Protection of the Ozone Layer: A Comment on the *Montreal Protocol*

Ivor Elrifi*

Few environmental issues have received as high a profile in Canada over the last several years as ozone depletion. The appearance of 'holes' in the ozone layer above the Antarctic, and more recently above the Canadian Arctic prompted widespread international concern and resulted in the creation of The Montreal Protocol on Substances that Deplete the Ozone Layer.

In this commentary, the author provides a brief scientific overview of the global problem of ozone depletion, and then demonstrates how factors inherent in existing legal and economic systems have inhibited attempts to address it. Turning to the Montreal Protocol itself, he outlines national legislative precursors and responses. Finally, he addresses the problem of implementation of this international attempt at environmental regulation. The solutions that he suggests are equally applicable to numerous other environmental concerns faced by our society today.

Depuis ces quelques dernières années, peu de problèmes reliés à l'environnement ont reçu une couverture aussi importante au Canada que celui de la destruction de l'ozone. L'apparition de ces fameux « trous » dans la couche d'ozone surplombant l'Antarctique, et plus récemment, l'Arctique canadien a provoqué une inquiétude de par le monde entier, résultant en l'organisation par le Canada d'une conférence internationale, qui vit la mise en oeuvre du « *Protocole de Montréal relatif à des substances qui apauvrissent la couche d'ozone* ».

L'auteur commence ce commentaire en donnant une brève explication scientifique du problème de la *destruction de l'ozone* et démontre ensuite quels facteurs inhérents à nos systèmes légal et économique ont entravé les efforts pour solutionner ce problème.

Étudiant ensuite le Protocole de Montréal, il résume quels ont été ses précurseurs législatifs nord-américains, ainsi que les réactions à ces derniers. Enfin, il discute du problème de la mise en oeuvre de cet effort international de réglementation environnementale. Les solutions qu'il suggère quant au problème de cette mise en oeuvre sont également pertinentes aux nombreuses autres questions environnementales que notre société doit maintenant régler.

*Ph.D. (Biology), LL.B., Student-at-Law, Rogers, Bereskin & Parr, Toronto.

Synopsis

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Introduction

Consumption curves for natural resources, virtually flat for 99% of human history, have risen so sharply in the last 150 years as to appear vertical. The pattern of environmental pollution has paralleled this increase. It is irrelevant whether, like Barry Commoner, one considers pollution to be a result of our increasing technological ability to create new kinds of goods[1] or an "inevitable consequence of population growth and affluence."[2] The simple fact is that environmental degradation closely follows social and industrial expansion. Herein lies the problem. Industry demands exponential growth in wealth. Profit alone is not sufficient, the rate by which profit increases must also rise annually. Our environment, however, has a finite capacity to absorb such plundering, whether in the form of resource removal (by harvesting) or resource destruction (by pollution).

Current global economic theory starts with the notion of money as the basis of value. Consequently, the goal of economic management is to achieve the most cost efficient result. This theory relies on the assumption that goods can be quantified in terms of price, and that willingness to pay reflects individual preferences. Environmental resources such as rain forests, the stratosphere and marine life cannot be treated as simple commodities because there is a market failure with respect to collective goods.[3] Market failure results when competition between industries producing the same good fails to remedy a public wrong such as pollution generated in the production of that good. There is an extended latency period between when pollutants are released, when biological tissue is exposed to this pollution and when disease or damage finally emerges. Although in the 1960s and 1970s the concern was with malodorous and tangible pollutants, we have become aware in the 1980s that the problem is more complex. Sources of pollution and pollutants themselves are often invisible, and the damage caused is both complex and becoming more dangerous.[4] In addition, today's ultrahazardous pollutants are extremely persistent. They cause damage at frighteningly low exogenous levels and/or become harmful only after being concentrated in complex food chains.[5]

Stratospheric ozone depletion by chlorofluorocarbon (CFC) use is one example of this type of environmental problem, since even small decreases in

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[1]*The Closing Circle* (New York: Knopf Publishing, 1971).

[2]P. Erlich & J. Holden, "Review of Commoner, The Closing Circle" (1972) 14 Environment 24.

[3]W. Ophuls, *Ecology and the Politics of Scarcity: Prologue to a Political Theory of the Steady State* (San Francisco: W.H. Freeman and Company, 1977).

[4]W.D. Ruckelshaus, "Risk, Science and Democracy" [1985] Issues in Science and Technology 20.

[5]P.Z.R. Finkle, "Canadian Environmental Law in the Eighties: Problems and Perspectives" (1982-83) 7 Dalhousie Law Journal 257.

the ozone column may cause great environmental damage.The ozone layer is a critical global resource. Recent scientific data has demonstrated its rapid depletion, in part the result of decades of continuous CFC production. The economic implications of ozone depletion are widespread and impossible to quantify in terms of any one commodity. The cause of the problem is at least 20 years old and is ongoing. Furthermore, while the immediate effect of ozone depletion is visible, the long term implications are the subject of speculation. Recognizing the potential significance of this problem, a number of countries have begun to regnlate the use of CFCs over the last ten years. The most significant international action has been the signing of the treaty for the protection of the ozone layer, the *Montreal Protocol on Substances that Deplete the Ozone Layer*.[6] However, while the treaty is an important first step, it still must be ratified by the signing countries, a process that is likely to take several years. Furthermore, international enforcement is likely to be difficult. Even in Canada, the effective regulation of CFCs may not be easily achieved.

This paper focuses on the deterioration of the ozone layer. Part I provides an introduction to the nature of the problem and the effect which this crisis might have on health and the environment. Part II analyzes the reasons for the market failure in CFC regulation, while Part III examines the efficacy of existing national and international legislation. Part IV discusses the *Montreal Protocol* and its implementation in Canada. In conclusion, it is argued that legislation is needed to impose responsibility on corporations to cease environmentally destructive activities.

I. Destruction of the Ozone Layer

A. Ozone — The Nature of the Problem

Ozone, O_3, is a type of oxygen resulting from the reaction of solar ultraviolet (UV) radiation and O_2 molecules. The reaction occurs in the stratosphere, a 20 km thick region of the atmosphere lying 30 to 50 km above the earth's surface.[7] Ozone in the stratosphere screens the earth's surface from UV radiation (wavelengths less than 286 nm). Ozone is unstable and will degrade by reacting with a variety of substances that occur naturally or are industrial by-products.[8]

As part of a global effort to mark 1957 as International Geophysical Year, an observation station was established at Halley Bay, Antarctica, to monitor the

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[6]U.N. Doc. UNEP/002565 (1987). Reprinted in (1987) 26 I.L.M. 1550. [hereinafter *Montreal Protocol*].

[7]T.B. Stoel Jr., A.S. Miller & B. Milroy, *Fluorocarbon Regulation* (Toronto: Lexington Books, 1980) at 7.

[8]Conservation and Protection Commercial Chemicals Branch, "The Ozone Layer: A Fragile Protective Screen" (Ottawa: Environment Canada).

stratospheric ozone. This monitoring has revealed that, between 1957 and 1979, ozone measurements have dropped from 300-330 Dobson units to approximately 225.[9] It has also become clear that the rate at which the decrease is occurring is accelerating.

In 1974, Rowland and Molina first identified CFCs as a major cause of ozone destruction in the stratosphere:

> Chlorofluoromethanes are being added to the environment in steadily increasing amounts. These compounds are chemically inert and may remain in the atmosphere for 40 to 150 years, and concentrations can be expected to reach 10 to 30 times present levels. Photodissociation of the chlorofluoromethanes in the stratosphere produces significant amounts of chlorine atoms and leads to the destruction of atmospheric ozone.[10]

Since then, the effect of CFCs on the ozone layer has been examined in great detail.[11] There are several interacting systems responsible for ozone destruction. The most important of these is the nitrogen system, which accounts for 70% of O_3 degradation. The catalytic agent is NO, produced from N_2O. N_2O is naturally abundant, but natural sources are usually balanced by ozone creating processes occuring in the stratosphere.[12] However, the introduction of man-made ozone destroying pollutants such as nitrogen fertilizers and supersonic aircraft emissions has upset this equilibrium.

The most serious source of ozone destroying pollutants are the CFCs. Also called chlorofluoromethanes or fluorocarbons, CFCs are simple compounds containing carbon (C), fluorine (F) and chlorine (Cl). Compounds in this group are chemically inert, non-flammable and non-toxic. In addition, they have a number of thermodynamic properties that make them suitable for use as refrigerants, as propellants in aerosol cans and as foaming agents in plastics.[13]

CFCs are manufactured from carbon tetrachloride (CCl_4), hydrofluoric acid (HF) and chloroform.[14] Upon release into the atmosphere, CFCs drift

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[9]*Supra*, note 7 at 16. A Dobson unit, so named after the Oxford professor who developed the spectroscopic technique for detection, measures the thickness the ozone layer would have if it were at sea level at 0 degrees Celsius. Under these conditions 1 Dobson unit equals 1/1000 cm of ozone.

[10]M.J. Molina & F.S. Rowland, "Stratospheric Sink for Chlorofluoromethanes: Chlorine Atom-catalysed Destruction of Ozone" (1974) 249 Nature 810 at 811.

[11]Conservation and Protection Commercial Chemicals Branch, "How CFCs (Chlorofluorocarbons) Eat Up The Ozone Layer" (Ottawa: Environment Canada).

[12]A.K. Biswas, *The Ozone Layer* (New York: Pergamon Press, 1979) at 8. The book was published for the United Nations Environment Programme.

[13]Conservation and Protection Commercial Chemicals Branch, "Chlorofluorocarbons (CFCs): A Chemical Threat to the Ozone Layer" (Ottawa: Environment Canada) [hereinafter "Chlorofluorocarbons"].

[14]*Supra*, note 7 at 9. The major CFCs currently produced are:

CF-11, trichlorofluoromethane (CCl_3F)

CF-12, dichlorodifluoromethane (CCl_2F_2)

slowly into the stratosphere, with a residence time of 70 to 150 years. In the stratosphere, otherwise stable CFCs are photodissociated to produce free Cl atoms which serve as catalytic agents in the breakdown of O_3 in a two step process. First Cl reacts with O_3 to produce ClO and O_2. Second, ClO combines with singlet O atoms to produce O_2, thereby releasing the free Cl atom.[15] It has been estimated that one Cl atom will catalyze the breakdown of approximately 10,000 O_3 molecules.[16] A depletion in O_3 will cause an increase in the amount of UV radiation reaching the earth's surface, with potentially harmful effects to the biota and to human health.

The stratospheric chemistry of ozone and its interaction with other gases is extremely complex. Predicting changes in the amount of ozone distributed vertically throughout the stratosphere is difficult, since while CFCs and $NO_{(x)}$ decrease stratospheric ozone, CH_4 and CO_2 (greenhouse gases) increase the level of ozone. Generally, it is predicted that if CH_4 and CO_2 increase at the current rates of 1 and ½% per year respectively, and CFCs increase at 3% per year, then a 10% reduction in ozone will result in the next 70 years and much more thereafter.[17] These changes will vary according to latitude, with greater depletion occurring at the poles than at the equator.

How CFCs are formulated determines how much risk they pose to the ozone layer. Formulations that have a greater degree of hydrogenation are more reactive, degrading more rapidly and thereby posing less of an environmental threat.[18] Similarly, Cl-free formulations do not threaten the stratosphere. These "ozone-safe" CFCs are currently available.

