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**Regulatory Processes and
Jurisdictional Issues in the
Regulation of Hazardous
Products in Canada**

by C. Bruce Down

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REGULATORY PROCESSES AND JURISDICTIONAL ISSUES
IN THE REGULATION OF HAZARDOUS
PRODUCTS IN CANADA

ANALYZED

CANADA INSTITUTE FOR
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Bruce Doern's interests are in the fields of Canadian government and politics, public administration and the politics of developing areas.

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FOREWORD

This background study describes and analyzes the Canadian regulatory process and the jurisdictional issues involved in the control and regulation of certain long-term hazards in Canada. Attention is focussed on six selected hazards, namely radiation, vinyl chloride, asbestos, lead, mercury and oxides of nitrogen. This study is included in background material commissioned as part of a Science Council study dealing with the problem of hazard containment. It was designed to provide the Science Council with an understanding of how our regulatory processes work, what social, economic and political forces are involved, and how these interact.

This book is being published to provide the general public and students interested in the Canadian political economy with a reference. Such a reference, to the best of our knowledge, has never been available before. As with all background studies, the analysis and conclusions are those of the author and do not necessarily reflect the views of the Science Council.

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PREFACE

I wish to express my thanks to the numerous public, corporate, union and interest group officials and spokesmen who co-operated fully and enthusiastically with my interviews and other requests for information. Special thanks are also due to Clarence Charlebois and Jack Basuk of the Science Council staff and to my graduate research assistants, John Kowalski, Karen Zavitz, Richard Saunders and Mark Tardiff of the School of Public Administration at Carleton University. The permission of the Law Reform Commission to utilize parts of its study on the AECB is also gratefully acknowledged. The constructive criticism of two anonymous assessors of this study has also improved the final product.

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INTRODUCTION

The object of this study is to describe and analyze the general regulatory processes and jurisdictional issues involved in the regulation of hazardous products in Canada, with particular reference to six selected hazards - radiation, vinyl chloride, asbestos, lead, mercury and oxides of nitrogen. The report focuses primarily on the politics and organization of regulatory processes and should be read in conjunction with other reports commissioned by the Science Council on the scientific, medical and legal aspects of the regulation of hazardous products in Canada.

More specifically the study will describe and critically examine:

- (1) The jurisdictional issues that impinge on the regulation of hazardous products, both federal-provincial and inter-departmental and inter-agency. The processes and problems of inter-governmental and inter-agency coordination and behaviour will be examined both in the area of regulation-making and regulatory compliance.
- (2) The regulation-making processes, including the process through which standards (threshold limit values or other guidelines) are derived. The study will include an examination of the respective roles of scientists, corporations, unions, regulatory authorities, public interest groups and international standard-setting bodies. The study will focus on current processes but will also examine how they might be improved so as to facilitate an open public examination of the nature of the scientific controversy, where such controversy exists, and of the issues of public health and safety.
- (3) The compliance processes through which existing or new standards are enforced or effective results are otherwise achieved. These processes include those generated both by regulatory authorities and by affected parties (corporations, unions, public interest groups, individual workers or citizens). The openness of the compliance process will require an examination of the role of the media and of the limits of bureaucratic growth to secure more effective compliance.
- (4) The possibilities of developing better processes through which we can anticipate the hazardous consequences of products. In recent years this has been expressed under various labels such

as "technology assessments", "environmental impact assessments", or the social management of economic "externalities".

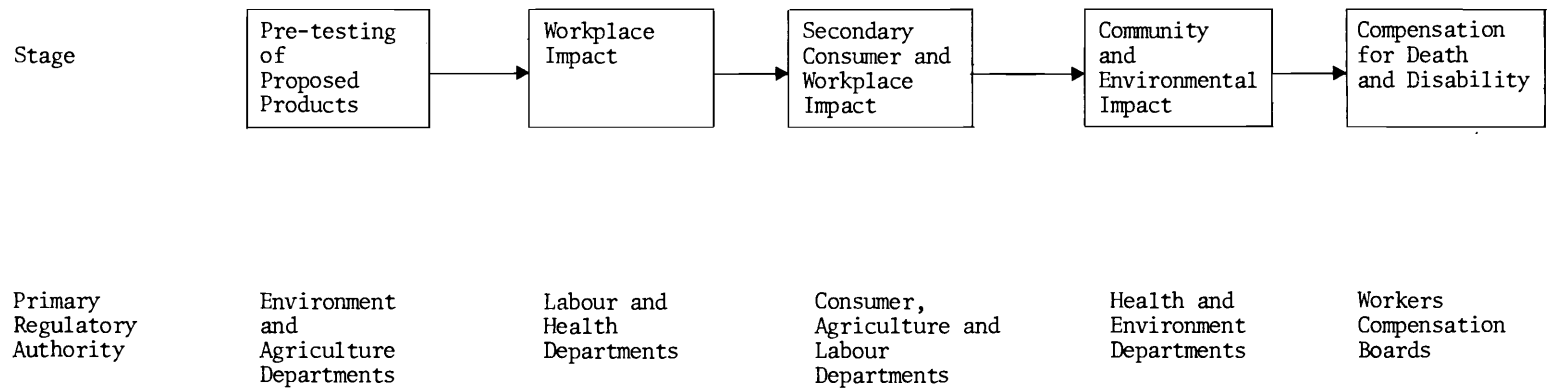
An analysis of the above is obviously not an easy undertaking and hence the limitations of this study must be acknowledged. It is based on the author's analysis of numerous governmental studies, and published literature, as well as on confidential interviews with many participants in the regulatory process. Most interviews were conducted in the summer of 1976 and the analysis deals with events up to the fall of 1976, when this report was submitted. The findings and the author's conclusions about the regulatory process are based on both the published and interviewed sources, and on the six case studies.

The study was conducted at a time when governments were actively involved in changing and reviewing their policies and organizations. By the time this study is published, no doubt further changes will have occurred. The analysis, moreover, would make no sense whatever unless current practices and future reforms are placed in the context of the political economy of Canadian regulatory processes. The Science Council study is organized (for quite valid reasons) on a hazard-by-hazard basis, e.g., those posed by radiation, lead, mercury, vinyl chloride, asbestos and oxides of nitrogen, but it is essential that each of these hazards (as well as others) be placed in the larger context of the Canadian political economy.

The Canadian political economy is largely (though not exclusively) characterized by a general liberal democratic view of the role of the state. It accords to market forces the primary (though not always exclusive) initiative in the introduction of new products and goods and hence of new hazards. This is not to suggest, of course, that the state does not partly referee the process. Obviously governments, federal, provincial and local, have intervened both to regulate and, in some cases, to assume direct involvement through public enterprise.

In general, however, it is in the realm of corporate decision-making that the true "front line" of the introduction of hazardous products exists. As Chart 1 indicates, occupational hazards and also broader consumer and community hazards can only be understood if something is known about corporate decision-making processes and criteria, and about the roles which organized labour and government play both in decisions about the nature of the workplace (occupational safety and health) and about the closely related questions of environmental or community health. Public policies and practices concerning hazards have obviously evolved on an ad hoc incremental basis in response to specific demands and pressures, as well as to changes in the state of knowledge. Thus improvements in

CHART 1 - THE PRODUCTION AND REGULATORY STAGES FOR HAZARDOUS PRODUCTS



the state of workplace safety have occurred over several decades, and have been accompanied by extensive compensation programs. Only recently, however, has a more catholic concern about the health of the workplace been considered or conceived. Similarly, governments have been involved for decades in effective programs of public health, but only recently have they attempted to establish policies directed more generally to the environment.

This study examines six hazards which variously effect both the workplace and the environment. It should be stressed, however, that while most occupational and community hazards have their origin in the introduction of new products and substances, the regulatory management of the hazards at these two levels may at times require quite different strategies since each may involve different degrees of voluntary or involuntary risk. Moreover, not all environmental hazards manifest themselves in the workplace, and on occasion both workers and management may have a common interest in exporting their pollution to the community outside the workplace.

The linkage between the workplace and the environment is a central reality of the regulatory process, but does not fully reflect the political and organizational dimensions that must also be considered. Both regulations and compliance can either speed ahead in some provinces or merely seek the lowest common denominator of performance. The cabinet system requires that responsibilities be assigned to particular ministers. At the same time, however, the realities of public management and administration require that governmental functions be grouped, allocated and delegated among departments. Departments and agencies are often at cross purposes, not because there are malevolent or mischievous bureaucrats but because departments have many purposes, each of which is difficult to quarrel with. Non-governmental participants frequently want tougher enforcement but at the same time do not want more bureaucrats and inspectors looking over their shoulders. Thus, the frustrations and the ambivalent views about the adequacy of the regulatory process can only be explained in the broader context of the Canadian political economy.

The dynamics of the regulatory process and of inter-departmental and inter-governmental relations can best be revealed through interviews, hence a considerable reliance has been placed on them. The severe limitations of time and resources has meant, however, that the breadth of the analysis has not been as great as ideally required. Nonetheless, it is hoped that the study will provide a useful starting point for understanding current Canadian policies, organizations and practices. The study is divided into two parts. Part I provides general background analysis of the regulatory process and Part II presents the six case studies.

