into the environment from human activities of all thirty A-1 substances; and the reduction of discharges to levels that are insufficient to cause harm of the remaining eighty-seven substances.

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[67] ARET Secretariat. *The ARET Substance Selection Process and Guidelines*. 1994.

[68] See Appendix 3.3 for a complete list of the ARET substances.

Through their action plans, participants were encouraged to pursue emission reduction targets based on the best affordable technologies, management systems, and what was "…do-able when all constraints and opportunities have been assessed."[69] Success would depend upon each participant's unique circumstances and the ARET Secretariat stated, "…any initiative that accelerates the reduction and elimination of toxic emissions will be welcomed."[70]

Evaluation of ARET: Successes, Failures, and Design Flaws

Participation in ARET

At the end of 1995, there were 278 facilities from 143 companies across Canada participating in ARET[71]. By May 2000, this number had risen to 316 facilities from 169 companies and government organizations. An additional 142 companies and government organizations have filed Declarations of Support for ARET in which they state that they have negligible or no emissions of ARET substances[72]. However, concerns regarding free riders remain a major issue. Within any given industry sector there are companies that refuse to participate in voluntary measures, or they do sign on and then do very little to meet their commitments under the program. This results in an uneven playing field where some companies are committing resources that the non-participating companies are not, resulting in a competitive advantage for the free riders in the short-term. In the

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[69] ARET Secretariat. *ARET Participation Guide: Voluntary Action on Toxic Substances*. 1994: 6.

[70] Ibid. page 6.

[71] Environment Canada. *Environmental Leaders 2: ARET Update.* 1998.

[72] Environment Canada. *Environmental Leaders 3: ARET Update.* 2000.

ARET program, there was an average participation rate of 68% across the eight sectors. However, participation was uneven between the sectors, ranging from 97percent in the chemical sector (perhaps due to mandatory participation in the Responsible Care Program for members of the Canadian Chemical Producers Association (CCPA)) to 46 percent in the oil and gas sector[73]. David Roewade conducted a survey of 200 ARET participating facilities (48 percent response rate) to study the effectiveness of the ARET program[74]. When asked why they agreed to join the program, three main reasons were given. Firms welcomed the ARET approach, based on sound science and responsible targets, as an appropriate means to develop feasible environmental protection strategies. In addition, many firms hoped to avoid additional regulatory measures by participating in the program. Secondly, firms already had commitments to an industry association initiative (*e.g.,* CCPA's Responsible Care program) or corporate environmental policy that was parallel to or compatible to ARET. Finally, many firms hoped participation would help to improve their corporate image.

However, despite outreach activities by the ARET Secretariat, recruitment of new members remained a difficult task. For example, results from the ARET letter campaign in November 1997 included: 1 – company said yes to participation; 7 – companies agreed to consider participation; 5 – companies did not respond at all; and, 7 – companies said no

[73] Roewade, David. *Voluntary Environmental Action: A Participant's View of ARET.* A report prepared for Industry Canada. 1996.

[74] Roewade, David. *Voluntary Environmental Action: A Participant's View of ARET.* A report prepared for Industry Canada. 1996.

to participation[75]. The ARET Secretariat had a survey of 55 potential companies (84 percent response rate) conducted in order to obtain a profile of non-participants and assess their viewpoint on the ARET program[76]. Some reasons for choosing not to participate included statements such as, "We've already made all the reductions we are going to make until we make process changes or until we find alternatives…" and, "We have adopted an internal strategy instead of ARET. ARET doesn't meet our needs."[77] Other reasons included philosophical differences with the design of ARET, concerns over time and labour associated with program set-up and operation, reporting costs, capital investments and production costs, and confusion over the relationship among and between voluntary programs and regulations. Forty percent of the sample had not been aware of the program previous to the survey, demonstrating a need for more intensive campaigning. However, this does lend hope that there may be a potential to increase participation in a follow-up initiative once more companies are aware of the program.

Benefits of ARET

David Roewade's survey of ARET participants also provides insights into perceived benefits of the program. In the survey, ARET companies stated that they derived the following benefits from their participation in ARET: process and product cost reduction; effective toxics management strategy development; improved leak detection

[75] Environment Canada. *Environmental Leaders 2: ARET Update.* 1998.

[76] Anacapa Consulting Service Inc. *Survey of Potential ARET Participants*. Prepared for ARET Secretariat. 1997.

[77] Anacapa Consulting Service Inc. *Survey of Potential ARET Participants*. Prepared for ARET Secretariat. 1997, 8.

and repair programs; increased product yield from reduced materials loss; reduced chemical spills; improved health and safety of employees; improved public image; and improved government relations[78]. Additionally, Roewade conducted in-depth case studies of ten participating companies. Overall, eight of the ten case studies provided detailed evidence that ARET had significantly affected corporate behaviour. Some qualitative results achieved under ARET included: increased communications with suppliers, shareholders, customers, and the general public with respect to reduction strategies; improved methods of data collection, monitoring, and reporting; the creation of internal task forces involving all levels of corporate employees; and enhanced decision-making influencing industrial processes, products, and practices.

For government, ARET offered opportunities for bridging jurisdictional boundaries by working towards a common goal, at a time when both the federal and provincial governments have cut their environmental budgets. More importantly, the federal government would not have been able to achieve the reductions realized under ARET by relying on the Canadian Environmental Protection Act alone. Only 21 of the 117 ARET substances (18 percent) are regulated under CEPA[79]. A review of the ARET Program by Environment Canada found that ARET offered a forum to discuss and raise the profile of toxic substances within industry. This forum also helped improve relationships between government and industry but at the same time may have strained

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[78] Roewade, David. *Voluntary Environmental Action: A Participant's View of ARET.* A report prepared for Industry Canada. 1996.

[79] See Appendix 3.3 for a listing of ARET substances and their coverage under the NPRI, CEPA, and the Canada-Ontario Agreement.

the relationship between government and environmental organizations[80]. Moreover, one of the most significant results of ARET was the drafting of the list of toxic substances to be reduced and/or eliminated[81]. The creation of the ARET substance list is an example of a multi-stakeholder process involving creative scientific discussions and the development of a categorized list of toxic substances based on sound scientific criteria. The establishment of the list helped focus industry, government, and non-governmental organizations efforts for the reduction of toxic substances.

Performance and Design Flaws

The ARET Secretariat releases publicly accessible reports entitled "Environmental Leaders" to provide periodic updates on the progress of the program. The focus of these reports is on achievements in emission reductions. The latest report released in May 2000 states, "...emissions of ARET substances in 1998 totaled 13, 026 tonnes – a 67 percent reduction from base-year emission levels."[82] The reports provide information on ARET emissions by substance category, by sector, and for individual participants. All reductions are measured based on base-year emissions.

However, reductions reported under ARET may be misleading. Although ARET officially commenced in March of 1994, participating companies were allowed to select a base year as early as 1988. There is a high level of criticism surrounding this due to the

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[80] Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET)*. Final report. 2000.

[81] See Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET)*. Final report. 2000; Environmental Policy Unit, Queen's University. *Lessons Learned from ARET: A Qualitative Survey of Perceptions of Stakeholders*. Working Paper series 96-4, 1996.

concern that companies could, theoretically, count reductions from an emission baseline chosen so as to highlight achievements[83]. The Environment Canada review of ARET found that approximately 50percent of the reductions reported in ARET were achieved before its start. In the case of A-1 substances, the analysis found that 80 percent of the reductions reported were achieved before 1994[84]. Thus, allowing the base year to be as much as seven years before the start of the program may distort the actual picture of achievements in emission reductions. As well, measuring and comparing reductions is more complicated since companies were not ascribed the same base-year. Emission claims under the ARET program have also been questioned because of disparate data collection methods. The ARET Secretariat receives data generated in a number of ways and delivered in different styles. Facilities can use a variety of analytical tools such as direct periodic monitoring, sampling protocols, extrapolation, mass balance calculations, engineering methods, and typical emission factor estimates and equations[85]. The margin

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[82] Environment Canada. *Environmental Leaders 3: ARET Update.* 2000.

[83] Van Nijnatten, Deborah, "The ARET Challenge" in Robert B. Gibson (Ed). *Voluntary Initiatives* (Peterborough: Broadview Press, 1999); Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET).* Final report, 2000; Gallon, Gary. *Voluntary Environmental Measures: The Canadian Experience* (Canadian Institute for Business and the Environment, 1997); Harrison, Kathryn, "Talking With the Donkey: Cooperative Approaches to Environmental Protection", *Journal of Industrial Ecology*, Vol. 2, 1998: 51-72.

[84] Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET).* Final report, 2000

[85]Van Nijnatten, Deborah, "The ARET Challenge" in Robert B. Gibson (Ed). *Voluntary Initiatives* (Peterborough: Broadview Press, 1999); Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET).* Final report, 2000; Gallon, Gary. *Voluntary Environmental Measures: The Canadian Experience* (Canadian Institute for Business and the Environment, 1997).

of error of the data reported is likely highly variable due to the broad spectrum of methodologies used to measure releases.

Some reductions may also have been driven by other motivating factors than ARET, mainly earlier regulations. For example, the ARET progress report states, "…in December 1994, INCO Ltd. completed a five-year $600 million rebuild of its smelter at Copper Cliff, Ontario. This resulted in a 90 percent containment of sulphur dioxide."[86] While these reductions are referred to as an ARET achievement, they were actually required by Ontario regulations under the province's Environmental Protection Act[87]. The Environment Canada review of ARET also found that participation in ARET was not one of the main motivating factors for industry to reduce their releases of toxic substances. Other factors such as regulations, modernization, and business decisions were considered to be more important in the environmental management decisions made by industry. For example, the Pulp and Paper Effluent Regulations that was promulgated in 1992 and came fully into effect in 1996 included technological upgrades and major retrofits in the pulp and paper and smelting sectors[88].

Furthermore, the relationship between ARET and the existing regulatory framework remains unclear. Regulations generally provide threshold limits or prescriptive equipment/operations standards, whereas ARET targets act as a guideline

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[86] Environment Canada. *Environmental Leaders 2: ARET Update.* 1998.

[87] Van Nijnatten, Deborah, "The ARET Challenge" in Robert B. Gibson (Ed). *Voluntary Initiatives* (Peterborough: Broadview Press, 1999); Gallon, Gary. *Voluntary Environmental Measures: The Canadian Experience* (Canadian Institute for Business and the Environment, 1997).

[88] Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET).* Final report, 2000.

that allows individual firms to devise the most effective way to reduce and/or eliminate toxic substances. David Roewade's survey of ARET participants found that 78% of respondents felt that ARET was a complementary toxic reduction mechanism that works well with other instruments such as regulations, industry association programs, and corporate mandates. Many stated that their ARET action plans were easily integrated into their operations since they had the flexibility to make them compatible with their production framework[89]. As well, industry members on the ARET Stakeholder Committee stated, "…a challenge issued to an industry to achieve a 50% reduction in emissions unleashes much more enthusiasm than a restrictive regulation."[90] However, the Environment Canada review found that linkages with other toxic management tools, programs, and policies could have been stronger. For example, increasing the linkage to the National Pollutant Release Inventory for reporting requirements or the federal National Pollution Prevention Strategy, since pollution prevention is one of the guiding principles of ARET[91].

The ARET program has been criticized for some additional design flaws. One of the biggest critiques of ARET has been its lack of a credible verification system by an

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[89] Roewade, David. *Voluntary Environmental Action: A Participant's View of ARET*. A report prepared for Industry Canada. 1996.

[90] Environmental Policy Unit, Queen's University. *Lessons Learned from ARET: A Qualitative Survey of Perceptions of Stakeholders*. Working Paper series 96-4, 1996: 15.

[91] Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET)*. Final report, 2000.

independent third-party[92]. Under the ARET program a CEO for the firm must personally certify the reported emissions. However critics argue that it is crucial to have a credible and impartial third party verification process in order to gain the confidence of regulatory agencies, shareholders, consumers, and the general public. For example, many feel that there is a strong need for a verification system similar to the one which has been implemented for the Responsible Care Program. Under this voluntary initiative, there are verification teams that prepare a report on their findings for public, employee, and peer scrutiny. The four-person teams are composed of community members, industry representatives, academics, and environmentalists who are entirely independent of the companies being inspected. Secondly, the ARET program has also been highly criticized, as there are no measures in place to impose consequences on companies who do not meet their commitments under the program[93].

The above discussion has provided an overview of the development of the ARET program, its implementation, and its successes and failures. The following section will provide an outline of current reviews of the program and suggestions for changes to move ARET beyond the year 2000.

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[92] See Van Nijnatten, Deborah, "The ARET Challenge" in Robert B. Gibson (ed). *Voluntary Initiatives* (Peterborough: Broadview Press, 1999); Gallon, Gary. *Voluntary Environmental Measures: The Canadian Experience* (Canadian Institute for Business and the Environment, 1997); Harrison, Kathryn, "Talking With the Donkey: Cooperative Approaches to Environmental Protection", *Journal of Industrial Ecology*, Vol. 2, 1998: 51-72.

[93] See Van Nijnatten, Deborah, "The ARET Challenge" in Robert B. Gibson (Ed). *Voluntary Initiatives* (Peterborough: Broadview Press, 1999); Gallon, Gary. *Voluntary Environmental Measures: The Canadian Experience* (Canadian Institute for Business and the Environment, 1997).

The Future: ARET2

Since the short-term goals of the ARET program were established to the year 2000, a renewal process for ARET has been initiated. In September 1997, the ARET Stakeholder Committee sponsored a one-day workshop on the future of ARET. Along with participants in ARET, invitations were sent to industry associations who did not currently endorse the program as well as to the environmental and labor groups who had withdrawn from the program in 1993. The workshop was held in December 1997 and was attended by thirty-one participants representing industry, academic and environmental organizations, and federal and provincial governments[94]. As well, in September 1999, the ARET Secretariat released a discussion document on the future of ARET outlining options and key issues being considered in the design of a new ARET. The discussion paper was put on the ARET website to be open for public comment[95]. In 1997 the federal Ministers of Environment, Health, and Industry congratulated ARET participants on the progress to date but also noted that "...there are still more than 250 other facilities that emit toxic substances and which have not responded to the ARET Challenge."[96] As a result, the ARET Stakeholders Committee asked the Secretariat to form a committee tasked with developing an action plan to increase participation in the program. The ARET Secretariat commissioned a survey of potential ARET participants

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[94] Versteeg, Hajo. *Final Report: Summary of Proceedings: Future of ARET Workshop*. Workshop held in Ottawa, Ontario, December 11, 1997.1998.

[95] Environment Canada. *Environmental Leaders 3: ARET Update*. 2000.

[96] Anacapa Consulting Service Inc. *Survey of Potential ARET Participants*. Prepared for ARET Secretariat. 1997: 1.

in order to address this information need[97]. Additionally, Environment Canada conducted an internal review of ARET released in April 2000 to make a decision about its continued support to the program[98]. As well, Industry Canada commissioned a survey of industry groups, departmental officials, environmental groups, and individual firms to address the core elements that should be integrated into a post-2000 program to optimize participation and increase the overall credibility of the initiative[99].

Furthermore, in May 1999, the Commissioner of the Environment and Sustainable Development released a report on the effectiveness of the federal government's toxic substance management programs. The report noted that while voluntary programs are being used as a core element of the federal management strategy, there is a need for the establishment of rigorous requirements including clear goals and targets, standardized performance measures, consequences if objectives are not met, and credible verification of results. Environment Canada recently developed a policy framework that establishes conditions under which voluntary measures should be used to manage toxic substances[100]. The criteria – clear objectives and measurable results, public participation, verification of results, incentives and consequences, continuous improvement, a regulatory backstop, and public reporting – are meant to ensure that voluntary initiatives are effective and

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[97] This report was prepared by Anacapa Consulting Services Inc. on behalf of the ARET Secretariat. See Anacapa Consulting Service Inc. *Survey of Potential ARET Participants*. Prepared for ARET Secretariat. 1997.

[98] Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET)*. Final report, 2000.

[99] RIAS Inc. *Accelerated Reduction/Elimination of Toxics (ARET) Renewal Program*. Prepared for Industry Canada, March 2001.

[100] See Environment Canada. *Policy Framework for Environmental Performance Agreements*. 2001.

credible complements to regulatory action and produce equivalent achievements in the management of toxic substances. These criteria must be taken into account in the development of a renewed ARET program.

From these evaluations of the current ARET program, several design criteria and implementation structures have been suggested for consideration for the successor ARET program. First, participants in the ARET workshop expressed strong support for a comprehensive evaluation of the ARET program. While they noted that a program review like that undertaken by Environment Canada is useful, they thought a review of the relative performance of the program (*i.e.,* comparing results achieved under ARET with what might have been expected if other policy instruments had been employed, such as regulation) would provide much needed insight into the program's effectiveness within the regulatory structure. In addition, it was suggested that a comprehensive examination of how ARET has changed the attitudes and practices of firms be undertaken as well as a comparison of ARET with such programs as the U.S. EPA 33/50 Program[101].

Secondly, the issue of credible verification of results was a controversial concern for the original ARET Program. Many viewed the release reductions claimed under ARET with skepticism since there was no independent verification or audit to ensure the accuracy of reported emissions. A number of formats for verification have been suggested including regular audits as a condition for participation (although this may be a disincentive for participation), an independent third party audit on a random basis, and a

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[101] See Versteeg, Hajo. *Final Report: Summary of Proceedings: Future of ARET Workshop*. Workshop held in Ottawa, Ontario, December 11, 1997.1998.

system of peer audits similar to the process under the Responsible Care Program[102]. However, many industry representatives had concerns over the costs of proposed audits and how they would fit into existing management mechanisms like ISO 14001 to which they already adhere.

It was also argued that, to be effective, voluntary programs must be integrated into the overall environmental management structure. In some cases, they may act to replace regulations and in others they may rely on regulatory backstop to give them legitimacy and provide incentives for participation and good performance. At a minimum, a new ARET should fit into the spectrum of powers that the government has under the new Canadian Environmental Protection Act (CEPA, 1999). For example, Part 4 of CEPA offers opportunities for participants in credible voluntary programs to use their actions under such programs to meet, in part or in whole, the requirements of pollution prevention plans for substances declared to be CEPA-toxic[103]. Participants in the ARET workshop saw the future role of Environment Canada in the ARET program as that of "nurturing leader" by setting targets, ensuring a level playing field, promoting incentives and rewards, and coordinating ARET with international agreements[104]. However, the

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[102] See Versteeg, Hajo. *Final Report: Summary of Proceedings: Future of ARET Workshop.* Workshop held in Ottawa, Ontario, December 11, 1997.1998; RIAS Inc. *Accelerated Reduction/Elimination of Toxics (ARET) Renewal Program.* Prepared for Industry Canada, March 2001; Bregha, Francois and John Moffet. *From Challenge to Agreement? Background Paper on the Future of ARET* (Resources Futures International, 1997).

[103] RIAS Inc. *Accelerated Reduction/Elimination of Toxics (ARET) Renewal Program.* Prepared for Industry Canada, March 2001.

[104] See Versteeg, Hajo. *Final Report: Summary of Proceedings: Future of ARET Workshop.* Workshop held in Ottawa, Ontario, December 11, 1997.1998.

evaluation of ARET by Environment Canada noted that the cost to the Department to date for the start-up and development of the ARET program was $2 million. Questions were raised as to whether this was the most efficient use of resources considering the fact that their evaluation found that other factors played a more important role than the program in reducing emissions of toxic substances for ARET participants[105]. However, while ARET was a much larger voluntary program, Environment Canada allocated fewer resources to it than the Canadian Chemical Producers Association dedicates to Responsible Care, a mature program that applies to a single industry with seventy-one companies[106]. As well, the review noted that regional administrators and municipalities should play a larger role as stakeholders because of their key role in controlling toxic substances. It is necessary for all levels of government to maintain a credible threat that encourages both participation and performance in the program as well as ensuring that policy instruments complement and reinforce each other.

There was also considerable concern that, despite outreach activities by the ARET Secretariat, recruitment of new firms remained a difficult task. There was general agreement that overlapping initiatives and reporting requirements, competing government initiatives, existing commitments and poor public relations have acted as disincentives to participation. Workshop participants made the following suggestions to increase participation: exploring and enhancing linkages between ARET and MOUs, providing a

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[105] Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET)*. Final report, 2000.

[106] Bregha, Francois and John Moffet. *From Challenge to Agreement? Background Paper on the Future of ARET* (Resources Futures International, 1997).

regulatory threat to encourage acceptance of the program by non-participants and free-riders, encouraging peer pressure and public highlighting of non-participants, promoting increased awareness of the program within industry, and promoting preferential government policies that favour ARET participants[107]. Additionally, industry representatives identified the following features as most likely to encourage broad participation: program simplicity, in particular a manageable number of substances; the ability to set sectoral goals for substances; no duplication of efforts; and public support and recognition by Environment Canada[108].

The long-term goal of the ARET Program was to virtually eliminate the emission of 30 A-1 substances and to reduce emissions of another 87 toxic substances to levels insufficient to cause harm. ARET participants have made significant reductions in the releases of these substances and many feel that the easiest reductions have already been achieved and any reductions made beyond current targets will take longer and be more costly. The issue now is whether these original substances should be included in a new ARET program. The alternatives under consideration are[109]:

- Include the substances in the new program, recognizing that previous participants are unlikely to make major additional reductions

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[107] Versteeg, Hajo. *Final Report: Summary of Proceedings: Future of ARET Workshop*. Workshop held in Ottawa, Ontario, December 11, 1997.1998; Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET)*. Final report, 2000.

[108] RIAS Inc. *Accelerated Reduction/Elimination of Toxics (ARET) Renewal Program*. Prepared for Industry Canada, March 2001.

[109] RIAS Inc. *Accelerated Reduction/Elimination of Toxics (ARET) Renewal Program*. Prepared for Industry Canada, March 2001; Versteeg, Hajo. *Final Report: Summary of Proceedings: Future of ARET Workshop*. Workshop held in Ottawa, Ontario, December 11, 1997.1998.

- Exclude these substances from the new program but make them subject to a continuous improvement undertaking
- Exclude them entirely from the new program

Furthermore, a crucial issue for a new ARET is the inclusion of a process for ongoing consideration of substances as they are screened and categorized by Environment Canada[110]. Under the new CEPA, the number of substances that are declared CEPA toxic and the number of other substances of concern will increase. There was also support for looking at substances and targets on a sectoral basis. A related issue is the setting of targets for a new ARET. Should the original targets be maintained for the 117 substances under the original ARET, assuming that those substances are included in the new program? How then should targets be set for new participants for these original substances, on the assumption that they are retained in the new program? Should targets vary by: substance, category, groups of substances (as in the original ARET program), or sector? Moreover, how should a new baseline be determined since the moving baseline in the original ARET program had been such a major concern?

Under the original ARET Program, participants reported annually to the ARET Secretariat regarding their progress in reducing emissions. One of the main criticisms of the original program was its lack of standardization in the reporting process. Thus, representatives from government, industry, and environmental groups have all suggested

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[110] RIAS Inc. *Accelerated Reduction/Elimination of Toxics (ARET) Renewal Program*. Prepared for Industry Canada, March 2001; Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET)*. Final report, 2000; Versteeg, Hajo. *Final Report: Summary of Proceedings: Future of ARET Workshop*. Workshop held in Ottawa, Ontario, December 11, 1997.1998.

adding ARET substance reporting to the National Pollutant Release Inventory[111]. This would make reporting easier providing a one-window process and mandatory reporting through the NPRI would increase the credibility of a new ARET. In its review Environment Canada noted, "…it may not be efficient to have two different systems to maintain similar information, even if it is in support of different programs, with different objectives. The weak linkages can be explained by the fact that these other initiatives were developed after or at the same time ARET was designed. However, any future voluntary program should reinforce these linkages."[112]

Finally, there has been a lot of discussion on how a new ARET could provide explicit incentives to increase participation in a new program and to motivate performance[113]. Such incentives are a key component of the new Policy Framework of Environment Canada. Suggestions for positive incentives include: public recognition of performance through government awards; reduced transaction costs through less duplication in reporting requirements; and legislative exemptions from regulatory requirements. Some possible negative incentives include: threat of government

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[111] RIAS Inc. *Accelerated Reduction/Elimination of Toxics (ARET) Renewal Program*. Prepared for Industry Canada, March 2001; Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET*). Final report, 2000; Versteeg, Hajo. *Final Report: Summary of Proceedings: Future of ARET Workshop*. Workshop held in Ottawa, Ontario, December 11, 1997.1998.

[112] Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET)*. Final report, 2000, 11.

[113] Environment Canada, Review Branch. *Evaluation of the Accelerated Reduction and Elimination of Toxics Initiative (ARET)*. Final report, 2000; RIAS Inc. *Accelerated Reduction/Elimination of Toxics (ARET) Renewal Program*. Prepared for Industry Canada, March 2001; Bregha, Francois and John Moffet. *From Challenge to Agreement? Background Paper on the Future of ARET* (Resources Futures International, 1997).

intervention through regulation for non-compliers; consumer pressure and adverse publicity of both participants and non-participants; and legal liability (*e.g.* an Alberta court ruled against a chemical producer on the basis that its failure to apply the Responsible Care's code of conduct demonstrated negligence)[114].

The above discussion has outlined the creation, development, and implementation of the original ARET program, its successes, and failures, and suggested criteria for a renewed ARET program beyond the year 2000. However, the most important question is whether the ARET program has led to significant reductions in emissions of the 117 targeted substances and whether these reductions are greater than those achieved under the regulatory system alone. While the ARET Secretariat claims significant reductions under the program, skepticism remains because of problems in the way releases are reported and measured, mainly the issue of a moving base-year. Chapter five will provide an in-depth analysis of reductions in emissions of participating firms as compared to reductions by non-participating firms to assess the effectiveness of the ARET Program. Such an evaluation was suggested by the ARET Workshop participants, noting the need for a comprehensive review of both the absolute performance of the program (*i.e.*, were the targets met?) as well as the relative performance of ARET as compared to other policy instruments. The following chapter provides a macro analysis of the institutional

[114] Bregha, Francois and John Moffet. *From Challenge to Agreement? Background Paper on the Future of ARET* (Resources Futures International, 1997).

framework, policy style and use of voluntary measures in the United States, as well as an overview of the development and implementation of the 33/50 Program.

Appendix 3.1
ARET Stakeholders Committee

Aluminum Association of Canada
Canadian Chemical Producers Association
Canadian Electricity Association
Canadian Manufacturers of Chemical Specialties
Canadian Petroleum Products Institute
Canadian Pulp and Paper Association
Canadian Steel Producers Association
Chemical Institute of Canada
Mining Association of Canada
The Alliance of Manufacturers and Exporters Canada
Comite de Sante Environnementale du Quebec
British Columbia Ministry of Environment, Lands and Parks
Nova Scotia Department of Environment
Ontario Ministry of Environment
Environment Canada
Health Canada
Industry Canada.

Source: Environment Canada. *Environmental Leaders 3: ARET Update*. 2000

Appendix 3.2
ARET Substance Selection Criteria

(1) Toxicity

Normalized toxicity scores (NTS) were calculated for the substances, based on six elements of toxicity, each with a maximum score of ten: acute lethality; chronic/ subchronic toxicity, plants; chronic/subchronic toxicity, non-mammals; chronic/subchronic toxicity, mammals; teratogenicity; carcinogenicity. Data on at least 3 elements were required to calculate a NTS. The sub-committee agreed that all substances with an NTS greater than 40 met the first criterion of toxicity.

(2) Bioaccumulation

Substances with bioconcentration scores of 7 or 10 (bioconcentration factor (BCF) greater than 500) met the second criterion.

(3) Persistence

Substances with persistence scores of 7 or 10 (i.e. environmental half-lives of greater than 50 days) met the third criterion.

Source: ARET Secretariat. *The ARET Substance Selection Process and Guidelines*. 1994.

Appendix 3.3
The ARET Substance List

ARET Substances				
Category	**Substance**	**NPRI**	**CEPA**	**COA**
A-1	Octachlorostyrene			T1
A-1	7H-dibenzo(c,g)carbazole			T2
A-1	Perylene			T2
A-1	Benz(a)anthracene			T2
A-1	Benzo(b)fluoranthene			T2
A-1	Pentachlorophenol			T2
A-1	Fluoranthene			T2
A-1	Phenanthrene			T2
A-1	Benzo(k)fluoranthene			T2
A-1	Chrysene			T2
A-1	Indeno(1,2,3-c,d)pyrene			T2
A-1	Methyl mercury			
A-1	Benzo(j)fluoranthene			T2
A-1	alpha-hexachlorocyclohexane			T2
A-1	1,6-dinitropyrene			T2
A-1	Tributyltin			T2
A-1	1,8-dinitropyrene			T2
A-1	Benzo(a)pyrene			T1
A-1	2,3,7,8-tetrachlorodibenzofuran		X	T1
A-1	Dibenz(a,h)anthracene			T2
A-1	gamma-hexachlorocyclohexane			T2
A-1	Dibenz(a,j)acridine			T2
A-1	4,4'-methylenebis(2-chloroaniline)	X		T2
A-1	Hexachlorobenzene		X	T1
A-1	PAHs A-1 (not speciated)		X	T2
A-1	Benzo(e)pyrene			T2
A-1	Pyrene			T2
A-1	2,3,7,8-tetrachlorodibenzo-p-dioxin		X	T1
A-1	Dibenzo(a,i)pyrene			T2
A-1	2,3,7,8-TCDF/TCDD			
A-1	Benzo(g,h,i)perylene			T2
A-1	PCBs		X	T1

ARET Substances				
Category	**Substance**	**NPRI**	**CEPA**	**COA**
A-2	Cadmium (inhalable & soluble inorganic)	X	X	T2
A-2	1,4-dichlorobenzene	X (as p-dichlorobenzene)		T2
B-1	7,12-dimethylbenz(a)anthracene			
B-1	Anthracene	X	X	T2
B-1	PAHs B-1 (not speciated)			
B-1	bis(2-ethylhexyl)phthalate	X	X	
B-1	2,4,6-trichlorophenol			
B-1	Hexachlorocyclopentadiene	X		
B-1	3,3'-dichlorobenzidine			T2
B-1	Tetraethyl lead	X 99		T1
B-1	Dimethylnaphthalene			
B-2	1,4-dioxane	X		
B-2	2,3,4,6-tetrachlorophenol			
B-2	Cyanides	X		
B-2	alpha-chlorotoluene	X (as benzyl chloride)		
B-2	Asbestos	X	X	
B-2	4,6-dinitro-o-cresol	X		
B-2	Benzo(a)fluorene			
B-2	Chlorodibromomethane			
B-2	1,2-dichloroethane	X	X	
B-2	bis(2-chloroethyl)ether			
B-2	Benzo(b)fluorene			
B-2	Dibenz(a,h)acridine			
B-2	1,1,2,2-tetrachloroethylene	X	X	
B-2	o-anisidine			
B-2	Methylene chloride	X (as dichloromethane)	X	
B-2	Ethylene oxide	X		
B-2	Lead (all forms except alkyl)	X	X	
B-2	Bromodichloromethane			
B-2	Copper (inorganic salts)	X		
B-2	Beryllium			
B-2	Cobalt (inorganic, soluble)	X		
B-2	Mercury (elemental and inorganic)	X	X	T1

ARET Substances				
Category	**Substance**	**NPRI**	**CEPA**	**COA**
B-2	Chromium (Cr6+)	X	X	
B-2	2-naphthylamine			
B-2	Arsenic (inorganic)	X	X	
B-2	Zinc (inorganic, inhalable, soluble)	X		
B-2	Carbon tetrachloride	X	X	
B-2	Uranium (inorganic,inhalable,soluble)			
B-2	2-nitropropane	X		
B-2	Silver (soluble inorganic salts)	X		
B-2	Chloroform	X		
B-2	PAHs B-2 (not speciated)			
B-2	Thiourea	X		
B-2	Nickel (inorganic, inhalable, soluble)	X	X	
B-3	1-chloro-4-nitrobenzene			
B-3	Chlorine dioxide	X		
B-3	Dimethylphenol (mixed isomers)	X 99		
B-3	Epichlorohydrin	X		
B-3	Ethylene dibromide			
B-3	1,3-butadiene	X		
B-3	Acrolein			
B-3	1-bromo-2-chloroethane	X 99		
B-3	n-dodecane			
B-3	2,4-dinitrotoluene	X		
B-3	2,4-dichlorophenol	X		
B-3	Acrylonitrile	X		
B-3	Methyl isobutyl ketone	X		
B-3	Phenol	X		
B-3	Tetramethylthiuram disulphide			
B-3	2-methylpyridine	X 99		
B-3	Benzidine		X	
B-3	1,2-diphenylhydrazine			
B-3	Benzene	X	X	
B-3	4-nitrosomorpholine			
B-3	4-aminoazobenzene			
B-3	Acetamide			
B-3	2,6-dimethylphenol			

ARET Substances				
Category	**Substance**	**NPRI**	**CEPA**	**COA**
B-3	2,6-dinitrotoluene	X		
B-3	N-nitroso-di-n-propylamine			
B-3	bis(chloromethyl) ether			
B-3	1,3-dichloropropene			
B-3	Aniline	X		
B-3	N-nitrosodimethylamine			
B-3	Ethylene thiourea	X		
B-3	Formaldehyde	X		
B-3	N-nitrosodiphenylamine	X		
B-3	1,2-dibromo-3-chloropropane			
B-3	Vinyl bromide			
B-3	4-aminobiphenyl			
B-3	Ethanol			
B-3	Quinoline	X		
B-3	Acetaldehyde	X		
B-3	Acrylamide	X		
B-3	1,1,2-trichloroethylene	X	X	
B-3	Hydrogen sulphide	X 99		
B-3	1,2-dichlorobut-3-ene			
B-3	Toluene diisocyanates	X		
B-3	Hydrazine	X		
OTH	PAHs and VOCs			
OTH	Iron			
OTH	Styrene			
OTH	AOX			
OTH	VOCs			

Source: Environment Canada. *ARET Secretariat Database.*

Chapter Four

Environmental Policymaking in the United States

Introduction

This chapter will provide an overview of the institutional and constitutional framework and policy style that shapes the policymaking process for the management of toxic substances in the United States. The chapter is divided into two sections. The first section focuses on the institutional rules-in-use of the American federal system. This includes a discussion of the constitutional basis for federal and state powers, the practical workings of intergovernmental relations in regulating toxic substances, the realities of policymaking in a system which is based on a separation of powers between the legislative and executive branches of government, and the role of the courts in the policy process. As well, the policy style which shapes environmental policymaking will be examined, particularly the influence of public participation on the policy system. Finally, this section will provide an overview of the major regulatory instruments being used to control pollutants in the environment and provide an evaluation of the use of voluntary measures as an alternative management approach. This will provide the foundation for further analyses to examine the role that policy style and institutional factors may play in affecting outcomes of the 33/50 Program and to compare performance of voluntary measures in the United States to that in Canada.

The second section of this chapter will focus on the use of one voluntary measure in particular, the 33/50 Program. This section will provide an overview of the development and implementation of the program, its primary goals and guiding principles, and a review of the performance of the program. This will provide the background necessary for the micro analysis of the effectiveness of the 33/50 Program which is the focus of Chapter Six.

Institutional Structure, Policy Style and Policy Instruments for Managing Toxic Substances

The United States: Institutional Framework

The evolution of American environmental policy has been shaped by the institutional setting within which it has taken place. There are three main aspects to the federal system of government that has affected the formation and implementation of environmental regulation. The first is the constitutional division of powers and the resulting need for intergovernmental coordination between the federal government and the states. The second is the separation of powers and system of checks and balances that govern the relationships between Congress and the President and between state governors and legislatures. The third is the strong role the courts play in the policymaking process.

The constitution listed specific areas of jurisdiction and gave all residual powers to the states. Thus, in theory, the states should have primary responsibility for environmental concerns. In practice, however, the federal government has become increasingly active in enacting legislation in environmental areas. The federal government has used its jurisdiction under the following constitutional areas to regulate environmental policy: commerce; taxing; spending; public property; treaties; and the supremacy clause[1].

The primary constitutional basis for federal environmental legislation is the commerce clause that grants Congress "…the authority to regulate commerce with foreign nations and among the states."[2] The Supreme Court has broadly interpreted this authority, extending it to areas of interstate commerce such as navigable waters and interstate competition. The federal government has used its taxing authority to establish the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and its spending authority to fund projects under the Resource Conservation and Recovery Act (RCRA) and to establish the Clean Water Act. As well, the federal government uses its powers to raise taxes, borrow money, and spend to "encourage" the states into administering federal programs and following federal guidelines. Finally, the federal government can preempt inconsistent state laws under the supremacy clause.

Under the Tenth Amendment, the states derive constitutional powers for environmental concerns through the police power, spending power, and power to regulate land use. Additionally, the constitution restricts both federal and state actions through the protection of private property rights. Under the Fifth and Fourteenth Amendments, the

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[1] See Commission for Environmental Cooperation. *Summary of Environmental Law in the United States* (Montreal: CEC, 1995); Fitzgerald, Edward A., "The Constitutional Division of Powers with Respect to the Environment in the United States" in Holland, Kenneth M, F.L. Morton and Brian Galligan (*Eds.*). *Federalism and the Environment: Environmental Policymaking in Canada, the United States, and Australia* (Westport: Greenwood Press, 1996); Davies, J. Clarence and Jan Mazurek. *Pollution Control In the United States: Evaluating the System* (Washington: Resources for the Future, 1998):11.

[2] Fitzgerald, Edward A., "The Constitutional Division of Powers with Respect to the Environment in the United States" in Holland, Kenneth M, F.L. Morton and Brian Galligan (*Eds.*). *Federalism and the Environment: Environmental Policymaking in Canada, the United States, and Australia* (Westport: Greenwood Press, 1996): 21.

federal and state governments cannot, without paying just compensation, take private property either directly or indirectly through government regulation.

While the above discussion has outlined the constitutional basis for environmental regulation, the realities of intergovernmental policymaking are much more complex. David Welborn describes the American approach to environmental regulation as one of "conjoint federalism," a blend of both national and state authority[3]. Rarely has the federal government entirely preempted state environmental powers, electing instead to establish minimum national standards that can be exceeded by state or local law. For example, the Clean Water Act, the Clean Air Act, and the RCRA all establish minimum federal standards that expressly allow the states to design stricter environmental programs[4]. As well, the federal government often offers states financial incentives to establish and enforce environmental standards that meet federal guidelines. However, these federal grants-in-aid to state governments have been declining over the last ten years[5]. The U.S. Environmental Protection Agency (EPA) is responsible for the administration of federal environmental regulation. The states rely upon the EPA for research, development, and technical assistance and often use the threat of the EPA as a "gorilla in the closet" to

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[3] Welborn, David M., "Conjoint Federalism and Environmental Regulation in the United States", *Publius*, Vol. 18, 1988: 27-43.

[4] See Pfander, James E., "Environmental Federalism in Europe and the United States: A Comparative Assessment of Regulation Through the Agency of Member States" in Braden John B., Henk Folmer and Thomas Ulen (*Eds.*). *Environmental Policy With Political and Economic Integration: The European Union and the United States* (Cheltenham: Edward Elgar, 1996): 84.

[5] See Davies, J. Clarence and Jan Mazurek. *Regulating Pollution: Does the U.S. System Work?* (Washington: Resources for the Future, 1997): 11; Pfander, James E., "Environmental Federalism in Europe and the United States: A Comparative Assessment of Regulation Through the Agency of Member States" in Braden John B., Henk Folmer and Thomas Ulen (*Eds.*). *Environmental Policy With Political and Economic Integration: The European Union and the United States* (Cheltenham: Edward Elgar, 1996).

enforce compliance[6]. However, while the EPA issues national standards, implementation is based on permits issued primarily by the states. As well, state and local governments are responsible for monitoring and enforcing compliance. Thus, in practice, the states and local governments play the primary role in implementation and enforcement of environmental regulations. Therefore, despite primary federal regulatory authority for pollution control, the realities of implementation require close cooperation between EPA and the states.

A further complicating factor is the system of checks and balances and the separation of powers that governs relations between the legislative and executive branches of government. Environmental legislation needs the support of both the President and Congress to be enacted into law. However, the realities of a divided government with the President and the majority of Congress belonging to different political parties fuels fragmentation and can stagnate the policymaking process. As well, the lack of party discipline and complex committee system often result in Congress being dominated by local economic interests leading to legislation which is driven by "pork barrel" projects[7]. The impact of executive-legislative discord can be seen in the recent Bush administration. In June 2001, the House of Representatives voted against drilling for oil and gas in the Gulf of Mexico and the Great Lakes, in direct opposition to

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[6] Rabe, Barry G., "Federalism and Entrepreneurship: Explaining American and Canadian Innovation in Pollution Prevention and Regulatory Integration", *Policy Studies Journal*, Vol 27:2, 1999, 288-306

[7] Kincaid, John, "Intergovernmental Costs and Coordination in U.S. Environmental Protection" in Holland, Kenneth M., F.L. Morton and Brian Galligan (*Eds.*), *Federalism and the Environment: Environmental Policymaking in Canada, the United States, and Australia* (Westport: Greenwood Press, 1996).

President Bush's energy policy. The Republican Whip, Tom Delay of Texas accused Democrats of "...trying to choke off every promising source of domestic energy."[8]

A final institutional element that plays a major role in environmental policymaking is the judicial branch. The courts play a much more active role in the United States than they do in Canada[9] Not only do the courts review EPA rulemaking, enforcement, and adjudication procedures, but also the substance of agency regulations and decisions. The most revolutionary effect of the judiciary on environmental protection was the altering of the rules of standing. In the 1970s, the courts granted access to citizen and environmental organizations pursuing such abstract goals as "good government" and "preservation of the natural environment."[10] The first case to do so was *Sierra Club v Morton* in 1972 in which the court allowed the Sierra Club to establish injury based on aesthetic loss that would be suffered by hikers using the area if a ski club was allowed to be built. Thus, many regulations end up in the courts, challenged either by businesses adversely affected by the regulations or by environmental groups.

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[8] Washington Post. *In Slap at Bush, House Votes to Bar Oil Drilling in Great Lakes*, June 28, 2001.

[9] Moffet, John. "Judicial Review and Environmental Policy: Lessons for Canada from the United States", *Canadian Public Administration*, Vol 39:3, 1994: 362-385. Holland, Kenneth, "The Role of the Courts in the Making and Administration of Environmental Policy in the United States" in Holland, Kenneth M, F.L. Morton and Brian Galligan (*Eds*). *Federalism and the Environment Environmental Policymaking in Canada, the United States, and Australia* (Westport: Greenwood Press, 1996). Howlett, Michael, "The Judicialization of Canadian Environmental Policy, 1980-1990: A Test of the Canada-United States Convergence Thesis", *Canadian Journal of Political Science*, Vol. 27:1, 1994: 99-127

[10] Holland, Kenneth, "The Role of the Courts in the Making and Administration of Environmental Policy in the United States" in Holland, Kenneth M, F.L. Morton and Brian Galligan (*Eds*) *Federalism and the Environment Environmental Policymaking in Canada, the United States and Australia* (Westport, Greenwood Press, 1996), 163.

The above discussion has outlined the institutional setting within which environmental policymaking takes place. The following section will examine the resulting political culture and policy style that governs the political actors within the American policy system.

Policy Style

Deborah Van Nijnatten characterizes the institutional framework of the United States as horizontally fragmented[11]. The separation of powers ensures that both the legislative and executive branches of government play an equal role in the policymaking process. Further, the strong presence of the judiciary essentially results in a triadic policymaking dynamic. This is further complicated by the complex committee system within the legislative branch. The result is a system with multiple access points for individual, corporate, and environmental interests. From 1970 to the mid-1980s, membership in environmental groups grew from approximately 500 000 to 2.5 million[12].

The U.S policy style is most often characterized as open, adversarial, formal, and legalistic[13]. A study by Harrison and Hoberg compared American to Canadian

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[11] Van Nijnatten, Deborah. "Environmental Governance in an Era of Participatory Decision Making: Canadian and American Approaches". *American Review of Canadian Studies*. Vol. 26:3. 1997: 405-423.

[12] Andrews, Richard N.L., *Managing the Environment, Managing Ourselves: A History of American Environmental Policy* (New Haven: Yale University Press, 1999): 238

[13] See Van Nijnatten, Deborah, "Environmental Governance in an Era of Participatory Decision Making, Canadian and American Approaches". *American Review of Canadian Studies*. Vol. 26.3. 1997: 405-423. Rabe, Barry G. and Janet Zimmerman, "Beyond Environmental Regulatory Fragmentation. Signs of Integration in the Great Lakes Basin". Governance, Vol. 8.1. 1995: 58-77. Harrison, Kathryn and George Hoberg. *Risk, Science and Politics: Regulating Toxic Substances in Canada and the United States* (Montreal: McGill-Queen's University Press, 1994): 8.

policymaking for a number of environmental issues[14]. They found that the multiplicity of actors and complexities of the policy process led to unpredictable outcomes, with different actors prevailing in different circumstances. As well, the U.S. system is more pluralistic, relying upon interest group participation in risk assessment and management. Michael Howlett's work extends this analysis through his studies on the role of the courts in the United States[15]. He argues that the openness of the U.S system is guaranteed by environmental legislation at the federal and state levels that allows citizens recourse to the courts to force compliance with environmental statutes. For example, the Toxics Substances Control Act (TSCA) has a citizen suit provision that allows actions against any person who violates TSCA's testing, notification, manufacturing, or use restrictions[16]. Thus, one of the most notable characteristics of American political culture is the high level of public participation in the policy process and the ability to use the judicial system to influence environmental management.

In the United States, access to information is granted through a number of statutes[17]. The Administrative Procedures Act requires public hearings and asks government agencies to publicly justify their regulatory proposals. As well, the National

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[14] Harrison, Kathryn, and George Hoberg, *Risk, Science and Politics: Regulating Toxic Substances in Canada and the United States* (Montreal: McGill-Queen's University Press, 1994): 176

[15] Howlett, Michael, "The Judicialization of Canadian Environmental Policy, 1980-1990: A Test of the Canada-United States Convergence Thesis", *Canadian Journal of Political Science*, Vol. 27:1, 1994: 99-127

[16] Commission for Environmental Cooperation *Summary of Environmental Law in the United States* (Montreal: CEC, 1995).

[17] See Davies, J. Clarence and Jan Mazurek *Regulating Pollution: Does the U.S. System Work?* (Washington: Resources for the Future, 1997), 33.

Environmental Policy Act requires agencies to publish information about the environmental impacts of their proposals. The Emergency Planning and Community Right-to-Know Act (EPCRA) requires state and local governments to plan for emergency response to chemical releases and requires industries to report publicly their use and release of several hundred chemicals. Furthermore, in addition to the relaxation of the rules of standing, Congress has authorized the courts to award attorney's fees in cases of environmental litigation to plaintiffs who have advanced the "public interest."[18] Thus, the general public and special interest groups have become important players in the policymaking process. The result is an extremely adversarial and litigious policy environment.

Within the literature there have been many critiques of the American system of environmental management as being overly costly, inefficient, and overlapping. Davies and Mazurek state, "the major problems with environmental legislation are their rigidity and lack of coherence. The laws are complex, unrelated to each other, and lacking in any unified vision of environmental problems or EPA's mission."[19] One problem they note is that major environmental laws are quite detailed and have been getting more so. For example, the original Clean Air Act was 22 pages in length, but the 1970 amendments added 38 pages, and the 1990 amendments added more than 300 pages.

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[18] Holland, Kenneth, "Introduction" in Holland, Kenneth M, F.L. Morton and Brian Galligan (*Eds.*) *Federalism and the Environment: Environmental Policymaking in Canada, the United States, and Australia* (Westport, Greenwood Press, 1996): 12.

[19] Davies, J. Clarence and Jan Mazurek, *Regulating Pollution: Does the U.S. System Work?* (Washington: Resources for the Future, 1997): 7

Much of the criticism surrounds the operational design and functioning of the EPA. In an evaluation of the U.S. system for pollution control, Davies and Mazurek identified five pathologies of the EPA's operations[20]:

- Reliance on command-and-control approach to regulating which reduces flexibility and promotes a legalistic culture
- Fragmentation due to media-specific design of operations
- Overlaps and inconsistencies among laws
- Disparity between resources and responsibilities
- Lack of scientific and cost-benefit information.

