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From Air Pollution to Acid Rain: Dilution and the Myth of 'Away'

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ABSTRACT

Industrial societies have always faced serious "waste disposal problems" and their political identification typically constitutes theperceptionoflimitations in the earth's capacity to "safely assimilate" this waste. The policy-response has been the concept and practice of "dilution": a systematic and concerted attempt to "enlarge" the globe's carrying capacity so as to "postpone" those limits. Dilution rests on the assumption that human-industrial-waste canbepushedinto a form or place where it is "rendered harmless"; it rests on the myth of "away". Dilution is anexpressionof society's preference to minimize its pollutioncontrolactivities, anactwhichentails reducing the perceived needs of the environment to their minimum, and then further compromising them still. It is a means of maximizing the valued (but polluting) social production activities, and so strong is the philosophy of "minimum necessary control/maximum permissable concentration" that even future-planning tools such as environmental impact assessments cannot escape its grip and divert us from its precarious course. Dilution also has a cognitive dimension: so strong is our desire toignoreourwasteproducts, and so strong is our refusal to accept limitations, that many contemporary industrial waste problems are diagnosed as originating "out there" in the non-human world. The concept of "acid rain" (whichhasbeen completely misunderstood to date) is an excellent example of the reification and mystification of industrial waste. When placed in itswiderhistorical context, "acid rain" encapsulates the dilemmas which characterize contemporary environmental problem-posing and the tensions to reconcile the increasing evidence thatthereifno "away", despite our hopes and wishes to thecontrary.

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I -INTRODUCTION AND CONCEPTUAL FRAMEWORK

Amongst the diverse literaturewhich tries to explain the perceived failure of environmental policy in Canada and the United States there appears tobea general consensus that policy efforts have produced "tough" legislation which is not enforced, resulting in no compliance and continually postponed deadlines. Without embarking upon a thorough review of this literature, severaldcminantthmes are worth noting to place the present study in its wider context. Schrecker (1984) argues forcefully that polluters, as the favoured and more powerful interest? group, have greater access to the decision-making and appeals processes, ensuring that their interests are maintained. Within this context other writers go on to stress thatlegislationis often ambiguous and contradictory and leaves too much discretion to agency staff. The result is fragmented and inconsistent policies whichunderutilize existing powers (Estrin and Swaigen 1974; Estrin 1975; Schrecker 1984). Many economists argue that within a context of differential power, regulatory strategies based on voluntary compliance fail to provide industry with enough incentives to stop polluting. They advocate "making the polluter pay" through the use of "emission charges" (Freeman and Haveman 1972; Freeman 1980; Dewees 1980a, 1980b). And finally, writers like Davies (1970) and Ross and Wolman (1970) argue that governmenthas notbeenwilling to spend themneynecessary to ensure compliance. The main emphasis in all of this literaure is the policy-making process, the relative power of the interest groups and the failure to met stated goals.

While many of these observations are important for an understanding of environmental policy, this essay hopes to contribute to the literature, and ultimately the policy-making process itself, by focusingon alargelyneglectedaspect of environmental policy: problem conceptualization. Rather than focusing simply onpolicy-outputs and problem-solving, I alsowanttoexamine the rootguestions

which guide policy-makers: the act of problem-posing. The solution to any problem is only as valuable as the questions asked. These questions, as with every aspect of problem-posing, presupposevalue judgements and choices on thepartof those who pose the problem; "environmental problems" cannot be taken at face value.

David V.J. Bell has argued that any conception of "political problems" must consider the "political identification of the problem, efforts to diagnose it, and policy responses to it." He has proposed the concept of the "political culture of problem-posing" as a conceptual tool for the study of public problems:

> **Political culture** constitutes a cognitive and evaluative filter that shapes our perception of problems: how we understand and **interpret** them; how we assign importance to then; andhowwe perceive solutions to them. (Bell 1981, p. 125, 113)[1]

I will refer to this cognitive and evaluative filter as the "policy culture" of problem-posing.[2]

The concept of a "policy culture of problem-posing" refers more to "influence" than "cause and effect" (Bell 1983, p. 5). It is a set of parameters which constrainand impinge upon possible interpretations of problems, restricting or reducing policy options. As an (often) unconscious ordering of reality, any given policycultureprovidesways ofbothactingandnotactig, of seeingandnot seeing, operating as a biaswhich favours certainavenues and discourages others. In its crudest terms, a policy culture can be understoodas the gamut of predispositions toward defining the "reality" of problems in a manner that is not disruptive to the status quo.

Problem conceptualization, in all its phases, is a political act. The meanings assigned to events in the political arena are not "given" responses to objective conditions.[3] By their very nature, public problems are subject to a plurality of meanings and therefore a plurality of solutions.[4] The political identification of a "problem" also implies the violation of an existing state of affairs: it

presupposes a state of "normality", a contrast between a "reality" and an "ideal" (Bell 1981, p. 115; Cotgrove 1982, p. 32). The way in which any particular problem is conceptualized will reflect this "valued state", and it is in the policy-makers' attempts to restore order thatthequestions andneedswhichguide the pmcessarehighlyreflectiveof thebroadercontextinwhichthey appear.

The emphasis on problem-posing (as opposed to mere problem-solving) is an attempttoplace theoverallprocess initswiderculturalandhistorical context. The aim is to demonstrate that many of the failures in environmental policy, past and present, can be attributed (or related back) to the way in which the problems were conceptualized in their earliest stages; that policy-makers have yet to achieve adequate solutions to environmental problems because they have yet to pose adequatequestions. Or rather, that the societywhichtheyare tryingtomanage has not "allowed" them to pose the right questions.

The discussion will be oriented, at least in part, to the environmental impact assessment (EIA) process, although it will go much deeper than EIA's per se. Environmental impact assessment's are part of a broader tradition of "environmental impact science": the documentation of human impacts upon the physical environment with the intent of aiding policy-makers in the formulation of objectives and strategies. The main objective is to determine environmental quality criteria with respect to thevarious contaminants and policy-makers look to manage society's activities within the parameters specified. All environmental impact science serves a predictive, guiding function. In those cases where the violation has already occured (the majority of cases), the data serve to document "environmental impact in retrospect" (or "environmental impact as it is occuring"). This is the earliest form of environmental impact science in a policy context and provides the backbone of all subsequent efforts to utilize impact data.

The same environmental quality criteria also inform "environmental impact forecasting". An excellent example is the Air Pollution Index, a tool introduced in the early 1970's to predict "air pollution episodes" and thereby provide the opportunity to prevent the episode from occuring.

"Environmental impact assessments" proper are an application or utilization of these environmntal quality criteria with a future orientation. The basic premise is that if social developments are planned, if environmental impacts are considered in the design of a project, many environmental problems can be eliminated, at least with respect to the project in guestion. Past problems, it is argued, have resulted from poor planning; future developments will be guided by foresight.[5]

While the idea of future-planning is obviously worthwhile, any form of planning is only as good as the social objectives which guide it. This essay hopes to demonstrate thatthelogicwhichguides environmental problem-posing in Canada is so deeply embedded, and so faulty at its core, that any attempt at "rational planning" which employs this logic, even if executed to its own terms of perfection, will not and cannot overcome many of the pollution problems suffered to date. The problem, it will be argued, lies not in the absence of planning (although this is part of it), but instead on the social objectives which govern the process. These objectives often receive their best expression in the generic (and more developed) environmntal impact science and the determination of environmental quality criteria. In this respect, an analysis of these basic criteria and how they are generated will prove instructive of the value, and possibilities, of EIA's as a planning tool.

A central task for environmntal policy-makers is to "balance" social and environmental "needs" (which are often seen to exist in conflict). The method used

is a form of cost-benefit analysis (CBA), which entails an assessment of the costs and benefits associated with a particular problem and the costs and benefits of various pollution abatement strategies. The process sees the conversion of all estimates into common (monetary) terms and the explicitgoalis to determine and implement the course of actionwhichwill result in theoptimum net perceived benefit to society, often expressed as the most "efficient" allocation of resources, both monetary and "natural".[6] My purpose here is not to criticize CBA as a method. I assume, for the sake of argument, that societies will always have to make decisions based on subjectivevalue judgements and make trade-offs in relation to the perceived interest, whether expressed in monetary terms or otherwise. The concern lies with the values and principles which govern contemporary CBA's relation to environmental problems. Cost-benefit analyses are simply a mans to an end, so the question must be: What is the optimal situation or order which policy-makers seek to maintain or restore in the face of anamolous circumstances? In what ways do CBA's reflect the broader context in which environmental and social needs aredefined and brought to bear?

Neither environmental nor socialneeds exist in an objective, unequivocable state. They are socialandhistoricalexpressions and subsequently subject to conflicting interpretations and change. Although seldomly expressed as such, the specification of environmental quality criteria is an indentification of "environmental needs". To say, for example, that concentration 'X' of a given contaminant has notable effects on a particular plant species, is also to say that this plant species needs or requires an environment free from, or lower than, concentration 'X'. Social interpretations of such needs are obviously critical in devising environmental policy.

"Social needs" do not receive concrete expression in environmental quality criteria, but they weigh upon the process heavily. Under the assumption that

"...the basic objective of society is to enhance the welfare of its citizens...' (United Nations 1983, p. 18) the paramount concept in the analysis of environmental costs andbenefitsis thesocialneed, the maximization of "social benefits". Although seldomly defined explicitly, the practicing definitions of "social need" and "social benefits" are a function of the quantity of material consumption, which in turn is a function of social production as a whole, as measured by the Gross National Product (GNP). The GNP is seen as a measure of "progress" and the well-being of the economy (i.e. growth) appears to be the overriding concern of governments and citizens alike. In short, theprovisioningof ahighguantityof material goods is the matrix of "well-being" in Canadian society.,

Canadian society is also more than a "growth-oriented" society. It takes the particular form of centralized, large-scale, energy-intensive production methods. This necessarily results in another "social need", albeit an undesireable one: the production (and consumption) of vast quantities of waste material. By necessity, high production/consumption societies are high-polluting societies. It is impossible to have one without the other.[8]

This matter contains the seedofa further "social need": the need for waste disposal facilities. This is one of the "resource-functions" of the environment: to provide a storehouse forhmanwastes. This is what the non-human environment means to citizens in advanced industrial societies and describes how it is utilized daily in such a society's efforts to practice its high-volume, energy-intensive lifestyle.[9]

These three social needs are inseparable. The more successfully Canadian society satisfies its endless material wants, the more waste material it produces and the greater is the need for waste disposal. This matter is critical for understanding the character of many environmental problems and thedesignationof environmental quality criteria.

William Catton (1980, p. 273) has described modern societies as "The Culture of Exuberance": "a culture founded upon the myth of limitlessness." This notion of limitlessness accurately describes andunderlies thematerialpursuitswhich characterize Canadian life and the traditional perception of the earth's capacity to support this order. Catton's description is important for understanding the context of contemporary environmental politics: the "environmental crisis" of the 1960's was the political identification of limits, in the environment and (implicitly) in human capacities. These circumstances were expressed in the central them of environmental politics at that time: "The Limits to Growth".,,[10] The perceived violation of limits in the physical environment signalled a potential crisis for the Cultureof Exuberance, a situation which Catton referred to as "overshoot". Just as the air and water pollution crises signalled that the environment did not have unlimitedcapacity toabsorbhumanwastes, the energy crisis of a few years later testifiedto similar limitations in theearth's capacitytiprovide endlessmaterial resources. The violations of these limits, in both cases, was precipitated by a standardand style of living that was overtaxing the earth's carrying capacity. It was this circumstance which gave rise to a need to define the environment's limits.

This circumstance was critical for the social and environmental needs "balance" which ensued. The identification of limits after the fact meant that these limits were or would be preventing Canadian society from doing what it had been doing: the non-human environment appeared as a hinderance to "human development". The two sides were thus cast into an oppositional, antagonistic context, a zero-sum equation, whereby social gains would represent environmental losses, and vice versa, meeting environmental needs would entail sacrificing human heeds. Environmental policy attempts to reconcile this conflict between: 1) the perception of physical

limits and the need to control society's actions to staywithin those limits, and2) the perceived social imperative tocontinue (andexpand) the very activities which threaten those limits.[11] The extent to which policy-makers had to "do something", then, was adirectfunctionof the proximity of those limits, the extent to which theperceivedneedsof the environment were pressing (or had been surpassed). Policy-makers thus hadavestedinterest (however unconscious) to interpret the environment's needs such that they were minimized; the greater the extent to which the perceived carrying capacity of the environment could be "enlarged", the lesser theextenttowhichthevalued social needswouldhaveto be compromised.

The result of this response to perceived limits was the "dilution paradigm", which functions as a mans of "postponing" those limits. It is an attempt to achieve "the best of both worlds": unlimited "social development" with "acceptable" environmental quality. This is the framework which guides thebalancingof environmental oosts and benefits. In practice it is a predisposition toward reducing the environment to its "basic" needs as a mans of facilitating the maximum material social gain. This is the broader framework within which environmental quality criteria are generated, whether theyarederived from studying "environmental impact in retrospect" or will be guiding forward-looking "environmental impact assessments".

The body of this paper will explore how these predispositions have manifested themselves with respect to modern air pollution policy. Two major issues will be explored: urban "air pollution", which was a prevalent policy-issue in the late 1960's and early 1970's (and still exists as a distinct policy-problem today), and the more recent "acid rain" problem which emerged in the mid-1970's. "Air pollution" was (and is) amtterof the "ambient concentration" of airborne "contaminants", emitted primarily from industrial sources and automobiles, mainly in urban areas,

and the primary concernwas for human health. "Acid rain" represents the long-rangetransport of air pollution and is mainly centered around the acidification of outlying, non-urban areas, primarily lakes and forests. A comparison of these two issues is essential for understanding the historical development of air pollution policy in Canada, and the study period, spanning 30 years and two "different" issues, allows for extrapolation of future trends in the politics of air pollution, as well as other environmental problems.

II - THE DILUTION PARADIGM AND AIR POLLUTION

Governments of Canada address environmental hazards through the "dilution paradigm".[12] With respect to air contaminants the foundational principles were well articulated by the mid-1950% (if not sooner) and remain firmly in place today with respect to acid rain. While air pollution policy within the paradigm is most commonly associated with the physical practice of dispersing pollutants so as to "dilute" them, its roots go much deeper. The basic premise is reflected in the definition of the problem itself: "air pollution" describes conditions in which the concentration of "air contaminants" exceed "tolerable" levels at the "valued" "point of impingement".[13] In this respect, the paradigm could rightfully be called the "concentration paradigm": diluting pollutants is a means of reducing their ambient concentration.

Working from this definition, the policy process beginswith perceived effects. Policy-makers address the results of pollution, after the fact.[14] This coincides with the present burden of proof laws, which place the onus on the complainant to prove both causation and harm. This orientation also makes the location and technique of problem-measurement critical variables in the determination of a "pollution problem".

The focus on the results of pollution also places meteorology in a central role. Thebehaviourof the contaminants after they are emitted, their "problem-potential", is determined by weather conditions and other non-human factors, such as topography. The dilutionparadigmis essentially a meteorological paradigm.

This definition of air pollution rests on the principle of a threshold (concentrations belowagivenpointare "acceptable") and contains the important assumption that, while all contaminants are potentially harmful (if they are "party" to the excessive concentration), not all contaminants contribute to such a state.[15]

-d finally, the dilution paradigm treats pollution problems as a component of "environmental and resource management".[16] The atmosphere's capacity for "self-cleansing" is an integral part of resource utilization and problems are seen to result from their "careless use" (Canada 1986a, p. 1). Policies seek to allocate and utilize this resource more "efficiently" (United Nations 1983, p. 1).

Based on these foundational principles, conceptualizing air pollution within the paradigm consists of four interrelated steps: 1) determining "valued" points of impingement; 2) determining "tolerable" concentrations; 3) determining the cause and effect relations between emission sources and perceived effects; and 4) determining the best means of controlling for concentration at the valued point of impingement. Each of these steps will be examined in tum for both air pollution and acid rain. The aim is to demonstrate that dilution is basically an "out of sight/out of mind" approach to environmental problems; at each step of problem conceptualization policy-makers specify the criteria under which certain ccmtaminants are "rendered harmless", and with each reduction in the number of "suspect contaminants", the proportion which are apparently diluted increases. In practice it entails relegating contaminants outside of the problem-scenario, either by dispersing them, ignoring them, or re-defining their problem-potential. In short, dilution is based on the myth of "away": the assumption that contaminants can be pushed into a place or form which renders them unproblematic.

Determining "Valued" Points of Impingement

The determination of "undesirable" effects is based initially on the relative valuation of that which is being effected, the "point of impingement". The ruling criteria in this judgement are narrowly humanistic and economistic in nature. The overriding concem is with human health and well-being, and then there are the perceived economic costs of pollution; whether or not a perceived effect to a non-human entity is classified as a "problem" depends on the economic "value"

of that entity. These priorities are expressed in Ontario's Environmental Protection Act, which focuses on "discomfort to persons", "loss of enjoyment of normal use of property", "normal conduct of business", "damage to property" and "injury to plant and animal life" (Estrin and Swaigen 1974, p. 45-6). These were the key issues surrounding the initial investigation of air contaminants and key justification for government intervention.[17] This anthropocentric and instrumentalist perspective reflects a strong current of contemporary industrial culture which views the earth "exclusively as a support system for human wants" (Leiss 1976, p. 39)[18], and is the first instance in which broader cultural values "crop" what is potentially problematic with respect to air contaminants.

Determining "Tolerable" Concentrations

Accepting for the moment this human division of the globe into valued and (by implication) valueless areas or components, what, then, is a "tolerable" concentration? What do the ambient air criteria reflect? In practice, "tolerable" is operationalized as the maximum tolerable concentration, sometimes referred to as "maximum permissable concentration". The matter was stated succinctly at the 1967 Ontario Pollution Control Conference:

> Control does not mean complete elimination any more than good water mans sterile distilled water. Thus, before any consideration can be given to the 'what', 'how' and 'timing' of control, it must first be decided for each pollutant what maximum amount, or rather maximum concentration, can be present in the atmosphere above which any increase in concentrations is undesirable." (Ontario 1967, p.83)[19]

The policy function of "maximum permissable concentration" can be understood in terms of its important corollary "minimum necessary control", the (often unstated) rule of thumb in environmental policy. Both concepts stem from the cost-benefit principle of "efficient resource allocation" and appear

in two contexts: first, as a general principle of economic rationality, irrespective of a particular pollution problem, and second, as aruleof thumb indefining minimal levels of abatement in those instances where a pollution problem has been identified.

This first context is critical because it does not normally receive explicit recognition, and as a "resource-principle" it receives its best expression in the work of Goodin (1976, p.176):

> The reason men pollute is tocutcosts, and from a socialpointof view it is positively undesirable to curtail cost-saving pollution that the environment would itself remove. Nature's self-cleaning mechanisms are natural resources which are continuously renewed, so it would be wasteful to fail to takeadvantageof them. The goal of environmental protection policy, then, is toguarantee that:
> 1) the natural capacity for environmental self-renewal is fully utilized:
> 2) polluting beyond nature's capacity for assimilation reflects a balancingof social harms against gains; and
> 3) pollution is ceased where the social interest does not justify it.[20]

Much more will be said about "nature's self-cleaning mehanisms" shortly. This passage is critical because it illustrates the logic of polluting to maximum "permissable" levels prior to the formal weighing of the costs and benefits of polluting beyond these levels. Although Canadian policy-makers do not explicitly abide by this formulation in such stark terms, their approach falls within the same broad conceptual framework. This passage also indicates that, in the case of environmental impact assessments, the utilization of the air as a natural resource to its maximum appears as a given, unstated premise.[21]

The second context in which minimum necessary control guides the determination of acceptable concentrations is in those instances when the environment's "natural capacity for self-renewal" has been fully utilized, and it is only now that"air pollution" proper enters into the picture. Contaminants emitted up to this point were "freely" disposed of. The pressure to minimize reductions is especially strong when problem are identified after the fact because control represents

an infringement upon society's current affairs. Some form of reduction of concentrations, however, is necessary at the time of identification, so policy-makers look to minimize them as a means of continuing the valued waste-producing activities to the greatest extent possible.

It is at this stage that cost-benefit analysis is formally applied. Teller (1967, p. 1082) has written:

> For most pollutants, the question is not how to control air pollution, but rather how much to control it. Pollutants like fly ash can be controlled to the 99.9 percentile, but is this necessary? One must ask this question because air pollution abatement is not free.

The costs of control increase exponentially with the degree of control, such that a 100 percent increase in expenditure, for example, may only result in a 10 percent increase in abatement. Within this framework, "the objective is to select the level of abatement that minimizes the total cost to society." Seeking out the "optimal" (minimal) level of abatement ensures that "the resources of society are being allocated efficiently" (p. 1080).

Similarly, Dales (1968, p.7-8) has argued that:

> It is only when the harm done by disposing of a particular waste in a particular way exceeds the benefits associated with the practice that a pollution problem exists.

Society cannot avoid paying for waste disposal, so the task is to ensure that costs are minimized. Within this framework, according to Dales, "some pollution is a good thing"'

> to the extent that we prefer to suffer the welfare damages caused by pollution rather than suffer them ney costs of preventing them. . ..The questions are always: 'How much?', and 'At what cost?'. (p. 15)

Minimum necessary control as a rule of thumb is succinctly united with the tensions to reconcile social and environmental needs in the 1967 Conference's Opening Address:

> Pollution of our environment is a by-product of human activity and we cannot eliminate it entirely. We can reduce it to a greater or lesser extent depending on what we are willing or able to pay. For example,

> a factory may be able to produce the goods we need very cheaply but it may create, as a result, gross air or water pollution. Alternatively, we may reduce thepollution to thepointof being negligible but we may face an increase in the price of goods beyond what we can afford to pay. Obviously, these are extremes and neither is thebestsolution. What we need is a solution somewhere between the extremes which will provide us with the goods we need, at a price we can afford, while creatingmmrepollution than we are prepared to tolerate. (Ontario 1967, p. 3)

"Tolerability", then, is simply a function of what we "need" and can "afford".

The principle of minimum necessary control, then, has two dimensions: society should not control emissions which are not contributing to perceived effects, nor should it control those which are any more thannecessary. These ewnomic pressures are an important determinant of what is considered "acceptable". Clearly the "social optimum" is paramount, not the "environmental optimum". The costs which are weighed against the benefits are both expressions of perceived social interests, based upon what we need and can afford. My concern lies less with where the level of "tolerability" is actually drawn and more with the existence of a social context which exhibits strong predispositions toward minimizing and then further compromising the perceived needs of the environment, its minimal functional requirements, in favour of the narrowly defined social interest.

Determining Cause and Effect

Recalling that each and every contaminant is potentially problematic, but that not all contaminants achieve such a state, policy-makers must determine which of the potential mission sources are responsible for the perceived effects. This causal link is vital, first, to establish that human sources are responsible (more important with acid rain), and second, to specify which particular missions account for what degree of the problem.

The pollution-formation or -prevention process describes the manner in which certain contaminants exceed or are prevented from exceeding "tolerable" levels.