In Chapter I the political economy of regulation is analyzed. An understanding is developed of the market economy, of the relationship between the regulatory function of the state and other governing functions (such as exhortation and spending), of the relationship between regulation-making and compliance, of the impact of federalism on basic regulatory processes, of the emerging demands for so-called "technology assessment", and of the regulatory relationships between the workplace and the environment.

Chapter II will examine in a general context the jurisdictional issues and regulatory participants. An outline of the roles played by, and the issues perceived by, the major participants will be presented. Participants include international and foreign bodies, federal regulatory organizations, provincial regulatory organizations, unions, industry, scientific and medical organizations, public interest groups, and media.

Chapters III to VI focus more specifically on the regulation-making and compliance processes, respectively, in each of the six hazardous products. Finally, Chapter VII makes some concluding observations about the regulatory processes and the areas of possible reform.

PART I

BACKGROUND

TO THE

REGULATORY PROCESS

CHAPTER 1 - THE POLITICAL ECONOMY OF REGULATION

The regulation of hazardous products, both in the workplace and in the environment, occurs in the broader context of the Canadian political economy, which is characterized by a regulated market economy with some state-owned corporations, federalism, extensive foreign ownership of industry, a partial adherence to the major pluralist tenets of liberal democracy, an emerging trace of what some call corporatism and which others describe as tripartite consultative processes, a general faith in the capacity of science and technology to solve problems, and a more recent scepticism about the social costs of technology.¹ Each of these elementary features of the Canadian political economy needs to be linked to the regulatory processes described in this study.

1. The Market Economy and the Production Cycle

Liberal democratic market economies tend overwhelmingly to accord to private corporations the primary opportunities to introduce new products and substances, and hence new hazards, to the market place. The technologies on which they are based are not entirely unregulated. The common law and criminal law impose certain restraints on the process of product development and innovation. Beyond these initial constraints there exists a vast range of unfettered or less fettered territory within which the state may or may not intervene, and unions or other parties may or may not bargain.

In its most extreme form, the regulation of hazardous products, whether in the workplace or in the environment, involves greater and greater state intervention in corporate production processes.² In many sectors, governments have intervened to regulate prices, to regulate output and/or to regulate access to the markets. The current nomenclature of regulation is likely to classify all of the above as "economic regulation". The regulation of workplace safety and health is characterized as social regulation, and not included under the general title of "regulated industries" or "economic regulation".³ Nothing could be further from the truth.

The regulation of hazardous products is the soft underbelly of economic regulation, precisely because it deals ultimately with who will bear the hidden costs of new products and production processes. To allocate these costs more accurately, and to improve health and safety ultimately involves more intervention in production and private sector decision-making.

The very early stages of the corporate production process are thus the initial point of possible intervention. To speak in these terms means that one is already partly into the realm of competing political ideologies. Behind the arguments about the validity of current practices and of possible future reforms of the regulatory process are ultimately the conservative, liberal and radical views about the appropriate role of the state, the extent of corporate market freedom, and the balance between property, individual rights, and collective or public goods. The conservative view is likely to regard further regulatory intervention by the state as an evil in itself. The liberal view is likely to take a benign view of the state as the neutral referee removing the excesses of the market place. The radical view tends to reject capitalism and market processes and thus suggest greater state intervention, including not only tougher regulations but also perhaps state ownership. The apparently emerging corporatist view might suggest a co-operative tri-partite mechanism.⁴

The Canadian debate does not always, in each case, reflect the full sweep of these ideological standpoints, but it would be utterly naïve to argue that these views do not partly influence the positions taken.

The physical path of a hazardous substance is not easy to trace but it logically begins in the corporate decision-making process with the initial concept of a new product or production process. The new product may be introduced indigenously by the firm itself or imported (as is frequently the Canadian case) from a parent plant or another firm. If adopted and moved into production it will immediately have impact on the workplace and hence on workers. The workers and the workplace thus become the front-line testing ground for new products and new hazards. Finally, the production and marketing cycle will propel the product and the hazard into stages of fabrication and re-use, into possible consumer and household use, and into the environment.

The fact that Canada's industry is predominantly foreign owned (especially the chemical industry) and that much of our primary resource industry (e.g. asbestos) is geared to serving American markets means that the American regulatory connection with respect to hazardous products is especially important.⁵ On the one hand, Canada may gain because chemicals may be pre-tested in the United States thus providing us, in theory, with an early warning system. However, this reliance on the United States can be viewed as a "beggar my neighbour" policy utilizing another country's people as a pre-test. On the other hand, in some industries, particularly mining, Canada may absorb the occupational and environmental health cost and export

the benefits of the resources to other countries, particularly the United States. These patterns of exchange are all the more complicated by the strength of Canadian unions' relationship to their international headquarters in the United States.⁶

2. Federalism

Federalism also imposes its curses and its blessings on the regulation of hazardous products. Federalism divides constitutional jurisdiction. Politically, however, it legitimizes the right of provinces and of the federal government to pursue independent and different priorities, albeit taking into account the national pressures imposed on them by their interdependence. The division of political authority enables both corporations and unions to lobby on a multi-lateral basis, having their preferred political party in power in some provinces but not in others. Differences in standards, in policies, and in compliance strategies and practices are partly explained by these political opportunities which federalism encourages.⁷ Federalism also requires the striking of bargains between regulation-making and compliance. Because many areas of jurisdiction are blurred, or are thought to be blurred, the political trade-offs between levels of government are frequently made, not just in the area of regulations themselves, but rather in the enforcement of regulations, with one level leaving or contracting the enforcement to another level of government.

Federalism, or rather the features of Canadian federalism, also impose more specific effects on the regulatory process. For example, in comparison with the United States, Canada has far less direct jurisdiction over labour relations; Canadian federal jurisdiction in direct terms provides federal legal responsibility for only a few industries viewed by statute or constitutional interpretation to be federal works and undertakings, e.g. banking, railways, grain, atomic energy, etc. Only a limited amount of secondary manufacturing industry comes under the jurisdiction of the Canada Labour Code.

Most of this study, both in the general analysis of jurisdictional issues in Chapter II and the subsequent case studies, deals with the impact of federalism. We mention it briefly now but its full import in the derivation of standards, in the efficacy of compliance practices, in the regional importance of selected industries, and in forms of organizational approach will become obvious later.

3. The Choice of Governing Instruments

Federalism is also ultimately related to the choice of governing instruments available to federal and provincial authorities through which they may achieve policy objectives and results. To regulate is merely to choose one instrument of governing. A regulation can be viewed politically as a rule of behaviour backed directly by the legitimate sanctions of the state.⁸ It is a directly coercive way of achieving objectives and can be distinguished in part from more pleasant ways of governing, such as spending (offering an incentive) or exhortation (soliciting voluntary compliance). Which types of instrument are used, and/or the sequence in which they are used (for indeed all may be tried or may be necessary) does matter politically, because the way one secures legitimate compliance in a democratic state is not merely a matter of technique. The selection of instruments is in part an end in itself. Subtle and not so subtle degrees of coercion are important.

Federalism, in part, helps determine which instruments are used. In some areas of policy affecting hazardous substances it is politically (and legally) easier for the federal government to spend its way into an involvement by, for example, financing or carrying out research, or by exhorting through consultative and information gathering mechanisms. It may not be easy for it directly to regulate (make rules of behaviour).

Regulation in political terms must be seen in relation to other instruments of governing such as spending and exhortation. Theories of regulation are ultimately meaningless politically until regulation as a governing instrument is tied to the kinds of choices politicians must make among a range of governing instruments. Those who see regulation as merely a problem of technique ignore the realities of politics and of governing. Politics involves both the allocation and pursuit of goals and values and also the selection of governing instruments through which legitimate support and/or compliance is achieved.

The day-to-day regulatory process, however, could not be understood merely by reciting the above elementary features of political life. The choices available, and thus the regulatory dynamics, can take on many forms and can occur in many permutations and combinations. To understand these infinite varieties one must explore more precisely the finer ranges of instruments available and the kinds of organizations in which these instruments might be grouped and located.

In broad political terms, it is appropriate to present a range of instruments such as regulation, spending, and exhortation, but the

choices available in day-to-day legal and administrative terms are much finer. At the regulatory end of the continuum for example, one can include sanctions which would encompass imprisonment, fines, revocation of licences, stop orders, and reporting requirements. Within the spectrum of spending instruments one can envisage grants, subsidies, transfer payments and conditional or shared grants. At the other end of the continuum one might group under exhortation such devices as information programs, research, and direct consultative and advisory committees and processes.

It can be argued that this study is about the regulatory process and that therefore we ought to focus on the regulatory spectrum only, but it is important to stress that such a narrow focus would be a distortion of reality, in two major respects. First, the realization of policy objectives in the field of hazardous products may in some cases be frustrated by the fact that regulatory functions may be housed in one government organization and expenditure functions in another, and the two may be working at cross-purposes. Second, even so-called regulatory agencies frequently do not just regulate. They are normally multi-functional and adjudicate disputes, do research, distribute subsidies, and give policy advice. This in turn affects how they behave, how aggressively the agency regulates and enforces, and how court-like are their procedures. It also affects the normative standards against which we might measure the processes followed by the particular agency concerned, and how much discretion, and thus, power, it possesses.⁹

It is thus important to stress that the regulatory processes are not confined to regulatory activity, precisely because the specific organizations are not just performing regulatory functions; nor can the resolution of the policy problems or the achievement of policy objectives, be implemented solely by regulatory means. This is true in most policy fields, and is especially true in the area of hazardous products and substances.