CFCs are widely used as propellants in aerosols, as refrigerants and as foaming agents in plastics.[19] Before 1974 over 70% of CFC production was for use in aerosols. Because of their Cl content and lack of hydrogenation, CF-11

CF-22, chlorodifluoromethane ($CHClF_2$)

CF-113, trichlorotrifluoromethane ($C_2Cl_3F_3$)

The numbering system, based on a system originally devised by Du Pont has now been generally adopted when referring to CFCs. The first digit on the right designates the number of F atoms. The second digit from the right designates the number of H atoms plus one. The third digit from the right designates the number of C atoms minus one (not present if zero). *The Sky is the Limit: Strategies for Protecting the Ozone Layer* (Research Report #3) by A.S. Miller & I.M. Mintzer (Washington: World Resources Institute, November 1986) at 7 [hereinafter *Sky is the Limit*].

[15]*Supra*, note 7 at 7. Also see M.J. Molina *et al.*, "Antarctic Stratospheric Chemistry of Chlorine, Nitrate, Hydrogen Chloride, and Ice: Release of Active Chlorine" (1987) 238 Science 1253 and J.A. Pyle & J.C. Farman, "Antarctic Chemistry to Blame" (1987) 329 Nature 103.

[16]*Supra*, note 13.

[17]17*Ozone Depletion, The Greenhouse Effect and Climate Change: Hearing Before the Subcomm. on Environmental Pollution of the Senate Comm. on Environment and Public Policy*, 99th Cong., 2nd Sess. 12 (1986) (statement of R. Watson, Director, Upper Atmospheric Program, NASA) [hereinafter *Ozone Depletion*].

[18]*Sky is the Limit*, *supra*, note 14 at 38.

[19]*Supra*, note 12 at 19.

and CF-12, the formulas used in aerosols, are particularly hazardous to the stratosphere. The United States, Canada and Sweden banned the non-essential uses of aerosols in the late 1970s. Despite these bans, CFC aerosol use is expanding and sales of CF-11 and CF-12 have continued to increase. On average, CFC sales increased by 13% annually between 1958 and 1983. More specifically, the sale of CF-11 and CF-12 grew by 5% between 1982 and 1984 alone.[20]

B. Health and Environmental Effects

The continued use of CFCs at the 1974 level will result in a 15% loss of ozone within 100 years. This, in turn, will result in a 30% increase in UV radiation reaching the earth's surface, causing 540,000 to 1,800,000 *additional* cases of malignant and non-malignant melanoma annually.[21] UV radiation has also been shown to be one cause of cataracts.[22]

In addition to the effects on human health, UV radiation has a number of effects on the biota. DNA, RNA and proteins in both plant and animal cells are sensitive to this radiation. Although some species have developed protective adaptations such as hair, fur, feathers and DNA repair mechanisms, studies indicate that irreversible injury will inevitably occur as a result of increased UV exposure. Plant organelles and plant hormones are especially sensitive to UV radiation, which impairs both photosynthesis and the growth process.[23] This includes aquatic photosynthetic microorganisms (phytoplankton) which are responsible for more than 70% of global O_2 production and are particularly vulnerable to UV radiation.[24]

CFCs may also contribute significantly to the "greenhouse effect" by absorbing thermal radiation that would otherwise escape from the earth's atmosphere. This heat retention could increase the average global temperature, causing thermal expansion of the oceans, and melting of the polar ice-caps. It could also bring changes in rainfall and weather patterns, in the global distribution of fresh water, and in the availability of habitable and cultivatable land.[25] Ozone itself is a greenhouse gas; consequently, depletion of O_3 might result in either

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[20]*Supra*, note 7 at 9.

[21]*Supra*, note 14 at 13.

[22]*Supra*, note 7 at 11.

[23]Conservation and Protection Commercial Chemicals Branch, "Ozone Depletion — Impacts on Health and the Environment" (Ottawa: Environment Canada).

[24]*Supra*, note 7 at 12. Another consequence of increased UV radiation is rapid aging of plastics and paints, decreasing the useful life of these materials in outdoor applications. See also *supra*, note 12 at 19.

[25]*Supra*, note 18 at 11.

an increase or a decrease in global temperature. An increase of even one degree Celsius would be sufficient to shrink the polar ice-caps.[26]

Ironically, while the accumulation of CFCs in the stratosphere is reducing ozone levels some 40 km above the earth's surface, ozone is accumulating in the troposphere — the layer of atmosphere extending about seven miles upwards from the earth's surface — as a by-product of many industrial processes. This tropospheric ozone, because it is highly localized, does not effectively screen UV radiation and moreover, is itself harmful to human health[27] and to the environment.[28] In Quebec, ozone is at least partly responsible for "die-back": already 52% of areas north of the St. Lawrence have exhibited some damage (11 to 25% foliage loss).[29]

Recently, it has been observed that the Antarctic ozone is decreasing substantially, particularly in the spring, leaving a large "hole" approximately 10 km deep over an area the size of the continental USA. In 1987, for example, the loss of Antarctic ozone was the highest ever recorded. Data for 1988 suggests the trend is continuing. The depletion of Antarctic ozone is alarming because the hole in the ozone layer is both massive and completely unexpected. Various estimates suggest that the hole could remain for 100 years or more.[30] Furthermore, similar stratospheric reductions in the ozone layer have now been recorded in

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[26]V.P. Nanda & P.T. Moore, "Global Management of The Environment: Regional and Multilateral Initiatives" in V.P. Nanda, ed., *World Climate Change: The Role of International Law and Institutions* (Boulder, Co.: Westview Press, 1983) 93 [hereinafter *World Climate Change*]. See also *Ozone Depletion, supra*, note 17 at 303 (Statement of M. Oppenheimer) and R. Revelle, "Carbon Dioxide and World Climate" (August 1982) 274 Sci. Am. 35.

[27]*Supra*, note 12 at 11.

[28]Ozone itself poses a health hazard, including damage to lung tissues. M. Mellon *et al.*, *The Regulation of Toxic and Oxidant Air Pollution in North America: A Joint Project of the Canadian Environmental Research Foundation, Toronto and the Environmental Law Institute, Washington, D.C.* (Toronto: CCH Canadian, 1986) 74.

[29]*Ibid.* at 77. As Mellon points out, tropospheric ozone is one of the most serious plant toxins in the oxidant group of pollutants, causing injury to foliage, chromosomal damage and significant crop-reductions at an annual cost of $200 million in Ontario. See also M. Trainer *et al.*, "Models and Observations of the Impact of Natural Hydrocarbons on Rural Ozone" (1987) 329 Nature 705 and B. Marotte, "Damage to Trees Spreads in Quebec: Ozone Harms Crops" *The [Toronto] Globe and Mail* (15 October 1987) A5.

[30]D.J. Hoffmann, "Direct Ozone Depletion in the Springtime Antarctic Lower Stratospheric Clouds" (1989) 337 Nature 447. See also M.B. McElroy *et al.*, "Reductions of Antarctic Ozone Due to Synergistic Interactions of Chlorine and Bromine" (1986) 321 Nature 752; D. Lindley, "Ozone Hole Deeper Than Ever" (1987) 329 Nature 473; D. Lindley, "Surprising New Ozone Data From NASA Satellite" (1988) 335 Nature 657; K.P. Bowman, "Global Trends in Total Ozone" (1988) 239 Science 48; *supra*, note 17 at 18 (statement of S. Rowland).

the Arctic.[31] It is clear that the degradation of the ozone has created an environmental crisis and that this is a situation which our society has failed to address.

II. The "Market Failure" in CFC Regulatiou

There are numerous problems with CFC regulation including the traditional difficulty involved in providing adequate protection for environmental amenities in a market system. The major obstacles to effective regulation of CFC emissions addressed here are: a) the lack of incentive on the part of polluters resulting in the "tragedy of the commons"; b) the corresponding free-rider attitude of consumers; c) poor information transfer; d) the failure of the private law system; and e) a lack of corporate social responsibility. The combination of these five factors has perpetuated a market failure.

A. Invcsting in Public Goods: The Tragedy of the Commons

For manufacturers, the use and discharge into the stratosphere of ozone-damaging CFCs is cheaper than the use and discharge of safe CFCs. The latter are more expensive because they reflect the higher research and production costs of more recent, less widespread technology. There is no incentive to invest in that technology without some guarantee of return.[32] Consequently manufacturers are unlikely to invest in research, development and promotion of ozone-safe CFCs in the absence of obligatory industry-wide legislation that requires them to do so.

The result of this classic avarice of the rational self-interested value-maximizers in industry is what G. Hardin refers to as the "tragedy of the commons".[33] The benefit of using ozone-damaging CFCs is enjoyed solely by the individual manufacturer while the cost, in terms of damage to the ozone layer, is borne by everyone. Since everyone acts to maximize the return to him or herself in a market system, the result is an overload of the CFC absorbing capacity of the stratosphere and subsequent destruction of the ozone layer. Great Britain's long-time refusal to ban CFC- containing aerosols until recently is one clear example of this tragedy.[34]

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[31]J. Palca & P. Lloyd, "Ozone Hole Looms Large" (1989) 337 Nature 492. See also J. Palca & P. Lloyd, "Arctic Chemistry May Cause Significant Ozone Loss" (1989) 337 Nature 677; R.A. Kcrr, "Arctic Ozone is Poised For A Fall" (1989) 243 Science 1007; C. Rodgers, "Global Ozone Trends Reassessed" (1988) 332 Nature 201.

[32]G.W. Sherk, "Unilateral Actions to Control Planned and Inadvertent Climate Modification: Options and Obstacles" in *World Climate Change, supra*, note 26 at 124.

[33]"The Tragedy of the Commons" (1968) 162 Science 1243.

[34]J. Gray, "Thatcher Enlists in Ozone War with Call for Worldwide Action" *The [Toronto] Globe and Mail* (8 March 1989) A9 [hereinafter *Thatcher*].

B. *The "Free Rider" Problem*

Another issue which plagues the regulation of public goods is the "free rider" problem.[35] This concept is essentially a corollary to the incentive problem faced by manufacturers. From the consumers' point of view, since no one can be excluded from enjoying the benefit of an intact ozone layer, there is no incentive to pay more for safe CFCs. Someone else presumably will pay for them. The result is market failure due to the disparity between consumers' desire for an intact ozone layer and their willingness to pay for it.

C. *Poor Information Transfer*

In the case of CFC regulation, a market failure also results from poor information transfer. This lack of information greatly affects the public's ability to quantify the ozone layer's value to society and to assess the willingness of consumers to pay for regulation of CFC emissions. Inadequate access to information is typical in the area of environmental protection where government and industry negotiate control orders. There is no tradition of public participation in these negotiations and the information upon which these decisions are based is not publicized.[36] This poor information transfer is particularly acute in relation to ozone deterioration, since the physical consequence of this type of pollution is not yet obvious and not, therefore, easily understood by the general public.