In its simplest terms, the relative concentration of contaminants is a function of two broad and diverse factors: 1) the emissions factor, which is the level or volume of contaminants released into the atmosphere from both human and non-human sources, and; 2) the dispersion factor, which comprises the meteorological and topographical variables which influence the movement and behaviour of contaminants after they have been emitted.[22]

The formation of air pollution is thus a function of the "fate" of the contaminants after they are titted: the relatimship between emission sources and points of impingement is mediated by non-human (mainly meteorological) variables. When formulating emissions standards this dispersion factor is vital:

> When consideringorevaluating emissions from a given industrial stack, how then, can these ambient air criteria be applied? What relationship exists between the specific emissions of a given stack and the ambient air quality in the neighbourhood? Theconcentrationofmntaminants, once they leave the stack, becmedilutedordispersed. Thedegree or rate of dispersion will depend on local meteorological conditions and topography. Knowing the local meteorology and topography one can estimate, to a practical degree, thedownwindmncentrationtobe expected under varying conditions using different formulae. Thus, if an industry is located in a valley where air movement is restricted, it would have to control its emissions to a greater degree thanifit were located on an open plain with good ventilation. Or again, under normal atmospheric conditions, pollutants emitted to the atmosphere will disperse quite readily, but when temperature inversions are experienced, the concentration of pollutants builds up. The frequency, intensity and duration of inversions thus affects greatly what the atmosphere can safely absorb. Meteorological and topographical considerations thus dictate downwind concentrations. (Ontario 1967, p. 84)[23]

It is in this respect that the dilution paradigm is, inessence, a meteorological paradigm-24 The role of dispersion in formulating control strategies will be discussedbelow. For the moment I amconcernedwiththe implications of this (and similar) formulations of the origins or causes of air pollution.

The importance of problem-diagnosis cannot be underestimated. The political identification of a problem, especially when labeled a "crisis", signals the need for remedial action.What is to be changed, the extent to which it must be

changed, and how it is to occur are closely related to the location of "causal responsibility", which "...is a matter of belief or cognition, an assertion about the sequence that factually accounts for the existence of the problem" (Gusfield 1981, p. 13). The concept of causal responsibility has a dual significance. On the one hand, any givencausalexplanationfixes certain variables as amenable to changeandothers as unamenable. Similarly, whereas one causal explanation my signify the need for radicalstructuralchange in society, anothermayonlycallfor minimal reform within the confines of the present institutional order. On the other hand, theamenabilityofparticular forms of change inagiven society influences the parameters of problem diagnosis. In other words, theunderstandings and priorities found within a given policy culture will favour certain causal explanationsand disfavour or rule out others. In this way, diagnosis fixes, and is a reflection of, the favoured locus of remedial action, the hinges upon which control efforts will swing.

In the diagnosis of air pollution, the post-emission factors are critical. A 1973 Environment Canada document describes the formation of air pollution problems as follows:

> Whether [undesirable] mncentrations occur, orwhether the atmosphere's self-cleaning machinery can disperse and diffuse the contaminants, depends on a host of [meteorological and other] factors...
>
> Under normal conditions theatmsphereoperatesits own conveyor belt for pollution. . ..During temperature inversions, the conveyor belt jams. . ..Gases and other pollutants build up at ground level.(Canada 1973a, p. 24, 27. Emphasis added)

The next example expresses clearly the reliance upon "nature's cleansing services" as well as the antagonistic "friend or foe" relationship which ensues:

> The atmosphere is a highly volatile and fickle receiving stream. It changes by the hour. Itismuchmre complex to understand and utilize than is a river as a receiving stream for liquid waste. The weather is both our friend and enemy Perhaps, most of the time, mother nature does a reasonable job of providing ventilation to carry away

> air contaminants. On theotherhand, there are times at any location when theweather stagnates and, for allpracticalpurposes, the air contaminants stay right where we put them in the air. Suchacondition is called an inversion. ...Even withsome degree of ventilation, there are wind and weather conditions which move contaminants fromlarge source areas across great distances where they are returned to ground level in sufficient concentration to have an adverse effect. The plume carrying the contaminants may very well fumigate an area having a clusterofpopulationoranarea supporting agricultural activities. As the clusters of population become more numerous and expand. ..distance and weather become less of an ally.
>
> Forallpacticalpurposeswe can't control the weather. Our only option at this time is with respect to the control at the source of air contaminant emissions. (Ontario 1967, p. 10. See also Ontario 1973b, p. 2. Emphasis added)

Note that pollution occurs under "adverse weather conditions", when the "conveyor belt" jams, acting to contain pollutants, or as a result of "certain wind and weather conditions" whicheventually fumigateareas beyond the emission source. Conversely, human emissions are not problematic if "mother nature does a reasonable job of providing ventilation to carry away pollutants". Thus, as "both our friend and enemy" is is the weather which either "creates" a pollution problem or "prevents" it from occuring. The problem-potential of a contaminant, and therefore human missions-related behavior, is dependent upon the uncontrollable and unpredictable air currents.

The fixation of causal responsibility is typically referred to as the "attribution" process, and the diagnosis of air pollution can be described with the concept of "external attribution": the process of assigning blame outside of the social order. An opposite conception, which would assign blame within the social order, could be considered "internal attribution".[25] In a political context attribution can be understood in terms of "scapegoating". Catton (1980), for example, has noted that environmental problems are often attributed to abstract forces, such as "inflation", or, as in the case of the energy crisis, to"Arab Blackmail".[26] These could be considered variations of external attribution. This internal/external

conception is necessary tocapture the dichotomous human/non-human featureof environmental politics and is closely related to the economic imperatives of minimum necessary control.The predisposition is to focus on "atmospheric limitations" rather thanexcessivehmandmands, choosing to ignore human sources and contributions and focus instead on post-emission behavior and "dilution". In this way thehumnactivitieswhichunderly the process escape critical appraisal; blame for the problem is conveniently assigned elsewhere. Many of the further, and even more interesting, implications of this attribution process will become evident in relation to acid rain.

Controlling For Ambient Air Concentration

It was stated above that the relative concentrationof air contaminants is a function of the emissions and dispersion factors. Each of these factors figure into the pollution-prevention equation in a different way. Of the emissions factor, only the human sources can be directly controlled. Post-emission behavior of the contaminants, the dispersion factor, cannot be controlleddirectly,butcanbe utilized so as to promote dispersion. In its simplest terms, then, a reduction of concentrations can be achieved in one of two ways: either the human emissions canbereducedat the source through, for example, better control technology or lower production rates: or by prcmting dispersion through, for example, increasing emission stack height or locating emission sources ingeographic areas favourable to dispersion. The former strategy would represent "internal control", while the latterwuldbe "external control". (This should be interpreted parallel to the concepts of "internal" and "external" attribution).

Historically, air pollution policy in Canada (and virtually everywhere else) has favoured external over internal strategies. The choice of dispersion over reduction at the source is a clear expression of minimum necessary control in

practice; dispersing contaminants is a more cost-effective way of reducing concentrations than emission reductions. And, as a passage quoted above indicated (page 18), even dispersion is a last resort, our "only option" because "we can't control the weather...at this time."[27] (One can only speculate in horror how policy-makers would have proceeded had they thoughtsuchweather control was even remotely possible).

"Control at the source" in this context does not refer to "reduction at the source". It refers simply to the utilization of post-emission conditions to promote dispersion. Air pollution "control" has been, since its infancy, a meteorological problem in almost every respect, and therefore never "control" as such. Inpractice it is no more than the fine artofmeteomlogicalpredictionregarding the relationshipbetween emissions and valued points of impingement; the basic aim is to try and employ the winds to divert contaminants away frcmthemeasuring instruments. In this way dispersion lends itself to the illusion that the environment's carrying capacity has been enlarged. Also, to the extent that pollution is diagnosed as resulting fmn particular weather conditions, control "naturally" entails the better use of these conditions.[28]

Ontario's Air Pollution Index (API), which functions as an Air Pollution Alert System, is an excellent example of dispersion and meteorological prediction under the guise of "pollution control".[29] When the Index reaches the "advisory level", and when adverse weather conditions are expected to continue for at least six hours, pollution sources in the area my be advised to curtail operations. If readings progress to the "first alert" level, the Minister can order a curtailment of polluting operations until a six hour weather forecast reads favourably. The atmospheric factor is paramount:

> The most practical advantage of the... Index is that, by tying it to presumed healtheffects, the province has givenitselfa tool with which it can control the emissions of utilities and industries at times when the Index is elevated, which is to say, when the ventilation of the city is inadequate. (Ontario 1973, p. 27. Emphasis added)

The Index, then, is simply a measure of "ventilation" and indicates when production is to be curtailed in anticipation of the next light wind (six hours on the horizon), at which time it can be increased to previously acceptable (dispersed) levels.

The economic rationales behind the use of such "warning systems" are neatly outlined by Teller (1967, p. 1090), who considers such "forecasting" or "selective abatement" economically worthwhile, first,

> . ..because it recognizes that acute air pollution episodes occur sporadically and can be predicted. Second, the degree of abatement reflects the situation at the moment. If the situation worsens, a greater amount of abatement can be used.

This approach mans that polluters do not have to use their control equipment at all times and can therefore "invest more economically in control equipment" (p. 1093). Selective abatement, then, allows policy-makers to maintain air quality standards while keeping the costs of control to a minimum.

One important shortcoming of the Index is that it only measures two of the many contaminants present.[30] The government's response to this criticism is that the Index is simply that, an index:

> . ..SO_2 and suspended particulate concentrations together give a very good idea of theextenttowhich all pollutants are accumulating or being dispersed. In other words, the air pollution index is a measure of the efficiency of ventilation in an area. (Ontario 1973, p. 27)

In practice this reasoning is contradicted. The Ministry keeps an "API calling list", which is "...a record of all pollution sources [in Toronto] emitting at least 3,000 pounds of either SO_2 or [suspended particulate matter] a week" (Ontario n.d.a, p. 14).

When the Index is elevated it is only these operations which are notified. Such action, directedatthe contaminantsbeingmeasured, should lower the Index, even if "adverse" weather conditions continue. However, no action is taken to reduce other contaminants which are no more able to "escape" the inversion. In other words, efforts to reduce pollution are directed at lowering the Index, not the overall problem it is said to represent. To effectively use the API as a "real" index would require curtailing automobile use during "adverse" weather conditions. Significantly, the automobile is not a major contributor of either of the two contaminants which serve as indices.

Another popular dispersion-oriented "control" strategy is the use of taller[31] emission stacks. Research on proper stack design to encourage dispersion was conducted extensively in the 1960's and the practice has been applied widely.[32] The logic behind the taller stacks is fairly simple and reflects the urban characterof the valued points of impingement during this stageofairpollution politics.[33] The objectives of the ambient air quality program required the maximum dispersion of contaminants away from urban areas, and the taller stacks aided considerably in the task. On several occassions Inco has argued that their new stackandrelatedmeasures:

> ...have done exactly what they were supposed to do: that is, improve the air quality in the Sudbury area by reducing ground level concentrations of sulphur dioxide and particulates. (Inco 1982, p.7)[34]

In this respect the "first-order consequence" of the taller stacks was positive: contaminants were moved away from the problem indicator. As to the eventual deposition of the dispersed contaminants and the "second-order consequences", I leave this for the discussion of acid rain.[35]

The practice was criticized from the outset, mainly on the charge that dispersed contaminants would not be "renderedharmless" as was apparently assumed,

and would merely transfer the problem further afield (Hall 1973, p.26). In response, the Ministry acknowledged that dispersing contaminants was no substitute for the reduction of emissions at the sourceanddefended thepolicyas an "interim measure":

> We think that [the Inco stack] . . .will assist, particularly when there are inversion conditions, in dispersing pollutants. . . .It is an interim measure and, of course, the ultimate goal is removal of the pollutants at the source.[36]

At the 1967 Pollution Control Conference tall stacks werecitedas a "stop-gap" measure (Ontario 1967, p.238).

Other strategies closely related to the taller stackssurmund the location of emission sources in areas with "good ventilation", or the burning of high sulphur coal on days with "favourable wind conditions".[37] All of these dispersion strategies are an expression of the deep-seated "need" for minimal necessary control. To the extentthat dispersion lessens the need to install costly control technologies it presents itself as the most "rational" choice.[38]

Internal, reduction-oriented strategies have been implemented, although never more than #necessary to alleviate the perceived problem, if that. While significant reductions can be attributed to these policies (on a source-by-source basis), mainly through conversions to "cleaner" fuels, changes in production processes and other mechanisms, many of these gains have been (or will be) offset by an increase in the number of sources.[39]

A significant shortcoming of any reduction-at-the-source strategy is that the contaminants are still "produced" and waste disposal is still necessary. Removing sulphur compounds via "scrubbers" prior to emission, or "washing" coal prior to combustion still leaves the producer with waste compounds, and airborne dispersion is merely replaced with the need for solid waste disposal. Thus, reduction at the source does not eliminate the waste disposal problem, it simply changes its form. This point will be taken up again later.

As the 1970's proceeded pollution problems slipped from the policy agenda, partially due to the intervention of the "energy crisis? The public was also somewhat placated after the initial policy responses: dispersion would have produced visible results and the problem may have appearedunder control. The success,however,was shortlivedas air contaminants re-appearedonthe agenda within a few years as "acid rain".

III - THE DILUTION PARADIGM AND ACID PAIN

The emergence of the "acid rain" problem in the latter half of the 1970's signalled a potential crisis for air pollution policy: "acid rain" demonstrated that many of the previously dispersed pollutants had not been "rendered harmless" and in fact were accumulating and threatening environs (andtheirinhabitants) further afield. Although "airborne dilution" per se was called into question, the principles of the dilution paradigm remain firmly in place and in fact have been more rigorously applied.

The relationship between air pollution and acid rain is critical. Although acid rain is essentially another expression of air pollution, the two issues are set apart in two important ways, stemming from where and how the problem is measured. Whereas "air pollution" was primarily an urban problem, "acid rain's" dominant points of impingement are found inoutlying, non-urban areas. This shift in where the problem is measured, which sees an increase in thephysical distance between emission sources and perceived effects, is pivotal: acid rain is considereda "long-range" problem, while air pollution is a "local" matter. A new concept was thus introduced into the politics of air pollution: LRTAP (Long-Range Transport of Air Pollutants). The importanceof LRTAP in distinguishing the two issues is statedclearly in a number of government publications. For example:

> During the 1970's the governmentsof North America were preoccupied with local or 'ambient' air quality....
>
> The concern for protecting local air quality remains important. Ground level concentrations of SO_2 and particulate matter are of particular concern with respect to protecting human health. But these standardswereneverdesigned to protect the natural environment from the slow accumulation of acidic deposition. In fact, the decision to build tall sticks in the 1970's to disperse the pollutants reduced the local air pollution burden by adding to the problem of long-range transport and deposition of acid compounds. Instead of reducing pollution, we merely exported the effects.
>
> There is an obvious linkage between local air quality and long-range

> transport of air pollutants because a reduction of emissions will effect both. However, legislationandrules designed for the protection of local air quality are neither appropriate nor sufficient to dealwithpollutiononaregionalorcontinental scale. (Ontario 1985a, p. 2)[40]

This passage highlights two points: dispersing pollutants to "clean up" cities contributed to the LRTAP phenomena (a second-order consequence), andcurrent emission guidelines were not designed with the effects of LRTAP in mind.It is important to note that dispersion policies contributed to LRTAP: the phenomena was known to policy-makers prior to the emergence of acid rain, and in fact, the Ontario government had been studying the acidification of the outlying Sudbury environment for many years, but these effects did not become a policy-issue until several years later.[41] In other words, "acid rain" simply represents the inclusion of previously ignored contaminants into the problem lens; pollutants are now followed past the dispersion stage, beyond the immediate locale of the pollution sources and the urban pollution monitors.

While the incorporation of LRTAP into air pollution policy may represent an extension or broadening of the traditional "short-range" problem lens, other aspects of acid rain conceptualization see this problem lens contracted significantly. Thesecontractions stem primarily fromthetechnigue used to measure the current problem: the perceived effects which triggered the political identification of "acid rain" were detected as increases in the ambient acid concentration of precipitation and lakes. They were recorded on a pH (potential of Hydrogen) scale, a well established measure to denote the relative acidity or alkalinity of a solution.[42] The pH scale has remained the singular problem-indicator since this time, and its influence is felt at every stage of problem conceptualization. First, the pH scale only reads the effects of "acid-causing" contaminants and therefore excludes (or ignores) all non-acidic contaminants from the problem lens. This is an extremely

important problem-reduction variable and is responsible for the singular focus on SO2 and NO_x in acid rain politics.[43] Second, the pH measure also reduces the problem lens to contaminants intheiragueous state. Sulphurous compounds, for example, must undergo a conversion to sulphuric acid if they are to appear on the problem indicator. In its simplest terms, the pH measure reduces the air contaminants problem, conceptually and pragmatically, to "acid" and "rain", and little else. A sample definition of acid rain reads:

> Acid rain is causedwhen sulphur dioxide and nitrogen oxide emissions mix with moisture in the atmosphere and return to earth as rainfall that damages forests, waterways and aquatic life. (Toronto Star, April U-1986)

Other definitions emphasize that the contaminants are "transported, sometimes great distances, by theprevailingwinds' (Canada 1984b, p.2). Thus, although LRTAP may represent a geographical extension of the problem lens, it has been accompanied by a bio-chemical reduction. This section intends to outline the implications and problems with this reduced definition of airborne industrial waste.

It must be stressed here that the use of the pH scale does not merely guide policy, it also reflects thebroadercontextinwhich itoccurs.Inotherwords, the pH scale has not simply led policy-makers down a narrow path; it's problem-reductionpotentialreadily serves the interests of minimum necessary control.

Determining "Valued" Points of Impingement

In addition to the'standard'economistic and humanistic crieriawhich characterize contemporary environmental values, acid rain conceptualization is based on the further distinction between "sensitive" and "non-sensitive" areas: waters and soils with a high alkaline composition are better able to "buffer" or neutralize acids. Other ecosystems cannot neutralize the acidity, making them "vulnerable".[44]

This acid-sensitivity-derived dichotomy reflects the pH measure and when used to designate "valued" ("vulnerable") areas, immediately renders a large portion of the receiving environments outside of the problem scenario.[45] This designation also mans that of the acidic contaminants (a relative minority), only those which are deposited on "vulnerable" areas contribute to theproblem, or so the argument goes.

> Acid rain is mainly caused by man-made emissions of sulphur dioxide and nitrogen oxides. When the rate of acid deposition exceeds the rate at which the receiving environment produces neutralizing substances, there is a loss of the ability of soils and waters to neutralize the deposited materials. (Canada 1984a, p.1)

Emissions not deposited on "sensitive" areas register as "diluted" so to speak, inthatthey falloutsideof the problem-measure. Thus, under theguidanceof pH-derived "valued" ecosystems, air pollution politics is immediately reduced to "acid-causing" contaminants which combine with moisture to realize their acid-potential and are then deposited on "vulnerable" areas.

Determining "Tolerable" Concentrations

The principle of minimum necessary control holds that emissions should be controlledmlywhen, and no more than, necessary to alleviate the perceived problem and the importance of this matter for determining "tolerable" (i.e. maximum) levels of pollution was established. The same principle operates to guide acid rain policy formulation. The costly nature of acid rain clean up has been well-established and, when weighed against "negligible" perceived benefits, creates tremendous pressure to minimize control efforts.[46] The following passage from an Ontario Ministry of the Environment document echoes some of the statements from the 1967 Conference cited earlier:

> While total abatement of sourceswouldsolve the problem, it must beaccepted that North American society will be using large amounts of fossil fuels for many years to come. . ..It must also be accepted that it is most unlikely that technology could reduceemissions of sulphur dioxide and nitrogen oxides to zero. Therefore, abatement programs applied to new and existing sourcesmustdefine the specific amount that can be realistically achiwedbytechnologyandbeeffective in protecting the environment. We must determine in quantitative terms how much acid loading the environment can safely withstand so that the minimal levels of abatement can be defined. (Ontario 1980, p. 16. Emphasis added)[47]

Thispassagehighlights two important points. First, the pressure to define the maximum permissable concentration ("how much acid loading the environment can safely withstand") results from the need (desire) to define "minimal levels of abatement". Second, this need to load the environment to its maximumcapacity applies to new and existing sources, which mans that the same principle would apply to an environmental impact assessment.

When acidic tolerability is operationalized, the environment's minimal needs are further compromised. Having estimated that the "affected parts of the Canadian and American environment (more thanamillion square miles) are receiving at least twice as much acid as they can tolerate" (Canada 1981, p.1. Emphasis in original), the federal and provincial environment ministers agreed on February 15, 1982 that "wet sulphate deposition should be reduced to less than 20 kg/ha/yr by 1990 to protect moderately sensitive lakes and streams" (Canada 1984a,p.10. Emphasis added). The target date has since been moved to 1994. This sacrifice of less-than-"moderately sensitive" lakes and streamsis another instanceof social priorities triumphing over the environment.

Determining Cause and Effect

As with air pollution, acid rain abatement strategies are tied to the demonstration of decisive causal relations between sources and effects: again, only

a fraction of all contaminants become "party" to the excessive concentrations being measured and these specific emissions must be earmarked for control. The role of post-emission factors (meteorological and now geological) is central once again:

> Three things are necessary for these airborne pollutants to create the problems we now face:
> - the first is the pollution source, usually in areas where there are alotof industries.
> - The secondisweather conditionswhichcarrythesepollutantsover long distances allowing for changes to take place.
> - The third is areas which are sensitive to the buildup of acid rain and snow. (Canada n.d.b, p.2)[48]

This version of problem-formation dcxninates acid rain thinking.

If a decisive cause and effect relationship was difficult, if not impossible, to prove with respect to the more localized air pollution problem, the LRTAP factor has complicated matters significantly. This has also been an important impediment to regulatory action and is often cited by those opposed to further abatement. Thepolicylens now includes emissions frcmavarietyof North American sourceswhicharemixed into a general "pool" of contaminants[49], and the potential effects (or lack of effects) of a single source are now weighed against the contributions of all sources combined. This has allowed Inco to argue on a number of occassions that even if all Ontario emissions were eliminated, acid rain, originating elsewhere, would continue to fall on the province, even on the Sudbury area (Ontario 1979, p. 17, 44).

The "appropriate" meteorological and geological conditions of acid rain fomtionhavebeen firmly incorporated into Canadian acid rain control programs:

> Whenaninventoryofpointorarea sources is coupled with meteorological data and with deposition fields and monitored effects, information is obtained which can be applied to abatement strategies. It can be determined what sources have an effect of specific areas and the share each source contributes to that effect. It can then be determined which sensitive areas will benefit from abatement from any one of these sources. (Ontario 1980, p.7)[50]

The importanceof this formulation cannot be underestimated. One reasonbehind the extension of Inco's 1978 control order was that, in the face ofnewanduncertain findings about acid rain, and in light of "the high costs of further abatement", it was judgedbesttiidentify the "ultimate abatement target" that would be required before proceeding. Under the guidance of the dilution-assumption (supported by the pH measue) policy-makers sought to determine "...the location and seriousness of Inco emission effects on precipitation acidity" (Ontario 1979, p. 43-45. Emphasis added. See also Ontario 1982b, p.14). Any Inco emissions which did not alter precipitation acidity would, of course, appear to be "rendered harmless".