Three subsidiary, but important, issues arise from the above discussion, each of which takes us more precisely into the day-to-day realm of the political economy of regulation. The first issue is the difference between regular departments and independent commissions as an organizational form for regulation. The second is the relationship between regulation-making and compliance within regulatory organizations. The third is the openness of both regulation-making and compliance processes, an issue that requires a discussion of the Canadian and the more open American models of the regulatory process. Each of these will be discussed briefly since they all affect who participates, and who does not, in the regulatory process.

4. Organizational Forms for Regulation

At first glance one usually thinks of regulation in the context of the major quasi-independent regulatory boards or commissions, such as the National Energy Board or the Canadian Transport Commission. Such boards are created with decision-making responsibilities lodged in a collective group of commission members. Their formal relationship to a cabinet minister or to the cabinet as a whole is intended to be at arms-length or quasi-independent. Under a cabinet system of government, they are never fully independent. Indeed the justification for the board often is to remove, and/or to appear to remove, certain kinds of decisions from elected politicians. The multi-member commission may also facilitate representation of key interests on the board itself, thus implying an obligation to consult the affected interests.

This form of regulatory agency can be contrasted with regulation by departments headed directly by ministers and deputy ministers. These single-headed, traditionally hierarchical organizations tend to operate as a bureaucracy. There seems at times to be less of a clamour for these departmental agencies to encourage participation and to create formal channels of consultation. Regular departments seem to be bound more directly by the norms of cabinet and ministerial accountability and responsibility.

Whether independent regulatory agencies and regulatory departments behave any differently in fact, rather than in theory, is difficult to say. Whether one form is more responsible and responsive depends on a host of factors in each case. Whether the independent form promotes more legitimacy than the departmental form depends in part on how one ranks the concept of ministerial accountability held by elected politicians, in comparison to more indirect forms of representation by collective boards appointed by elected politicians. Both forms are equally susceptible to being captured over time by the interests they were intended to regulate. Both forms must develop good relationships with interests they are regulating, or regulation becomes virtually impossible.

Differences in organizational form may or may not be illusory. It is, however, instructive to point out that in the field of occupational and environmental hazards most of the regulations are carried out by regular departments. With the exception of the Atomic Energy Control Board (AECB) in the radiation field, and the several workers compensation boards, most of the regulations are carried out by regular departments of labour, health, mines and resources, and environment. It is not unimportant to note that in areas of long recognized economic regulation there has been much more of a tendency to assign regulation to quasi-independent bodies while in the "softer" areas of economic regulations (which is, of course, what

occupational health is less often perceived to be) the regulation seems to be kept more closely to the bosom of ministers and of the collective cabinet.

There is no ultimate magic to these two major organizational forms. They can, however, imply different degrees of freedom and perhaps seriousness of purpose. The creation of a quasi-independent "occupational health board" or the creation of a board for a specific particularly serious hazard may make sense but reforms in this direction would clearly have to be assessed in the light of the specific political will and resources available to the organization rather than by relying on any superficial or stylish preferences for the board or the departmental model.

The above problems are symptomatic of a larger reality, imposed by the Canadian political economy of regulation. The cabinet system of ministerial and collective responsibility does impose limitations on how many units (departments and boards) can be created, co-ordinated, grouped and re-grouped to achieve new or emerging policy objectives. The creation of a super department on occupational and environmental health, for example, would solve some problems but, in other respects, would merely make the problems intra-departmental in a big department, rather than inter-departmental in a few smaller departments.

Existing government departments have acquired their mandates over a long period of time in response to evolving views about political and legislative priorities, each one of which, on its own, is usually seen to be beneficial. Although inter-agency conflict is often caused by bureaucratic empire building, it is also just as often caused by the simple fact that most departments have been given many purposes through past and present political processes.

5. Regulation Making and Regulatory Compliance

The problems of inter-agency allocation of functions are but a broader manifestation of the problems of linking regulation-making with regulatory compliance. The actual effective implementation of regulations obviously requires a considerable amount of voluntary compliance by the parties being directly regulated, a considerable and visible inspection and compliance capability in the regulatory organization's own staff, the co-operation of compliance personnel located in other public organizations, and the technical capability to develop and/or utilize existing or required compliances and monitoring technology. The compliance function everywhere encounters a need to resolve the natural human desire for effective and fair

enforcement without the annoying presence of too many enforcers. A number of other factors influence the overall compliance capability.

Most regulatory agencies in Canada tend to be sparsely staffed. Their compliance capability does not usually measure up to their regulatory intent. There is a tendency to avoid unnecessary duplication of personnel, or to "piggy back" one agency's compliance needs on the backs of agencies already in the field. Up to some undefined point, more effective regulatory compliance does require more staff, although more staff is clearly not itself a sufficient condition for more effective compliance. This fact implies bureaucratic growth at a time when many arguments are being mounted against the growth of public bureaucracies.

Some growth is necessary, but the concern about excessive bureaucratic growth should counsel a more intelligent search for other compliance mechanisms. In the workplace, for example, there may be some very practical advantages to the use of joint worker-management committees as a complementary compliance device, as well as to serve other purposes. There may also be value in wider legal remedies by outside parties, e.g. class actions. Obviously these alternative compliance mechanisms will not be assessed merely on the grounds of avoiding the growth of bureaucracy; they do suggest the need to consider the compliance capability in broader and terms.

Considerations of compliance capability should also take into account the conditions under which inspectors operate in the sociology of contemporary public bureaucracies. In recent years, high status has been accorded the policy and policy advisory roles in government. The "nuts-and-bolts" line operators and field inspection personnel tend to have been downgraded both relatively and absolutely. The formal educational qualifications of inspectors also tend to be regarded as inferior. From the point of view of the regulated parties, the inspectors also often tend to be viewed as second-class policemen.¹⁰ These factors complicate a situation in which it is already difficult, in many fields, to get and retain qualified and experienced technical manpower at the inspectorate and monitoring levels.

None of the above is intended to suggest that no co-operative relationships are developed in particular regulatory areas between inspectors and colleagues in government and in the regulated organizations. What is suggested, however, is that the inspection and compliance functions are grossly undersupported or devalued in the current Canadian climate of public administration.

This situation is made worse by the "piggy backing" phenomena referred to above. Its recent practice has reached a stage where

inspectors from other departments are utilized by a regulatory agency not so much as part-time inspectors but rather as overtime inspectors. The same phenomenon occurs between the federal and provincial governments as well as among departments within each level of government. The likelihood of piggy-backing has increased in the current Canadian climate since budgetary constraints cause requests for new staff to be viewed with scepticism by central treasury officials.

The regulation-making and compliance processes, as they are now legally enshrined, confer enormous discretionary powers on regulatory authorities. Discretion exists, in many instances, in the determination of how open the regulatory process will be; who will be consulted; whether reports and the results of monitoring will be released and, if so, to which parties; whether sanctions will be applied, and the type of sanctions; and a host of other related questions.

Discretion itself is clearly not an evil. A great deal obviously depends upon how it is exercised and how openly it is exercised. The more uncertainty that exists in the process, however, and the more closed the process, the more affected groups will be likely to perceive themselves as the objects of arbitrary power.

Regulatory and compliance processes also are not without costs, both in financial and human terms. Virtually all regulations directly affect and alter private spending. The difficulty of assessing the costs of regulation is that the private expenditure consequences (on individuals and corporations) do not normally appear in government budgets.¹¹ The budgetary process in government is a highly visible activity in which values are at least partly converted into the common denominator of money. There is a central budgetary process and there is a treasury board. There is no equivalent in the regulatory process. Money is needed to operate the regulatory machinery, but the expenditure consequences of regulation are rarely calculated in any direct financial sense, although they certainly are in more general political terms.

For example, in response to increases in urban crime, governments could hire more policeman and buy more police patrol cars, an act which would appear directly in public budgets. On the other hand, governments could require that all homes be equipped with burglar alarms, an act which would affect private budgets but would not appear in public budgets at all. Although governments would typically not directly calculate the financial costs, they would certainly be aware in political terms of who was paying the price.

Even the above example, however, does not adequately reveal the nature of who wins and who loses in the regulatory process. It fails to reveal the redistributive effects of regulation. For less wealthy home owners the cost of the burglar alarm would effectively be a regressive tax in comparison with a wealthy owner. This is a central issue in the regulation of occupational health and environmental hazards, since the costs of regulation fall disproportionately on different economic classes, e.g. workers, and low income families who live near industrial plants because they cannot afford to live in the suburbs.