At the most basic level, the EPA is inherently fragmented because of its operational design. First, the realities of overseeing environmental regulation in fifty states results in EPA staff being split between the head office in Washington and ten regional offices. The regional offices are responsible for reviewing permits and conducting inspections. Secondly, the EPA is designed around a two-tier system in which program offices deal with media-specific issues and functional offices deal with enforcement, policy, administration, and research and development. However, the physical realities of cross-media pollution problems result in overlap of programs and duties[21]. As well, there is a large discrepancy between the financial resources the EPA has at its disposal and its increasing responsibilities. William Ruckelshaus, EPA

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[20] Davies, J. Clarence and Jan Mazurek *Pollution Control In the United States Evaluating the System* (Washington: Resources for the Future, 1998), 16

[21] See Funke, Odelia, "Struggling with Integrated Environmental Policy, The EPA Experience", *Policy Studies Review*, Vol 12:3, 1993 137-161, Davies, J. Clarence and Jan Mazurek *Pollution Control In the United States Evaluating the System* (Washington Resources for the Future, 1998) 33

Administrator in 1995, stated, "the Agency has the resources to do not much more than 10 percent of the things Congress has charged it to do."[22]

Additionally, a study by the General Accounting Office reported problems with EPA's grant management structure[23]. The EPA uses grants to implement its programs at the state and local level. In 2002, grants constituted one half of the EPA's annual budget, or about $4.2 billion. The GAO study found that the EPA was not overseeing compliance with the terms of the grants and had no system in place to measure the environmental outcomes for all its grant programs to ensure that the grants were being used to achieve environmental results. As a result of this review, the EPA issued a five-year Grants Management Plan in April 2003.

However, the EPA has taken steps to reinvent itself[24]. In 1994, the EPA launched a regulatory reform initiative entitled the "Common Sense Initiative" intended to bring affected stakeholders together to find "cleaner, cheaper, smarter" environmental management solutions. In 1995 the Clinton Administration followed this with its document "Reinventing Environmental Regulation." The intent of both was to initiate a reformation of the EPA in terms of organizational coordination, the promotion of pollution prevention methods, and a move towards multi-stakeholder partnerships and collaborative decision making. Similarly, in his analysis of implementation styles in the

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[22] Davies, J. Clarence and Jan Mazurek, *Pollution Control In the United States: Evaluating the System* (Washington: Resources for the Future, 1998), 20.

[23] United States General Accounting Office. *Environmental Protection Agency: Problems Persist in Effectively Managing Grants*. June 2003.

United States. Michael Howlett found that procedural devices such as partnerships and consultations were supplanting and complementing the traditional legalistic arrangements[25].

The result has been a move towards alternative policy instruments such as voluntary measures which make use of cost-effective innovations and pollution prevention approaches, are multi-media in nature, and promote a collaborative policy environment. The following section will outline the major regulatory instruments and legislation employed in the United States to manage toxic substances. This will be followed by an outline of the magnitude of the use of voluntary measures in the United States.

Policy Instruments for Managing Toxic Substances

The 1970s have been called the "environmental era" in the United States. Beginning in 1970, U.S. environmental policy entered a fundamentally new period defined by greatly expanded access for citizen participation and the emergence of many new federal regulations. The Environmental Protection Agency was established to coordinate the expanding federal environmental management system. The result was an environmental regulatory framework, both at the state and federal level, which has been characterized as decidedly command-and-control in nature. However, since the early 1990s, the American approach to environmental management has undergone a change.

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[24] Environmental Commissioner of Ontario. *The Ontario regulation and Policy-Making Process in a Comparative Context* 1996

[25] Howlett, Michael. "Beyond Legalism? Policy Ideas, Implementation Styles and Emulation-Based Convergence in Canadian and U.S. Environmental Policy". *Journal of Public Policy*. Vol. 20 3, 2000: 305-329.

The new approach emphasizes partnerships, coordination, and the pollution prevention ethic. This section will outline the major regulatory structure for the management of toxic substances in the United States. This will include a review of key pieces of legislation as well as the primary system for monitoring chemical releases into the environment. As well, this section will provide an overview of the use of voluntary measures and how they fit into the regulatory structure in the United States.

Regulatory Instruments

In the United States, the federal government has played the larger role in establishing national guidelines and federal legislation that forms the foundation of the environmental management system. Table 4.1 lists the history of some of the major pieces of environmental legislation[26]. Of these, three are media specific (*e.g.*, Clean Air Act, Clean Water Act, and Water Resources Development Act); one is focused primarily on a medium – land - but deals with other matters as well (*e.g.*, Resource Conservation and Recovery Act); one deals with chemicals in general (*e.g.*, Toxics Substance Control Act); one deals with accidents, spills, dumpsites, and liabilities (*e.g.* Environmental Response, Compensation, and Liability Act); and two deal with general policy (*e.g.*, National Environmental Policy Act and Pollution Prevention Act).

[26] For a list of key environmental regulations See: Davies, J. Clarence and Jan Mazurek, *Pollution Control In the United States: Evaluating the System* (Washington, Resources for the Future, 1998), 12.

Table 4.1
The United States: Major Federal Environmental Legislation

Name	Date Enacted	History
Water Pollution Control Act	1948	Became Clean Water Act in 1972; major amendments in 1956, 1965, 1977, 1987
Air Pollution Control Act	1955	Became Clean Air Act in 1963; major amendments in 1967, 1970, 1977, 1990
Resource Conservation and Recovery Act (RCRA)	1976	Originally Solid Waste Disposal Act of 1965; major amendments in 1984, 1986; minor amendment in 1996
Toxics Substances Control Act (TSCA)	1976	Amended in 1986, 1988, 1992
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	1980	Major amendments in 1986; various minor amendments
National Environmental Policy Act	1970	Amended in 1975, 1977
Water Resources Development Act	1986	Amended 2000
Pollution Prevention Act	1990	

The National Environmental Policy Act (NEPA) is the overarching national environmental policy framework in the United States[27]. NEPA was designed as a government-wide policy framework to ensure that all federal agencies would incorporate environmental concerns into their actions. It has been emulated by over half the U.S. state governments, by over eighty other national governments (including the European Union), and by international institutions such as the World Bank and the Asian

[27] Commission for Environmental Cooperation, *Summary of Environmental Law in the United States* (Montreal: CEC, 1995).

Development Bank[28]. NEPA is comprised of three reinforcing elements: a declaration of policy; a series of implementing mechanisms; and an oversight organization (the President's Council on Environmental Quality). Perhaps the most significant outcome of NEPA is the requirement for "environmental impact statements" for any government action which may impact the quality of the environment. This opened the door for public challenges of federal projects. In the first nine years alone, agencies prepared over eleven thousand impact statements[29].

Like most countries, early environmental management strategies in the United States were primarily command-and-control in nature, focusing on end-of-pipe approaches. While significant progress was made under this regime, the pollution prevention (P2) concept began to gain momentum in the late 1980s. In 1990, through the Pollution Prevention Act, Congress established a national policy to prevent or reduce pollution at its source[30]. In 1993 EPA Administrator Carol M. Browner issued this policy statement regarding the move towards a P2 approach:

> We have learned that traditional end-of-pipe approaches not only can be expensive and less than fully effective, but sometimes transfer pollution from one medium to another. Additional improvements to environmental quality will require us to move "upstream" to prevent pollution from occurring in the first place[31].

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[28] Andrews, Richard N.L. *Managing the Environment, Managing Ourselves: A History of American Environmental Policy* (New Haven: Yale University Press, 1999): 286.

[29] Andrews, Richard N.L. *Managing the Environment, Managing Ourselves: A History of American Environmental Policy* (New Haven: Yale University Press, 1999): 287.

[30] United States, Environmental Protection Agency. *Pollution Prevention Policy* (www.epa.gov/opptintr/p2home/index.htm) 2003.

[31] United States, Environmental Protection Agency. *P2 Policy Statement: New Directions for Environmental Protection* (www.epa.gov/opptintr/p2home/p2policy/policy.htm) 2003

By the mid 1990s, the EPA began to institutionalize pollution prevention into its mainstream activities, including regulations, permitting, and technical assistance. The P2 Grant Program was created to provide matching funds to state, local, and tribal programs to support pollution prevention activities. An example is the Massachusetts's Waste Prevention F.I.R.S.T. project through which the state promotes source reduction as the principal means of correcting violations detected through inspections[32]. The EPA has also encouraged collaborative efforts with industry or public agencies to help achieve results through pollution prevention. EPA's Green Program, 33/50 Program, and WAVE are all voluntary partnerships which are meant to supplement regulatory measures to achieve pollution prevention. As well, pollution prevention mandates can be seen in the following federal statutes: Clean Air Act; Clean Water Act; Emergency Planning and Community Right-to-Know Act; Resource Conservation and Recovery Act; Federal Insecticide, Fungicide, and Rodenticide Act; and the National Environmental Policy Act[33].

Federal guidelines and legislation are supported by a permitting system which is implemented and monitored at the state and local government level. Permits contain limits on what can be discharged and monitoring and reporting requirements. For example, the Clean Water Act requires that all point sources discharging into waters in

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[32] United States. Environmental Protection Agency *Pollution Prevention Grant Program* (www epa.gov opptinr p2home grants ppis ppis.htm) 2003

[33] United States. Environmental Protection Agency. *P2 Mandates in Federal Statutes* (www epa.gov opptinr p2home p2policy provisions.htm). 2003

the United States must obtain a permit through the National Pollution Discharge Elimination System (NPDES)[34]. Similarly, the Operating Permits Program was established by state, local, and tribal permitting authorities to streamline the regulation of air emissions required under the Clean Air Act[35].

As well, international actions are becoming increasingly influential in affecting the policies of the EPA. Two international agreements which have significant impact on the regulation of toxic substances in the United States include the Montreal Protocol and the Great Lakes Bi-national Toxics Strategy. The United Nations' Montreal Protocol targets ozone-depleting substances, relying on implementation through national regulation. The EPA has issued regulations under the Clean Air Act to implement the Montreal Protocol and phase out the production of several ozone-depleting substances[36]. While the United States initially signed on to the Kyoto Protocol (an international agreement focusing on greenhouse gases and global warming), the Bush administration subsequently withdrew from the agreement on March 29, 2001[37]. In February 2002, President Bush announced the *Clear Skies and Global Climate Change Initiative*, which aims to achieve goals comparable to the Kyoto Protocol using market-based approaches. The Great Lakes Bi-national Toxics Strategy was signed by the United States and Canada

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[34] United States. Environmental Protection Agency. Office of Wastewater Management. *National Pollution Discharge Elimination System Permitting Program* (www.epa.gov/owm/npdes.htm). 2000.

[35] United States. Environmental Protection Agency. Office of Air Quality Planning and Standards. *EPA Operating Permits Program* (www.epa.gov/oar/oaqps/permits.htm). 2000.

[36] Scorecard. *Regulatory Controls: Environmental Hazards Lists: Montreal Protocol* (www.scorecard.org). 2003.

[37] United States Embassy. Public Affairs Section. Vienna, Austria. *United States Policy on the Kyoto Protocol*. (www.usembassy.at). 2002.

to implement the revised Great Lakes Water Quality Agreement. The strategy classifies toxic substances into two levels of concern for priority action based on the following criteria: persistence; bioaccumulation; and toxicity[38].

There exists no uniform and comprehensive regulation of toxic substances in the United States. At the federal level numerous separate statutes address various aspects of toxic substance regulation: the Clean Water Act governs hazardous pollutants of surface waters; the Clean Air Act regulates toxic emissions to air; the Resource Conservation and Recovery Act addresses hazardous wastes that are currently being generated; the Comprehensive Environmental Response, Compensation and Liability Act governs abandoned hazardous waste sites; the Federal Insecticide, Fungicide, and Rodenticide Act regulates the manufacture, sale, distribution , and use of pesticides; the Marine Protection, Research, and Sanctuaries Act addresses toxic waste in the marine environment; the Safe Drinking Water Act addresses hazardous substances in public drinking water; and the Occupational Safety and Health Act governs toxic substances in the workplace[39].

However, the primary federal statute regulating the manufacture, import, and distribution of chemical substances in the United States is the Toxic Substances Control Act (TSCA). The TSCA has two main purposes: to regulate the manufacture and use of chemical substances that are dangerous to human health or the environment; and to

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[38] Scorecard. *Regulatory Controls Target Lists Great Lakes Bi-national Toxics Strategy* (www.scorecard.org), 2003

[39] See Davies, J. Clarence and Jan Mazurek. *Pollution Control In the United States Evaluating the System* (Washington, Resources for the Future, 1998): 12; Commission for Environmental Cooperation. *Summary of Environmental Law in the United States* (Montreal, CEC, 1995); Scorecard. *Regulatory Controls Federal Regulatory Program Lists* (www.scorecard.org), 2003.

compile a comprehensive catalogue of the toxic substances produced and distributed in the United States[40]. The TSCA addresses chemicals already in use differently from those that are proposed for use[41]. The EPA inventory consists of about 62 000 chemicals that are already in commercial use. TSCA directs the Environmental Protection Agency to assign priority for testing to each of these chemicals - the act stipulates that the EPA can test no more than 50 high-priority chemicals per 12 month period. There are currently about 48 000 chemicals on the EPA priority list, for which there is no information on the toxic effects of 79 percent of these chemicals. For chemicals that are either newly manufactured or newly imported, TSCA requires that EPA be given a pre-manufacturing notice (PMN) at least 90 days prior to manufacture or import. Within five days of receipt of the PMN a notice is published by EPA in the Federal Register. The EPA has issued stop or limit orders for only 13 of the 2300 chemicals for which PMN notices have been submitted.

Thus, toxic substances are regulated through a variety of federal statutes, each with its own target lists. For example, Section 307 of the Clean Water Act defines a list of priority pollutants for which the EPA must establish ambient water quality criteria and effluent limitations. The list is based on the toxicity, persistence, and degradability of the pollutant. There are currently 133 priority pollutants listed on the Clean Water Act[42]. A

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[40] Rankin, M., "The Legal Perspective", in Cote, Raymond and Peter Wells (*Eds.*) *Controlling Chemical Hazards. Fundamentals of Management of Toxic Substances* (London, Unwin Hyman, 1991).

[41] Commission for Environmental Cooperation, *Summary of Environmental Law in the United States* (Montreal: CEC, 1995); United States, Environmental Protection Agency, *What is the TSCA Chemical Substance Inventory* (www.epa.gov/opptinr/newchems/inventory.htm), 2003

[42] Scorecard, *Regulatory Controls. Federal Regulatory program Lists* (www.scorecard.org), 2003.

list of the 33/50 target substances and their placement on major federal statutes is provided in the next section.

Monitoring Toxic Substances

The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 has been heralded as one of the most potent pieces of environmental legislation in twenty years. The primary purpose of EPCRA is to inform communities and citizens of chemical hazards in their area, requiring businesses to report the locations and quantities of chemicals stored on-site. Through Section 33 of EPCRA, Congress mandated that a Toxic Release Inventory (TRI) be made public, providing information on toxic chemicals that are being used, manufactured, treated, transported, or released into the environment[43]. In 1990 the first TRI report was released, detailing information on releases and transfers for 1988 data. Newspapers and television reporters compiled "dirty dozen" lists of the worst polluters and state officials compared plants in their jurisdictions with facilities elsewhere[44]. Thus, the TRI became an extraordinarily influential policy tool, providing a powerful new incentive for pollution control - public recognition of environmental management efforts.

The original TRI list contained over 300 chemicals, covered the manufacturing sectors only, and required information on on-site releases, transfers offsite for disposal and transfers offsite for treatment. Passage of the Pollution Prevention Act of 1990

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[43] United States. Environmental Protection Agency. *Toxic Release Inventory Reporting and the 1996 Public Data Release* (www.epa.gov/tri). 1998.

[44] Andrews, Richard N.L. *Managing the Environment, Managing Ourselves: A History of American Environmental Policy* (New Haven: Yale University Press, 1999): 273.

broadened the information TRI collects to include offsite transfers to recycling and energy recovery as well as facilities' management of toxic chemicals in waste on-site, such as on-site treatment, recycling and energy recovery, as well as qualitative information on pollution prevention activities (*e.g.*, source reduction) at the facility. The first year for the expanded information reporting was 1991. The list of chemicals has been expanded over the years and now covers more than 650 substances[45].

The TRI requires companies which meet the following criteria to submit annual reports: have 10 or more employees; the substance is manufactured or processed in quantities of more than 25 000 pounds; or the substance is in use in quantities of more than 10 000 pounds[46]. Each year, over 80 000 reports representing billions of pounds of chemical releases and transfers are submitted to the EPA by more than 20 000 facilities and 200 federal facilities[47].

There have, however, been some criticisms identified with the TRI process. The inventory does not cover toxic chemicals that reach the environment from non-industrial sources such as dry cleaners. Also, reported releases are annual estimates - the amounts could be released evenly over the course of the year or in a single burst. Moreover, variations can exist due to the use of different estimation techniques. Estimates are reported through monitoring data or through calculations using mass balance or

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[45] Commission for Environmental Cooperation. *Taking Stock 2000* (Montreal: CEC, 2003).

[46] Commission for Environmental Cooperation. *Taking Stock 2000* (Montreal: CEC, 2003).

[47] United States. Environmental Protection Agency. *Toxic Release Inventory Reporting and the 1996 Public Data Release* (www.epa.gov/tri) 1998.

engineering approaches. Finally, EPA conducts only a limited number of data quality inspections; otherwise the submitted data are not independently verified[48].

Non-Regulatory Instruments

Since the early 1990s, the United States has expanded its regulatory toolbox with the implementation of a variety of voluntary measures meant to supplement the regulatory system. Most of EPA's programs are designed to gain environmental improvements in areas that are not generally addressed by laws and regulations, such as reducing greenhouse gases or encouraging energy-saving technologies[49]. John Maxwell and Thomas Lyon (1999) argue that the emergence of voluntary measures in the United States policymaking system was the result of the following four interconnected changes which reached critical proportions in the mid-to-late 1980s: mounting legislative pressures as EPA was having a difficult time keeping up with the legislative responsibilities imposed by Congress; changes in technological innovation; cuts to EPA's budget; and the rise of citizen suits as national environmental groups began to sue the EPA for failure to enforce regulations[50].

Thus, in slightly more than a decade, voluntary measures evolved from the first two experimental programs - 33/50 and Green Lights - to include a plethora of varied

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[48] Commission for Environmental Cooperation. *Taking Stock 2000* (Montreal: CEC, 2003). Commission for Environmental Cooperation. *Putting the Pieces Together: The Status of Pollutant Release and Transfer Registers in North America* (Montreal, CEC, 1996)

[49] United States. Environmental Protection Agency. *Achievement Through Partnership: A Progress Report Through 2000*. 2002; United States. Environmental Protection Agency. *Partners for the Environment About Us* (www.epa.gov/partners/about/index.htm). 2003.

[50] Maxwell, John W., and Thomas Lyon. *What Causes U.S. Voluntary Environmental Agreements?* CAVA Working Paper No. 99/10/2 (Denmark, European Research Network on Voluntary Approaches, 1999).

programs. The use of voluntary measures is more institutionalized in the United States. The various programs are pulled together under the administrative umbrella of the "Partners for the Environment" program managed through the Office of Policy, Economics, and Innovation[51]. The EPA provides technical assistance, networking opportunities, and recognition to encourage partners in their efforts, and cites cost savings, increased profits, and a cleaner environment as some of the benefits of joining[52]. The EPA surveyed its partnership programs to obtain information on cost savings and environmental benefits. Table 4.2 illustrates the number of partners which have signed on to the many "Partners for the Environment" programs, as well as the cost savings and environmental benefits reported to have been achieved under these programs[53]. However, presumably these results do not control for the effect of mandatory regulations. That is, they do not isolate the impact of the voluntary programs alone.

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[51] Environmental Protection Agency, *Partners for the Environment About Us* (www.epa.gov partners about index.htm). 2003; United States. Environmental Protection Agency *Partners for the Environment A Catalogue of the Agency's Partnership Programs* 1998

[52] United States. Environmental Protection Agency *Partners for the Environment Why Join?* (www.epa.gov partners benefits index.htm). 2003

[53] Data in this table are based on results reported by participants in EPA's survey to 19 of its voluntary programs. Data for 1999 and 2000 surveys can be found at. United States Environmental Protection Agency *Achievement Through Partnership: A Progress Report Through 2000* 2002; United States.

Table 4.2
EPA Partnership Program Results

Achievements	1999	2000
Number of partners	8793	11 294
Money saved by partners	$4.1 billion	$5.9 billion
Greenhouse gas reductions	29 MMTCE	37.3 MMTCE
Water saved	627 million gallons	603 million gallons
Energy saved	519 trillion BTUs	768.8 trillion BTUs
Nitrogen oxide emission reductions	109 000 tons	158 172.5 tons
Sulfur dioxide emission reductions	196 000 tons	288 627.49 tons

The OECD conducted a study of voluntary measures in the United States and found a total of 42 programs in place as of 1999, with the majority of programs falling into the category of public voluntary programs. These are agreements signed between the EPA and an individual company, with the primary incentive for participation being public image considerations. Table 4.3 shows the number of programs for each of the three main categories of voluntary measures[54]. The EPA has developed some new programs since this time, including: the National Environmental Performance Track; Climate Leaders; Resource Conservation Challenge; Commuter Choice Leadership Initiative; Combined Heat and Power Partnerships; and Green Power Partnership[55].

Environmental Protection Agency *Partners for the Environment About Us* (www.epa.gov/partners/about/index.htm) 2003

[54] Organization for Economic Cooperation and Development *Voluntary Approaches for Environmental Policy: An Assessment* (Paris, OECD, 1999).

[55] United States Environmental Protection Agency, *Achievement Through Partnership: A Progress Report Through 2000*, 2002.

Table 4.3
Voluntary Measures at the Federal Level in the United States

Category of Voluntary Measure	Number of Programs
Public voluntary program	31
Unilateral commitments	9
Negotiated Agreements	2

There are only two voluntary measures in the United States which can be classified as *negotiated agreements* - the Common Sense Initiative and Project XL. While the Common Sense Initiative targets groups of companies from six industrial sectors, Project XL is directed at individual firms. Both programs target larger companies and both promote a multi-stakeholder consultative process to ascertain innovative ways to streamline the environmental management structure while improving environmental outputs[56]. Negotiations between firms and the public authorities concentrate on two criteria: the environmental target to be met by companies; and regulatory relief granted by EPA to participating firms. Thus, at the core, these programs are designed to trade improved environmental performance for simplified regulations. However, the OECD study notes that the implementation of Project XL and the Common Sense Initiative has been hampered because Congress has not given EPA the authority to provide firms with relief from existing regulations and laws[57].

[56] See United States. Environmental Protection Agency. *Partners for the Environment: A Catalogue of the Agency's Partnership Programs*. 1998; United States. Environmental Protection Agency. *The Common Sense Initiative: Lessons Learned About Protecting the Environment in Common Sense, Cost-effective Ways*. 1998. United States. Environmental Protection Agency. *Project XL* (www.epa.gov/ProjectXL). 2003.

[57] Organization for Economic Cooperation and Development. *Voluntary Approaches for Environmental Policy: An Assessment* (Paris: OECD, 1999), 84.

The second most prevalent type of voluntary measure in the U.S. is *unilateral commitments*. While not as popular as public voluntary programs, these programs do encompass a significant number of participating companies, mainly because most are sector-wide programs in which all industry members are required to participate. Perhaps the most well known of these is the Responsible Care Program, including members of the American Chemical Manufacturers Association. The initiative contains six management practice codes that range from pollution prevention to product stewardship. Monitoring is based mainly on self-reporting as only ten of the 190 members have chosen to include third-party reviews[58]. The majority of the other unilateral commitments follow a similar design: the targets are set by the firms themselves, usually in the form of management codes; the agreements are non-binding; and they target a single sector, mainly the chemical sector in the United States. The OECD study notes that the development of unilateral commitments in the United States has been hampered by anti-trust law which limits the right of industry associations to develop and enforce self-regulatory codes[59]. A primary motivation for participation in such programs is the benefits of public recognition provided through awards and the use of logos.

Public voluntary programs are by far the preferred type of voluntary measure in the United States. Of the 31 programs examined in the OECD study, ten addressed

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[58] Organization for Economic Cooperation and Development *Voluntary Approaches for Environmental Policy: An Assessment* (Paris, OECD, 1999).

[59] Organization for Economic Cooperation and Development *Voluntary Approaches for Environmental Policy: An Assessment* (Paris, OECD, 1999): 90.

pollution prevention and 21 addressed climate change[60]. Some programs target individual sectors or industries, such as the Voluntary Aluminum Industrial Partnership and the Coalbed Outreach Program, while others target more than one sector (*e.g.*, Energy Star, Green Lights, Wastewise and Climate Wise)[61]. As well, some programs focus on targeting a specific group of substances such as the Pesticide Environmental Stewardship Program and the Chlorofluorocarbon Substitutes Program. However, for all programs individual firms agree to participate and abide by standards and targets set by public authorities. The 33/50 Program, one of the first public voluntary programs established by EPA, will be discussed in more detail in the following section.

The above discussion has provided an overview of the expanding use of voluntary measures in the United States. While not meant to replace regulatory standards, such programs are an important complement to the environmental management system. It is clear that the complexity of the American regulatory system and the pervading adversarial political culture demands a change in policymaking style which makes use of the technological and financial benefits as well as the collaborative nature of such partnerships. However, the prevalence of public voluntary programs rather than negotiated agreements continues to foster a more formal policy environment, reflecting the more formal and complex institutional "rules" which govern environmental

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[60] Organization for Economic Cooperation and Development *Voluntary Approaches for Environmental Policy: An Assessment* (Paris: OECD, 1999): 88.

[61] See United States Environmental Protection Agency, *Partners for the Environment: List of Programs* (www.epa.gov/partners/programs/index.htm) 2003; United States, Environmental Protection Agency *Partners for the Environment: A Catalogue of the Agency's Partnership Programs* 1998, Organization for Economic Cooperation and Development, *Voluntary Approaches for Environmental Policy: An Assessment* (Paris: OECD, 1999)

management in the United States. The following section will look in detail at the development and implementation of the 33/50 Program, its design and target goals, and its performance in reducing chemical releases.

<u>The 33/50 Program</u>

Introduction

In 1991, the Environmental Protection Agency launched the 33/50 Program. The first of its kind, the program marked a fundamental change in the regulatory approach. Chris Tirpak, of the 33/50 staff, characterized the program as representing a paradigm shift, remarking, "...we're moving from confrontation on environmental problems to collaboration on environmental solutions...This is a bridge to a new way of doing business. It gives industry an incentive to reduce chemical releases and transfers."[62] The 33/50 program was essentially meant to be an experiment to demonstrate whether voluntary partnerships could augment the EPA's traditional command-and-control approach by bringing about targeted reductions more quickly than would regulation alone. The 33/50 program targeted a group of 17 high-priority toxic substances for 50 percent reduction by 1995. The Program was designed to achieve two things[63]:

- Reduce releases and transfers of 17 high priority toxic substances
- Foster a pollution prevention ethic, encouraging companies to consider and apply pollution prevention approaches to reducing their releases and transfers rather than end-of-pipe methods.

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[62] United States, Food and Drug Administration, *EPA's 33/50 Program: From Confrontation to Collaboration* (www.fda.gov/cdrh/leveraging/2.html), 1995: 2.

[63] United States, Environmental Protection Agency, *33/50 Program: The Final Record*, 1999

This section will provide an overview of the 33/50 program, as well as an evaluation of its implementation success. First, this will include an outline of the history and development of the program, its main goals and guiding principles, and its basic implementation format. Secondly, an evaluation of 33/50 will look at participation rates and incentives for performance and perceived benefits of the program, as well as provide a critique of the success of the program in reducing toxic emissions. The section will conclude with a discussion of the completion of the program in 1995 and why it was not continued.

Formulation and Implementation of the 33/50 Program

The Origins of 33/50

In contrast to the ARET Program in Canada, the 33/50 program was not the result of extensive negotiations with stakeholders. There were, however, two factors which led to its creation[64]. In 1990, the Science Advisory Board released its report *Reducing Risk: Setting Priorities and Strategies for Environmental Protection.* The report stressed the need for source reduction as the preferred method to reduce public risk, with particular emphasis on managing toxic substances. At the same time, the Pollution Prevention Act was passed which focused on methods for reducing waste at its source, promoting approaches which prevent pollution, rather than controlling or treating emissions. The 33/50 Program was designed as a response to this increased focus on pollution

[64] Davies, T., J. Mazurek, K. McKarthy, and N. Darnall. *Industry Incentives for Environmental Improvement: Evaluation of U.S. Federal Initiatives* (Washington DC: Resources for the Future, Center for Risk Management, 1996); United States. Environmental Protection Agency. *33/50 Program: Achievements* (www.epa.gov/ooaujeag/notebook/3350.htm), 1993; United States. Environmental Protection Agency. *Partners for the Environment. A Catalogue of the Agency's Partnership Programs.* 1998; Nachtrieb, Rebecca, "US EPA's Partners for the Environment", *Industry and the Environment*, Vol. 21:1, 1998: 24.

prevention, asking firms to significantly reduce toxic chemical releases and transfers primarily through source reduction activities. Secondly, the 33/50 Program was a response to the release of the first Toxic Release Inventory report which demonstrated the magnitude of the problem of toxic substances in the United States, both to government and to the public. Until the Superfund Act was revised in 1986, the United States had no national system in place to publicly report the amount of chemicals released into the environment. In 1987, the TRI became an integral part of the Community-Right-To-Know Program. The TRI began collecting data in 1988 on releases to air, water, landfills, and transport to off-site locations. The 1988 figures were released to the public in 1990, with a significant impact. The New York Times ran a full page article, showing the names and locations of the country's top ten polluters[65]. As a result, the EPA began to look for a way to reduce emissions - leading to the creation of the 33/50 Program. For industry, the program offered companies a powerful tool to demonstrate their willingness to reduce their emissions of high priority chemicals. The 33/50 Program was designed and directed primarily by the EPA. However, to "...enhance the program's effectiveness, each of the ten EPA regional offices was encouraged to help through additional efforts at communication and exhortation."[66]

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[65] Nachtrieb, Rebecca, "US EPA's Partners for the Environment", *Industry and the Environment*, Vol. 21:1, 1998: 24

[66] O'Toole, Laurence et al., "Reducing Toxic Chemical Releases and Transfers: Explaining Outcomes for a Voluntary Program", *Policy Studies Journal* Vol. 25:1, 1997 11-26 13.

33/50: Guiding Principles and Program Goals

The 33/50 Program derives its name from its overall goals: an interim goal of 33 percent reduction by the end of 1992 and an ultimate goal of 50 percent reduction by 1995 in releases and transfers of 17 targeted chemicals. The overarching goal was to "…demonstrate whether voluntary reduction programs can augment the Agency's traditional command-and-control approach by achieving targeted reductions more quickly than would regulations alone."[67] Evaluations of reductions used 1988 TRI reporting as a baseline. Environmental releases and transfers of the 17 targeted chemicals totaled almost 1.5 billion pounds as reported to TRI in 1988. Thus, the goals of the program represented a reduction of 491 million pounds by 1992 (33%) and 744 million pounds by 1995 (50%)[68]. Additionally, the EPA encouraged pollution prevention activities as the primary approach to reducing emissions. Table 4.4 provides a summary of these program goals. Monitoring and reporting of participant reductions were based on TRI reporting – unlike the ARET program which had annual emissions reported directly to the ARET Secretariat.

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[67] United States. Environmental Protection Agency. *EPA's 33/50 Program: Fifth Progress Update* (www.epa.gov/opptintr/3350.htm). 1994: 1.

[68] United States. Environmental Protection Agency. *33/50 Program: Achievements* (www.epa.gov/ooaujeag/notebook/3350.htm). 1993; Davies, T., J. Mazurek, K. McKarthy, and N. Darnall. *Industry Incentives for Environmental Improvement: Evaluation of U.S. Federal Initiatives* (Washington DC: Resources for the Future, Center for Risk Management, 1996).

Table 4.4
33/50 Program Goals

▪ Reduce 17 TRI chemicals by 33 percent (491 million pounds) by 1992
▪ Reduce 17 TRI chemicals by 50 percent (744 million pounds) by 1995
▪ Achieve reductions primarily through source reductions (pollution prevention)

Adapted from: Davies, T., J. Mazurek, K. McKarthy, and N. Darnall. *Industry Incentives for Environmental Improvement: Evaluation of U.S. Federal Initiatives* (Washington DC: Resources for the Future, Center for Risk Management, 1996): 10.

The EPA listed the following as guiding principles of the 33/50 Program[69]:

- Promote pollution prevention as the most cost-effective means to reduce pollution and the environmental and health risks associated with pollution
- Instill a pollution prevention ethic among American businesses
- Demonstrate voluntary efforts to augment EPA's command-and-control approach to achieve reductions
- Reduce industry costs for raw material purchases, end-of-pipe treatment technologies, waste disposal, and liability for toxic use and waste generation
- Promote technology transfer to help find efficient ways to prevent pollution
- Provide national recognition to companies who make voluntary reductions and devise innovative programs for pollution prevention.

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[69] United States. Environmental Protection Agency. *The 33/50 Program: Voluntary Action Success Story* (www.epa.gov/opptintr/3350.htm). 2000.

The hallmark of the 33/50 Program was flexibility. It invited companies that used the target substances to monitor their own releases, set specific goals for reducing those releases, and find the best way to meet those goals. It did not dictate how companies should reduce their emissions, it did not monitor their releases, and it did not penalize companies who fell short of their commitments. In a statement encouraging companies to join the program, the EPA stated, "...whatever works best for each company's particular circumstances will work for the 33/50 Program as well."[70] Several points should be noted here about the program's design[71].

First, the sole requirement for participation in the 33/50 Program was a short letter of intent stating the facility's reduction goal for the sum of the 17 target substances for 1995. This only needed to be a one-paragraph letter; however companies were encouraged to provide more detailed reduction plans. Secondly, the EPA allowed companies to decide which of the designated 17 chemicals they wanted to reduce. As well, companies could target reduction efforts to all, some, or very few of their plants. Furthermore, goals could be changed as circumstances dictated. Thirdly, the 33 and 50 percent goals were national goals, not goals imposed on each company. Participants were able to set the goals that worked best for them. As well, while companies were encouraged to use the 1988 baseline, this was flexible also. Finally, the EPA did not monitor participating facilities

[70] United States Environmental Protection Agency, *Questions and Answers About the 33 50 Program* (www.epa.gov opptintr 3350.htm) 1994, 1

[71] See United States, Environmental Protection Agency, *Questions and Answers About the 33 50 Program* (www.epa.gov opptintr 3350.htm), 1994; United States, Environmental Protection Agency *Suggested Language for Participating in EPA's 33 50 Program*, (www.epa.gov opptintr 3350.htm), 1995.

to ensure accurate reporting. The program only required that the company's chief financial officer sign the annual report.

33/50 Target Substances

The 33/50 Program targets 17 high priority chemicals. The 17 substances were selected on the basis of three criteria: they posed environmental and health concerns; they were high-volume industrial chemicals; and they could be reduced through pollution prevention[72]. These substances represented the most widely released and most toxic chemicals reported to the TRI. Combined, they represented about one-fourth of the total TRI releases and transfers in 1988[73]. A secondary reason for the selection of these chemicals was that they mostly comprised airborne releases and were also regulated under the Clean Air Act Amendments (CAAA). Companies that chose to participate in 33/50 were eligible for the Early Emissions Reduction provision of the CAAA[74]. Appendix 4.1 lists the 33/50 target substances as well as their corresponding TRI name and their presence on major American regulatory target lists[75].

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[72] United States, Environmental Protection Agency *Questions and Answers About the 33/50 Program* (www.epa.gov/opptintr/3350.htm), 1994.

[73] Arora, Seema and T. Cason, "Why Do Firms Volunteer to Exceed Environmental Regulations? Understanding Participation in EPA's 33/50 Program", *Land Economics*, Vol. 72:4, 1996, 413-432; Davies, T., J. Mazurek, K. McKarthy, and N. Darnall. *Industry Incentives for Environmental Improvement Evaluation of U.S. Federal Initiatives* (Washington DC, Resources for the Future, Center for Risk Management, 1996)

[74] Davies, T., J. Mazurek, K. McKarthy, and N. Darnall. *Industry Incentives for Environmental Improvement: Evaluation of U.S. Federal Initiatives* (Washington DC: Resources for the Future, Center for Risk Management, 1996)

[75] The TRI lists chemical substances separately. The components are added together to form the chemical category used in the 33/50 Program.

Evaluation of the 33/50 Program

Participation

EPA solicited potential participants by extending invitations to three specific groups of firms, as shown in Table 4.5. The "Top 600" companies with the greatest amounts of releases and transfers were the first to be contacted for participation in the 33/50 Program. These firms were characterized by larger operations and accounted for more than 75 percent of the total 1988 TRI releases and transfers of the target chemicals. A little over 60 percent of these companies agreed to participate. The second group represented the remaining companies that reported 33/50 chemicals in the 1988 TRI report - 18 percent of the companies contacted agreed to join the program. The final group was invited to join in July 1992, comprised of companies that had not reported 33/50 chemical releases in 1988 but did so in subsequent years. This group was characterized primarily by smaller operations that were less responsive, with only a seven percent participation rate. The program targeted parent companies rather than individual facilities, hoping for participation from all facilities within the company. Of the almost 8000 parent companies contacted, nearly 1300 pledged participation (encompassing over 6800 individual facilities), representing 63 percent of all 33/50 chemical releases in 1988.

Table 4.5
Participation in the 33/50 Program

Group	No. Invitations	Invitation Date	Participation Pledged
1st group	509	1991	328 (64 percent)
2nd group	4534	1991	819 (18 percent)
3rd group	2512	1992	140 (7 percent)
Total participation	7555		1287 (17 percent)

Source: United States. Environmental Protection Agency. *33 50 Program The Final Record*. 1999: Table adapted from Davies. T.. J. Mazurek. K. McKarthy. and N. Darnall. *Industry Incentives for Environmental Improvement. Evaluation of U.S. Federal Initiatives* (Washington DC: Resources for the Future. Center for Risk Management. 1996).

Arora and Cason studied the profile of firms participating in the 33/50 Program[76]. They found that firms with large releases of 33/50 and non-program chemicals. large firms. and companies closer to final markets were more likely to participate. Table 4.6 shows the results of their study. This suggests that a primary motivation for participants may have been public recognition for corporate environmental actions.

Table 4.6
Characteristics of Firms Likely to Participate in 33/50

Firm Description	Increased Probability of Participation
High customer interfacing	20 percent
High R&D intensity	12 percent
Large number of employees	44 percent
High non-33/50 chemical releases	99 percent
High 33/50 chemical releases	22 percent

Source: Arora. Seema and T. Cason. "An Experiment in Voluntary Environmental Regulations: Participation in EPA's 33/50 Program". *Journal of Environmental Economics and Management*. Vol. 28. 1995: 271-286.

[76] Arora. Seema and T. Cason. "An Experiment in Voluntary Environmental Regulation. Participation in EPA's 33/50 Program". *Journal of Environmental Economics and Management*. Vol. 28. 1995 271-286

Program Incentives and Benefits

The EPA designed the 33/50 program to provide incentives for participation. First, it was hoped that firms would participate to take advantage of the early emissions reduction provisions of the CAAA. However, Davies and Mazurek argue that this incentive has not had a significant impact, as in 1994 there were only 40 active applications for the Early Reductions Program[77]. Secondly, 33/50 was designed to give participants a great deal of flexibility in reducing their emissions and required few prerequisites to join, thereby minimizing administrative burdens[78]. The flexibility of the program also encouraged innovative approaches to pollution control rather than outlining prescriptive standards, allowing firms to decide their most cost-effective method for reducing emissions. Thirdly, participants in 33/50 received support from EPA in several ways[79]. Support came in the form of technical assistance and information on emerging pollution prevention technologies. In addition the EPA provided industry-specific guidance, reference manuals, and videos with instructions on setting up waste reduction programs for specific processes or materials. Most importantly, the EPA marketed the 33/50 Program as a means for firms to gain public recognition for their responsible

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[77] Davies, T., J. Mazurek, K. McKarthy, and N. Darnall. *Industry Incentives for Environmental Improvement: Evaluation of U.S. Federal Initiatives* (Washington DC: Resources for the Future, Center for Risk Management, 1996): 16.

[78] Ibid.

[79] Organization for Economic Cooperation and Development. *Voluntary Approaches for Environmental Policy: An Assessment* (Paris: OECD, 1999). Davies, T., J. Mazurek, K. McKarthy, and N. Darnall *Industry Incentives for Environmental Improvement: Evaluation of U.S. Federal Initiatives* (Washington DC: Resources for the Future, Center for Risk Management, 1996)

environmental management. In return for 33/50 commitment letters, EPA acknowledged each facility with a 'certificate of appreciation' signed by the EPA Administrator. Upon achievement of the 33/50 national goal of 50 percent reduction by 1995, companies also received a congratulatory certificate signed by Vice President Gore. The Program also highlighted the progress made by individual facilities through a series of detailed 'Company Profiles' and briefer '33/50 Success Stories'[80]. Companies also received public recognition through periodic progress reports and press releases. For example, the November 1995 issue of *Chemical Engineering* highlighted the achievements of more than 20 companies in the chemical process industry that had dramatically reduced their chemical releases under the 33/50 Program[81].

The End of 33/50

The 33/50 Program officially terminated December 31, 1995. In November 1994, the EPA released a document entitled *The 33/50 Program: The Next Generation*[82]. The objective was to obtain input from industry, environmental groups, citizens, and government agencies on the future of the program. Some of the questions it raised included:

- Should there be a next generation of the 33/50 Program?

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[80] United States. Environmental Protection Agency. *Partners for the Environment: A Catalogue of the Agency's Partnership Programs*. 1998; United States. Environmental Protection Agency. *33/50 Program Company Profiles: Reduction Highlights* (www.epa.gov/opptintr/3350.htm), 1994.

[81] United States. Environmental Protection Agency. *33/50 Program: Achievements* (www.epa.gov/ooaujeag/notebook/3350.htm), 1993

[82] United States. Environmental Protection Agency. *The 33/50 Program: The Next Generation* (www.epa.gov/opptintr/3350.htm), 1994.

- What should be the goals, timeframes, and associated measures of a next generation program?
- Who should be invited to participate?
- Should a next generation program be linked to TRI?
- To what extent should participants make use of previously planned or initiated activities in meeting the goals of a next generation program?
- What incentives should be offered to encourage participation?

However, once the final evaluation of the 33/5o Program was released, the program ceased to exist (even the program website was removed). The program was heralded as a success and the accomplishments recognized by the receipt of two prestigious awards[83]. In 1995, 33/50 received a "Hammer Award" for reinventing government from Vice President Gore's National Performance Review. In 1997, the program was recognized as one of the 25 best government innovations in the country by the "Innovations in American Government Award Program" sponsored by the Ford Foundation and the John F. Kennedy School of Government at Harvard. The 33/50 Program has served as a model for many spin-off programs[84]. The Departments of Energy and Defense have adopted internal 33/50-type programs to help promote pollution prevention at their own facilities and those of contractors working for them. State

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[83] United States. Environmental Protection Agency. *Partners for the Environment: A Catalogue of the Agency's Partnership Programs*. 1998.

[84] United States. Environmental Protection Agency. *33/50 Program: Achievements* (www.epa.gov/ooaujeag/notebook/3350.htm). 1993; United States. Environmental Protection Agency. *The 33/50 Program: Voluntary Action Success Story*. (www.epa.gov/opptintr/3350.htm). 2000. United Nations. *Initiative: 33/50 program* (www.un.org/esa/sustdev/viaprofiles/33_50.html). 2001.

programs modeled after 33/50 include Minnesota 50 and Texas 2000, which encourage companies within the state to reduce toxic pollution. As well, the Chesapeake Bay Program launched a multi-state program to achieve toxic reduction goals in the Chesapeake Bay drainage basin. While the 33/50 program did not go on to a next generation program, the EPA has not deserted voluntary measures as an important part of their environmental management strategy. In March of 1995, EPA came out with a new environmental initiative entitled "Reinventing Regulation," including such voluntary programs as Project XL and the Common Sense Initiative[85].

Program Performance: Success or Failure?

The 33/50 Program has been heralded as a success, claiming the achievement of the 50 percent reduction goal one year early. However, many have questioned the validity of the EPA's evaluation for several reasons. The program did not look at company performance individually, nor performance at a chemical level. Rather all releases and transfers for all 17 target substances for all participating companies taken together were used to evaluate program performance. Table 4.7 shows the final report by EPA detailing reductions achieved under the 33/50 Program.

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[85] United States. Food and Drug Administration. *EPA's 33/50 Program: From Confrontation to Collaboration* (www.fda.gov/cdrh/leveraging2.html), 1995.

Table 4.7
Releases and Transfers of 33/50 Program Chemicals vs Other TRI Chemicals 1988-1996

Year	All TRI Chemicals (Pounds)	TRI Chemicals less 33/50 Chemicals (Pounds)	33/50 Chemicals Only (Pounds)
1988	4,020,250,532	2,524,122,352	1,496,128,180
1990	3,428,644,482	2,163,382,571	1,265,261,911
1995	2,289,147,796	1,616,832,014	672,315,782
1996	2,216,858,876	1,616,250,453	600,608,423

Source: United States. Environmental Protection Agency. *33 50 Program The Final Record*. 1999: 3.

There have been many critiques that the EPA overstated the success of the program. The most obvious concerns the fact that the program set 1988 as the base-year, essentially enabling firms to claim reductions under the program that they had made prior to the start of the program in 1991[86]. Davies and Mazurek examined how 33 50 results change when the base-year is modified from 1988 to 1991. Table 4.8 shows that chemical emissions fell only by 27 percent, rather than 51 percent, when 1991 is used as the base-year[87]. As well, researchers from INFORM, a non-profit environmental research organization, found that 31 percent of 33 50 Program participants had already initiated reduction activities prior to 1991[88].

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[86] Harrison, Kathryn. "Talking with the Donkey: Cooperative Approaches to Environmental Protection". *Journal of Industrial Ecology*, Vol 2, 1998: 51-72; Harrison, Kathryn. "Voluntarism and Environmental Governance" in E.A. Parson (ed). *Governing the Environment Persistent Challenges, Uncertain Solutions* (Toronto. University of Toronto Press, 2001)

[87] Davies, T., J. Mazurek, K. McKarthy, and N. Darnall *Industry Incentives for Environmental Improvement Evaluation of U S Federal Initiatives* (Washington DC: Resources for the Future, Center for Risk Management, 1996).

[88] Mazurek, Janice. *Voluntary Agreements in the United States An Initial Survey* CAVA Working Paper No. 98 11 1. Paper presented at CAVA Workshop "The World-Wide Use of Voluntary Approaches". November 26-27, Gent, Belgium, 1999

Table 4.8
Comparison of Baseline Years and Participant Reductions to 33/50 Program Goals

Reduction Goal/ Year	Total Reductions 1988-1994	Total Reductions 1991-1994
1992: 33 percent	40 percent	12 percent
1995: 50 percent	51 percent	27 percent

An ancillary goal of the program was to promote pollution prevention. An evaluation by the United States General Accounting Office (GAO) found no evidence to suggest that the 33/50 program promoted prevention measures over others[89]. Similarly, the study by INFORM found that most companies relied primarily on end-of-pipe treatment technologies or on-site recycling and energy recovery rather than source reduction to reduce their releases and transfers of the target substances[90]. There have also been criticisms regarding the way EPA calculated reductions. The EPA calculated chemical reductions by aggregating all firm reductions reported to TRI, without distinguishing between reductions made by program participants and those made by non-participants[91]. The GAO evaluation estimated that 38 percent of targeted reductions were attributable to non-participating companies[92].