Time magazine has summarized the entirecause and effect problem neatly:

> Thus far researchers have been unable conclusively to trace increased acidification to a particular source of sulfate emissions. Scientists are currentlyworkingon computer models [to] provide a firmer understanding of the process by which emissions are swept along by prevailing winds, chemically transformed into acid rain, and deposited in far away places.
>
> Up in the clouds, the chemical reactions that transforms02 and NO_x into the sulfur and nitrogen compounds ofacidrainare still imperfectly understood. Studies are now under way using 'cloud chambers'...to test pollutant gases in simulated atmospheric conditions. (Nov. 8, 1982, p. 104)[51]

These circumstances surrounding cause and effect are closely related to acid rain problem-reduction: the implicit assumption is that contaminants which do not undergoe a transformation to "acid rain" are unproblematic. The entire matter, however, is radically flawed in its logic: the specific cause and effect questions beingposedare only valid to the extent that the problem scenario has been "artificially" reduced in the preceding stages. In other words, having reduced the scenario, policy-makers are led to ask questions which would not be relevant otherwise. These artificial reductions are closely related to the pH measure and the extent to which "acid rain" is a true misnomr.[52]

First, the designation of "sensitive" and "non-sensitive" areas is misleading. It has been acknowledged (and apparently forgotten) by policy-makers on a number

of occassions that even so-called non-sensitive areas are adversely affected by the pollution:

> . ..it has been found that many well-buffered lakes can lose an entire year's hatch of valuable sports-&h due to the acidic shock effect of Spring run-off, when the pollutant laden winter accumulation of snow suddenly melts into the waterways. Heavy rain episodes can also cause the same acidic shock effect. (Ontario 1980, p. 1. Emphasis in original)

The sensitivity criteria, then, is extremely limited and does notaccountfor the full impact of these acidic contaminants. Therefore, if policies were not based upon this measure, regulatory officials would not be faced with the difficult problem of determining which acidic emissions are deposited on these sensitive environments.

The next stage of artificial problem-reduction pertains to the question of "acidity". Policy-makers have acknowledged in a number of occassions that a wide range of non-acidic contaminants, many of which were being regulated as "air pollution", are stillbeingemittedandare subject to long-range transport.[53] It is alsoacknowledgedthatmnyofthese contaminants, such as heavy metals (often emanating from the same sources which emit acidic compounds) harm a givenecosystem, whether sensitiveornon-sensitive, and irrespective of the pH criteria. For example, it has been reported that the Ministry of the Environment tried to recover several lakes in the Sudbuyarea after the constructionof the superstack. Although the application of lime was able to "neutralize" the acidity, high metal concentrations (nickeland copper) still prevented the lakes from becoming "livable" (Ontario 1979, p.18). These points further invalidate the use of the sensitivity criteria to designate the problem-potential of contaminants, and further renders the causal relationship between acidic contaminants and sensitive areas to circumstantial status.

The third point relates to the misnomer aspect of the "rain". Sulphurous

compounds readily oxidize to form SO_2 and SO_3, and SO_3 readily combines with H_2O to form H_2SO_4 - sulphuric acid. Under the guidanceof the pH measure, policy-makers can only measure sulphur pollution in its aqueous state, as sulphuric acid; hence the importance of this conversion in acid rain problem conceptualization. However, it is widely acknowledged that "dry deposition" accounts for approximately half of all sulphurous and nitrous deposition, and is equally harmful.[54] This bit of basic chemistry is vital because the contaminant SO_2 clearly poses a threat, wet or dry, and in fact, "the dry component of deposition is more important than the wet in many forest ecosystems", mainly through absorption into leaves and needles (International Symposium 1985, p.4).Policy-makers have known this for a long time: "air pollution" measured the gaseous concentration of sulphur in one of its dry, oxidized states (SO_x).Sulphur dioxide's potential to convert to sulphuric acid was also recognized long ago, althoughapparentlydisregarded, at least to the extent that it was not one of the urban pollution indicators.[55] Inreducing the current problem to sulphurous compounds in their aqueous state, policy-makers havecreatedaneed to determine which particular emissions react or combine with moisture to form "wet sulphate". These are thespecific missions which are targeted for control.[56] Ignoring this artificial distinction between "wet" and "dry" deposition, and hence the focus on acidic "rain", would render this particular policy question irrelevant, or circumstantial at best.

It should be clear that if policy-makers responded to their knowledge that "acidity" and the "rain", as well as the entire "sensitivity" criteria, are circumstantial variables in problem-formation, and not causal, they would not be presented with the need to determinewhichof the many SO_2 particles are transformed into acid and deposited on sensitive areas. It would notmatterwhether sulphurous pollution appeared in its gaseous or aqueous state, nor would it matter where these

and other contaminants were deposited. This, however, is what "dilution" is all about: ignoring the fact that sulphur causes problems, period.

If it were argued that the pH scale is merely serving as an index of all long-range problems, thislogicwouldbe wntradicted in the same fashionasits "local" counterpart, the API: policy-makers aredirectingtheirefforts to (some of) the contaminants whose effects are read on the pH index, and little else. When policy-makers decide to include more than SO_2 and NO_x in their sights, when they recognize (or admit) that these two contaminants in their liquid state comprise only a portion of a larger problem, it will become apparent that pH only measures certain aspects of acidic impact, and the question of acid-sensitivity will be relegated to sewndary status (at best) and pH (hopefully) will be dethroned as the dominant problem-measure. There will no longer be a need to determine the precise "acid-causing' relationship outlined above, nor will opponents of further abatement be inaposition to invoke the arguments about uncertainty which ensue from this matter. The further implications of the diagnosis of acid rain will bediscussed in a separate sectionbelow.

Controlling Fbr Ambient Acid Concentration

It has already been indicated that "controlling" acid rain entails no more than alimitednumberofcontaminants. Inlookingatthe strategies available to the governments of Canada, the circumstances surrounding the problem rule out two of the major air pollution "control" methods: altered stack heights and a warning system. Altered stack heights are not an option for obvious reasons. Just as taller stacks contributed to the problem, lowering stacks would reintroduce more serious urban air pollution problem. As to the development of an acid rain warning system along the lines of the API, such a system is not feasible. The nature of the problem, with its considerable time lag between emissions and deposits, the slow

andcumulativenatureof the effects, as well as theuncertain links between the causes of a given acidic rainfall are in direct contrast to the conditions surrounding an urban "air pollution episode".

Another dilution-oriented strategy for "controlling" acid rain is the application of lime to acidified lakes as a way of neutralizing the pH. While liming has been carriedoutin some areas of Canada, it is openly acknowledged as a remedial measure and not an effective abatement strategy.[57]

These circumstances leave the reduction of emissions at the source as the only feasible long-term abatement option, and has been readily acknowledged as such. Ontario's Standing Committee on Resources Development (1979, p. 20) wrote:

> All of the experts appearingbefore the committee agreed that the only effective, long-term solution to the acidic precipitation problem is substantialreductionof the quantities of sulphur and nitrogen oxides emitted into the atmosphere from human sources.[50]

The elimination of "selective" and "interim" abatement thus intensifies the pressure to reduce theemissionswhichwere so strongly resisted in the earlier years. It is not surprising, therefore, that after more than a decade of debate and "further research", these reductions have not been made. Inretrospect, the regulatory actions which led to dispersion were relatively prompt, most likely because "external" control is much less threatening to the Canadian political-economicorder than are "internal" strategies.

The major policy questions for some time have surrounded the implementation of thepmposedreductions, and the limited problem definition outlined above has remained unquestioned. How effective, however, can such policies be, even if executed to perfection? Even if, for example, Canada and the U.S. resolve their differences and abatement efforts receive full commitment, including the financial backing necessary to achieve the 50 percent reduction of emissions by 1994, this goal was derived fromestimates of "wet sulphate" on "moderately sensitive areas".

What about dry sulphate, non-sulphate andnon-sensitiveareas? Add to this the economic growth rates predicted (and prayed for) for coming years. Will it seem "rational" to go any further, especially in the face of economic pressure? Having struggled for over two decades to achieve such modest gains, will opponents (or even proponents) of environmental protectionaccept the need for further abatement? Present policies, if implemented, will likely be seen as an "end" to the problem, and it will be hard to argue otherwise until the problem resurfaces, at which time the debate will start anew, and most likely under more mystifying terms.

Itmustalsobe notedthat, although a 100 percent abatement would be "irrational" resource utilization, even such a complete removal of all contaminants from stack emissions would not relieve society of the need todisposeof thiswaste. Once "captured", these contaminants must go "somewhere", they must be storedand "managed", most likely in a "slag heap" (an "acid waste landfill"), where they willaddto society's growing solid waste disposal problem. Whether you look at toxic and radioactive waste, household garbage or air contaminants, "disposal" is another dilution-myth which functions to prop up the illusion that there is an "away". Matter is never "disposed" of, it is merely moved somewhere else. Furthermore, even this strategy does not address the inevitable waste "production" which appears long before any given compound is slated for combustion. Even if Inco, for example, were able to remove and safely store 100 percent of the effluent which comes from the stack, their mining practices are responsible for an estimated 50,000 tonnes of fine acid tailings, amongst other substances, emitted into local water systems daily. Similarly, coal mining contributes to the acidification of aquatic bodies through "acid mine drainage".[59]

THE REIFICATION OF INDUSTRIAL WASTE AS ACID RAIN

> "[Acid rain] is so unassuming. Yet it is perhaps our ultimate horror - thedestructionof our way of life by badweather." (Toronto Star, April 5, 1987)

The weather has always played an important causal role in the formation of air pollution. Looking at acid rain, this causal role has beenheightened considerably, and the air contaminants problem often appears in a highly "reified" form.[60] This "naturalization" of the problem can be attributed to three factors. First is the altered control strategy scenario. The elimination of many dispersion techniques and the subsequent increase in pressure to finally reduce emissions at the source gives policy-makers a vested interest, however unconscious, to further extemalize the problem. Second, acid rain is testimony to past policy failures, and therefore, any respect in which the problem can be naturalized relieves the burden of facing up to these failures. This is especially important because policy-makers are still employing may of the same concepts which misguided air pollution policy. And third, once the phenomenon was cast into the meteorological (non-human) realm, thepotential existed, andevenmnifestitself to varying degrees in conceptions of air pollution. In fact, this is why it was cast outwards in the first instance; to side-step the human role and "hide" the wastes. LRTAP problems see an increase in the physical distance between emission sources and perceived effects, and this mere shiftingeographicproximity lends itself to greater "meteorological intervention" in the problem-formation process. This is especially the case when the complex causal variables are seen to reside in the atmosphere itself.

Acid rain problem-formation was presented above as a three-stage process. At other times it appears diagramatically as a five-stage process. An example is reproduced as Figure One below. Figure Two is a truncated version of the same

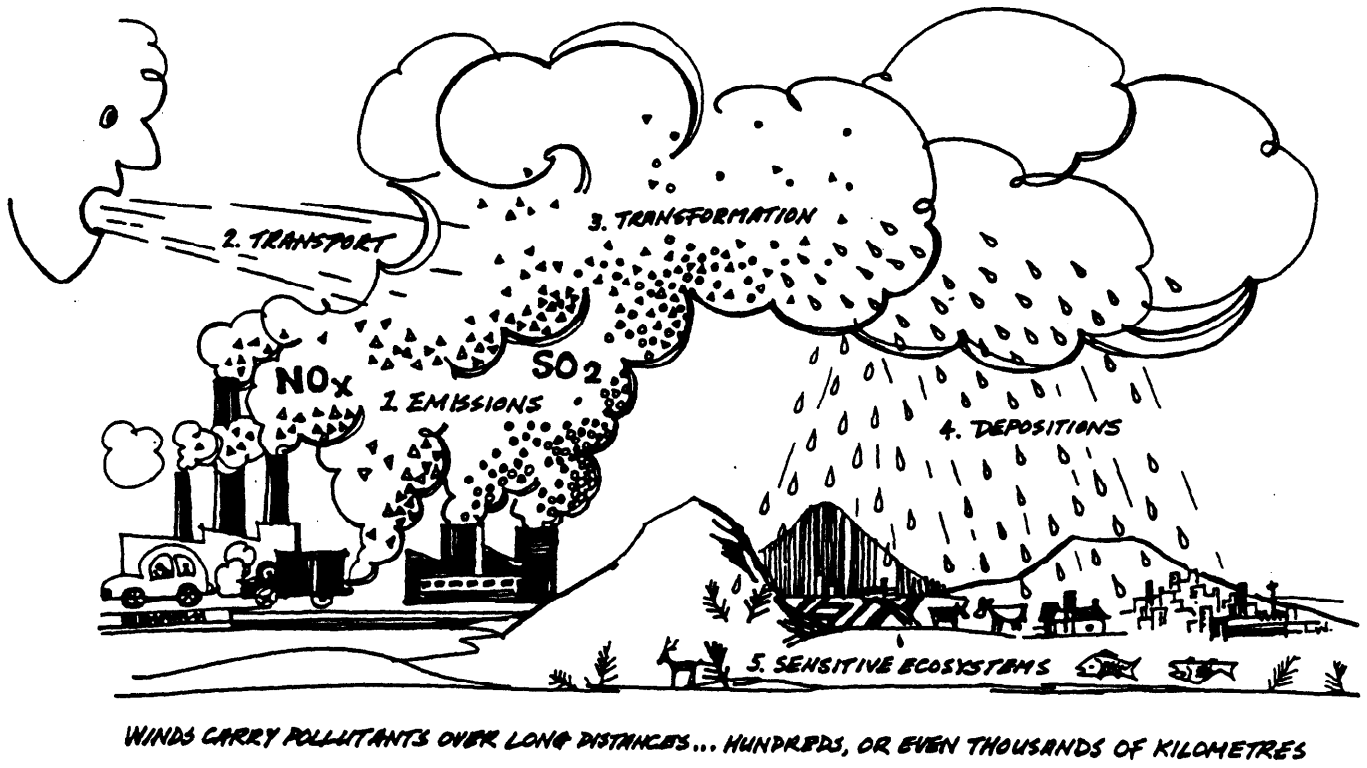


FIGURE ONE - A Diagramtic Representation of Acid Rain Problem-Formation
(Source: Canada (n.d.b)

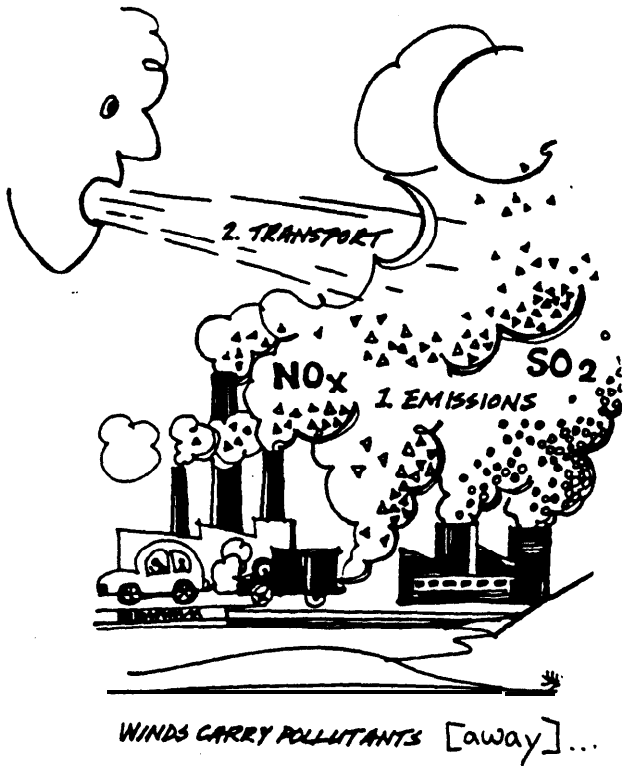


FIGURE TWO - A Diagramtic Representation of Air Pollution Problem-Formation
(Adapted From: Canada (n.d.b)

diagram to represent the dominant conception of air pollution in retrospect. Note that in the case of air pollution the assumption that contaminants are sufficiently diluted (supported by local ambient air measures) stops the process at this stage. It was only with the "discovery" of acid rain that the model (scope of vision) was extended. I will address each of these five stages, begining with transportation, to demonstrate themannerandextmttowhichacid rain has become reified and mystified with respect to its origins or causes.

Transportation: The Winds

Conceptions of air pollution saw the wind as a "receiving stream" or "conveyor belt", terms which imply an "end" to the problem, i.e. dilution. As "dispersion" the wind takes pollutants away from the valued points of impingement and thus often plays a preventative role. Acid rain and the LRTAP process, on the other hand, look at the end result of dispersion, that is, the eventual deposition of contaminants, and this places the wind into a role of "mode of transport". The wind thus enters the problem scenario prior to the perception of effects; pollutants are transported by the winds before their effects aremeasured, and subsequently, the problem is oftensaid to "come from" thewinds:

> This fallout of destructive acid rain, snow, and to a lesser extent dry particulate matter, results from the long-range transport of air pollutants.... (Ontario 1980, p.1. Emphasis added)

The wind also "causes" the pollutants to transform:

> [SO_2 and NO_x] go through chemicalchangeswhilebeing carried by the winds through the atmosphere. (Canada n.d.b, p.2. Emphasis added)

The implication is that a problem would not ensue if LRTAP were absent.

This scenario contains an instructive irony. m the extent that air pollution is caused by "poor ventilation" or the lack of dispersion, it could be said to result from the absence of LRTAP. "Cleaning up" pollution entailed dispersion,

and this dispersion, now read LRTAP, apparently is the cause of acid rain. Policy-makers, in effect, painted themselves into a corner (or were trapped there by their predecessors). When pollutants fail to disperse, they cause one problem: when they do disperse, they cause another. The division of the globe into sensitive and non-sensitive areas is obviously an important addition here: the problem-potential of contaminants is now a function of where the winds take them.[61]

The Mysterious Transformation

Several passages cited above suggest that the transformation of sulphur dioxide to sulphuric acid is the result of LRTAP. Another example from Ontario's Environment Ministry:

> . ..acid pollution is formed by a complex series of chemical and physical reactions....
> Sulphur and nitrogen compounds, emitted primarily in the form of sulphur dioxide (SO_2) and oxides of nitrogen (NO_x), are transported by winds and air currents at high and low altitudes. Meteorological conditions can carry these pollutants hundreds to thousands of miles from their starting point, allowing time for chemical transformation to acids. (Ontario 1980, p.1. Emphasis added)[62]

The mysterious nature of this transformation is played-up considerably. Environment Canada has referred to it as "abracadabra"-like (Canada 1981, p.15) and Time has written: "Precisely how acid rain forms in the atmosphere is still a mystery to scientists" (Nov. 8, 1982, p.98). I have already shown that the transformation to acid is not a causal variable in the damage attributed to SO_2, nor is LRTAP a causal variable in the conversion. It was even acknowledged publicly by Environment Canada in the early 1970's that the conversion to sulphuric acid could take place in the respiratory tract of humans and animals (Canada 1973c). At no time during the air pollution controversy was this matter referred to as "mysterious" or "abracadabra"-like, probably because it wasn't being used to derive emission standards. LRTAP, on the other hand, is said to "allow changes to take place", creating the impression that the contaminants would not pose a problem

if theywerenot transported and did not convert. The emergence of this factor in the politics of acid rain is an important feature of the problem's mystification: the problem is created "up there", in the clouds.

Deposition: The Rain

Acid rain has become so closely associated with the rain, literally, that it appears as if therainis the cause of the problem. A Canadian newspaper has referred to "the rain of death" and "stopping the rain"; Environment Canada (1984b) discusses "the cost of cleaning the rain"; the Ontario government has published a document entitled The Case Against The Rain (1980); Time opens its wver story on the problem by saying "nowadays the davastation brought by the rains..."; araindropisoftenusedto symbolically represent the issue, as aredecapitated umbrellas; and possibly themstdisheartening occurancehas been the appearance of a colouring book for children aged 4-9 entitled Rain Rain Go Away .[63] Furthermore, Environment Canada's "Acid Rain Watch", published weekly, recently report&that:

> Sunny skies againprovidedaneasyweek for researchers at the Ontario Environment Ministry's acid rain centre at Dorset.... The only recorded precipitationwas on Wednesday when fourmillimeters of dangerously acidic rain fell with a pH level of 4.1" (Toronto Star, March 28, 1987)

One is led to believe that air wntaminants are not a problem when it is not raining. The preceding pages have already showed that this is not true, and it is here that we find a similar irony to that of the wind as "prevention/cause". Measurements ofambientairwncentration do not detect sulphur in its aqueous state, andwnsequently, the rainappears here as a "cleansing agent", "washing" the wntaminants from the sky and preventing an air pollution problem from forming.[64] Through the contemporary problem lens, on the other hand, the contaminants only become problemtic because the rain brings them from the sky, as a "rain of death".

Clearly the contaminants pose a problem whether it rains or not. An important contributing factorhereis that rain is naturally acidic, a factwhichhas allowed opponents of regulation to argue that "acid rain is natural" (Tim, November 8, 1982, p.98). This statement is not false, simply misleading and further testimony to the inappropriate nature of the pH measure.

The rain, as with the conversion to acids, are circumstantial variables in problem-formation which have been made to appear as causal.[65] This process also lends further credence to themythof "away', the assumption that if contaminants are blown here or there, or are converted this way or that, they are "diluted". The dual roles played by both the wind and rain in recent history are testimony that the assumption is patently false. Pollutants must go "somewhere", and in the case of air pollution and acid rain, "somewhere" is always the other. If the two issues were conceptualized in the sambreaththe contradiction would become unbearably explicit. Acid rain policy-makers are in a particularly difficult situation because many of the "aways" have been eliminated; hence the elaborate meteorological and chemical criteria under which contaminants are still excluded from the problem scenario. In effect, policy-makers, with the help of pH, have created more "aways".

The altered conceptions of the wind and the rain in problem-formation have the following important result: the distance between sources and effects is now more than geographical, it is also bio-chemical, meteorological and, in effect, ideational.

Sensitive Receiving Areas

Sensitivity denotes a geological condition and emissions which are not deposited on these areas are not considered problematic. More often than not, this geological circumstance is cited as one of the main reasons Canada is presently suffering from the effects of acid rain. An Inco official has stated that:

> The soils of much of Eastern North America are thinandlow in alkalinity and the acidity that might otherwise be neutralized by wellbuffered soils reports into lakes andriversunneutralized. (Inco 1982, p.1-2. Emphasis added)66

In this way the geological factors are cast into acausalroleand, just as the weather sometimes acts as an "ally", policy-makers and polluters now have "geological allies" in those areas which are not "vulnerable".

Emissions: Natural Versus Anthropogenic Sources

Further testimony to air pollution's reification is found in the discussions of emission sources. It has been recognized for some time that certain contaminants, such as sulphur dioxide, are present in the atmosphere as aresultof volcanoes, forest fires, and other occurances. With acid rain, however, this matter has received such prominence that it must be interpreted as a prime factor in thenaturalizationof pollution. Figure One depicts emissions as being of human origin, and this is in concert with the commonly acceptedunderstandingof the problem. Many discussions of acid rain however, before anything else, mention that there are natural sources of pollution and that rain is naturally acidic. An Environment Canada "Fact Sheet on Acid Rain" (1985) asks, as its 'first of fifteen questions, "What causes acid rain? Are sources of acid rain natural or man-made?" The Special Envoys Report (1986) opens its discussion of "missions" with:

> Some of the sulfur and nitrogen compounds that are theprecursors of acid rain are emitted by natural sources. Sulfur and nitrogen are natural components of the sea, soils, and organic matter; consequently, both sulfurandnitrogenccmpounds areregularlyreleased to the atmosphere through organic and inorganic processes. (p.8)67

While non-human sources of air contaminants were often mentioned in earlier air pollution discussions, they were never assigned the importance one finds today with acid rain,68 and at no time was their presence seen as reason enough to seriously question the human role in problem-formation.69 Although policy-makers today often acknowledge that "naturalmissions of sulfur and nitrogen compounds

are relatively insignificant contributors to acid rain" (Special Envoys 1986, p.8) the prominence assigned to this fact prior to dismissal is an interesting reflection of current conceptualizations of air pollution.