The pace of the technological revolution has dramatically increased so much that average consumers cannot be expected to have sufficient information about the goods and services they buy. Indeed, consumers may realistically have only enough knowledge to operate these goods. While most consumers probably know how to use a microwave oven or a car, they do not know how these goods work. In recognition of the fact that industrial technology is beyond the reach of most people, a variety of mechanisms have emerged to protect the innocent consumer. For example, in Ontario, legislation such as the *Consumer Protection Act*,[37] was designed in part to prevent abuse of a vendor's duty to provide safe goods to purchasers by the vendor. Such statutes recognize the fact that consumers often rely on commercial vendors to supply technologically complex goods and services without fully understanding how these goods or services work. Similarly the seminal common law cases, such as *Lloyds Bank* v. *Bundy*,[38] and *Canadian Kawasaki Motors Ltd* v. *McKenzie*[39] reinforce the

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[35]*Supra*, note 7.

[36]M. Rankin, "Information and the Environment: The Struggle for Access" in J. Swaigen, ed., *Environmental Rights in Canada* (Toronto: Butterworths, 1981) 285.

[37]R.S.O. 1980, c. 87.

[38](1974), [1975] Q.B. 326, [1974] 3 All E.R. 757 (C.A.).

[39](1981), 126 D.L.R. (3d) 253 (Ont. Co. Ct.).

notion that the provider of services and goods has some legal duty not to impose unconscionable transactions upon purchasers who suffer from an inequality of bargaining power. The imposition of this duty is in the public interest since it attempts to rectify a market failure resulting from poor information transfer.

However, no equivalent to consumer protection acts exists for goods such as the ozone layer, which are held in common. In addition, consumers do not have access to sufficient information concerning the threat to the ozone layer for them to adequately assess their willingness to pay for ozone-safe CFCs. Exacerbating this problem is the apparent uncertainty surrounding predictions concerning the destruction of ozone. Scientific researchers are reluctant to draw conclusions about the causal link between CFC use and ozone destruction without extensive testing. This testing may not even be possible due to the scale of the problem and the poor understanding of atmospheric chemical interactions.[40]

CFC manufacturers have taken advantage of this poor information transfer to protect their interests. Uncertainty breeds misinformation: because the potential damage to the ozone layer is based on statistical predictions, different models provide different damage scenarios. CFC manufacturers have been extremely active in promoting models that generate information downplaying the effects of CFCs on the ozone layer.

The Alliance for Responsible CFC Policy is one example of a manufacturer's association active in disseminating misinformation based on the selective use of statistics. This organization is composed of 500 member companies of the Chemical Manufacturers' Association (CMA) that use or produce CFCs. Even as late as February 1986, the CMA, which has spent $18 million on research, took the position that:

> (1) CFC's serve a critical need in refrigeration, air conditioning and other beneficial uses;
> (2) no significant change in the globally averaged total ozone can be demonstrated; model calculations predict no change in total ozone for the next two or three decades; and
> (3) continued release of CFCs poses no significant environmental threat.[41]

The International Chamber of Commerce echoed these findings before the United Nations Environmental Program (UNEP) in a review of industry-sponsored research into the effect of CFCs on the concentration of atmospheric

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[40]J.F. Castrilli, "Problems of Proof and Credibility Issues in Relation to Expert Evidence in Toxic Tort Litigation" [1984] Queen's L.J. 71; R.S. Eckman, J.D. Haigh & J.A. Pyle, "An Important Uncertainty in Coupled Chlorine-Carbon Dioxide Studies of Atmospheric Ozone Modification" (1987) 329 Nature 616.

[41]*Ozone Depletion, supra*, note 17 at 278 (statement of S.R. Ofeo, Allied-Signal, Inc., on behalf of the Chemical Manufacturers Association).

ozone. The Chamber emphasized the uncertainty of current scientific predictions, claiming:

> (1) that no reduction in the total ozone column had been statistically shown, and (2) the predicted cumulative depletions are too large to be explained by the sum of CF-11 and CF-12 emissions, emissions from aircraft engines, nitrogen fertilizers and other sources.[42]

It should be pointed out that this information is somewhat misleading since these results are based on stochastic model statistics. These statistics suggest there is no significant non-random change in the total amount of ozone. However, these data do not explain marked changes in the vertical distribution of ozone throughout the stratosphere. Furthermore, these data do not take into account the fact that the sources and sinks for ozone vary significantly with latitude; there is much greater depletion at the poles and the capacity of the stratosphere to self-heal decreases from the equator to the poles.[43]

Industry also capitalizes on the latency, uncertainty and diffuse nature of environmental problems by emphasizing the immediacy of economic problems related to regulation. Finally, by putting a relatively modest amount of money into research, industry may hope to stall legislative action until clear results are obtained, and in the meantime reap big profits. Recent announcements indicate that industry is preparing to take this tack regarding CFCs.[44]

There is another, more insidious information problem; that of social preference shaping. It can be argued that our preferences for goods are shaped by those who manufacture such goods. Clearly this is relevant to the consumer demand for "convenient aerosol sprays". What is not so clear is that manufacturers may also shape preferences by not disclosing information that is not in their interest. There is only a limited extent to which one can form a preference for something of which one is unaware. Cigarette advertising provides a topical example of this.[45] By continually de-emphasizing the dangers associated with smoking and presenting smokers in "lifestyle" advertisements, manufacturers discourage smokers from forming negative images that adequately correspond to the dangers of smoking.

Various opinion polls suggest that the majority of Canadians want tighter environmental controls and are willing to pay for them, yet pollution is an increasingly serious problem in Canada.[46] With regard to the ozone problem, it

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[42]*Supra*, note 12.

[43]*Supra*, note 17 at 9.

[44]D. Israelson, "Chemical Firms Give $8 Million to Help Protect Ozone Layer" *Toronto Star* (6 January 1988) A1.

[45]D. Suzuki, "Industries Use Slick Ads to Foil Critics" *The [Toronto] Globe and Mail* (27 February 1988) D4.

[46]B. McDougall, "Time to Clean-up" *Small Business* (September 1987) 32.

appears that consumers, when offered a choice, have preferred substitute technologies such as deodorant sticks over damaging products like aerosols.[47] This willingness to pay, however, has been reduced by misinformation and a mistaken belief on the part of consumers that current government legislation provides a sufficient remedy to air pollution problems. Furthermore, promises made by industry to reduce or eliminate ozone-damaging CFC emissions create the impression that industry is responsive to environmental concerns. Although these changes are scheduled at a rate of implementation too slow to be useful, these gestures further reduce consumer willingness to pay *now* for ozone-safe CFCs.

D. Failure of the Private Law System

The inadequate transfer of information has two major legal iinplications. First, in terms of the setting of regulations, it renders the direct negotiations between polluters and their victims ineffective. Instead, industry uses negotiation as a means of political seduction to obtain lax environmental regulations. In order to show good faith, environmentalists are forced to compromise basic ideals and to make overly generous concessions. This imbalance is partly the result of a definitional bias inherent in the concept of negotiation, in which both environmental and industrial interests are seen as equally valid. Compromise is seen as "fair and just" in situations where compromise is not an appropriate solution. Furthermore, such negotiation is coercive due to a gross inequality of bargaining power. Environmentalists do not have sufficient financial resources to gain access to technical information and expertise. This unequal distribution of information and power affects not only those who can participate in the negotiating process, but also the quality of those negotiations.[48] Moreover, governments' ability to effectively negotiate is restricted by the limited amount of research into environmental problems. Rather, information is provided by the industry itself.

A second problem further illustrates the inadequacy of private law in dealing with environmental issues. Scientific uncertainty and the consequent production of misinformation results in a legal bias against the victims of pollution. There are four significant barriers to successful litigation and all are generally too large to overcoine. They are: the difficulty in bringing class actions,[49] the

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[47]*Supra*, note 11.

[48]D.J. Amy, "The Politics of Environmental Mediation" (1983) 11 Ecology L.Q. 1.

[49]L. Nissen, "Class Actions in Canada: An Environmental Perspective" (1983) 48 Sask. L. Rev. 29; N.J. Williams, "Consumer Class Actions in Canada — Some Proposals for Reform" (1975) 13 Osgoode Hall L.J. 1.

difficulty in obtaining standing,[50] the legal bias manifest in credibility of evidence[51] and the burden of proof on the environmental plaintiff.[52]

In terms of bringing the suits, individual damage may be insufficient to economically justify separate litigation and class actions might appear an appropriate alternative. However, class action suits have not been well received in Canada due to the restrictive interpretation that the judiciary has given to the governing rules of civil procedure. The main difficulty in bringing a class action suit is the requirement that all members of the class share the same interest and can benefit from the same remedy.[53] Traditionally, therefore, representative actions have not been allowed for damages.[54] With respect to the CFC problem, for example, it would be difficult to establish that each member of the class had suffered the same damage.

Finally, environmental class action suits raise serious questions about access to justice. It is extremely difficult to bring these suits because of judicial unwillingness to grant standing.[55] Environmental claims are frequently brought in public nuisance. This requires the plaintiff to have suffered a "special damage" in order to be granted standing.[56] This barrier creates a serious obstacle to representative litigation, partly because environmental interests may be considerably more diffuse than those typically served by class actions. Due to the delay between release and damage, proof of legal causation is problematic. This is especially true for the CFC problem since the effects are not likely to be manifest for some 50-100 years. There are few people who have a direct interest in the issue or who have directly suffered damage. In addition, since environmental damage is widespread, aggregation of parties with the same interest may be

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[50]M. Cappelletti & B. Garth, "Access to Justice: The Newest Wave in the Worldwide Movement to Make Rights Effective" (1978) 27 Buff. L. Rev. 181.

[51]*Palmer* v. *NSFI* (1983), 60 N.S.R. (2d) 271, 2 D.L.R. (4th) 397 (S.C.) [hereinafter *Palmer*].

[52]J. Krier, "Environmental Litigation and the Burden of Proof" in H.F. Baldwin & J.K. Page Jr., eds, *Law and the Environment* (New York: Walker, 1970) 110.

[53]*Naken* v. *General Motors of Canada Ltd*, [1983] 1 S.C.R. 72, 144 D.L.R. (3d) 385. More generally, see M. Rankin & P.Z.R. Finkle, "The Enforcement of Environmental Law: Taking the Environment Seriously" in P.Z.R. Finkle & A.R. Lucas, eds, *Environmental Law in the 1980s: A New Beginning* (Calgary: Canadian Institute of Resources Law, 1982) 169.

[54]The rule stems from *Preston* v. *Hilton* (1920), 48 O.L.R. 172, 55 D.L.R. 647 (S.C.). Also see J.K. Bankier, "The Future of Class Actions in Canada: Cases, Courts and Confusion" (1984) 9 Can. Bus. L.J. 260 and W.A. Bogart, "Naken: The Supreme Court and What Are Our Courts For?" (1984) 9 Can. Bus. L.J. 280.

[55]For examples of such judicial unwillingness see *Cowan* v. *Canadian Broadcasting System*, [1966] 2 O.R. 309, 56 D.L.R. (2d) 578 (C.A.); *Green* v. *R.* (1972), [1973] 2 O.R. 396, 34 D.L.R. (3d) 20 (H.C.); *Islands Protection Society* v. *R.*, [1979] 4 W.W.R. 1, 11 B.C.L.R. 372 (S.C.); *Rosenberg* v. *Grand River Conservation Authority* (1976), 12 O.R. (2d) 496, 69 D.L.R. (3d) 384 (C.A.).