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[89] United States, General Accounting Office, *Toxic Substances: EPA Needs More Reliable Source Reduction Data and Progress Measures*, 1994

[90] Mazurek, Janice. *Voluntary Agreements in the United States: An Initial Survey*, CAVA Working Paper No. 98/11/1. Paper presented at CAVA Workshop "The World-Wide Use of Voluntary Approaches", November 26-27, Gent, Belgium, 1999

[91] Harrison, Kathryn, "Voluntarism and Environmental Governance" in E.A. Parson (ed), *Governing the Environment: Persistent Challenges, Uncertain Solutions* (Toronto: University of Toronto Press, 2001); Harrison, Kathryn and Werner Antweiler, "Incentives for Pollution Abatement: Regulation, Regulatory Threats, and Non-Governmental Pressures", *Journal of Policy Analysis and Management*, Vol. 22:3, 2003 362-382. Mazurek, Janice. *Voluntary Agreements in the United States: An Initial Survey*, CAVA Working Paper No. 98/11/1. Paper presented at CAVA Workshop "The World-Wide Use of Voluntary Approaches", November 26-27, Gent, Belgium, 1999.

There have been several studies which have provided insight into general characteristics of participating firms, as well as their incentives to participate in the program. Studies by Khanna and Damon (1998) and Arora and Cason (1995 and 1996) both suggest that the opportunity for improved public image was a primary reason companies joined the 33/50 Program[93]. Arora and Cason also concluded that larger firms were more likely to participate. Furthermore, study results suggest that the potentially avoided costs of compliance under mandatory regulations provided a strong incentive for participation[94]. The study conducted by Khanna and Damon is the only one which provides a comparative analysis of the 33/50 Program and mandatory regulations. They demonstrated that the program led to a statistically significant decline in the release of target chemicals after controlling for sample selection bias, the impact of mandatory regulations, and firm-specific characteristics.

While most analyses of the ARET Program in Canada concerned an evaluation of the design and implementation of the program, there have been more quantitative

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[92] United States, General Accounting Office. *Toxic Substances: EPA Needs More Reliable Source Reduction Data and Progress Measures*. 1994.

[93] Arora, Seema and T. Cason, "An Experiment in Voluntary Environmental Regulation: Participation in EPA's 33/50 Program", *Journal of Environmental Economics and Management*, Vol. 28, 1995: 271-286; Arora, Seema and T. Cason, "Why Do Firms Volunteer to Exceed Environmental Regulations? Understanding Participation in EPA's 33/50 Program", *Land Economics*, Vol. 72.4, 1996, 413-432. Khanna, Madhu and Lisa A. Damon, "EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms", *Journal of Environmental Economics and Management*, Vol. 37, 1999: 1-25

[94] Khanna, Madhu and Lisa A. Damon, "EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms", *Journal of Environmental Economics and Management*, Vol. 37, 1999: 1-25; O'Toole, Laurence et al., "Reducing Toxic Chemical Releases and Transfers: Explaining Outcomes for a Voluntary Program", *Policy Studies Journal*, Vol. 25:1, 1997: 11-26.

evaluations of the 33/50 Program. These have included evaluations of program performance in terms of reductions of target chemicals, as well as examinations of the incentives for participation and general firm characteristics of program participants. What is lacking is a study of the relative effectiveness of the 33/50 Program as compared to the mandatory regulatory system alone. As well, there has not been a post-program review of the 33/50 participants to see if their emissions have increased or decreased since the end of the program in 1995. Such an analysis of the 33/50 Program will be provided in Chapter six. The next chapter will provide a similar analysis of the effectiveness of the ARFT Program in Canada.

Appendix 4.1
33/50 Target Substances

TRI Chemical Name	33/50 Chemical Name	EPCRA (Community Right-to-Know)	CERCLA (Superfund)	Clean Air Act	Clean Water Act
Cadmium, Cadmium compounds	Cadmium and compounds		X	X	X
Chromium, Chromium compounds	Chromium and compounds	X	X	X	X
Lead, Lead compounds	Lead and compounds		X	X	X
Mercury, Mercury compounds	Mercury and compounds		X	X	X
Nickel, Nickel compounds	Nickel and compounds		X	X	X
Benzene	Benzene		X	X	X
Methyl ethyl ketone	Methyl ethyl ketone		X	X	
Methyl isobutyl ketone	Methyl isobutyl ketone		X	X	
Toluene	Toluene		X	X	X
Xylene (mixed isomers)	Xylenes		X	X	
Carbon tetrachloride	Carbon tetrachloride		X	X	X
Chloroform	Chloroform	X	X	X	X
Dichloromethane	Dichloromethane				
Tetrachloroethylene	Tetrachloro-ethylene		X	X	X
1,1,1-Trichloroethane	1,1,1-Trichloroethane		X	X	X
Trichloroethylene	Trichloroethylene		X	X	X
Cyanide compounds	Cyanides	X	X	X	

Source: United States. Environmental Protection Agency. *Regulatory Matrix. TRI Chemicals in Other Federal Programs.* (www. epa.gov/triinter/chemical). 2003; United States. Environmental Protection Agency. *The 33 50 Program: The Next Generation* (www.epa.gov/opptintr 3350.htm). 1994.

Chapter Five
Evaluation of the Effectiveness of the ARET Program in Canada

Introduction

This chapter will provide an evaluation of the effectiveness of the ARET program in reducing releases of target substances through a comparison of emissions by participating and non-participating firms (representing the business-as-usual scenario). The first section provides an overview of the variables and measures used in the study as well as their corresponding data collection procedures. The following three sections outline the results of the analysis at three levels. The first includes an overview of descriptive characteristics comparing the two study populations to give a general picture of the firms being studied. The second level of analysis is the core of this study – comparing reductions in releases between participating and non-participating firms to evaluate the success of the ARET Program. This includes information on the yearly total releases of the target substances and percentage change and absolute change in reported releases during the tenure of the program. The final level of analysis examines performance in relation to firm characteristics outlined in the first stage of analysis. This provides insight into how factors such as firm size and industry sector may affect performance.

ARET Program: Data Collection and Procedures

Environmental Effectiveness:

The primary indicator of program success was environmental effectiveness as measured by reductions in releases of the ten target substances in the matched dataset.

These ten chemicals were chosen as they were common to the target lists of both voluntary programs. The substances included: benzene; chloroform; carbon tetrachloride; methyl isobutyl ketone; cadmium; chromium; cyanide; lead; mercury; and nickel. For analysis of the ARET Program case study, data were collected for two study populations - facilities who were participants in the program and non-participating facilities (representing the business-as-usual scenario). Data were collected at the individual facility level, for each substance separately, as this reflects the method of reporting to both the ARET Secretariat and the NPRI. This also allowed for an evaluation of the effects of firm characteristics (*e.g.*, company size, region) on program outcome as this data was collected at the individual firm level as well.

The ARET Secretariat database was used to collect information on substance releases for participating firms[1]. This database contained data on reported releases of ARET substances from 1988-2000. Data were collected for yearly emissions for each substance separately and then aggregated to provide an overall list of all firms with emissions of any of the ten target substances[2]. The result was a list of 180 firms. From these, firms which had reported releases of only one of the ten substances or which had zero releases for all substances for all years were omitted from the study population[3]. The

[1] The ARET database is not publicly available; however, a copy was provided for the purpose of this study. The database was in Microsoft Access format, allowing for a search of firms which reported releases of the matched substances.

[2] Both the ARET and NPRI databases report information by individual facilities, by substance, by year. In order to establish a group of firms which have releases of the ten target chemicals in common, it was first necessary to search for yearly releases by substance. Microsoft Access was then used to pull together these 10 separate lists to form a master list of firms which included yearly releases for all ten substances.

[3] The master list contained 180 facilities which had reported releases of any of the ten target substances. Cases which reported a 0 value for all reported substances for all years were omitted from the study as they

resulting participant population contained 64 cases. The facilities were identified by their ARET identification number and their corresponding NPRI identification number[4].

Data for non-participating companies were collected through the National Pollutant Release Inventory. The NPRI CD-ROM was used to collect data reported to the NPRI from 1994-1999[5]. From this, it was possible to search for facilities which had reported releases of any of the ten target substances over this time period. This was then aggregated to form a master list of 139 firms with releases of any of the ten chemicals. Once again, firms with releases of only one of the ten substances or with zero emissions for all substances for all years were excluded, leaving a total of 47 cases for the non-participant sample population. Facilities were identified through their NPRI identification numbers to ensure accuracy. Table 5.1 displays the number of cases in the final study sample.

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did not provide any basis for analysis (*i.e.*, no change in emissions over the time period studied). As well, cases which had reported releases for only one of the ten substances were omitted from the study as they did not provide a significant amount of information for analysis (*e.g.*, comparing firms with releases of only one substance to firms with releases of five chemicals). Because the cases were selected on the basis of their releases of the ten target substances, there was a fair amount of variation among the resulting cases in terms of how many which chemicals they reported. The intent was to try to keep the firms as similar as possible. Additionally, the number of cases in the sample was a consideration. It was felt that 180 cases would be too many to use as one of the 4 study groups. Similarly, omitting firms which did not have reported releases for more than one substance resulted in too few cases.

[4] Firms were assigned an identification number by the ARET Secretariat. It was important to note these ID codes to ensure the accuracy of the data as there are many facilities which carry the parent company name, but with different plant locations. The database supplied the corresponding NPRI identification code as well, which was used to ensure accuracy in collecting data on firm characteristics from the NPRI database.

[5] Environment Canada. *1994-1999 NPRI Data CD-ROM*. 2000. This CD-ROM is a comprehensive collection of all NPRI data and Annual Summary Reports. Microsoft Access was used to search for data on firms with reported releases of the target substances.

Table 5.1
The ARET Program: Number of Cases in Study Sample

Population	ARET Participants	Non-Participants
Number of companies with releases of any of the ten target substances	180	139
Number of companies in study sample	64	47

Since data for ARET participants and non-participants were obtained through two data sources, it was important to ensure the accuracy of comparisons between reported releases. Under both inventories releases are reported for various mediums (*i.e.*, air, land, and, water) and then added together to get total annual release values. However, in the ARET database, releases to secure on-site landfills are not included in land releases as they are in the NPRI[6]. Thus, it was determined that only reported releases to air and water would be collected and then they would be added together to form the total releases measure to enable comparison between the two groups[7].

As outlined in chapter three, the following dependent variables were used to measure environmental effectiveness: percentage change in emissions from the start of the ARET program in 1994 to year 2000; absolute change in releases from 1994-2000; and total yearly releases for participants versus non-participants.

Industrial Sector:

Information for both participants and non-participants were collected with regards to the industrial sector to which facilities belonged. The category of industrial sector for

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[6] Personal Communication, Brad Fisher, ARET Secretariat, November 1999

each firm was provided in both the ARET and NPRI databases. In both Canada and the United States, there is a system of standard industrial classification codes which are used to describe the types of activities and operations performed by a facility. Companies in Canada are identified by a Canadian Standard Industrial Classification Code (SIC). Companies in the United States are identified through a similar system. However, to allow for comparison between companies from the American case study of the 33/50 Program and companies in the Canadian case study, the North American Industrial Classification System (NAICS) was used for both Canadian and American firms[8]. The intent here was to evaluate: (1) whether some sectors were more likely to participate in the ARET Program; and (2) whether some sectors reduced their emissions of the ten target chemicals more than other sectors.

Company "Greenness":

Two measures of company "greenness" were collected: compliance records and participation in other voluntary measures. First, it was assumed that firms which participated in other voluntary measures are more "green" than others. Further, it was assumed that that since such firms appear more environmentally conscious, they would perform better in reducing emissions of the target substances. Membership in Responsible Care and the Voluntary Challenge Registry were used as indicators of participation in other voluntary measures. These programs were chosen as they are two of the largest national voluntary programs in Canada (besides ARET). The membership

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[7] In most cases, the majority of total reported releases were primarily air releases, followed by water and then land. Thus, the measure of total releases used here captures the greater part of annual pollutant releases

lists of both programs were examined to determine which firms in the participant and non-participant populations were members[9]. The second measure of greenness was firms' compliance records in relation to environmental offenses. The assumption here was that firms with a history of non-compliance would be less successful than "green" firms in reducing emissions. Data on compliance records are reported through provincial and territorial environmental inspections and enforcement branches. Information on firm compliance records was collected through an investigation of regional government documents, with the availability of data varying from region to region. For participating and non-participating firms located in Ontario and British Columbia, it was possible to search for compliance records through government documents supplied on the internet[10]. Data were obtained for compliance records for firms in Ontario from 1995-2001 and for British Columbia from 1994-2001. Compliance records for firms located in Alberta[11] were obtained through a combination of online documents (for more recent years) and annual compliance reports supplied by the governing agency. Data were obtained for compliance records in Alberta from 1993-2001. For firms located in Manitoba,

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[8] Information on adjusting the Canadian SIC codes to NAICS was found at www.statcan.ca english subjects standard index.htm

[9] Participant lists for the Responsible Care Program can be found at www.ccpa.ca and for the Voluntary Challenge Program at www.vcr-mvr.ca.

[10] Ontario. Ministry of the Environment. *Environmental Compliance Reports 1995-2001* (www.ene.gov.on.ca envision compliance compliance.htm); British Columbia. Ministry of Water, Land, and Air Protection. *Non-Compliance Reports 1994-2001* (www.elp.gov.bc.ca epd epdnon).

[11] Alberta. Alberta Environmental Protection. Pollution Control Division. *Enforcement of the Environmental Protection and Enforcement Act September 1993-December 31 1995*. April 1996. Alberta. Alberta Environmental Protection. Pollution Control Division. *Enforcement of the Environmental Protection and Enforcement Act January 1-December 31 1996*. March 1997. Alberta. Alberta Environmental Protection. Pollution Control Division. *Enforcement of the Environmental Protection and Enforcement Act January 1-December 31 1997*. April 1998; www.gov.ab.ca env protenf enforcement index.html.

compliance records for 1996-2001 were obtained from online enforcement documents[12]. Information on firms' compliance from 1993-1995 was obtained through personal communication with an agency representative[13]. Data for compliance records from 1990-2000 for firms located in Saskatchewan and the North West Territories were obtained through personal communication with regional agency representatives[14]. There were no publicly available data for firms located in Quebec, Nova Scotia, and Newfoundland, and efforts to obtain data from regional environmental representatives were unsuccessful. Firm compliance records were categorized by three values: 0, if there were no records of non-compliance; 1, if a facility had a history of non-compliance but it did not result in a fine; and 2, if a firm was fined or taken to court over non-compliance infractions[15]. No value was given for firms for which it was not possible to collect compliance information.

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[12] Manitoba, Regional Operations *Enforcement Actions 1996-2001* (www.gov.mb.ca/conservation/regoperations/enforce/index.htm)

[13] Personal Communication Doris Maxwell, Manitoba Conservation, Regional Operations Division, December 6, 2001.

[14] Personal Communication, Kim Hallard Environmental Project Officer Saskatchewan Environment and Resource Management, November 28, 2001, Personal Communication, Dave Williams Environmental Protection Service Northwest Territories, November 20, 2001.

[15] The data collected from provincial compliance reports provided information on whether a facility was found to be in violation of mandatory regulations on a yearly basis. Under such compliance monitoring a facility can be given a warning (if the violation was minor in scale or not a repeat offense), fined (if the violation was substantial in scale or in cases of repeated offences), or taken to court. Court action is rare as most facilities are given a warning or a fine. Thus, the 3-value scale used to measure compliance records reflects this hierarchy of compliance enforcement. Firms were given a value of 1 if they had been issued warnings but no fines. Firms which had more significant violations, as exemplified through fines or court action, were given a value of 2. It was determined that fines and court action would be collapsed into one measure indicating significant violations as these are cases of severe and or repeated non-compliance

Company Size:

Company size was measured by the number of employees employed at a facility. Data for both participant and non-participant cases were obtained through the 1999 NPRI database. NPRI identification numbers were used to ensure accuracy of data and firm identification. Once the number of employees for each firm was collected, firms were categorized by four values.

- 0 if there were less than 20 employees (small-sized firm)
- 1 for firms with 21-99 employees (small-sized)
- 2 for firms with 100-500 employees (medium-sized)
- 3 for firms with more than 500 employees (large-sized firm)

This categorization was taken from that used by Statistics Canada to group company size through number of employees[16]. Here the assumption was that larger firms would be more likely to participate in the ARET Program, and would also show greater emission reductions of the target substances.

Pollution Prevention Activities:

The National Pollutant Release Inventory collects information on the pollution prevention activities of firms. The data are reported annually for individual firms for each substance separately. For each of the firms in the participant and non-participant population, yearly pollution prevention activities for each of the ten target substances

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[16] Statistics Canada. Table 282-0075. (www.statcan.ca)

were collected. Pollution prevention activities were distinguished by the following categories[17]:

- materials substitution
- product design or reformulation
- equipment/process modifications
- spill and leak prevention
- on-site recovery, re-use, recycling

This information was then collapsed into a three-range measure of pollution prevention activities for each facility: 0 if there were no pollution prevention activities; 1 if there was some minor level of P2 activity (*e.g.*, onsite-recovery, re-use, recycling; spill and leak prevention); and 2 if a facility demonstrated more substantial P2 activities (*e.g.*, equipment process modification; product design or reformulation; materials substitution) which would indicate more significant changes in firm behaviour and operations.

Region:

The location of firms was reported in order to examine whether region had any impact on program outcomes. While the focus of this study was on industrial releases into the Great Lakes Basin, in order to maintain a larger N firms from other regions of Canada were included in this section of the analysis as well[18]. However, the focus of the analysis was on the performance of firms located in Ontario and Quebec. Additionally,

[17] Canada. Environment Canada *National Pollutant Release Inventory Annual Report 2000* 2001.

[18] The comparative analysis of the ARET and 33/50 Programs in chapter seven includes only firms which are located in the provinces surrounding the Great Lakes Basin (Ontario and Quebec).

this provides a basis for comparison of regional differences in the success of the ARET Program across Canada.

A complete list of the variables used in this analysis is provided in Appendix 5.1. This table includes the variable labels and values attached to each. The remainder of this chapter will summarize the results of the investigation of the effectiveness of the ARET Program. The analysis is divided into three sections. First, a descriptive overview of the characteristics of the two study populations is presented, providing a general picture of the types of firms in the participant and non-participant groups in relation to such factors as firm size, industrial sector, location of facilities, and company greenness. The second section evaluates and compares the effectiveness of the participant and non-participant groups in terms of reductions in releases of the target substances. The third section examines the relationship between performance in emission reductions and specific firm characteristics.

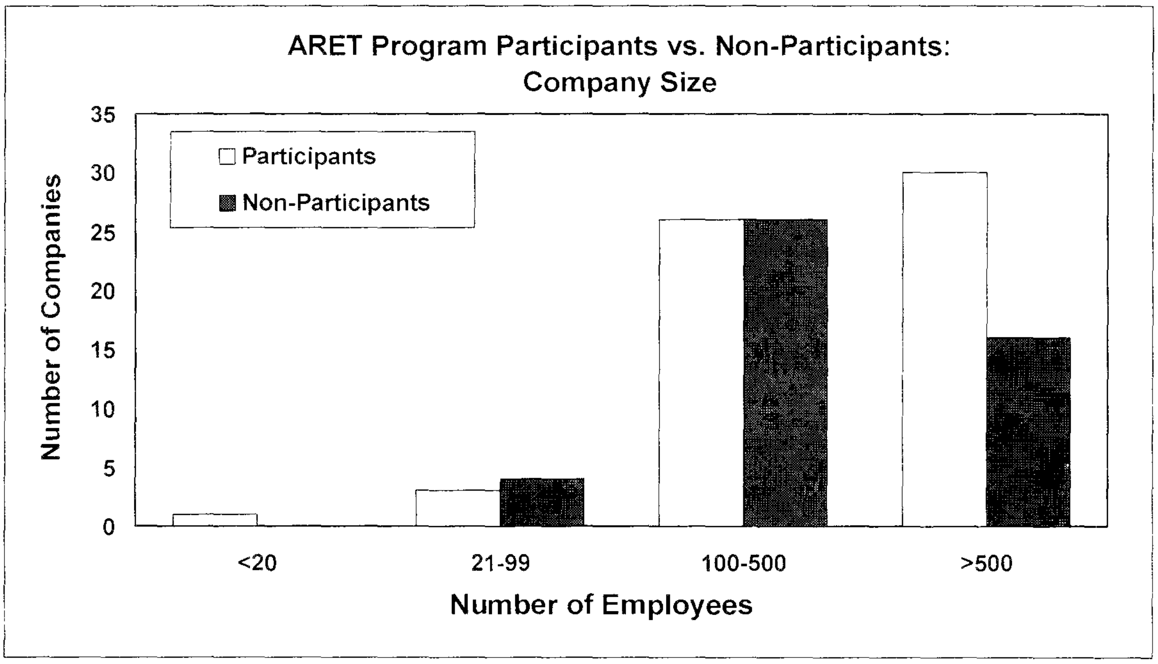
Results: Descriptive Characteristics of Participants vs. Non-Participants

Data were collected for each firm in relation to the following firm characteristics: company size; industrial sector; location of facility; compliance records; participation in other voluntary programs; and pollution prevention activities. The purpose of this section is simply to provide an overview of the general characteristics of the two study populations with regards to these variables[19]. Most importantly, this provides a general picture of a typical firm in each sample group.

[19] Appendix 5.2 provides a summary of results detailing firm characteristics of the participants and non-participants groups

Figure 5.1 demonstrates that the two groups, participants and non-participants, display similar characteristics with regards to *company size* (as measured through number of employees). The majority of facilities in both populations are medium to large-sized firms. This coincides with findings in other studies which have shown that larger firms are more likely to participate in voluntary measures[20].

Figure 5.1



Two measures were used to examine company greenness: firm compliance records and participation in other voluntary programs. Figure 5.2 displays the results of participant's and non-participant's *participation in other voluntary programs*. Here there was a clear distinction between the two groups. Over 80 percent of firms participating in

[20] See Arora, Seema and Timothy Cason, "An Experiment in Voluntary Environmental Regulation. Participation in EPA's 33/50 Program", *Journal of Environmental Economics and Management*. Vol. 28. 1995. 271-286; Karamanos, Panagiotis. *Voluntary Environmental Agreements for the Reduction of Greenhouse Gas Emissions. Incentives and Characteristics of Electric Utility Participation in the Climate*

the ARET Program also participate in other voluntary programs in Canada. In contrast, non-participating firms were fairly evenly split between those who do (45 percent of sample) and those who do not (55 percent) participate in other programs. This may imply that firms who joined the ARET Program are those who are more environmentally conscious to begin with. From this, it can be assumed that these firms will perform better in reducing their emissions of the target substances. Figure 5.3, however, provides an alternate picture of ARET participants. It displays the level of firm *compliance* with environmental regulations. In this case, 46 percent of participants had no records of non-compliance while 54 percent had some level of non-compliance history. It may be the case that firms with poor environmental compliance records joined ARET (and other voluntary programs) as a way to improve their "green image."[21] In contrast, over 80 percent of non-participating firms had no records of non-compliance, thus removing the incentive to participate in voluntary measures as a way to gain public recognition for environmental achievements.

Challenge Program. Paper presented at the Western Economic Association Annual Meeting, San Diego, California, July 6-10, 1999.

[21] As outlined in chapter one, one of the proposed benefits of voluntary programs is the public recognition participating firms receive (i.e. as being environmentally conscious organizations). This positive "green image" is important for firms in relation to the public (consumers) and to stockholders.

Figure 5.2

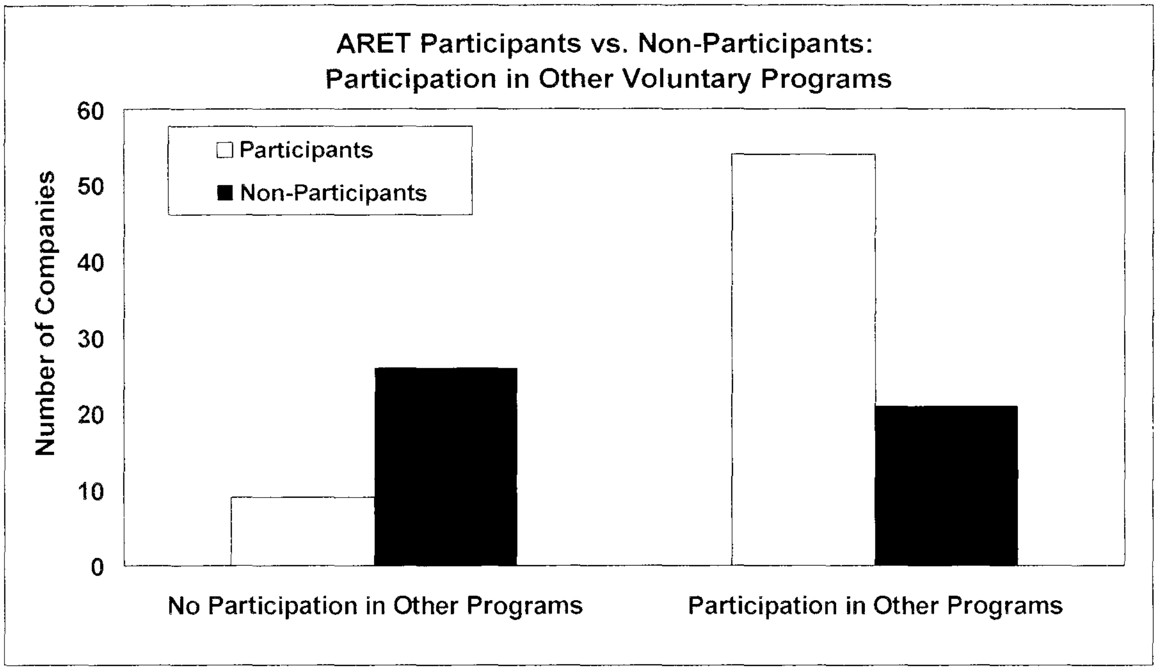


Figure 5.3

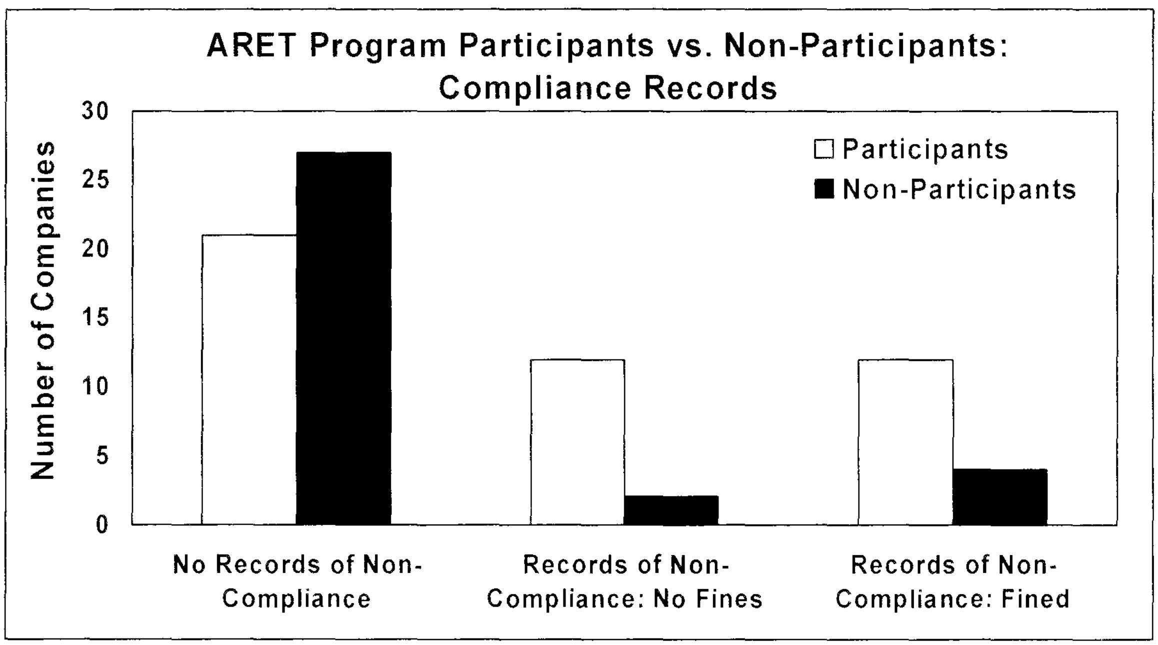
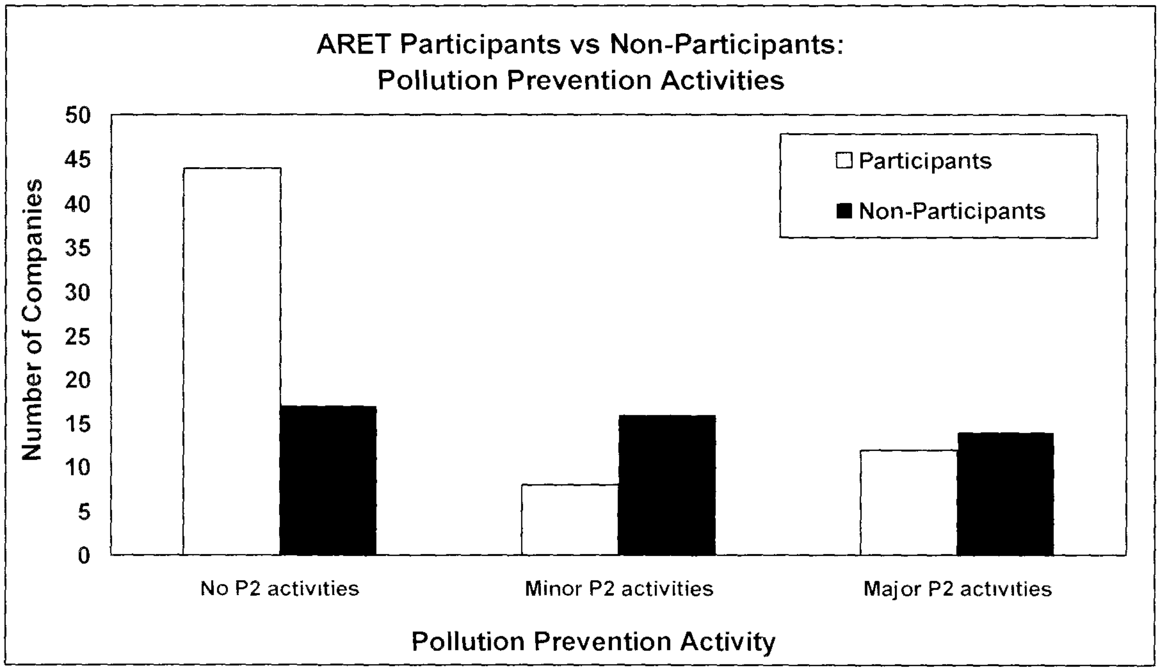


Figure 5.4 illustrates firms' *pollution prevention activities.* It is argued that one of the major benefits of voluntary programs such as ARET is the promotion of technological innovation and pollution prevention activities. Unfortunately, in this sample of firms, ARET participants did not display a greater level of P2 activity[22]. Sixty-eight percent of participants had no reported pollution prevention activities, 13 percent reported minor activities, and 19 percent reported major pollution prevention activities like equipment and process modifications. In contrast, only 36 percent of non-participating firms had no reported P2 activity and 64 percent had some level of pollution prevention activities.

Figure 5.4



[22] As noted earlier, firms' pollution prevention activities were divided into three categories. First, firms that had no pollution prevention activities reported. Secondly, minor P2 activities were determined to be those which did not necessitate major changes in operations and included on-site recovery, re-use, and recycling and spill and leak prevention. Thirdly, major P2 activities (materials substitution, product design and reformulation; and equipment process modification) were determined to be those which required more substantial changes in firms' behaviour and operations.

The remaining two firm characteristics examined were industrial sector and firm location by region. Figure 5.5 displays the *regions* of Canada in which the firms were located. For both study populations, the majority of firms were located in Ontario (51 percent of participants and 60 percent of non-participants) and Quebec (27 percent of participants and 28 percent of non-participants). Thus, firms from these two provinces accounted for approximately 80 percent of both groups. This is not surprising given the fact that the majority of industry in Canada is located in these areas, thus making the study populations a fairly representative sample of Canadian industry.

Figure 5.5

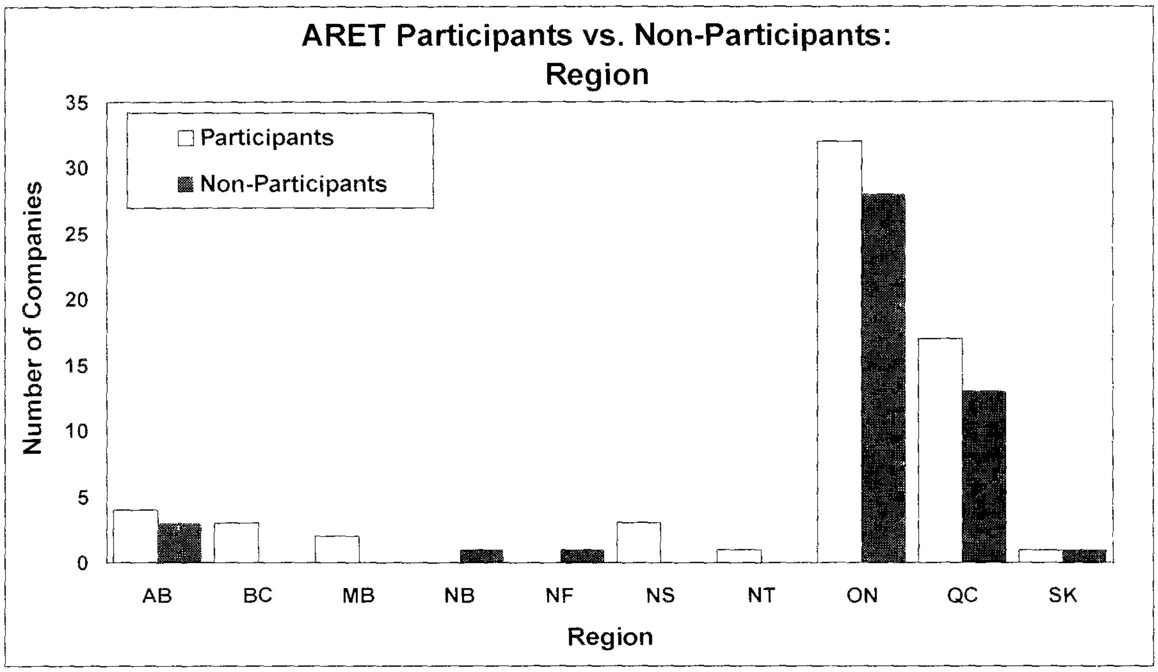
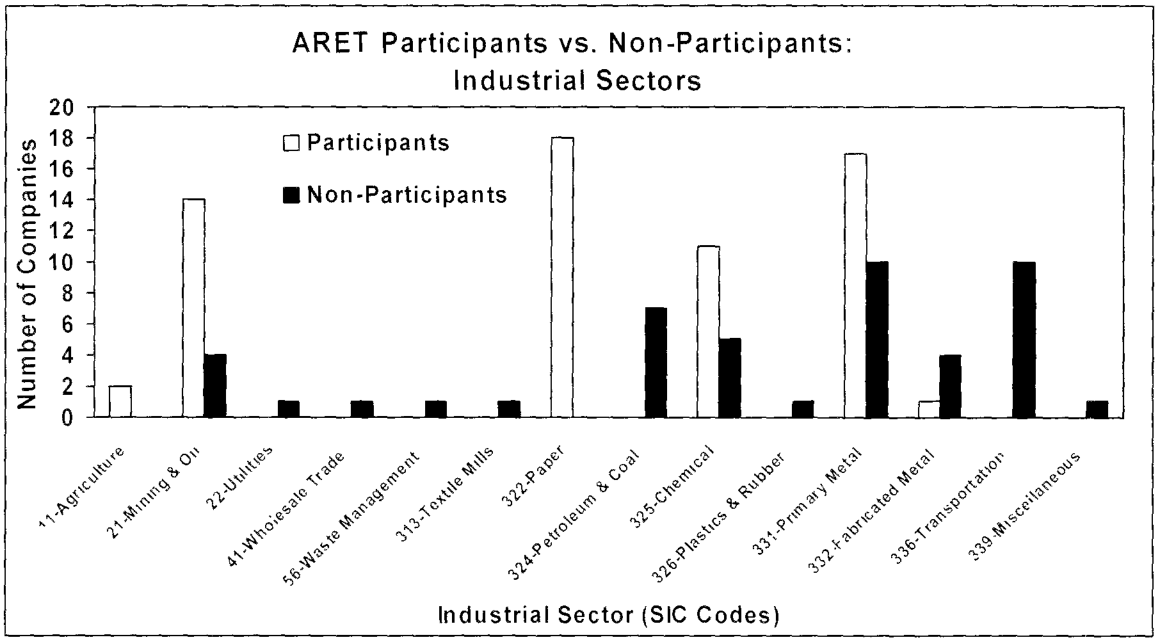


Figure 5.6 provides a breakdown of the *industrial sectors* to which participating and non-participating firms belonged. Approximately 95 percent of firms who were participants in the ARET Program were from four industrial sectors: 322 – Paper Manufacturing (29 percent); 21 – Mining and Oil and Gas Extraction (22 percent); 331 –

Primary Metal Manufacturing (27 percent); and, 325 – Chemical Manufacturing (17 percent). While non-participating firms were more spread out across industry sectors, 79 percent were from the following five sectors: 331 – Primary Metal Manufacturing (22 percent); 336 – Transportation Equipment Manufacturing (22 percent); 324 – Petroleum and Coal Products Manufacturing (15 percent); 325 – Chemical Manufacturing (11 percent); and, 21 – Mining and Oil and Gas Extraction (9 percent). In both populations, there was an emphasis on manufacturing sectors; however, only the Chemical Manufacturing, the Primary Metal Manufacturing, and the Mining and Oil and Gas Extraction sectors provide commonality between participating and non-participating firms.

Figure 5.6



The above results provide a general picture of a typical firm in each of the two study populations. The sample of ARET participants was fairly homogeneous.

Participants were mainly larger-sized firms, located in either Ontario or Quebec, from four major industry sectors (*i.e.*, Paper Manufacturing, Mining and Oil and Gas Extraction, Primary Metal Manufacturing, and Chemical Manufacturing). In terms of environmental greenness, almost all participating firms also participated in other voluntary programs; however, they were almost equally divided in terms of past compliance with regulations with 46 percent having no history of non-compliance and 54 percent having some level of non-compliance records. As well, the majority of participating firms did not report pollution prevention activities. The sample of non-participants was less consistent with regards to firm characteristics. Again, most non-participating firms were larger-sized facilities from either Ontario or Quebec. However, they were more spread out across industry sectors with 79 percent of firms from five sectors: Primary Metal Manufacturing, Transportation Equipment Manufacturing, Petroleum and Coal Products Manufacturing, Chemical Manufacturing, and Mining and Oil and Gas Extraction. In terms of environmental greenness, firms were fairly evenly split between those that did and those that did not participate in other voluntary programs. However, in terms of compliance, most non-participants had no history of non-compliance with environmental regulations and in terms of pollution prevention, over 60 percent had some reported level of pollution prevention activity.

<u>Results: Reductions in Releases</u>

At an initial level of analysis, comparisons between participating and non-participating firms were evaluated for total releases of all ten substances in the matched dataset. Figure 5.7 illustrates total releases for the ten substances by year for the two study populations. There were no pre-1994 data for non-participating firms as the National Pollutant Release Inventory only began collecting information in 1994. As well, when making comparison between yearly releases for participating firms, it is important to note that the number of cases for which there were reported releases is limited for years 1989-1992 and 1994[23]. Thus, the relatively small total releases for these years are most likely a direct function of a small N. Figure 5.8 illustrates total releases for participating firms only for the years in which the number of cases provided a more robust basis for comparison. However, it is clear from both figures that non-participating firms had lower overall total releases from 1994-2000. It may be that these firms did not participate in the ARET Program as their releases of the target substances were relatively lower. Furthermore, it is a positive finding that the program did appeal to firms with larger releases of the target substances, thus allowing for a more substantial impact on the environment by encouraging reductions in emissions. Moreover, it is clear from these figures that there was a definite reduction trend in total releases for ARET participants.

[23] As noted previously, the NPRI did not begin reporting releases until 1994. Thus, the ARET Secretariat database was used to collect information for ARET Program participants. While this analysis includes all data that were reported to the ARET Secretariat, there simply were not a lot of data for the years 1989-1992 and 1994. While ARET participants were asked to supply the Secretariat with all information on releases during these time periods, the lack of data from 1989-1992 is not surprising given the fact that there were no national regulatory requirements on firms to collect such information. However, the lack of data for 1994 is surprising, especially since this is the starting year for the program. The important point here is to

Figure 5.7

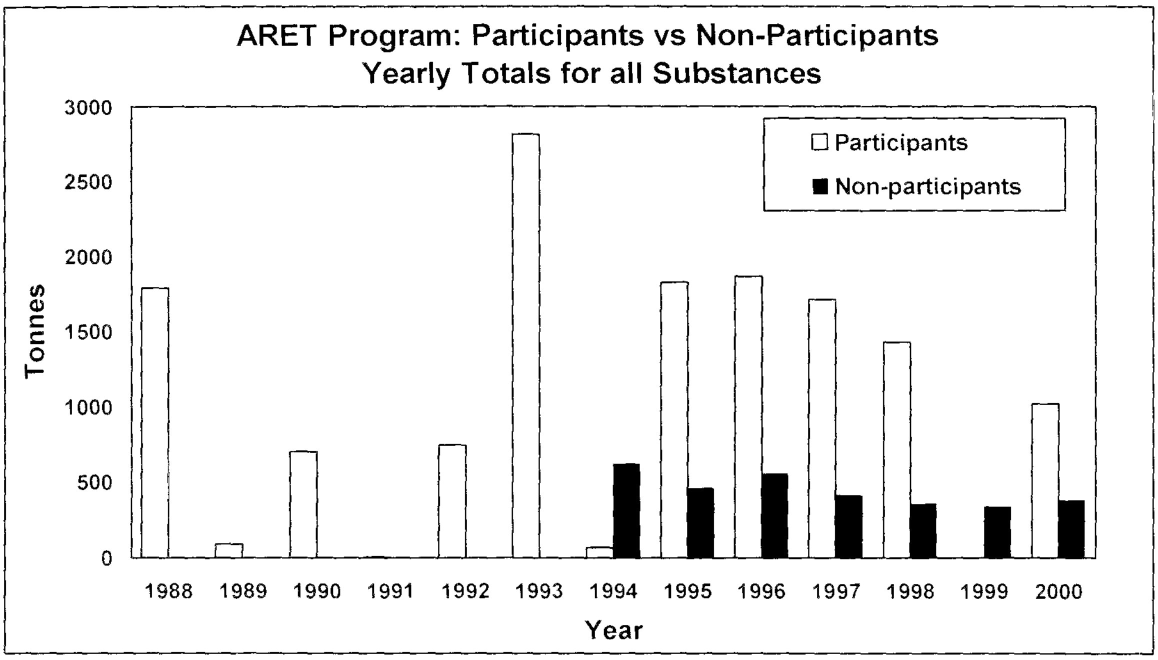
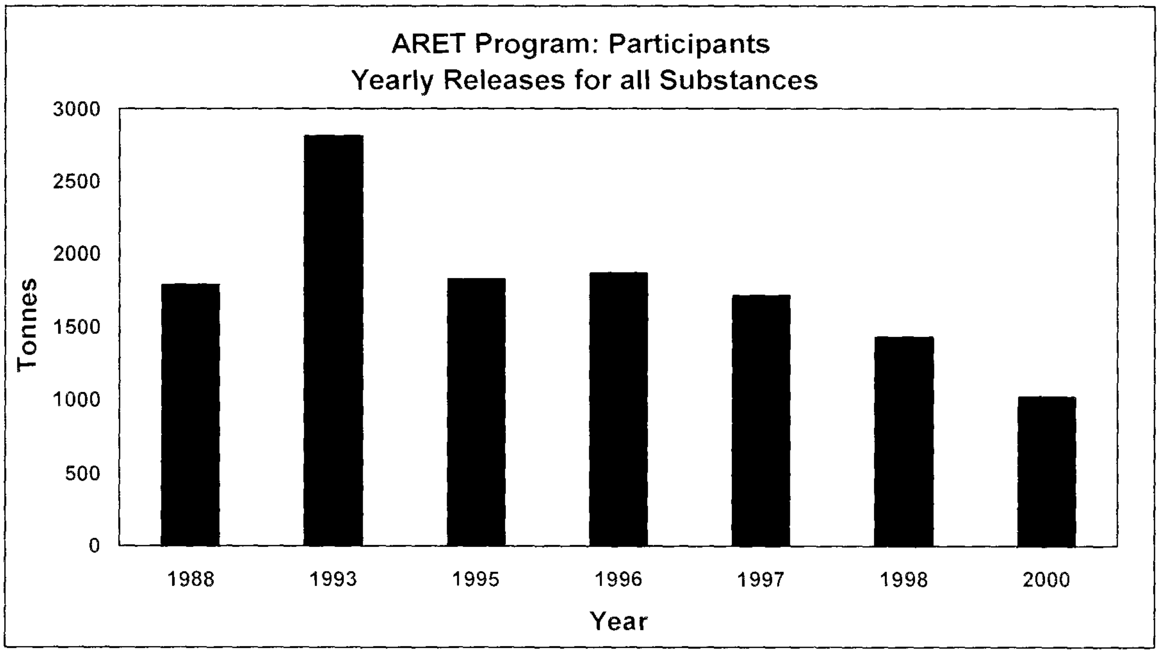


Figure 5.8



make clear that total releases for these years is based on a very small number of cases making yearly trends difficult until after 1995.

Since this evaluation of the ARET Program was focused on performance in *reducing* emissions of the target substances, it is more illustrative to look at change in releases over time. Two measures were used to do this: absolute change and percentage change in emissions. The intent of both measures was to demonstrate change in releases since the *start* of the ARET Program since a major criticism of the success of the program has been that it allowed firms to choose their own base-year as far back as 1988, thus including reductions made before the program began. The problem here was that the ARET database did not contain information for the majority of facilities for 1994 releases. Thus, it was determined that 1995 would be used as the base year from which to measure change in emissions. Since the ARET challenge was issued in March 1994, it is fair to assume that a significant impact on emissions would not have been made until the following year. Thus, to assess changes in releases during the tenure of the ARET Program, absolute change was calculated using the following function:

AChange = 2000 releases - 1995 releases.

This calculated changes in actual tonnage of releases. The percentage change in emissions was measured by:

PChange = (2000 releases- 1995 releases) / 1995 releases x 100.

While absolute change provides an indication of the actual amount (tonnage) of pollutants released into the environment (*N.B.* most relevant when evaluating impact on the environment), percentage change measures the actual change in a firm's releases over the time period (*N.B* most relevant when evaluating the impact of the *program*).

Table 5.2 provides a comparison of absolute change and percentage change in total releases of all ten substances for 1995-2000[24]. Also included are measures for ARET participants calculating change in emissions based on the 1988 base-year as well as the amount of reductions made before the start of the program (absolute change for 1988-1995).

Table 5.2

ARET Program: Participants vs Non-Participants
Total Substances: Reductions by Absolute Change and Percentage Change
Comparison of 1988 and 1995 Base-years

Time Period	Participants		Non-Participants	
	Absolute Change (tonnes)	Percentage Change (Percent)	Absolute Change (tonnes)	Percentage Change (Percent)
1988-2000	-766.95	-43	--	--
1988-1995	+39.37	+2	--	--
1995-2000	-806.32	-44	-82.03	-18

These results demonstrate two things. First, for the ARET participant population the program appears to have had a significant effect. Using the 1988 base-year, participants decreased their total releases by 767 tonnes. However, when 1995 is used as the base-year (*i.e.*, the start of the program) ARET participants decrease their emissions by 806 tonnes. Thus, emissions actually increased by almost 40 tonnes from 1988-1995. Therefore, in this sample of firms the criticism that most program reductions were made before the start of ARET is not true. Secondly, a comparison of participant and non-participant reductions from 1995-2000 demonstrates a substantial difference between the

[24] A list of ARET participant and non-participant facilities is provided at the end of the chapter (appendix 5.6). This includes information on firm location, industrial sector, and absolute and percentage change measures for the total of the ten target substances from 1995-2000.

two groups (*c.f.*, figures 5.9 and 5.10). Participating firms reduced their total releases by 806 tonnes (a 44 percent decrease in output) while non-participating firms reduced their total releases by only 82 tonnes, representing an 18 percent decrease in output. While reductions made by participating firms were significant, it is important to remember that they were still releasing 56 percent (approximately 1026 tonnes) of their output into the environment.