Monster In The Clouds

Given the combination of factors cited above, that there arenatural sources of acidic compounds, that the pollutants are "brought" by the winds, that they are "created" by some "mysterious" atmospheric and chemical process, that they are often deposited by a non-human agent, the rain, which is naturally acidic, and thattheultimatedet exminantofhaxmis geological, it is only a mall step, conceptually, by which acid rain takes on extreme, highly reified forms of representation. Former Environment Canada Minister John Roberts referred to acid rain as "the most devastating form of pollution imaginable, an insidious malaria of the biosphere" and "a far more subtle and insidious foe than we thought possible not too long ago" (emphasis added); former Ontario Environment Minister Keith Norton stated that "[acid rain] appears to our experts to remain rampant" and referred to the province's "all-out war" on acid rain" (emphasis added); Prime Minister Mulroney has spoken thus of acid rain: "it's killing our lakes, it's killing our environment and we can't solve it alone. The nefarious effects of this are indiscriminate" (emphasis added): and Environment Canada (1981, p. 12,10) has referred to the pollutants as "a heavyweight prizefighter" and an "unnatural killer stalking the water".[70] At times the science fiction overtones become explicit:

> You know, it sounds like yellow journalism, like something out of 2001, when you talk about the rain essentially being a rain of death;
>
> It sounds like a screen play for a science fiction movie; a planet where invisible gases undergo a transformation as they travel through the clouds, eventually falling to earth - sometimes thousands of

> kilometers from their source - as acids capable of crippling the environments they invade." (Canada 1981, p. 17,3. Emphasis added)

Stated simply, the problem is presented as non-human, as something which originates "up there" and preys upon the innocent earth. This portrayal of a "mad killer" on thelooseperhaps reaches its graphic epitome on the cover of Time magazine (November 8, 1982) where it is represented, literally, as a monster in the clouds preying upon a serene wilderness area.[71]

It could be argued that the reified representations of acid rain which we witness are merely "attention getters" or "effective symbolic communications", but the "attention getters" used to communicate air pollution fifteen years ago weregualitativelydifferentanddidnotmystify the relationship between source andreceptor to theextentwe find today. In 1970 Time referred to "poisoning the air" and "an a-spheric sewer", phrases which could imply a human source. Conversely, some newspaper headlines from the 1980% have read: "Acid From The Sky - Corrosive Rain Has Become An Insidious Menace" and "Death In The Sky" (emphasis added), descriptions which in no way suggest a human source.[72] Furthermore, in light of the rain metaphors which characterize acid rain discourses, consider the following, also from Time in 1970:

> Lawsuits continue to spew from [Illinois Attorney General William Scott Junior's] office in Springfield like smoke from a busy factory in East St. Louis. (January 5, 1970, p.37. Emphasis added)

Table One below counterposes selected passages from Time's first major cover story on "the environment" in 1970 and the 1982 cover story on "acid rain". The contrast should be clear.

This reification of air pollution may be more ambiguous than unequivocal at the present time, in that few people may actually believe that acid rain is caused by external, natural forces. However, the evidence presented here may

TABLE ONE - Selected Passages From Time Comparing Air Pollution and Acid Pain

1970	1982
Title: "Fighting to Save The Earth From Man"	Title: "Acid Rain: The Silent Plague"
"The U.S environment is seriously threatened by the pmdigalgarbage of the world's richest economy."	". ..the devastation brought by the rains is so silent, invisible, pervasive...."
". ..the country's visible decay, America the Ugly."	". ...an insidiousmalariaof the biosphere."
". ..the dangerous illusion that [man] can build bigger and bigger industrial societieswith scant regard for the iron laws of nature. . ..Like maggots in a sack of flour..."	". ..a blight as widespread and careless of its victims, and of international boundaries, as the winds that disperse it."
"U.S. plants...gush 172 million tons of smoke and fumes into the air."	". ..a catastrophe of a leisurely kind, trouble building up a shower at a tin-e."
"...man's mindless destruction."	"Acid rain is natural."
Feb.2,1970 pp. 42-49	Nov.8,1982 pp. 98-104

represent the early stages of a trend which will see the human role in problem-formation increasingly absolved or removed. The potential for this trend is especially strong becauseitappears that policy-makers will be increasingly faced with the task of re-addressing problems which were the focus of past policy efforts, and the location of blame will have important ramifications for how these policy efforts are evaluated.

Numerous examples support my contention that this trend is increasing. For example, in April, 1986, a report on "Toxic and Oxidant Air Pollution" was released withthehopes of moving contemporary air pollution politics "Beyond Acid Pain" (Mellon et al 1986). Within days newspapers reported the new problem as

"Toxic Rain" (Toronto Star, April 29, May 5, 1986) and the label quickly found its my into an editorial cartoon (Toronto Sun, April 30, 1986). Thus, while the report may have helped policy-makers recognize the need to move beyond "acid", the problem is still associated with the "rain". In light of the well entrenched existence of "acid rain" the incident was not surprising, but disheartening nevertheless. At least with acidic contaminants the rain is a circumstantial variable, but no such connection exists with toxic pollutants. It would appear that the symbol is runningawaywithotherissues as well.

This tendency to naturalize environmental problems is notrestrictedto matters of air pollution. The well-known case of the "Toxic Blob" in the St, Clair river is a reified expression of "industrial waste", its former name. Consider also the circumstances surroundingtheclosingof Metro Toronto beachesinthe summer of 1986, as presented in the daily press. On July 20 the Toronto Star reported thatdangemus bacterial levels atthewaterfrontwere "caused by a combination of hot, rainy weather and an antiquated sewer system." The story is dominated by the non-humar. variable, the rain, and says little of the sewer system itself. Subtitled "Pollution is Suspected After Near-Record Rainfall" the story stated that the beaches would remain closed for several days, "depending on the weather." The rains continued for severalweeks andonAugust8 the Star reported that "persistent and at times torrential rains thathavediacouraged swimmers are also responsible for the warning signs that went up today at Hanlan's Point." Complaining that "we're at the mercy of the weather'*, a Toronto Health inspector is quoted further: "If the weather changes, if it stops raining, and if we get some wind to move the water around the situation could change." The next day the paper reported that "warm temperatures andwetweatherwillkeepall of Toronto's

beaches closed this weekend", and the Toronto Sun reported on August 28, under theheadline "Rain Gods Frowned on Metro", that "the downpour closed many beaches for at least 24 hours and others for the rest of the summer", citing a Toronto Board of Health official as its source. This is an excellent example of circumstance turned into cause: the rain could not close the beaches by itself, only in conjunction with other, human, factors.

The rain was alsoaculpritin the famous Love Canal case, at least according to one press report:

> Foratleastadecade, theburiedchemicalswereno problem. But in 1976, after years of abnormally heavy rain, the chemicals, leaking from corroded containers, began to rise. (Time, August 14, 1978)

Significantly, each of these examples stem from the re-emergence of apparently "controlled" pollutants. If the evidence presented here is any indication of how policy-makers will attempt to explain future environmental problems, extreme reification will be the order of the day.[73]

Recalling the conceptsof internaland external attribution introduced earlier, if causal responsibility for these problems was located within society's dominant values and practices (internal attribution), we would, in effect, be admitting thatourdeep-seatedandcherishedgoals are the primary component of problem-formation, the causal factor. As a result, wide-reaching and potentially revolutionary change would be called for. Internal attribution, not surprisingly, is strongly resisted. External attribution, on the other hand, manages to side-step such critical self-appraisal and helps prop up the illusion that Canadian society can carry on without significant alteration. Wecanallrestassured that any problems encountered along the way originate from "without" and not from "within"; at least it's "not our fault". If the political classification and interpretation of particular meteorological and bio-chemical occurances we witness

appear to saylittleaboutthenatureof theproblemitself, they speak volumes on the policy culture of air pollution. External attribution also legitimates the employment of the preferred external. control strategies.

IV - CONCLUSIONS

When policy-makers address pollution problems after they have occured, as theyusuallydo, they ostensibly seektodeteminewhichcontaminants are responsible for the infraction. In doing so, they alsodecidewhichcontaminants are not responsible for the perceived problem. Establishing innocence in this context is an implicit component of establishing guilt and it is within the machinations surrounding cause and effect that we findanunveilingof the criteria under which contaminants appear "diluted", the unfolding and articulation of the various "artificial" problem-reduction factors which indicate that the majority of emissions are "rendered harmless". The effort is guided, at least in part, by the unstated maxim "out of sight/out of mind".[74] Donning a set of "glasses" which immediately relegate the "unvalued" parts of the environment outside of their field of vision, policy-mkers then further sacrifice (ignore) perceived environmental needs in the name of short-temeconcmic gain. Measures are then utilized which implicate only a fraction of all contaminants, leaving the rest "unseen". When, and if, a response does ensue, it looks to push the problem out of sight, into a form or place where it will not be detected. Here it awaits to be "re-discovered" under infinitely more complicated and mystifying cause and effect circumstances. The case of acid rain is a perfect example.Indeed, policy-makers appear to be engaged in an elaborate effort to relegate the vast majority of contaminants outside of the problem scenario to support the assumption that they have been "diluted".

The process is closely related to the principle of minimum necessary control: caught in a circumstance which sees a large amount of contaminants already in the environment, and under tremendous pressure from all sides to "clean up" as little as possible to ensure unimpeded production, any contaminant which policy-makers

can successfully divert from their measuring instruments relieves the perceived clean up burden accordingly. In short, policy-mkers have a strong vested interest inrelieving the perceived proximity of the earth's limitations, and dilution serves this illusionwell.

C.C. Lax's interpretation of the Toronto lead smelter controversy provides another illustration of the way in which contaminants are given a "clean slate", and also demonstrates that the process applies to local and long-range problems alike. At the risk of oversimplifying the lead case, the following generalizations can be made. All parties acknowledged thattheleadsmelters in question emitted lead into theatmsphereandthatthepresenceofleadcouldbedetectedin the surrounding areas. It was also agreed, at least in principle, that lead poses a serious health threat and that incidences ofleadpoisoning were documented in the area (although this last point was not wholly accepted by some). The main questions surrounded the demonstration of cause and effect. Put simply: "How do we know that the lead emitted from these smelters was responsible for contaminating the residents? It could have been other sources." The burden of proof rested on the complainants, and as theaffectedresidents disco-, answering this question in decisive terms is impossible. Assuming, for the sake of argument, that the lead emitted from the smelters was <u>not</u> the same lead which contaminated the residents, as thedefendents claimed, and that other sources were responsible, the followingguestionbegs to be asked: What, then, happened to the lead smelter's emissionsiftheydidnotmntaminate the immediate vicinity? Wherediditheygo and how is it that they were "rendered harmless"? Theansweris that they contaminated other regions where the effects of lead were not being monitored.[75] The net result in this case, as with acid rain, is that the perceived carrying capacity of the earth is "enlarged", at least according to policy-mkers' calculations.

When the principle of minimum necessary control operates with respect to future developments, when pollution problems haveyettooccur, the deeper resource-logic upon which it rests is fully exposed. This dimension is clearly vital for the environmental impact assessmentprocess. Once defined as a resource, the air (aswithanything else) is fully subject to the contemporary laws of economic rationality, which dictates that all resourcesmstbeused in the most efficient manner. Efficiency in this context entails exploiting all of the atmosphere's capacity for "self-renewal" as a cost-effective measure. In some instances, if this logicwere followed toits extreme, the result would be more pollution as society would attempt to use all the "wasted" air in "undeveloped" areas. If policy-makers have not yet consciously erected polluting factories in theseareas simply to utilize this air, it is most likely because such factories have not been needed. When the need does arise for this air to serve as a waste disposal facility, EIA's themselves will inform policy-tiers how best to utilize it to its maximum, either by recommendingthattheplantbelocated in an area with "good ventilation" or some other dispersion tactic.

Even if such EIA's were executed to perfection, if they were completely comprehensive and integrated into the decision-making process well in advanceof all project commitments, if they were based on complete and precise information regarding all ecosystem interactions, and if they were backed by the necessary politicalwillto see their perfect implementation, they still could not escape the grips of maximum permissable concentration. As a passage quoted above (page 29) indicated, new and existing sources of pollution should be designed in relation to the maximum amount of acid loading the environment can "safely" withstand. Even if policy-makers could predict all the likely consequences of a given project, is it wise to consciously maximize the human impact on the earth for the sake of

fulfilling narrowly defined social interests?

Arguments in favour of such a course of action are even less tenable in relation to the "real" scenario, where EIA's are not (and cannot) be executed to perfection. This realistic scenario features:

> [An] . . .immense scope of the unknown. Knowledge of the factors affecting the operation of ecosystems may be vast, but it is still far from being complete enough to permit the constructionofaccuratecausal models. Without such models, it is not likely that the effects of environmental disturbances will be forecast accurately. We simply do notknowallthe implications of many complex cause-and-effect relationships (Canada 1986a, p.6);
>
> . . .relevant scientific knowledge [often takes] many years to accumulate to the level which scientists feel is an acceptable basis for important social decisions. Although scientific uncertainties remain, the public interest must be served as best it can, and policy-makers must act (p.27); [and]
>
> errors in predicting the magnitude of change are common; multistageand cumulative impacts are correctly predicted less frequently, if at all . . .;[and] complex systems with many linkages are not usually well understood (p.14).

Add to this the realityofcmpetingpoliticaland social interests aswellas the fact that, broadly speaking, humans make mistakes, as do their machines. If this is the case, is it "sensible" to practice the philosophy of maximum permissable concentration? It is akin to filling up a balloon with poisonous gas to just below its bursting point, andwithoutactuallyknmingwhere thatburstingpoint is, defining it in relation to the amount of gas the dispensor wishes to put in it. The balloon'scarrying capacity can be enlarged in the dispensor's mind, but this will bear no relation to when the balloon will actually burst. Similarly, the environment's minimal needs canbecontinuallyredefined to keep pace with society's burgeoning waste, but society does so at the earth's expense. The carrying capacity of the globe can be enlarged, but only in the human mind, or on a balance sheet, and this will bear no relation to that carrying capacity, wherever it my lie. And furthermore, in this case we do not have the luxury of a separate

balloon to act as a threshold and to insulateus from the gases we dispense before theclimax. On the wntrary; we live in the balloon and are fumigating ourselves (and everything else) in the process. The balloon's bursting will only be the logical conclusion of a destructive affair which has been relatively constant for severalhmdredyears.

Even accepting that "advances" inknowledgehavebeen achieved and are still forthcoming, such advances have not kept pace with the phenomena to which they are addressed, nor wuld they reasonably be expected to. These "advances" can also be interpreted as "regressions" in at least two respects. First, when SO_2 and other contaminants fell under the rubric "smoke" or "fumes" at the begining of this century, their status as a "nuisance" was ironically more accurate than their modern expression as "acid rain". Whereas "acid rain" represents a reduction of the problem, literally, to "acid" and "rain", the focus on "smoke" (at least potentially) encapsulates all of the contaminants (and activities) which made up the "smoke" problem, at least to the extent that the wncept of "smoke" *(or "fumes"* or "noxious gas") in no way automatically excludes the vast majority of emissions from its domain. This does not mean that "smoke policy-makers" did not eventually exclude most contaminants from their field of vision. In the spirit of "out of sight/out of mind" they wntrolled for visible emissions, using a "smoke density chart" as their problem-measure (which, incidently, is still meteorologically-sensitive). *The* "smoke" problem was somewhat relieved, but many of the invisible gases continued unabated (and unseen). A portion of them are finally being re-addressed today.[76]

As political priorities shifted in the wurseof the century and pollution was placed closer to the fore, policy-makers adopted more "precise" measurements and ironically, the more precise the measure became, the narrower the problem became.

This is especially the case with long-range problems where a joumey from effects to probable causes, under the guidance of pH-precision, can eliminate most of the suspects, evenbefore departure. Anytime the evidence does warrant a decisive guilty verdict for a particular set of contaminants, it equally decisively excludes all other contaminants from the scene of thecrime, and the more precise themeasure, thegreateris the number of contaminants which are excluded. In simple terms, if pressure to control air pollution results in a need to further specify the criteria under which contaminants will be ignored, the "scientization" of industrial waste as "acid rain" aides considerably in the task.

Increasing scientific precision has several other implications. First, it lends "credibility" to the increasingly regressive interpretation of pollution, thoroughly disguising the wider socialcharacterof the phenomena under a mask of "value-free rationality", "facts" and "efficiency".[77] Furthermore, the greater the scientization of the problem, the greater is the distancing of the non-scientist from the problem, who must then turn to the experts for a scientific interpretation of a social and political problem. Citizens have to rely on scientists for verification of acid rain's existence more so than they do for a "smoke" problem.

Thesecondregressive aspect of contemporary environmental politics is merely an extension of the first, although more firmly in the cognitive realm. The reification of industrial waste as "acid rain" further demonstrates just how far policy-makers (and everyone else) are from coming to grips with a relatively simple contaminant such as SO_2. As something which originates "out there" as a result of "natural" pmcesses, the industrial waste problem has become effectively naturalized. In thus scape-goating the non-human, policy-makers have foregone

any self-criticism in favour of "better management" and meteorological prediction, and deep down we are 'off the hook" so to speak.

Furthermore, in conceiving of the problem as an external threat (rather than as something of society's own makings), the social order itself is reinforced as it is called upon to defend itself from this "external" challenge. Thus, the reification of air pollution is in fact the reification of a high-polluting social order whose problematic beliefs and practices are fixed as the "given", "natural order of things", and in turn emerges as a positive, "improving" force which will ratify and manage the challenge from outside. In other words, although Canadian society is presently addressing "acid rain", we are in reality speaking to and about ourselves, and the extent to which we do not understand "acid rain", we obviously do not understand ourselves. We seem to have forgotten that it is not "acid rain" which is presently destroying the environment: it is humans and certain human activities which are responsible. Until this basic fact is grasped we shall continue to gamble with the wind and wage war with the rain.

In presenting the argument this way I do not mean to suggest that policy-makers are inept, nor am I denying that it is possible to "improve" the situation. The point is that policy-makers should not be expected to meet the task of "safely managing" the incredible volumes of waste presently being produced to maintain the Canadian way of life, even to a moderate degree of success. It is simply beyond their, and anyone else's, means. This is not an "overly-pessimistic", "defeatist" position. It is a realistic appraisal of the present state of affairs and the historical record bears this out. The case of SO_2 is particularly instructive here. This single contaminant, with a relatively simple compo-

sition, has been the subject of political controversy for at least 700 years (Chambers 1973, p.116-117). Despite this long history and all of the experience which should have ensued, this substance continues to defy society's understandings and control efforts. Its consequences have been misunderstood, misinterpreted (or simply ignored) time and time again, and the emergence of, and inability to deal with, "acid rain" is only the most recent example. If this is the case, can we reasonably expect policy-makers to safely manage the incredible volume of contaminants presently being produced, and increasing daily? And whose complex properties are even less understood that SO_2? Even within their own criteria of acceptability? Even with margins of safety it amounts to a highly volatile and dangerous "game", the stakes for which are incredibly high.

Operating in a context of extreme uncertainty it is obviously unwise to assume that we can "fill up" the biosphere, and then push the limits further still, and not encounter disastrous consequences. The case is especially so when the negative feed-back loops, the mechanisms which give content to any "cautious" procedure, only speak in the same resource-efficiency terms which presuppose the very predicament itself. In fact, the very need to determine the environment's limits presupposes their encroachment or violation: a society is only faced with the need to determine the concentration of SO_2 which kills trees if it is already killing these trees with SO_2. In other words, the act of setting environmental quality criteria is precipitated by their apparent violation. Within this context, it was inevitable that the environment's perceived needs would be reduced to their minimum.

Under the circumstances, what policy-makers should do is proceed with extreme caution, but it my not be possible to practice caution in a society thatisbursting at its seams. Therefore, the onus does not fall entirely on policy-makers. Each and every Canadian citizen is practicing a life-style that renders such "cautious environmental management" impossible. In other words, policy-making reflects a social order to the same extent that it guides it, and the performance of public officials often merely testifies to, or symbolizes, society as a whole as it tries to grapple with and understand its affairs. Clearly, Canadian culture's (and not just policy-makers') humanistic and economistic criteria of "value", when combined with the resource-logicofmaximm permissable concentration, ensures that policy-makers will err on the side of uncertainty.[78] Adding to this the intense pressures for economic and political expediency, uncertainties are more likely imbeignoredthanheeded, especially in the case of an EIA where further consideration of uncertainties will likely jeopardize the project. Dilution is essentially the practice of ignoring contaminants, andthepracticeofignoringcontminantsis an exercise in uncertainty.

The present burden of proof laws represent the legislation of this uncertainty. The case for reversing the burden of proof laws has been well argued by others[79] and such a reversal is clearly needed. The problem, however, is not this simple.As with policy-making, laws reflect as much as they lead and the present burden of proof laws only testify to society's predisposition to ignore its waste. The laws will not change until society's priorities change. In other words, pollution is not a legal problem with a legal solution, just as it is not a scientific or technological problem with a scientific or technological solution. If reversing theburdenofproofappears untenable within the current

social order, and it is, this is just an indication of the need to question, and violate, that order if we are to deal more sensibly with environmental problems. Pollution is a deep, cultural problem that will only respond to cultural solutions.

At the core lies the practicing definition of social need, a social choice which renders it in society's best interests to reduce the entire earth to its "basic" (minimal) functional requirements as a means of ensuring uninterrupted "social progress". It amounts to elavating the perceived needs of a single species onto a pedestal and allowing them to overrun the earth. Consciously. To the extent that society's material demands produce equal quantities of waste, the problem lies in the "need" for the material, period. Once needed, the waste products cannot be avoided, they can only be hidden or ignored.[80] Reducing the waste can only result from reducing the occurances and volume of matter-transformation. Policy-makers have foregone this strategy in favour of "better managing" the increasing rate of such transformations. Planning tools like EIA's can only aid the effort, they cannot redirect it. And in fact, in the present context, "better management" will only facilitate the destruction in a more efficient manner.

To conclude, it has not been policy-makers' failure to meet their stated goals which has presented Canadian society with its pollution problems, nor has it simply been "poor planning" or a lack of political will. The ideal itself, and the logic upon which it rests, are fundamentally misguided.

FOOTNOTES

1 - Bell considers the concept to be an important aspect of what Simon (1976) calls the "political framework": "the constraints and opportunities defined by 'the broad social and economic environment, the system of power and influence, the dominant ideas and values in society, the formal institutional structures'. This framework 'greatly restricts the alternatives [policy-makers] consider and the range of innovations they make'." (Bell, 1983, p.12)
My approach to air pollution policy has also been influenced by Gusfield's concept of a "structure of public problems": "To desribed the structure of public problems is to describe the ordered way in which ideas and activities emerge in the public arena." (1981, p.8-9)
The concept is also related to the literature on "paradigms", to be introduced below.

2 - I prefer the term "policy culture", partially because of the different meaning originally associated with the concept of "political culture", but mainly to reflect the problem-specific approach which Bell calls for. The term was originally suggested to me by professor Harold Kaplan of York University.

3 - "All situations that are experienced by people as painful do not become matters of public authority and targets of public action. Neither are they given the same meaning at all times by all peoples. 'Objective' conditions are seldom so compelling and so clear in their form that they spontaneously generate a 'true' consciousness." (Gusfield 1981, p.3)
"The societal definition, and not the objective makeup of a given social condition, determines whether the condition exists as a social problem." Herbert Blumer, quoted in Ross and Staines (1972, p.21).