6. The Openness of Regulatory Process

The final and perhaps the most important issue in the day-to-day political economy of the regulatory process in Canada is the degree of openness of the process. The evolving debate about this process brings into sharper focus what can be identified, for analytical purposes, as two models of regulation. For want of better phrases we will call these models the professionally open model (Model 1) and the democratically open model (Model 2). Many people directly involved with regulation in Canada implicitly or explicitly have these polar models in mind when commenting on possible reform. Both deserve thoughtful analysis.¹²

Model 1, the professionally open model, is characterized by a high degree of mutual trust. Its proponents assert that it is internally open in that it fosters frank criticism and evaluation among professional technical people. These proponents suggested that when regulators arrive, the industries are likely to view them as professional people trying to achieve a common goal, e.g. health and safety. Professionals in the industry are more likely to show their professional peers things that are working well, as well as things that are not. Thus an internally but professionally open process of evaluation will promote effective regulation by expert professionals who know what the problems are. Model 1 will also be characterized by minimum reporting requirements and fewer hearings thus giving the "front-line" regulators (the professionals in the industry) more time to spend on real health and safety issues.

Model 2, the democratically open model, would be based implicitly, if not explicitly, on the American model in which the processes would be more democratically open. Extensive hearing procedures would be required and opportunities for litigation by interested groups would be broadened. As a consequence, Model 2s opponents claim that the processes would induce a damaging environment of confrontation. Regulatory professionals would be viewed by the regulated much more in an "us-and-them" adversary

manner. In day-to-day regulatory and compliance relationships regulators would be more likely to be given only the information they ask for, rather than take part in a frank discussion of problems. The procedural requirements of Model 2 would necessitate much more time being spent by the regulated in complying with the paper requirements of regulation.

Both models represent over-simplifications of reality but they do reflect certain kinds of relative costs and benefits which have to be taken into account. This study reflects a view in which regulatory reform is seen as moving towards Model 2. There has been too much professional coziness. The evolution towards Model 2, however, should not be seen as being achievable without costs. The democratically closed, but professionally trustful, model which Canada has tended to adopt has probably had some benefits. For example, Canada's relatively more stringent requirements regarding possible reactor breakdown may be attributable to the close professional contact. The less onerous paper work and hearings processes have left industry professionals more time to deal with substantive problems of health and safety.

It is also true, that there is a very fine line between professionally open exchanges, and professional coziness. Both the substance and appearance of professional coziness become all the more critical as one deals with greater technologically complex and scientifically mysterious area of regulation. All regulatory areas have some degree of technological complexity, but some have a great deal more than others. The regulation of broadcasting and the regulation of atomic energy for example, will have many similar procedural issues but it is argued that in degree, the regulation of nuclear energy is far more technologically difficult as far as laymen's understanding and control are concerned. It is this small degree of difference which imposes marginally extra obligations on nuclear regulatory authorities to establish greater independence and to create more open regulatory and compliance processes in order to facilitate better public understanding and to promote real health and safety.

These marginal extra obligations are rendered even more imperative by what one author has properly described as the politics of "hypotheticality":

"Hypotheticality, of course, is not a word in regular usage but its logic expresses precisely what must be expressed in the line of reasoning presented here. Its logic is the same as that of the word "criticality", for example, a term which is familiar to reactor engineers. The rule followed is that for Latin words ending in

-itas, for example, veritas or felicitas. Such substantives point to features which exist in principle and which if actualized, lead to the fact that something can have a certain property: a reactor can become critical or a situation can be considered to be hypothetical. The process of interaction between theory and experiment which leads to truth in its traditional sense is no longer possible. Such truth can no longer be fully experienced. This means that arguments in the hypothetical domain necessarily and ultimately remain inconclusive. I think that this ultimate inconclusiveness which is inherent in our task explains, to some extent, the peculiarities of the public debate on nuclear reactor safety. The strange and often unreal features of that debate, in my judgement, are connected with the "hypotheticality" of the domain below the level of the residual risk".¹³

Thus, standards of proof, and risk-benefit, cannot be easily or reassuringly offered. The technological mystery of several aspects of the hazardous products regulatory process cannot be underestimated. It affects both substantive standards and how they are perceived. For example, some judge the nuclear alternative to be too risky and thus seek its abolition. Others wish to be more convincingly reassured. These standards in turn impose different criteria regarding the adequacy of the nuclear regulation.

Important parts of the hazardous products regulatory debate are conducted in the realm of hypotheticality in that the typical standards of demonstrable proof often cannot be achieved.¹⁴ Questions of nuclear reactor breakdowns, nuclear disasters, waste storage in geologically safe underground caves, and the adequacy of threshold limit values are issues which, more than most, take both the regulators and the public into the indeterminable arena of hypothetical standards. Compared with most, if not all, regulatory processes in Canada, the hazardous products regulatory process must be adjusted to this important reality of its regulatory environment. It must also resist the natural professional temptation to think that if an issue is scientific it ought not be publicly discussed with laymen for fear that they will not understand or will develop irrational or hysterical fears about probable consequences.

7. Science, Technology and Regulation

The question of hypotheticality is one important feature of the political economy of the regulatory process surrounding hazardous products, but it is clearly not the only issue in the relationship of

knowledge, science, technology, and regulation. Who does the research and how independent it is perceived to be, the general advocacy of better processes of technology assessment, the need for basic research, the need for better or new applied technologies for monitoring and compliance, and when the call for more research becomes merely an excuse for not taking action, are all important issues on which some comments are essential.

The growing concern about the regulation of hazardous products and substances in the workplace and in the environment is part of a larger concern about the "environment" and about "technology assessment".¹⁵ The logic of the argument is simple and unassailable. The proponents of environmental and technology assessment suggest that contemporary industrial societies must develop a greater collective capability to assess, in advance, the cost, benefits and risks of new technologies, and to understand and better control existing technologies. Where the technology is complex, various suggestions have been made and some adopted, to improve the technology assessment capability. These suggestions include creating offices of technology assessment or special science courts, information screening programs, and the pre-testing of chemicals.¹⁶

Central to this question is the issue of the independence and/or the appearance of independence of the research, and the freedom with which the knowledge is traded and communicated. Scientists tend to think of research as a search for causal knowledge and as an input to government and other decision-making processes. This view of research is frequently accurate. Research, however, is also an output and a political and economic weapon. We frequently duplicate research because one agency distrusts, or cannot be seen to be trusting, research done by others. To study a problem or to seek more knowledge is frequently a middle-of-the-road alternative between doing nothing and taking more vigorous action.

In many areas of the regulation of hazardous products and substances, lack of research is not the main problem. A very normal conflict emerges in this regard. Scientists, for example, are naturally and necessarily cautious about the statements they make about causal knowledge. They have a more cautious sense of evidence about standards or TLV's (threshold limit values) for example. They are likely to advocate, therefore, that the standards be viewed as guidelines and that more research needs to be done. Economic interests will exploit this argument and use it to justify looser standards or to postpone action until more conclusive cause-and-effect evidence is produced. Unions and others who must seek more precise administrative and legal criteria of evidence will opt for precise legislated standards.

The history of occupational and environmental health hazards bears witness to the constant presence of two kinds of experience about evidence.¹⁷ One kind is found in the more rarified level of scientific journals and symposia. A second is found in union halls and work sites or in workmen's compensation cases. The first level of experience tends to view the second as being merely a series of "cases" and thus not causal evidence. The second level tends to perceive the first as remote, foreign and largely subservient to interests other than its own. The bridging of the gap between these two levels of evidence, each of which asserts a compelling claim to legitimacy, is a major problem to be overcome in the regulatory process. Each part of the level of experience demonstrates an enormous ignorance of the other.

The above obstacles arise out of the lack of communication regulators, scientists, and those who are the presumed beneficiaries of the regulatory process. But there are other obstacles in the exchange of knowledge and technology about actual compliance mechanisms. For compliance technology to be workable it must be closely related to the production processes in the firms in which it is implanted. Because of this, corporations are sometimes reluctant to trade knowledge with other firms about safer production processes; it is sometimes difficult to separate the production technology from the safety mechanism. Trade secrets are, therefore, a regulatory obstacle. For similar reasons, firms are reluctant to release information about the health effects of their production processes or about their own research on these questions.

Summary

The political economy of the Canadian regulatory process embraces a number of characteristics against which the regulation of hazardous products and substances must be seen. The nature of the market economy, its relationship to federalism, the relationship of federalism to the choice of governing instruments, the alternative organizational forms in which regulatory authorities might be located, the interface between regulation and compliance, and the perceptions of research needs and standards of proof and evidence by the major regulatory participants, are all factors which influence the adequacy of the regulatory response in each of the six case studies.

CHAPTER II - JURISDICTIONAL ISSUES AND REGULATORY PARTICIPANTS

Before we examine the regulatory and compliance processes in each of the six case studies, we will present an aggregate portrait of the main jurisdictional issues and regulatory participants. Although the concept of jurisdiction is usually applied to international, federal, and provincial levels of government, we will use the word to include questions of inter-departmental and inter-agency roles, as well as those of corporations and industry associations, unions, the scientific and medical communities, public interest groups, and the media. The last have jurisdictional claims of their own.