[56]*Hickey* v. *Electric Reduction Co. of Canada*, [1970] 2 N & P.E.I.R. 246, 21 D.L.R. (3d) 368 (Nfld S.C.).

ineffective due to wide geographic dispersal, insufficient information and the inappropriateness of a single strategy for all affected individuals.[57] Consequently, environmental class actions are rare and are often unsuccessful. Between 1974 and 1984 only five environmental class actions reached the Canadian courts, only one of which was successful.[58]

Individual actions framed in private nuisance require that the plaintiff suffer either material injury or a requisite degree of personal discomfort. In Canada, the test for actionable injury requires that the damage be visible. In *Walter* v. *McKinnon Industries Ltd*,[59] McRuer J. adopted the judgment in *Salvin* v. *North Brancepeth Coal Co.*:[60] "[for] the injury to be actionable, [it] must ... visibly ... diminish the value of the property and the comfort and enjoyment of it..."[61].

This source of potential liability is useless in the context of the ozone problem. By the time the damage is visible, there will be no remedy. Furthermore, obtaining a *quia timet* injunction is often precluded because of the uncertainty over whether future damage will occur.[62] In *Palmer* an application for a *quia timet* injunction to prevent future spraying of the herbicides 2,4-D and 2,4,5-T was refused because the plaintiffs were unable to prove that there was "any strong probability or sufficient degree of probability of risk to health to warrant the granting of the remedy sought."[63] Clearly private law is a totally inadequate tool for dealing with environmental problems such as ozone layer destruction where it is not possible to establish a strong probability of substantial, repeated injury and a direct causal link between CFC use and ozone depletion.

E. Corporate Goals and Social Responsibilities

Given poor public access to information and the improbability of bringing successful private law actions, one could argue that some form of corporate obligation to protect the environment should be legislated. This seems particularly self-evident in light of the duty owed by manufacturers to consumers recognized in Anglo-American law.[64] In Canada, however, no legislated obligation

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[57]*Supra*, note 50.

[58]Nissen, *supra*, note 49.

[59][1949] O.R. 549, [1949] 4 D.L.R. 739 at 752 (H.C.). See also *Cloutier* v. *Carrefour Assomption Ltée* (1984), 55 N.B.R. (2d) 114, 144 A.P.R. 114 (Q.B.).

[60](1874), L.R. 9 Ch. App. 705.

[61]*Ibid.* at 706, Jessel, M.R.

[62]A *quia timet* injunction is an injunction sought to prevent certain activities in apprehension of some future probable injury to the applicant's rights or interests. See H.C. Black, *Black's Law Dictionary*, 5th ed. abr'd. (St. Paul: West Publishing Co, 1983) 651.

[63]*Supra*, note 51.

[64]*Supra*, note 38 and surrounding text.

exists. Adhering to the paradigm of economic organization, profit maximizing, corporations continue to act in a fashion that is often at odds with the public good, at least with regard to environmental protection. Despite the superficial economic rationality of this approach, the absence of corporate social responsibility perpetuates market failure. Thus, industry generates misinformation and uses the common law to support its manufacturing activity and to silence environmental plaintiffs. These strategies serve to perpetuate market failure by continually exacerbating its causes. The rationality of this approach is therefore illusory.

Since the 1930s the issue of corporate social responsibility has been hotly contested among scholars. The debate began with the rapid expansion of large corporations in the early 1900s. In *Dodge* v. *Ford Motor Co.*,[65] the *locus classicus* of corporate responsibility, it was held that the purpose of a corporation was to make a profit for the shareholders and that the powers of the directors must be employed towards that end:

> The discretion of the directors is to be exercised in the choice of means to obtain that end and does not extend to a change in the end itself, to the reduction of profits or to the non-distribution of profits among stockholders in order to devote them to other purposes.[66]

This argument was carried further in *Parke* v. *Daily News Ltd*[67] where it was held that a company's funds cannot be applied in making *ex gratia* payments as such. The court will examine the motives and objectives of such payments and only uphold them if a "goals test" for justified capital expenditure is satisfied. This goals test requires that the transaction be *bona fide*, that it be reasonably incidental to company business, and that it benefit the company and promote its prosperity.

As early as 1932, E. Merrick Dodd argued that corporations owed a sense of responsibility not just to the shareholders, employees and consumers, but to the public at large.[68] This duty was based on an understanding of the corporation as a separate legal entity.[69] Dodd argued that granting the corporation the rights and privileges of a natural person implied a reciprocal undertaking by the corporation to act in accordance with ethical standards rather than solely for the purpose of profit:

> If we think of it as an institution which differs in the nature of things from the individuals who compose it, we may then readily conceive of it as a person, which, like other persons engaged in business, is affected not only by the laws which reg-

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[65]204 Mich. 459, 170 N.W. 668, 3 A.L.R. 413 (Sup. Ct. 1919).
[66]*Ibid.* at 463 (Ostrander, J.).
[67][1962] 2 All E.R. 929, [1962] 1 Ch. 927.
[68]"For Whom are Corporate Managers Trustees?" (1932) 45 Harv. L. Rev. 1145.
[69]*Salomon* v. *Salomon and Co.* [1897] A.C. 22, 66 L.J. Ch. 35 [1895-99] All E.R. 33 (H.L.).

> ulate business but by the attitude of public and business opinion as to the social obligations of the corporation.[70]

Dodd concluded that the narrow perception of a director's duty as being focussed upon pursuing the corporation's best interests purely in terms of profit maximization was quite simply a creation of lawyers.[71] In a reply to Dodd, A.A. Berle promoted a position that rested squarely on the traditional property argument. He argued that corporate managers and directors were trustees with a fiduciary duty to corporate security holders. These security holders hold a primary property right in the corporation. To allow directors to engage in social obligations would be to uncontrollably subordinate this property right to a number of other claimants, including the community at large.[72] Berle thus concluded:

> Business corporations exist for the sole purpose of making profits until such time as you are prepared to offer a concrete and reasonably enforceable scheme of responsibilities to someone else.[73]

Scholars have continued to debate the question of corporate responsibility and a number of schools of thought have emerged.[74] These range from the market school, which regards the idea of corporate social responsibility as subversive, to the radical school, which holds that a corporate responsibility should be statutorily placed on all large corporations.[75] Richard Posner has enormously popularized the economic efficiency argument,[76] outlining a variety of problems he views as inherent in the corporate pursuit of social goals. His main argument is that business cannot internalize the cost of pollution control and still remain competitive. Directors who attempt to produce goods for the market at the lowest cost to the corporation and to improve society at the same time are not likely to be successful.[77] Furthermore, corporate involvement in promoting social policy amounts to a delegation of social responsibility by the government and raises questions of political accountability. Finally, he contends that cost internalization is a form of regressive taxation whereby the consumers who are least able to afford it are forced to bear the brunt of the costs of corporate social

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[70]*Supra*, note 68 at 1161.

[71]*Ibid.*

[72]"For Whom Corporate Managers are Trustees: A Note" (1932) 45 Harv. L. Rev. 1365 at 1371-72.

[73]*Ibid.* at 1367.

[74]See R.N. Leavell, "Corporate Social-Reform, The Business Judgment Rule and Other Considerations" (1986) 20 Ga. L. Rev. 565; K.A. Linsley, "Statutory Limitations on Directors' Liability in Delaware: A New Look at Conflicts of Interest and the Business Judgment Rule" (1987) 24 Harv. J. on Legis. 527; J.L. Marshaw, "Corporate Social Responsibility: Comments on the Legal and Economic Context of a Continuing Debate" (1984) 3 Yale L. and Pol'y Rev. 114.

[75]F.B.A. Wedderburn, Lord, "Trust, Corporation and the Worker" (1985) 23 Osgoode Hall L.J. 221 at 227.

[76]R.A. Posner, *Economic Analysis of Law*, 2d ed. (Boston: Little, Brown, 1977) at 310-13.

[77]*Ibid.*

responsibility.[78] Others have argued that corporate management should not limit itself to maximizing profit, leaving the government to regulate a solution to the numerous problems with which our society is faced. These problems are too numerous and too diverse for corporate leadership to play such a narrow role.[79]

At present, the Canadian legal and business community continues to adhere to the profit maximization approach. The *CNR "Run-Through" Report*[80] stressed that corporations were under no legal obligation to continue non-economic activities. Similarly, the *Report of the Royal Commission on Corporate Concentration (1975)*[81] suggested that corporations meet social challenges but not lead them. Consequently, Canadians cannot expect corporations to willingly accept any duty of care in relation to the protection of the environment. The profit maximization principle remains central to our notion of corporate government and, as a result, industry will continue to resist any CFC regulations that could potentially reduce profits.

1. Statutory Penalties

If regulatory measures are introduced by either federal or provincial legislatures, CFC manufacturers can resort to jurisdictional challenges in an attempt to invalidate the legislation. In Canada, according to the separation of jurisdiction outlined in sections 91 and 92 of the *Constitution Act 1867*,[82] the Federal government has the power to ratify treaties, but its power to implement terms may be limited if the subject matter of the treaty falls within the Provincial jurisdiction.[83] Both levels of government have constitutional jurisdiction to regulate air quality. The Federal government has authority under the *Clean Air Act*,[84] the *Canadian Environmental Protection Act*[85] and the *Environmental Contaminants Act*.[86] In particular, s. 61 of the *C.E.P.A.* provides a framework for controlling compounds such as CFCs which may create international air pollution:

> 61.(1) Subject to subsection (2), where the Ministers have reason to believe that an air contaminant emitted into the air, either alone or in combination with any

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[78]*Ibid.*

[79]R.H. Mundheim, "A Comment on the Social Responsibilities of Life Insurance Companies as Investors" (1975) 61 Va. L. Rev. 1247 at 1256-58.

[80]Industrial Relations and Disputes Investigation Commission, *Report of Industrial Inquiry Commission on Canadian National Railways "Run Throughs"* (Ottawa: Queen's Printer, 1965) (Commissioner: Freedman J.).

[81]*Report of the Royal Commission on Corporate Concentration* (Ottawa: Ministry of Supply and Services, 1978) (Chair: G. Bryce).

[82](U.K.) 30 & 31 Vict., c. 3.

[83]H.M. Kindred *et al.*, *International Law, Chiefly as Interpreted and Applied in Canada*, 4th ed., (Toronto: Emond Montgomery, 1987) at 205.

[84]S.C. 1970-71-72, c. 47.

[85]S.C. 1988, c. 22 [hereinafter *C.E.P.A.*].

[86]S.C. 1974-75-76, c. 72.

> other air contaminant, by a source or by sources of a particular class or classes in Canada (a) creates or may reasonably be anticipated to create air pollution in a country other than Canada, or (b) results in or is likely to result in the violation of an international agreement entered into by the government of Canada in relation to the control or abatement of pollution, the Minister shall recommend to the Governor in Council regulations wih respect to the source or sources for the purpose of controlling or preventing the air pollution or correcting or preventing the violation.