4 - "As phenomena are open to various modes of conceptualizing them as problems, so too their public character is open to various means of conceiving their resolution." (Gusfield 1981, p.5)

5 - "As the extent and consequences of environmental degradation and careless use of natural resources have become better known, widespread concern has arisen about the nature of development. . . . A response to these concerns and questions has been the concept and practice of environmental management, . ..the entire process of planning, managing and conserving the environment and natural resources." Environmental impact assessments, as an integral part of sound environmental management, ". ..is a process which attempts to identify, predict and assess the likely consequences of proposed development activities." (Canada 1986a, p.1,2)

6 - "The management of the natural environment is apart of the general problem of allocating the economy's resources between competing ends" (United Nations 1983, p.17). Under the guidance of cost-benefit analysis, "environmental policy should...be concerned with the efficient use of our natural environment" (p.22). Efficiency means simply "not being wasteful with any resources, including those of the natural envirnment" (p.17). CBA can be used to "assist in the rational design of development projects. . ..If environmental effects of a project can be incorporated into the whole CBA procedure at the very beginning, then the result is likely to be a project in which

economic and environmental objectives areincloserhanmny and theoverall socialbenefits maximized" (p.16).

7 - Leiss (1976, p.18) has argued that social and political stability in contemporary industrial societies depends on "...the ability of the social system as a whole to ensure the steady growth in the quantity and variety of commodities." The reality of these goals and "needs" has become a self-evident truth in industrial societies the world over, whether "capitalist" or "socialist". The important questions pertain to whether such goals are desirable or not.

8 - "A policy of maximizing GNP is practically the equivalent of maximizing... pollution. . . . Sincematterandenergycannotbedestroyed, consumptionis merely the transformation into waste of GNP..." Daly 1971, p.83). The argument is based on the laws of thermodynamics and the "entropy" phenomenon, whichholds that all economic "throughputs" transform matter-energy from a "low entropy" (free, available) state to a "high entropy" (bound, unavailable) state. This "bound" energy is the "valueless waste" (air contaminants) which result from every transformationofmtter. The more matter which is transformed, the more waste which is produced. See Georgescu-Roegen (1980).

9 - "...we tend to regard the restofnaturealrmstexclusively as awarehouse of resources and a dumping ground for wastes" (Leiss 1976, p.32) See also Beakhust (1979) and Swift (1974).

10--Cotgrove (1982, p.1) summarizes the flood of literature which appeared in defence of the environment: "All had in common the same message -that the industrialworldcouldnotgo on as it was; that continued exponential growth was a physical impossibility, and that growth in population, pollution, production, and the use of energy and non-renewable resources hadreached a point where, unless drastic action was taken, crisis and collapse were inevitable." Conversely, many writers emphasized opposite social forms, resting on "stability", "equilibrium" and "steady-state economics" as the best future direction. The underlying goal was to unite economics with ecology, stressing the interdependence of all life forms, in opposition to the dominant myth of human independence or exemption. No government hasheeded to any of these calls. See for example, Daly (1980) Johnson and Hardesty (1971), and Millbraith (1984).

11 - The reconciliation of such a conflict is especially difficult because, as Johnson and Hardesty (1971, p.2) note, present social needs are "diametrically opposed to the requirements of ecosystem stability." See also Detweiller et al (1973, p.34).
Leiss (1979, p.275) has written: "Environmental problem will set some difficult tests for our political institutions.What will make these tests especially hard for us is the fact that we have come to define environmental values primarily in relation to demands for steady economic growth - or, more precisely, in relation to a sense of well-being that seems torequire, apparently forever, a regular increase in GNP."

12 - Contemporary uses of the term "paradigm" are largely drawn from Thomas Kuhns' The Structure of Scientific Revolutions. In Cotgrove's words: "paradigms... providemaps ofwhattheworldis believed to be like. They constituteguidelines forgetting around and foridentifyingand solving problems. Above all, paradigms provide the framework of meaning within which 'facts' and experiences acquire significance and can be interpreted. . ..They have a normative aswellas a cognitive dimension,indicating not only what is but what ought to be done" (1982, p.26). See also Millbraith (1984).

13 - The Canadian Clean Air Act (1971) defines an "air contaminant" as: "...a solid, liquid, gas or odour or a combination of any of them that, if emitted into the ambient air, would create or contribute to thecreation of air pollution. 'Air pollution' means a conditionof the ambient air, arising wholly or partly from the prsence therein of one or more air contaminants, thatendangers the health, safetyorwelfareofpersons, thatinterfereswith the mormal enjoyment of life andproperty, that endangers the health of animal life or that causes damage to plant life or to property." Sec. 2(1) (a) and (b).
Ontario's Environmental Protection Act (1971), Sec. 1(1) (c) does not make a distinction between "air contaminants" and "air pollution", but the interpretation of "air pollution" is in concert with the Clean Air Act.

14 - Estrin and Swain (1974, p.46). The matter was expressed at the 1967 Ontario Pollution Control Conference as follows: ". ..the fundamental guidepost - the underlying concept which must be used -in controlling air pollutants is that of effects. Thus, to decide what concentration of any contaminants is undesirable, it is necessary to examineealltheknowneffects of that pollutant on man, animals, vegetation and property. This study produces ambient air criteria for the contaminant" (Ontario 1967, p.83).

15 - In its simplest terms, "'air pollution' means not simply that the contaminants are there, but that they are present in sufficient concentration to cause harm" (Canada 1973a, p.29. Emphasis added).

16 - "Cost-benefit analysis treats the natural environment as another resource in production" (United Nations 1983, p.2).
Air pollution in Ontario was the responsibility of the Department of Energy and Resource Management from 1969 to 1971. Federal responsibility for air pollution was in the hands of the Department of Energy, Mines and Resources for several years prior to the creation of Environment Canada in 1971.
See also note 5 , on "environmental management".

17 - The Select Committee on Air Pollution and Smoke Control, created in 1955 and one of the earliest extensive Ontario government investigations of the problem, was centered around crop damage, livestock, farmbuildings and equipment and human health. (Ontario 1957, p.13-23).
The mandate of the Hall Committee (Ontario 1968, p.xiv) was to investigate the effects of pollution upon "human health, livestock, agricultural and horticultural crops, soil productivity and economic factors."
Neil Evernden (1985) has argued that one of the main reasons the environment

became such an important political issue in the 1960's is that certain key books, such as Rachel Carson's Silent Spring, stressed the effects of environmental hazards on human health. Previous "conservation" movements which had dominated environmental politics in the firsthalfof the century were defending and preserving non-humans.

18 - "This perspective establishes the provisioning of our material demands as the single organizing principle for our relationship with the rest of nature" (Leiss 1976, p.39).

19 - The Hall Committee (Ontario 1968, p.309) recommended that tests beconducted to "help in determining the maximmconcentrationof air-borne pollutants permissable in an area."

20 - Dales (1968, p.18) attributes problem to excessive urban concentration, which "'overloads' nature's disposal system in those areas, leaves unused much of the natural waste disposal capacity in lightly populated regions, and thus increases society's waste disposal costs."

21 - The basis for not leaving the atmosphere "unutilised" lies clearly in our economic priorities, as the No Significant Deterioration (NSD) issue in the U.S. demonstrates. An NSD clause was established at the behest of environmentalists toprotectrelativelyunpopulatedareas from further deterioration. NSD, however,was eventually successfully combatted by those opposed to further pollution control because itwouldlimiteconomic growth. See Victor (1980, p. 205-213) A discussion of the "economic irrationality" of NSD can be found in O'Riordon (1979).

22 - The 1955 Select Committee (Ontario 1957, p.43) put it this way: "Air pollution is the result of excessive use of the atmosphere by man for waste disposal, combined with certain predisposing and contributing factorsprovidedby nature. Man's part comprises the emission into the air of smoke, soot, fly ash, cinders, dusts, gases, vapours, fumes and odours. Nature's contribution might be a topography that hinders winds in their efforts to dispose man's airborne garbage, it might be humidity and fog, itmightbe too much wind or no wind at all, it might be just plain sunlight which catalyzes reactions in the air between various of man's contaminants, itmightbe a temperature inversion, or it might be other conditions or combinations of conditions."

23 - "From man's point of view, theharmdonebydiscardingawasteinto the environment often depends not so much on the properties of the waste itself as on other factors: the chemical and biological processes that take place after the waste has been discarded" (Dales 1968, p.5). Dales understands these "other factors" primarily in relation to "self--purifying" air. The Toronto Telegram, reporting on the Hall Committee, wrote that "...allowable limits (of pollution) are a compromise between technological capabilities, economic feasibility, and the (climactic) conditions prevailing in any given area" (April 18, 1969).

24 - Since 1969, initially under the Department of Health, the Ontario Ministry responsible forpollutionoftheairhashadanoperating sectionentitled "Meteorology and Air Quality". Environment Canada operates the most extensivemeteorological network in the country under the Atmospheric Environment Service. The "Air Pollution Index" and "Acid Rain Watch" typically appear on the weather page of the newspaper. See Ontario (1978).

25 - This matter is usuallyconceptualizedas "personalversus systemic attribution" (Ross and Staines 1972) or "individual versus structural attribution" (Bell 1983).

26 - Regarding "Arab Oil Blackmail" Catton (1980) observes that "as long as the suddendelugeof troubles canbeattributedtovillains inanother-land, the world could seem to remain in tune with traditional definitions of right and wrong" (p.60). At another point he observes that "tycoons" and "tyrants" are popular targets and that " . ..the temptation persists to attribute human hardships to such forces as 'inflation' which 'devours' prosperity". Similarly, the Irish potatoe famine was blamed on bacteria rather than human overdependence on a single crop. (p.254)

27 - 'With most resources, whether renewable or nonrenewable, [man] is potentially able to modify to some degree their elemental and/or locational characteristics in order to suit his economic needs. But with air man's actions, institutions, and artifacts must be modified. He is unable to adjust the winds to any appreciable extent; therefore he must adjust himself to the whims and vagaries of the air currents. His inability to face up to this fact appears to be the root cause of the atmospheric pollution problem" (mocker 1966, p-63).
Allen Kneese (1966, p.33) has pointed out that it is less economically feasible to control air pollution than water pollution because it is more difficult to control meteorological events to improve waste-assimilative capacity than to controlhydmlogicalevents for thatpurpose.

28 - "Our challenge is to understand the receiving capacity of the atmosphere, to determine the concentration of contaminants that is significant, and to manage our activities so as to stay well within those concentrations' (Ontario 1967, p.8).
Herfindahl (1970) states that a strategy to improve environmental quality is to "reduce damage from harmful residuals by a) increasing the assimilative capacity of the environment (e.g. stream aeration or low flow augmentation); b) discharging to a place where less damage results; c) moving the activities or organisms subject to damage."

29 - The API is basedonarunning 24 hour average of SO_2 and suspended particulatematterconcentrations. It was first introduced in Toronto in 1970 and expanded to eight Ontario cities by 1982. Similar warning systems are used in other provinces and the U.S. See Ontario n.d.a; 1971; and 1984.

30 - Estrin and Swain (1974, p.60). These authors also argue that because the Index is based on a running 24 hour average a number of short, intense concentrations will not be immediately evident and will be lost in the averaging (p.60). The Index also presupposes an even distribution of pollution and will not

detect a number of isolated episodes (p.61). See also Ontario Legislature, October 16, 1970, p.5109 and 5117.

31 - I say "taller" because "tall" stacks were not a new idea. At Inco's Copper Cliff smelter, for example, stacks have become progressively higher since the 1930's in an attempt to disperse contaminants away from the area and in relation to altered production techniques. Prior to the inroduction of this method, (before the use of stacks at all), the first form of pollution "control" at this cite was to move the open roasting yards away from the populated area. (Ontario 1982a, p.7)

32 - On stack design, see Leuthesseur (1974) and Canada (1986b, p.4-9). Prior to 1970 there were fewer than 100 stacks over 500 feet in the U.S. By 1982 there were over 500, many of them towering over 1,000 feet. Many of these stacks were raised at the behest of government regulatory agencies, but in some cases companies proceeded on their own initiative to avoid prosecution for urban air quality violations. Time, November 8, 1982, p.101. See also Macleans, July 15, 1985, p.46.
Inco's 1,250 foot stack is the tallest in the world. They were ordered to build the stack under a Ministerial control order, but it has been observed that the company was planning to raise the stack for some time prior to this, mainly as a means of increasing production. See Alternatives Interview (1973) and Ontario Legislature, October 15, 1970, p.5091.

33 - "One of the methods adopted [to clean up cities] seemed simple and logical: build tall stacks to send emissions high into the atmosphere where they could disperse among the clouds and be rendered harmless. The idea seemed to work as cities . ..benefited from the removal of the offending pollution. What was not known at the time, however, was that the act of sending emissions high and far away gave life to a new problem - acid rain" (Canada 1981, p.17).

34 - Another Inco official told the Ontario Standing Committee on Resources Development in 1979 that "emissions from the 1,250 foot chimney permitted the recovery of the Sudbury environment to begin" (in Wellar 1980, p. 34).

35 - Simeon (1976, p.557) calls a "first-order consequence" the intended or immediately perceivable effects of a policy. A "second-order consequence" refers-to unforseen consequences, either benign or malign, of that policy. It is interesting to note that, despite the acknowledgements that dispersion did not render contaminants harmless, Environment Canada has claimed that "sulphur dioxide, as a local air quality problem, has been successfully controlled in Canada" (Canada 1984a, p.7. Emphasis added).

36 - Statement by George Kerr, Ontario Legislature, October 16, 1970, p. 5108. See also Ontario 1980, p.13 and Ontario n.d.b, p. 8.

37 - See Ontario 1967, p. 81-85 and 237-239, on plant location and ventilation. As to the buming of high sulphur coal on "favourable" days, this was one of Ontario Hydro's methods during the 1970's. See Wellar 1983, p.23.

38 - The rationales for dispersion also intensified under the pressures of the oil crisis and recession, allowing many industries to argue for relaxed standards, including the use of "intermittant" control (i.e. dispersion) rather than reductions via "scrubbers". (Victor 1980, p. 210-213). The oil crisis and other factors were thus used as a justification for dispersion policies which had already been set in motion many years earlier.

39 - Changes in production processes are often associated with attempts to improve the efficiency of pmduction. Whereas billowing smokestacks have longbeena symbol of prosperity, it was recognized at least 100 years ago that a billowing smokestack also symbolizes incomplete combustion. Consequently, early pollution ("smoke") control was directed toward the more efficient use of fuel, rationalized as a cost saving measure. See any of the following: Briggs (1941); Cohen and Rusto (1912); Marsh (1947). When reductions are mtassociatedwith improved productivity they are resisted adamantly by the industries in question. For an account of Ontario's attempts to regulate Inco, see Wellar (1980, p. 30-39, 60-74); Howard and Perley (1980); and Ontario 1979, p.36-51).

40 - "Environment Ontario has been dealing with SO_2 and NO_x as pollutants in their own right, concernedwith theirlocalandcumunityeffects. It did not at first deal with them as constituents of acidic precipitation - acid rain which is now defined as a long-term and long-range problem with effects onacontinental, evenglobalscale. The accumlationof SO_2 and NO_x cause damage even though conventional air quality criteria are not exceeded" (Ontario 1980, p.14). See also p.6 of this report; Ontario (1979, p.23,42); and Canada (1981, p.17).
It is interesting to note that air pollution appears to have beenlabeled a "local problem" only in retrospect, with the advent of "long-range" problems. Tohave explicitly labelled early policy efforts as "local" abatement would ha/e drawn attention to the neglected non-local matters.

41 - See Ontario (n.d.c; 1974; 1982 and 1985b).
Non-govemmntscientistsbegan documenting the increasing acidity of rainfall near industrial centers in England in the mid-19th century, and as the 20th century progressed acidified pollution was being measured in rural areas in Canada, the U.S., England and the Scandanavian countries. By 1970 the phenomenon was well documented in academic journals. See Erickson (1973); Gorham (1981); Howard and Perley (1980, p.23-32); and Kramer (1973).

42 - Ontario Environment retrospectively claims to have realized the severity of the problem in 1975: "The severity of acid rain in Ontario became apparent when Environment Ontario, working with the Ministries of Housing and Natural Resources, began to monitor the impact of cottage development in the Muskoka/Haliburton resort areas in 1975, in the context of the Lakeshore Capacity Studies. While examining the material input into the lake from all sources, including atmospheric contribution, it was discovered that the atmospheric was much more acidic than anticipated" (Ontario 1980, p.14). Environment Canada claims to have discovered acid rain in 1976: "The need for investigating the extent and effects of the LRTAP and associated acidic precipitation problem and identifying possible abatement/control options for Canada was first

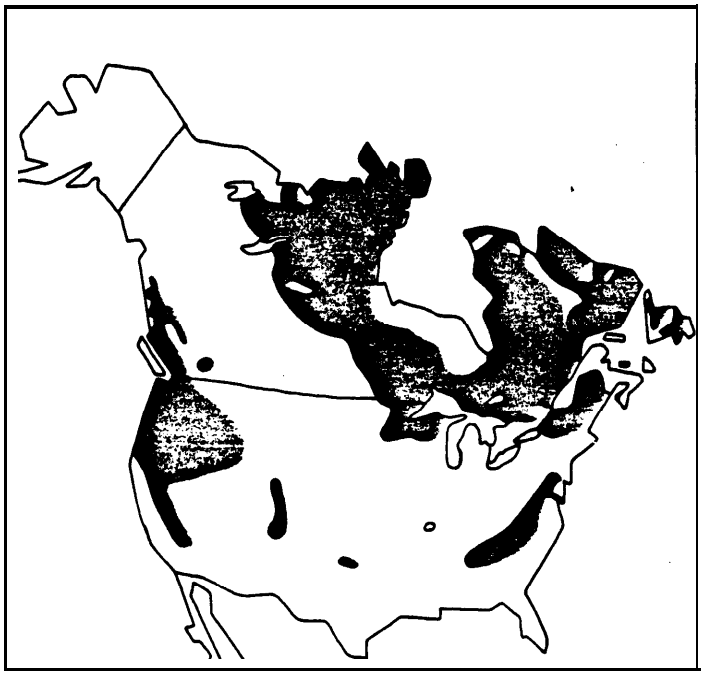
identified by the federal government in 1976. Convincing presumptive evidencewas collected which demonstrated that acidic precipitation posed serious and worsening environmental problems which werecausing extensive damage tovaluable fisheries resources and freshwater ecosystems ineastern Canada" (Canada 1980, p.5).

43 - "Air pollution" was dominated by the "big five": sulphur dioxide, nitrogen oxides, carbon monoxide, hyrdocarbons and suspended particulate matter, with the addition of lead and other contaminants in isolated incidents. See any of the following: Canada (1973a,b,c); Ontario (n.d.a,b, 1973). Although the API only measured SO_2 andsuspendedparticulates, all of these contaminants were the subject of regulatory concern and many were subject to dispersion policies. The recognition that SO_2 hadmtbeen rendered harmless should have implicated many of these others, and although they areoftenmntioned indiscussions ofacidrain, they are not the focus of concern at present, most likely because theyarenotreadon the pH scale. An interesting researching project would be to study the early history of "acid rain", when it first received a lot of publicity, to see how and why the limited vision crystallized the way it did.

44 - In July, 1980, former Ontario Environment Minister Harry Parrott told a gathering of Canadian and U.S. officials: "I am concerned about thousands of Ontario lakes which are vulnerable" (Ontario 1980, p.15). Ontario's Acid Precipitation in Ontario Study has been publishing a report on "Acid Sensitivity of Lakes in Ontario" annually since 1981, a listing of over 5,000 lakes and their relative sensitivity to acids. (Ontario 1985c).

45 - Numerous maps have appeared which divide North America into "sensitive" and "non-sensitive" areas. Theexample reproduced here is from Ontario (1980, p.1).

North American Areas Containing Lakes Sensitive to Acid Precipitation



Source: James N. Galloway and Ellis B. Cowling, Journal of the Air Pollution Control Association 28, no. 3 (March 1978).

46 - "At a time of economic stagnation, with record postwar unemployment, inflation and high interest rates, the costs of eliminating sulphur dioxide emissions by installing 'scrubbers' ...are prohibitive and would likely mean production cutbacks. . ..It is questionable whether the situation is dire enough to justify immediate action. Says Joseph David, general counsel for American Electric Power... 'this could break the economic backnone of the Midwest. And there's no assurance that it will improve the acidity of rainfall in the East'" (Time, November 8, 1982, p.103).

47 - A U.S. g o -t official has said: ". ..let's not pursue corrective measures which are not needed, or go beyond that which may be needed" (Taylor, 1981, p.151). This is essentially the Canadian position as well, only our policy-makers are convinced that action should be taken now. Many in the U.S. are simply not (publicly) convinced as to the seriousness and cause of the problem.

48 - ". ..the problem is one of a three-fold nature, comprising: a) the source of pollutants; b) a-spheric transport and transformation; c) deposition on susceptible ecosystems" (Ontario 1981, p.5-6).

49 - "Unfortunately, the large number of sources make it impossible to trace damage to an individual site from an individual source. There is a pool of acid air over the whole northeastern part of the continent..." (Gorham 1981, p.6).

50 - Environment Canada (1984a, p.10) has expressed it this way: "The Canadian approach to acid deposition abatement is to determine an acceptable rate of deposition in selected receiving areas, and then to estimate the range of reductions in emissions for contributing source areas that would achieve the environmental objective." (Emphasis added).

51 - "What is not known [about acid rain] is how much man-made emissions from one region effect precipitation quality in other regions, or what is the local impact. And it is impossible to project how any control strategy will change precipitation quality at any location" (Taylor 1981, p.153).

52 - That "acid rain" is a misnomer is often aknowledged, but it is usually restricted to the "rain" and the full implications of the matter are apparently not recognized. Canada (1981, p.6): "The problem has been labelled 'acid rain'. More precisely, though, it should be called acid deposition. Wet deposition refers to acid rain, acid snow and acid smog (acid smog occurs in large cities like Los Angeles, California, where there is an overabundance of automobiles). Dry deposition refers to deposits of sulphur and nitrogen compounds during dry periods. They fall to earth before they have time to change into sulphuric and nitric acid as they travel in the clouds. These particles, however, carry molecules which can become acidic when mixed with surface water, rain, fog, dew or mist, and is falling in approximately equal amounts to the wet. In this booklet the popular term 'acid rain' will be used to represent the overall problem of acid deposition." This formulation still hinges the dart-age-potential of sulphur and nitrogen on an eventual conversion to acids, and fails to recognize that no such conversion is necessary for damage to ensue.

53 - "As the winds carrying acidic substances speed across the countryside, other pollutants often hitch a ride: heavy metals such as mercury, lead, zinc and copper. These metals come from industrial emissions and automobiles and when deposited on lakes can be toxic to fish" (Canada 1981, p.17). See also note 43.

54 - see note 52 and Canada (1984b,p.2).

55 - When SO_2 was talked about as airpollutiononeofitsmstimprtantfeatures was its ability to combine with misture to form sulphuric acid. An Environment Canada document from 1973 states: "[Sulphur dioxide] . ..is one of the most [air pollutants] in terms of effect. It includes sulphur dioxide (S02) and sulphur trioxide (SO_3), together with their acids and salts. SO_2 accounts for most of the damage done by air pollution to materials and vegetation. It is also a health hazard.... SO_2 sometimes combineswith oxygen and moisture in the atmosphere to form sulphuric acid. This can result in the transformation of a fine mist of sulphuric acid - or in the presence of sulphuric acid in rain water" (Canada 1973a, p.24). To underline thepoint, the following statement was made in the Ontario Legislature in 1970:"Sulphur dioxide, as most of the members know, when combined with misture and particles in the rain, becomes sulphurous acid, andirritates the nose and throat causing lining of the membrane andbronchial tubes to become swollen and eroded, and even some clogging of the small arteries and veins" (Mr. Ben, MPP Humber, October 15, 1970, p. 5087). See also Canada (1973a, p.26) and (1973b, p.6-7).