It is to be stressed that in this Chapter, we are attempting to present only an aggregate or general portrait. The purpose is to highlight the major jurisdictional issues and to outline the apparent approaches and standard operating habits of each participant. The presentation of each of the participants should not be interpreted as placing each of them at a similar or equal level of power or influence in the regulatory process. Quite the contrary: there is ample evidence to suggest that unions, public interest groups and the media are far less influential, and their participation more episodic.

1. International and Foreign Organizations

It is obviously important that Canadian regulatory authorities utilize the knowledge and expertise of international and foreign organizations involved in occupational and environmental health. International standard setting bodies like the International Committee on Radiological Protection (ICRP) and the American Conference of Governmental Industrial Hygienists (ACGIH) are invaluable sources of expertise and advice. Canadian involvement with other international research and advisory bodies such as the International Labour Organization (ILO), the World Health Organization (WHO), the Organization for European Cooperation and Development (OECD), and the International Atomic Energy Agency (IAEA), is also immensely valuable.

Canadian agencies have also benefited from close day-to-day professional contacts and exchange with their counterparts in the United States, particularly the Environment Protection Agency (EPA), the National Institute of Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), and the Consumer Product Safety Commission.¹ The considerably greater

TABLE 1 - FEDERAL AGENCIES ADMINISTERING MAJOR LEGISLATION RELATED TO OCCUPATIONAL AND ENVIRONMENTAL HEALTH AND SAFETY

<u>Type of Agency</u>	<u>Workplace Oriented Legislation</u>	<u>Environment Oriented Legislation</u>
Department of Labour	Canada Labour Code	
Atomic Energy Control Board	Atomic Energy Control Act	
Department of National Health and Welfare	Radiation Emitting Devices Act	Food and Drug Act
Department of the Environment		Fisheries Act Clean Air Act Canada Water Act Environmental Contaminents Act
Department of Agriculture		Pest Control Products Act Feeds Act Fertilizers Act
Department of Consumer and Corporate Affairs		Hazardous Products Act
Department of Transport		Canada Shipping Act Motor Vehicle Safety Act
Public Service Commission and Treasury Board	Public Service Employment Act	

American resources and Canada's proximity to the United States confer a considerable advantage.

No one would argue that these international and foreign resources should not be utilized, but it is also important to point out the dangers that can occur if Canadian regulatory authorities depend on them excessively. It is very easy for a sense of deference to develop. Standards developed in an international arena are frequently subject to the wider trade-offs and compromises that may develop not only out of scientific controversy but also out of the differing views of producer and consumer countries. There is also a sense in which this deference and dependence can become, in effect, a form of beggar my neighbour policy by which we simply wait for hazards to occur elsewhere. Moreover, excessive deference will cause Canadian authorities to be less aware of problems that are indigenous to Canada.

2. Federal Organizations

Table 1 shows the federal departments that can be said to have a major regulatory responsibility for occupational and environmental health and safety. The table attempts to classify legislation according to whether it is more workplace-oriented than environmentally-oriented, but this classification can be misleading and arbitrary as overlapping abounds. The use of pesticides, for example, can affect both farm workers and the farm workplace as well as the broader environment. The Atomic Energy Act can affect both the workplace (uranium mines, and nuclear power plants) as well as the immediate environment around the plant site.

The list of federal statutes, moreover, is by no means exhaustive. Two dozen or more other statutes could be said to impinge on the area of occupational and environmental health.² The table also fails to capture the considerable research and monitoring role played by the Department of National Health and Welfare in support of several of the statutes listed. The federal government, generally speaking, has jurisdiction over occupational health matters concerning public servants, about three quarters of a million workers falling under the provisions of the Canada Labour Code, and workers in a number of specific industries under federal jurisdiction, e.g. atomic energy, banking, railways, grain.

Federal jurisdiction in the workplace is more limited than in the environment, where a number of statutes are available for federal intervention. In the workplace, the key departments are the Department of Labour, the Atomic Energy Control Board, and the Department of National Health and Welfare.

The Department of Labour's responsibility is centred on its Occupational Safety and Health Directorate which in turn is part of the Research and Program Development Branch. Occupational health and safety is thus located in the middle level of Labour Canada's organizational hierarchy. The Department's evolution, especially since the formation in the mid-1960's of the Department of Manpower and Immigration, has caused it to focus primarily on its more traditional facilitative, industrial relations role, and on traditional problems of labour and employment practices. As is the case in most jurisdictions its focus within the occupational safety and health area has been more on the safety issues.

Organizationally, the Department operates through five regional offices. About 50 to 60 employees make up the main field compliance capability but these persons have responsibility for a variety of inspection functions in addition to occupational health. In addition almost 1300 people in provincial governments are employed on a contractual part-time basis to act as federal inspectors. Departmental officials acknowledge that they remain grossly understaffed in the field.³

On the research side the Department retains a minimum scientific and technical staff to monitor and evaluate literature and information, but otherwise relies heavily on the Department of National Health and Welfare. It also maintains strong direct links with OSHA in the US.

The Department of National Health and Welfare is involved in several ways in the occupational health field. The Health Protection Branch provides a comprehensive service for radiation workers. In enforcing the Radiation Emitting Devices Act and Regulations the Branch has designated responsibilities for radiation devices under the Canada Dangerous Substances Regulations and acts as advisor to the Atomic Energy Control Board. It also provides the national radiation dosimetry service and registry as well as specialized radiation or radioisotopes. The Branch also conducts research on the toxic properties of selected materials used in industry and has undertaken surveys, in co-operation with provincial governments to evaluate health hazards in industrial plants. It advises the Department of Agriculture on the occupational risks to pesticide applicators and farmers, and the Department of Consumer and Corporate Affairs on matters related to the Hazardous Products Act.

The Medical Services Branch provides occupational health services for the Public Service of Canada and advises the Department of Labour in the provision of occupational health services to other federal workers (except on radiation). It also has responsibilities

for occupational diseases in native peoples, and advises the Department of Indian Affairs and Northern Development on occupational health in the north.

The Health Programmes Branch has responsibility for the National Health Grants Programme, a major source of research funds for occupational health research in universities and institutes.

On the environmental side, the Health Protection Branch, in addition to its existing responsibilities for advice and research under the Clean Air Act and for regulation under the Food and Drug Act, is assuming major research and monitoring functions under the reporting provisions of the Environmental Contaminants Act administered by the Department of the Environment.

In general terms, therefore, the Department of National Health and Welfare tends to play a research and monitoring role. It is a major centre of research and expertise on which several of the other more directly regulatory departments must depend. The Health Protection Branch now faces and will face serious manpower problems as it tries to respond to the new responsibilities thrust on it by statutes like the Environmental Contaminants Act. The Branch has historically focused on food and drug regulations, thus other components of its role have had to struggle for resources. About 58 man-years are devoted by the Branch to occupational health, of which 48 are devoted to radiation surveillance. The remaining 10 man-years are inadequate for current responsibilities, let alone new and evolving roles.⁴

The Department of Consumer and Corporate Affairs administers the Hazardous Products Act through its Product Safety Branch. The Act deals with consumer goods such as those designed for household, garden, or personal use, for use in sports and recreation and for use by children. It also mentions, however, products "without reference to end use" which are poisonous, toxic, flammable, explosive or corrosive and thus can be applied to broader end use or even workplace situations.⁶ The Cabinet may include in the schedule to the Act any product the Minister is satisfied is, or is likely to be, a danger to the health or safety of the public. The Act defines a hazardous product to be any included in Part I or Part II of the Schedule. Products in Part I cannot be advertised, sold or imported into Canada. Products in Part II can only be advertised, sold or imported as authorized by regulations. An offence is punishable on summary conviction by a fine of \$1000, or imprisonment up to two years. Inspectors have full powers of search and seizure.

The Product Safety Branch is part of a larger Consumer Standards Directorate which has responsibility for legal metrology

and economic fraud as well as product safety. The field staff, located in five regional and twenty-five district offices, is organized under a separate assistant deputy minister to serve several functions of the Department. The inspections for hazardous products are carried out by personnel who also have heavy responsibilities in other areas, such as economic fraud. The Product Safety Branch retains its own basic capability to monitor and evaluate literature and to maintain on-going contact with bodies such as the US Product Safety Commission, but must rely for more extensive research capability on the Department of National Health and Welfare for advice concerning toxicological hazards.⁷ Where necessary the Branch has also initiated laboratory work at other institutions including universities, other government departments, and research institutes.

The Department of the Environment exercises regulatory responsibility through a number of statutes, the most important of which are the Fisheries Act, the Clean Air Act, the Canada Water Act and the Environmental Contaminants Act.

For example, under the Clean Air Act the responsibilities of the Minister of the Environment are to:

- (a) establish, operate, and maintain a system of air pollution monitoring stations throughout Canada;
- (b) collect, both through the operation of air pollution monitoring stations and from other appropriate sources data on air pollution in Canada and process, correlate, and publish such data on a regular basis;
- (c) conduct research and studies relating to the nature, transportation, dispersion, effects, control, and abatement of air pollution and provide consultative advisory and technical services, and information related thereto;
- (d) formulate comprehensive plans and designs for the control and abatement of air pollution and establish demonstration projects; and
- (e) publish or otherwise distribute or arrange for the publication or distribution of all pertinent information that would serve to inform the public of all aspects of ambient air quality and of the control and abatement of air pollution.