Figure 5.9

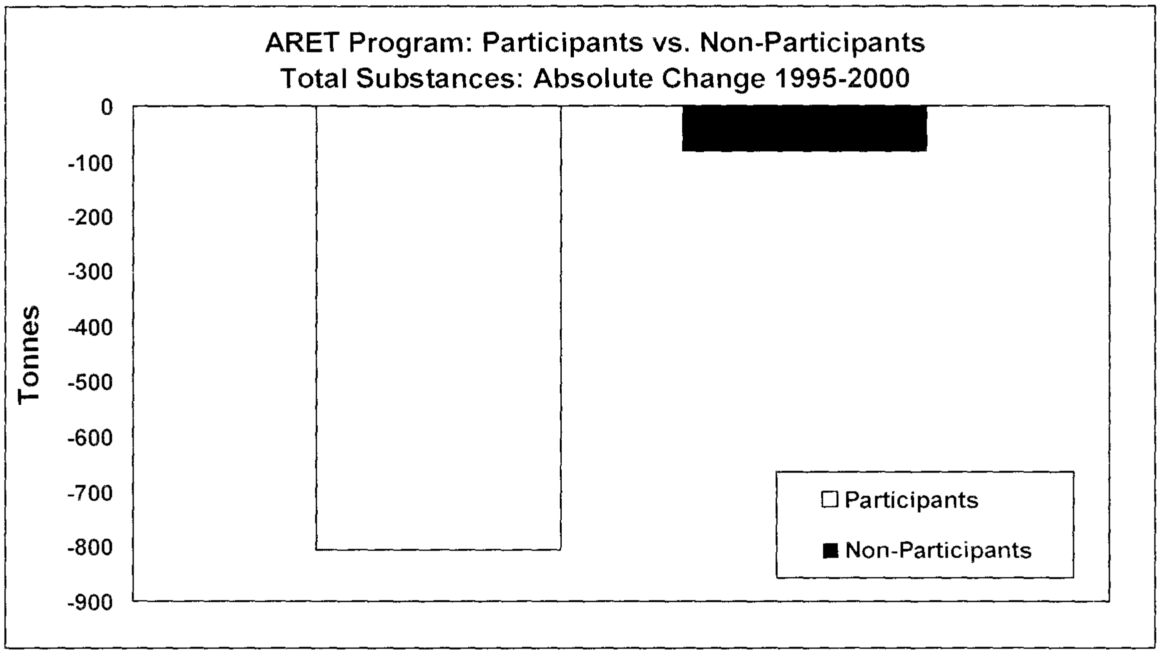
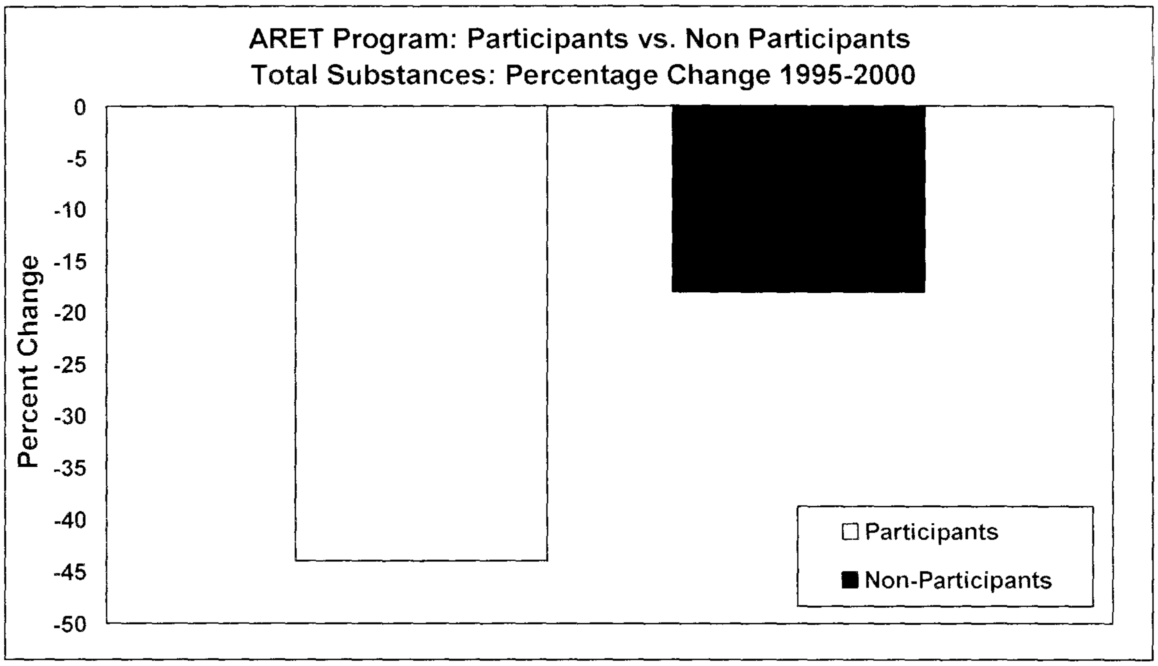
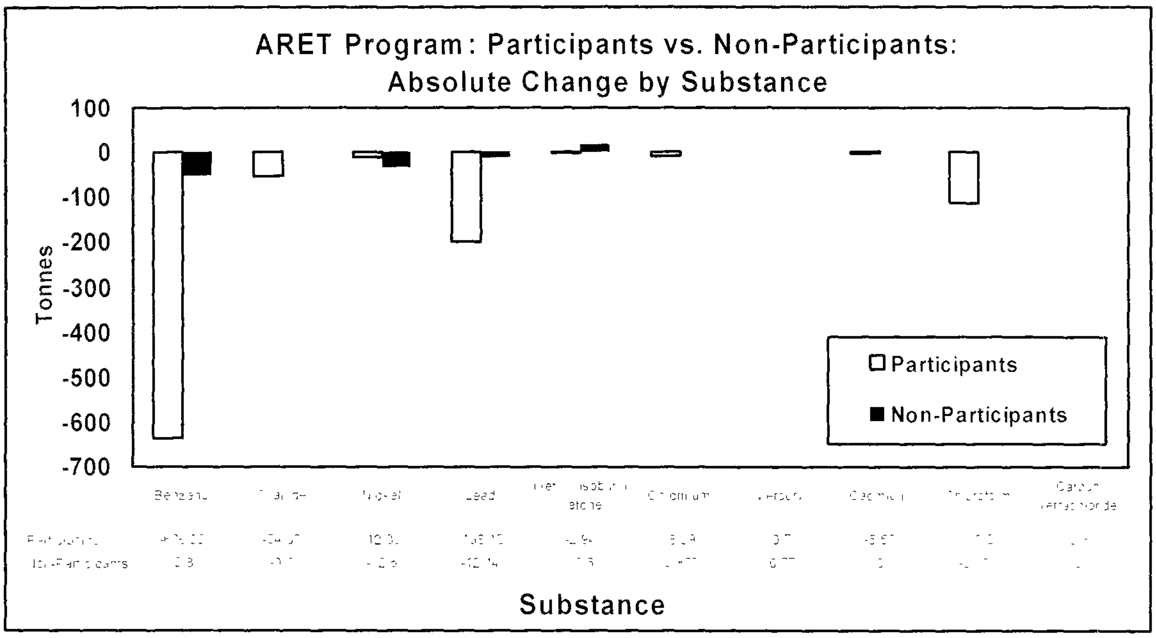


Figure 5.10



While the above evaluation has looked at performance in reducing emissions for the total ten substances, an examination of changes in emissions at the substance level provides another level of analysis. Figure 5.11 compares performance by participating and non-participating firms by looking at absolute change in emissions for each of the ten substances individually from 1995-2000.

Figure 5.11



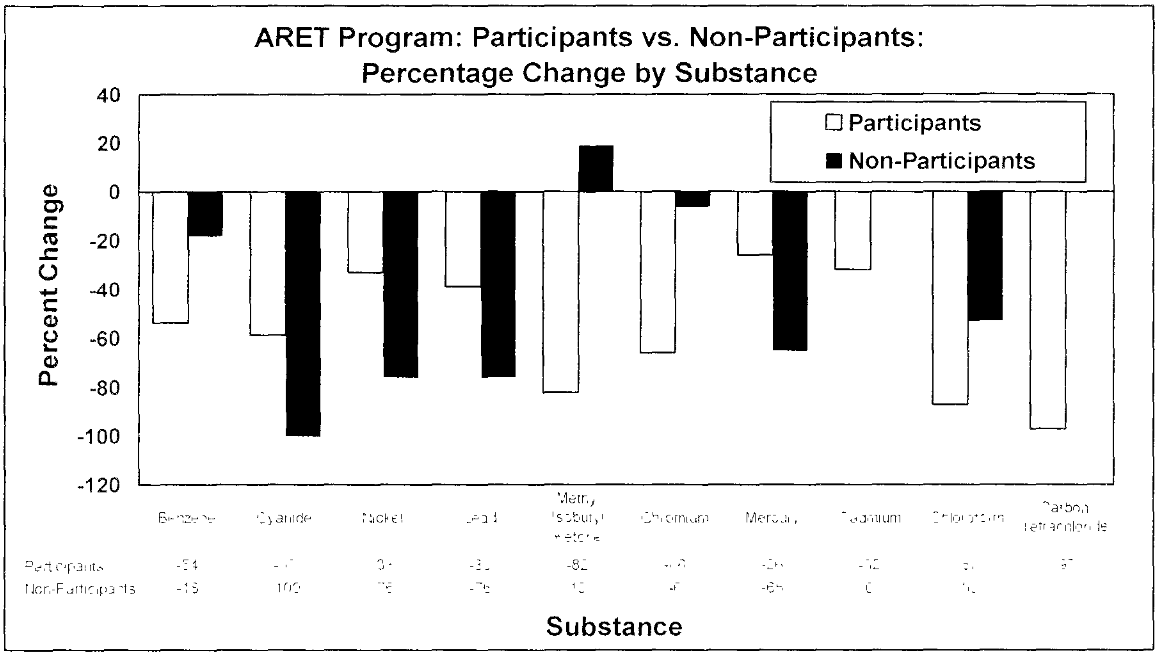
For all of the ten chemicals, participating firms reduced their releases of the target substance, while non-participating firms reduced their emissions of seven of the ten substances, increased their releases of methyl isobutyl ketone, and did not have any significant change in emissions for cadmium and carbon tetrachloride. In terms of comparing reductions by the two groups, for eight of the ten chemicals the participating firms had higher overall reductions in releases, the non-participating firms had higher reductions for nickel, and the two groups had about equal emission reductions in the case of mercury. As well, the overall largest reductions in tonnes of releases were seen for the following substances: benzene, lead, and chloroform. Appendix 5.3 lists the ten matched substances and their regulation under major Canadian standards. Benzene is regulated under CEPA, is on the Priority Substance List 1, and has been identified for further management under the Strategic Options Process. Thus, it is understandable that the largest reductions would be seen for this substance. While lead is also regulated under CEPA, chloroform does not appear on any of the major chemical target lists

Figure 5.12 illustrates percentage change for each substance for participating and non-participating firms. Before examining the results in figure 5.12 it is important to note that percentage change measures can be disproportionate to absolute change values when calculating small amounts of releases. For example, the above absolute reduction by participants for benzene was 636 tonnes, representing a 54 percent decrease. In comparison, absolute change for carbon tetrachloride was only 0.8 tonnes, with a corresponding 97 percent decrease. Again, it is important to remember the difference in the two measures. Absolute change measures change in releases to the environment, while percentage change measures the change in firm behaviour in terms of production or output of chemicals. It is important to report both measures in this analysis as they tell slightly different stories. However, for the intent of this study, more weight was placed on percentage change measures as they are more important in understanding the impact of the *program*.

In this case, while participating firms had negative percentage change measures for all ten substances (thereby representing decreases in emissions), they only outperformed non-participating firms for six substances - benzene, methyl isobutyl ketone, chromium, cadmium, chloroform, and carbon tetrachloride. The non-participants had greater percentage reductions for nickel, lead, and mercury. In the case of cyanide, non-participants demonstrated a 100 percent output reduction.

Another important question here is whether ARET participants met program goals for the ten substances. Of the ten chemicals, nine were on the ARET B-2 substance list which had a goal of 50 percent reduction in releases by 2000. Cadmium was on the ARET A-2 substance list in which the goal was simply "best effort." Thus, for seven of the ten target substances, participating firms in this study met or exceeded the ARET Program goals. Program goals were not met for nickel, lead, and mercury. Furthermore, even though firms in the non-participant group had not been part of the ARET program, they met the equivalent of ARET program reduction goals for six of the ten chemicals (however, the participating firms generally had higher reductions).

Figure 5.12



Overall, ARET participating firms reduced their releases of the ten matched substances substantially more than firms in the non-participant group over the period 1995-2000. This was the case both for total releases of the ten chemicals and on an individual substance basis. Moreover, ARET participants' releases actually increased from 1988-1995, thereby negating the criticism that most program reductions were achieved before the start of the program. However, it is important to remember that ARET participants had overall larger emissions of the target substances over the time period studied. Furthermore, this reduction in emissions only represents a 44 percent reduction of their output from 1995-2000. As well, ARET target goals were met for only seven of the ten substances. In relation to non-participants, significant reductions were made as well, although to a lesser degree than ARET participants. However, non-participating firms had lower overall emissions of the target chemicals to begin with. Furthermore, non-participating firms met the equivalent of ARET program goals for six of the ten substances. Thus, while both participating and non-participating firms have shown reductions in emissions, for this sample of firms participation in the ARET Program appears to have resulted in proportionately larger emission reductions versus non-participation[25].

Results: Reductions in Releases According to Firm Characteristics

The purpose of this level of analysis was to ascertain whether firm characteristics may influence outcomes. Did the "bad polluters" reduce their emissions more or less than more environmentally "green" firms? Did larger facilities perform better? Did participation in the ARET Program lead to more pollution prevention activities? Since

[25] This is for a limited number of substances (the ten chemicals in the matched dataset) for which the ARET Program had program goals (total substances in ARET target list is 117).

the results from the previous analysis did not reveal a significant amount of variation in performance based on individual substances, this evaluation examined results for the ten substances as a group, using the average absolute and percentage change values from 1995-2000 (the tenure of the program) for each of the two study populations[26]. Appendix 5.4 lists the variables and measures used to illustrate firm characteristics with the corresponding results for average absolute change and percentage change calculations for total substances. As well, the number of cases on which each calculation is based is included as there is often a large variance between variable groups (*e.g.*, in the case of region, the majority of firms are located in Ontario and Quebec, with only a few cases from the rest of Canada). Additionally, analyses of variance were conducted for absolute and percentage change from 1995-2000 according to all possible combinations in relation to firm participation in the ARET Program and each of the six firm characteristics studied (*i.e.*, firm size, sector, region, compliance records, participation in other voluntary programs, and pollution prevention activities)[27]. Appendix 5.5 provides a summary of

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[26] Average absolute and percentage change measures were used to examine how if firm characteristics may influence performance in reducing emissions. The period of the tenure of the ARET Program was used in order to capture any impacts from program participation. Participating and non-participating firms were grouped according to the various categories of firm characteristics and an average of each group's absolute and percentage change measures was calculated. While it was determined that the average was the best measure to capture possible effects by the various categories of firm characteristics, large absolute and percentage change measures by a small number of cases may skew the overall mean. However, these cases were not removed from the analysis as it was determined that they represent the reality of form behaviour and overall pollutant releases to the environment.

[27] It was only possible to do comparisons with a maximum of two independent variables in order to maintain viability for statistical procedures. Increasing the number of independent variables tested at any one instance resulted in too few cases for comparison. It was not possible to conduct statistical analyses by individual substances due to missing data points, extreme standard deviation scores, and differences in the number of cases within each variable group.

only those results which indicated some level of statistical relationship between the dependent and independent variables.

The first evaluation examines emission reductions in relation to measures of company greenness. Figures 5.13 and 5.14 illustrate average absolute and percentage change measures for firms which did and did not participate in *other voluntary programs*. The majority of ARET participating firms were also members of other programs whereas non-participating firms were almost equally split between those who did and did not participate in other programs. Participants who were also members of other voluntary programs, showed a greater overall average absolute reduction in total releases versus non-participants (18 versus 1.06 tonnes respectively). However, this represented only a seven percent reduction in participant overall output as compared to a 19 percent decrease in overall output by non-participating firms who also belonged to other voluntary measures. In contrast, participating firms who did not participate in other voluntary programs showed a greater percentage reduction in output (38 percent representing approximately 3 tonnes) versus non-participating firms which showed a 17 percent reduction in output (2.39 tonnes). Overall, the greatest average percentage reductions were demonstrated by ARET participants that did not participate in other voluntary programs.

Figure 5.13

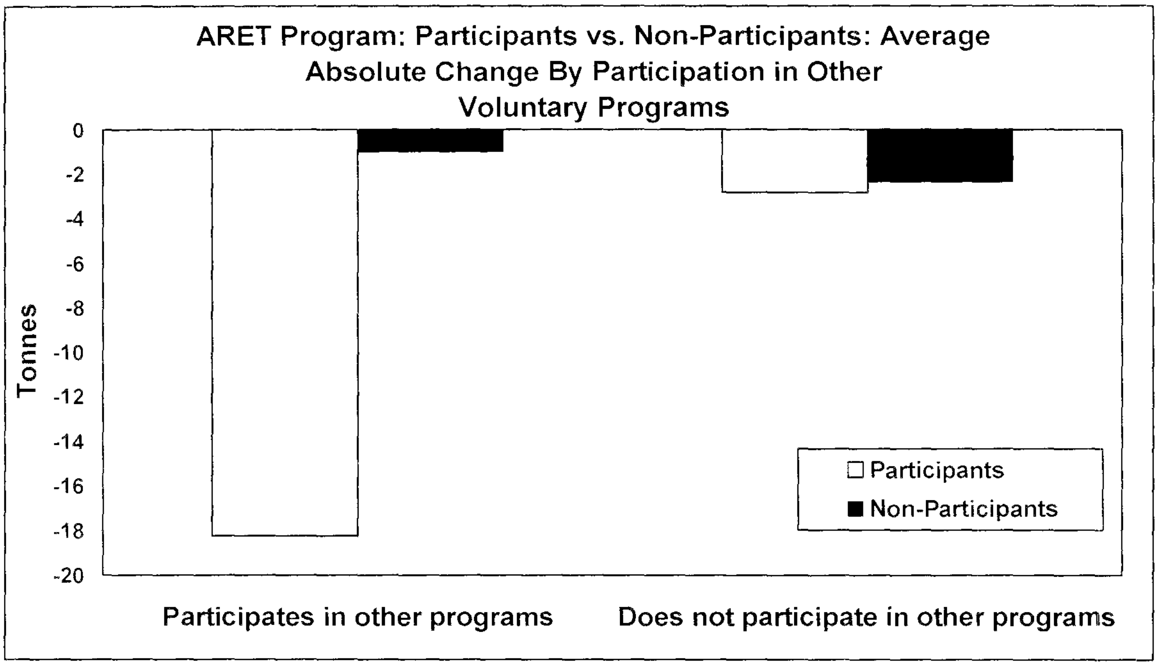
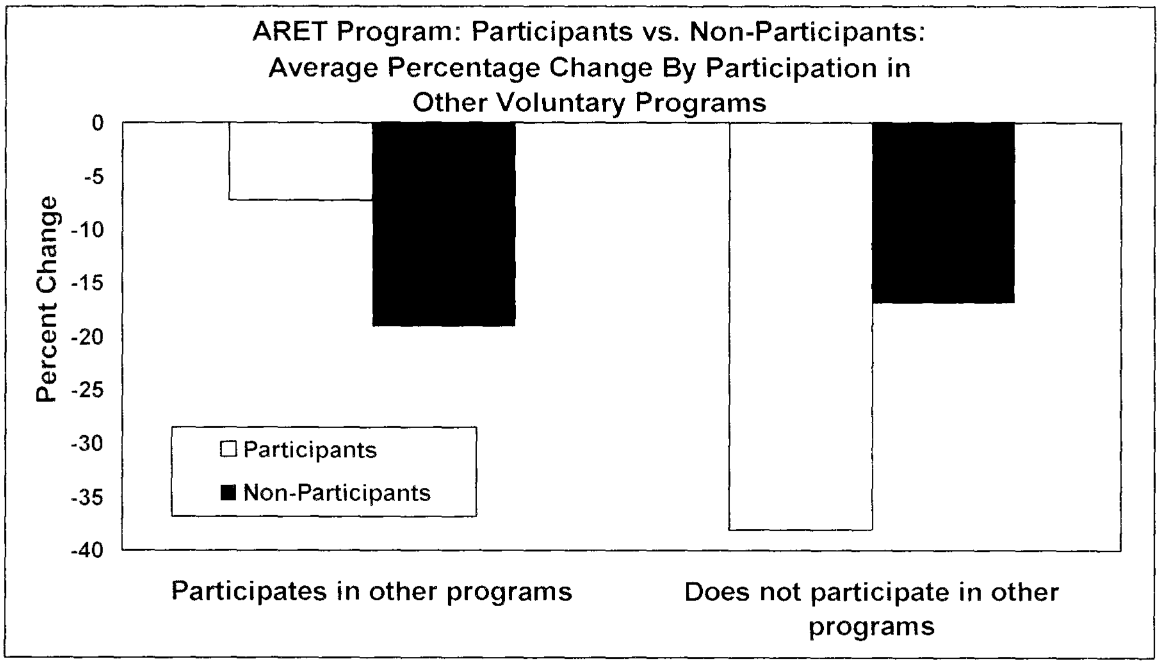


Figure 5.14



With regards to *compliance records*, ARET participants were fairly equally split between firms which had no history of non-compliance and firms which had some level of non-compliance with environmental regulations. In contrast, the majority of non-participating firms had no records of non-compliance. Figures 5.15 and 5.16 demonstrate average absolute and percentage change values in relation to firm compliance records. For both participating and non-participating firms, those with records of non-compliance with fines (*i.e.*, the worst environmental compliance records) had greater average absolute change reductions in emissions. However, the proportionate emission reduction as measured by average percentage change was not as significant for participating firms. Both participant and non-participant firms with no records of non-compliance demonstrated reductions in emissions, although not to the same degree as firms which had received fines. Non-participating firms that had records of non-compliance without fines actually showed an 88 percent increase in emissions. These results might suggest the importance of a regulatory "stick" as a backup to enforce compliance.

Figure 5.15

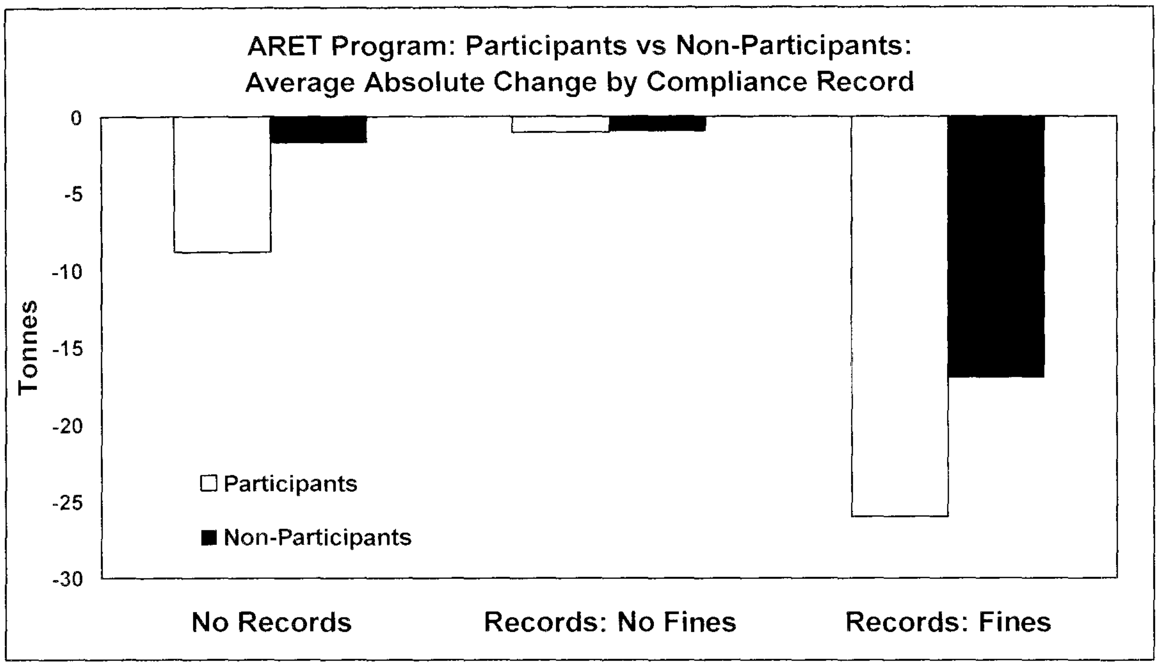
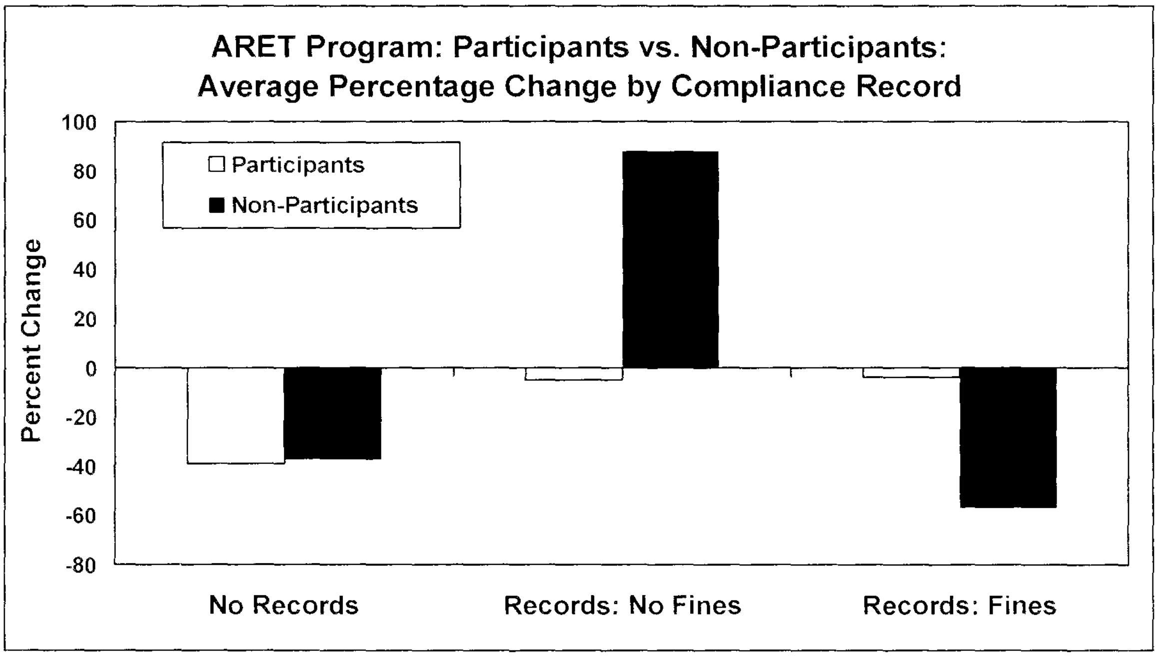


Figure 5.16



In terms of *size*, the majority of both participating and non-participating cases were medium to large-sized facilities. Figures 5.17 and 5.18 illustrate the results of average absolute change and percentage change measures from 1995-2000 in relation to company size. The results show that larger firms did perform better than small facilities. Overall, smaller firms in both participant and non-participant groups had lesser reductions in emissions as measured through both average absolute and percentage change. In the case of ARET participant firms with 21 to 99 employees, releases actually increased by 246 percent. However, this result was based on a very small number of cases. Since most firms fell into the categories of having either 100 to 500 or greater than 500 employees, the results for these measures are most important. Firms with 100 to 500 employees from both the participant and non-participant groups had similar outcomes - the average reductions as measured by absolute change was approximately 3.5 tonnes, representing a 14 and 29 percent decrease in emissions respectively. However, the results for the largest category of firm (greater than 500 employees) were more varied. Participating firms showed an average decrease of 35 tonnes as compared to an increase of 0.513 tonnes by non-participants. This represented a proportionate reduction in emissions of 26 and 5 percent respectively. In general, few conclusions can be reached on the effects of size as no clear trends are apparent. Results in Appendix 5.6 reveal that the interaction between participation in the ARET Program and firm size approached significance for percentage change in emissions from 1995-2000 ($F=2.867$, $p=0.062$), although the degree of variability in emission reductions which can be explained by these variables is low.

Figure 5.17

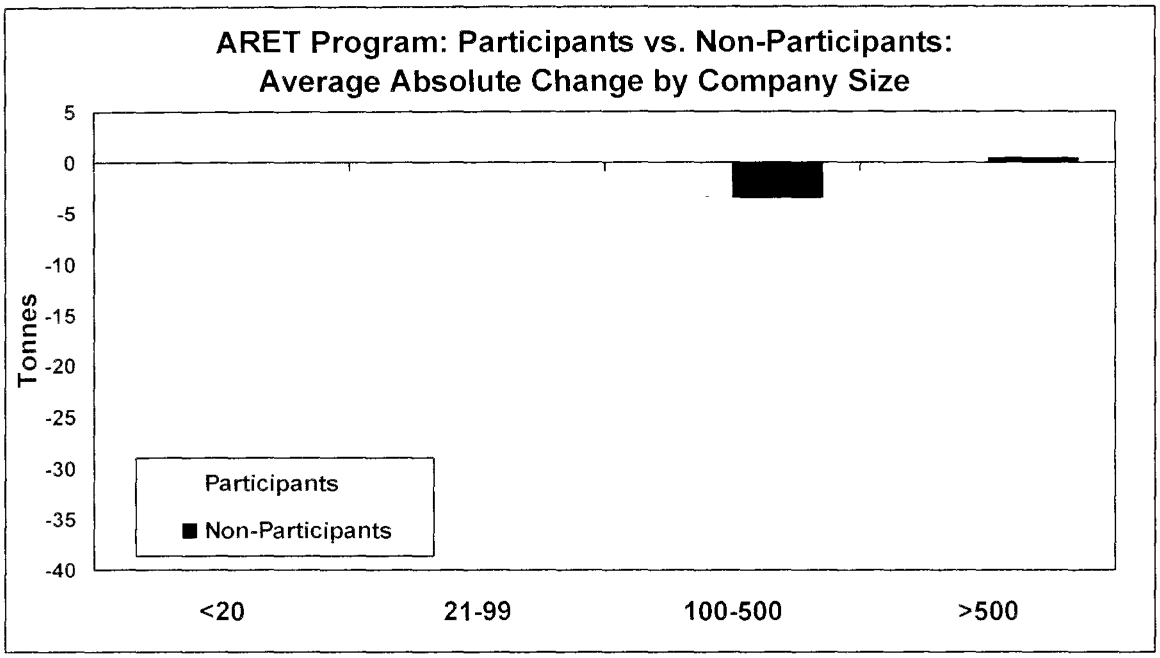
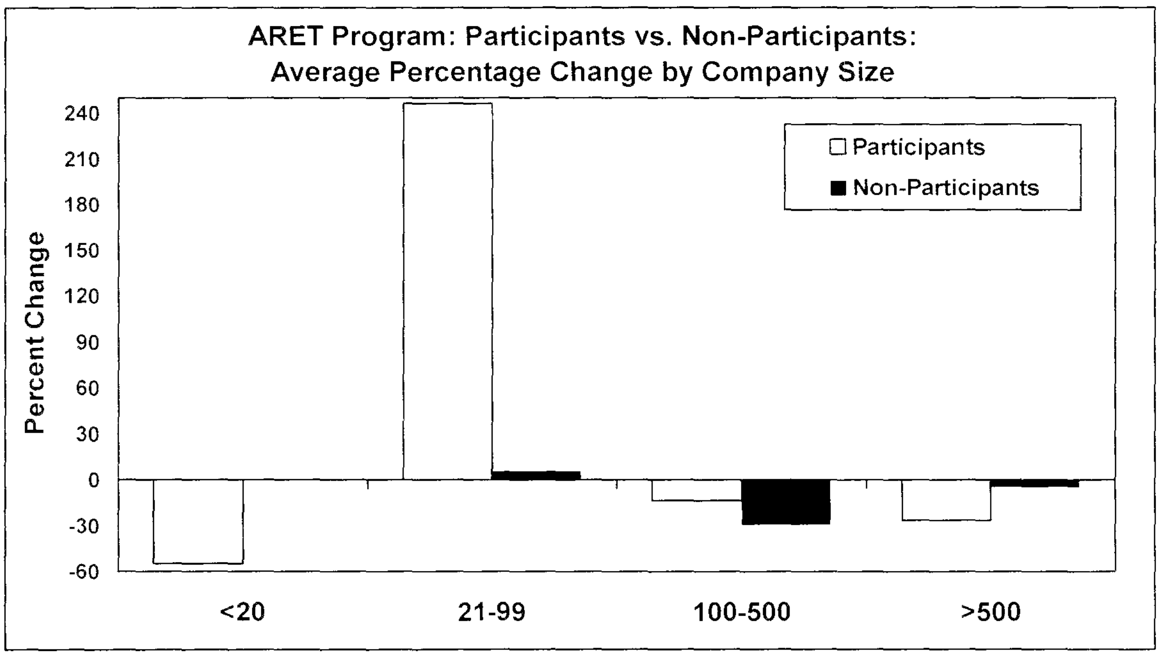


Figure 5.18



In terms of the *location* of firms, the majority of cases in both the participant and non-participant populations were from the regions of Ontario and Quebec. Since the results from the other regions were based on very few cases, they will not be discussed in detail here. As well, the focus of this study is on industrial releases within the Great Lakes Basin which incorporates only the provinces of Ontario and Quebec. Figures 5.19 and 5.20 illustrate the average absolute and percentage change values from the period 1995 to 2000. Firms from Quebec showed a significant reduction in releases. Participating firms had an average reduction of almost ten tonnes versus a six tonne reduction by non-participating firms. Moreover, these reductions represent a substantial reduction in percentage of output – a 43 percent decrease by participating firms and a 32 percent decrease by non-participating firms. While ARET participants from Ontario demonstrated a 27 tonne average reduction in emissions from 1995-2000, this only represented an average of seven percent decrease in output. When looking at the entire country, there are only two provinces which showed an increase in emissions for both average absolute and percentage change measures by participating firms: Alberta and Manitoba. Overall, both ARET participants and non-participants located in Quebec had much larger reductions in total releases than firms located in Ontario. This may indicate that the regulatory environment in Quebec is more supportive of voluntary measures than that in Ontario. These results approached statistical significance for the absolute change measure with a significant main effect for the regional location of firms ($F=3.43$, $p=0.067$). However, the amount of variation in absolute change in emissions which can be explained by these variables is low.

Figure 5.19

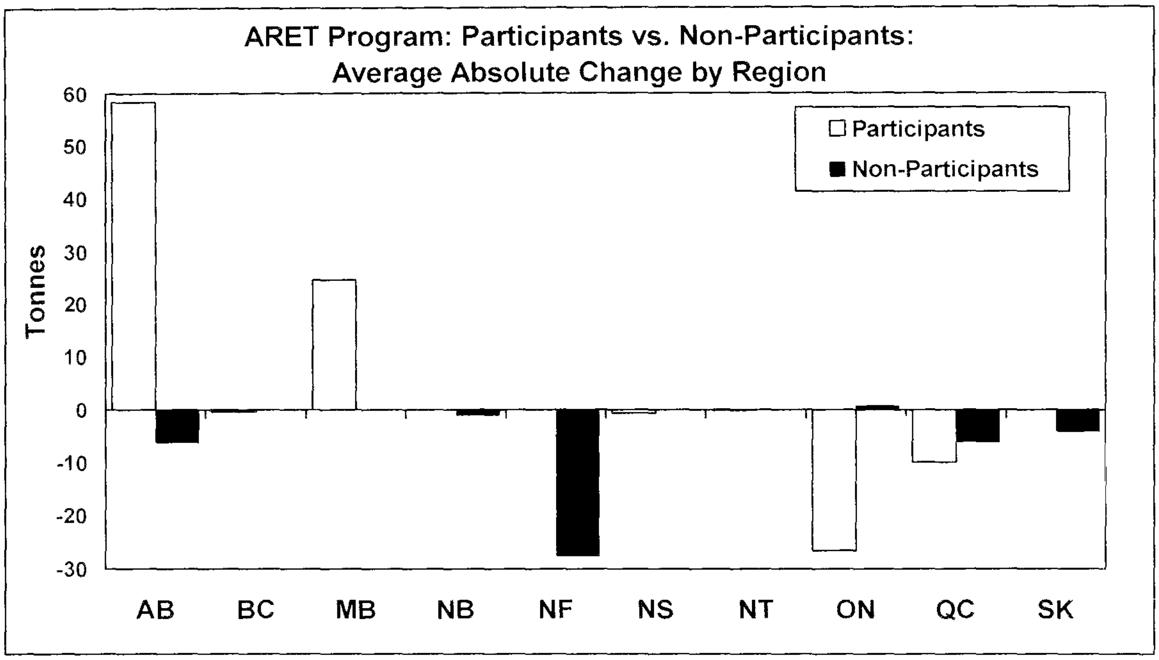
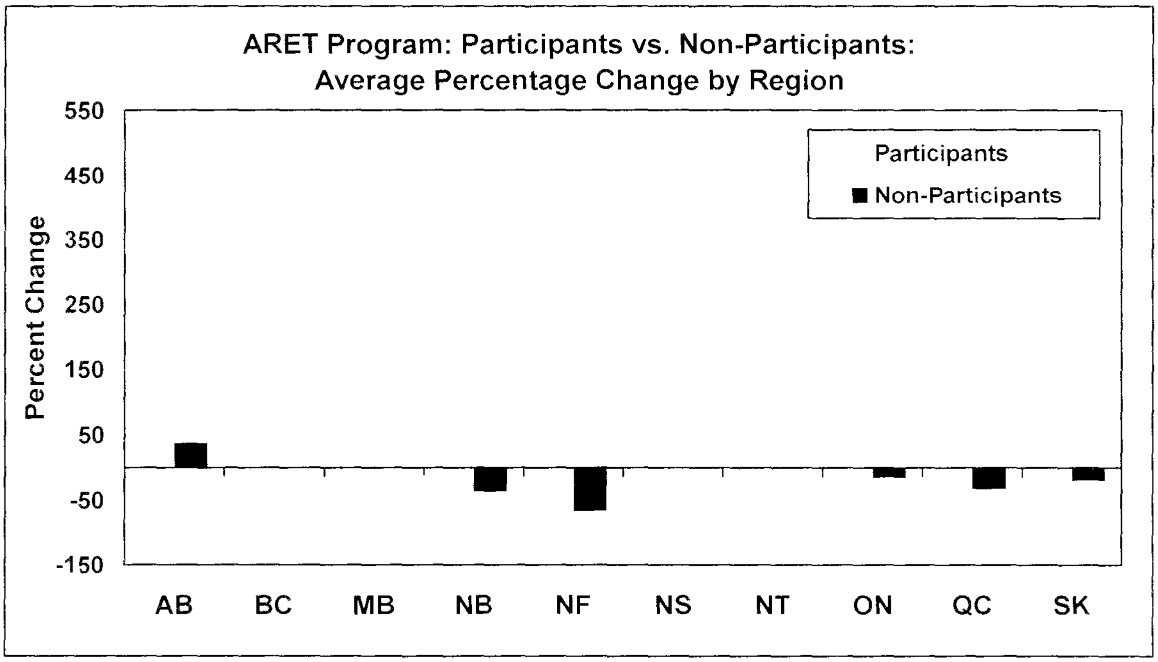


Figure 5.20



Proponents of voluntary programs argue that such arrangements foster technological innovation and *pollution prevention activity*. However, the majority of firms in the ARET participant population did not report any pollution prevention activities to the NPRI. Firms in the non-participant group were fairly evenly distributed between no reported P2 activity, minor activity, and major activity (*e.g.*, equipment modifications). Figures 5.21 and 5.22 illustrate the results of average absolute and percentage change from 1995-2000 in relation to pollution prevention activities by firms. Overall, firms from both the ARET participant and non-participant groups who had reported minor levels of pollution prevention activities had larger reductions in releases from 1995-2000, as measured by the average percentage change in output (26 percent decrease and 22 percent decrease respectively). Non-participants who had reported major pollution prevention activities also demonstrated significant average percentage change in reductions (25 percent decrease). However, ARET participants who had reported major P2 activities did not have as large a reduction in emissions. These firms demonstrated only a one percent average decrease in total releases of target substances. Moreover, ARET participants who had no reported level of pollution prevention activities decreased their releases more, with an average 15 percent decrease representing a reduction of 21 tonnes of emissions. Appendix 5.6 reveals a statistically significant interaction between participation in the ARET Program and pollution prevention activities of firms. These results were statistically significant for absolute change from 1995 to 2000 (F=2.999, p=0.054) and a stronger effect for percentage change in emissions from 1995 to 2000

($F=3.172$, $p=0.046$). However, less than ten percent of the variation in absolute and percentage change in emissions from 1995 to 2000 can be explained by these variables.

Figure 5.21

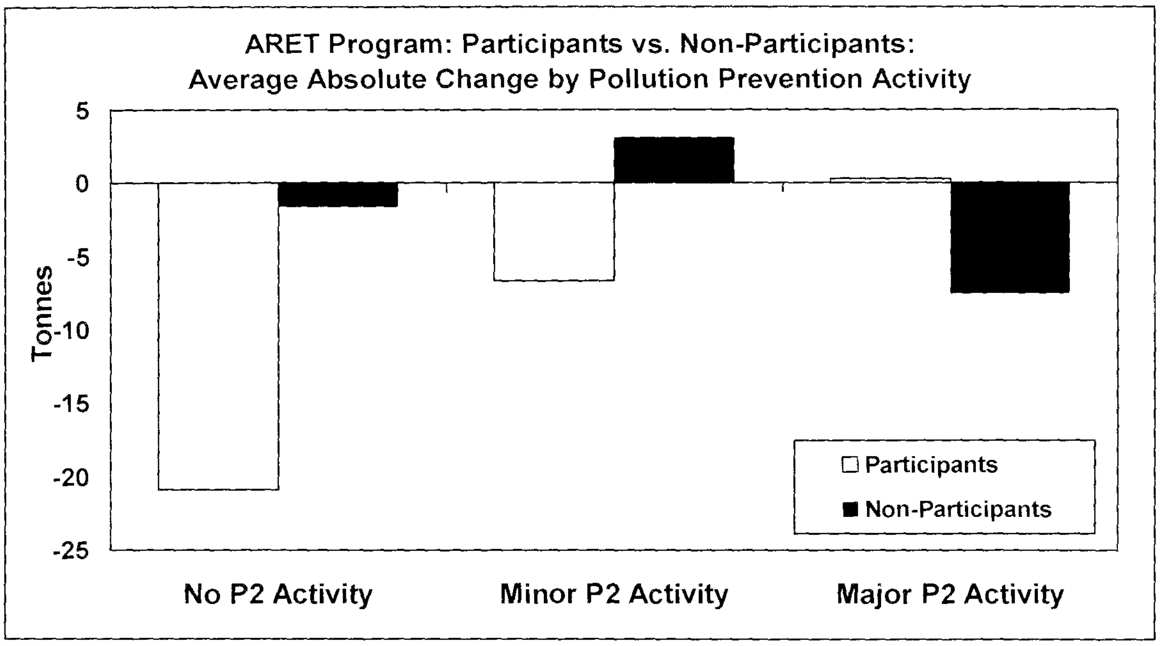
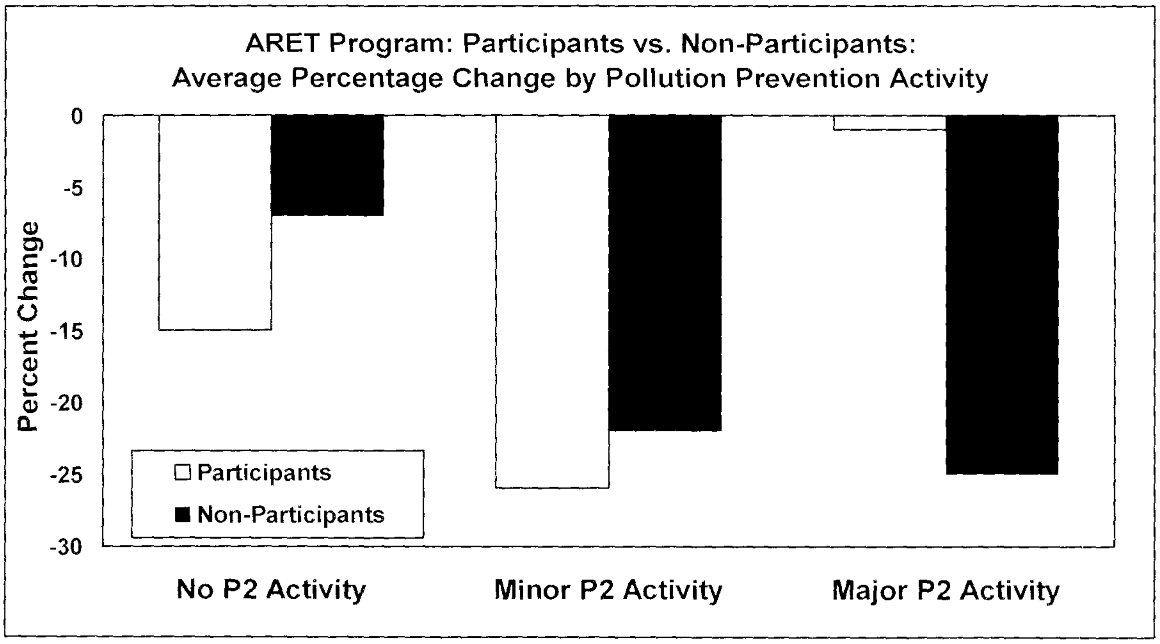


Figure 5.22



In the case of *industrial sector*, ninety-five percent of ARET participating firms were from four sectors: Mining and Oil and Gas Extraction (SIC 21), Paper Manufacturing (SIC 322), Chemical Manufacturing (SIC 325), and Primary Metal Manufacturing (SIC 331). The majority of non-participating firms (79 percent) were from five industry sectors: Primary Metal Manufacturing, Transportation Equipment Manufacturing (SIC 336), Petroleum and Coal Products Manufacturing (SIC 324), Chemical Manufacturing, and Mining and Oil and Gas Extraction. Figures 5.23 and 5.24 illustrate the average absolute and percentage change in total releases from 1995 to 2000 in relation to industrial sector. Thus, there are three sectors which are common to the participant and non-participant populations. Firms from both groups which are in the Chemical Manufacturing sector displayed the poorest results with regards to reducing their emissions over the time period studied. Participating firms increased their average total releases by 31 percent and non-participants by an average of 72 percent. Similarly, participating and non-participating firms in the Primary Metal Manufacturing sector did not have significant reductions in emissions, with an average three percent decrease by participating firms and an average zero percent decrease by non-participants. The results for the Mining and Oil and Gas Extraction sector were not consistent between participating and non-participating firms (average 9 percent increase and an average 67 percent decrease in emissions respectively). Overall, the largest average percent decrease in total releases was demonstrated by non-participating firms in the Textile Mills (SIC 313) sector and the Plastics and Rubber Products Manufacturing sector (SIC 326) which reduced their emissions by 100 percent (on average) and by ARET participants in the

Agriculture, Forest, Fishing, and Hunting sector (SIC 11) which decreased their emissions by an average 89 percent.