56 - This matter is also reflected in the frequent references to "acid-causing emissicms" and "acid precursors" found in many discussions of the problem. They refer to those specific missions which convert and can therefore be detected on the problem-measure. The term "acid-causing" immediately suggests that many missions are not acid-causing (which is true) and immediately implies that they are not a problem for that reason (which is not true). The following passage, from Perhac (1981, p.17-18), a spokesman for the Elecric Power Research Institute in the U.S., is worth quoting at length: "In order to assess the utility contribution to acid rain, what we want to know, in its simplest terms, is the relationship between what goes up the stack in one locality and comes down inanotheras acid rain. Unfortunately, in order to answer thisquestion, it is not sufficient to know something just about emissions or about what comes down as acid rain. We must know something, also, about chemical transformations which take place in the atmosphere, for example, from the precursor SO to the finalproductsulphate, or acid rain. We need a better understanding o2 long-range transport and we must know something about the cloud chemistry processes which occur. If we put together this information, we can then develop a predictive model which then allows us to assess what the utility contribution to acid rain is.

. ..Utilities put out S02. SO2 is a precursor for sulphates. We are finding, however, tnattheutilityemission innottheonly factor in thedistribution and magnitude of the sulphate level in the atmosphere. Meteorology plays a significant role. Dewpoint temperature, for example, shows a very strong relationship to sulphate in the atmosphere. In like manner, ambient air temperature shows a very strong relationship to sulphate in the atmosphere.

So what do we need to get high sulphate levels? You need, obviously S02, but you also need certain meteorological conditions. Unfortunately we cannot control the meteorology but it has to be considered in any development of a predictive model which allows you to assess the utility contribution to the occurance and distribution of acid rain."
Of course, this entire passage could not have been sensibly uttered had the question of "sulphates" and the transformation to acid rain not been singledoutas the conditions of problem-formation.

57 - See Ontario (1979, p.20); (1980, p.20) and the quote and liming and heavy metals in Sudbury on page 32. This strategy is advocated by thoseopposed to further abatement. See Taylor (1981, p.153). A colleague of mine has spoken to a number of Ontario cottagers and apparently many of them have expressed interest in liming as a control strategy.

58 - An Environment Canada document (1985) stated it this way: "Controlling acid rainposes a challenge that is unique and typical of the environmental problems that confront Canadians in the 1980's.It requires that we consider the impacts ofpollutionbeyondtheaxea surrounding the pollution source. It requires pollution controls beyond those initiated by industrialized societies in the 1970% to ensure clean air in our cities. It requires significant reductions of sulphur dioxide...and nitrogen oxide...emissions."

59 - On Inco see Canada (1982a, p.40). "Acid seepage from tailings can also be present. The waste solids discharged to the tailings impoundment area from the concentrating operation contain iron sulphides. The sulphides, especiallypyrrhotite, by theactionofbacteriaareoxidized to ferric sulphate which subsequently forms sulphuric acid. Under these acid conditions, sulphides of copper, chromium, cobalt, manganese, nickel and zinc dissolve. Thus, the effluent is not only excessively acidic but contains metals in solutions that are toxic to aquatic life" (p.41).
In the U.S. "The Department of Interior has catalogued thousands of miles of Eastern streams that have been biologically ruined by acid mine drainage from coal mining. This chemical form of water pollutant is produced by the leaching and oxidation that occurs when sulfur-bearing rock formations are exposed to air and water in the mining process" (Victor 1980, p.241).
See also Davis (1970, p. 29) on acid mine drainage.
Granted, these compounds can be put to other "uses", such as the manufacture of fertilizer, but this mans that they will simply contribute to the already out-of-hand fertilizer-pollution problem.

60 - Berger and Luckmann (1967, p.89) ciefine reification as "...the apprehension of human phenomena as if they were things, that is, in non-human or possibly supra-human terms...as if they were something else than human products - such as facts of nature, results of cosmic laws, or manifestations of divine will. Reification implies that man is capable of forgeting his own authorship of the human world, and further, that the dialectic between man, theproducer, and his products, is lost to consciousness. The reified world is, by definition, a dehumnized world."

61 - Time writes that acid rain is "...a blight as widespread and careless of its victims, andofintemationalboundaries, as the winds that disperse it" (November 8, 1982, p.98). Thus, it is not LRTAP per se which is the problem, it is the fault of "careless" winds. Had the winds transported the contaminants to a non-valued or non-sensitive area, problems would not occur, or so the argument goes.

62 - "Had we known in the 1950% the effect sulphur dioxide and other airborne pollutantswouldhave, it is unlikely we would face the big acid rain clean up job before us. We did not know, so we built superstacks that shot the pollution high into the air where it could be transformed to acid" (Canada n.d.a, p.21. Emphasis added). See also Canada (1981, p.4) and (n.d.b, p.2).

63 - Newspaper quotes from the Toronto Star, April 5 and 4, 1987; Time, November 8, 1982. For raindrops and umbrellas, see thegraphics on the covers of Canada (1982b) and (1984b); seealso editorial cartoons in the Toronto Star, March 29, 1986, and the Toronto Sun, March 22m 1986. Rain Rain Go Away was published by Public Focus on the Great Lakes, 1979. Bell (1983, p.6) has noted the importance of symbols in representing public issues: "The symbol conveys simultaneously a definition of the problem, a diagnosis of its causes, a prescription for its cure, and a powerful affective cue indicating how we should respond to it." In our case the entire issue has been condensed into a single raindrop: the problem appears in, about, and of the rain.

64 - In 1970 Time (February 2, p.47) expressed disappointment that the rain would not "wash" certain contaminants from the supersonic aircraft back to earth, allowing them to remain in the air where they would reflect sunlight away from the earth, contributing topotentiallyadverseweather conditions. Goodin (1976, p.151) also makes a reference to the rain as cleansing.

65 - Gusfield (1981, p. 71-74) uncovered many instances in his study of drinking-drivingwhere circumstance appearedas cause.

66 - Since the advent of acid rain it has become almost public knowledge that "For geological reasons theecologyofalargeportionof Eastern Canada is extremely sensitive to the effects of LRTAP and acidic deposition" (Canada 1980, p.7). See also notes 45 and 48 and the quotes on pages 28 and 30.

67 - Canada (1984a, p.1), in its introduction states: "Acid rain is mainly caused by man-made emissions of sulphur dioxide and nitrogen oxides" (emphasis added). Seealsopage 4 of this publication, first paragraph, under the title "emissions". See also Canada (n.d.b) and Ontario (1985a). Time has said that two questions are at the center of the acid rain controversy: "To what extent are sulfur and nitrogen emissions responsible for acidity in rain, apart from natural causes? Will a reduction of emissions significantly reduce that acidity?" (November 8, 1982, p.103. Emphasis added).

68 - Canada (1973a, p.24) opens its discussion of "air and air pollution" with the following: "Our environment can take a considerable amount of punishment, natural as well as man-made. There is in fact no 'pure air' in nature. Forest

fires, volcanic eruptions andothernatural events contribute some sontamination to the atmosphere." The document then goes on to remind the reader that the presence of thesenatural "contaminants" does not mean thaycause "air pollution". U.S. (1963, p.195) has written: "Pollution of natural origins, as from volcanic eruptions, forest fires and dust storms, is generally uncontrollable, but fortunately in most localities, is rarely of major significance in terms of the total air pollution problem. The problem owes its importance to man and his activities." See also Ontario (n.d.b). Canada (1973b) does not mention non-human sources at all.

69 - Thismatterreacheditsheightin the followingquotation from the Globe and Mail under the title: "Reagan Now Believes Volcanoes and Ducks Not Acid Rain Source": "Progresshasbeenmadein persuading U.S. President Ronald Reagan that acid rain is not caused by 'volcanoes, plants or even ducks', Environment Minister Tom MacMillan said yesterday....Mr. Reagan now recognizes that acid rain is a problem and that man-made pollution is the cause...." (January 14, 1986), Whether or not Mr. Reagan seriously entertained the notion that ducks cause acidrainis beside the point. The point is that the question has been raised today, and was not with respect to air pollution several years ago.

70 - Roberts quoted in Time, November 8, 1982, p. 98 and Munton (1981, p.21). Norton quote in Gold (ed) (1981, p.57). Mulroney quoted in the Toronto Sun, March 17, 1986, p.6.

71 - Time (September 19, 1983, p.50) had the following caption under a photograph of a polluted valley: "Nearby mountains keep cleansing South Atlantic winds from blowing away toxic smog that hangs over Cubatao [Brazil]; giving birth to 'monsters'." (Emphasis added). Note thatthewinds here are "cleansing" and that it is the muntains which are "giving birth" to "monsters". We can be sure that if the mountains were absent the winds at the point of deposition would be considered "culprits".

72 - Tim, (May 4, 1970, p. 18 and January 5, 1970, p.37). Two newspaper headlines cited in Taylor (1981, p. 151).

73 - Regarding "toxic rain": a personal discussion with one of the press conference organizers revealed that they consciously did not use the term "toxic tain", although some questions from the press employed this term. When I questioned the Toronto Star's environment reporter, who used the term, he replied that it seemed appropriate and did not seem misleading to him. Further research needs to be conducted into the role of the press and the generation of environmental symbols and labels.
Regarding the closing of Toronto's beaches, an interesting research project would trace the history of the closing of the beaches to see if the matter was blamed on the rain in the past. If not, this would support my thesis that reification is becoming more prevalent in recent years.
Another example of reification is that, when Vancouver's False Greek was being dredged in preparation for Expo 86, the highly toxic waste uncovered in the creek bed was labeled "sludge" and its origins were a "mystery" to local politicians. False Greek was the cite of a good portion of Vancouver's industry in the earlier part of this century. And finally, one more example which

testifies to the power of linguistic classifications is cited in Ritchie-Calder (1973, p.56-7), who notes that biologists working on early nuclear tests ". . .had found [radiostrontium] in the skin bums of animals exposed in Nevada testing ranges and they knew itssinisternatureasa'bone-seeker'. But the authorities clapped security on their work, classified it as 'Operation Sunshine', and cynically called the units of radiostrontium 'Sunshine Units' - an instance not of ignorance but of deliberate noncummonication."

74 - This tendency characterizes many social phenomena and is comparable to what Philip Slater (1970, p.58) has called the "toilet assumption": "Our ideas about **institutionalizingtheaged,** psychotic, retarded and infirmarebasedonapattemof thoughtwemightcallthe **Toilet** Assumption - thenotion that unwanted matter, unwanted difficulties, unwanted complexities and obstacles will disappear if they are removed from our immediate field of vision."

75 - Time (November 8, 1982, p.103) has quoted a U.S. government official and a coal company spokesman to say the following respectively: "There is no question that man-made emissions contribute- the problem. The question is the relationshipbetween emissions and deposits. We have a kind of back-of-the-envelope idea, but no hard scientific fact."; 'We can't yet identify the smoking gun. Is it Ohio.? Is it Illinois? Or is it some local source?" The question "Is it Ohio or Illinois" is of the utmost importance. Given the prevailing assumptions and definition of the problem, if it is demonstrated to be Ohio, for example, then Illinois' emissions are rendered unproblematic and can continue unabated. It would be assumed that Illinois emissions were rendered harmless under one of the exclusionary criteria already cited.

76 - See Briggs (1941); **Cohen** and Rusto (1912); and Marsh (1947).

77 - "Science has become the idiom of our age. It is the language in which command is cast as the compulsion of external nature. Authoritative law thatrestsits claim to legitimacy and acceptance on the technical **reasoning** of the realm of science denies any moral status. It denies that a moral decision has taken place, that a political choice among alternatives has been made. The ownership and responsibility for social problems and their solution are given as a matter of fact and not of values" (Gusfield 1981, p.194). Evernden (1985) has argued that the incorporation of scientific research and planning into "sound environmental management" replaced "values" with "facts", and lent scientific credence to the "sensible", when "in most cases, 'sensible' turns out to be a synonym for the customary..."(p.9).Out of this movement emerged EIA's, which "whileappearing to be the tool of environmental defense... turns out to serve the interest of the developer by making ecology the handmaiden of a continuing environmental transformation" (p.11). Evernden's article also contains an excellent critique of "resourcism".

78 - Evernden (1985, p.14) has stated that: "Other societies have no doubt managed to visit considerable destruction on the natural world from time to time, but we alone seem to have so understood the world as to make this inevitable."

79 - Most writers on this subject are working within the law community. See for example, Lax (1979); Large and Michie (1981); Page (1978); Stone (1972); and Schrecker (1984).

80 - Catton (1980) has argued that a central problem lies in the assumption that the use of "fossil fuels" as fuels is inherent in their nature. "It's high time to learn . ..that the wisest 'use' of coal andoilmaybe toleave them underground as nature's safe disposal of a primeval atmospheric 'pollutant' - carbon. By our ravenous use of [the substances we] beganuudoingwhatevolution had done in getting the atmosphere ready for animals (includingman) to breathe, and ready to sustain the kind of climate inwhichpresentspecies (including ourselves) had been evolved. Hundreds of millions of years of evolution had produced the oxygen-rich and nearly carbon-free atmosphere we need...." (p. 232) One does not even have to completely forego burning fossil 'fuels' to see that society is mistaken to consciously maximize their use, and hence the transformation to waste. It appears that the only limitations we see to our behavior are economic and technological, and nothing else.

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TABLE ONE - Selected Passages From Time Comparing Air Pollution and Acid Pain

1970	1982
Title: "Fighting to Save The Earth From Man"	Title: "Acid Rain: The Silent Plague"
"The U.S environment is seriously threatened by the pmdigalgarbage of the world's richest economy."	". ..the devastation brought by the rains is so silent, invisible, pervasive...."
". ..the country's visible decay, America the Ugly."	". ...an insidiousmalariaof the biosphere."
". ..the dangerous illusion that [man] can build bigger and bigger industrial societieswith scant regard for the iron laws of nature. . ..Like maggots in a sack of flour..."	". ..a blight as widespread and careless of its victims, and of international boundaries, as the winds that disperse it."
"U.S. plants...gush 172 million tons of smoke and fumes into the air."	". ..a catastrophe of a leisurely kind, trouble building up a shower at a tin-e."
"...man's mindless destruction."	"Acid rain is natural."
Feb.2,1970 pp. 42-49	Nov.8,1982 pp. 98-104

represent the early stages of a trend which will see the human role in problem-formation increasingly absolved or removed. The potential for this trend is especially strong becauseitappears that policy-makers will be increasingly faced with the task of re-addressing problems which were the focus of past policy efforts, and the location of blame will have important ramifications for how these policy efforts are evaluated.

Numerous examples support my contention that this trend is increasing. For example, in April, 1986, a report on "Toxic and Oxidant Air Pollution" was released withthehopes of moving contemporary air pollution politics "Beyond Acid Pain" (Mellon et al 1986). Within days newspapers reported the new problem as

"Toxic Rain" (Toronto Star, April 29, May 5, 1986) and the label quickly found its my into an editorial cartoon (Toronto Sun, April 30, 1986). Thus, while the report may have helped policy-makers recognize the need to move beyond "acid", the problem is still associated with the "rain". In light of the well entrenched existence of "acid rain" the incident was not surprising, but disheartening nevertheless. At least with acidic contaminants the rain is a circumstantial variable, but no such connection exists with toxic pollutants. It would appear that the symbol is runningawaywithotherissues as well.

This tendency to naturalize environmental problems is notrestrictedto matters of air pollution. The well-known case of the "Toxic Blob" in the St, Clair river is a reified expression of "industrial waste", its former name. Consider also the circumstances surroundingtheclosingof Metro Toronto beachesinthe summer of 1986, as presented in the daily press. On July 20 the Toronto Star reported thatdangemus bacterial levels atthewaterfrontwere "caused by a combination of hot, rainy weather and an antiquated sewer system." The story is dominated by the non-humar. variable, the rain, and says little of the sewer system itself. Subtitled "Pollution is Suspected After Near-Record Rainfall" the story stated that the beaches would remain closed for several days, "depending on the weather." The rains continued for severalweeks andonAugust8 the Star reported that "persistent and at times torrential rains thathavediacouraged swimmers are also responsible for the warning signs that went up today at Hanlan's Point." Complaining that "we're at the mercy of the weather'*, a Toronto Health inspector is quoted further: "If the weather changes, if it stops raining, and if we get some wind to move the water around the situation could change." The next day the paper reported that "warm temperatures andwetweatherwillkeepall of Toronto's

beaches closed this weekend", and the Toronto Sun reported on August 28, under theheadline "Rain Gods Frowned on Metro", that "the downpour closed many beaches for at least 24 hours and others for the rest of the summer", citing a Toronto Board of Health official as its source. This is an excellent example of circumstance turned into cause: the rain could not close the beaches by itself, only in conjunction with other, human, factors.

The rain was alsoaculpritin the famous Love Canal case, at least according to one press report:

> Foratleastadecade, theburiedchemicalswereno problem. But in 1976, after years of abnormally heavy rain, the chemicals, leaking from corroded containers, began to rise. (Time, August 14, 1978)

Significantly, each of these examples stem from the re-emergence of apparently "controlled" pollutants. If the evidence presented here is any indication of how policy-makers will attempt to explain future environmental problems, extreme reification will be the order of the day.[73]

Recalling the conceptsof internaland external attribution introduced earlier, if causal responsibility for these problems was located within society's dominant values and practices (internal attribution), we would, in effect, be admitting thatourdeep-seatedandcherishedgoals are the primary component of problem-formation, the causal factor. As a result, wide-reaching and potentially revolutionary change would be called for. Internal attribution, not surprisingly, is strongly resisted. External attribution, on the other hand, manages to side-step such critical self-appraisal and helps prop up the illusion that Canadian society can carry on without significant alteration. Wecanallrestassured that any problems encountered along the way originate from "without" and not from "within"; at least it's "not our fault". If the political classification and interpretation of particular meteorological and bio-chemical occurances we witness

appear to saylittleaboutthenatureof theproblemitself, they speak volumes on the policy culture of air pollution. External attribution also legitimates the employment of the preferred external. control strategies.

IV - CONCLUSIONS

When policy-makers address pollution problems after they have occured, as theyusuallydo, they ostensibly seektodeteminewhichcontaminants are responsible for the infraction. In doing so, they alsodecidewhichcontaminants are not responsible for the perceived problem. Establishing innocence in this context is an implicit component of establishing guilt and it is within the machinations surrounding cause and effect that we findanunveilingof the criteria under which contaminants appear "diluted", the unfolding and articulation of the various "artificial" problem-reduction factors which indicate that the majority of emissions are "rendered harmless". The effort is guided, at least in part, by the unstated maxim "out of sight/out of mind".[74] Donning a set of "glasses" which immediately relegate the "unvalued" parts of the environment outside of their field of vision, policy-mkers then further sacrifice (ignore) perceived environmental needs in the name of short-temeconcmic gain. Measures are then utilized which implicate only a fraction of all contaminants, leaving the rest "unseen". When, and if, a response does ensue, it looks to push the problem out of sight, into a form or place where it will not be detected. Here it awaits to be "re-discovered" under infinitely more complicated and mystifying cause and effect circumstances. The case of acid rain is a perfect example.Indeed, policy-makers appear to be engaged in an elaborate effort to relegate the vast majority of contaminants outside of the problem scenario to support the assumption that they have been "diluted".

The process is closely related to the principle of minimum necessary control: caught in a circumstance which sees a large amount of contaminants already in the environment, and under tremendous pressure from all sides to "clean up" as little as possible to ensure unimpeded production, any contaminant which policy-makers

can successfully divert from their measuring instruments relieves the perceived clean up burden accordingly. In short, policy-mkers have a strong vested interest inrelieving the perceived proximity of the earth's limitations, and dilution serves this illusionwell.

C.C. Lax's interpretation of the Toronto lead smelter controversy provides another illustration of the way in which contaminants are given a "clean slate", and also demonstrates that the process applies to local and long-range problems alike. At the risk of oversimplifying the lead case, the following generalizations can be made. All parties acknowledged thattheleadsmelters in question emitted lead into theatmsphereandthatthepresenceofleadcouldbedetectedin the surrounding areas. It was also agreed, at least in principle, that lead poses a serious health threat and that incidences ofleadpoisoning were documented in the area (although this last point was not wholly accepted by some). The main questions surrounded the demonstration of cause and effect. Put simply: "How do we know that the lead emitted from these smelters was responsible for contaminating the residents? It could have been other sources." The burden of proof rested on the complainants, and as theaffectedresidents disco-, answering this question in decisive terms is impossible. Assuming, for the sake of argument, that the lead emitted from the smelters was <u>not</u> the same lead which contaminated the residents, as thedefendents claimed, and that other sources were responsible, the followingguestionbegs to be asked: What, then, happened to the lead smelter's emissionsiftheydidnotmntaminate the immediate vicinity? Wherediditheygo and how is it that they were "rendered harmless"? Theansweris that they contaminated other regions where the effects of lead were not being monitored.[75] The net result in this case, as with acid rain, is that the perceived carrying capacity of the earth is "enlarged", at least according to policy-mkers' calculations.

When the principle of minimum necessary control operates with respect to future developments, when pollution problems haveyettooccur, the deeper resource-logic upon which it rests is fully exposed. This dimension is clearly vital for the environmental impact assessmentprocess. Once defined as a resource, the air (aswithanything else) is fully subject to the contemporary laws of economic rationality, which dictates that all resourcesmstbeused in the most efficient manner. Efficiency in this context entails exploiting all of the atmosphere's capacity for "self-renewal" as a cost-effective measure. In some instances, if this logicwere followed toits extreme, the result would be more pollution as society would attempt to use all the "wasted" air in "undeveloped" areas. If policy-makers have not yet consciously erected polluting factories in theseareas simply to utilize this air, it is most likely because such factories have not been needed. When the need does arise for this air to serve as a waste disposal facility, EIA's themselves will inform policy-tiers how best to utilize it to its maximum, either by recommendingthattheplantbelocated in an area with "good ventilation" or some other dispersion tactic.

Even if such EIA's were executed to perfection, if they were completely comprehensive and integrated into the decision-making process well in advanceof all project commitments, if they were based on complete and precise information regarding all ecosystem interactions, and if they were backed by the necessary politicalwillto see their perfect implementation, they still could not escape the grips of maximum permissable concentration. As a passage quoted above (page 29) indicated, new and existing sources of pollution should be designed in relation to the maximum amount of acid loading the environment can "safely" withstand. Even if policy-makers could predict all the likely consequences of a given project, is it wise to consciously maximize the human impact on the earth for the sake of

fulfilling narrowly defined social interests?

Arguments in favour of such a course of action are even less tenable in relation to the "real" scenario, where EIA's are not (and cannot) be executed to perfection. This realistic scenario features:

> [An] . . .immense scope of the unknown. Knowledge of the factors affecting the operation of ecosystems may be vast, but it is still far from being complete enough to permit the constructionofaccuratecausal models. Without such models, it is not likely that the effects of environmental disturbances will be forecast accurately. We simply do notknowallthe implications of many complex cause-and-effect relationships (Canada 1986a, p.6);
>
> . . .relevant scientific knowledge [often takes] many years to accumulate to the level which scientists feel is an acceptable basis for important social decisions. Although scientific uncertainties remain, the public interest must be served as best it can, and policy-makers must act (p.27); [and]
>
> errors in predicting the magnitude of change are common; multistageand cumulative impacts are correctly predicted less frequently, if at all . . .;[and] complex systems with many linkages are not usually well understood (p.14).