The Act is administered by the Environmental Protection Service (EPS) primarily through its Air Pollution Control Directorate and the five regional offices of EPS. By 1976 the staff of the air pollution control program was approaching 175 man-years, about five times its 1971 strength.⁸

The Air Pollution Control Directorate's organization deserves specific mention in order to illustrate the scope and nature of its task. The Directorate is divided into three branches, the Air Pollution Programs Branch, the Abatement and Compliance Branch and the Technology Development Branch.

The Air Pollution Programs Branch carries out the development and co-ordinates the operation of Canada's National Pollution Surveillance (NAPS) Program; develops national emission inventories of major air pollutants and inventories of potentially hazardous air contaminants; is responsible for the non-technical aspects of emission regulations and guidelines development, including analyses of the socio-economic implications of air pollution control; co-ordinates the development and prescription of National Air Quality Objectives and conducts inter-service, inter-governmental, and international liaison.

The Abatement and Compliance Branch is responsible for carrying out engineering and technical assessment of pollution emissions and emission control and abatement methods to establish the technical basis for development of air pollution control guidelines, standards, and regulations. The Branch is composed of five divisions: (a) chemical process sources, (b) mining, mineral, and metallurgical, and (c) combustion sources, which cover major stationary sources; (d) mobile sources, which is concerned with emissions from motor vehicles, railways, ships, and aircraft; and (e) fuels, which deals with fuel composition and additives.

The Technology Development Branch is responsible for fostering the development and demonstration of control technology and scientific and technical methods for the control and abatement of air pollution. The Branch provides chemical services, the development of sampling, analysis, and measurement procedures for air pollutants, a motor vehicle testing facility, and a technology transfer service that incorporates both publications and training. The Technology Development Branch comprises three divisions: engineering, chemistry, and publications and training.⁹

The above activities obviously mean that considerable inter-agency co-operation and co-ordination must be achieved by the Directorate and by the EPS. The control program initiated by the EPS must also rely heavily on activity carried out for it by provincial agencies. At the policy level this is co-ordinated by the Federal-Provincial Committee on Air Pollution.

Although the direct regulation of fuel and fuel additives is possible under the Clean Air Act, the Act largely enables the federal government to exercise some indirect co-ordinating influence rather

than an explicit regulatory control. For example, with respect to mobile sources of pollution, direct regulation occurs through other acts. The passage of the Motor Vehicle Safety Act enables the federal government to initiate a program to combat air pollution from all new motor vehicles manufactured in, or imported into, Canada starting with the 1971 model year. The Ministry of Transport is responsible for the administration of the Motor Vehicle Emissions Regulations while the Department of the Environment is designated to carry out the required compliance testing and to provide technical advisory services in support of the Regulations. Within the Department of the Environment, these activities are carried out by the Mobile Sources Division and by the Emission Testing Laboratory of the Air Pollution Control Directorate.

The compliance monitoring program is designed to ensure that new motor vehicles offered for sale in Canada conform to current emission standards as certified by the manufacturers. At the beginning of a model year the Ministry of Transport selects a representative sample of all the makes and models of motor vehicles imported into or made in Canada which are then tested by the Department of the Environment for compliance with emission standards.¹⁰

The arms-length regulatory role provided by the Clean Air Act is also illustrated by the National Air Quality Objectives. These objectives are developed by the Department through a series of inter-agency, federal-provincial and government-industry task forces and committees. The Clean Air Act calls for three levels of air quality objectives - "desirable", "acceptable", and "tolerable" - for each major pollutant. For most pollutants only the first two levels of objective have been developed and approved by the Cabinet.

The maximum acceptable level is intended to provide adequate protection against effects on soil, water, vegetation, materials, animals, visibility, personal comfort and well-being. It represents the realistic objective today for all parts of Canada. When this level is exceeded, control action by a regulatory agency is indicated. Maximum tolerable levels are intended to denote concentrations of air contaminants that lead to a substantial threat to public health.¹¹

In addition to the above the Act provides for the promulgation of National Emission Guidelines which are currently being developed for each industry. The purpose of these guidelines is to specify levels of emissions of air contaminants that reflect the application to industrial processes of the best operating practices and best practicable technology in air pollution control. It is hoped that the adoption of the guidelines by appropriate regulatory agencies

will result in a significant reduction in emissions of air contaminants and thus prevent deterioration of air quality on a national basis.

The guidelines are published in a form that it is hoped will allow for their ready adoption by regulatory agencies, in particular provincial air pollution control agencies, as minimum standards for industry located within their jurisdiction. It is recognized that local conditions, such as the density of industrial development or local topography, will necessitate the adoption of more stringent environmental requirements for all works, businesses, and undertakings involving the federal government.

Because the Department of the Environment is a fairly new alliance of several old and new units of government, it has had to struggle both internally and in relation to other departments to establish its identity and role; it defies simple description. Some of the other organizational dilemmas are illustrated by the Environmental Contaminants Act. We will use it as an example since the Act has been characterized as the closest instrument currently available in Canada to "pre-test" chemicals or, at least, to create an early warning system.

The Environmental Contaminants Act is modelled in many respects on the Hazardous Products Act in that it establishes processes through which substances may be put on a schedule and regulated. Manufacturers, importers and processors are required to submit information concerning new chemical substances. Where the Minister of the Environment or the Minister of National Health and Welfare suspect a danger they may investigate and appoint advisory committees. A suspect substance may then be banned or made subject to use on certain conditions, in ways similar to those followed in the Hazardous Products Act. The Environmental Contaminants Act does not license substances or in any way positively assign the equivalent of a "good housekeeping seal of approval".¹²

Organizationally, the Act will require enormous resources to collect and monitor incoming information, to examine and test substances that are suspect, and to enforce the law. Department officials expect to have to draw heavily on other parts of their own Department, but will especially have to depend on Health and Welfare for research, and perhaps (unless they get their own compliance staff) on the Agriculture and Consumer and Corporate Affairs departments for compliance.

The above portrait of four areas of federal involvement does not nearly do justice to the intricacies of the federal role or to the role played by other agencies, e.g. AECEB, Agriculture, the

National Research Council, Transport. However, it does illustrate the extent to which the federal role, with a few exceptions, is more concerned with monitoring, issuing guidelines and doing research, rather than with direct regulation. This is partly due to constitutional factors but is also related to the political use of governing instruments discussed in Chapter I.

The portrait also shows the difficult issues of inter-departmental co-ordination, and the problems of relating regulation-making, research and compliance processes and roles. The major departments obviously need each other to do their job. Although day-to-day co-ordinating mechanisms have developed, in the form of professional contact, operating level committees, and bodies like the newly created Federal Interdepartmental Committee on Environmental Contaminants, the amount of energy spent crossing jurisdictional lines and coaxing co-operation from other departments undoubtedly exacts enormous costs. It would be difficult to envisage a consolidation of functions on both the workplace and the environment but there is reason to believe that some consolidation within each of these areas would assist both the research and the regulation-making and compliance processes. The Health and Welfare and Labour departments undoubtedly co-operate to a significant extent but they also regard each other with considerable suspicion. The Department of Labour tends to see labour as its clientele. The Department of National Health and Welfare has a more diffuse constituency, of which occupational health is but one component. The former consists more of managers and social scientists at the senior level while the latter consists, relatively speaking, more of scientific and medical personnel. As the issues of occupational health receive higher priority the relationships between these two departments will have to be clarified if a more concerted federal occupational health role is to materialize.

Departments will almost always argue that they can use more staff, but there is reason to believe that the compliance roles of all of the above departments are inadequate and that a considerable commitment of new staff resources is necessary if changes are to occur in the effective and visible implementation of existing policy. Our discussion in Chapter III of the regulation of radiation (and thus of the role of the AECB) will also show the compliance weakness.

The regulation-making processes in all the departments involve informal processes of consultation, but the concept of which parties ought to be consulted varies with each department. The Department of Consumer and Corporate Affairs' Product Safety Branch seems to view the industrial producers to be its most natural constituency. It still encounters difficulty in viewing consumer groups and labour as a normal participant, partly because it feels that they have less

direct expertise and knowledge. Health and Welfare seems to rely much more on scientific and professional consultation, while the Department of Labour consults unions and business in a more even-handed way.

Although the departments do consult parts of their affected clientele, their standard operating habits counsel them to consult those sectors with which they have the most comfortable relationships. Much of the process is relatively informal and closed. The most potentially open processes of regulation-making are to be found under the Hazardous Products Acts and the Environmental Contaminants Act. Both statutes provide for public boards of review if objections are received to proposed regulations. Their reports are published unless a board requests non-disclosure. The provision to create a board of review has only been used twice under the Hazardous Products Act.¹³ Some openness is beginning to occur more frequently in the pre-regulation-making stages through the release of study reports. For example, the Department of the Environment made public its report on PCB contamination as did the Department of National Health and Welfare its report on asbestosis.