Figure 5.23

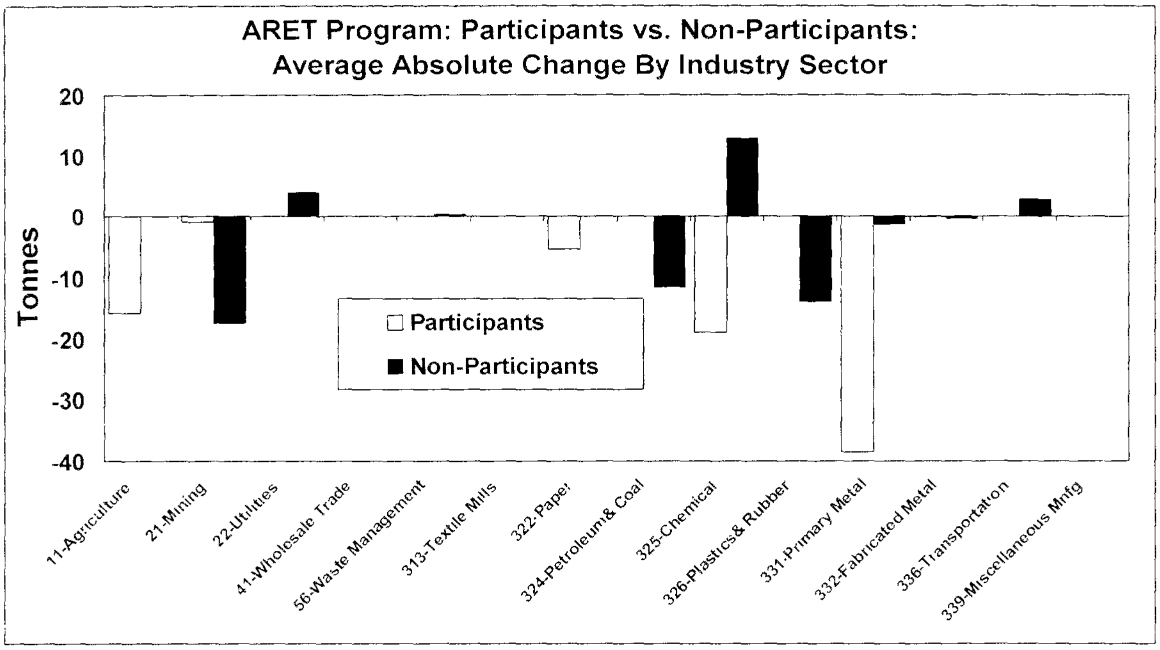
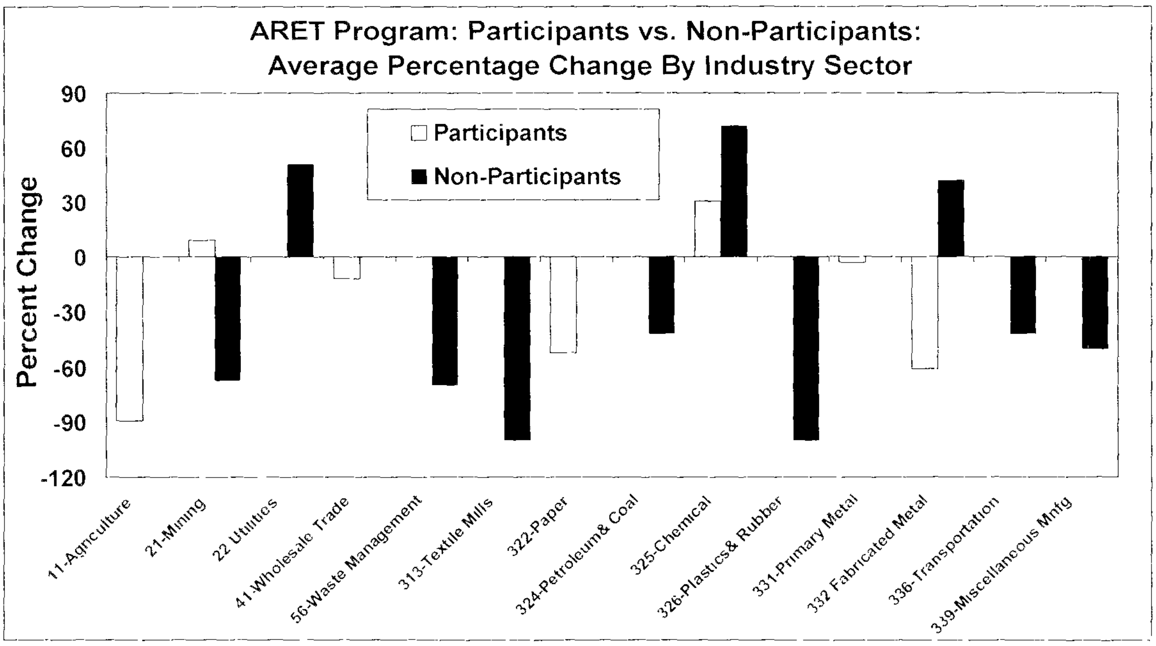


Figure 5.24



Conclusions

What kinds of firms participated in the ARET Program? This sample of facilities exhibited some consistent trends when comparing participating and non-participating firms. In terms of firm size, the assumption that larger firms are more likely to participate in such voluntary measures was proven true for this sample of firms. The majority of ARET Participants were larger-sized facilities. Additionally, most facilities (both participants and non-participants) were located in Ontario and Quebec, most likely reflecting the larger concentration of industrial activity around the Great Lakes Basin. Two measures of company "greenness" were evaluated: compliance records and participation in other voluntary programs. In both cases, the assumption was that ARET Program participants would be more "green" than non-participating firms. This assumption was true with regards to firms' participation in other voluntary measures. The majority of ARET participants were also members of the other programs while the majority of non-participating firms were not. The opposite was true in the case of compliance records. The majority of non-participating firms had no history of non-compliance with mandatory regulations while the majority of ARET participants did exhibit some level of violations. Taken together, these results may suggest that ARET participants joined the program (and other voluntary measures) as a way to improve their environmental image, whereas non-participating firms which displayed better compliance records would not have had this incentive. It was also proposed that ARET participants would exhibit higher levels of pollution prevention activities. Again, the opposite was found for this sample of firms. The majority of ARET participants showed no records of

P2 activity while the majority of non-participating firms did. Finally, in relation to industrial sector, few trends are evident. Ninety-five percent of ARET participants were from four industrial sectors. Seventy-nine percent of non-participating firms were from five sectors. The following three industrial sectors were common to both groups: Primary Metal Manufacturing; Chemical Manufacturing; and Mining and Oil and Gas Extraction.

While the above evaluation provides a picture of the types of firms in each study group, the question here is whether firm characteristics influence performance in reducing emissions of the target substances. The simple answer is that it depends on the feature being studied. In looking at the environmental "greenness" of firms, those who would be characterized as less environmentally conscious (as measured through participation in other voluntary programs and compliance records) demonstrated greater average emission reductions. ARET participants who did not participate in other programs had the greatest reduction in total releases as measured through absolute change from 1995 to 2000. In terms of compliance records, both participating and non-participating firms who had been fined for non-compliance showed the greatest average reduction in emissions. This may suggest the influence of two things: 1) participation in the ARET program resulted in better performance in reducing emissions; and, 2) the importance of a regulatory "stick" to enforce compliance with mandatory regulations.

With regards to company size, the majority of cases in both the participant and non-participant groups were categorized as larger-sized facilities. Overall, larger firms performed better in reducing emissions, with firms which were participants in the ARET program showing the greatest average reduction in total releases of the target substances.

The majority of firms from both study populations were located in either Ontario or Quebec. While ARET participant firms showed the largest average reduction in tonnage of emissions, both participant and non-participant firms in Quebec demonstrated the greatest decrease in total releases as measured through average percentage change from 1995 to 2000. Overall, both participating and non-participating firms reduced their emissions of the target substances in all regions of Canada except Alberta and Manitoba which demonstrated an increase in average releases.

While participation in the ARET Program does not appear to have led to greater pollution prevention activities, there does appear to be a relationship between reported P2 activities and performance in emission reductions. The largest average percent decrease in total releases was demonstrated by both participant and non-participant firms who had reported minor pollution prevention activities, and for non-participating firms who reported major P2 activities.

With regards to industrial sector, there was little consistency between results for participating and those for non-participating firms. The firms with the largest average percent decrease in total releases were those who were non-participants from the Textile sector and Plastics and Rubber Products Manufacturing sector. ARET participating firms from the Agriculture, Forestry, Fishing and Hunting sector had the third highest reduction in emissions as measured through average percentage change. Firms in the Chemical Manufacturing sector from both the participant and non-participant populations demonstrated the worst performance with an increase in emissions from 1995 to 2000.

Finally, the focus of this study was assessing the effectiveness of the ARET Program on reducing emissions of the ten target substances. Yearly releases for the total ten substances demonstrated that, overall, ARET participants had larger emissions for the years which allowed for a comparative analysis. In one sense, this is a positive finding, suggesting that the program was able to target worse polluters. Overall, ARET participating firms reduced their emissions of the ten substances more than firms in the non-participant group during the tenure of the program (1995 to 2000). This was true at both the individual substance level and for total releases of the ten chemicals. Moreover, an analysis of releases from 1988 to 1995 reveals that for this sample of program participants, releases of the ten substances actually increased over the pre-program period, thus negating the criticism that the reported success of the ARET Program included reductions made before the start of the program in 1994. Overall, this comparison of participating and non-participating firms reveals larger emission reductions by program participants, suggesting the program does have a greater impact on releases than mandatory regulations alone. This is not to say that such voluntary measures should replace regulations. Rather, they offer a way to supplement regulatory standards and achieve additional reductions in releases that may not have been made otherwise.

Appendix 5.1
Evaluation of ARET Program: Variable List

Variable Label	Value
Dependent Variables	
Percentage Change (PChange)	
Absolute Change (AChange)	
Yearly Total Releases	
Independent Variables	
Participant In ARET	1= non-participating firms 2= participating firms
Industrial Sector	11=Agriculture. Forestry. Fishing and Hunting 21=Mining and Oil and Gas Extraction 22=Utilities 41=Wholesale Trade 56=Administration. Waste Management. Remedial Services 313=Textile Mills 322=Paper Manufacturing 324=Petroleum & Coal Products Manufacturing 325=Chemical Manufacturing 326=Plastics & Rubber Products Manufacturing 331=Primary Metal Manufacturing 332=Fabricated Metal Product Manufacturing 336=Transportation Equipment Manufacturing 339=Miscellaneous Manufacturing
Company size (number employees)	0=less than 20 1=21-99 2=100-500 3=more than 500
Location of Firm (region)	1=Alberta 2=British Columbia 3=Manitoba 4=New Brunswick 5=Newfoundland 6=Nova Scotia 7=Northwest Territories 8=Ontario 9=Quebec 10=Saskatchewan

Variable Label	Value
Participation in other voluntary programs	0=did not participate in other programs 1=did participate in other programs
Compliance records	0=no records of non-compliance 1=records of non-compliance; no fines 2=records of non-compliance; fines or court action
Pollution prevention activities	0=no pollution prevention activity 1=reported minor pollution prevention activity 2=reported substantial pollution prevention activity

Appendix 5.2
ARET Program: Summary of Firm Characteristics

Firm Characteristic	Participants		Non-Participants	
	N	Percent of cases	N	Percent of cases
Company Size				
<20	1	2	0	0
21-99	3	5	4	8
100-500	26	43	26	57
>500	30	50	16	35
Compliance Records				
No records	21	46	27	82
Records: no fines	12	27	2	6
Records: fines	12	27	4	12
Participation in other voluntary programs				
Did not participate	9	14	26	55
Did participate	54	86	21	45
Industry Sector				
11-Agriculture, Forestry, Fishing & Hunting	2	3	0	0
21-Mining & Oil & Gas Extraction	14	22	4	9
22-Utilities	0	0	1	2
41-Wholesale Trade	0	0	1	2
56-Adminstration, Waste Management	0	0	1	2
313-Textile Mills	0	0	1	2
322-Paper Manufacturing	18	29	0	0
324- Petroleum & Coal Products Manufacturing	0	0	7	15
325-Chemical Manufacturing	11	17	5	11
326-Plastics & Rubber Products Manufacturing	0	0	1	2
331-Primary Metal Manufacturing	17	27	10	22
332-Fabricated Metal Manufacturing	1	2	4	9
336-Transportation Equipment Manufacturing	0	0	10	22
339-Miscellaneous Manufacturing	0	0	1	2

Firm Characteristic	Participants		Non-Participants	
	N	Percent of cases	N	Percent of cases
Region				
AB-Alberta	4	6	3	6
BC-British Columbia	3	5	0	0
MB-Manitoba	2	3	0	0
NB-New Brunswick	0	0	1	2
NF- NewFoundland	0	0	1	2
NS-Nova Scotia	3	5	0	0
NT-Northwest Territories	1	2	0	0
ON-Ontario	32	51	28	60
QC-Quebec	17	27	13	28
SK-Saskatchewan	1	2	1	2
Pollution Prevention Activity				
No P2 activity	44	68	17	36
Minor P2 activity	8	13	16	34
Major P2 activity	12	19	14	30

Appendix 5.3
ARET Program: Matched Substances' Regulation under Major Canadian Standards

Substance	CEPA	Canada-Ontario Agreement	PSL1	PSL2	Strategic Options Process
Benzene	X		X		X
Cyanides					
Nickel	X				
Lead	X				
Methyl Isobutyl Ketone					
Chromium	X				
Mercury	X	X			
Cadmium	X	X	X		X
Chloroform					
Carbon Tetrachloride	X				

Appendix 5.4

ARET Program: Participants vs Non-Participants Average Absolute and Percentage Change Reductions 1995-2000 According to Firm Characteristics

Firm Characteristics	Participants			Non-Participants		
	N	Average Absolute Change (tonnes)	Average Percentage Change	N	Average Absolute Change (tonnes)	Average Percentage Change
Company Size						
<20	1	-2.05	-54	0	--	--
21-99	3	-0.027	246	4	0.074	5.48
100-500	26	-3.4	-14	26	-3.5	-29
>500	30	-35.24	-26	16	0.513	-5
Compliance Record						
No records	21	-8.81	-39	27	-1.75	-37
Records: no fines	12	-1.0399	-5	2	-0.971	88
Records: fines	12	-26.009	-4	4	-16.99	-57
Participation in other programs						
Did not participate	9	-2.87	-38	26	-2.39	-17
Did participate	54	-18.25	-7	21	-1.06	-19
Region						
AB-Alberta	4	58.33	531	3	-6.25	37
BC-British Columbia	3	-0.356	-75	0	--	--
MB-Manitoba	2	24.67	33	0	--	--
NB-New Brunswick	0	--	--	1	-1.08	-37
NF-Newfoundland	0	--	--	1	-27.7	-67
NS-Nova Scotia	3	-0.57	-95	0	--	--
NT-Northwest Territories	1	-0.04	-38	0	--	--
ON-Ontario	32	-26.6	-7	28	0.907	-14
QC-Quebec	17	-9.97	-43	13	-6.13	-32
SK-Saskatchewan	1	-0.002	-100	1	-4.12	-19

Firm Characteristics	Participants			Non-Participants		
	N	Average Absolute Change (tonnes)	Average Percentage Change	N	Average Absolute Change (tonnes)	Average Percentage Change
Industry Sector						
11-Agriculture, Forestry, Fishing	2	-15.68	-89	0	--	--
21-Mining, Oil & Gas Extraction	14	-0.844	9	4	-17.43	-67
22-Utilities	0	--	--	1	4.06	51
41-Wholesale Trade	0			1	-0.004	-12
56-Adminstration, Waste Management	0	--	--	1	0.407	-70
313-Textile Mills	0	--	--	1	0	-100
322-Paper Mnfg.	18	-5.31	-52	0	--	--
324-Petroleum & Coal Products Mnfg.	0	--	--	7	-11.5	-42
325-Chemical Mnfg.	11	-18.9	31	5	12.89	72
326-Plastics & Rubber Products Mnfg.	0	--	--	1	-13.87	-100
331-Primary Metal Mnfg.	17	-38.44	-3	10	-1.412	0
332-Fabricated Metal Product Mnfg.	1	-0.034	-61	4	-0.4	42
336-Transportation Equipment Mnfg.	0	--	--	10	2.85	-42
339-Miscellaneous Mnfg.	0	--	--	1	-0.031	-50
Pollution Prevention Activity						
No P2 activity	44	-20.88	-15	17	-1.61	-7
Minor P2activity	8	-6.63	-26	16	3.15	-22
Major P2 activity	12	0.309	-1	14	-7.51	-25

Appendix 5.5
The ARET Program: Results of Analysis of Variance for Absolute and Percentage Change (1995-2000) In Emissions by Firm Characteristics

Variable	F	Significance of F	eta	R square for equation
ACh 1995-20000				
By Region[28]	1.565	0.214	0.15	
Participation (in program)	3.43	0.067	0.16	0.052
PCh 1995-2000				
By Size	2.262	0.086	0.25	
Participation	0.360	0.550	0.04	
Size x Participation	2.867	0.062		0.065
ACh 1995-2000				
By P2	3.781	0.05*	0.16	
Participation	2.232	0.112	0.17	
P2 x Participation	2.999	0.054*		0.063
PCh 1995-2000				
By P2	1.047	0.304	0.02	
Participation	3.36	0.039*	0.22	
P2 x Participation	3.172	0.046*		0.057

* indicates significance at p 0.05
** indicates significance at p 0.01

[28] Region was recoded to reflect a three-point scale of Ontario, Quebec, and the rest of Canada in order to maintain a large enough n to allow for viable comparisons between groups

Appendix 5.6
ARET Program: Participants and Non-Participants
Total Substances: Absolute Change and Percentage Change 1995-2000

Facility Name and ID- ARET Participants	Region	Sector	ACh 1995-2000	PCh 1995-2000
Algoma Steel (ARET # 72)	ON	331	-87 40	-52 24
BASF Canada Ltd (ARET #78)	ON	325	-1 70	-100 00
Falconbridge Ltd (ARET #91)	ON	21	-5 47	-21 18
Falconbridge Ltd (ARET #92)	ON	21	-69 44	-89 97
Daishowa Inc (ARET # 122)	QC	322	-0 05	-30 67
Hudson Bay Mining & Smelting Co (ARET#133)	MB	21	51 13	130 83
E B Eddy Forest Products Ltd (ARET#153)	ON	322	-38 81	-84 82
E B Eddy Forest Products Ltd (ARET#154)	BC	322	0 00	0 00
E B Eddy Forest Products Ltd (ARET#155)	ON	322	-0 08	-39 40
Natural Resources Canada (ARET#156)	ON	91	0 00	-12 02
Syncrude Canada Ltd (ARET#158)	AB	21	58 09	527 95
Solutia Canada Inc (ARET#166)	QC	325	-0 10	-100 00
St Laurent Paperboard Inc (ARET#180)	QC	322	-16 56	-82 48
Hydro Agri Canada (formerly Nutrite) (ARET#182)	ON	325	-0 01	-25 00
Bayer Inc (ARET#186)	ON	325	-167 74	-99 96
Abitibi-Consolidated Inc (ARET#190)	ON	322	-0 35	-87 77
Rhodia Canada Inc (ARET# 206)	ON	325	-0 20	-100 00
Rhodia Canada Inc (ARET# 208)	QC	325	-0 01	-100 00
Saskatoon Chemicals Ltd (ARET#213)	SK	325	0 00	-100 00
Kimberly-Clark Corporation (ARET #214)	NS	11	-1 25	-86 21
Billiton Metals Canada Inc (ARET#215)	QC	21	-0 05	-22 33
Slater Steels Inc (ARET#217)	ON	331	-1 04	-62 74
Abitibi Consolidated Inc (ARET#218)	ON	322	-0 14	-78 95
Stelco Inc -Lake Erie Steel Company (ARET#231)	ON	331	-53 49	-50 55
Stelco Inc -Hilton Works (ARET#232)	ON	331	-41 33	-22 44
Stelco Inc -Alta Steel (ARET#233)	AB	331	0 46	73 56
Stelco Inc -Stelco McMaster (ARET#234)	QC	331	1 08	124 91
Stelco Inc -Stelpipe (ARET#235)	ON	331	0 08	191 97

Facility Name and ID- ARET Participants	Region	Sector	ACh 1995-2000	PCh 1995-2000
Stelco Inc -Stelwire Ltd-Parkdale Works (ARET#237)	ON	331	0 07	202 67
Stelco Inc -Stelwire Ltd-Burlington Works (ARET#238)	ON	332	-0 03	-60 78
Perkins Papers Ltd (ARET#244)	QC	322	0 00	0 00
Atlas Stainless Steels (ARET#245)	QC	331	-10 41	-95 24
Weyhaeuser Canada Ltd (ARET#251)	AB	322	-0 22	-69 90
Dupont Canada Inc (ARET#253)	ON	325	0 04	0 00
Crestbrook Forest Industries (ARET#255)	BC	322	-1 08	-92 28
Ivaco Rolling Mills Limited Partnership (ARET#262)	ON	331	-0 26	-34 09
Boliden Westmin Limited (ARET#264)	BC	21	0 01	17 46
Echo Bay Mines Ltd (ARET#272)	NT	21	-0 04	-38 31
Domtar Inc (ARET#288)	ON	322	-7 56	-6 73
Domtar Inc (ARET#289)	ON	322	0 00	0 00
Domtar Inc (ARET#292)	ON	322	0 00	0 00
Domtar Inc (ARET#293)	QC	11	-30 10	-91 84
Bowater Mersey Paper Company (ARET#295)	NS	322	-0 42	-100 00
StoraEnso North America (ARET#303)	NS	322	-0 03	-100 00
Atlas Specialty Steels (ARET#316)	ON	331	-0 49	-82 58
Dofasco Incorporated (ARET#329)	ON	331	-357 14	-75 70
Co-Steel Lasco (ARET#347)	ON	331	-0 10	-6 15
Gerdau Courtice Steel Inc (ARET#348)	ON	331	0 00	0 00
Abitibi_Consolidated Inc (ARET#352)	QC	322	-0 07	-32 41
Ethyl Canada Inc (ARET#372)	ON	325	0 05	900 00
Falconbridge Limited (ARET#387)	ON	21	-0 02	-22 22
Noranda Inc (ARET#395)	QC	21	0 03	2 93
Noranda Inc (ARET#397)	QC	21	-10 05	-44 34
Noranda Inc (ARET#399)	QC	331	-0 77	-55 00
Noranda Inc (ARET#400)	QC	21	-1 53	-79 22
Noranda Inc (ARET#401)	QC	331	-100 95	-27 72
Battle Mountain Canada Ltd (ARET#405)	ON	21	-35 43	-58 37
Battle Mountain Canada Ltd (ARET#406)	QC	21	-0 01	-100 00
Battle Mountain Canada Ltd (ARET#407)	ON	21	-0 01	-69 44
Gerdau MRM Steel (ARET#646)	MB	331	-1 78	-65 41
Kimberley-Clark Corporation (ARET#649)	ON	322	-35 46	-81 22

Facility Name and ID- ARET Participants	Region	Sector	ACh 1995-2000	PCh 1995-2000
Aur Resources (ARET#659)	QC	21	0 11	0 00
Norampac Inc (ARET#665)	ON	322	0 00	0 00
St Laurent Paperboard Inc (ARET#673)	ON	322	-0 08	-100 00
Bombardier Inc (NPRI#0057)	QC	336	0 02	0 00
Les Mines Agnico-Eagle (NPRI#0099)	QC	21	-0 80	-100 00
Delhi Industries Inc (NPRI#0231)	ON	331	0 07	66 60
Atotech Canada Ltd (NPRI#1109)	ON	325	0 12	55 80
Celanese Canada (NPRI#1162)	AB	325	56 24	249 07
Inco Limited-Port Colborne Refinery (NPRI#1471)	ON	21	-0 35	-17 74
Facility Name and ID-Non-Participants	**Region**	**Sector**	**ACh 1995-2000**	**PCh 1995-2000**
Kindred Industries Limited (NPRI#1555)	ON	332	-1 34	-100 00
Novacor Chemicals Canada Ltd (NPRI#1776)	ON	324	7 01	17 50
Novacor Chemicals Canada Ltd (NPRI#1785)	ON	325	8 21	35 70
PPG Canada Inc (NPRI#1953)	ON	325	-0 36	-57 07
Suncor Energy Inc (NPRI#2230)	AB	21	-68 41	-73 88
Tuyaux Wolverine Canada Inc (NPRI#2312)	QC	331	0 20	0 00
Safety-Kleen Ltd (NPRI#2537)	ON	56	0 41	-70 10
Kuntz Electroplating Inc (NPRI#3111)	ON	332	-0 24	-54 65
TRW VSSL- Plant 1 (NPRI#3190)	ON	332	0 01	400 00
GE Canada (NPRI#3254)	QC	336	0 00	-100 00
Ford Motor Company-Windsor Plant (NPRI#3416)	ON	331	-2 96	-99 33
Ford Motor Company-Oakville Plant (NPRI#3419)	ON	336	17 12	50 11
Canadian General Tower Ltd (NPRI#3475)	ON	313	0 00	-100 00
Communaute Urbaine de Montre (NPRI#3571)	QC	22	4 06	51 29
Ispat Sidbec Inc -Acierie (NPRI#3649)	QC	331	-11 62	-86 14
General Motors of Canada Limited-London (NPRI#3766)	ON	336	0 03	5 37
Blount Canada Ltd (NPRI#3845)	ON	332	-0 04	-78 26
General Motors of Canada Limited-Oshawa (NPRI#3893)	ON	336	13 41	33 03
Petro Canada-Montreal Refinery (NPRI#3897)	QC	324	-38 56	-55 72
Petro Canada-Edmonton Refinery (NPRI#3903)	AB	324	-6 59	-62 76

Facility Name and ID-Non-Participants	Region	Sector	ACh 1995-2000	PCh 1995-2000
Ultrmar Canada Inc (NPRI#3928)	QC	324	-9 12	-68 57
Consumers Cooperative Refineries Ltd (NPRI#4048)	SK	324	-4 12	-19 39
Irving Oil Limited-Refinery Division (NPRI#4101)	NB	324	-1 08	-37 11
A H Tallman Bronze Company (NPRI#4205)	ON	331	-0 02	-44 44
North Atlantic Refining Limited (NPRI#4316)	NF	324	-27 69	-67 29
Peinture Can-Lak Inc (NPRI#4353)	QC	325	0 23	61 38
Orenda Aerospace Corporation (NPRI#4507)	ON	336	-0 20	-100 00
DDM Plastics Inc (NPRI#4520)	ON	326	-13 87	-100 00
Nelson Muffler Canada Inc (NPRI#4547)	ON	336	-0 01	-100 00
TKA Fabco Corp (NPRI#4637)	ON	331	0 20	275 00
Dana Canada Inc,-Axle Plant (NPRI#4737)	ON	336	-2 14	-100 00
Dominion Castings Ltd (NPRI#4739)	ON	331	-0 09	-7 72
Les Forges de Sorel Inc (NPRI#4797)	QC	331	-0 09	-57 06
Norcast Inc (NPRI#4819)	QC	331	0 04	13 21
Krupp Fabco-Fabricated Steel Products Inc (NPRI#4912)	ON	336	0 00	-100 00
Zalev Brothers Limited (NPRI#4980)	ON	339	-0 03	-50 82
Resources Breakwater-Mine Bouchard-Hebert (NPRI#5400)	QC	21	-0 15	-75 00
Bombardier Transportation-Thunder Bay Plant (NPRI#5601)	ON	336	0 30	0 00
Procor Limited-Oakville (NPRI#5660)	ON	48-49	0 01	-95 00
Brake Parts Canada Inc-Neelon Casting Plant (NPRI#5668)	ON	331	0 16	-60 00
Russel Metals Inc (NPRI#5681)	QC	41	0 00	0 00

Chapter Six

Evaluation of the Effectiveness of the 33/50 Program in the United States

Introduction

This chapter provides an analysis of the effectiveness of the 33/50 Program in reducing emissions of target substances in the United States. The overarching goal was to compare reductions made under the program (by 33/50 participating facilities) to reductions made by a group of non-participating firms (representing the business-as-usual scenario of reductions achieved by standard regulatory controls alone). The first section of this chapter outlines the major variables and measures used in the analysis, as well as describes the sources of data and collection procedures. The second section provides an overview of facilities comprising the two study populations with regards to general descriptive characteristics including: firm location; industrial sector; compliance records; pollution prevention activities; and participation in other voluntary programs. The third section presents the results of the analysis at two levels. First, a comparison of reductions achieved by participating and non-participating firms was used to evaluate the success of the 33/50 Program in reducing releases of toxic substances. This included an analysis of yearly total releases of the target substances as well as absolute and percentage change measures during (and after) the tenure of the program. Secondly, reductions in emissions were evaluated in relation to general firm characteristics to ascertain how these factors may affect firm performance. For example, did some industrial sectors reduce their emissions more than others? This chapter focuses on evaluating the effectiveness of the 33/50 Program on reducing emissions of target substances in the United States. Chapter seven provides a comparison to the Canadian experience with the ARET Program as detailed in chapter five.

33/50 Program: Data Collection and Procedures

Environmental Effectiveness:

Program success was evaluated in terms of environmental effectiveness as measured by reductions in releases of the ten target substances in the matched dataset. Data were collected at the facility level for two study populations: firms who were participants in the 33/50 program and non-participating firms. The Toxic Release Inventory was used to collect information on reported releases of each substance separately for both the participant and non-participant groups[1]. Unlike the ARET Program, participants under 33/50 were not required to submit separate reports on their releases of target substances. Rather, the 33/50 Program used reported releases to the TRI to track progress and evaluate the success of the program.

The TRI 1987-1996 CD-ROM was used for the initial identification of firms with reported releases of any of the ten target substances[2]. This software allows retrieval of data from a complete copy of the TRI database. More importantly, the database allows the user to aggregate information for a group of substances. As a result of delisting petitions and regulatory initiatives, the list of chemicals that must be reported under TRI often changes from year to year. As well, reporting guidelines may also change so that

[1] Data were collected at the substance level (annually) as this is the method of reporting under TRI. Firms submit a separate report for annual emissions of individual substances.

year-to-year releases are not comparable. The TRI software includes a "core chemical" search function that ensures that year-to-year comparisons only include chemicals that were reported in the same way in all years[3]. The database was used to locate all facilities with reported releases of any of the ten target substances. The TRI facility ID code was used to identify firms and ensure accuracy of data collection[4]. This collection of firms was then exported into Microsoft Access in order to generate a report that sorted the data by facility for yearly releases of each substance. The result was a group of 3827 facilities. From these, firms which had reported releases of only one of the ten substances or which had zero releases for all substances for all years were omitted[5]. As well, it was determined that the study would concentrate on states surrounding the Great Lakes Basin. This corresponds to the most industrialized area in Canada, as well as decreases the variability among cases. The result was a total of 486 cases. The 33/50 Program participant list was obtained from the Environmental Protection Agency and a manual examination of the cases was necessary to locate participating firms according to their

[2] All data reported to TRI are publicly available. The 1987-1996 CD-ROM includes all reported information for these years and allows for the aggregation of data for a group of substances. The CD-ROM is available for mail order through the TRI website at www.epa.gov/tri.
[3] United States. Environmental Protection Agency. *1987-1996 Toxic Release Inventory CD-ROM User Manual* July 1999.

[4] It is necessary to identify firms primarily through their TRI ID code as firms may change their names from one year to another (the TRI ID remains the same) or facilities may be listed under the same name but for different plant locations.

[5] The rationale used was the same as that outlined in chapter 5 and also ensured comparability with the Canadian case study

TRI ID code[6]. A random selection of cases was then used to obtain the final group of participant and non-participant firms. Table 6.1 shows the final number of cases for each study population.

Table 6.1
The 33/50 Program: Number of Cases in Study Samples

Population	33/50 Participants	Non-Participants
Number of cases with releases of two or more target substances	231	255
Number of cases in study sample	70	70

Once these firms were selected, data for reporting years 1997 to 2000 were obtained through the TRI online database. The TRI contains information on reported releases and transfers for over 600 chemicals. The focus of this study was on releases. Total releases include emissions to air, water, land, and underground injection. Data were collected and summed for air and water emissions only to allow for comparisons to the Canadian case study. Since TRI releases were reported in pounds, they were converted to tonnes to allow for comparisons with Canadian releases. As outlined in previous chapters, the following dependent variables were used to measure environmental effectiveness: yearly total releases; absolute change; and percentage change in releases for participants versus non-participants.

[6] While the 33/50 Program website provided a list of participants, this did not include their corresponding TRI ID number. As many companies had multiple facilities participating in the program, the only way to ensure accuracy was to match cases through their TRI ID. Locating a program participant list (with TRI

Industrial Sector:

Information for both participants and non-participants was collected with regards to the industrial sector under which their facility's operations are categorized. The TRI database provided the American standard industrial classification code (SIC) for each firm. This code was then compared to the North American Industrial Classification System (NAICS) to find the corresponding matched SIC in order to allow for comparisons to the Canadian case study[7].

Company "Greenness"

As in the Canadian case study, two measures were used to evaluate the environmental record of facilities: compliance records and participation in other voluntary programs. First, firms' compliance records were collected as an indicator of "greenness". Data on compliance records were collected through the online ECHO database of the Environmental Protection Agency[8]. ECHO, Enforcement and Compliance History Online, contains information from both EPA, state, and local environmental agencies on records of compliance with the Clean Air Act, Clean Water Act, and Resource Conservation and Recovery Act for the last two years. The database categorizes offences at three levels: *violations* in which a facility has been in violation at some time over the last two years; *significant violations* which indicates that a facility is currently designated

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ID) was difficult as the program had terminated in 1995. A master list of 33 50 Program participants was provided by David Sarokin, USEPA Headquarters, Washington, DC

[7] Information on changing the American SIC codes to the NAICS was found at www.census.gov/eped/www/naics.html.

[8] United States. Environmental Protection Agency. *Enforcement and Compliance History Online* (www.epa.gov/echo.html).

as a "High Priority Violator" due to violations of significant magnitude or duration; and *enforcement actions* which indicates that at least one enforcement action has been taken against the facility. ECHO allows users to search for information by city, state and facility name. Searches were performed for each firm in the two groups by facility name and address. Analysis of firm compliance records were categorized according to three values: 0 – if there were no records of non-compliance; 1 – if a firm had been designated as having violations; and 2 – if a firm was designated as a significant violator or had been the object of enforcement action[9].

Data were also collected for each firm with regards to participation in other voluntary programs. Membership in Responsible Care, WasteWise, and the National Environmental Performance Track programs were used as indicators of participation in other voluntary programs[10]. These programs were chosen because they are national in scope and had the largest membership listings. The participant lists of these programs were examined to determine if participant or non-participant firms were members.

Pollution Prevention Activities:

The Toxic Release Inventory collects annual information on the pollution prevention activities of firms under the category "total waste managed". This represents

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[9] This corresponds to the three-point scale used in the Canadian case study which was based on an increasing degree of violations with mandatory regulations

[10] The Responsible Care Program is an international voluntary initiative of the chemical industry (started in Canada) which promotes product stewardship and the reduction of the impact of chemicals on the environment. WasteWise is a voluntary program that targets the reduction of municipal solid waste: waste that would otherwise end up in a trash dumpster. The National Environmental Performance Track recognizes facilities that demonstrate strong environmental performance beyond regulatory requirements and that have implemented high quality environmental management systems.

the sum of materials recycled on and off-site, energy recovery on and off-site, and treated on and off-site materials. The TRI provided a trend analysis for each firm's total waste managed from 1991 to 2000. This information was collapsed into a two-value measure of pollution prevention activity for each facility: 0 – if total waste managed from 1991 to 2000 decreased; and 1 – if total waste managed increased over this time period. An increase in waste management indicates an improvement in pollution prevention activities while a decrease in total waste managed indicates a reduction in pollution prevention activities.

Region:

Firm location was included as a measure to examine whether region had any impact on performance in reducing emissions. It was determined that the study would focus on firms located in the eight states surrounding the Great Lakes Basin - Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin.

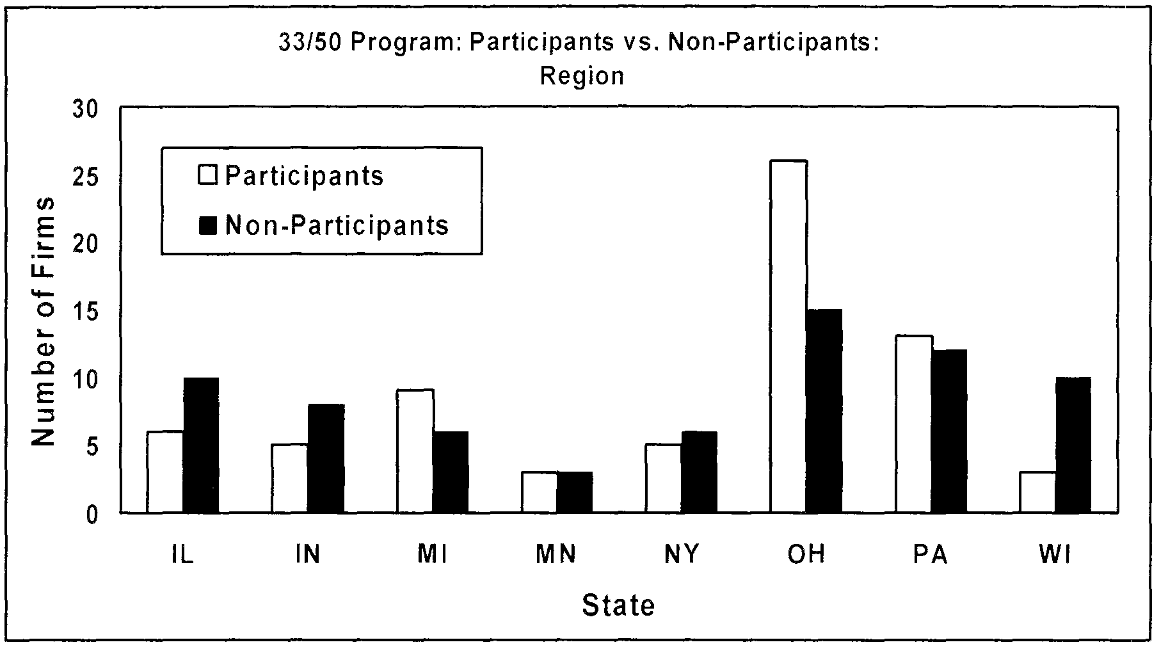
Appendix 6.1 provides a list of the variables used in this analysis as well as the values attached to each categorization. The following section provides a descriptive overview of facilities in the two study groups in relation to the above-listed firm characteristics. This supplies a general picture of facilities comprising the study populations. The remainder of the chapter summarizes the results of the analysis of reductions achieved by participating and non-participating firms as well as the relationship between performance and firm characteristics.

Results: Descriptive Characteristics of Participants vs. Non-Participants

This section provides information on the general characteristics of firms in the participant and non-participant groups according to the following variables: industrial sector; firm location; compliance records; participation in other voluntary programs; and pollution prevention activities. The purpose was simply to provide a general picture of facilities comprising the participant and non-participant populations. Appendix 6.2 provides a summary of the number of firms (and percentage of study population) within each category.

Figure 6.1 demonstrates the breakdown of facilities with regards to *firm location*. Overall, participating and non-participating facilities were spread across the eight states fairly uniformly. For both participants and non-participants, the largest percentages of facilities were located in Ohio (37 and 21 percent respectively), followed by Pennsylvania (19 and 17 percent respectively). As well, the fewest cases in both groups were from the state of Minnesota, comprising only four percent of both participating and non-participating firms. Further, a large difference between the groups is seen in the case of Wisconsin that contains 14 percent of non-participants and only 4 percent of participating firms. Thus, overall, only the states of Wisconsin and Ohio show significant differences in the number of facilities for the participant and non-participant groups.

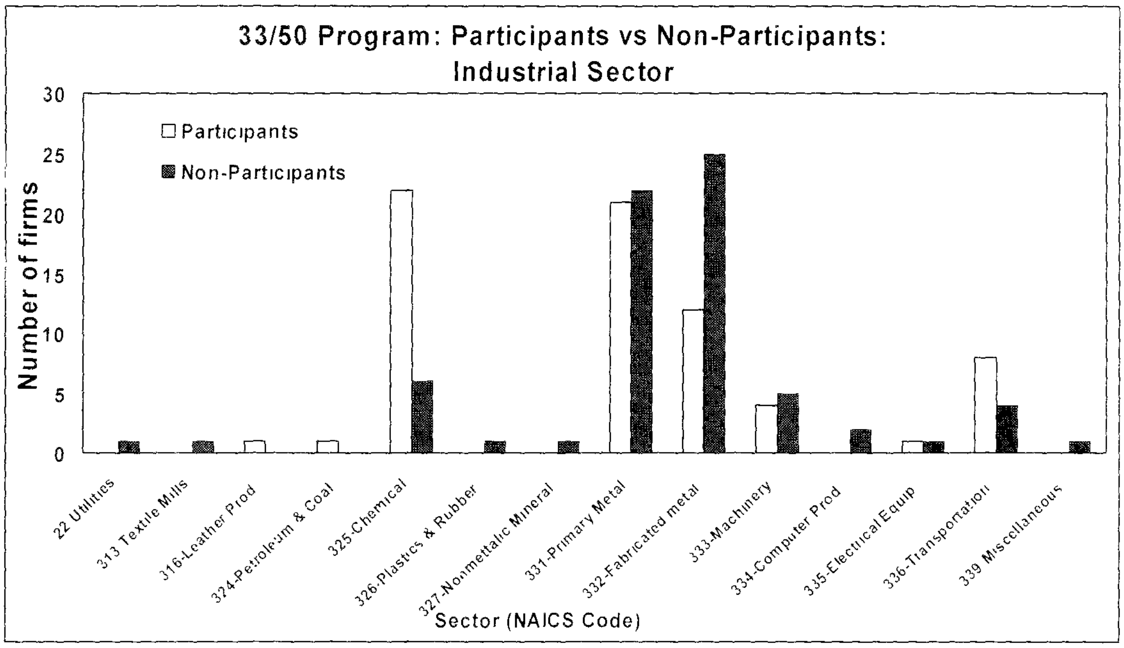
Figure 6.1



Industrial sector describes the types of activities and operations performed by each facility. Figure 6.2 provides a breakdown of the number of facilities from each industrial sector. For 33/50 participants, 95 percent of firms were from the following five sectors: 31 percent from the Chemical Manufacturing sector (325); 30 percent from Primary Metal Manufacturing sector (331); 17 percent from Fabricated Metal Product Manufacturing sector (332); 11 percent from the Transportation Equipment Manufacturing sector (336); and six percent from Machinery Manufacturing sector (333). In the case of non-participating firms, 88 percent were from the same five industrial sectors: 36 percent from the Fabricated Metal Manufacturing sector; 31 percent from Primary Metal Manufacturing sector; eight percent from the Chemical Manufacturing sector; seven percent from Machinery Manufacturing sector; and 6 percent from

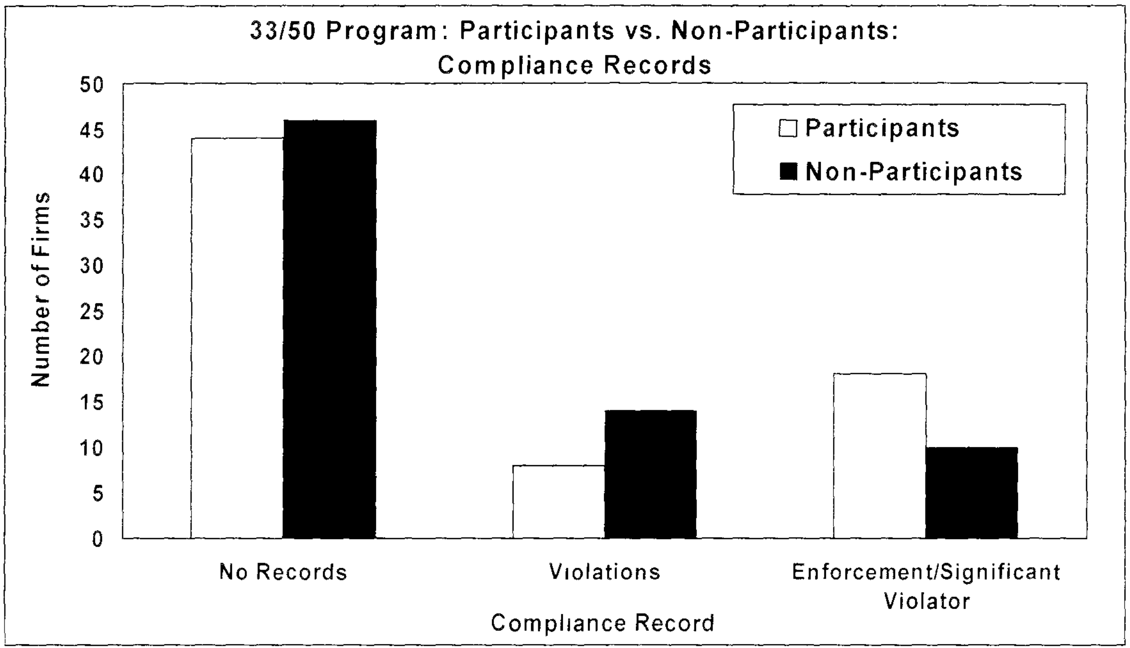
Transportation Equipment Manufacturing sector. Again, overall, the two groups are fairly similar in terms of industrial sector. The large majority of facilities were from the same five sectors, although the number of cases differed somewhat in the case of the Chemical Manufacturing (325) and Fabricated Metal Product Manufacturing sectors (332). Furthermore, for both groups only one (non-participant from Utilities sector) firm was not from a manufacturing sector.

Figure 6.2



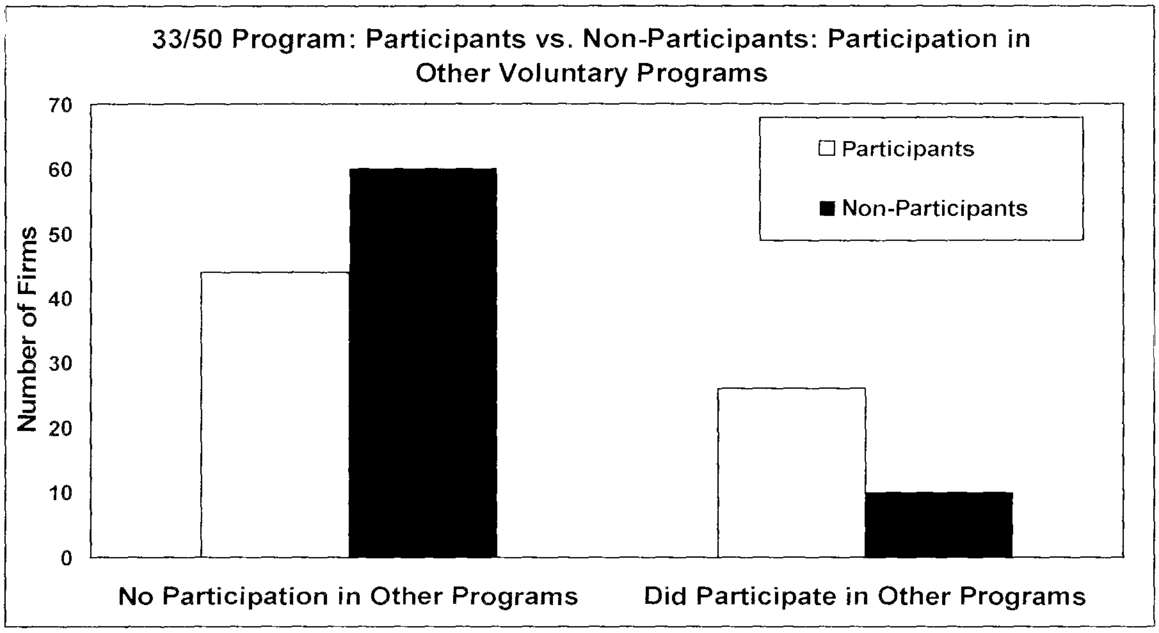
Two measures were used to evaluate company greenness: firm compliance with regulatory standards; and participation in other voluntary programs. Figure 6.3 displays the results with regards to *compliance records*. For both participating and non-participating facilities, the majority of cases did not have a history of non-compliance with regulatory controls. Sixty-three percent of participants and 66 percent of non-participants had no records of regulatory violations. In the case of 33/50 participating firms that had records of violations. 11 percent of all participating firms had some minor level of violations and 26 percent had been designated as a significant violator or had enforcement actions. For non-participants. 20 percent had some history of violations and 14 percent had significant levels of non-compliance. In the case of participants. this may indicate that facilities that joined the 33/50 Program have an environmentally green record and should perform better in regards to reducing emissions. On the other hand, non-participating firms also displayed clear compliance records which may imply that these firms are environmentally conscious anyway and do not need program participation to improve their image. The final section of this chapter will shed some light on the relationship between performance and compliance records.