The federal statutes provide reasonably severe penalties for offences. Under the *Environmental Contaminants Act*, a person violating s. 17 by releasing an environmental contaminant is liable on summary conviction to a maximum fine of $100,000 and on indictment to imprisonment for a maximum of two years. Under the *Clean Air Act* the penalty for contravention of s. 10 is a maximum fine of $200,000. The *C.E.P.A.* penalty for polluting is the most severe. It is an offence to fail to provide information or to provide false information to the inspector regarding the testing, manufacture or importation of a substance that creates air pollution. Where damage to the environment or death or harm to persons results from either intentional or reckless activity, s. 115 provides that a fine or iinprisonment for up to five years or both may be imposed. Furthermore, where death or harm to persons results from this activity, sections 203 and 204 of the *Criminal Code* are applicable. Of the three Acts, *C.E.P.A.* is the most likely to have the widest application, since CFCs are embraced in the definition of "air contaminant" without the enactment of specific regulations dealing with CFC manufacture, importation and use.

In Ontario, the Provincial government has authority to regulate air pollution under the *Environmental Protection Act*.[87] The polluter may be subject to a control order or a stop order if the pollution is of the type within the scope of the Act. It is likely that specific regulations dealing with CFCs would have to be passed in order to make this Act applicable to the ozone problem.

In general, constitutional questions on the separation of powers have generally favoured the corporate litigant. For example, in both leading cases, *Inter-Provincial Co-operatives* v. *R.*[88] and *Dan Fowler* v. *R.*,[89] legislation was ruled *ultra vires* the provincial and federal jurisdictions respectively.[90] In *Inter-Provincial*, the *Fisherman's Assistance and Polluters' Liability Act*[91] was held *ultra vires* the Manitoba legislature on the ground that the statute encroached on the exclusive federal jurisdiction to regulate in the area of pollution of interprov-

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[87]R.S.O. 1980, c. 141.

[88](1975), [1976] 1 S.C.R. 477, 53 D.L.R. (3d) 321, [hereinafter *Inter-Provincial*].

[89][1980] 2 S.C.R. 213, 113 D.L.R. (3d) 513 [hereinafter *Dan Fowler*].

[90]*Inter-Provincial, supra*, note 83 follows a long line of authority stemming from the rule in *Phillips* v. *Eyre* (1870) L.R. 6 Q.B. 1 [hereinafter *Phillips*].

[91]R.S.M. 1970, c. 32.

incial rivers. Similarly, in *Dan Fowler*, s. 33(3) of the *Fisheries Act*[92] was held *ultra vires* the federal parliament as an overbroad attempt to regulate sea coast and inland fisheries, thereby encroaching on provincial powers granted by the Constitution.

Finally, where environmental regulation is achieved by negotiation between the government and industry, as is likely for CFC emissions, the corporate polluter may attempt to undermine the force of the legislation by moving to stay prosecutorial proceedings as being an abuse of process. In *Re Abitibi Paper and R.*[93] such a motion was granted when the Minister of the Environment initiated proceedings against Abitibi despite correspondence confirming negotiations and an implied promise not to prosecute. Furthermore, where the polluter can show they were acting pursuant to a negotiated order, the defence of statutory authority may be available despite the contravention of an environmental statute.

2. Shareholder Actions

Shareholders have already attempted to impose a social conscience on corporate management[94] by purchasing enough shares to initiate a shareholder proposal requiring that the directors act in a socially responsible manner. These attempts have failed in Canada, largely because the Business Judgment Rule gives directors great latitude in acting to protect the corporation from potential harm, whether the harm originates either from within or from outside the corporation.[95] It has also been suggested that shareholders can influence corporate policy by gaining enough control over the shares to select the directors.[96] This approach seems impractical in relation to the ozone problem, however, since most CFC manufacturers are widely held multinational corporations. It is unlikely that any group would gain sufficient control to challenge the corporate executives.

3. Statutory Duties of Canadian Corporate Directors

Corporate management may also argue that it has an actual duty *not* to be environmentally conscious. Since the Canadian legal community has restricted the scope of corporate goals to profit maximization, directors of companies in Canada who engage in pollution abatement activities may find themselves subject to shareholder sanctions for breach of their duty to the corporation. There are four general duties imposed on directors of corporations: the standard duty

[92]R.S.C. 1970, c. F-14.
[93](1979), 24 O.R. (2d) 742, , 99 D.L.R. (3d) 333, (C.A.).
[94]Leavell, *supra*, note 74 at 622.
[95]Linsley, *supra*, note 74 at 527.
[96]*Supra*, note 93 at 624.

of care, a fiduciary duty, a duty to disclose their interest in the corporation's transactions, and a duty not to engage in insider trading. The first two are of relevance here. The *Canadian Business Corporations Act*[97] outlines them in section 122:

> 122(1) Every director and officer of a corporation in exercising his powers and discharging his duties shall, (a) act honestly and in good faith with a view to the best interests of the corporation; and (b) exercise the care, diligence and skill that a reasonably prudent person would exercise in comparable circumstances.[98]

Under s. 122(1)(b), the standard of care to which directors are held is extremely low, generally requiring gross negligence or mismanagement. It could be argued that the directors may be in breach of the duty of care by engaging in pollution abatement activities.[99]

Environmentally conscious directors may escape liability by bringing themselves within the Business Judgment Rule. According to the rule, if directors are acting with what they consider to be reasonable prudence, the court will not attach liability merely on the basis of bad business judgment.[100] A director who is environmentally conscious may also be able to argue that pollution abatement is, in fact, consistent with his or her duty of care. This argument is premised on the understanding that capital assets may not be the only source of profit to a corporation. Public image also may have a substantial effect on share price.[101] This results from two factors. First, shareholder confidence is lost when industry continually operates under the threat of prosecution for environmental damage. Under these conditions there is greater incentive to invest in environmentally "friendly" businesses. Second, when consumers perceive that a product is made by a particularly environmentally damaging process, they may not purchase it, thereby reducing sales and driving down the share price. Consequently, activities that are socially appropriate and in the public good, such as pollution control, may increase share price. In *Kamin* v. *American Express Co.*,[102] for example, it was held that business strategies designed solely to keep the share price up by issuing dividends to disguise a capital loss, thereby maintaining a good public image, were within the Business Judgement Rule and thus not a breach of the duty of care.

This type of analysis will generally only work for corporations that are close to the consumer market where consumers' willingness to pay will reflect public desire to deal with environmentally conscious manufacturers.

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[97]R.S.C. 1985, c. C-44 as am S.C. 1988, c.2 [hereinafter *C.B.C.A.*].

[98]*Business Corporations Act, 1982*, S.O. 1982, c. 4 [hereinafter *O.B.C.A.*] contains similar provisions in section 134.

[99]Linsley, *supra*, note 74 at 527.

[100]*Ibid.*

[101]*Re Royal Trustco Ltd. (No. 3)* (1981), 14 B.L.R. 307 (Ont. S.C.).

[102]86 Misc. 2d 809, 383 N.Y.S. 2d 807 (App. Div. 1976).

Corporations who distribute to other corporations are not as immediately affected by this public image value, a problem which is characteristic of the CFC market. CFC manufacturers for the most part supply to secondary industries and not to the consumer directly.

The directors' fiduciary duty to the corporation (s. 122(1)(a) of the *C.B.C.A.*) is held to a much higher standard, and this standard generally requires that the directors act in a fashion that maximizes profit. If instituting costly programs to effect pollution abatement deviates from this principle of profit maximization, the directors may be found in breach of their fiduciary duty. A "complainant" then may bring a derivative action under s. 239 of the *C.B.C.A.* or s. 245 of the *O.B.C.A.* on behalf of the corporation.

The tendency of corporate directors to engage the corporation in polluting and pay the resulting fines as an ongoing cost of business is not inconsistent with this duty. In fact both statutory and common law has supported this position. In *Day and Ross Ltd* v. *R.*[103] it was held that fines for overweight trucks on logging roads were tax deductible since they were unavoidable and could be classified as an ongoing cost of business. Fines are tax deductible under the *Income Tax Act*[104] if:

> the incurrence of fines or penalties is a normal risk of carrying on business even though reasonable care is exercised in avoiding them, the imposition of such fines or penalties is inevitable and beyond the control of the taxpayer and his employees.[105]

The whole concept of tax deductions for these abuses of the environment is consistent with an argument based on economic efficiency, since it is efficient to pay a cheap fine if the continuation of the activity results in net profit. This practice, however, runs counter to any long term concern with our environmental well-being.

There are some indications that environmental inroads are being made to the profit-maximization paradigm. First, even judicial discretion has its bounds, and the severity of environmental crimes (in the public eye) are such that the courts are unlikely to condone this type of activity beyond a certain "forgiveable" level. They will certainly not do so when the crime is of sufficient "moral turpitude" to disqualify a tax deduction.[106]

Furthermore, new higher fines under a variety of environment protection statutes, notably the federal statutes discussed earlier, may no longer make the "ongoing cost of business" approach an economically viable one. There are

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[103][1976] C.T.C. 707, [1976] D.T.C. 6433 (F.C.T.D.).
[104]S.C. 1988, c. 55.
[105]Revenue Canada, *Interpretation Bulletin IT-104R* (5 June 1978) s. 14(a).
[106]*Ibid.* s. 14(b).

examples in the common law to support this proposition. The best interests of the corporation on occasion have been held to include the duty to avoid tax penalties.[107] It also might be argued that the director of a corporation is similarly under a fiduciary duty to avoid penalties incurred by infringement of applicable environmental laws. At the very least, the cost of a minimum level of pollution abatement is likely to be calculated in the corporate balance sheets. Moreover, in situations where corporations are flagrantly and repeatedly disobeying the law, the court also has the sanction of contempt of court. This sanction is powerful and severe, and may subject the director(s) to imprisonment for breach of a court order.[108]

Finally, recent judicial responses indicate that the scope of a director's fiduciary duty may include at least some degree of corporate community responsibility. In *Teck Corporation Ltd* v. *Millar*,[109] Berger, J. noted:

> A classical theory that once was unchallengeable must yield to the facts of modern life...if the directors were to consider the consequences to the community of any policy that the company intended to pursue, and were deflected in their commitment to that policy as a result, it could not be said that they had not considered *bona fide* the interests of the shareholders.[110]

While *Teck* provides some hope that the common law will shield "good" corporate directors from shareholder sanction, it is a far cry from the imposition of a corporate social responsibility to actively engage in pollution abatement activities. Mr Millar may not be representative of the majority of corporate directors who, paid on the basis of profit, are not concerned with community welfare.[111] If we are all self-interested value maximizers, as Coase tells us we are[112], then there is little incentive for directors to embark on a stringent course of environmental pollution abatement in the absence of strict statutory standards that compel him or her to do so.

III. Existing National and International Legislation for the Protection of the Ozone Layer

A. Existing Canadian and U.S. Legislation

In recognition of the threat to the ozone layer by CFC pollution, a variety of nations have regulated CFC emissions. Nevertheless, it would appear that existing legislation may not be sufficient to deal with this problem. In addition

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[107]*Smith v. Atlantic Properties Inc.* 12 Mass. 201, 422 N.E. 2d 798 (Sup. ct. 1981).

[108]*R.* v. *Jetco Manufacturing Ltd* (1985), 1 C.E.L.R. (N.S.) 79 (Ont. H.C.).

[109](1973), 33 D.L.R. (3d) 288, [1973] 2 W.W.R. 385 (B.C.S.C.) [hereinafter *Teck*].

[110]*Ibid.* at 314.