3. Provincial Government Organizations

The jurisdictional issues at the provincial level are somewhat similar to those described at the federal level at least in so far as the behavioural characteristics of public bureaucracies are concerned. The issues differ, however, in several important respects and these differences deserve considerable emphasis.

First, the scale of government at the provincial level (with the exception of the largest provinces) is smaller and thus the communicating distance between departments and central agencies and among the several departments is relatively easier, although by no means perfect. This generally smaller scale is also accompanied by vast disparities in the level and supply of expertise in the occupational and environmental health field in different provinces. For some departments the problem is what standards to set, while for others the problem begins literally with the publications and journals to which they ought to subscribe in order to discover what problems are involved.

The provincial level of government also reveals a wide spectrum of governing political parties. The presence of NDP governments in Manitoba, Saskatchewan and, until recently, British Columbia has resulted in the introduction of alternative approaches which reflect the relatively strong political influence of organized labour, an influence generally much stronger than that exercised by

TABLE 2 - EMPLOYMENT SAFETY AND HEALTH IN CANADA - PRINCIPAL AREAS OF RESPONSIBILITY OF REGULATORY AUTHORITIES

	Canada	Nfld.	P.E.I.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	Alta.	B.C.	Yukon	N.W.T.
1 MECHANICAL													
Boilers & Pressure Vessels	LAB	M & IR	LAB	LAB	LAB	L & M	CCR	LAB	LAB	M & L	PW	Commissioner	Commissioner
Elevating Devices	LAB	M & IR	CS	LAB	LAB	L & M	CCR	LAB	LAB	M & L	PW	"	
Electrical Installations	LAB	WCB AG	CS	LAB	LAB	L & M	CCR	MH	LAB	M & L	PW	"	
Gas & Oil Installations	LAB	MAR	-	LAB	LAB	L & M	CCR	LAB	LAB	M & L	PW	"	
11 GENERAL SAFETY													
Industrial & Commercial	LAB	WCB	WCB	LAB	LAB	L & M	MOL	WCB	LAB	WCB	LAB WCB	"	
Construction	-	WCB	WCB	LAB	LAB	L & M	MOL	WCB	LAB	WCB	WCB	"	
Mining	LAB	MAR	-	M	NR	NR	NR	MR & EM	LAB	M & M	M & PR	"	
111 SPECIAL CATEGORIES													
Industrial Hygiene	LAB	WCB	WCB	PH	LAB H	MA	MOL PH	H	LAB	H	WCB	"	"
Sanitation	LAB	WCB	WCB	PH	LAB H	MA	MOL PH	H	LAB	M & L	LAB	"	"
Explosives	EMR LAB	WCB	WCB	LAB	LAB	L & M	MOL MR & EM WCB	LAB	LAB	WCB	WCB	"	"
Radiation	AECB NHW	-	WCB	PH	LAB H	MA	PH	H	LAB	H	HS	"	"
Fire Prevention	LAB PW	AG	CS	LAB	LAB	L & M	SG	LAB	LAB	M & L	AG	"	
1V EDUCATION & TRAINING	LAB	WCB	WCB	WCB	ISC	WCB IAPA	WCB IAPA	WCB	WCB	WCB	WCB	"	

Codes

AECB	Atomic Energy Control Board	MH	Manitoba Hydro
AG	Attorney General	M & IR	Manpower and Industrial Relations
CCR	Consumer and Commercial Relations	M & L	Manpower and Labour
CS	Community Services	M & M	Mines and Minerals
EMR	Energy, Mines & Resources	MOL	Ministry of Labour
H	Health	M & PR	Mines and Petroleum Resources
HS	Health Services	M & EM	Mines, Resources and Environmental Management
IAPA	Industrial Accident Prevention Association	NHW	National Health and Welfare
ISC	Industrial Safety Council	NR	Natural Resources
LAB	Labour	PH	Public Health
L & M	Labour and Manpower	PW	Public Works
M	Mines	SG	Solicitor General
MA	Municipal Affairs	WCB	Workmen's Compensation Board
MAR	Mines, Agriculture & Resources		

Source: Air Pollution Control Branch, Ottawa, April 1973.

provinces governed by the Liberal or Progressive Conservative parties.¹⁴ This degree of influence is in turn related to the nature and degree of industrialization in each province. In the more industrialized provinces labour's influence seems to be weaker in a direct political sense unless it is accompanied, as it is currently in Ontario, by the existence of minority government and thus greater third party political leverage. The fairly aggressive role taken by the B.C. Workers Compensation Board during the Barrett regime in the early 1970's is said by some to have been a factor in the government's subsequent defeat, at least in the view of industry.¹⁵

The widely varying degree and nature of industrialization also means that each province will have different views on their priority hazards. Many hazards affect all jurisdictions; some affect some provinces more than others. The more important the industry (in which a particular hazard is centred) is to the province, the higher the political and economic stakes on the regulations to be set and on the degree of compliance to be tolerated.

a) Employment Safety and Health

Table 2 lists the principal areas of responsibility of federal and provincial regulatory authorities in employment safety and health. Its focus is on the workplace areas of regulation.¹⁶ In general, the table reveals the overall concern for occupational safety and reflects the emergence of the larger health issues. As expected, only radiation is mentioned as a specific hazard and is the only area where federal jurisdiction is paramount. Otherwise, as noted earlier, federal jurisdiction centres on the Labour Department and/or its responsibilities for federal industries. The Table does not reflect the other areas of potential federal presence which might be exercised through research and research financing in the National Research Council, and the Department of National Health and Welfare, or the influences and powers emanating from the federal environmental roles.

This allocation of functions within provincial departments and agencies is varied to say the least, but tends to focus on four departments which bear the names (or reasonable facsimiles thereof) Labour, Mines, Workers Compensation Board, and Health. Provinces can also be roughly placed along a continuum according to the department on which they tend to focus their regulatory authority and compliance. Saskatchewan has the most functionally integrated approach. British Columbia has tended to focus more of its approach on its Worker's Compensation Board, but is not as integrated as Saskatchewan. Alberta and Manitoba have recently taken steps to

consolidate their regulatory processes in Labour departments while most other provinces (at time of writing) tend to have much more of a dispersed allocation of functions among the major types of departments.¹⁷

The above portrait means very little until it is related to such factors as the different degrees and forms of industrialization in each province and thus of the varying political strength of industry and labour, and the size and nature of the expertise and the inspectorates in each department (for some smaller governments only one or two experts may be available to it).

It warrants mention that in most areas (other than Workers Compensation Boards) the regulatory authorities are regular departments of government rather than so-called independent regulatory commissions. This difference between a board and a regular department is frequently illusory. In other circumstances, however, the difference can matter, particularly since, when compared with regular departments (which are under the more direct thumb of their minister), a board may feel itself to be freer from political influence both in regulation-making and in compliance processes.

The illusiveness of organizational form is perhaps best illustrated by Workers Compensation Boards (hereafter referred to as WCB's). WCB's were initially created to compensate the victims of industrial accidents and to encourage better safety practices through processes that were less burdened by either the procedural complexity and costs of the regular courts, or by the perceived prejudicial (or at least unsympathetic) attitude of judges towards workers. Typically, the WCB's contain representation from labour and industry and the compensation is based on direct industrial levies. The levies on industry change according to a particular industry or firm's safety record. The WCB's were also intended in, part at least, to take some of the burden of proof for compensative claims away from workers, both as a matter of operating philosophy and through the investigative role of the WCB's staff.

WCB's have developed generally effective procedures for their traditional areas of concern, namely industrial safety. With respect to industrial health and toxic substances, however, the boards have demonstrated severe growing pains. First, WCB's have suffered from the normal hardening of the organizational arteries which seems to afflict all mature organizations that have developed some success in their traditional operating areas. Second, the WCB's have been among the first agencies to have to deal with specific cases and which, because of our past social failure at preventing occupational diseases, brings them to the centre of the debate about the nature and adequacy of causal knowledge (to which we referred in Chapter I).

On the one hand, WCB's feel that they cannot give compensation merely because a few claimants think (or even their doctors think) their illness was caused by a toxic substance in the workplace. On the other hand, the tradition of WCB's is supposed to be to give the benefit of the doubt to the worker and to lessen the burden of proof.

WCB's are thus properly under enormous pressures. The British Columbia board has recently been under pressure from industry for being too generous to labour, and the Ontario board has been the object of persistent and rigorous criticism by the NDP Opposition Leader, Stephen Lewis, for being insensitive to labour claimants. It is clear that health hazards created by toxic substances greatly increase the regulatory stakes. For industry the issue is no longer just fixing a guardrail but involves potentially new, often expensive, production technologies. This in turn should be related to corporate safety and health records and the industrial levies from which WCB's derive their revenue. In short, the politics, economics, and organization of the regulatory process are again inextricably linked.