Figure 6.3



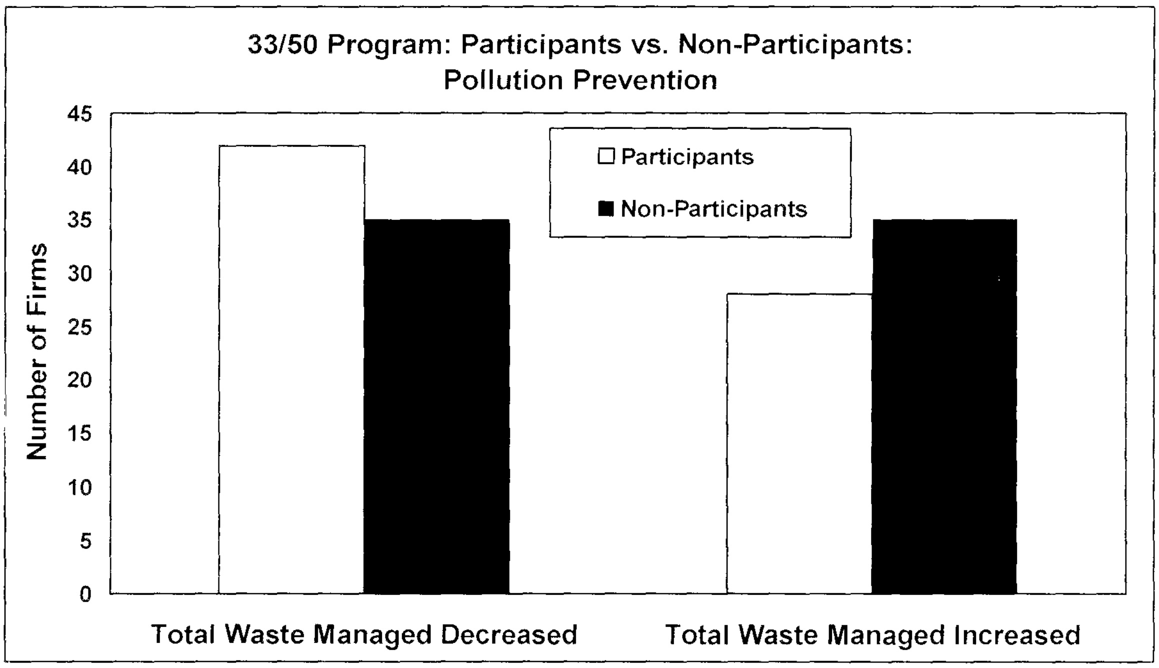
The breakdown of firms that did and did not participate in *other voluntary programs* is presented in figure 6.4. These results are the opposite of those found for the previous characteristic. Here the majority of both participating and non-participating firms were not members of other voluntary programs (63 percent and 86 percent respectively). This is especially surprising in the case of 33/50 participants as it can be assumed that firms who are open to joining one voluntary program would be involved in others as well. Further, 31 percent of participants were from the Chemical Manufacturing sector for which participation in the Responsible Care Program is mandatory. In the case of firms that did participate in the other voluntary programs, there were more 33/50 participants (37 percent) than non-participants (14 percent). Overall, more participants than non-participants were also members of other programs; however, this was not the case for the majority of facilities.

Figure 6.4



The final firm characteristic examined was *pollution prevention activities*. Figure 6.5 displays the number of firms from both groups who have increased or decreased their total amount of waste managed from 1991to 2000. The results were similar for both participants and non-participants. Non-participating firms were exactly divided between those that increased and those that decreased their waste managed. Similarly, in the case of 33/50 participants, 60 percent of firms decreased and 40 percent increased their total waste managed from 1991 to 1995. Overall, non-participating firms actually had a better record for pollution prevention activities. This is surprising given the fact that a secondary goal of the 33/50 Program was to encourage source reductions of the target substances through pollution prevention activities.

Figure 6.5

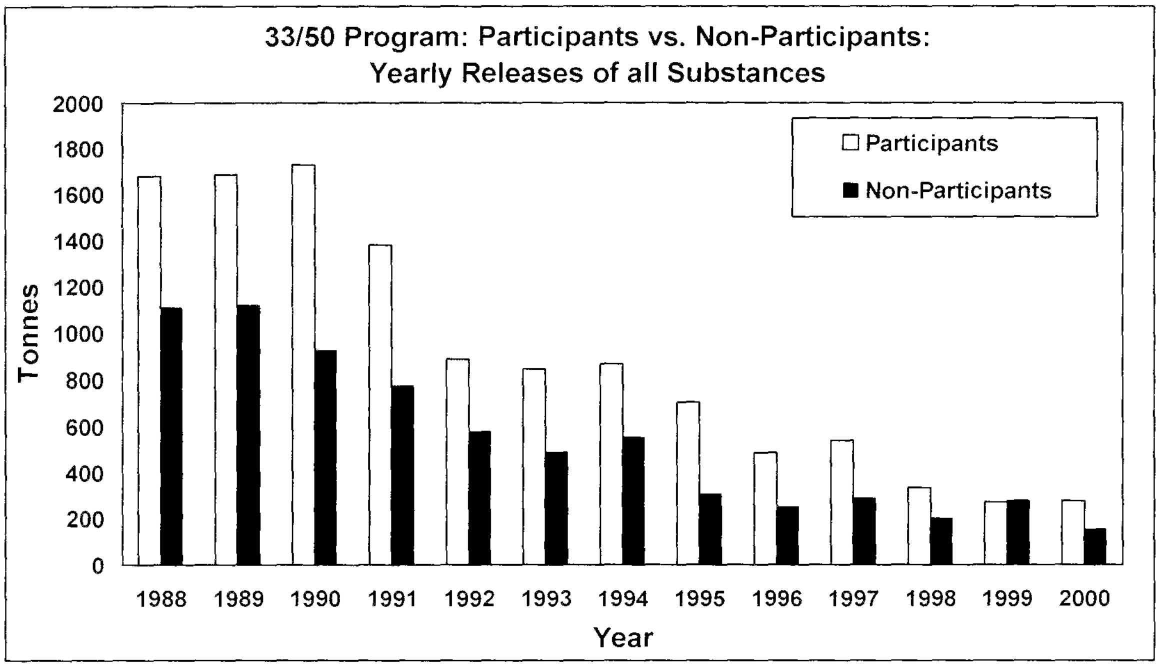


Overall, facilities from both study groups were quite similar with regards to firm characteristics. In the case of location, with the exception of Wisconsin and Ohio, the number of participant and non-participant facilities was fairly uniform across the regions. With regards to industrial sector, 95 percent of participants and 88 percent of non-participants were from the following five sectors: Chemical Manufacturing; Primary Metal Manufacturing; Fabricated Metal Manufacturing; Machinery Manufacturing; and Transportation Equipment Manufacturing. Results were similar for the two measures of environmental greenness as well. The majority of both participating and non-participating firms had no records of non-compliance and did not participate in other voluntary programs. While it is logical to assume that 33/50 participants would have good compliance records, it is surprising that the majority of firms were not members of other voluntary programs as well. Finally, with regards to pollution prevention activities, both participants and non-participants were almost equally split between firms that decreased their total waste managed and firms that increased their total waste managed from 1991 to 2000. This is the most unexpected result since the 33/50 Program promoted pollution prevention as the primary method to obtain emission reductions. The real test will be the results of the final section of this chapter that examines performance in reducing releases of the target substances in relation to these variables.

Results: Reductions in Releases of the Target Substances

This section provides an overview of results for emission reductions by 33/50 participating and non-participating firms. The first level of analysis is shown in figure 6.6 which displays yearly total releases for the ten target substances. For both participating and non-participating firms there was a definite downward trend in emissions from 1988 to 2000. However, overall, 33/50 participants had larger yearly emissions than non-participants. This is not surprising given the fact that the 33/50 Program made a point of targeting large emitters for participation in the program. The 33/50 program invited facilities to join the initiative in the spring and summer of 1991, with the tenure of the program ending in 1995. We were thus able to compare emissions during three time periods: 1988 to 1991 capturing releases made before the start of the program; 1991 to 1995 measuring reductions achieved during the program's tenure; and 1995 to 2000 which tracks developments since the end of the program. An initial survey of results in figure 6.6 suggests that there were significant reductions achieved by participating companies from 1991 to 1995. Further, this downward trend has not been as substantial since the program ended in 1995. However, results for non-participating firms follow a similar trend, making one skeptical of the impact of the program on emission trends.

Figure 6.6



Thus, a better indicator of performance is evaluating reductions over time through absolute and percentage change measures. The focus here was on reductions achieved during the tenure of the program. Thus, absolute and percentage change in emissions was captured through the following formulae:

AChange = 1995 emissions – 1991 emissions

PChange= (1995 emissions-1991 emissions) / 1991 emissions x 100

Absolute and percentage change measures were calculated for the other time periods as well to compare releases achieved both before and after the program was in existence. Table 6.2 provides a comparison of absolute and percentage change in total releases of all ten target substances over the various time periods. The results for absolute and percentage change measures are also shown in figure 6.7 and figure 6.8 respectively. Further, Appendix 6.6 provides details of absolute and percentage change measures between 1991 and 1995 for individual facilities.

Table 6.2
33/50 Program: Participants vs. Non-Participants
Total Substances: Reductions by Absolute Change and Percentage Change
Comparison of Pre-and-Post Program Reductions

Time Period	Participants		Non-Participants	
	Absolute Change (Tonnes)	Percentage Change	Absolute Change (Tonnes)	Percentage Change
1988-1995	-973.65	-58 percent	-803.55	-72 percent
1988-1991	-300	-18 percent	-337.88	-30 percent
1991-1995	-674.69	-49 percent	-465.67	-60 percent
1995-2000	-427.267	-60 percent	-153.26	-49 percent

One of the biggest criticisms of the 33/50 Program (as with the ARET Program) was that it allowed facilities to choose their own base-year as far back as 1988 from which to measure reductions, thus including emission reductions achieved before the start of the program in 1991 when evaluating program success. Table 6.2 provides a comparison of reductions achieved by this sample of 33/50 participants from 1988 and 1991 base-years. If one evaluates program performance by measuring change in emissions from 1988 to 1995, firms reduce their emissions of the ten target substances by 974 tonnes, reflecting a 58 percent reduction in emissions output. However, 300 tonnes of these reductions were actually achieved between 1988 and 1991, before the 33/50 program started. When using the actual start of the program as the base-year, absolute change in emissions from 1991 to 1995 demonstrate a 675 tonne reduction in emissions of the target substances by 33/50 participants. a 49 percent reduction in output. Thus. in this sample of participating firms. the 1995 goal of 50 percent reduction in releases of these ten substances was just short of being reached (the 33/50 Program has claimed that this goal was reached a year early in 1994). Further. more substantial reductions were achieved since the program ended in 1995. From 1995-2000. participating firms reduced their total releases by 427 tonnes. representing a 60 percent reduction in output. This may indicate a lasting influence of the program in changing firm behaviour.

Comparisons of reductions achieved by participating and non-participating firms raise some doubt about the impact of the 33/50 program in reducing releases of the target substances. First. a comparison of reductions in emissions during the tenure of the program from 1991 to 1995 demonstrates that in terms of absolute change in quantity of releases. participating firms reduced their emissions by 675 tonnes while non-participating firms reduced their emissions by 466 tonnes. However. while participants performed better in terms of actual tonnage of substances reduced. the percentage change in reductions tells a different story. Reductions achieved by participating firms represented only a 49 percent reduction in releases versus a 60 percent reduction by non-participants. The larger absolute reduction in tonnes can be explained by the overall larger yearly releases of participating firms as shown in figure 6.6. Thus. in terms of the change in overall output. non-participating firms were more effective in reducing their emissions of the target substances. A comparison of reductions by participants and non-participants from 1995 to 2000 show a less substantial reduction by non-participating firms (153 tonnes representing a 49 percent change) than participants who reduced their overall emissions by 60 percent (427 tonnes).

Figure 6.7

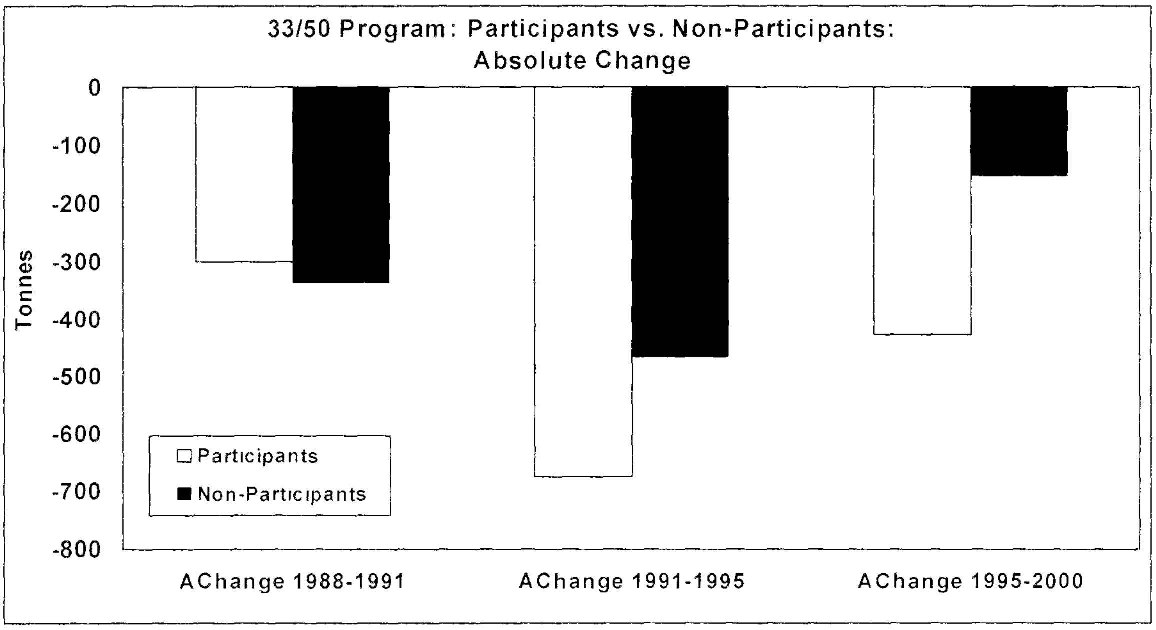
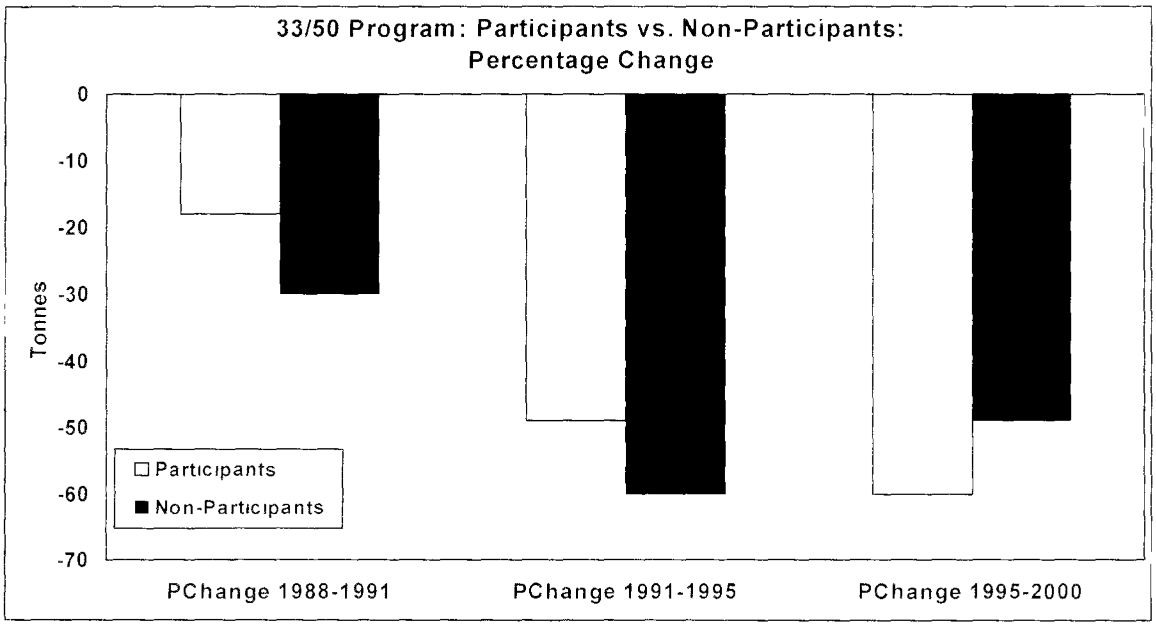


Figure 6.8



A second stage of analysis examined reductions in releases at the substance level. Figure 6.9 compares performance by participating and non-participating firms by looking at absolute change in emissions from 1991 to 1995 for each of the ten substances individually. Overall, participating firms reduced emissions of six of the nine substances for which they had reported releases and increased their emissions for the remaining three chemicals. The largest reduction in releases was seen in the case of benzene at 707 tonnes and the largest increase in methyl isobutyl ketone at 118 tonnes. Non-participants reduced their emissions for five of the eight substances for which there were reported releases and increased emissions for the remaining three chemicals. Their largest reduction in releases was seen for methyl isobutyl ketone at 381 tonnes and the largest increase for nickel at 35 tonnes. Generally, for both participating and non-participating firms, decreases in emissions were larger than increases. For the seven substances for which there were reported releases for both groups, only in the case of benzene and lead did both groups have similar performance outcomes with both participants and non-participants showing decreases in releases. In all other cases, participating firms and non-participating firms showed conflicting results. Overall, there is little similarity between participating and non-participating firms in terms of performance for individual substances. Further, only in the case of benzene for both participants and non-participants and methyl isobutyl ketone for non-participating firms were significant reductions in quantity of releases achieved.

Figure 6.9

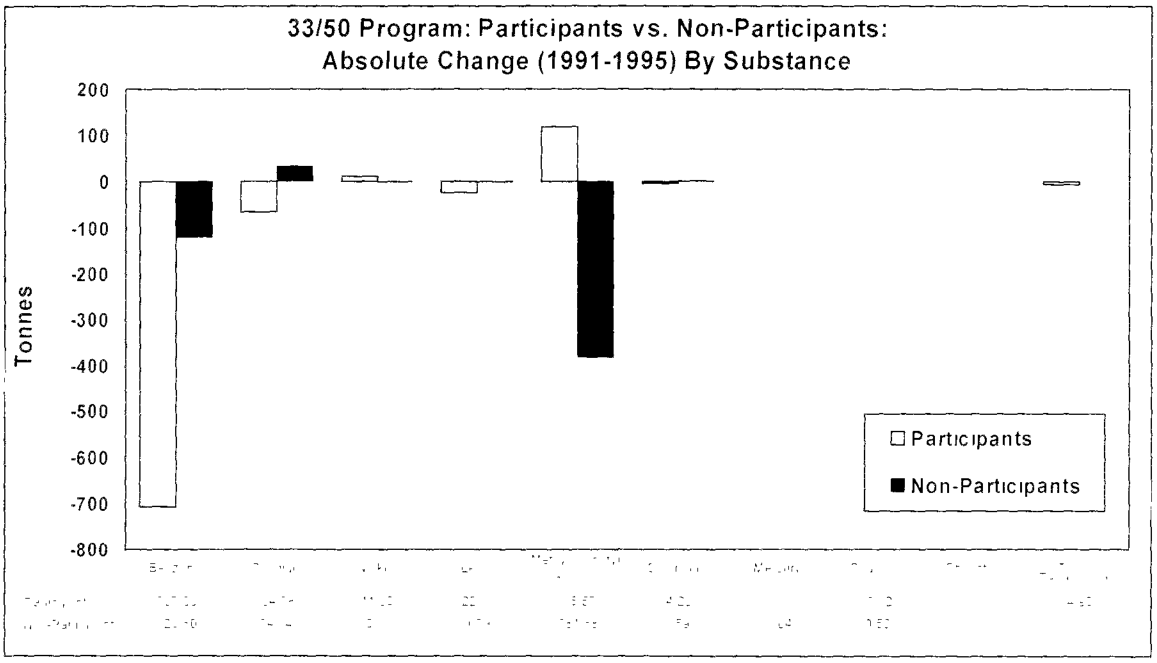


Figure 6.10 provides a substance level comparison of reductions as measured through percentage change from 1991 to 1995. This figure demonstrates that while the quantity of reductions as measured through absolute change was not large, the percentage change in output they represent was more substantial. Significant reductions in output were achieved by participating firms for the following substances: 87 percent reduction in benzene: 80 percent reduction in lead: 78 percent reduction in cyanide: and a 78 percent reduction in carbon tetrachloride. Only in the case of nickel did participating firms display a large increase with an 82 percent increase in output. Reductions achieved by non-participating firms were not as substantial. Non-participants achieved percentage reductions in releases of the following substances: 66 percent decrease in benzene: 67 percent reduction in methyl isobutyl ketone: and a 70 percent decrease in mercury output.

However, significant increases were seen in the case of chromium with a 66 percent rise in output and cyanide with an 817 percent increase in releases (representing an increase in releases of 34.8 tonnes). However, this drastic value for cyanide was influenced by very large emissions in 1995 by two facilities: Bethlehem Steel Corporation in New York which released 18 tonnes of cyanide and New Boston Coke Corporation in Ohio which reported releases of 19 tonnes of cyanide in 1995[11]. Otherwise, the average emission of cyanide by non-participating firms in 1995 was around 1 tonne.

Moreover, it is likely that the differences in reductions for individual substances were not due to variations in the regulatory standards governing usage. Appendix 6.3 provides a listing of the ten target substances and their regulation under major U.S. environmental legislation. This demonstrates that for the most part the ten target substances are subject to the same level of regulatory standards, with the exception of chromium, chloroform, and cyanides which are subject to additional controls under the Community Right-to-Know Act. However, the above results do not show an unusual level of emission reductions for these substances.

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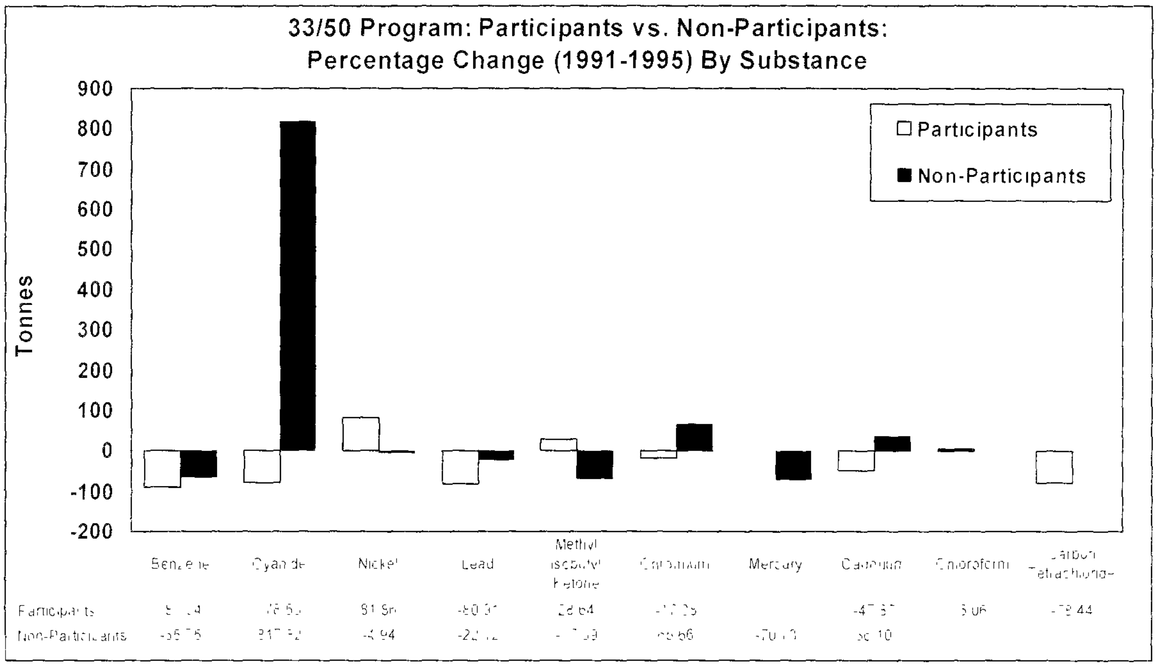
[11] If these two facilities are removed from the analysis, the result is a 52 percent decrease in cyanide releases from 1991-1995 for non-participating firms. However, it is important to include them in the overall analysis as this represents the reality of pollution emissions over this time period. As well, in both cases, large emissions were exhibited for all years of reported releases of cyanide, indicating that these facilities are overall large polluters and the high release in 1995 was not an anomaly.

Figure 6.10



Overall, there was little consistency between participating and non-participating firms when comparing reductions for individual substances. The previous evaluation which looked at yearly emissions and absolute and percentage change measures for total releases of all ten target substances provide a more cohesive level of analysis. These results demonstrate that for this sample of participating and non-participating firms, 33/50 participants actually had lower overall reductions in total releases of the ten target substances (49 percent reduction representing 674 tonnes) during the time frame of the program as compared to non-participating firms (60 percent reduction in output representing 564 tonnes). The greater quantity of reductions in tonnage is most likely due to the fact that participating firms had much larger yearly releases than non-participants. The final section of this chapter examines the relationship between emission reductions and a variety of firm characteristics. This focuses on releases of all ten substances as a group, using average absolute and percentage change measures during the tenure of the program from 1991 to 1995.

Results: Reductions in Releases According to Firm Characteristics

This section of analysis evaluates whether firm characteristics influenced performance in reducing emissions of the ten target substances. This evaluation used total releases for all ten substances, measuring absolute and percentage change in emissions from 1991 to 1995. For each firm characteristic - region, industrial sector, compliance records, participation in other voluntary programs, and pollution prevention activities - facilities in the two study groups were sorted according to the variable value categories outlined in Appendix 6.1. Average absolute and percentage change measures for 1991 to1995 were then calculated for each firm characteristic grouping[12]. Appendix 6.4 lists the variables and measures used to evaluate the influence of firm characteristics along with the corresponding results for average absolute and percentage change calculations for total releases of the ten substances as well as the number of cases within each category upon which the calculations were based. Additionally, analysis of variance were conducted for absolute and percentage change from 1991 to 1995 (tenure of the program) and 1995 to 2000 (post-program) according to all possible combinations of participation in the program and each of the five firm characteristics being studied (*i.e.*,

[12] The system of calculation and rationale was the same as that described in chapter five (footnote 26). However, data for Ford Motor Company, Michigan Truck Plant was omitted from this analysis as this facility displayed a very large percentage change measure (7030 percent increase) for total releases from 1991-1995 which greatly skewed the overall averages.

sector, region, compliance records, participation in other voluntary programs, and pollution prevention activities) [15]. Appendix 6.6 summarizes the results for only those analyses that demonstrated some level of statistical significance (or approached significance).

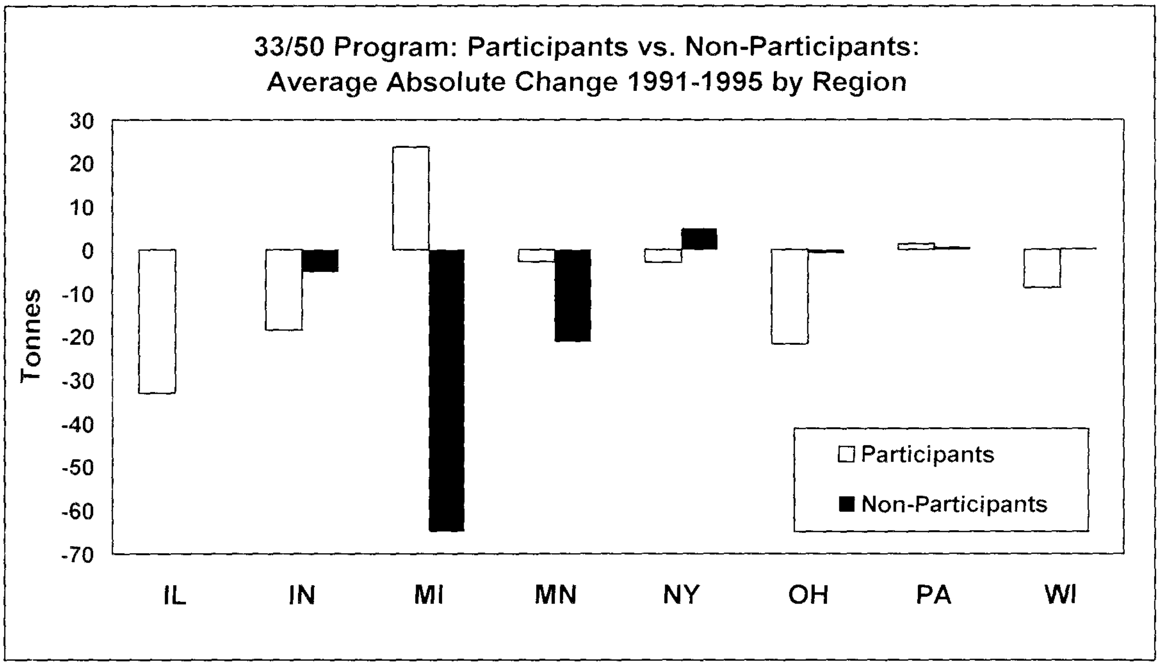
Figure 6.11 and figure 6.12 illustrate the results for average absolute change and average percentage change in total releases from 1991-1995 according to the *location* of facilities. For both study populations, facilities located in the state of Minnesota demonstrated the greatest reductions in releases. Participating firms had an average 73 percent decrease (2.85 tonnes) in total emissions and non-participating firms an average decrease of 66 percent (21 tonnes). However, these values were based on a sample of three facilities for each study group. Facilities located in Indiana also showed a significant decrease in total releases with participants averaging reductions of 40 percent (18 tonnes) and non-participants an average 17 percent reduction (five tonnes).

The majority of both participating and non-participating firms were from the states of Ohio and Pennsylvania. Both states showed a high level increase in total releases from 1991 to 1995 for both study groups. Participating firms located in Pennsylvania increased their emissions by an average of 33 percent (1.37 tonnes) and non-participating firms by an average of 38 percent (0.66 tonnes). In Ohio 33/50 participants increased their total releases by an average of 55 percent and non-participants by an average of 31 percent. Overall, 33/50 participants decreased their average

[15] As outlined in chapter five, only ANOVAs of a maximum of two independent variables could be conducted. As well, it was only possible to conduct analyses for total substances, rather than individual

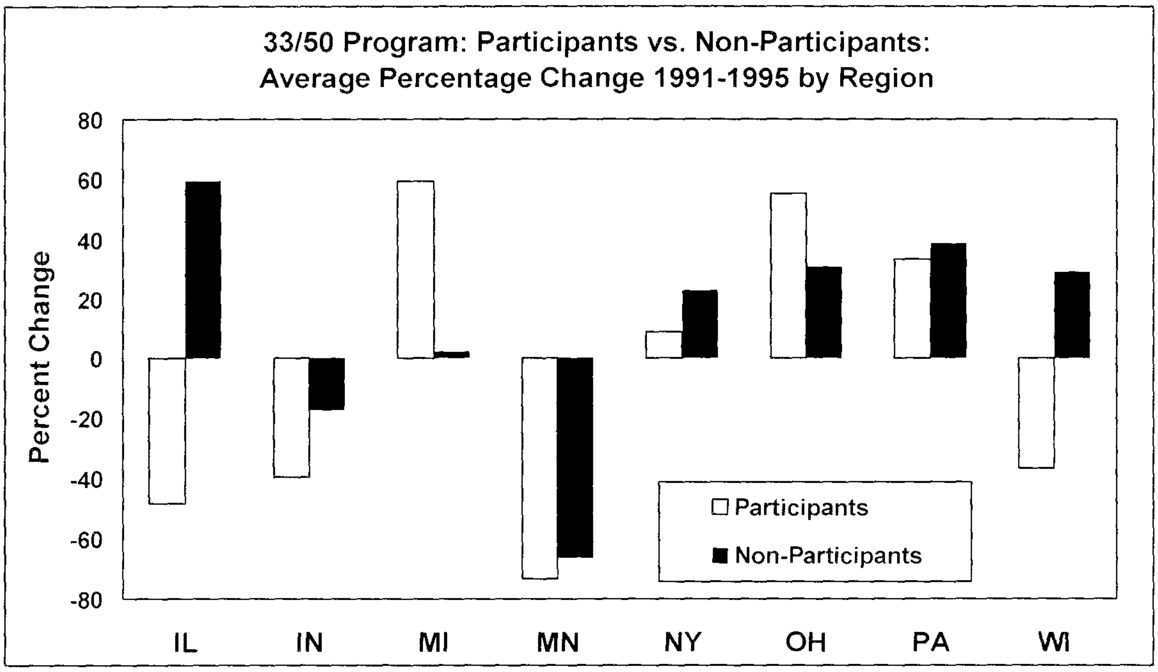
emissions in the following 4 states: Illinois (48 percent); Indiana (40 percent); Wisconsin (36 percent); and Minnesota (73 percent). On the other hand, non-participating firms only showed an average percent reduction in emissions in Indiana (17 percent) and Minnesota (66 percent). The largest increases were demonstrated by non-participating firms located in Illinois and by participating facilities in Michigan both with an average 59 percent increase in total releases. Results in Appendix 6.5 reveal a marginally significant interaction between participation in the 33/50 Program and the region in which the facilities were located ($F=1.996$, $p=0.061$); however the amount of variation in absolute change in emissions from 1991 to 1995 which can be explained by these variables is low.

Figure 6.11



chemicals.

Figure 6.12



Average absolute and percentage change measures for total releases from 1991 to 1995 in relation to *industrial sector* are illustrated in figure 6.13 and figure 6.14 respectively. The majority of firms for both 33/50 participating firms (95 percent) and non-participating firms (88 percent) were from the following five industrial sectors: Chemical Manufacturing (325); Primary Metal Manufacturing (331); Fabricated Metal Product Manufacturing (332); Machinery Manufacturing (333); and Transportation Equipment Manufacturing (336). Both participating and non-participating firms in the Chemical Manufacturing sector increased their emissions during the tenure of the 33/50 Program, by an average of 31 percent and 27 percent respectively. Firms in the Fabricated Metal Product Manufacturing sector also demonstrated an overall average increase in emissions, with participants displaying an average 23 percent increase and non-participants an average 13 percent increase. However, the worst performance was seen in the Transportation Equipment Manufacturing sector. Participating and non-participating facilities increased their emissions by an average of 97 percent and 123 percent respectively. However, this was largely due to very large increases in percentage change measures for two facilities: the Daimler Chrysler Warren Truck Assembly Plant in Michigan (728 percentage change for total emissions 1991-1995) and Great Dane Trailers in Illinois (598 percentage change). When these two firms are removed from the analysis, participating firms in this sector show an average eight percent reduction in emissions and non-participating firms an average 36 percent reduction. While it is important to note such large polluters and their effect on measures, it is more important to include them in the analysis as they represent the reality of pollution control in these areas.

Results for the remaining two industry sectors were varied. Participating firms decreased their total releases by an average of 36 percent in the Primary Metal Manufacturing Sector and by an average of three percent in the Machinery Manufacturing sector. Non-participants showed a poorer performance in these sectors with firms in the Primary Metal Manufacturing sector increasing their average emissions by 25 percent and firms in the Machinery Manufacturing sector by 13 percent. On the whole, 33/50 participants in the Primary Metal and Machinery Manufacturing sectors demonstrated the only reductions in emissions and the worst performance was seen in the Chemical and Transportation Equipment Manufacturing sectors. Results outlined in Appendix 6.6 indicate that industrial sector may play a small role in explaining emission reductions. A significant main effect for sector ($F=4.033$, $p=0.02$) was found for percentage change in reductions from 1991 to 1995. However, the level of variance in emissions which can be explained by this variable increases in the post-program time period of 1995 to 2000 was small (16 percent). A significant main effect for sector was found for absolute change in emissions (F=7.146, p=0.001) and percentage change in emissions (F=7.146, p=0.001) from 1995 to 2000.

Figure 6.13

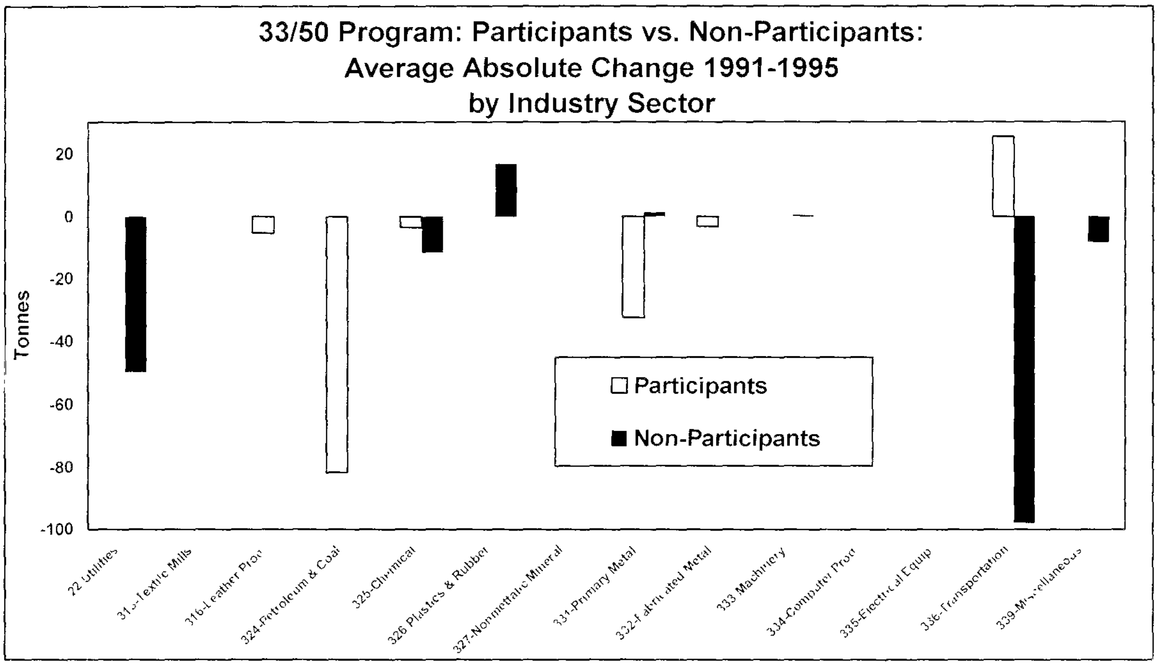
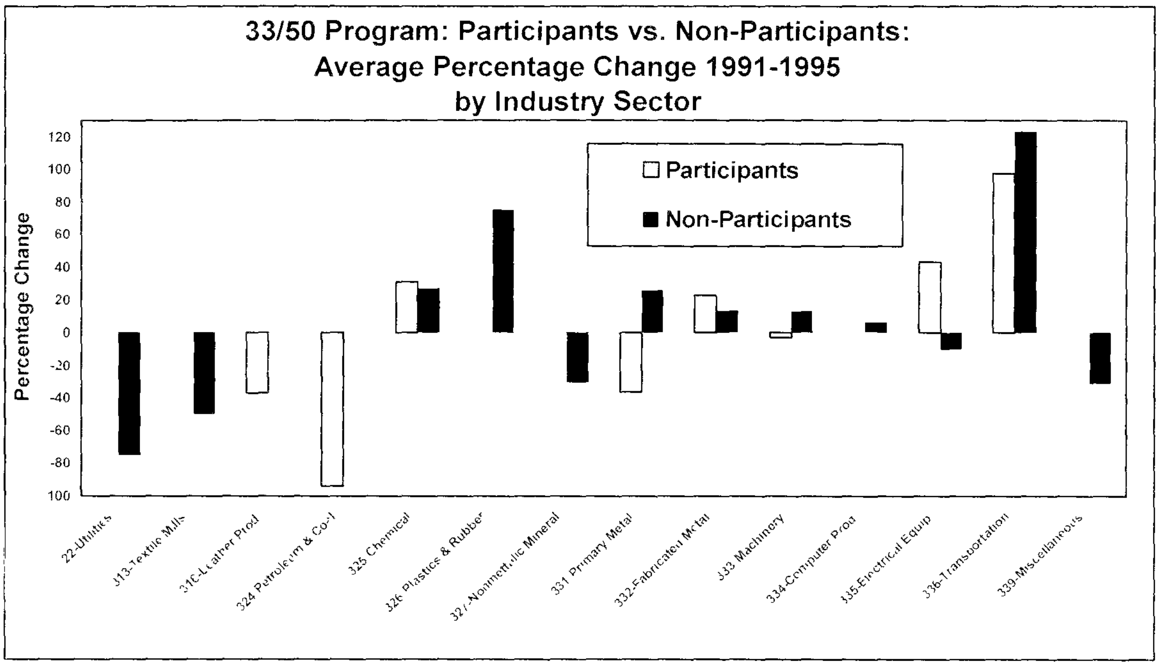


Figure 6.14



Two measures of environmental greenness of firms were collected: participation in other voluntary programs and compliance records. The majority of both 33/50 participating facilities (63 percent) and non-participating facilities (86 percent) were not members of *other voluntary initiatives*. Figures 6.15 and 6.16 display the results of average absolute and percentage change measures for total releases between 1991 and 1995 according to this firm characteristic. When looking at average absolute change in emissions, non-participating firms who were members of other programs showed the largest reductions with an average of 44 tonnes. This corresponds to an average 10 percent increase in total output. 33/50 participating firms who did not participate in other programs displayed the worst performance. These facilities had an average 35 percent increase in total releases (four tonnes) over the time period. Overall, 33/50 participant firms which did not participate in other programs demonstrated a lower average increase in total emissions (15 percent) than participating facilities which were members of other initiatives (average of 25 percent increase). The results were the exact opposite for non-participating firms with the lower increase in emissions displayed by facilities who were members of other programs. On the whole, while there was some discrepancy in the results when comparing participating and non-participating firms, there was really little difference between firms that did and did not participate in other voluntary programs. This sheds considerable doubt on the assumption that firms which participate in other voluntary initiatives are inherently more environmentally friendly, thus resulting in greater emission reductions. While a significant effect was found for the interaction of participation in the 33/50 Program and firm participation in other voluntary programs ($F=9.421$, $p=0.003$), the degree of variance in absolute change in emissions from 1991 to 1995 that can be explained by these variables is low.

Figure 6.15

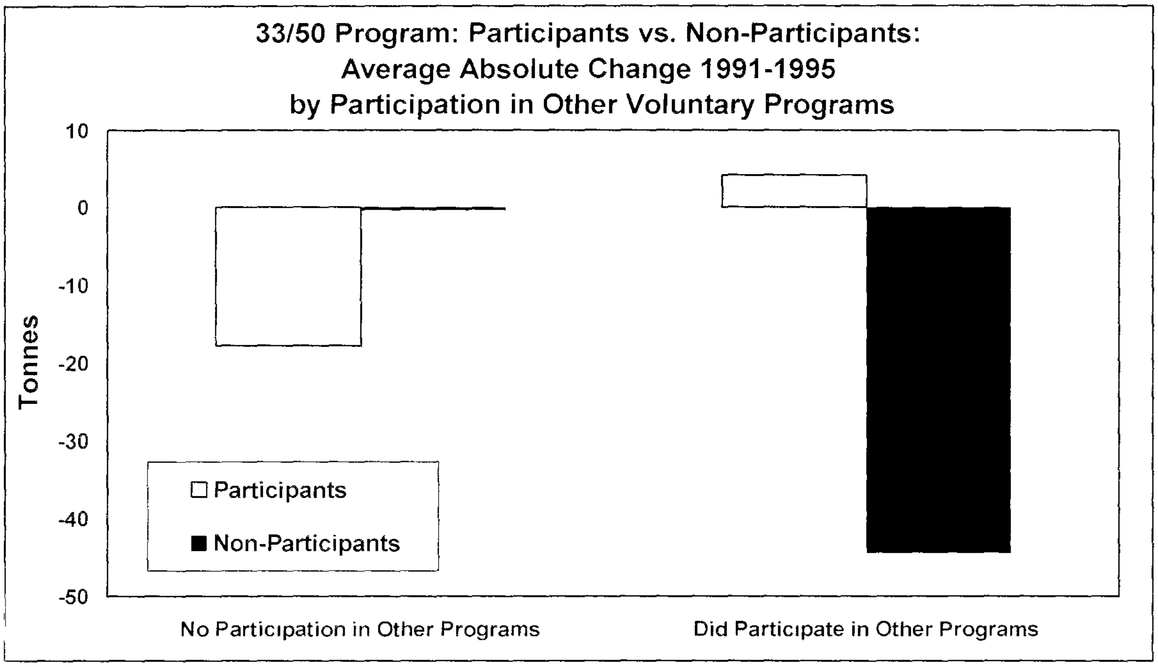


Figure 6.16

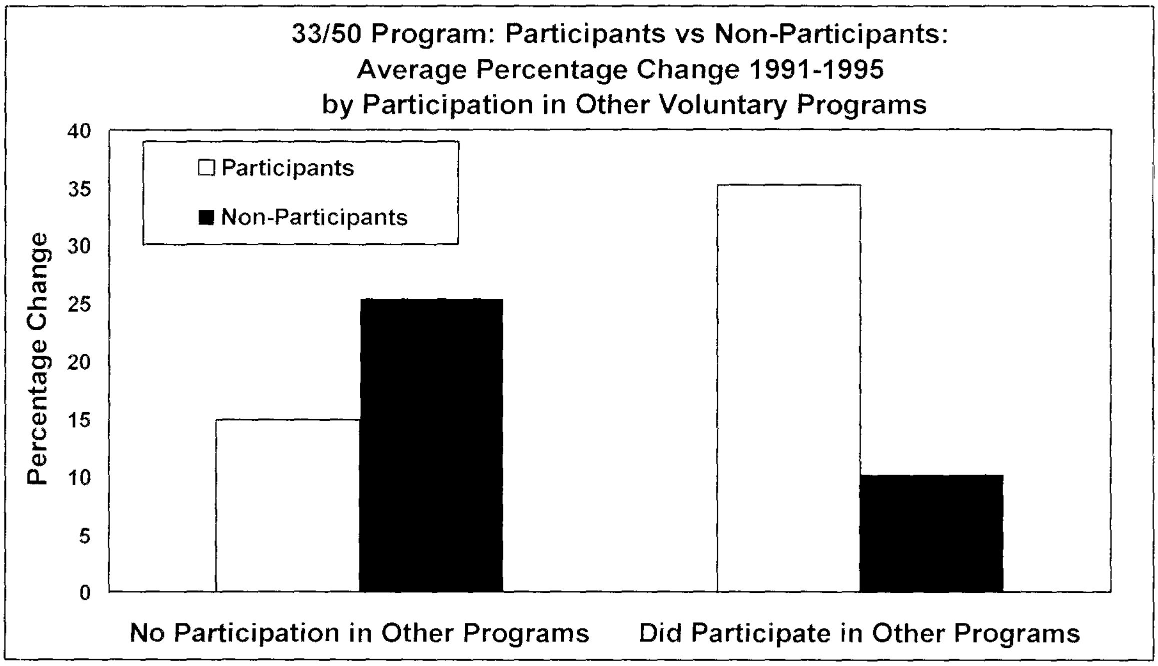


Figure 6.17 and figure 6.18 illustrate average absolute and percentage change values in total releases of the ten target substances from 1991 to 1995 in relation to firms' *compliance records*. The majority of firms in both study groups had no records of non-compliance. In terms of average absolute change in the case of facilities that had significant compliance violations, participating firms decreased their average total releases by 20 tonnes and non-participating firms by 41 tonnes. This corresponds to an average increase in output of 33 percent and 22 percent respectively. On the other hand, firms with no records of non-compliance demonstrated an average 22 percent increase in total releases for 33/50 participants and a 28 percent average increase for non-participants. The best performance was demonstrated by facilities that had some minor violations of major federal regulations. Participating firms reduced their emissions by an average of 2 percent and non-participating firms increased their releases on average by 9 percent. Again, the assumption that a clean compliance record as an indicator of firm "greenness" would lead to greater emission reductions is proven false for the cases in this study. Further, there was little variation in results between participating and non-participating facilities. Overall, firms who had some history of non-compliance demonstrated the best performance. These firms were not considered "significant violators" and perhaps being subject to an environmental violation resulted in improved performance. On the other hand, facilities that had been the object of enforcement action displayed the worst performance. This is not surprising as these firms had been subject to compliance violations either on a reoccurring basis or of large magnitude, which may indicate a low level of corporate environmental consciousness.