[111]J. Howard, "Takeover Battles and the Business Judgment Rule: Recent American Case Law Development" (1986) 11 Can. Bus. L.J. 445.

[112]R.H. Coase, "The Problem of Social Cost" (1960) 3 J. L. & Econ. 1.

to the difficulties with ensuring compliance under current international law, the current North American domestic legislative process may not be responsive enough to provide a timely solution, despite the establishment of CFC regulations.

In the international community, Canada has to date played a model role in regulating CFC emission controls. In June 1975, the *Report of the Atmospheric Environment Services Advisory Committee on Stratospheric Pollution* concurred with the findings of the Molina and Rowland research. Based on this report, the Canadian government pursued a regulatory and co-operative approach to restrict CFC emissions.[113] In 1976, industry voluntarily agreed to reduce CFC emissions by 50%. This goal was met in 1977.[114] In December 1976, the government also announced that the CFCs in non-essential aerosol products would be restricted. At the time, these uses constituted 70% of the CFC market in Canada. These restrictions were instituted under the authority of the *Environmental Contaminants Act*. Under s. 14(1) of the *Act*, the Governor in Council on the recommendation of the Minister of Health and Welfare was given the power to regulate:

> a substance that is entering or is likely to enter the environment in a quantity or concentration under conditions that may constitute a danger to human health or the environment.

The U.S. government has similarly banned non-essential uses of CFCs. In May 1977, the Environmental Protection Agency (EPA), the Food and Drug Agency (FDA) and the Consumer Product Safety Council (CPSC) jointly issued proposed regulations prohibiting the manufacture, processing and import of CFCs for use in most aerosol products. These regulations came into force in late 1978 under the authority of the *Toxic Substances Control Act*.[115] In the second phase of the CFC effort, the government enacted legislation directly addressing ozone depletion in the *Clean Air Act Amendment of 1977*. The *Amendment* enables the Administrator of the EPA to carry out research and provides authority to protect the ozone layer by regulating CFCs as substances. It also provides for the regulation of processes and activities connected with uses of CFCs that could affect the stratosphere.[116]

Since the *Montreal Protocol*, new CFC regulations have been proposed at the federal, provincial and municipal levels of government in Canada (see *infra* at section IV).

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[113]Government and industry have worked closely on the regulation of fluorocarbons. Negotiations were greatly simplified by the fact that there are only two CFC manufacturing industries in Canada. See *supra*, note 7, at 104.

[114]E.B. Weiss, "A Resource Management Approach to Carbon Dioxide During the Century of Transition", in *World Climate Change*, *supra*, note 27 at 184.

[115]15 U.S.C. sec. 2601 (1976).

[116]*Clean Air Act Amendment of 1977*, 126, 42 U.S.C. sec. 7401 (1978).

B. Chronology of the International Response to Ozone Depletion

In response to Molina and Rowland's 1974 paper, the United Nations Environmental Programme (UNEP) held an international meeting in 1977. At this meeting, most European countries officially recognized that aerosols containing CFCs were harmful to the ozone layer.[117] Based on recommendations from the European Economic Community (EEC) and the Organisation for Economic Co-operation and Development (OECD), UNEP established the Co-ordinating Committee on the Ozone Layer and adopted the World Plan of Action on the Ozone Layer. This plan provided the impetus for international discussion on the protection of the ozone layer. After lengthy negotiations from 1981 to 1985, the *Vienna Convention for the Protection of the Ozone Layer*[118] was signed by 22 countries in 1985. Few countries have, to this date ratified the Vienna Convention. Canada was the first to ratify the treaty in June of 1986, with the United States following suit in August of 1986.[119] To date, of the 28 nations that sigued, only 10 nations have ratified the Vienna Convention.[120]

At least 20 countries must ratify an international convention before it becomes international law.[121] However, in the case of the *Vienna Convention*, the major stumbling block has been the protocol for reduction at the national level.[122] Even as late as June 22, 1987, the United States House of Representatives recommended that in the development of such a protocol for CFC reductions, no time frames or schedules should be specified thus allowing maximum flexibility for the President in negotiating with the international community.[123]

The development of an international protocol was especially problematic because of the lack of agreement between the US and the EEC. European nations in the EEC can shift production between factories in different countries to keep the national average in accordance with the terms of the treaty. Consequently the US demanded that Europe be treated as a bloc to prevent this

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[117]*Supra*, note 7 at 41.

[118] U.N. Doc. UNEP/IG.53/5 (1985). Reprinted in (1987) 26 I.L.M. 1529.

[119]The Canadian response is outlined in Conservation and Protection Commercial Chemicals Branch, "Historical Perspective and Lead-up to the Montreal Protocol" (Ottawa: Environment Canada). The U.S. responded with the enactment of s. 126 of the *Clean Air Act Amendment*, *supra*, note 115.

[120]Conservation and Protection Commercial Chemicals Branch, "Control Measures: Canada — A Key Player in International Protection of the Ozone Layer" (Ottawa: Environment Canada).

[121]*Supra*, note 83 at 121, 137.

[122]R.E. Benedick, "Address" in C. Saboo, ed., *International Cooperation to Protect the Ozone Layer* (Washington: U.S. Dept. of State, Bureau of Public Affairs, 1986) Current Policy No. 808.

[123]*House Comm. on Energy and Commerce, Report by J.D. Dingell on the Vienna Convention for the Protection of the Ozone Layer* H.R. Rep. No. 106, 100th Cong., 1st Sess., 363-12 (1987).

and eventually Europe consented.[124] The way was open finally for the development of a protocol.

On September 8, 1987, UNEP offered the *Montreal Protocol on Substances that Deplete the Ozone Layer* for signature.[125] On Sept. 16, 1987 over 40 of the 62 nations in attendance adopted the protocol. The USSR was the only major CFC producing nation not to sign the treaty.[126] Terms of the agreement include:

> (1) A freeze of CFCs at 1986 levels starting July 1, 1989, a 20% reduction from July 1, 1993 and a 50% reduction of atmospheric releases of CFCs by July 1, 1998;
> (2) A freeze at 1986 levels in the release of halons, and other chemical compounds with ozone-depleting properties, starting in 1992;
> (3) Provision of developing nations with CFCs for vital uses such as refrigeration, until alternatives are available;
> (4) Provision for co-operation among nations regarding information sharing and research on the ozone layer;
> (5) Provision for trade sanctions against countries who are not a party to the Protocol and nations who try to undermine the force of the Protocol;
> (6) Incentives for government/industry co-operation in developing alternatives to CFCs.

The *Montreal Protocol* deals with all fully halogenated CFCs that are of commercial significance. However, this historic treaty has yet to be ratified by the 43 signatory nations. Even if the treaty is ratified within a reasonably short time frame, there remain severe problems with both the effectiveness of the treaty's terms and the enforcement of those terms under current international law.

Firstly, the treaty is not binding on States that choose not to ratify it. Furthermore, there is no mechanism that compels States to adopt the *Montreal Protocol*. Even if a State does ratify it, enforcement of the terms is problematic. Under international law no cause of action lies if the offence complained of is legal in the offending nation's sovereign law. This rule, in existence for over 100 years, is most clearly stated in *Phillips*:

> As a general rule, in order to found a suit in England for a wrong alleged to have been committed abroad, two conditions must be fulfilled. First, the wrong must be of such a character that it would have been actionable if committed in England...Secondly, the act must not have been justifiable by the law of the place where it was done.[127]

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[124]M. Keating, "Pact Calls for 50% Cut in Harmful Chemicals That Erode Ozone Layer" *The [Toronto] Globe and Mail* (16 September 1987) A1.

[125]*Montreal Protocol, supra*, note 6.

[126]I. Block, "Diplomats Sign Global Treaty on Ozone Layer" *The [Montreal] Gazette* (17 September, 1987) A3.

[127]*Phillips, supra*, note 90 at 28-29.

This rule continues to be good law, and has been applied in Canada, both between Canada and other nations[128] as well as between Provinces.[129]

The *Montreal Protocol* also expressly recognizes that ozone-destroying CFCs should be made available to developing nations. This provision, while attempting to guard against withholding of vital technology from developing nations, seriously weakens the effectiveness of the treaty. Furthermore, this provision shields developing nations from liability by authorizing use of these chemicals in certain jurisdictions.

There are also problems with the sanctions available for breach of the terms of the *Montreal Protocol*. If the political position in South Africa is any example, trade sanctions are unlikely to provide an effective safeguard against non-compliance. Moreover, developed States that ratify the *Montreal Protocol* and subsequently breach the conditions may only be acted against with their consent. Underlying the whole problem of achieving a satisfactory international solution to global environmental problems, such as ozone depletion, is the issue of state recognition. States must recognize one another to warrant mutually binding obligations. Thus, recognition is crucial to establishing liability for environmental injuries. However, within this definition of recognition is an understanding that 'recognised' States are sovereign equals and thus may not be legally bound against their will, as discussed in *Luther* v. *Sagor*:[130]

> This immunity follows from recognition as a sovereign State... . But it is impossible to recognise a government and yet claim to exercise jurisdiction over its person or property against its will.[131]

Since 1982 there has been no state immunity for commercial activity in Canada.[132] Other jurisdictions have similar laws.[133] Environmental concerns, however, generally do not come under this category, and are therefore internationally actionable only at the consent of the injuring State. Finally, there is at present, no international body in existence to ensure compliance with the terms of the treaty.[134]

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[128]*C.A.P.A.C.* v. *International Good Music, Inc.*, [1963] S.C.R. 136, 40 C.P.R. 1, 37 D.L.R. (2d) 1.

[129]*Canadian National Steamships Co.* v. *Watson*, [1939] 1 S.C.R. 11, 64 B.R. 1, [1939] 1 D.L.R. 273.

[130][1921] 1 K.B. 456, rev'd [1921] 3 K.B. 532 (C.A.).

[131]*Ibid.* at 556, Scrutton, L.J.

[132]*State Immunity Act*, S.C. 1982, c. 95.

[133]See *State Immunity Act* (U.K.), 1978, c. 33; *Foreign Sovereign Immunities Act of 1976*, 28 U.S.C. sec. 1602 (1982).

[134]G. Wetstone & A. Rosencranz, "Transboundary Air Pollution: the Search for an Interuational Response" (1984) 8 Harv. Env. L. Rev. 89. Recently, the establishment of an international pollution agency to police the environment was proposed. This agency would fall under the auspices of the United Nations. There has been no interuational agreement on the proposal to date. See J. Gray, "Mulroney Set to Sign Environmental Pact" *The [Toronto] Globe and Mail* (11 March 1989) A8

C. *Industry Response to the Montreal Protocol*

The *Montreal Protocol* calls for a freeze of CFC emissions at 1986 levels, a 50% reduction by 1999, and the development of alternatives to ozone-depleting CFCs.[135] Industry sales of CFCs internationally are in excess of $750 million and support secondary industries which produce $27 billion in goods and services. Consequently, it is not surprising that CFC manufacturers would reject this invasion into such a lucrative market. In Canada, Du Pont has opposed further regulation of CFCs on the ground that unilateral Canadian action would reduce CFC emissions by an insignificant amount.[136] American industry has reacted more strongly.[137] To take one example, while openly commending the signing of the convention,[138] the Chemical Manufacturers Association has expressed several concerns with the particular terms.[139] Industry claims that the *Montreal Protocol* will result in increased prices for air conditioners and refrigerators and loss of business for foam-insulator contractors. Further, it argues that years of testing will be required to develop safe alternative compounds. The Canadian Manufacturing Association maintains that the total cost of replacing or adapting CFC products will be $6 billion.