Add to this the realityofcmpetingpoliticaland social interests aswellas the fact that, broadly speaking, humans make mistakes, as do their machines. If this is the case, is it "sensible" to practice the philosophy of maximum permissable concentration? It is akin to filling up a balloon with poisonous gas to just below its bursting point, andwithoutactuallyknmingwhere thatburstingpoint is, defining it in relation to the amount of gas the dispensor wishes to put in it. The balloon'scarrying capacity can be enlarged in the dispensor's mind, but this will bear no relation to when the balloon will actually burst. Similarly, the environment's minimal needs canbecontinuallyredefined to keep pace with society's burgeoning waste, but society does so at the earth's expense. The carrying capacity of the globe can be enlarged, but only in the human mind, or on a balance sheet, and this will bear no relation to that carrying capacity, wherever it my lie. And furthermore, in this case we do not have the luxury of a separate

balloon to act as a threshold and to insulateus from the gases we dispense before theclimax. On the wntrary; we live in the balloon and are fumigating ourselves (and everything else) in the process. The balloon's bursting will only be the logical conclusion of a destructive affair which has been relatively constant for severalhmdredyears.

Even accepting that "advances" inknowledgehavebeen achieved and are still forthcoming, such advances have not kept pace with the phenomena to which they are addressed, nor wuld they reasonably be expected to. These "advances" can also be interpreted as "regressions" in at least two respects. First, when SO_2 and other contaminants fell under the rubric "smoke" or "fumes" at the begining of this century, their status as a "nuisance" was ironically more accurate than their modern expression as "acid rain". Whereas "acid rain" represents a reduction of the problem, literally, to "acid" and "rain", the focus on "smoke" (at least potentially) encapsulates all of the contaminants (and activities) which made up the "smoke" problem, at least to the extent that the wncept of "smoke" *(or "fumes"* or "noxious gas") in no way automatically excludes the vast majority of emissions from its domain. This does not mean that "smoke policy-makers" did not eventually exclude most contaminants from their field of vision. In the spirit of "out of sight/out of mind" they wntrolled for visible emissions, using a "smoke density chart" as their problem-measure (which, incidently, is still meteorologically-sensitive). *The* "smoke" problem was somewhat relieved, but many of the invisible gases continued unabated (and unseen). A portion of them are finally being re-addressed today.[76]

As political priorities shifted in the wurseof the century and pollution was placed closer to the fore, policy-makers adopted more "precise" measurements and ironically, the more precise the measure became, the narrower the problem became.

This is especially the case with long-range problems where a joumey from effects to probable causes, under the guidance of pH-precision, can eliminate most of the suspects, evenbefore departure. Anytime the evidence does warrant a decisive guilty verdict for a particular set of contaminants, it equally decisively excludes all other contaminants from the scene of thecrime, and the more precise themeasure, thegreateris the number of contaminants which are excluded. In simple terms, if pressure to control air pollution results in a need to further specify the criteria under which contaminants will be ignored, the "scientization" of industrial waste as "acid rain" aides considerably in the task.

Increasing scientific precision has several other implications. First, it lends "credibility" to the increasingly regressive interpretation of pollution, thoroughly disguising the wider socialcharacterof the phenomena under a mask of "value-free rationality", "facts" and "efficiency".[77] Furthermore, the greater the scientization of the problem, the greater is the distancing of the non-scientist from the problem, who must then turn to the experts for a scientific interpretation of a social and political problem. Citizens have to rely on scientists for verification of acid rain's existence more so than they do for a "smoke" problem.

Thesecondregressive aspect of contemporary environmental politics is merely an extension of the first, although more firmly in the cognitive realm. The reification of industrial waste as "acid rain" further demonstrates just how far policy-makers (and everyone else) are from coming to grips with a relatively simple contaminant such as SO_2. As something which originates "out there" as a result of "natural" pmcesses, the industrial waste problem has become effectively naturalized. In thus scape-goating the non-human, policy-makers have foregone

any self-criticism in favour of "better management" and meteorological prediction, and deep down we are "off the hook" so to speak.

Furthermore, in conceiving of the problem as an external threat (rather than as something of society's own makings), the social order itself is reinforced as it is called upon to defend itself from this "external" challenge. Thus, the reification of air pollution is in fact the reification of a high-polluting social order whose problematic beliefs and practices are fixed as the "given", "natural order of things", and in turn emerges as a positive, "improving" force which will ratify and manage the challenge from outside. In other words, although Canadian society is presently addressing "acid rain", we are in reality speaking to and about ourselves, and the extent to which we do not understand "acid rain", we obviously do not understand ourselves. We seem to have forgotten that it is not "acid rain" which is presently destroying the environment: it is humans and certain human activities which are responsible. Until this basic fact is grasped we shall continue to gamble with the wind and wage war with the rain.

In presenting the argument this way I do not mean to suggest that policy-makers are inept, nor am I denying that it is possible to "improve" the situation. The point is that policy-makers should not be expected to meet the task of "safely managing" the incredible volumes of waste presently being produced to maintain the Canadian way of life, even to a moderate degree of success. It is simply beyond their, and anyone else's, means. This is not an "overly-pessimistic", "defeatist" position. It is a realistic appraisal of the present state of affairs and the historical record bears this out. The case of SO_2 is particularly instructive here. This single contaminant, with a relatively simple compo-

sition, has been the subjectofpolitical controversy for at least 700 years (chambers 1973, p.116-117). Despite this long history and all of the experience which slmuldhaveensued, this substance continues to defy society's understandings and control efforts. Its consequences have been misunderstood, misinterpreted (or simply ignored) time and time again, and the emergence of, and inability to deal with, "acid rain" is only the most recent example. If this is the case, can we reasonably expect policy-makers to safely manage the incredible volume of contaminants presently being produced, andincreasingdaily? And whose complex properties are even less understood that SO_2? Even within their own criteria of acceptability? Even with margins of safety it amounts to a highly volatile and dangerous "game", the stakes for which are incredibly high.

Operatinginacontext of extreme uncertainty it is obviously unwise to assume that we can "fill up" thebiosphere, and then push the limits further still, and not encounter disastrous consequences. The case is especially so when the negative feed-back loops, the mechanisms which give content to any "cautious" procedure, only speak in the same resource-efficiency terms which presuppose the very predicament itself. In fact, the very need to determine the environment's limits presupposes their encroachment or violation: a society is only faced with the need to determine the concentration of SO_2 which kills trees if it is already killing these trees with SO_2. In other words, the act of setting environmental quality criteria is precipitated by their apparent violation. Within this context, it was inevitable that the environment's perceived needs would be reduced to their minimum.

Under the circumstances, what policy-makers should do is proceed with extreme caution, but it my not be possible to practice caution in a society thatisbursting at its seams. Therefore, the onus does not fall entirely on policy-makers. Each and every Canadian citizen is practicing a life-style that renders such "cautious environmental management" impossible. In other words, policy-making reflects a social order to the same extent that it guides it, and the performance of public officials often merely testifies to, or symbolizes, society as a whole as it tries to grapple with and understand its affairs. Clearly, Canadian culture's (and not just policy-makers') humanistic and economistic criteria of "value", when combined with the resource-logicofmaximm permissable concentration, ensures that policy-makers will err on the side of uncertainty.[78] Adding to this the intense pressures for economic and political expediency, uncertainties are more likely imbeignoredthanheeded, especially in the case of an EIA where further consideration of uncertainties will likely jeopardize the project. Dilution is essentially the practice of ignoring contaminants, andthepracticeofignoringcontminantsis an exercise in uncertainty.

The present burden of proof laws represent the legislation of this uncertainty. The case for reversing the burden of proof laws has been well argued by others[79] and such a reversal is clearly needed. The problem, however, is not this simple.As with policy-making, laws reflect as much as they lead and the present burden of proof laws only testify to society's predisposition to ignore its waste. The laws will not change until society's priorities change. In other words, pollution is not a legal problem with a legal solution, just as it is not a scientific or technological problem with a scientific or technological solution. If reversing theburdenofproofappears untenable within the current

social order, and it is, this is just an indication of the need to question, and violate, that order if we are to deal more sensibly with environmental problems. Pollution is a deep, cultural problem that will only respond to cultural solutions.

At the core lies the practicing definition of social need, a social choice which renders it in society's best interests to reduce the entire earth to its "basic" (minimal) functional requirements as a means of ensuring uninterrupted "social progress". It amounts to elavating the perceived needs of a single species onto a pedestal and allowing them to overrun the earth. Consciously. To the extent that society's material demands produce equal quantities of waste, the problem lies in the "need" for the material, period. Once needed, the waste products cannot be avoided, they can only be hidden or ignored.[80] Reducing the waste can only result from reducing the occurances and volume of matter-transformation. Policy-makers have foregone this strategy in favour of "better managing" the increasing rate of such transformations. Planning tools like EIA's can only aid the effort, they cannot redirect it. And in fact, in the present context, "better management" will only facilitate the destruction in a more efficient manner.

To conclude, it has not been policy-makers' failure to meet their stated goals which has presented Canadian society with its pollution problems, nor has it simply been "poor planning" or a lack of political will. The ideal itself, and the logic upon which it rests, are fundamentally misguided.

FOOTNOTES

1 - Bell considers the concept to be an important aspect of what Simon (1976) calls the "political framework": "the constraints and opportunities defined by 'the broad social and economic environment, the system of power and influence, the dominant ideas and values in society, the formal institutional structures'. This framework 'greatly restricts the alternatives [policy-makers] consider and the range of innovations they make'." (Bell, 1983, p.12)
My approach to air pollution policy has also been influenced by Gusfield's concept of a "structure of public problems": "To desribed the structure of public problems is to describe the ordered way in which ideas and activities emerge in the public arena." (1981, p.8-9)
The concept is also related to the literature on "paradigms", to be introduced below.

2 - I prefer the term "policy culture", partially because of the different meaning originally associated with the concept of "political culture", but mainly to reflect the problem-specific approach which Bell calls for. The term was originally suggested to me by professor Harold Kaplan of York University.

3 - "All situations that are experienced by people as painful do not become matters of public authority and targets of public action. Neither are they given the same meaning at all times by all peoples. 'Objective' conditions are seldom so compelling and so clear in their form that they spontaneously generate a 'true' consciousness." (Gusfield 1981, p.3)
"The societal definition, and not the objective makeup of a given social condition, determines whether the condition exists as a social problem." Herbert Blumer, quoted in Ross and Staines (1972, p.21).

4 - "As phenomena are open to various modes of conceptualizing them as problems, so too their public character is open to various means of conceiving their resolution." (Gusfield 1981, p.5)

5 - "As the extent and consequences of environmental degradation and careless use of natural resources have become better known, widespread concern has arisen about the nature of development. . . . A response to these concerns and questions has been the concept and practice of environmental management, . ..the entire process of planning, managing and conserving the environment and natural resources." Environmental impact assessments, as an integral part of sound environmental management, ". ..is a process which attempts to identify, predict and assess the likely consequences of proposed development activities." (Canada 1986a, p.1,2)

6 - "The management of the natural environment is apart of the general problem of allocating the economy's resources between competing ends" (United Nations 1983, p.17). Under the guidance of cost-benefit analysis, "environmental policy should...be concerned with the efficient use of our natural environment" (p.22). Efficiency means simply "not being wasteful with any resources, including those of the natural envirnment" (p.17). CBA can be used to "assist in the rational design of development projects. . ..If environmental effects of a project can be incorporated into the whole CBA procedure at the very beginning, then the result is likely to be a project in which

economic and environmental objectives are in closer harmony and the overall social benefits maximized" (p.16).

7 - Leiss (1976, p.18) has argued that social and political stability in contemporary industrial societies depends on "...the ability of the social system as a whole to ensure the steady growth in the quantity and variety of commodities." The reality of these goals and "needs" has become a self-evident truth in industrial societies the world over, whether "capitalist" or "socialist". The important questions pertain to whether such goals are desirable or not.

8 - "A policy of maximizing GNP is practically the equivalent of maximizing... pollution. ... Since matter and energy cannot be destroyed, consumption is merely the transformation into waste of GNP..." Daly 1971, p.83). The argument is based on the laws of thermodynamics and the "entropy" phenomenon, which holds that all economic "throughputs" transform matter-energy from a "low entropy" (free, available) state to a "high entropy" (bound, unavailable) state. This "bound" energy is the "valueless waste" (air contaminants) which result from every transformation of matter. The more matter which is transformed, the more waste which is produced. See Georgescu-Roegen (1980).

9 - "...we tend to regard the rest of nature almost exclusively as a warehouse of resources and a dumping ground for wastes" (Leiss 1976, p.32) See also Beakhust (1979) and Swift (1974).

10--Cotgrove (1982, p.1) summarizes the flood of literature which appeared in defence of the environment: "All had in common the same message - that the industrial world could not go on as it was; that continued exponential growth was a physical impossibility, and that growth in population, pollution, production, and the use of energy and non-renewable resources had reached a point where, unless drastic action was taken, crisis and collapse were inevitable." Conversely, many writers emphasized opposite social forms, resting on "stability", "equilibrium" and "steady-state economics" as the best future direction. The underlying goal was to unite economics with ecology, stressing the interdependence of all life forms, in opposition to the dominant myth of human independence or exemption. No government has heeded to any of these calls. See for example, Daly (1980) Johnson and Hardesty (1971), and Millbraith (1984).

11 - The reconciliation of such a conflict is especially difficult because, as Johnson and Hardesty (1971, p.2) note, present social needs are "diametrically opposed to the requirements of ecosystem stability." See also Detweiller et al (1973, p.34).
Leiss (1979, p.275) has written: "Environmental problems will set some difficult tests for our political institutions. What will make these tests especially hard for us is the fact that we have come to define environmental values primarily in relation to demands for steady economic growth - or, more precisely, in relation to a sense of well-being that seems to require, apparently forever, a regular increase in GNP."

12 - Contemporary uses of the term "paradigm" are largely drawn from Thomas Kuhns' The Structure of Scientific Revolutions. In Cotgrove's words: "paradigms... providemaps ofwhattheworldis believed to be like. They constituteguidelines forgetting around and foridentifyingand solving problems. Above all, paradigms provide the framework of meaning within which 'facts' and experiences acquire significance and can be interpreted. . ..They have a normative aswellas a cognitive dimension,indicating not only what is but what ought to be done" (1982, p.26). See also Millbraith (1984).

13 - The Canadian Clean Air Act (1971) defines an "air contaminant" as: "...a solid, liquid, gas or odour or a combination of any of them that, if emitted into the ambient air, would create or contribute to thecreation of air pollution. 'Air pollution' means a conditionof the ambient air, arising wholly or partly from the prsence therein of one or more air contaminants, thatendangers the health, safetyorwelfareofpersons, thatinterfereswith the mormal enjoyment of life andproperty, that endangers the health of animal life or that causes damage to plant life or to property." Sec. 2(1) (a) and (b).
Ontario's Environmental Protection Act (1971), Sec. 1(1) (c) does not make a distinction between "air contaminants" and "air pollution", but the interpretation of "air pollution" is in concert with the Clean Air Act.

14 - Estrin and Swain (1974, p.46). The matter was expressed at the 1967 Ontario Pollution Control Conference as follows: ". ..the fundamental guidepost - the underlying concept which must be used -in controlling air pollutants is that of effects. Thus, to decide what concentration of any contaminants is undesirable, it is necessary to examineealltheknowneffects of that pollutant on man, animals, vegetation and property. This study produces ambient air criteria for the contaminant" (Ontario 1967, p.83).

15 - In its simplest terms, "'air pollution' means not simply that the contaminants are there, but that they are present in sufficient concentration to cause harm" (Canada 1973a, p.29. Emphasis added).

16 - "Cost-benefit analysis treats the natural environment as another resource in production" (United Nations 1983, p.2).
Air pollution in Ontario was the responsibility of the Department of Energy and Resource Management from 1969 to 1971. Federal responsibility for air pollution was in the hands of the Department of Energy, Mines and Resources for several years prior to the creation of Environment Canada in 1971.
See also note 5 , on "environmental management".

17 - The Select Committee on Air Pollution and Smoke Control, created in 1955 and one of the earliest extensive Ontario government investigations of the problem, was centered around crop damage, livestock, farmbuildings and equipment and human health. (Ontario 1957, p.13-23).
The mandate of the Hall Committee (Ontario 1968, p.xiv) was to investigate the effects of pollution upon "human health, livestock, agricultural and horticultural crops, soil productivity and economic factors."
Neil Evernden (1985) has argued that one of the main reasons the environment

became such an important political issue in the 1960's is that certain key books, such as Rachel Carson's Silent Spring, stressed the effects of environmental hazards on human health. Previous "conservation" movements which had dominated environmental politics in the firsthalfof the century were defending and preserving non-humans.

18 - "This perspective establishes the provisioning of our material demands as the single organizing principle for our relationship with the rest of nature" (Leiss 1976, p.39).

19 - The Hall Committee (Ontario 1968, p.309) recommended that tests beconducted to "help in determining the maximmconcentrationof air-borne pollutants permissable in an area."

20 - Dales (1968, p.18) attributes problem to excessive urban concentration, which "'overloads' nature's disposal system in those areas, leaves unused much of the natural waste disposal capacity in lightly populated regions, and thus increases society's waste disposal costs."

21 - The basis for not leaving the atmosphere "unutilised" lies clearly in our economic priorities, as the No Significant Deterioration (NSD) issue in the U.S. demonstrates. An NSD clause was established at the behest of environmentalists toprotectrelativelyunpopulatedareas from further deterioration. NSD, however,was eventually successfully combatted by those opposed to further pollution control because itwouldlimiteconomic growth. See Victor (1980, p. 205-213) A discussion of the "economic irrationality" of NSD can be found in O'Riordon (1979).

22 - The 1955 Select Committee (Ontario 1957, p.43) put it this way: "Air pollution is the result of excessive use of the atmosphere by man for waste disposal, combined with certain predisposing and contributing factorsprovidedby nature. Man's part comprises the emission into the air of smoke, soot, fly ash, cinders, dusts, gases, vapours, fumes and odours. Nature's contribution might be a topography that hinders winds in their efforts to dispose man's airborne garbage, it might be humidity and fog, itmightbe too much wind or no wind at all, it might be just plain sunlight which catalyzes reactions in the air between various of man's contaminants, itmightbe a temperature inversion, or it might be other conditions or combinations of conditions."

23 - "From man's point of view, theharmdonebydiscardingawasteinto the environment often depends not so much on the properties of the waste itself as on other factors: the chemical and biological processes that take place after the waste has been discarded" (Dales 1968, p.5). Dales understands these "other factors" primarily in relation to "self--purifying" air. The Toronto Telegram, reporting on the Hall Committee, wrote that "...allowable limits (of pollution) are a compromise between technological capabilities, economic feasibility, and the (climactic) conditions prevailing in any given area" (April 18, 1969).

24 - Since 1969, initially under the Department of Health, the Ontario Ministry responsible forpollutionoftheairhashadanoperating sectionentitled "Meteorology and Air Quality". Environment Canada operates the most extensivemeteorological network in the country under the Atmospheric Environment Service. The "Air Pollution Index" and "Acid Rain Watch" typically appear on the weather page of the newspaper. See Ontario (1978).

25 - This matter is usuallyconceptualizedas "personalversus systemic attribution" (Ross and Staines 1972) or "individual versus structural attribution" (Bell 1983).

26 - Regarding "Arab Oil Blackmail" Catton (1980) observes that "as long as the suddendelugeof troubles canbeattributedtovillains inanother-land, the world could seem to remain in tune with traditional definitions of right and wrong" (p.60). At another point he observes that "tycoons" and "tyrants" are popular targets and that " . ..the temptation persists to attribute human hardships to such forces as 'inflation' which 'devours' prosperity". Similarly, the Irish potatoe famine was blamed on bacteria rather than human overdependence on a single crop. (p.254)

27 - 'With most resources, whether renewable or nonrenewable, [man] is potentially able to modify to some degree their elemental and/or locational characteristics in order to suit his economic needs. But with air man's actions, institutions, and artifacts must be modified. He is unable to adjust the winds to any appreciable extent; therefore he must adjust himself to the whims and vagaries of the air currents. His inability to face up to this fact appears to be the root cause of the atmospheric pollution problem" (mocker 1966, p-63).
Allen Kneese (1966, p.33) has pointed out that it is less economically feasible to control air pollution than water pollution because it is more difficult to control meteorological events to improve waste-assimilative capacity than to controlhydmlogicalevents for thatpurpose.

28 - "Our challenge is to understand the receiving capacity of the atmosphere, to determine the concentration of contaminants that is significant, and to manage our activities so as to stay well within those concentrations' (Ontario 1967, p.8).
Herfindahl (1970) states that a strategy to improve environmental quality is to "reduce damage from harmful residuals by a) increasing the assimilative capacity of the environment (e.g. stream aeration or low flow augmentation); b) discharging to a place where less damage results; c) moving the activities or organisms subject to damage."

29 - The API is basedonarunning 24 hour average of SO_2 and suspended particulatematterconcentrations. It was first introduced in Toronto in 1970 and expanded to eight Ontario cities by 1982. Similar warning systems are used in other provinces and the U.S. See Ontario n.d.a; 1971; and 1984.

30 - Estrin and Swain (1974, p.60). These authors also argue that because the Index is based on a running 24 hour average a number of short, intense concentrations will not be immediately evident and will be lost in the averaging (p.60). The Index also presupposes an even distribution of pollution and will not

detect a number of isolated episodes (p.61). See also Ontario Legislature, October 16, 1970, p.5109 and 5117.

31 - I say "taller" because "tall" stacks were not a new idea. At Inco's Copper Cliff smelter, for example, stacks have become progressively higher since the 1930's in an attempt to disperse contaminants away from the area and in relation to altered production techniques. Prior to the inroduction of this method, (before the use of stacks at all), the first form of pollution "control" at this cite was to move the open roasting yards away from the populated area. (Ontario 1982a, p.7)

32 - On stack design, see Leuthesseur (1974) and Canada (1986b, p.4-9). Prior to 1970 there were fewer than 100 stacks over 500 feet in the U.S. By 1982 there were over 500, many of them towering over 1,000 feet. Many of these stacks were raised at the behest of government regulatory agencies, but in some cases companies proceeded on their own initiative to avoid prosecution for urban air quality violations. Time, November 8, 1982, p.101. See also Macleans, July 15, 1985, p.46.
Inco's 1,250 foot stack is the tallest in the world. They were ordered to build the stack under a Ministerial control order, but it has been observed that the company was planning to raise the stack for some time prior to this, mainly as a means of increasing production. See Alternatives Interview (1973) and Ontario Legislature, October 15, 1970, p.5091.

33 - "One of the methods adopted [to clean up cities] seemed simple and logical: build tall stacks to send emissions high into the atmosphere where they could disperse among the clouds and be rendered harmless. The idea seemed to work as cities . ..benefited from the removal of the offending pollution. What was not known at the time, however, was that the act of sending emissions high and far away gave life to a new problem - acid rain" (Canada 1981, p.17).

34 - Another Inco official told the Ontario Standing Committee on Resources Development in 1979 that "emissions from the 1,250 foot chimney permitted the recovery of the Sudbury environment to begin" (in Wellar 1980, p. 34).

35 - Simeon (1976, p.557) calls a "first-order consequence" the intended or immediately perceivable effects of a policy. A "second-order consequence" refers-to unforseen consequences, either benign or malign, of that policy. It is interesting to note that, despite the acknowledgements that dispersion did not render contaminants harmless, Environment Canada has claimed that "sulphur dioxide, as a local air quality problem, has been successfully controlled in Canada" (Canada 1984a, p.7. Emphasis added).

36 - Statement by George Kerr, Ontario Legislature, October 16, 1970, p. 5108. See also Ontario 1980, p.13 and Ontario n.d.b, p. 8.