Figure 6.17

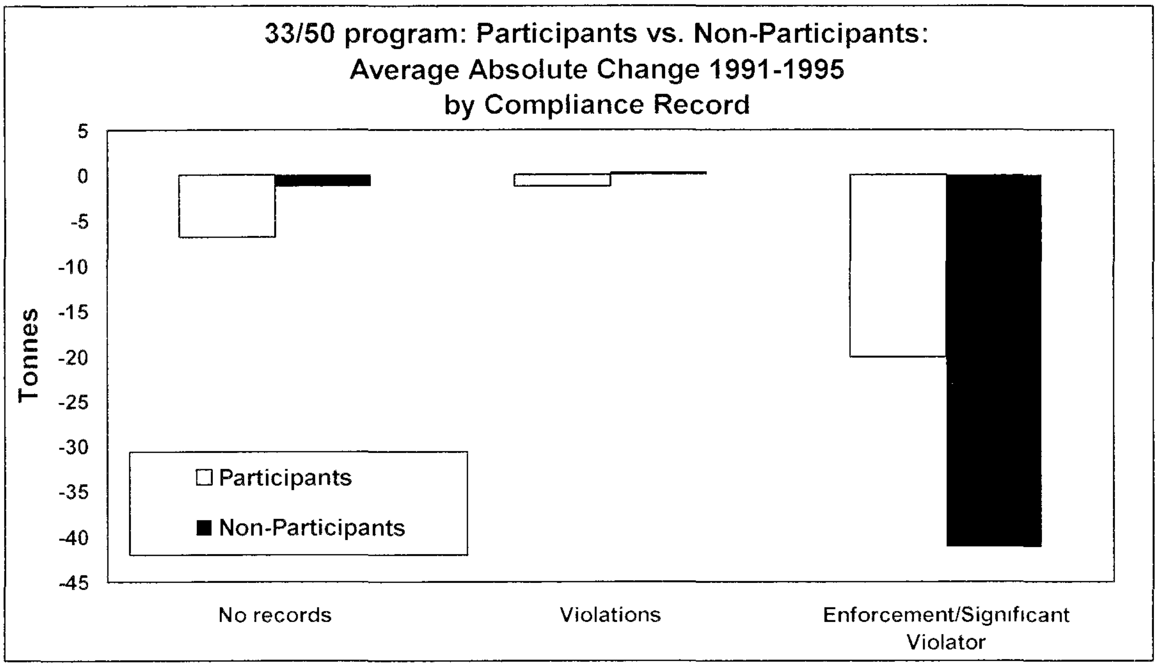
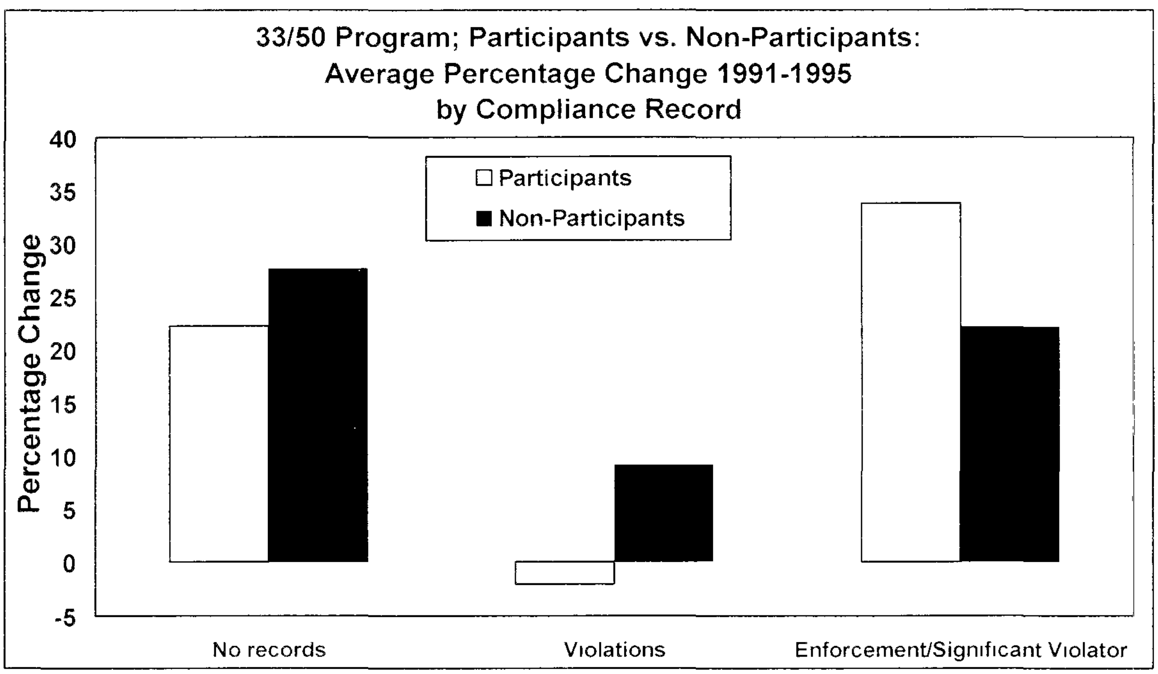


Figure 6.18



The final firm characteristic evaluated was *pollution prevention activities*. Figures 6.19 and 6.20 illustrate average absolute and percentage change values in total releases from 1991-1995 in relation to pollution prevention activities. As outlined previously, an increase in pollution prevention activities is indicated by an increase in total waste managed. Conversely, a firm that reduces their pollution prevention activities will demonstrate a decrease in total waste managed. In the case of 33/50 participants, 60 percent of facilities had decreased their total waste managed from 1991 to 2000 and 40 percent had shown an increase over this time period, reflecting an improvement in their pollution prevention activities. In this case participating firms who had increased their pollution prevention activities also demonstrated a reduction in total releases by an average of 11 percent. On the other hand, 33/50 participating firms who had decreased their pollution prevention activities displayed an increase in emissions by an average of 45 percent. Non-participating facilities were equally divided between those who had increased and those who had decreased their total waste managed from 1991 to 2000. In this case, while non-participating firms in both categories showed an average decrease in emissions in terms of tonnage, on the whole facilities increased their emissions as measured by average percentage change (20 percent by firms who had decreased their pollution prevention activities and 26 percent by firms who had increased their P2 activities). Appendix 6.6 reveals a marginally significant main effect for firms' pollution prevention activities for absolute change in emissions from 1991 to 1995 ($F=2.918$, $p=0.09$). The strength of this variable increases in the post-program time period with absolute change in emissions from 1995 to 2000 showing a main effect for pollution prevention activities of firms ($F=5.532$, $p=0.02$). Thus, overall, 33/50 participants who had increased their pollution prevention activities performed better, reflecting perhaps the impact of the 33/50 Program's commitment to achieving reductions primarily through source reductions. The impact of this variable may increase in the post-program period as firms have more time to implement operational changes to increase the amount of waste managed through pollution prevention activities.

Figure 6.19

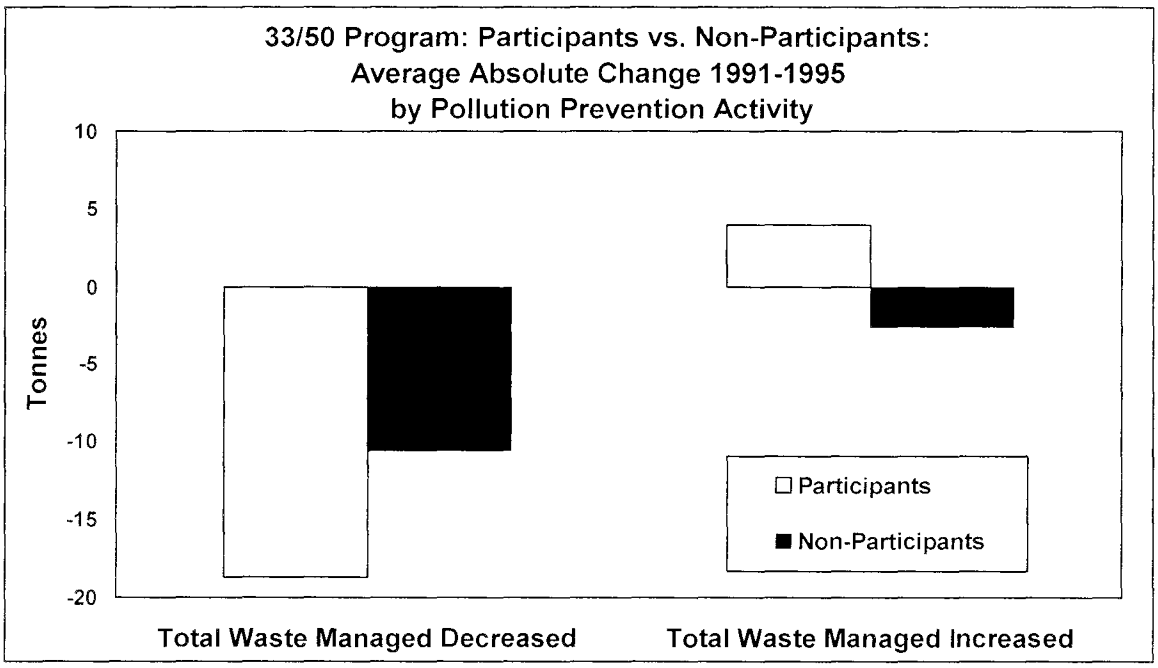
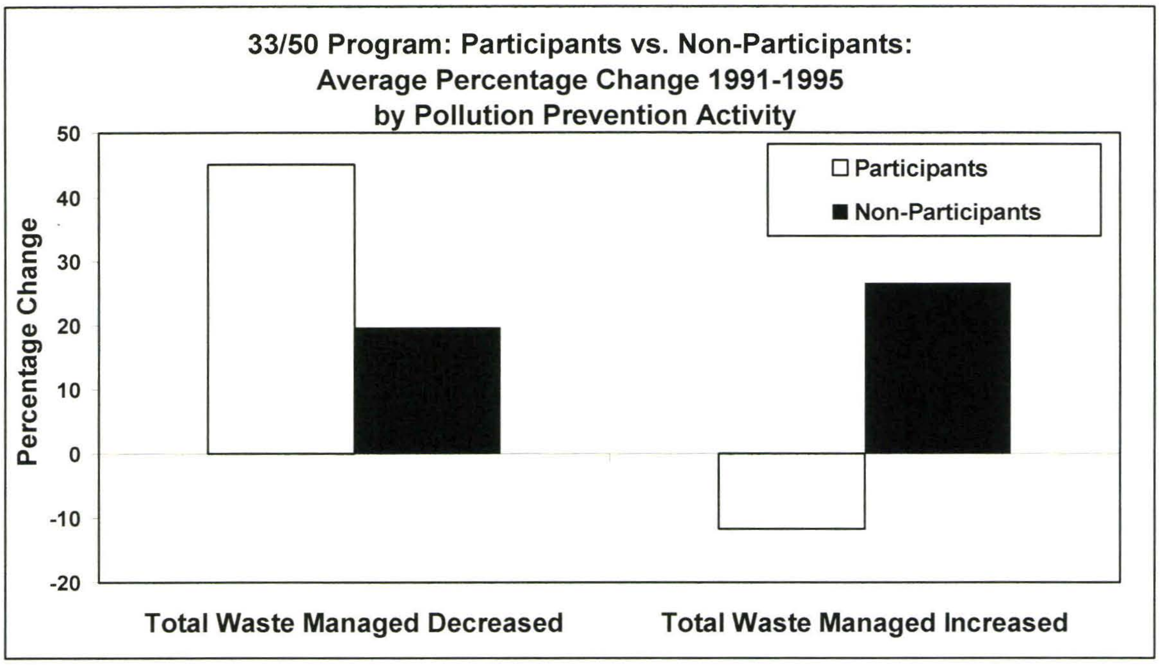


Figure 6.20



Conclusions

The first level of analysis raised the question of what kinds of firms participated in the 33/50 Program (and compared these to the types of firms in the non-participant control group). Overall, facilities in both study groups were fairly similar when compared on a variety of firm characteristics. The majority of both participating and non-participating firms: were located in Ohio and Pennsylvania; did not participate in other voluntary programs; and had no records of non-compliance with mandatory regulations. In terms of the industrial sector categorizing operations, 95 percent of 33/50 participants and 88 percent of non-participants were from the following five sectors: Chemical Manufacturing; Primary Metal Manufacturing; Fabricated Metal Manufacturing; Machinery Manufacturing; and Transportation Equipment Manufacturing. Finally, with regards to pollution prevention activities, no clear trend was evident. Both study groups were almost evenly split between firms that increased and those that decreased their "total waste managed" from 1991 to 1995.

At this point there are two questions raised by the above analysis. Do firm characteristics influence performance in reducing emissions and, what role does participation in the 33/50 Program play in these results? It is difficult to see a general trend as the results varied according to firm characteristic.

In terms of the location of firms, the largest reductions were seen in Minnesota and Indiana in which participants displayed a reduction in total releases by an average of 73 percent and 40 percent respectively and non-participating firms an average reduction of 66 percent and 17 percent respectively. While the majority of firms were located in Ohio and Pennsylvania, both states demonstrated an increase in output, with participating firms showing an average increase of 55 percent and 31 percent respectively and non-participating firms increasing emissions on average by 31 percent and 38 percent respectively. Overall, 33/50 participants showed reductions in total releases for four of the eight states, while non-participating firms reduced emissions in only two states.

Table 6.3 provides some insight into regional differences relating to environmental attitudes. It illustrates two measures of state support for environmental policies. First, pollution abatement and operating costs for years 1992, 1994, and 1999 provide an indicator of state spending on environmental matters[14]. Secondly, the number

[14] United States. Census Bureau *Current Industrial Reports. Pollution Abatement Costs and Expenditures 1994* (U.S. Department of Commerce, May 1996); United States. Census Bureau. *Current Industrial*

of environmental organizations present in each state in 1997 provide an indicator of the level of state environmental activism[15]. A high degree of environmental activism may result in more stringent regulatory standards as groups put pressure on state agencies. As well, facilities may be more inclined to reduce their emissions in regions with a strong environmental lobby. While both Ohio and Pennsylvania showed increases in emission releases by both study groups, these states also demonstrated some of the higher levels of environmental spending and environmental activism during the time the 33 50 Program was in operation. One would expect these states to have performed better. On the other hand, firms located in Minnesota and Indiana demonstrated the largest reductions in emissions. While Minnesota did not have a high level of environmental spending, there was a high degree of environmental activism (especially since the population of this state is lower than others). Conversely, while the state of Indiana did not demonstrate a high level of environmental activism, pollution abatement spending was relatively high. Overall, these results support only a weak linkage between performance in emission reductions and state attitudes regarding environmental issues.

Reports. Pollution Abatement Costs and Expenditures 1999 (U.S. Department of Commerce: November 2002).

[15] United States. Census Bureau. *Environment, Conservation and Wildlife Organizations. Selected Industry Statistics by State 1997 and 1992* (www.factfinder.census.gov).

Table 6.3
State Environmental Attitudes

State	Total Pollution Abatement Capital Expenditures and Operating Costs (millions of dollars)			Number of Environment, Conservation and Wildlife Organizations
	1992	**1994**	**1999**	**1997**
Illinois	366.8	309.2	153.2	107
Indiana	363.4	216.7	90.5	67
Michigan	183.9	321.7	140.9	96
Minnesota	137.2	41.9	39.4	99
New York	184.5	180.2	91.2	23
Ohio	335.6	435.3	85.8	122
Pennsylvania	305.7	340.1	124.8	142
Wisconsin	147.3	100.5	25.5	92

With regards to sector, there was a fair amount of similarity between participating and non-participating firms in terms of the industrial sectors to which they belonged. Overall, 33/50 participants displayed the best performance with average reductions of 36 percent in the Primary Metal Manufacturing sector and three percent in the Machinery Manufacturing sector. The worst performance was seen from both participating and non-participating firms from the Chemical and Transportation Equipment Manufacturing sectors. In this case, there was more consistency in performance with regards to industrial sector than participation in the 33/50 Program.

Both measures of environmental "greenness" negated the guiding assumptions that facilities that were more environmentally friendly (as measured by clean compliance records and participation in other voluntary programs) would have greater reductions in the targeted substances. In the case of participation in other voluntary programs, the best performance was demonstrated by non-participating firms that did participate in other voluntary initiatives and the worst performance by 33/50 participants who were also members of other programs. Thus, there was little consistency in results comparing performance by 33/50 participants and non-participating firms nor in comparisons between firms that did and did not participate in other voluntary programs. Regarding compliance records, the best performance was demonstrated by both participating and non-participating firms with minor levels of compliance violations while the largest increases in total emissions was seen in participant and non-participant facilities which had been designated as significant violators or who had enforcement actions taken against them. Thus, while there was significant variation in results among the three categories of compliance records, there was little variation between participating and non-participating firms.

Finally, for both participating and non-participating firms, those that had decreased their total waste managed from 1991 to 2000 also demonstrated an increase in total emissions by an average of 45 percent and 20 percent respectively. Nevertheless, the fact that 33/50 participants who increased their pollution prevention activities displayed an average 11 percent reduction in total reductions, suggests that the 33/50 Program's promotion of source reductions may have had an effect.

Finally, the most important level of analysis for this study was comparing total releases of the ten target substances during the tenure of the 33/50 Program. Few trends were evident at the individual substance level when comparing participant and non-participant emission reductions. However, it is possible to see how well participating firms met the Program goal of 50 percent reduction in emissions by 1995[16]. In this sample of 33/50 participants, firms met program goals for four of the nine substances for which they had reported releases. On the other hand, non-participating firms attained reductions equivalent to program goals for 3 of the 8 substances for which they reported releases[17]. In terms of total reductions achieved during the program for all ten chemicals, there is a clear distinction between the two study groups. Further, this analysis indicates that the 33/50 Program was not more effective than mandatory regulations alone in reducing releases. Firms in the non-participant control group actually achieved greater emission reductions (60 percent) during the tenure of the program (1991 to 1995) than participating firms (49 percent). However, during the post-program period of 1995 to 2000, firms in the participant group demonstrated greater reductions (60 percent) than non-participating firms (49 percent). This may indicate a lasting influence of the 33/50 Program on firm behaviour and the need to increase the program length of such voluntary measures. The following chapter provides a comparative analysis of the effectiveness of the two programs: the ARET Program in Canada and the 33/50 Program in the United States.

[16] For this group of ten substances and using the start of the program in 1991 as the baseline.

[17] This increases to 4 of the 8 substances if the two cases with extremely high levels of cyanide (outlined previously) are removed from the analysis.

Appendix 6.1
Evaluation of the 33/50 Program: Variable List

Variable Label	Value
Dependent Variables:	
Percentage Change (Pchange)	
Absolute Change (Achange)	
Yearly Total Releases	
Independent Variables:	
Participant in 33/50 Program	1=non-participating firm 2=participating firm
Industrial Sector	22= Utilities 313=Textile Mills Manufacturing 316=Leather & Allied Product Manufacturing 324=Petroleum & Coal Products Manufacturing 325=Chemical Manufacturing 326=Plastics & Rubber Products Manufacturing 327=Nonmetallic Mineral Product Manufacturing 331=Primary Metal Manufacturing 332=Fabricated Metal Product Manufacturing 333=Machinery Manufacturing 334=Computer & Electronic Product Manufacturing 335=Electrical Equipment & Component Manufacturing 336=Transportation Equipment Manufacturing 339=Miscellaneous Manufacturing
Location of Firm (Region)	1=Illinois 2=Indiana 3=Michigan 4=Minnesota 5=New York 6=Ohio 7=Pennsylvania 8=Wisconsin
Participation in Other Voluntary Programs	0=did not participate in other voluntary programs 1=did participate in other voluntary programs
Compliance Records	0=no records of non-compliance 1=some violation records 2=enforcement action designated as a significant violator
Pollution Prevention	0=total waste managed decreased 1991-2000 1=total waste managed increased 1991-2000

Appendix 6.2
Analysis of the 33/50 Program:
Summary of Firm Characteristics

Firm Characteristic	Participants		Non-Participants	
	N	Percent of cases	N	Percent of cases
Compliance Records				
No records	44	63 percent	46	66 percent
Violations	8	11 percent	14	20 percent
Enforcement Action/ Significant Violator	18	26 percent	10	14 percent
Participation in other voluntary programs				
Did not participate	44	63 percent	60	86 percent
Did participate	26	37 percent	10	14 percent
Industry Sector				
22-Utilities	--	--	1	1.5 percent
313-Textile Mills Manufacturing	--	--	1	1.5 percent
316-Leather & Allied Product Manufacturing	1	1.5 percent	--	--
324-Petroleum & Coal Products Manufacturing	1	1.5 percent		
325-Chemical Manufacturing	22	31 percent	6	8 percent
326-Plastics & Rubber Products Manufacturing	--	--	1	1.5 percent
327-Nonmettalic Mineral Product Manufacturing	--	--	1	1.5 percent
331-Primary Metal Manufacturing	21	30 percent	22	31 percent
332-Fabricated Metal Product Manufacturing	12	17 percent	25	36 percent
333-Machinery Manufacturing	4	6 percent	5	7 percent
334-Computer & Electronic Product Manufacturing	--	--	2	3 percent
335-Electrical Equipment & Component Manufacturing	1	1.5 percent	1	1.5 percent
336-Transportation Equipment Manufacturing	8	11 percent	4	6 percent
339-Miscellaneous Manufacturing	--	--	1	1.5 percent

Appendix 6.2 continued

Firm Characteristic	Participants		Non-Participants	
	N	Percent of cases	N	Percent of cases
Region				
IL-Illinois	6	9 percent	10	14 percent
IN-Indiana	5	7 percent	8	11 percent
MI-Michigan	9	13 percent	6	9 percent
MN-Minnesota	3	4 percent	3	4 percent
NY-New York	5	7 percent	6	9 percent
OH-Ohio	26	37 percent	15	21 percent
PA-Pennsylvania	13	19 percent	12	17 percent
WI-Wisconsin	3	4 percent	10	14 percent
Pollution Prevention Activity				
Total Waste Managed Decreased (1991-2000)	42	60 percent	35	50 percent
Total Waste Managed Increased (1991-2000)	28	40 percent	35	50 percent

Appendix 6.3
33/50 Program: Matched Substances' Regulation Under Major American Standards

33/50 Chemical Name	EPCRA (Community Right-to-Know)	CERCLA (Superfund)	Clean Air Act	Clean Water Act
Cadmium and compounds		X	X	X
Chromium and compounds	X	X	X	X
Lead and compounds		X	X	X
Mercury and compounds		X	X	X
Nickel and compounds		X	X	X
Benzene		X	X	X
Methyl Isobutyl Ketone		X	X	
Carbon Tetrachloride		X	X	X
Chloroform	X	X	X	X
Cyanides	X	X	X	

Appendix 6.4
33/50 Program: Participants vs. Non-Participants
Average Absolute and Percentage Change Reductions 1991-1995
According to Firm Characteristics

Firm Characteristics	Participants			Non-Participants		
	N	Absolute Change (tonnes)	Percentage Change	N	Absolute Change (tonnes)	Percentage Change
Compliance Record						
No records	44	-6.88	22 percent	46	-1.29	28 percent
Violations	8	-1.29	-2 percent	14	0.339	9 percent
Enforcement Action-Significant Violator	18	-20.08	33 percent	10	-41.07	22 percent
Participation in other programs						
Did not participate	44	-17.79	15 percent	60	-0.35	25 percent
Did participate	26	4.16	35 percent	10	-44.43	10 percent
Region						
IL-Illinois	6	-32.84	-48 percent	10	-0.01	59 percent
IN-Indiana	5	-18.52	-40 percent	8	-5.15	-17 percent
MI-Michigan	9	23.65	59 percent	6	-64.94	2 percent
MN-Minnesota	3	-2.85	-73 percent	3	-21.14	-66 percent
NY-New York	5	-2.88	9 percent	6	4.84	23 percent
OH-Ohio	26	-21.66	55 percent	15	-0.75	31 percent
PA-Pennsylvania	13	1.37	33 percent	12	0.66	38 percent
WI-Wisconsin	3	-8.82	-36 percent	10	0.285	29 percent

Appendix 6.4 continued

Firm Characteristics	Participants			Non-Participants		
	N	Absolute Change (tonnes)	Percentage Change	N	Absolute Change (tonnes)	Percentage Change
Industry Sector						
22-Utilities	--	--	--	1	-49.76	-75 percent
313-Textile Mills Mnfg.	--	--	--	1	-0.006	-50 percent
316-Leather Product Mnfg.	1	-5.17	-37 percent	--	--	--
324-Petroleum & Coal Products Mnfg.	1	-81.93	-94 percent	--	--	--
325-Chemical Mnfg.	22	-3.38	31 percent	6	-11.5	27 percent
326-Plastics & Rubber Product Mnfg.	--	--	--	1	16.83	75 percent
327-Nonmettalic Mineral Product Mnfg.	--	--	--	1	-0.05	-30 percent
331-Primary Metal Mnfg.	21	-32.41	-36 percent	22	1.48	25 percent
332-Fabricated Metal Product Mnfg.	12	-3.18	23 percent	25	0.04	13 percent
333-Machinery Mnfg.	4	0.017	-3 percent	5	0.52	13 percent
334-Computer & Electronic Mnfg.	--	--	--	2	-0.02	6 percent
335-Electrical Equipment Mnfg.	1	0.004	43 percent	1	-0.06	-10 percent
336-Transportation Equipment Mnfg.	8	25.45	97 percent	4	-97.9	123 percent
339-Miscellaneous Mnfg.	--	--	--	1	-8.11	-31 percent
Pollution Prevention Activity						
Total Waste Managed Decreased (1991-2000)	42	-18.71	45 percent	35	-10.65	20 percent
Total Waste Managed Increased (1991-2000)	28	3.96	-11 percent	35	-2.65	26 percent

Appendix 6.5
The 33/50 Program: Results of Analysis of Variance for Absolute and Percentage Change (1991-1995 and 1995-2000) In Emissions by Firm Characteristics

Variable	F	Significance of F	eta	R square for equation
ACh 1991-1995				
By Participation (in program)	0.00	0.803	0.07	
Sector	0.220	0.991	0.02	
Participation x Sector	6.662	0.002**		0.005
PCh 1991-1995				
By Sector	4.033	0.02*	0.3	
Participation	0.229	0.634	0.07	0.095
ACh 1995-2000				
By Sector	7.146	0.001**	0.39	
Participation	0.012	0.913	0.05	0.095
PCh 1995-2000				
By Sector	7.146	0.001**	0.39	
Participation	0.012	0.913	05	0.156
ACh 1995-2000				
By P2	5.532	0.02*	0.19	
Participation	1.448	0.225	0.08	0.045
ACh 1991-1995				
By Other Voluntary Program	0.006	0.941	0.01	
Participation	0.099	0.753	0.03	0.001
ACh 1991-1995				
By Region	0.284	0.959	0.12	
Participation	0.035	0.851	0.03	
Region x Participation	1.996	0.061		0.015

* indicates significance at p 0.05
** indicates significance at p 0.01

Appendix 6.6
33/50 Program: Participants and Non-Participants
Total Substances: Absolute Change and Percentage Change 1991-1995

Facility Name - 33/50 Participants	TRI ID	Region	Sector	ACh 1991-1995	PCh 1991-1995
BUFFALO COLOR CORP	14210BFFLC100LE	NY	325	0 00	-0 98
CARRIER CORP	13221CRRRCCARRI	NY	333	0 04	13 48
EASTMAN KODAK CO KODAK PARK	14652STMNK1669L	NY	325	-14 48	-40 50
GE CO CPQP	12328GNRLL381UP	NY	335	0 00	42 86
R P ADAMS CO INC	14150RPDMS225EA	NY	332	0 00	30 00
AK STEEL CORP	45043RMCNC1801C	OH	331	-386 34	-97 92
AKZO NOBEL COATINGS INC	43211HNNCH1313W	OH	325	1 14	99 80
ALCOA CLEVELAND WORKS	44105LMNMC1600H	OH	332	-0 01	-6 32
BP AMERICA INC TOLEDO REFY	43616SHLCM4001C	OH	324	-81 94	-94 13
BP CHEMICALS INC	45805BPCHMFORTA	OH	325	3 35	161 94
DEGUSSA CORP	45714SHLNDHWY7N	OH	325	-32 77	-51 87
DELPHI AUTOMOTIVE SYS WISCONSIN OPS	45401DLCMR1420W	OH	336	0 00	2 31
FERRO CORP 130CLEVELAND130	44105FRRCR4150E	OH	325	0 02	2 48
FORD MOTOR CO OHIO ASSEMBLY PLANT	44012FRDMT650MI	OH	332	21 51	314 98
FORD MOTOR CO CLEVELAND CASTING	44142FRDMT5600H	OH	331	-1 09	-72 87
FORD MOTOR CO LORAIN ASSEMBLY PLANT	44053FRDMT5401B	OH	332	-59 45	-33 35
HARSCO CO HECKETT MULTISERV PLANT 22	44701HRSCC8THST	OH	331	0 00	-75 00
HOHMAN PLATING & MFG INC	45404HHMNP814HI	OH	332	0 27	40 13
HONDA OF AMERICA MFG INC	43040HNDFM24000	OH	336	-2 72	-37 92
INGERSOLL-RAND FLUID PRODS	43506RCRP ONEAR	OH	333	1 89	833 20
LINCOLN ELECTRIC CO	44060LNCLN6500H	OH	325	0 32	64 20
LTV STEEL CO INC WARREN COKE PLANT	44482LTVST2234M	OH	331	-22 73	-62 49
NORTH STAR STEEL TUBULAR DIV	44510NRTHS2669W	OH	331	0 30	22 13

Facility Name - 33/50 Participants	TRI ID	Region	Sector	ACh1991-1995	PCh 1991-1995
PARKER HANNIFIN CORP	45338PRKRHRTE40	OH	332	-0 10	-88 46
PCC AIRFOILS L L C	44657PCCRF3860U	OH	336	1 69	94 45
PPG INDS OHIO INC (CL)	44111PPGND3800W	OH	325	1 71	563 53
PPG INDS OHIO INC DELAWARE	43015PPGND760PI	OH	325	-5 08	-97 68
TIMKEN CO - FAIRCREST STEEL PLANT	44706THTMK4511F	OH	331	-0 44	-46 00
TIMKEN CO GAMBRINUS BEARING PLANT	44706TMKNC2400G	OH	332	0 03	66 36
TIMKEN CO HARRISON STEEL PLANT	44706HRRSNHARRI	OH	331	0 07	8 80
WHEELING-PITTSBURGH STEEL CORP MINGO	43952WHLNGMCLIS	OH	331	-2 85	-75 83
ALLEGHENY LUDLUM CORP	15656LLGHNPOBOX	PA	331	-4 22	-78 69
CARPENTER TECH CORP	19612CRPNT101WB	PA	331	11 37	172 46
ESAB GROUP INC	17331LLYRDKAREN	PA	333	0 02	18 18
FERRO CORP COLOR DIV	15204FRRCR60GRE	PA	325	0 15	32 16
HARSCO CO HECKETT MULTISERV PLANT 21	15065HCKTTFEDER	PA	331	0 02	36 08
J & L SPECIALTY STEEL INC	15059JLSPC12THS	PA	331	0 00	-0 08
LATROBE STEEL CO (DBA TIMKEN LATROBE)	15650LTRBS2626L	PA	331	0 00	0 00
LORD CORP	16433LRDCRSOUTH	PA	325	2 81	139 17
OBERG INDS INC	16229BRGNDSILVE	PA	331	0 00	0 00
PPG INDS INC SPRINGDALE COMPLEX	15144PPGND125CO	PA	325	6 28	202 23
SKF USA INC ALTOONA PLANT	16601SKFSN1000L	PA	332	0 00	0 00
SKF USA INC HANOVER PLANT	17331SKFBRRD3BO	PA	332	0 00	0 00
UNIVERSAL STAINLESS & ALLOY PRODS INC	15017CYTMPMAYER	PA	331	-1 71	-86 05
CARRIER CORP	46231CRRRC7310W	IN	333	0 00	-41 18
BETHLEHEM STEEL CORP BURNS HARBOR	46304BTHLHBURNS	IN	331	-90 14	-94 92

Facility Name - 33/50 Participants	TRI ID	Region	Sector	ACh1991-1995	PCh 1991-1995
HARSCO HECKETT MULTISERV PLANT 11	46312HCKTT3210W	IN	331	-2 23	-62 47
DELTA FAUCET CO	47240DLTFCHIGHW	IN	332	0 01	24 73
ALLEGHENY LUDLUM CORP	47362LLGHNPOBOX	IN	331	-0 22	-24 50
PPG CHEMFIL-TROY	48083PPGCH1330P	MI	325	-0 04	-89 80
DAIMLERCHRYSLER CORP WARREN TRUCK	48091WRRNT21500	MI	336	76 11	728 73
FORD MOTOR CO DEARBORN ENGINE PLANT	48121FRDM33001M	MI	336	-0 01	-1 82
FORD MOTOR CO MICHIGAN TRUCK PLANT	48184FRDMT38303	MI	336	135 43	7030 25
GMVM - FLINT ASSEMBLY PLANT	48551GMCTRG3100	MI	336	-2 97	-96 24
DOW CORNING CORP	48686DWCRN3901S	MI	325	4 84	43 91
CLARIANT CORP MASTERBATCHES DIV	49224RDPLSALBIO	MI	325	0 00	0 00
HOWMET CORP WHITEHALL CASTINGS	49461HWMTCONEMI	MI	331	-0 22	-49 00
PFIZER INC PARKE-DAVIS DIV	49424PRKDV188HO	MI	325	-0 28	-60 78
PPG INDS INC OAK CREEK	53154PPGND10800	WI	325	-25 99	-32 19
NORTHLAND STAINLESS INC	54487NRTHL11194	WI	332	0 02	20 45
SK WILLIAMS CO	53225SKWLL4600N	WI	332	-0 50	-98 21
S B FOOT TANNING CO	55066SBFTTBENCH	MN	316	-5 17	-37 06
NORTH STAR STEEL MINNESOTA	55119NRTHS1678R	MN	331	-3 15	-82 59
CLARIANT	55428CHRLS9101I	MN	325	-0 23	-100 00
ABBOTT LABS NORTH CHICAGO FACILITY	60064BBTTL1400N	IL	325	-1 32	-37 97
AKZO NOBEL AEROSPACE COATINGS INC	60085MDLND17EWA	IL	325	-0 98	-40 75
DAIMLERCHRYSLER BELVIDERE ASSEMBLY PLANT	61008BLVDR3000W	IL	336	-3 94	-7 84
ENGINEERED POLYMER SOLUTIONS	61265MLNPN54002	IL	325	-0 16	-86 93
GRANITE CITY STEEL	62040GRNTC20THS	IL	331	-176 99	-92 23
SOLUTIA INC	62206MNSNT500MO	IL	325	-13 64	-25 21

Facility Name- Non Participants	TRI ID	Region	Sector	ACh1991-1995	PCh 1991-1995
AMPHENOL CORP	13838MPHNL4060D	NY	334	-0 05	-5 61
BETHLEHEM STEEL CORP LACKAWANNA COKE DIV	14218BTHLHPOBOX	NY	331	29 00	171 51
CRUCIBLE SPECIALTY METALS DIV	13209CRCBLSTATE	NY	331	0 34	24 88
FIRTH RIXSON INC	14603MNRFRPOBOX	NY	332	-0 02	-30 18
GRAY-SYRACUSE INC	13037GRYSY901EA	NY	331	0 00	0 00
SPECIAL METALS CORP	14048SPCLMWILLO	NY	331	-0 19	-22 96
AEXCEL CORP	44060XCLCR7373P	OH	325	-11 62	-94 75
ALCAN ALUMINUM CORP	44483LCNRL390GR	OH	331	2 87	65 37
CENTRIA	43725GSMTH530NO	OH	332	-0 04	-83 48
ELJER PLUMBINGWARE INC	44460LJRPL921SE	OH	332	-0 68	-50 00
ENERFAB	45232NRFBC4955S	OH	332	0 22	551 14
GENERAL COLOR & CHEMICAL CO INC	44657GNRLCREAR6	OH	325	0 57	166 67
HOBART BROS CO FILLER METALS OPS PIQUA	45356TRMRK8585I	OH	332	0 00	0 00
I SCHUMANN & CO	44146SCHMN22500	OH	331	0 00	0 67
KAISER ALUMINUM & CHEMICAL CORP	43056KSRLMROUTE	OH	331	-0 02	-29 79
MANUFACTURERS PLATING CO	44103MNFCT1960E	OH	332	-0 10	-41 58
NEW BOSTON COKE CORP	45662NWBST600RI	OH	331	-1 76	-5 42
SANDUSKY INTL INC	44871SNDSK615WE	OH	331	-0 75	-82 24
STOCK EQUIPMENT CO	44022STCKQ16490	OH	333	0 11	94 34
TEXTILEATHER CORP	43608DVRST3729T	OH	313	-0 01	-50 00
UNITED FOUNDRIES INC CANTON PLANT	44705NTDFN1400G	OH	333	0 00	20 00
ALLVAC LATROBE PLANT	15650TLDYNROUTE	PA	331	3 07	127 14
ARCOS INDS L L C	17851HSKNS1ARCO	PA	333	0 00	-13 64
BRIDESBURG FNDY CO	18052BRDSBFRONT	PA	331	-0 02	-7 10
CENTRIA	15003HHRBR14THS	PA	332	0 02	16 67
GLIDDEN CO	19601THGLD3RDAN	PA	325	5 10	244 77
JOY TECH INC PLANT #1	16323JYTCH925BU	PA	333	-0 11	-50 00
MARKOVITZ ENTS INC	16107FLWLN1400N	PA	332	0 03	139 22

Facility Name- Non Participants	TRI ID	Region	Sector	ACh 1991-1995	PCh 1991-1995
NATIONAL ROLL CO	15618NTNLRRAILR	PA	331	0 02	30 00
PRECISION COMPONENTS CORP	17404PRCSN500LI	PA	332	-0 11	-49 00
SANDMEYER STEEL CO	19116SNDMYONESA	PA	332	0 00	0 00
STANDARD STEEL	17009STNDR500WA	PA	331	0 00	0 00
TRW AUTOMOTIVE DANVILLE VALVE PLANT	17821TRWNC601EM	PA	336	0 00	25 00
LONE STAR INDS INC	46135LNSTRPUTNA	IN	327	-0 05	-30 45
CITIZENS GAS & COKE UTILITY MFG DIV	46203CTZNS2950E	IN	22	-49 76	-75 44
PRAXAIR SURFACE TECH INC	46224NNCRB1245M	IN	332	-0 09	-42 65
DAVIES IMPERIAL COATINGS INC	46320DVSMP1275S	IN	325	0 00	0 00
SYNDICATE SYS INC	46540SYNDC402NO	IN	332	-0 01	-35 14
BATESVILLE MFG INC DOLL PLANT	47006BTSVLEASTP	IN	339	-8 11	-30 80
GOLDEN CASTING CORP	47202CWCTX1616T	IN	331	0 00	0 00
GUARDIAN AUTOMOTIVE TRIM	47715WNDSR601NO	IN	326	16 83	75 27
GM MCG ORION ASSEMBLY	48055GNRLM4555G	MI	336	-391 96	-82 08
ROUGE STEEL CO	48121RGSTL3001M	MI	331	-0 67	-45 96
TRW AUTOMOTIVE COMMERCIAL STEERING SYS	48875TRWNC902LY	MI	336	0 00	-50 00
CANNON MUSKEGON CORP	49441CNNNM2875L	MI	331	0 75	164 30
KEELER BRASS CO FKI HARDWARE GROUP	49503KLRBR955GO	MI	332	2 22	59 93
ALLIED FINISHING INC	49508LLDFN4100B	MI	332	-0 01	-32 93
BRADLEY CORP	53051BRDLYW142N	WI	332	0 01	100 00
WISCONSIN CENTRIFUGAL	53188WSCNS905EA	WI	331	0 11	32 03
KRAMER INTL INC	53204KZMRN114EP	WI	331	0 22	188 46
WAYNE PIGMENT CORP	53204WYNPG300SB	WI	325	-0 24	-66 24
MASTER LOCK CO	53210MSTRL2600N	WI	332	0 03	28 26
CITATION CORP INTERSTATE FORGING INDS	53216NTRST4051N	WI	332	0 00	0 00
MILWAUKEE VALVE CO PRAIRIE PRODS DIV	53578MLWKV1075W	WI	332	0 45	129 41

Facility Name- Non Participants	TRI ID	Region	Sector	ACh 1991-1995	PCh 1991-1995
THOMAS & BETTS CORP	54014MYRNDHIGHW	WI	332	-0 11	-86 40
BRILLION IRON WORKS INC	54110BRLLN200PA	WI	331	-0 22	-48 76
BRUNSWICK CORP MERCURY MARINE DIV	54936MRCRYW6250	WI	333	2 60	13 04
KOCH PETROLEUM GROUP L P	55164KCHRFPOBOX	MN	325	-62 80	-89 28
FEDERAL CARTRIDGE CO	55303FDRLH900EH	MN	332	-0 17	-32 74
MINNCAST INC	55432MNNCS200NE	MN	331	-0 45	-76 88
INLAND DIE CASTING	60090NLNDD161CA	IL	334	0 00	18 18
PERFECTION PLATING INC	60007PRFCT775MO	IL	332	0 00	0 00
BELMONT PLATING WORKS INC	60131BLMNT3410N	IL	332	-0 23	-33 33
SIPI METALS CORP	60622SPMTL1720E	IL	332	0 02	20 80
EXIDE CORP DBA GNB INDL POWER	60901GNBNC2500W	IL	335	-0 06	-10 14
BIRMINGHAM STEEL CORP KANKAKEE ILLINOIS	60914BRMNGRR1BO	IL	331	-1 55	-73 10
AMERICAN NICKELOID CO	61354MRCNNWESTM	IL	332	-0 11	-93 85
EAGLE WINGS INDS	61866GLWNG400SH	IL	332	-0 23	-100 00
GREAT DANE TRAILERS	61920TRLMB1000N	IL	336	0 20	598 63
BIG RIVER ZINC CORP	62201BGRVRRTE3M	IL	331	1 85	266 89

Chapter Seven

Comparative Analysis of the Effectiveness of the ARET and 33/50 Programs and Conclusions on the Use of Voluntary Programs in Canada and the United States

Introduction

This chapter provides a comparative analysis of the effectiveness of voluntary measures in Canada and the United States. The first section summarizes the relative performance of each program in reducing emissions of the ten target substances in the matched dataset. This includes a comparative examination of the success of each program and the impact of firm characteristics on program success. The second section involves a discussion of the relative success of each program in the context of country-specific institutional factors which may influence the use and implementation of voluntary measures. Finally, the chapter provides some general conclusions on the effectiveness of voluntary programs in the regulatory framework of both Canada and the United States as well as some insight into the problems of evaluating such programs in a consistent empirical manner.

Effectiveness of the ARET and 33/50 Programs: A Comparative Analysis

ARET and 33/50: Who Participated and Which Firms Performed Better?

The ARET and 33/50 Programs were evaluated in relation to a set of firm characteristics which included: firm size; compliance records; participation in other voluntary programs; industrial sector; facility location; and pollution prevention activities. The first level of analysis examines these general characteristics for the participant and non-participant groups in each case study. This provides an indication of the kinds of firms which participated in the two voluntary programs. The second level of analysis evaluates how these variables may have affected firm performance in reducing emissions of the ten target substances. This involves a comparison of average absolute and percentage change values for the tenure of each program (*i.e.*, 1995-2000 for the ARET Program and 1991-1995 for the 33/50 Program). These time periods were chosen in order to capture the impact of the voluntary programs on firm performance. Since the actual tenures of the two programs were different, it was not possible to do a comparative analysis over an equivalent time period. However, the focus of this study is on how well each program was able to promote reductions above those expected under mandatory regulations.

Reductions in emissions were measured through two means: absolute change and percentage change. Absolute change values are most relevant to the impact on the environment as they represent the actual quantity of chemicals released. However, percentage change measures are most relevant to this study as they demonstrate the level of change in firms' emissions over the time periods studied. Moreover, percentage change measures draw attention to the impact of smaller companies or companies with lower total emissions which are nonetheless reducing their emissions substantially. Additionally, Appendix 7.1 provides a summary of results for statistically significant comparisons using analysis of variance. Analyses were conducted for yearly totals of all ten substances from 1988 to 2000 in relation to the various firm characteristics being studied.[1] Appendix 7.1 only includes results for analyses which were statistically significant (or approaching significance)[2]. For the entire firm characteristics analyzed, none showed any level of statistical significance. The only factor which showed an effect was differences in country (*i.e.*, Canada versus United States) yearly levels of emissions. This will be discussed in the next section.

Table 7.1
Average Absolute and Percentage Change in Emission Reductions in Relation to Firm Size: The ARET Program

Firm Characteristic	ARET Program (1995-2000)				33/50 Program (1991-1995)			
	Participants		Non-Participants		Participants		Non-Participants	
	Mean ACh (tonnes)	Mean PCh (percent)	Mean ACh (tonnes)	Mean PCh (percent)	Mean ACh (tonnes)	Mean PCh (percent)	Mean ACh (tonnes)	Mean PCh (percent)
Size								
<20 employees	-2.05 (n=1)	-54	--	--	N/A	N/A	N/A	N/A
21-99 employees	-0.027 (n=3)	246[3]	0.074 (n=4)	5.5	N/A	N/A	N/A	N/A
100-500 employees	-3.4 (n=26)	-14	-3.5 (n=26)	-29	N/A	N/A	N/A	N/A
>500 employees	-35.24 (n=30)	-26	0.513 (n=16)	-5	N/A	N/A	N/A	N/A

(N/A) indicates that data were not available for collection
(--) indicates that there were no reported emissions for this category

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[1] Analyses were conducted only for firm compliance records, participation in other voluntary programs, and sector. It was not possible to do a comparative analysis for firm size, region, and pollution prevention activities due to missing data points and disparity in the way the variables were measured in Canada and the United States. As well, since the programs took place during different time periods, it was not possible to conduct statistical analyses of absolute and percentage change measures.

[2] It was not possible to conduct inferential statistical analyses by individual substances due to empty data points, extreme standard deviation scores, and extreme differences in the number of cases within each variable group (*e.g.*, 1 firm from the Utilities sector versus 20 from the Chemical Manufacturing sector).

[3] As described earlier, these values are the mean of absolute and percentage change measures for participating and non-participating firms in each category. In such cases as this, the large discrepancy between average absolute and percentage change measures is because of high values for one few cases. In this instance, a high percentage change in emissions by one firm which is pulling the mean percentage change measure up. However, in this case (and others), it was decided that such firms would be left in the analysis as they represent the reality of firm behaviour and chemical releases at the time.

Regarding the *size* of facilities, it was only possible to gather information for firms in the ARET case study[4]. Table 7.1 provides a summary of average absolute and percentage change measures for the ARET program in relation to the size of facilities. For both participating and non-participating firms, the majority of cases were medium to large-sized facilities. This is consistent with many studies of voluntary measures which show that larger firms are more likely to participate in such programs[5]. The results indicate that larger firms did perform better than smaller facilities in reducing emissions of the ten target substances. ARET participating firms with greater than 500 employees reduced their emissions by an average of 26 percent and non-participating firms in the 100 to 500 employee range by an average of 29 percent[6].

[4] Efforts to obtain information on firm size (i.e. number of employees) for participating and non-participating firms in the United States case study were unsuccessful. The TRI Database did not contain this information. Other sources consulted did not provide TRI ID numbers, and thus, it would have been difficult to ensure the accuracy of data.

[5] As outlined in the review of empirical studies in the introduction and the literature review on the use of voluntary programs in chapter 1.