These claims are only partly true. First, in the U.S., 30% of current CFC emissions result from leakage of CFCs during servicing or scrapping of refrigeration and air conditioning equipment. Improvements in this area would have a marked effect in reducing CFC emissions with little economic cost. Second, costs for equipment using CFCs will not increase significantly. Third, alternate technologies and compounds currently exist. These strategies[140] for reducing CFC emissions are outlined in further detail below.

Another strategy would be to use ozone safe CFCs (those that are Cl free and that contain H). There are CFCs existing that could replace CF-11 and CF-12; the most promising of these are CF-22, CF-123, CF-134a and CF-142b.[141] These compounds are not restricted by the *Montreal Protocol* in

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and J. Gray, "PM Faces a Tough Job Selling Thatcher on World Pollution Agency" *The [Toronto] Globe and Mail* (13 March 1989) A3.

[135]*Montreal Protocol*, *supra*, note 6.

[136]*Supra*, note 7 at 53.

[137]E.D. Lee, "Pending Treaty Worries Chlorofluorocarbon Industry" *Wall Street Journal* (15 September 1987) 6.

[138]Alliance For Responsible CFC Policy, Release, "CFC Alliance Commends Signing of Global CFC Accord" (16 September 1987).

[139]K.J. Fay, "Statement" (Address to the United Nations Environment Programme Conference of Plenipotentiaries For the Protocol on Chlorofluorocarbons, 14 September 1987).

[140]*Supra*, note 14 at 16.

[141]F. Barnaby, "Refrigerants and The Ozone Layer" (1988) 17 Ambio 354; Conservation and Protection Commercial Chemicals Branch, "Alternatives to CFCs: Chemicals, Products, Services and Technologies" (Ottawa: Environment Canada).

recognition of the fact that they are substantially more ozone safe than CF-11 and CF-12. While these new compounds are good refrigerants, they are five to ten times more expensive to produce. However, if borne by the consumer, this would translate into a cost of only a few dollars.[142] As an example, Rowland argues that currently only about 50 cents worth of CFCs are used in a refrigerator compression system. This would then escalate to $5 worth of refrigerant with the safe CFCs, an additional cost that is minor compared to the total cost of the refrigerator.[143] Currently, at least one of the five major manufacturers is developing alternative CFCs (Allied-Signal) and two already have commercially available products to replace CF-12 (Du Pont and Pennwalt).[144]

Du Pont and Pennwalt have both released press statements to the effect that they will no longer continue to produce CFCs. These statements are misleading, however, and are good examples of poor information transfer. The statement by Du Pont calls for "an orderly transition to the total phaseout of fully halogenated chlorofluorocarbon production."[145] This does not mean that these two manufacturers are immediately discontinuing all CFC production, merely that they are phasing it out, and replacing these CFCs with more hydrogenated (more reactive and thus less ozone damaging) CFCs. This move is certainly to be applauded. However, it is crucial that the time frame for such a transition be sufficiently rapid to avert significant destruction of the ozone layer.

Finally, for many consumer goods, CFC-containing aerosols can be replaced by alternate goods, such as pump dispensers, hydrocarbon propellants, or deodorant sticks.[146] In addition, alternate products and services for refrigeration and foaming agents also exist, but these are generally more expensive to produce or less efficient for the particular purpose.[147] Furthermore, secondary industries that use CFCs in their products are generally in favour of adopting alternative safe technologies, provided their competitors do the same. The food packaging industry, for example, has agreed to switch to CF-22 for use in polystyrene cups, cartons and packaging by the end of 1988. Similarly, the foam manufacturers industries have agreed to discontinue use of ozone destroying CFCs. In contrast, the electronics industry, where CFCs are used to clean semi-

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[142]*Supra*, note 14 at 18.

[143]*Ozone Depletion*, *supra*, note 17 (statement of S. Rowland).

[144]See P. Lush, "Du Pont Announces Two Alternatives to Ozone-Depleting Compounds", *The [Toronto] Globe and Mail* (6 March 1989) B5; Penwalt Chemicals, News Release, "Refrigerant is Now Available as Alternative to Ozone Depleting CFCs" (1988).

[145]G. Darst, "Only One Other U.S. Chemical Company Joins du Pont in Planning End to CFCs", *The [Toronto] Globe and Mail* (11 April 1988) B12; see also *infra*, note 152.

[146]*Supra*, note 12 at 19.

[147]Also note that fiberglass insulation can be used instead of polyurethane foam and deodorant sticks or pump delivery systems can be used in preference to aerosols.

conductor chips, is resisting reduced CFC use because of the lack of adequate alternative cleaners.[148]

D. Scientific, Environmentalist and Public Responses to the Montreal Protocol

Many scientists believe that the *Montreal Protocol* will be ineffective in remedying the destruction of the ozone layer. At present, ozone-destroying CFCs are being introduced into the stratosphere at a rate five times faster than that at which they are naturally degraded.[149] A freeze at 1986 levels and a subsequent 50% cut in emissions by 1999 will still lead to a net accumulation of CFCs in the stratosphere. Dr. J. Farman estimates that in order for CFC levels in the stratosphere to remain constant, CFC emissions must be cut to 15% of their current level.[150]

Furthermore, research conducted since the *Montreal Protocol* has called into question the adequacy of the models of ozone loss on which the treaty was based. The new data indicate that there is now a definite ozone hole developing over the Arctic as well as the Antarctic, that CFCs are causally linked to ozone loss and that the extent of the loss is greater than was previously thought. Perhaps the most succinct statement of the situation has been made by the US Environmental Protection Agency: "Regretfully our new analysis predicts an even worse scenario than anticipated."[151]

The EPA release called for an end to all CFC use. Similarly, Environment Canada has stated that CFC emissions must be reduced by 85% in order that the Antarctic and Arctic ozone holes disappear.[152]

Two Canadian environmental groups have released statements charging that the terms of the *Montreal Protocol* are too weak to be effective. Friends of the Earth claim that Canada has been too willing to compromise on stringent environmental standards in order to reach an international agreement.[153] The

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[148]"Restocking the Fridge — Learning to Live Without CFCs" *The Economist* (29 October 1988) 90.

[149]J. Farman, "What Hope for the Ozone Layer Now?" *New Scientist* (12 November 1987) 50 at 54.

[150]*Ibid.*

[151]"Threat to Ozone More Serious Than Thought, Agency Warns" *The [Toronto] Globe and Mail* (27 September 1988) A10.

[152]D. Downey, "End Ozone Damage, Chemical Makers Told" *The [Toronto] Globe and Mail* (1 December 1988) A8.

[153]M. Keating, "Ozone Pact too Weak, Environmentalist Says" *The [Toronto] Globe and Mail* (14 September 1987) A8 and M. Keating, "International Pact Near Completion on Curbing Ozone-Killing Chemicals" *The [Toronto] Globe and Mail* (15 September 1987) A8.

Canadian Wildlife Federation concurs with this, adding that a reduction will be insufficient and that Canada should ban all CFC uses.[154]

The public also appears to be skeptical of the *Protocol*'s effectiveness. There is a feeling that the delay in reaching an international agreement, along with the extended time frame allowed for the implementation of reduction programs, has undermined the effectiveness of the *Protocol*'s remedies.[155] Given that predictions based on 1974 levels would result in 15% ozone reduction within one century and that CFC emissions at the 1986 level have increased significantly, it is clear that public concern is well founded. Furthermore, the public is understandably wary of the potential for industry compliance with the terms of the treaty, given industry's track record for prolonged negotiations on other environmental issues.[156] This does appear to be a valid concern; one example, *McKie* v. *K.V.P. CO. Ltd*,[157] will suffice to make the point. Despite successful litigation to enjoin a pulp and paper mill from discharging effluent in 1948, the defendant, with the help of intervening Provincial legislation, is today still polluting the Espanola river.[158]

IV. Implementation of the *Montreal Protocol*

A. Economics and Political Decision Making as Obstacles

Given the market failure in the regulation of CFC emissions, the enactment of public law as a means of protecting human health seems both necessary and justified.[159] A question remains, however, as to what form of Canadian legislation should be enacted to ensure compliance with the terms of the *Montreal Protocol*. The new proposed legislation dealing with CFC regulation is outlined below in section *IV.B*. This section of the paper illustrates some of the potential dilemmas with which a legislative solution would have to cope.

Only a handful of manufacturers produce ozone depleting CFCs. Consequently, it is efficient to aim regulatory CFC legislation at this small group rather than consumers. Several suggestions, including environmental audits, establishment of emissions guidelines and criminalization of deviant cor-

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[154]Canadian Wildlife Federation, Communiqué, "Canada Should Ban All CFCs" (9 September 1987).

[155]J.G. Speth, "Ozone Layer's Smoking Gun", *Toronto Star* (10 April 1988) B6; see also "The Ozone Shield" *The [Toronto] Globe and Mail* (17 September 1987) A6.

[156]P. MacLean, "Protecting The Ozone Layer" *The [Toronto] Globe and Mail* (29 September 1987) A6. The example given in this article was the Pulp and Paper Liquid Effluent Regulations, passed in 1971, and still under negotiation in 1987.

[157](1948), [1949] S.C.R. 698, [1948] O.R. 398, [1948] O.W.N. 812.

[158]J. Robinson, "9 Charges of Polluting Dismissed by Judge" *The [Toronto] Globe and Mail* (4 February 1988) A14.

[159]M.J. Horwitz, "The History of the Public/Private Distinction" (1982) 130 U. Pa. L. Rev. 1423.

porate activities have been forwarded.[160] Whatever the form of the regulatory legislation adopted, it is certain that industry will have significant input into the political process. Indeed, Kernahagn Webb's report for the Law Reform Commission of Canada[161] outlines the willingness of the government to negotiate exceptions to existing regulatory schemes on the basis that the industry in question, because of its age, does not possess the "Best Available Technology."

Industry has had a very powerful influence on the standards and time frames set for CFC regulation thus far. The power of these industrial lobbyists is even greater when one considers that only 20 major corporations world-wide are responsible for more than 99% of total CFC production.[162] Industry exerts an unduly powerful influence over political decision making. Given the reality of the political process, Ison argues that the economic strength of corporations substantially skews the democratic use of accountable political power towards industry:

> To a large extent, power lies in the hands of those who control a few multi-national conglomerate oligopolies. This corporate power in relation to the political process and public administration is assured by the scale of modern production, finance

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[160]H.J. Glasbeek, "Why Corporate Deviance is Not Treated as a Crime — The Need to Make 'Profits' a Dirty Word" (1984) 22 Osgoode Hall L.J. 393; see also L.H. Leigh, "The Criminal Liability of Corporations and Other Groups" (1977) 9 Ottawa L. Rev. 247.

[161]*Pollution Control in Canada: The Regulatory Approach in the 1980s* (Hull: Ministry of Supply and Services, 1983).