37 - See Ontario 1967, p. 81-85 and 237-239, on plant location and ventilation. As to the buming of high sulphur coal on "favourable" days, this was one of Ontario Hydro's methods during the 1970's. See Wellar 1983, p.23.

38 - The rationales for dispersion also intensified under the pressures of the oil crisis and recession, allowing many industries to argue for relaxed standards, including the use of "intermittant" control (i.e. dispersion) rather than reductions via "scrubbers". (Victor 1980, p. 210-213). The oil crisis and other factors were thus used as a justification for dispersion policies which had already been set in motion many years earlier.

39 - Changes in production processes are often associated with attempts to improve the efficiency of pmduction. Whereas billowing smokestacks have longbeena symbol of prosperity, it was recognized at least 100 years ago that a billowing smokestack also symbolizes incomplete combustion. Consequently, early pollution ("smoke") control was directed toward the more efficient use of fuel, rationalized as a cost saving measure. See any of the following: Briggs (1941); Cohen and Rusto (1912); Marsh (1947). When reductions are mtassociatedwith improved productivity they are resisted adamantly by the industries in question. For an account of Ontario's attempts to regulate Inco, see Wellar (1980, p. 30-39, 60-74); Howard and Perley (1980); and Ontario 1979, p.36-51).

40 - "Environment Ontario has been dealing with SO_2 and NO_x as pollutants in their own right, concernedwith theirlocalandcumunityeffects. It did not at first deal with them as constituents of acidic precipitation - acid rain which is now defined as a long-term and long-range problem with effects onacontinental, evenglobalscale. The accumlationof SO_2 and NO_x cause damage even though conventional air quality criteria are not exceeded" (Ontario 1980, p.14). See also p.6 of this report; Ontario (1979, p.23,42); and Canada (1981, p.17).
It is interesting to note that air pollution appears to have beenlabeled a "local problem" only in retrospect, with the advent of "long-range" problems. Tohave explicitly labelled early policy efforts as "local" abatement would ha/e drawn attention to the neglected non-local matters.

41 - See Ontario (n.d.c; 1974; 1982 and 1985b).
Non-govemmntscientistsbegan documenting the increasing acidity of rainfall near industrial centers in England in the mid-19th century, and as the 20th century progressed acidified pollution was being measured in rural areas in Canada, the U.S., England and the Scandanavian countries. By 1970 the phenomenon was well documented in academic journals. See Erickson (1973); Gorham (1981); Howard and Perley (1980, p.23-32); and Kramer (1973).

42 - Ontario Environment retrospectively claims to have realized the severity of the problem in 1975: "The severity of acid rain in Ontario became apparent when Environment Ontario, working with the Ministries of Housing and Natural Resources, began to monitor the impact of cottage development in the Muskoka/Haliburton resort areas in 1975, in the context of the Lakeshore Capacity Studies. While examining the material input into the lake from all sources, including atmospheric contribution, it was discovered that the atmospheric was much more acidic than anticipated" (Ontario 1980, p.14). Environment Canada claims to have discovered acid rain in 1976: "The need for investigating the extent and effects of the LRTAP and associated acidic precipitation problem and identifying possible abatement/control options for Canada was first

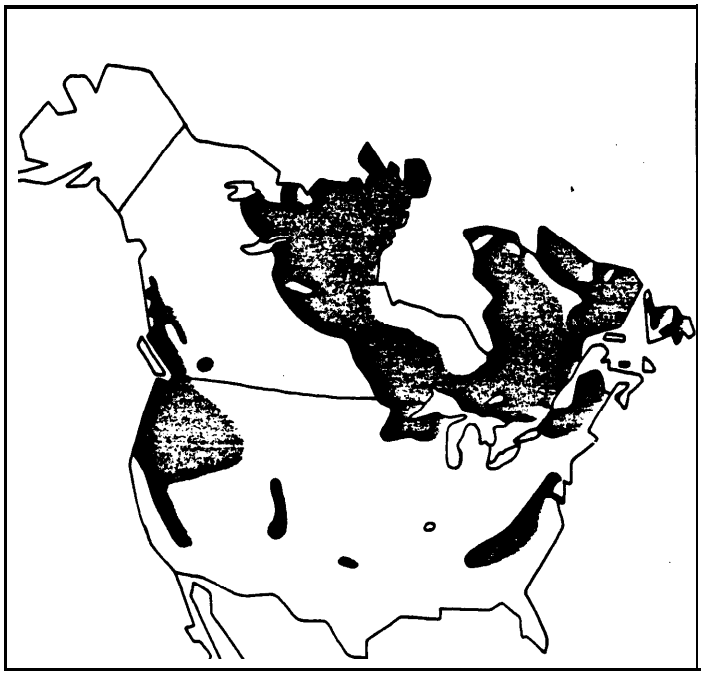
identified by the federal government in 1976. Convincing presumptive evidencewas collected which demonstrated that acidic precipitation posed serious and worsening environmental problems which werecausing extensive damage tovaluable fisheries resources and freshwater ecosystems ineastern Canada" (Canada 1980, p.5).

43 - "Air pollution" was dominated by the "big five": sulphur dioxide, nitrogen oxides, carbon monoxide, hyrdocarbons and suspended particulate matter, with the addition of lead and other contaminants in isolated incidents. See any of the following: Canada (1973a,b,c); Ontario (n.d.a,b, 1973). Although the API only measured SO_2 andsuspendedparticulates, all of these contaminants were the subject of regulatory concern and many were subject to dispersion policies. The recognition that SO_2 hadmtbeen rendered harmless should have implicated many of these others, and although they areoftenmntioned indiscussions ofacidrain, they are not the focus of concern at present, most likely because theyarenotreadon the pH scale. An interesting researching project would be to study the early history of "acid rain", when it first received a lot of publicity, to see how and why the limited vision crystallized the way it did.

44 - In July, 1980, former Ontario Environment Minister Harry Parrott told a gathering of Canadian and U.S. officials: "I am concerned about thousands of Ontario lakes which are vulnerable" (Ontario 1980, p.15). Ontario's Acid Precipitation in Ontario Study has been publishing a report on "Acid Sensitivity of Lakes in Ontario" annually since 1981, a listing of over 5,000 lakes and their relative sensitivity to acids. (Ontario 1985c).

45 - Numerous maps have appeared which divide North America into "sensitive" and "non-sensitive" areas. Theexample reproduced here is from Ontario (1980, p.1).

North American Areas Containing Lakes Sensitive to Acid Precipitation



Source: James N. Galloway and Ellis B. Cowling, Journal of the Air Pollution Control Association 28, no. 3 (March 1978).

46 - "At a time of economic stagnation, with record postwar unemployment, inflation and high interest rates, the costs of eliminating sulphur dioxide emissions by installing 'scrubbers' ...are prohibitive and would likely mean production cutbacks. . ..It is questionable whether the situation is dire enough to justify immediate action. Says Joseph David, general counsel for American Electric Power... 'this could break the economic backnone of the Midwest. And there's no assurance that it will improve the acidity of rainfall in the East'" (Time, November 8, 1982, p.103).

47 - A U.S. g o -t official has said: ". ..let's not pursue corrective measures which are not needed, or go beyond that which may be needed" (Taylor, 1981, p.151). This is essentially the Canadian position as well, only our policy-makers are convinced that action should be taken now. Many in the U.S. are simply not (publicly) convinced as to the seriousness and cause of the problem.

48 - ". ..the problem is one of a three-fold nature, comprising: a) the source of pollutants; b) a-spheric transport and transformation; c) deposition on susceptible ecosystems" (Ontario 1981, p.5-6).

49 - "Unfortunately, the large number of sources make it impossible to trace damage to an individual site from an individual source. There is a pool of acid air over the whole northeastern part of the continent..." (Gorham 1981, p.6).

50 - Environment Canada (1984a, p.10) has expressed it this way: "The Canadian approach to acid deposition abatement is to determine an acceptable rate of deposition in selected receiving areas, and then to estimate the range of reductions in emissions for contributing source areas that would achieve the environmental objective." (Emphasis added).

51 - "What is not known [about acid rain] is how much man-made emissions from one region effect precipitation quality in other regions, or what is the local impact. And it is impossible to project how any control strategy will change precipitation quality at any location" (Taylor 1981, p.153).

52 - That "acid rain" is a misnomer is often aknowledged, but it is usually restricted to the "rain" and the full implications of the matter are apparently not recognized. Canada (1981, p.6): "The problem has been labelled 'acid rain'. More precisely, though, it should be called acid deposition. Wet deposition refers to acid rain, acid snow and acid smog (acid smog occurs in large cities like Los Angeles, California, where there is an overabundance of automobiles). Dry deposition refers to deposits of sulphur and nitrogen compounds during dry periods. They fall to earth before they have time to change into sulphuric and nitric acid as they travel in the clouds. These particles, however, carry molecules which can become acidic when mixed with surface water, rain, fog, dew or mist, and is falling in approximately equal amounts to the wet. In this booklet the popular term 'acid rain' will be used to represent the overall problem of acid deposition." This formulation still hinges the dart-age-potential of sulphur and nitrogen on an eventual conversion to acids, and fails to recognize that no such conversion is necessary for damage to ensue.

53 - "As the winds carrying acidic substances speed across the countryside, other pollutants often hitch a ride: heavy metals such as mercury, lead, zinc and copper. These metals come from industrial emissions and automobiles and when deposited on lakes can be toxic to fish" (Canada 1981, p.17). See also note 43.

54 - see note 52 and Canada (1984b,p.2).

55 - When SO_2 was talked about as airpollutiononeofitsmstimprtantfeatures was its ability to combine with misture to form sulphuric acid. An Environment Canada document from 1973 states: "[Sulphur dioxide] . ..is one of the most [air pollutants] in terms of effect. It includes sulphur dioxide (S02) and sulphur trioxide (SO_3), together with their acids and salts. SO_2 accounts for most of the damage done by air pollution to materials and vegetation. It is also a health hazard.... SO_2 sometimes combineswith oxygen and moisture in the atmosphere to form sulphuric acid. This can result in the transformation of a fine mist of sulphuric acid - or in the presence of sulphuric acid in rain water" (Canada 1973a, p.24). To underline thepoint, the following statement was made in the Ontario Legislature in 1970:"Sulphur dioxide, as most of the members know, when combined with misture and particles in the rain, becomes sulphurous acid, andirritates the nose and throat causing lining of the membrane andbronchial tubes to become swollen and eroded, and even some clogging of the small arteries and veins" (Mr. Ben, MPP Humber, October 15, 1970, p. 5087). See also Canada (1973a, p.26) and (1973b, p.6-7).

56 - This matter is also reflected in the frequent references to "acid-causing emissicms" and "acid precursors" found in many discussions of the problem. They refer to those specific missions which convert and can therefore be detected on the problem-measure. The term "acid-causing" immediately suggests that many missions are not acid-causing (which is true) and immediately implies that they are not a problem for that reason (which is not true). The following passage, from Perhac (1981, p.17-18), a spokesman for the Elecric Power Research Institute in the U.S., is worth quoting at length: "In order to assess the utility contribution to acid rain, what we want to know, in its simplest terms, is the relationship between what goes up the stack in one locality and comes down inanotheras acid rain. Unfortunately, in order to answer thisquestion, it is not sufficient to know something just about emissions or about what comes down as acid rain. We must know something, also, about chemical transformations which take place in the atmosphere, for example, from the precursor SO to the finalproductsulphate, or acid rain. We need a better understanding o2 long-range transport and we must know something about the cloud chemistry processes which occur. If we put together this information, we can then develop a predictive model which then allows us to assess what the utility contribution to acid rain is.

. ..Utilities put out S02. SO2 is a precursor for sulphates. We are finding, however, tnattheutilityemission innottheonly factor in thedistribution and magnitude of the sulphate level in the atmosphere. Meteorology plays a significant role. Dewpoint temperature, for example, shows a very strong relationship to sulphate in the atmosphere. In like manner, ambient air temperature shows a very strong relationship to sulphate in the atmosphere.

So what do we need to get high sulphate levels? You need, obviously S02, but you also need certain meteorological conditions. Unfortunately we cannot control the meteorology but it has to be considered in any development of a predictive model which allows you to assess the utility contribution to the occurance and distribution of acid rain."
Of course, this entire passage could not have been sensibly uttered had the question of "sulphates" and the transformation to acid rain not been singledoutas the conditions of problem-formation.

57 - See Ontario (1979, p.20); (1980, p.20) and the quote and liming and heavy metals in Sudbury on page 32. This strategy is advocated by thoseopposed to further abatement. See Taylor (1981, p.153). A colleague of mine has spoken to a number of Ontario cottagers and apparently many of them have expressed interest in liming as a control strategy.

58 - An Environment Canada document (1985) stated it this way: "Controlling acid rainposes a challenge that is unique and typical of the environmental problems that confront Canadians in the 1980's.It requires that we consider the impacts ofpollutionbeyondtheaxea surrounding the pollution source. It requires pollution controls beyond those initiated by industrialized societies in the 1970% to ensure clean air in our cities. It requires significant reductions of sulphur dioxide...and nitrogen oxide...emissions."

59 - On Inco see Canada (1982a, p.40). "Acid seepage from tailings can also be present. The waste solids discharged to the tailings impoundment area from the concentrating operation contain iron sulphides. The sulphides, especiallypyrrhotite, by theactionofbacteriaareoxidized to ferric sulphate which subsequently forms sulphuric acid. Under these acid conditions, sulphides of copper, chromium, cobalt, manganese, nickel and zinc dissolve. Thus, the effluent is not only excessively acidic but contains metals in solutions that are toxic to aquatic life" (p.41).
In the U.S. "The Department of Interior has catalogued thousands of miles of Eastern streams that have been biologically ruined by acid mine drainage from coal mining. This chemical form of water pollutant is produced by the leaching and oxidation that occurs when sulfur-bearing rock formations are exposed to air and water in the mining process" (Victor 1980, p.241).
See also Davis (1970, p. 29) on acid mine drainage.
Granted, these compounds can be put to other "uses", such as the manufacture of fertilizer, but this mans that they will simply contribute to the already out-of-hand fertilizer-pollution problem.

60 - Berger and Luckmann (1967, p.89) ciefine reification as "...the apprehension of human phenomena as if they were things, that is, in non-human or possibly supra-human terms...as if they were something else than human products - such as facts of nature, results of cosmic laws, or manifestations of divine will. Reification implies that man is capable of forgeting his own authorship of the human world, and further, that the dialectic between man, theproducer, and his products, is lost to consciousness. The reified world is, by definition, a dehumnized world."

61 - Time writes that acid rain is "...a blight as widespread and careless of its victims, andofintemationalboundaries, as the winds that disperse it" (November 8, 1982, p.98). Thus, it is not LRTAP per se which is the problem, it is the fault of "careless" winds. Had the winds transported the contaminants to a non-valued or non-sensitive area, problems would not occur, or so the argument goes.

62 - "Had we known in the 1950% the effect sulphur dioxide and other airborne pollutantswouldhave, it is unlikely we would face the big acid rain clean up job before us. We did not know, so we built superstacks that shot the pollution high into the air where it could be transformed to acid" (Canada n.d.a, p.21. Emphasis added). See also Canada (1981, p.4) and (n.d.b, p.2).

63 - Newspaper quotes from the Toronto Star, April 5 and 4, 1987; Time, November 8, 1982. For raindrops and umbrellas, see thegraphics on the covers of Canada (1982b) and (1984b); seealso editorial cartoons in the Toronto Star, March 29, 1986, and the Toronto Sun, March 22m 1986. Rain Rain Go Away was published by Public Focus on the Great Lakes, 1979. Bell (1983, p.6) has noted the importance of symbols in representing public issues: "The symbol conveys simultaneously a definition of the problem, a diagnosis of its causes, a prescription for its cure, and a powerful affective cue indicating how we should respond to it." In our case the entire issue has been condensed into a single raindrop: the problem appears in, about, and of the rain.

64 - In 1970 Time (February 2, p.47) expressed disappointment that the rain would not "wash" certain contaminants from the supersonic aircraft back to earth, allowing them to remain in the air where they would reflect sunlight away from the earth, contributing topotentiallyadverseweather conditions. Goodin (1976, p.151) also makes a reference to the rain as cleansing.

65 - Gusfield (1981, p. 71-74) uncovered many instances in his study of drinking-drivingwhere circumstance appearedas cause.

66 - Since the advent of acid rain it has become almost public knowledge that "For geological reasons theecologyofalargeportionof Eastern Canada is extremely sensitive to the effects of LRTAP and acidic deposition" (Canada 1980, p.7). See also notes 45 and 48 and the quotes on pages 28 and 30.

67 - Canada (1984a, p.1), in its introduction states: "Acid rain is mainly caused by man-made emissions of sulphur dioxide and nitrogen oxides" (emphasis added). Seealsopage 4 of this publication, first paragraph, under the title "emissions". See also Canada (n.d.b) and Ontario (1985a). Time has said that two questions are at the center of the acid rain controversy: "To what extent are sulfur and nitrogen emissions responsible for acidity in rain, apart from natural causes? Will a reduction of emissions significantly reduce that acidity?" (November 8, 1982, p.103. Emphasis added).

68 - Canada (1973a, p.24) opens its discussion of "air and air pollution" with the following: "Our environment can take a considerable amount of punishment, natural as well as man-made. There is in fact no 'pure air' in nature. Forest

fires, volcanic eruptions andothernatural events contribute some sontamination to the atmosphere." The document then goes on to remind the reader that the presence of thesenatural "contaminants" does not mean thaycause "air pollution". U.S. (1963, p.195) has written: "Pollution of natural origins, as from volcanic eruptions, forest fires and dust storms, is generally uncontrollable, but fortunately in most localities, is rarely of major significance in terms of the total air pollution problem. The problem owes its importance to man and his activities." See also Ontario (n.d.b). Canada (1973b) does not mention non-human sources at all.

69 - Thismatterreacheditsheightin the followingquotation from the Globe and Mail under the title: "Reagan Now Believes Volcanoes and Ducks Not Acid Rain Source": "Progresshasbeenmadein persuading U.S. President Ronald Reagan that acid rain is not caused by 'volcanoes, plants or even ducks', Environment Minister Tom MacMillan said yesterday....Mr. Reagan now recognizes that acid rain is a problem and that man-made pollution is the cause...." (January 14, 1986), Whether or not Mr. Reagan seriously entertained the notion that ducks cause acidrainis beside the point. The point is that the question has been raised today, and was not with respect to air pollution several years ago.

70 - Roberts quoted in Time, November 8, 1982, p. 98 and Munton (1981, p.21). Norton quote in Gold (ed) (1981, p.57). Mulroney quoted in the Toronto Sun, March 17, 1986, p.6.

71 - Time (September 19, 1983, p.50) had the following caption under a photograph of a polluted valley: "Nearby mountains keep cleansing South Atlantic winds from blowing away toxic smog that hangs over Cubatao [Brazil]; giving birth to 'monsters'." (Emphasis added). Note thatthewinds here are "cleansing" and that it is the muntains which are "giving birth" to "monsters". We can be sure that if the mountains were absent the winds at the point of deposition would be considered "culprits".

72 - Tim, (May 4, 1970, p. 18 and January 5, 1970, p.37). Two newspaper headlines cited in Taylor (1981, p. 151).

73 - Regarding "toxic rain": a personal discussion with one of the press conference organizers revealed that they consciously did not use the term "toxic tain", although some questions from the press employed this term. When I questioned the Toronto Star's environment reporter, who used the term, he replied that it seemed appropriate and did not seem misleading to him. Further research needs to be conducted into the role of the press and the generation of environmental symbols and labels.
Regarding the closing of Toronto's beaches, an interesting research project would trace the history of the closing of the beaches to see if the matter was blamed on the rain in the past. If not, this would support my thesis that reification is becoming more prevalent in recent years.
Another example of reification is that, when Vancouver's False Greek was being dredged in preparation for Expo 86, the highly toxic waste uncovered in the creek bed was labeled "sludge" and its origins were a "mystery" to local politicians. False Greek was the cite of a good portion of Vancouver's industry in the earlier part of this century. And finally, one more example which

testifies to the power of linguistic classifications is cited in Ritchie-Calder (1973, p.56-7), who notes that biologists working on early nuclear tests ". . .had found [radiostrontium] in the skin bums of animals exposed in Nevada testing ranges and they knew itssinisternatureasa'bone-seeker'. But the authorities clapped security on their work, classified it as 'Operation Sunshine', and cynically called the units of radiostrontium 'Sunshine Units' - an instance not of ignorance but of deliberate noncummonication."

74 - This tendency characterizes many social phenomena and is comparable to what Philip Slater (1970, p.58) has called the "toilet assumption": "Our ideas about **institutionalizingtheaged,** psychotic, retarded and infirmarebasedonapattemof thoughtwemightcallthe **Toilet** Assumption - thenotion that unwanted matter, unwanted difficulties, unwanted complexities and obstacles will disappear if they are removed from our immediate field of vision."

75 - Time (November 8, 1982, p.103) has quoted a U.S. government official and a coal company spokesman to say the following respectively: "There is no question that man-made emissions contribute- the problem. The question is the relationshipbetween emissions and deposits. We have a kind of back-of-the-envelope idea, but no hard scientific fact."; 'We can't yet identify the smoking gun. Is it Ohio.? Is it Illinois? Or is it some local source?" The question "Is it Ohio or Illinois" is of the utmost importance. Given the prevailing assumptions and definition of the problem, if it is demonstrated to be Ohio, for example, then Illinois' emissions are rendered unproblematic and can continue unabated. It would be assumed that Illinois emissions were rendered harmless under one of the exclusionary criteria already cited.

76 - See Briggs (1941); **Cohen** and Rusto (1912); and Marsh (1947).

77 - "Science has become the idiom of our age. It is the language in which command is cast as the compulsion of external nature. Authoritative law thatrestsits claim to legitimacy and acceptance on the technical **reasoning** of the realm of science denies any moral status. It denies that a moral decision has taken place, that a political choice among alternatives has been made. The ownership and responsibility for social problems and their solution are given as a matter of fact and not of values" (Gusfield 1981, p.194). Evernden (1985) has argued that the incorporation of scientific research and planning into "sound environmental management" replaced "values" with "facts", and lent scientific credence to the "sensible", when "in most cases, 'sensible' turns out to be a synonym for the customary..."(p.9).Out of this movement emerged EIA's, which "whileappearing to be the tool of environmental defense... turns out to serve the interest of the developer by making ecology the handmaiden of a continuing environmental transformation" (p.11). Evernden's article also contains an excellent critique of "resourcism".

78 - Evernden (1985, p.14) has stated that: "Other societies have no doubt managed to visit considerable destruction on the natural world from time to time, but we alone seem to have so understood the world as to make this inevitable."

79 - Most writers on this subject are working within the law community. See for example, Lax (1979); Large and Michie (1981); Page (1978); Stone (1972); and Schrecker (1984).

80 - Catton (1980) has argued that a central problem lies in the assumption that the use of "fossil fuels" as fuels is inherent in their nature. "It's high time to learn . ..that the wisest 'use' of coal andoilmaybe toleave them underground as nature's safe disposal of a primeval atmospheric 'pollutant' - carbon. By our ravenous use of [the substances we] beganuudoingwhatevolution had done in getting the atmosphere ready for animals (includingman) to breathe, and ready to sustain the kind of climate inwhichpresentspecies (including ourselves) had been evolved. Hundreds of millions of years of evolution had produced the oxygen-rich and nearly carbon-free atmosphere we need...." (p. 232) One does not even have to completely forego burning fossil 'fuels' to see that society is mistaken to consciously maximize their use, and hence the transformation to waste. It appears that the only limitations we see to our behavior are economic and technological, and nothing else.

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