Table 7.2
The ARET and 33/50 Programs: Comparison of Average Absolute and Percentage Change in Emissions in Relation to Compliance Records and Firm Participation in Other Voluntary Programs

Firm Characteristic	ARET Program (1995-2000)				33/50 Program (1991-1995)			
	Participants		Non-Participants		Participants		Non-Participants	
	Mean ACh (tonnes)	Mean PCh (%)	Mean ACh (tonnes)	Mean PCh (%)	Mean ACh (tonnes)	Mean PCh (%)	Mean ACh (tonnes)	Mean PCh (%)
Compliance								
No Records	-8.81 (n=21)	-39	-1.75 (n=27)	-37	-6.88 (n=44)	22	-1.29 (n=46)	28
Some Violations	-1.04 (n=12)	-5	-0.971 (n=2)	88	-1.29 (n=8)	-2	0.339 (n=14)	9
Significant Violations: Fined: Enforcement	-26.01 (n=12)	-4	-16.99 (n=4)	-57	-20.08 (n=18)	33	-41.07 (n=10)	22
Participation in Other Voluntary Programs								
Did not participate	-2.87 (n=9)	-38	-2.39 (n=26)	-17	-17.79 (n=44)	15	-0.35 (n=60)	25
Did participate	-18.25 (n=54)	-7	-1.06 (n=21)	-19	4.16 (n=26)	35	-44.43 (n=10)	10

Table 7.2 provides a summary of average absolute and percentage change values in relation to two characteristics measuring the environmental "greenness" of firms. First, for both the ARET and 33 50 programs information was collected in relation to the *compliance history* of individual facilities. The original assumption here was that program participants would most likely include firms which are more environmentally conscious, as exhibited through compliance with mandatory regulations. Moreover, firms

[6] While ARET participating firms in the category of less than 20 employees had the highest average percentage change in emissions at 54 percent, this measure is based on only 1 case so is not generalizable to the larger study population

displaying better compliance records would be more likely to demonstrate greater reductions in emissions of the ten target substances. In both case studies, a similar three point scale was used to measure compliance records: 0 – if no records of non-compliance were found; 1 – if there was some level of violations; and 2 – if firms had demonstrated a higher level of non-compliance (labeled as "significant violators" in the U.S.) to the point where they were fined or the object of enforcement action. In Canada, more non-participating firms (82 percent) than ARET participants (46 percent) had no records of non-compliance. Moreover, 54 percent of participants had demonstrated some level of non-compliance with mandatory regulations, with 27 percent exhibiting major violations/fines. This may indicate that firms joined ARET as a way to improve their "green image." On the other hand, non-participating firms would not have had this incentive to join the program as they displayed better compliance records to begin with. In contrast, the majority of firms in both the 33/50 participant and non-participant groups displayed no records of non-compliance (63 percent and 66 percent respectively). However, as in the case of Canada, more participants (26 percent) than non-participants (14 percent) fell into the category of significant violators. Overall, ARET participants in the Canadian case study had poorer compliance records than 33/50 participants in the United States. However, in both case studies more program participants than non-participants exhibited the highest level of compliance violations. Moreover, the best records of compliance was displayed by ARET non-participants, followed by 33/50 non-participants. Taken as a whole these cases give more weight to the hypothesis that firms join voluntary programs as a way to improve their green image rather than to the hypothesis that firms who join such programs are more environmentally friendly to begin with.

Table 7.2 also provides information on whether better compliance is linked to greater emission reductions. In the Canadian case study this assumption is generally true. Firms in both the ARET participant and non-participant study groups who had no records of non-compliance demonstrated an average reduction in emissions of the ten substances of 39 percent and 37 percent respectively. However, the greatest reduction in emissions (average of 57 percent) was exhibited by non-participating firms who were categorized as major violators. In contrast, in the American case study, it was facilities which were in the middle category of having displayed some level of non-compliance who demonstrated the best performance. Participants in the 33/50 Program decreased their average emissions by two percent and non-participants increased their average emissions by nine percent. In contrast both participating and non-participating firms with no records of non-compliance increased their emissions by an average of 22 percent and 28 percent respectively. Taken as a whole these results do not support the assumption that a better compliance record will result in better performance in reducing emissions, although there was more support for this assumption in the Canadian case study than the American case.

The second measure of environmental "greenness" was firm *participation in other voluntary programs*. The assumption here was that firms who were participants in the ARET and 33/50 programs would: (1) be more likely to participate in other voluntary programs; and (2) be more likely to perform better in reducing their emissions of the ten target substances. For both Canada and the United States, membership in major national programs was examined with cases being categorized into two groups: firms which did and firms which did not participate in other programs. In the ARET case study there was a clear distinction with regards to this variable. The vast majority of participating firms (80 percent) also participated in the other voluntary programs. In contrast, 45 percent of non-participants did participate in the other programs while 55 percent did not. At first glance this may indicate that ARET participating firms are more environmentally conscious as they are more open to joining voluntary measures. However, taken in conjunction with the results from the previous firm characteristic, it may be that firms with poor compliance records joined ARET (and these other programs) as a way to improve their green image (or detract attention from their environmental violations). In the American case study, the opposite was found. The majority of both 33/50 participants (63 percent) and non-participants (86 percent) did not participate in the other voluntary programs. However, this may relate to the fact that the majority of both groups also exhibited no records of non-compliance with mandatory regulations and thus do not have the same incentive to join such voluntary measures.

With regards to the second assumption, Table 7.2 provides information on the average absolute and percentage change in emissions in relation to membership in other voluntary programs. In the case of the ARET Program, most program participants also participated in these other programs. However, this group of facilities actually demonstrated the lowest reduction in emissions (average seven percent). In contrast ARET participants who did not participate in other programs performed best, reducing their emissions by an average of 38 percent. In the case of the 33/50 Program in the

United States, there is little trend with regard to firm participation in other voluntary programs. Program participants and non-participants who were not members of the other programs increased their emissions on average by 15 percent and 25 percent respectively. 33/50 participants who did participate in other programs performed the worst with an average increase in emissions of 35 percent. In general, the results for this variable are less consistent than those found in the case of compliance records. Moreover, these results provide less support for the assumption that firms which participate in other voluntary measures (and can therefore be considered more "green") will reduce emissions more than firms that do not participate in other programs.

Table 7.3
The ARET and 33/50 Programs: Comparison of Average Absolute and Percentage Change in Emissions in Relation to Industrial Sector[7]

Firm Characteristic	ARET Program (1995-2000)				33/50 Program (1991-1995)			
	Participants		Non-Participants		Participants		Non-Participants	
	Mean ACh (tonnes)	Mean PCh (%)	Mean ACh (tonnes)	Mean PCh (%)	Mean ACh (tonnes)	Mean PCh (%)	Mean ACh (tonnes)	Mean PCh (%)
Industrial Sector								
21-Mining & Oil & Gas Extraction	-0.844 (n=14)	9	-17.43 (n=4)	-67	--	--	--	--
322-Paper Manufacturing	-5.31 (n=18)	-52	--	--	--	--	--	--
324-Petroleum & Coal Product Manufacturing	--	--	-11.5 (n=7)	-42	-81.93 (n=1)	-94	--	--
325-Chemical Manufacturing	-18.9 (n=11)	31	12.89 (n=5)	72	-3.38 (n=22)	31	-11.5 (n=6)	27
331-Primary Metal Manufacturing	-38.44 (n=17)	-3	-1.412 (n=10)	0	-32.41 (n=21)	-36	1.48 (n=22)	25
332-Fabricated Metal Product Manufacturing	-0.034 (n=1)	-61	-0.4 (n=4)	42	-3.18 (n=12)	23	0.04 (n=25)	13
333-Machinery Manufacturing	--	--	--	--	0.017 (n=4)	-3	0.52 (n=5)	13
336-Transportation Equipment Manufacturing	--	--	2.85 (n=10)	-42	25.45 (n=8)	97	-97.9 (n=4)	123

(--) indicates that there were no reported emissions for this category

Firms in both the Canadian and American programs were categorized according to their *industrial sector* under the North American Industrial Classification Code. The

[7] This table only includes those industrial sectors under which the majority of emissions are reported for both the ARET and 33/50 programs. Ninety-five percent of ARET participants were from 4 sectors: Mining and Oil and Gas Extraction; Paper Manufacturing; Primary Metal Manufacturing; and Chemical Manufacturing. Seventy-nine percent of non-participating firms were from five sectors: Mining and Oil and Gas Extraction; Primary Metal Manufacturing; Chemical Manufacturing; Petroleum and Coal Product Manufacturing; and Transportation Equipment Manufacturing. In the American case study, the majority of both 33/50 participants (95 percent) and non-participants (85 percent) fell into five sectors: Chemical

purpose of this variable was to ascertain whether some industrial sectors were more likely to participate in the ARET and 33/50 Programs. Table 7.3 displays the number of firms which fall into each of the eight sectors within which the majority of facilities in the Canadian and American case studies were categorized. Within each country there was a fairly high level of consistency with regards to industrial sector. The majority of ARET participants (95 percent) were from the following 4 sectors: Mining and Oil and Gas Extraction; Paper Manufacturing; Primary Metal Manufacturing; and Chemical Manufacturing. The majority of non-participating firms (79 percent) were from the following five sectors: Mining and Oil and Gas Extraction; Primary Metal Manufacturing; Chemical Manufacturing; Petroleum and Coal Product Manufacturing; and Transportation Equipment Manufacturing. In the American case study, the majority of both 33/50 participants (95 percent) and non-participants (85 percent) fell into the same five sectors: Chemical Manufacturing; Primary Metal Manufacturing; Fabricated Metal Product Manufacturing; Machinery Manufacturing; and Transportation Equipment Manufacturing. Overall, there was a higher degree of consistency between firms in the 33/50 case study.

Comparatively, the industrial sectors that show the most similarity between the two countries are the Chemical Manufacturing, Primary Metal Manufacturing, and Transportation Equipment Manufacturing sectors. In the Canadian case, 44 percent of ARET participants and 55 percent of non-participants were members of these industry

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Manufacturing; Primary Metal Manufacturing; Fabricated Metal Product Manufacturing; Machinery Manufacturing; and Transportation Equipment Manufacturing.

sectors. In the American case, 72 percent of 33/50 participants and 45 percent of non-participants were classified under these sectors. However, an important distinction between the two countries is that 51 percent of ARET participants were from the Mining and Oil and Gas Extraction and Paper Manufacturing sectors while there were no firms within the American case study that fall under these two categories. Overall, there was a clear predominance of firms from the manufacturing sectors for both ARET and 33/50 program participants.

The question here is whether some sectors performed better in reducing their emissions than others. Table 7.3 compares average absolute and percentage change in emissions of all ten substances for the eight sectors under which the majority of firms in both the Canadian and American case studies were categorized. There was little consistency, both within each country/program case study and between Canada and the United States. ARET non-participants in the Mining and Oil and Gas sector and ARET participants in the Paper Manufacturing sector performed best with an average decrease in emissions of 67 percent and 52 percent respectively[8]. In the United States, 33/50 Program participants from the Petroleum and Coal Products Manufacturing and Primary Metal Manufacturing sectors demonstrated the best performance with average decreases in emissions of 94 percent and 36 percent respectively. The one commonality between the two countries was that both program participants and non-participants in the Chemical Manufacturing sector exhibited poor performance, increasing emissions on average

[8] ARET participants in the Fabricated Metal Manufacturing sector showed a decrease in emissions of 61 percent; however this is based on only one firm so is not generalizable to the sector as a whole.

between 27 and 72 percent. This is surprising given the fact that companies in the Chemical sector are required to be members of the Responsible Care Program in order to sustain membership in the Canadian and American Chemical Producers Associations.

Table 7.4
The ARET and 33/50 Programs: Comparison of Average Absolute and Percentage Change in Emissions in Relation to Region

Firm Characteristic	ARET Program (1995-2000)				33/50 Program (1991-1995)			
	Participants		Non-Participants		Participants		Non-Participants	
	Mean ACh (tonnes)	Mean PCh (%)	Mean ACh (tonnes)	Mean PCh (%)	Mean ACh (tonnes)	Mean PCh (%)	Mean ACh (tonnes)	Mean PCh (%)
Region								
Ontario	-26.6 (n=32)	-7	0.907 (n=28)	-14	--	--	--	--
Quebec	-9.97 (n=17)	-43	-6.13 (n=13)	-32	--	--	--	--
Illinois	--	--	--	--	-32.84 (n=6)	-48	-0.01 (n=10)	59
Indiana	--	--	--	--	-18.52 (n=5)	-40	-5.15 (n=8)	-17
Michigan	--	--	--	--	23.65 (n=9)	59	-64.94 (n=6)	2
Minnesota	--	--	--	--	-2.85 (n=3)	-73	-21.14 (n=3)	-66
New York	--	--	--	--	-2.88 (n=5)	9	4.98 (n=6)	23
Ohio	--	--	--	--	-21.66 (n=26)	55	-0.75 (n=15)	31
Pennsylvania	--	--	--	--	1.37 (n=13)	33	0.66 (n=12)	38
Wisconsin	--	--	--	--	-8.82 (n=3)	-36	0.285 (n=10)	29

(--) indicates that there were no reported emissions for this category

In terms of the *location* of facilities, the focus of this study was on the Great Lakes Basin which is comprised of two provinces in Canada and eight states in the United States. Table 7.4 summarizes average absolute and percentage change values for firms located in the Great Lakes Basin. In the Canadian Case study, 51 percent of ARET participants and 60 percent of non-participating firms were located in Ontario while 27 percent of participants and 28 percent of non-participants were from the province of Quebec[9]. In the American case, 56 percent of 33/50 participants and 38 percent of non-participating firms were located in the states of Ohio and Pennsylvania. The remaining cases were fairly similarly split throughout the remaining six states with the exception of Minnesota from which only four percent of both participating and non-participating firms were located. Table 7.4 also provides some insight into whether firms from some regions demonstrated a better record of emission reductions. In the Canadian case study, both ARET participants and non-participating firms from Quebec exhibited greater emission reductions (average of 43 percent and 32 percent respectively) than firms located in Ontario (average reduction of seven percent and 14 percent respectively). In the United States case study, the best performance was exhibited by 33/50 participants and non-participants located in Minnesota with an average reduction in emissions of 73 percent and 66 percent respectively. This was followed by firms located in Indiana that displayed an average of 40 percent and 17 percent reduction in emissions respectively. The two

[9] The remaining 22 percent of ARET participants and 12 percent of non-participating firms were located throughout the rest of Canada. As discussed previously, these firms were included in the study for two reasons. First, for practical reasons, it was necessary to include these firms so as to increase the total number of cases in the Canadian case study. Secondly, it was felt that including these firms in the analysis

states with the largest number of cases, Ohio and Pennsylvania, demonstrated the worst performance, increasing their emissions of the ten substances by an average of 31 to 55 percent.

Due to the nature of available information in relation to the final firm characteristic, *pollution prevention*, the data were not directly comparable between the Canadian and American case studies. In Canada, a three-level measure was used to evaluate pollution prevention activities of firms. The NPRI collects information for each facility annually with regards to whether they use a variety of pollution prevention methods in their operations. Thus, each firm was given a value of 0 if they displayed no use of pollution prevention activities, 1 if they used minor P2 activities, and 2 if they demonstrated the use of more significant P2 activities. In contrast, a two-level measure was used to evaluate firms' pollution prevention activities in the United States. The TRI collects information on the quantity of waste managed (since 1991) through a variety of pollution prevention activities. Thus, each firm was given a value of 0 if their total waste managed from 1991 to 2000 decreased (indicating a decline in pollution prevention activity) and a 1 if their total waste managed increased over this time period (indicating an increase in P2 activity). Although measured differently, this analysis does provide an indication of the level of pollution prevention activities exhibited between participating and non-participating firms in the ARET and 33/50 case studies. The assumption here was that participants in the ARET and 33/50 Programs would demonstrate higher levels

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of the Canadian case would enable an evaluation of national differences in the use and implementation of the ARET Program.

of P2 activities. Furthermore, it was assumed that firms which demonstrate greater achievements in pollution prevention would also exhibit better performance in reducing emissions of the target substances.

Table 7.5
The ARET and 33/50 Programs: Comparison of Average Absolute and Percentage Change in Emissions in Relation to Pollution Prevention Activities

Firm Characteristic	ARET Program (1995-2000)				33/50 Program (1991-1995)			
	Participants		Non-Participants		Participants		Non-Participants	
	Mean ACh (tonnes)	Mean PCh (%)	Mean ACh (tonnes)	Mean PCh (%)	Mean ACh (tonnes)	Mean PCh (%)	Mean ACh (tonnes)	Mean PCh (%)
Pollution Prevention Activities								
No P2	-20.88 (n=44)	-25	-1.61 (n=17)	-7	--	--	--	--
Minor P2	-6.63 (n=8)	-26	3.15 (n=16)	-22	--	--	--	--
Major P2	0.309 (n=12)	-1	-7.51 (n=14)	-25	--	--	--	--
Waste Managed Decreased (reduce P2)	--	--	--	--	-18.71 (n=42)	45	-10.65 (n=35)	20
Waste Managed Increased (increase P2)	--	--	--	--	3.96 (n=28)	-11	-2.65 (n=35)	26

(--) indicates that there were no reported emissions for this category

Table 7.5 demonstrates that in the Canadian case study, non-participating firms demonstrated a higher level of pollution prevention activity than ARET participants. For non-participating firms, 64 percent displayed some level of P2 activity versus only 32 percent of ARET participants. A similar result was found in the American case study. Forty percent of 33/50 participants increased their total waste managed versus 50 percent of non-participating firms. Moreover, 60 percent of 33/50 participants reduced their total waste managed from 1991-2000, signifying a reduction in pollution prevention activity, even though a secondary goal of the 33/50 Program was reduction of the target chemicals through P2. Thus, in both case studies, participation in the voluntary program was not linked to an increase in pollution prevention activities.

Table 7.5 also addresses the question of whether there is a link between pollution prevention activities and emission reductions. The Canadian case study shows some level of association. ARET participants and non-participating firms which demonstrated some level of pollution prevention activities reduced their average emissions (26 percent and 22 percent respectively) more than facilities which reported no level of P2 endeavors (average reduction of 15 percent and seven percent respectively). A similar finding was seen in the American case study. 33/50 Program participants who increased their pollution prevention activities demonstrated, overall, better performance (average reduction of 11 percent) than facilities that reduced their P2 activities (average increase in emissions of 45 percent by participants and 20 percent by non-participants).

ARET and 33/50: Success or Failure?

This section looks at the success or failure of the voluntary programs at two levels: the attainment of program goals; and program performance in reducing emissions of the ten matched substances as compared to the business-as-usual scenario represented by the non-participating firms. This evaluation focuses on comparing releases by program participants and non-participants (representing the control group of reductions achieved under mandatory regulations alone).

Table 7.6 displays the percent change in emissions for each of the ten substances individually. Percent change represents the change in emissions during the tenure of each program. In the ARET case, this change was measured from 1995 to 2000 and for the 33/50 Program from 1991 to 1995. In both voluntary measures, program goals were based on achievements in emission reductions at the substance level. For the 33/50 Program, the goal was 50 percent reduction by the year 1995. For the ARET Program, substances were categorized into five groups according to their level of toxicity, persistence, and bioaccumulation in the environment. For the ten matched substances in this study, nine were classified in the B-2 category for which the program goal was 50 percent reduction by the year 2000 and 1 chemical (cadmium) was classified in the A-2 category which simply had "best efforts" by 2000 as the program goal.

Table 7.6
Percent Change in Emissions by Substance in Relation to Program Goals

Substance	Canada		United States	
	ARET Participants (percent)	Non-Participants (percent)	33/50 Participants (percent)	Non-Participants (percent)
Benzene	-54	-18	-87	-66
Cyanide	-59	-100	-78	+817[10]
Nickel	-33	-76	+82	-5
Lead	-39	-76	-81	-22
Methyl Isobutyl Ketone	-82	+19	+29	-67
Chromium	-66	-6	-17	+66
Mercury	-26	-65	--	-71
Chloroform	-87	-53	+6	--
Carbon Tetrachloride	-97	0	-78	--
Cadmium	-32	0	-48	+36

(--) Indicates that there were no reported releases for this substance.

This table illustrates program effectiveness at two levels. First, the relative effectiveness of the programs can be evaluated by comparing percentage change at the substance level between participating and non-participating firms. Secondly, the effectiveness of each program in meeting its program goals can be assessed. As well, it provides a comparison of emission reductions at the substance level between the Canadian and American case studies.

First, in terms of the attainment of program goals, ARET participants met the target goals of the programs for seven of the 10 substances. While this may indicate a

[10] The large increase in emissions is due to high releases of cyanide by two facilities. When these cases are removed from the analysis, the result is a 52 percent decrease in emissions. However, it is important to include such cases in the study as they represent the reality of pollution levels in the United States. Both companies had high emissions of cyanide for all years so it can be assumed that it is a case of them being "bad polluters" rather than an abnormal emission due to a spill or accident.

positive effect of participation in the ARET program in reducing emissions. the fact that non-participating firms met the equivalent of ARET Program goals for six of the ten substances casts some doubt on the true impact of the program. However, one must remember that non-participating firms also were more environmentally "green" to begin with (as measured through compliance records) so one would expect them to perform well in reducing emissions. In the American case study, 33/50 participants met the program goals for five of the nine chemicals for which they had emission data. Non-participating firms met the equivalent of 33/50 Program goals for three of the eight substances for which they had emission data.[11] Overall, firms participating in the ARET Program met program goals in more cases (70 percent of the chemicals studied) than 33/50 participants (56 percent of chemicals). Non-participants in the ARET case study also outperformed non-participating firms from the 33/50 case study in meeting the equivalent of program goals for individual substances.

Table 7.6 also provides insight into the level of reductions achieved by participating versus non-participating firms. In the ARET case study, participating firms exhibited greater emission reductions than non-participants for six of the ten substances. In comparison, 33/50 participants achieved greater reductions in emissions over non-participants for 5 of the 7 substances for which both study groups had emission data. Thus, at this level of analysis, 33/50 participants performed better than ARET participants.

[11] This changes to 4 of the 8 substances, if the two firms which demonstrated extremely high emissions of cyanide are removed from the study

While the above analysis has evaluated program success at the substance level, the following section will provide a more macro-level analysis of the effectiveness of the two programs. Table 7.7 provides a comparison of emission reductions (as measured through absolute and percentage change) of total substances over three time periods according to the timeframes of the ARET and 33/50 programs: pre-program; tenure of program; and post-program.

Table 7.7
Emission Reductions Achieved Under the ARET and 33/50 Programs

Time Period	ARET Program		33/50 Program	
	Participants	Non-Participants	Participants	Non-Participants
Pre-Program				
ARET: 1988-1995-ACh	+39.4 tonnes	N/A[12]	--	--
-PCh	+2 percent			
33/50: 1988-1991-ACh	--	--	-300 tonnes	-338 tonnes
-PCh			-18 percent	-30 percent
Tenure of Program				
ARET: 1995-2000-ACh	-806 tonnes	-82 tonnes	--	--
-PCh	-44 percent	-18 percent		
33/50: 1991-1995-ACh	--	--	-675 tonnes	-466 tonnes
-PCh			-49 percent	-60 percent
Post Program				
ARET: 2000-2001-ACh	+169 tonnes	+1015 tonnes	--	--
-PCh	17 percent	+268 percent		
33/50: 1995-2000-ACh	--	--	-427 tonnes	-153 tonnes
-PCh			-60 percent	-49 percent

In the case of the ARET Program, participants actually increased their emissions during the pre-program period. Thus, for this sample of participating firms, the criticism

[12] No data is available for ARET non-participating firms during the pre-program period of 1988-1995 Yearly emissions for this study group were collected from the NPRI database for which the first year of reporting was 1994

that a large proportion of reductions claimed under the program actually took place before the start of the program in 1994 is proven false. In the American case study 33/50 participants reduced their emissions by 300 tonnes (an 18 percent reduction) during the pre-program period of 1988 to 1991. This means that if 1988 were used as the base-year from which to measure the success of the 33/50 Programs, 30 percent of the 974 tonnes of emissions reduced from 1988 to 1995 would have been achieved before the start of the program. Non-participating firms had even higher reductions, exhibiting a 30 percent decrease in emissions (338 tonnes).

The second time period measures changes in emissions that took place during the actual tenure of the program (*i.e.*, using the start of the program as the base-year rather than a base-year chosen by firms). For this sample of Canadian facilities, firms participating in the ARET Program demonstrated greater emission reductions (44 percent reduction - 806 tonnes) from 1995 to 2000 than non-participating firms (18 percent reduction - 82 tonnes). The opposite was found in the American case study. Firms participating in the 33/50 Program reduced their emissions of the ten target substances by 49 percent (675 tonnes) from 1991 to 1995, while non-participating firms reduced their emissions by 466 tonnes, representing a 60 percent decrease in their overall emissions.

These results embody the heart of this study. Here, it is shown that for this sample of facilities, ARET participants performed better than non-participating firms (*i.e.*, the business-as-usual scenario) in reducing their emissions of the ten target substances during the tenure of the program. In contrast, the 33/50 Program was not as successful. Non-participating firms actually decreased their emissions more than program participants (as measured through percentage change). The larger reduction by 33/50 participants in tonnage is most likely due to the fact that these firms generally had higher yearly emissions than non-participating firms (see figure 7.1). It is important to note that this conclusion is based on evaluating program effectiveness during the tenure of each program's specified start and end dates, rather than during an equivalent time period. However, the focus here is on how well each program was able to encourage reductions over and above those expected under mandatory regulations.

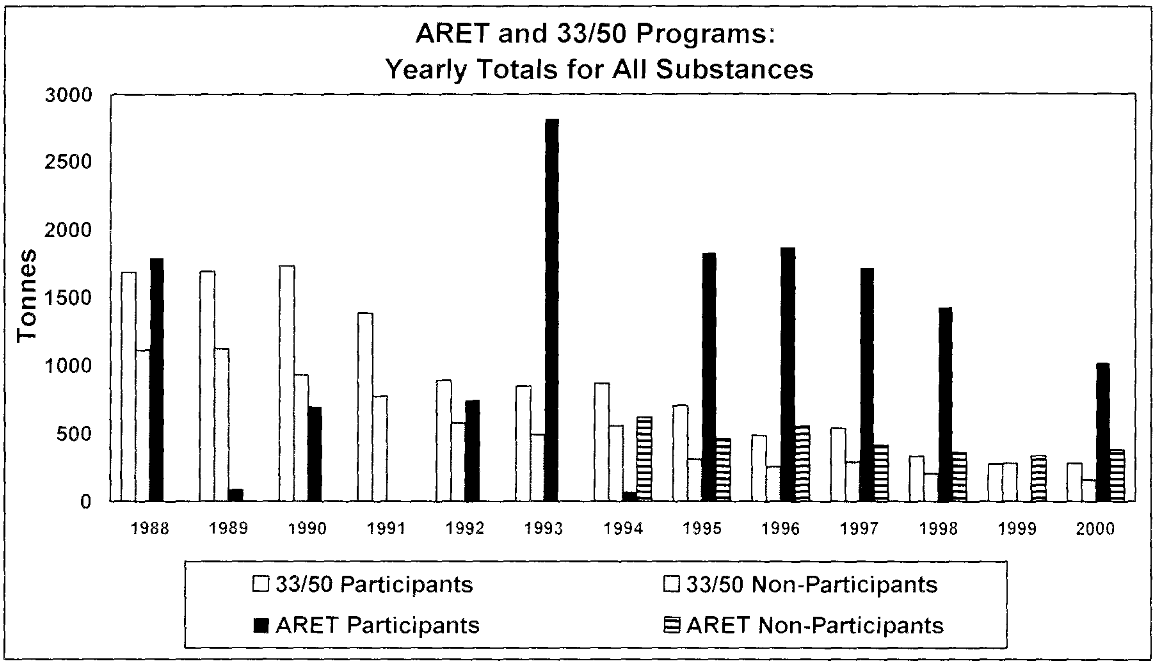
In terms of comparing the level of reductions in emissions released to the environment, results indicate that 33/50 participants reduced their emissions by 49 percent during the tenure (1991-1995) of their program versus a 44 percent reduction by ARET participants (1995-2000). As well, non-participating firms in the 33/50 case study reduced their total emissions of the ten substances by 60 percent versus a reduction of 18 percent by ARET non-participants. Thus, in terms of actual reductions in emissions being achieved in each country, firms located in the United States performed better than firms located in Canada[13]. Furthermore, Figure 7.1 illustrates yearly emissions for all ten substances by ARET and 33/50 participating and non-participating firms[14]. Within each country, a similar trend was apparent - firms participating in the programs had higher yearly emissions than non-participating facilities. This is most likely due to the fact that the programs tried to concentrate their participation campaigns on firms with higher

[13] This is also the case when comparing reductions in emissions over the similar time period of 1995-2000.

[14] As outlined previously, no data was available for ARET non-participants before 1994. As well, data for ARET participants was limited from 1988-1995 except for years 1988 and 1993.

emissions of the target substances. In this way, the programs would be able to make the most impact on the level of pollution reaching the environment. A surprising outcome of this figure is the fact that ARET participants generally had much higher yearly emissions versus all firms located in the United States. As well, ARET non-participants generally had slightly higher emissions versus 33/50 participants and non-participants from 1995 on. Thus, overall, releases of these ten substances were higher in Canada than in the United States. This may be indicative of generally more stringent regulations in the United States. Results outlined in Appendix 7.1 show statistically significant F-scores for this difference between the countries for each year from 1988-2000. However, while country was the only factor that showed any effect, the strength of the relationship between yearly emission totals and country was weak.

Figure 7.1



Finally, the post-program period of analysis allows for an examination of the lasting impact of the programs on firm behaviour with regards to pollutant emissions. Here, 33/50 program participants perform better, with emission reductions of 60 percent (427 tonnes) versus 49 percent (153 tonnes) reductions by non-participating firms. It may be that such voluntary programs need to be designed to be of longer duration as it may take firms some time to implement operational and technological changes to meet program targets. In the case of the ARET Program, it was only possible to evaluate one year of post-program emissions[15]. Both ARET participants and non-participating firms increased their emissions from 2000-2001. However, again, program participants demonstrated better performance than non-participants, increasing their emissions by 169 tonnes (17 percent increase) versus an increase of 1015 tonnes (268 percent increase) by non-participating firms. Since there is only one year of post-program data, it is too soon to evaluate the lasting impact of the ARET Program on firm behaviour in Canada or to propose any comparative analysis to post-program emissions under the 33/50 Program.

Institutional Context and Conclusions

The above discussion has provided a comparative analysis of the ARET and 33/50 Programs at three levels: what types of facilities participated in the programs; how firm characteristics may have affected performance in reducing emissions; and which program ultimately was more successful in meeting its goals for reducing releases of the ten

[15] The most recent year of data available on the NPRI is 2001. Companies did not have to submit 2001 reports until June 2002 and the NPRI did not release the data until the spring of 2003. The NPRI database was used to collect emissions for 2001 for both ARET participants and non-participants as the ARET Secretariat stopped collecting information when the program ended in 2000.

matched chemicals into the environment. The following section examines how these results may have been affected by the institutional setting within which they took place.

The development and implementation of voluntary measures can be either hampered or enhanced by the institutional context within which environmental policymaking takes place. Table 7.8 provides a summary of key elements of the institutional setting and policy style of Canada and the United States that were outlined in Chapters three and four respectively[16]. These chapters provided an overview of prevailing views within the literature regarding the policymaking style and institutional constraints that govern the management of toxic substances in Canada and the United States. As well, these chapters outlined the use of voluntary measures within the regulatory framework of each country. Table 7.8 pulls these elements together in an attempt to shed some light onto how these institutional elements may influence the successful implementation of voluntary programs like ARET and 33/50. Studies of policy styles have argued that an institutional culture marked by consensual policymaking provides a more stable environment for the use of voluntary measures as compared to an adversarial policy environment with formal rules and legal enforcement[17].

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[16] Table adapted from Delmas, Magali and Ann Terlaak, "Regulatory Commitment to Negotiated Agreements: Evidence from the United States, Germany, The Netherlands, and France", *Journal of Comparative Policy Analysis*, Vol. 4, 2002, 5-29

[17] See Delmas, Magali and Ann Terlaak, "Regulatory Commitment to Negotiated Agreements: Evidence from the United States, Germany, The Netherlands, and France", *Journal of Comparative Policy Analysis*, Vol. 4, 2002: 5-29, Sairinen, Rauno and Outi Teittinen. *The Voluntary Agreement as an Environmental Policy Instrument in Finland*. CAVA Working Paper no 98/11/4. Paper presented at the CAVA Workshop, November 26-27, 1998, Gent, Belgium; Liefferink Duncan. *Joint Environmental Policy-making - The Emergence of New Interactive Approaches to Environmental Policy*. Paper presented at the CAVA summer symposium on "The Innovation of Environmental Policy", Bologna, Italy, July 21-25, 1997.

Table 7.8
Characteristics of the Institutional Environment and Potential for the Implementation of Voluntary Measures

Institutional Environment	**Policy Style**	**Canada**	**United States**
Institutional Structure	Centralized vs Decentralized	Decentralized	Decentralized
Public Participation	Access Points to the System	Some Access Points	Numerous Access Points
Nongovernmental Organization and Industry's Interaction with Regulatory Agencies	Consensual culture vs adversarial relations	Consensual	Adversarial
Number of Voluntary Measures in Use[18]		95 (30 unilateral commitments; 63 negotiated agreements; and 2 public voluntary programs)	42 (9 unilateral commitments; 2 negotiated agreements; and 31 public voluntary programs)
Potential for Implementation of Voluntary Measures[19]		Medium	Medium

Dispersed policy-making responsibilities can hamper the coordination and implementation of voluntary measures. For example, programs employed at the national level must be harmonized with regional regulations. Moreover, for implementation purposes, the regulating body may require the authority to change existing rules and

[18] Organization for Economic Cooperation and Development *Voluntary Approaches For Environmental Policy: An Assessment* (Paris: OECD, 1999).

[19] This evaluation of country potential to implement voluntary measures is based on the model by Magali Delmas and Ann Terlaak's analysis of the United States, France, Germany, and the Netherlands. The present study used a similar set of criteria based on the examination of institutional constraints and policy style outlined in chapters 3 and 4. The classification of Canada and the United States as having "medium" potential is subjective, rather than based on empirical findings.

permit procedures. This is especially problematic for the implementation of MOUs (used increasingly in Canada) that involve negotiations with individual firms. As outlined in chapter 4, environmental policy making in the United States is marked by fragmentation. This is a function of the separation of powers that often produces divided governments with the President and the majority of Congress being from different parties, and complicated by a judiciary which is actively involved in the drafting and implementation of environmental policy. Mazurek notes that the execution of Project XL in the United States was hampered by uncertainties concerning EPA's authority to relax regulatory standards enacted by Congress[20]. As well, U.S. regulations are a complex overlay of federal and state regulations that may hinder any one regulatory body's ability to negotiate and execute a program. In contrast, environmental policy making in Canada is marked by considerable overlap between federal and provincial authority, resulting in a high degree of vertical fragmentation. However, the traditional pattern of federal-provincial relations that has emerged in Canada is one of a cooperative division of responsibility for environmental management.

Furthermore, greater fragmentation of power provides multiple access points for public interests. If third parties are involved in the negotiation and development process of a voluntary program, they may be less likely to challenge it later. This was an issue for the ARET Program in Canada. The dispersion of responsibilities in the United States provides numerous access points for interest groups to influence the policy making

[20] Mazurek, Janice. *The Use of Voluntary Agreements in the United States: An Initial Survey*. CAVA Working Paper no 98/11/1. 1998

process, making them powerful players in the regulation of environmental policy. Additionally, easy court standing encourages public participation in the review of environmental policy, making arrangements between regulators and firms open to challenge in the court system. The result is a policy environment that is highly adversarial and legalistic, with an emphasis on formal rules rather than cooperation and trust. In contrast, the Canadian system is generally less litigious with the judiciary playing a less prominent role in the management of the environment. As well, historically we have seen a pattern of closed, bilateral negotiations between government and industry in the setting of environmental standards. However, as outlined in chapter 3, Canada's policy style is undergoing a change. The increased emphasis on self-regulation and multi-stakeholder consultations has opened up the policy-making process to other interests.

Voluntary measures are based on a foundation of cooperation and trust among partners - both public and private. The informal rules guiding collaboration between government and industry are an important factor in the development and implementation of a voluntary program. Industry organizations or individual firms are elevated to a role of direct participant in the policy formulation process and are directly responsible for the implementation of the program. As well, regulators require some level of discretion to commit credibly to the agreements. Statutory sanctions ensuring participation and compliance are not the norm under voluntary measures. Instead, participants must be induced to comply through a variety of incentives (*e.g.*, lessening of regulatory requirements). In their study of voluntary measures in the United States, Delmas and

Terlaak note, "high fragmentation and easy access for third parties to enter the game via the courts limits EPA's ability to commit credibly to NAs [negotiated agreements]. As a result, the very few NAs found in the United States are fraught with problems."[21] Voluntary measures do not seem to be as prevalent in the United States as in Canada (42 programs versus 95 programs respectively) and there also appears to be a distinct difference in the types of programs developed in each country. As outlined in chapter four, the majority of voluntary measures in the United States fall into the category of public voluntary programs (31 programs), rather than the more cooperative form of negotiated agreements (two programs). This may reflect the more formal and legalistic institutional "rules" which govern environmental management in the United States.

The more cooperative and consensual policy style in Canada may be more conducive to both the development and the implementation of voluntary measures. The recent development of the *Policy Framework on Environmental Performance Agreements* outlines the design criteria and implementation strategy for the use of such voluntary measures as a key policy instrument in the regulation of toxic substances in Canada. The trend in Canada seems to be towards the use of negotiated agreements (63 agreements) rather than public voluntary programs (two programs). We are seeing an increasing number of Memorandums of Understanding negotiated between regulatory agencies and either individual facilities or industry sectors. This trend will most likely continue as Environment Canada's Policy Framework focuses on developing a formal strategy for the

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[21] D. Magali & A. Terlaak, "Regulatory Commitment to Negotiated Agreements: Evidence from the United States, Germany, the Netherlands, and France", J. of Comparative Policy Analysis, Vol. 4, 2002, 5-29 27.

use of this type of voluntary measure. The danger here is that such agreements grant concessions to individual firms, resulting in an uneven playing field. As well, such agreements are most often negotiated behind closed doors and provide no transparency or accountability to the public.

Conclusions

Both the ARET and 33/50 Programs were the subject of a great deal of criticism, mainly in relation to fundamental flaws in the design of the programs. The most contentious issue was that of the baseline from which the programs measured success. Both allowed firms to choose a base-year before the start of the program, essentially including emission reductions completely unrelated to participation in the programs. The intent of this study was to evaluate the effectiveness of the ARET and 33/50 Programs on releases *during the tenure of the program.* Secondly, the inclusion of the non-participating firms as a control group for each case study also allowed for a comparison with emission reductions achieved under the mandatory regulatory system alone. The study had four main research questions. First, did participation in the ARET and 33/50 Programs lead to greater reductions in releases of the ten matched substances than what was achieved under the standard regulatory system? Secondly, how do participating and non-participating firms differ in terms of general firm characteristics? Thirdly, how do differences in basic characteristics of facilities affect performance in reducing emissions? Finally, how can institutional differences help explain the use of voluntary measures in Canada and the United States?

As noted above, it was important to evaluate reductions in releases during a variety of time periods, including pre- and post-program emissions. The focus of each case study analysis, however, was on changes in releases during the tenure of the two programs. Thus, absolute change and percentage change for the total releases of all ten substances were calculated for the ARET Program from 1995 to 2000 and for the 33/50 Program from 1991 to 1995. More weight was given to percentage change values as they represent changes in firms' emissions during the specified time periods, more accurately reflecting the impact of participation in the program. A comparison of program participant and non-participant emissions was used to evaluate the effect of the program versus a "business-as-usual-scenario." As outlined in Table 7.2, for this sample of firms, participation in the ARET Program was shown to result in greater emission reductions than those achieved under the standard regulatory system alone. Firms who participated in the ARET Program reduced their releases of the ten target substances by 44 percent from 1995 to 2000, versus an 18 percent reduction by non-participating firms. In contrast, participation in the 33/50 Program in the United States did not lead to greater reductions in releases. Non-participants exhibited a 60 percent reduction in emissions from 1991-1995 while 33/50 participating firms demonstrated only a 49 percent reduction.

An examination of post-program releases provides some insight into the lasting effects of the programs on firm behaviour. In the case of the 33/50 Program, five years of post-program data are available. From 1995 to 2000, firms who were participants in the 33/50 Program reduced their emissions of the ten chemicals by 60 percent, versus a 49 percent reduction by non-participating firms. This may indicate that changes to firms' operations and equipment to meet the increased emission reductions requested under the 33/50 Program were not operational until the program was ended. Perhaps extending the tenure of the program would have allowed more time for facilities to make the necessary changes to meet program goals. Unfortunately, the 33/50 Program was not renewed after 1995 and no similar program has been developed to take its place. In the case of the ARET program, only one year of post-program data is available. Both ARET participating firms and non-participants increased their emissions from 2000 to 2001 (although program participants increased their releases less than non-participating firms). While not enough time has passed to allow for any meaningful conclusions as to the lasting impact of the ARET program, a successor program is in the process of being developed which will (hopefully) expand on the design and achievements of this initiative.

A secondary intent of this study was to evaluate how basic firm characteristics affected performance in reducing emissions of the target substances. In terms of firm size, the assumption was that: (1) larger firms would be more likely to participate in the programs; and (2) larger firms would perform better in reducing emissions of the target substances. Data on firm size was only collected in the Canadian case study of the ARET Program. Findings supported the above hypothesis with the majority of firms in the ARET participant sample being larger in size and exhibiting greater emission reductions than smaller firms.

Two measures were used to examine the "environmental greenness" of firms. First, it was hypothesized that firms participating in the ARET and 33/50 Programs would have better compliance records than non-participating firms as they would be more "green" to begin with. Furthermore, firms with better compliance records would also demonstrate greater reductions in releases of the target substances. The results did not support either assumption. In both programs, non-participating firms had better compliance records than program participants. Participants in the 33/50 Program had a better compliance history than participants in the ARET Program. This may indicate that firms join such programs as a way to improve their "environmental image." Such public recognition for environmental efforts has often been touted as one of the major benefits of participation in voluntary measures (especially in the case of programs like ISO 14000 which provide a publicly recognized certification label). As well, better compliance records did not result in greater emission reductions, although this trend was stronger in the American case study than in Canada.

The second measure of "greenness" was participation in other voluntary measures. The assumption here was that: (1) firms which were participating in the ARET and 33/50 Programs would be more likely to also participate in other major voluntary programs and (2) such participation would result in better performance in reducing releases of the target chemicals. Contrasting results were found between the two countries. In Canada, the majority of ARET participants were also members of the other voluntary programs. In the United States, the majority of 33/50 participants did not participate in the other major programs. As well, little support was found for the assumption that firms that participate in a variety of voluntary measures would also display greater emissions reductions. These results may suggest that firms that join such programs are doing so as a way to improve their "green" image (especially in cases where they also demonstrate poorer compliance records).

Both the ARET and 33/50 Programs endorse the use of pollution prevention activities as a preferred method of attaining reductions in releases. It was thus assumed that participants in the programs would display higher levels of pollution prevention activity and that this would then lead to greater emission reductions. In both case studies, participants in the voluntary program did not exhibit higher levels of pollution prevention activities. However, there was some indication that those firms that did increase their pollution prevention activities also demonstrated higher levels of reductions in releases of the ten target substances.

In terms of the location of firms, the intent was to determine if firms located in different regions displayed higher or lower emissions. In Canada, a strong trend was apparent with facilities located in Quebec demonstrating much greater reductions in emissions. This may suggest a more supportive environmental policy environment for the use of voluntary measures in Quebec as opposed to Ontario. Positive performance trends were less evident in the American case study. The best performance was demonstrated by firms located in Minnesota, with firms from Ohio and Pennsylvania (which had the highest number of cases) showing the worst performance.

Finally, did some industrial sectors exhibit higher lower releases than others? Here, there was more consistency within each country case study than between countries.

Overall, no sector stood out as being exceptional in terms of reducing emissions of the target substances. However, firms from the Chemical Manufacturing sector in both countries stood out as having high increases in releases over the time periods studied.

The intent of this study was to provide a quantitative analysis of the effectiveness of the ARET and 33/50 Programs in relation to reductions in emissions achieved under the mandatory regulatory system alone. No such comparative analysis has been performed previously. The majority of research on the use of voluntary measures has focused on essential design features and factors that increase the probability of participation in such programs. While this study was limited in scope in terms of the number of substances and firms for which data were collected, it does provide a comparative basis for evaluating the success of the use of these two voluntary programs in Canada and the United States. As well, it highlights the need for more rigorous reporting of releases in a consistent manner (both within each country and between Canada and the United States). Additionally, it underlines the need for such programs to provide a consistent and verifiable baseline from which to measure success. Most criticisms of both the ARET and 33/50 Program focused on design and implementation problems. Future programs (*e.g.*, ARET2) should build on these past mistakes. If voluntary measures are to be taken seriously (and their achievements not viewed with skepticism), they must be designed so as to promote: transparency; verifiable and measurable results (with a consistent baseline); participation by interested third parties; and incentives for both participation and good performance. As well, the post-program evaluation of the 33/50 Program may indicate that longer program durations are necessary in order to allow time for firms to implement changes to achieve emission reductions.

While Canada and the United States both have a demonstrated history of using voluntary measures within their environmental management framework, they differ in their implementation styles. In Canada, the majority of voluntary measures to date have been in the form of negotiated agreements. Such agreements reflect a more cooperative approach, most often being based on negotiations between government agencies and individual firms or industry sectors. The opposite is found in the United States. Here, the majority of voluntary measures have been public voluntary programs with a more national scope. Such programs are more formal and prescriptive in nature, perhaps reflecting the more legalistic policy style of the United States. While the ARET Program was shown to be more effective than the 33/50 Program for this sample of firms, significant releases were achieved under the 33/50 Program as well (as compared to those achieved by non-participating firms). However, firms located in Canada had overall higher emissions than firms located in the United States. Thus, voluntary measures can offer a useful way for regulatory agencies to achieve greater emission reductions than what would be realized under the regulatory system alone. This is not to say that such programs should replace mandatory regulations, but rather that they can act as an augmentation to the standard regulatory process.

Appendix 7.1

Comparison of the Effectiveness of the ARET and 33/50 Programs: Results of Analysis of Variance

Variables	F	Significance of F	eta	R square for equation
Total Substances 1988				
Country	7.49	0.007**	0.17	
Participation	0.431	0.512	0.03	0.03
Total Substances 1989				
Country	9.91	0.002**	0.19	
Participation	0.491	0.484	0.484	0.04
Total Substances 1990				
Country	6.76	0.01	0.16	
Participation	0.75	0.39	0.04	0.03
Total Substances 1991				
Country	8.14	0.005**	0.17	
Participation	0.78	0.38	0.04	0.03
Total Substances 1992				
Country	9.58	0.002**	0.19	
Participation	0.52	0.472	0.03	0.04
Total Substances 1993				
Country	11.19	0.001**	0.20	
Participation	0.99	0.321	0.05	0.045
Total Substances 1994				
Country	8.38	0.004**	0.18	
Participation	0.494	0.483	0.03	0.03
Total Substances 1995				
Country	15.37	0.00**	0.23	
Participation	2.819	0.09	0.08	0.065
Total Substances 1996				
Country	17.325	0.00**	0.25	
Participation	2.133	0.145	0.07	0.07
Total Substances 1997				
Country	14.86	0.00**	0.23	
Participation	1.65	0.20	0.06	0.06
Total Substances 1998				
Country	16.53	0.00**	0.25	
Participation	1.206	0.27	0.05	0.065

Variables	F	Significance of F	eta	R square for equation
Total Substances 1999				
Country	9.625	0.002**	0.19	
Participation	0.004	0.952	0.02	0.04
Total Substances 2000				
Country	17.64	0.00**	0.25	
Participation	1.71	0.192	0.06	0.07

* indicates significance at $p<0.05$

** indicates significance at $p< 0.01$

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