[162]*Supra*, note 12 at 151. The major companies involved in the production and distribution of CFCs throughout the non-communist world are:

Akzo Chemie N.V. (Holland)
Allied Chemical Corporation (USA)
Asahi Glass Co., Ltd. (Japan)
Australian Fluorine Chemical Pty., Ltd (Australia)
Daikin Kogyo Co., Ltd. (Japan)
E.I. du Pont of Canada Ltd. (Canada)
Du Pont of Canada Ltd. (Canada)
Fabwerke Hoechst AG (West Germany)
Imperial Chemical Industries Ltd. (England)
I.S.C. Chemicals (England)
Kaiser Aluminum and Chemical Corp. (USA)
Kali-Chemie Aktiengesellschaft (West Germany)
Mitsui Fluorochemicals Co., Ltd. (Japan)
Montedison S.P.A. (Italy)
Penwalt (USA)
Racon Inc. (USA)
Rhone-Poulenc Industrie (France)
ShowaDenko, K.K. (Japan)
Ugine Kuhlmann, Produits Chimiques (France)
Union Carbide (USA)

> and marketing, creating as it does an inevitable coincidence between economic and political power.[163]

The tragic result of this industry influence is that the public law has also failed as an effective mechanism to correct market failure. The importance of economics in political decision-making relating to ozone depletion is highlighted by the number of reports published on the economic significance of CFC regulation.[164] This emphasis on economics has pervaded international policy making bodies. The United Nations Environment Programme considered the economic implications of a possible ban on fluorocarbons.[165] They outlined two types of controls:

> (1) controls setting a limit on the amount of waste released and requiring industry to bear the costs of these controls (cost internalization);
> (2) fiscal incentives by way of (a) tax credits for reductions in emissions, or (b) subsidies for firms using less pollution intensive techniques.

The *Montreal Protocol* adopted the first type of control system.

In general there is unlikely to be domestic legislative action if a significant economic disadvantage to industry will result, unless a clear public health issue is identified.[166] Legislation of this sort often requires a form of risk analysis based on a cost/benefit consideration.[167] The U.S. government has treated the ozone problem in terms of risk assessment and risk management requiring a cost/benefit analysis to develop the most efficient approach to regulating CFC use.[168] For example, the U.S. National Academy of Sciences Decision Making Report on fluorocarbon regulation states:

> Suppose that continued use of an aerosol propellant is judged to have a probability of 0.001 of causing a significant depletion of the ozone layer...[The] consequences are valued as a social loss of approximately $1 trillion. Thus, the expected value of the loss from continued use of the chemical is $1 billion [0.001 times $1 trillion]. The expected economic loss if the chemical were banned is estimated to be $10 billion. Based on a criterion of maximizing expected value, the continued use alternative appears preferable.[169]

Clearly economic analyses such as this do not take into account a variety of factors which cannot adequately be valued. Particularly problematic is the

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[163]T.G. Ison, "The Sovereignty of the Judiciary" (1985) 10 Adelaide L. Rev. 1 at 13-14.

[164]For a listing of papers on the economic importance of CFC regulation see *supra*, note 7 at 46-50.

[165]*Supra*, note 12 at 143.

[166]*Supra*, note 7 at 27.

[167]B. Fischoff *et al.*, *Acceptable Risk* (Cambridge: Cambridge University Press, 1981); Canadian Environmental Assessment Research Council, *Risk Management and EIA: Research Needs and Opportunities* by A.P. Grima *et al.* (Hull: Ministry of Suppply and Services, 1986).

[168]*Ozone Depletion, supra*, note 17 at 199 (statement of L.M. Thomas, Administrator, U.S. Environmental Protection Agency).

[169]*Supra*, note 7 at 32.

weight given in the cost/benefit equation to the estimate of the probability of severe ozone depletion. Clearly this estimate is an approximate prediction. The accuracy of this prediction may vary over several orders of magnitude, reflecting the uncertainty attached to complex stratospheric CFC chemistry. Furthermore, this estimate of risk does not take into account the public perception of risk.[170] However, there is indication that some legislators have accurately assessed the magnitude of the potential environmental damage:

> Many decision makers might feel that because of the enormousness of the possible consequences, the decision should be to ban aerosols. Even though the expected value is small, we "cannot afford the risk."[171]

Economic impact studies form an important aspect of the legislative decision-making process. In Canada, between 1979 and 1985, a socio-economic impact assessment was required prior to government actions that would result in the loss of any employment or more than $10 million in revenue over 1 year (or $30 million in 10 years). These have been abandoned in favour of Regulatory Impact Analysis Statements which, although less detailed, still require a cost/benefit analysis of the proposed legislation.[172]

B. Developments Since the Montreal Protocol

Recently, Canadian initiatives at the federal, provincial and municipal levels concerning CFC manufacture and use have been announced. At the municipal level, the City of Toronto has enacted a by-law banning Toronto businesses from using ozone destroying CFCs in manufacturing.[173]

On February 16, 1989, Ontario Environment Minister James Bradley announced an amendment to the Ontario *Environment Protection Act*, designed to eliminate CFC production by 1998.[174] The time frame for such elimination is quite rigid and has been contested by industry.

The federal government, on Feb. 20, 1989, announced similar plans requiring an 85% reduction in CFCs by 1999, rather than the 50% reduction called for

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[170]A. Whyte & I. Burton, "Perception of Risks in Canada" in I. Burton, C.D. Fowler & R.S. McCullough, eds, *Living with Risk: Environmental Risk Management in Canada* (Toronto: Univ. of Toronto, Institute for Environmental Studies, 1982) 39.

[171]*Supra*, note 7 at 181.

[172]J.M. Evans *et al.*, *Administrative Law Cases, Texts and Materials*, 3d ed. (Toronto: Emond Montgomery, 1989) 237.

[173]R. MacLeod, "City Board of Health Endorses Ban on Anti-Ozone Chemicals" *The [Toronto] Globe and Mail* (12 January 1989) A17.

[174]C. McInnes, "Products Damaging Thinning Ozone Layer Facing Ban in Ontario" *The [Toronto] Globe and Mail* (17 February 1989) A1.

by the *Montreal Protocol.*[175] This is likely to be enacted under *C.E.P.A.* as well as under the *Environmental Contaminants Act.*

There has also been international action to exceed the requirements of the *Montreal Protocol.* The European Community has agreed to a pact, signed March 2, 1989, eliminating CFC production and consumption completely by the year 2000, with an 85% reduction to be imposed as soon as possible. This pact is significant since the European Community produces 40% of the total global CFC output. In addition, in March 1989, Britain, formerly a key opponent to CFC regulation, as noted above, organized a 100 nation conference on the ozone layer to persuade developing nations, such as India and China, who are major CFC producers, to sign the *Montreal Protocol.*[176]

C. Solutions that Result in Effective Pollution Regulation

The solution to the ozone problem despite initial industry objection, has turned out to be an easy one for industry to swallow. There are alternative ozone safe CFCs that perform the same function and yet do not significantly affect the price of consumer goods containing these substances. However, it should be pointed out that the market failure in CFC use has been corrected not by forces within the market itself but by legislative intervention internationally and in Canada, at provincial and federal levels. Furthermore, this legislative action was taken 15 years after the environmental problem was first identified, and then only when the problem was of great proportions. It is submitted here that the following suggestions would rectify market failure in CFC use more rapidly.

First, there is a need for the creation of financial or legal incentives to encourage industry to independently reduce and eliminate unsafe pollutants, such as CFC emissions, before they become a problem. The framework for such incentives is already in place, at least in some areas of the law. For example, Class 27 of the *Income Tax Act*, Regulation 1100(1)(t)(i), Schedule II permits fast write-offs for pollution control devices, thereby creating a tax-motivated incentive to be environmentally conscious. Other ideas include a system of environmental audits and a pay-as-you-go system for taxing industry by the pollution unit: the greater the CFC emissions, the more the manufacturer must pay.[177]

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[175]R. Howard, "Ottawa to Step Up Elimination of Ozone-Depleting Chemicals" *The [Toronto] Globe and Mail* (21 February 1989) A1.

[176]*Thatcher, supra*, note 34.

[177]R. Cotton & L. Nicholls, "Environmental Audits: Role of Legal Counsel and Soliciter Client Privilege" and H.D. Goodfellow, "Hazardous Waste Audits: Management Implementation and Reporting" in Canadian Institute, *Hazardous Waste: Strategies for Efficient Waste Management and Liability Avoidance* C1 and D1.

Second, in order to rectify market failure with respect to environmental damage, there must be enhanced information transfer from the manufacturer to the consumer. Improved public awareness can be effected by a variety of educational mechanisms; most effective are media exposure, public education and marking requirements for CFC-containing products. In addition, advertising campaigns must be regulated to the extent that creation of social preferences for environmentally hazardous goods is discouraged. Furthermore, opportunities for greater public participation in industry/government negotiations regarding acceptable CFC emissions regulations must be provided.

Third, existing legal doctrines must be expanded or revised to eliminate the imbalance between the environmental and the industrial litigant. The structure of such legislation is already in place in some jurisdictions. For example, the *Michigan Environmental Protection Act of 1970*[178] removes most of the barriers to environmental litigation. Rather than the traditional restrictive rules for standing in class actions, under this Act anyone has standing. Furthermore, the burden of proof shifts to the industrial defendant to adduce evidence that there has been no environmental damage. The court has the power to appoint independent scientific advisors to overcome any expertise problems. The court also has the power to change any standard that it finds deficient. This undermines industry's power to obtain government compromises on environmental standards by excluding the public from the negotiations.

Fourth, a legal duty should be imposed on corporations to be socially responsible for their manufacturing activities. This duty would include the obligation to test new products and processes extensively for their environmental impact. The duty would also require industry to fully disclose any information regarding the potential environmental hazard of any product or process. Furthermore, such a duty would make it obligatory for industry to operate in a preventative rather than *post hoc* fashion, thereby eliminating the practices of confusing the public and circumventing environmental protection in the name of profit maximization.

Conclusion

To conclude, the weight of scientific evidence gathered over the last 15 years suggests that the ozone depletion problem is very real. Despite this data, there has been no effort until recently to tackle the problem. To a large extent, the reason for the delayed response to this pressing environmental problem was market failure in the controlled use of CFCs. Several factors were responsible for this market failure. Inadequate consumer information and lack of bargaining power in the market place and in the political arena preclude the use of judicial review to effect a satisfactory solution for the public good. Furthermore,

[178]Mich. Comp. Laws sec. 691.1201 (1970).

because of the inherent tie between economics and politics, governments are unduly influenced by corporate policy. Moreover, in Canada, there is no independent sense of corporate responsibility that operates to compel corporations to act with a view towards environmental protection in the absence of a regulatory scheme. Rather, the reality is that environmentally conscious directors are likely to be subject to shareholder sanctions for engaging in pollution abatement activities above the bare legal minimum if these activities conflict with the profit maximization paradigm.

Timely action to reduce CFC emissions is crucial to prevent further stratospheric damage, which is almost certain to be irreversible. To date, there has been a reasonably large degree of international response dedicated to the protection of the ozone layer, culminating in the *Montreal Protocol.* However, implementation of the terms of the treaty are not likely to be sufficient to be effective. In recognition of this, there has been both international and national action to impose regulatory schemes that exceed the terms of the *Montreal Protocol.* Hopefully these schemes will provide adequate protection for as important a global resource as the ozone layer.