In recent months all provincial governments have been reviewing their respective practices, policies and organization in the occupational health and safety fields, and thus the portrait supplied by Appendix B (not to mention Appendices C and D) will be quickly out of date. Most indicators lead to the conclusion that provincial governments will tend to move toward a more integrated organizational allocation of functions, to be at least slightly better able to treat the workplace as a workplace rather than as a series of partial mandates possessed by several departments. Changes of form are therefore likely to occur. Whether this will be accompanied by change in substance is governed by a number of other factors which make up what the Ontario Royal Commission on the Health and Safety of Workers in Mines (Ham Commission) has accurately called the "responsibility system". In Ontario, the Ham Commission observed:

"The responsibility system seems to have been lacking in two significant ways. First, divided jurisdictions have made it unclear where the initiative necessary to deal with problems is to be taken. Second, the worker as an individual and workers collectively in labour unions or otherwise have been denied effective participation in tackling these problems; thus the essential principles of openness and natural justice have not received adequate expression. Participation may be understood in terms of the following three major elements: 1) knowledge - having ready access to information about actual and expected conditions at the workplace, and about the state of the health of the workers; 2) contributive responsibility -

to provide individual and collective insight on problems on the basis of knowledge and work experience; and 3) direct responsibility - to make operative decisions that influence conditions at work.¹⁸

The interim report of the Beaudry Commission on Asbestos expressed a similar view, albeit in stronger language, about the regulatory processes effecting the Quebec asbestos industry.¹⁹

Tables 3 and 4, in one sense, both narrow and broaden our portrait.²⁰ They narrow the portrait in that they are confined to a more detailed look at provincial agencies (Table 3) and provincial legislation (Table 4)*. They broaden it, however, in the sense that they incorporate more of the environmental departments and legislation, at the provincial level.

b) Environmental Hazards

As is the case at the federal level, provincial organization and machinery for the regulation of environmental hazards has been of more recent vintage. Environment departments have been created either as separate departments or in combination with other policy mandates such as resource policy. There are, however, wide disparities from province to province in the degree of resources committed to and of expertise possessed by these newly formed environment agencies.

In terms of public regulatory processes, perhaps the most interesting example of provincial legislation in the environmental field is the Ontario Environmental Assessment Act and the Environmental Assessment Board. The latter will be a 14-member board which will replace the earlier Environmental Hearing Board (EHB), a seven-member board which has been in operation since 1972. The EHB had the power to hold hearings on environmental matters such as the Toronto Lead Case (see Chapter V) and to make recommendations to the Minister of the Environment. The new Environmental Assessment Board will have more direct powers to judge projects, with their decisions being subject to a possible veto by the Ontario Cabinet. The Cabinet will also retain some discretion on whether a project is to be subject to an EAB hearing. Board decisions will be based on environmental impact reports and statements which the proponent of a facility or project must provide to the board's satisfaction.

*For a more complete list of legislation at the provincial level see Appendix A.

TABLE 3 - PROVINCIAL AGENCIES ADMINISTERING LEGISLATION RELATED TO OCCUPATIONAL HEALTH & SAFETY

Type of Agency	NFLD.	N.B.	P.E.I.	N.S.	QUE.	ONT.	MAN.	SASK.	ALTA.	B.C.
Health	Health	Health & Social Services	Health	Public Health	Affaires Sociales	Health	Health & Social Development			Health Services & Hospital Insurance
Labour	Manpower & Industrial Relations	Labour & Manpower	Labour	Labour	Travail et Main-D'œuvre	Labour	Labour	Labour	Labour	Labour
Mines & Energy	Mines & Energy	Natural Resources		Mines	Resources Naturelles	-Energy -Natural Resources	Mines Resources & Environ. Mgt.		Energy Res. Conservation Board	Mines & Petroleum Resources
Environment	Provincial Affairs & Environ.			Environ.	Service de Environ. la Prot. de l'Env.				Environ.	
WCB	WCB	WCB	WCB	WCB	CAT	WCB	WCB	WCB	WCB	WCB
Transport	Transp. & Commun.		Highways		Transp. Commun.	Transp. Commun.	Highways	Highways & Transp.	Highways & Transp.	Transp. & Commun.
Agriculture	Forestry & Agri.	Agri. & Rural Dev.	Agri. & Forestry				Agri-culture	Agri-culture		
Attorney-General	Attorney-General				Justice	Solicitor-General				Attorney-General
Municipal Affairs	Mun. Affairs & Housing		Mun. Affairs		Affaires Municipales					Mun. Affairs
Other	Prov. Fire Comm.	Prov. Secretary	Public Utilities Comm.	Public Works Prov. Sec.	Office de la Construction du Québec ^a	Consumer & Commercial Relations	Public Utilities		Public Utilities	Public Works

^a para-government agency.

Source: D.M. Chisholm, Preliminary Summary of Items and Concerns Regarding Occupational Health in Canada, Health and Welfare Canada, 1976.

TABLE 4 - MAJOR BASIC LEGISLATION FOR THE PREVENTION OF INJURY AND ILLNESS AT WORK

Province	Nature of Administering Agency				
	Labour	Workmen's Compensation	Health	Mines	Environment
Newfoundland		Workmen's Compensation Act & Regulations		The Regulation of Mines Act & Regulations	
New Brunswick	Industrial Safety Act & Regulations			Mining Act Regulations	
Nova Scotia	1. Industrial Safety Act & Regulations 2. Construction Safety Act & Regulations	Workmen's Compensation Act & Regulations		1. Coal Mines Regulations Act 2. Metalliferous Mines & Quarries Regulation Act	
Prince Edward Island		Workmen's Compensation Act & Regulations			
Quebec	Loi des Établissements Industriels et Commerciaux et Règlements		Loi des Établissements Industriels et Commerciaux et Règlements ^a	Loi des Mines et Règlements	Loi de la Qualité de l'Environnement et Règlements
Ontario	1. Industrial Safety Act & Regulations 2. Construction Safety Act & Regulations			Mining Act (Part IX)	
Manitoba		Employment Safety Act & Regulations	Public Health Act & Reg.s	Mines Act & Regulations	
Saskatchewan	1. Occupational Health Act & Regulations 2. Mines Regulations Act & Regulations				
Alberta	Occupational Health & Safety Act & Regs.			1. Quarries Regulations Acts & Regs. 2. Coal Mines Safety Act ^b	
British Columbia	Factories Act & Regs.	Worker's Compensation Act & Regulations		1. Coal Mines Regulation Act 2. Mines Regulation Act	

Notes: ^a jointly administered - safety by Labour and hygiene by Health

^b inspections by Mines and standard setting by Labour - soon to be transferred entirely to Labour

Source: D.M. Chisholm, Preliminary Summary of Items and Concerns Regarding Occupational Health in Canada, Health and Welfare Canada, 1976.

While the Toronto Lead Case and other areas of the regulation of toxic substances clearly illustrate the need for this kind of permanent public hearing apparatus, the adequacy of these processes will be subject to widely varying interpretations of their past, or probable future, success. The Toronto Lead Case, for example, showed the need to bring the issue to the then EHB at a much earlier stage than it was, a decision of timing left to the discretion of the cabinet. Both industry and environmental groups were critical of the process. The EHB has also been subject to criticism about other projects and about the degree to which technical as opposed to other political and environmental factors seemed to dominate the EHB's hearing process.²¹

c) Inter-Agency Co-ordination

Although there appears to be some movement in certain provinces toward an integration of functions on the occupational health or workplace side, there is little similar integration between the workplace and the environmental side. Most provincial environment departments are relatively new and they have been preoccupied with determining the limits of their power vis-à-vis other departments. Regardless of the degree of functional integration that might occur within the federal and provincial governments there will inevitably be a need to examine and improve the mechanisms of interdepartmental co-ordination and consultation.

Thus future regulatory effectiveness will be partly (but not totally) a function of effective co-ordination and political will as well as of improved information and research. Among the criteria which will help identify the practical administrative gaps are the following:

- (a) the comprehensiveness of the statute (occupational health and/or environmental contaminants acts);
- (b) the degree to which legislated inder-departmental mechanisms (e.g. inter-departmental committees) are provided;
- (c) the degree of overlap in standards between departments affecting the same area or hazard;
- (d) the degree to which multiple inspections are carried out as opposed to a single inspection force.

Provincial experience also indicates some of the behavioural difficulties within an integrated department when a wide variety of technical and professional personnel are put in the same shop. There

are differences among boiler inspectors, hygienists, engineers and doctors, both in terms of how they perceive themselves and how they accord relative status to others. If more integration is to occur at this important level then very careful attention has to be paid to strategies for developing a co-operative climate among these diverse groups.²²

The above tables are only a beginning. They tell us little about the degree to which the unions in each province trust or distrust the Mines department, or the degree to which industry trusts or distrusts the Labour department. They tell us little about how the regulation-making process occurs. Most regulation-making is subject to formal requirements for notice or publication in the various provincial gazettes prior to their enactment. Many departments have informal processes for consulting their clientele interest groups, but not necessarily other departments' clientele. Thus the regulation-making process is generally kept undisclosed. It is not totally closed but it is not very open either.

It is impossible in the context of this study to discuss in any detail all of the jurisdictional intricacies in each province, but it is instructive to present briefly two other forms of information about the provincial levels. The first will be a portrait of the agency powers, workers' rights, and types of exposure standards for airborne contaminants in each province, and the second will be a brief presentation of the Saskatchewan and Ontario models of organization which reflect two quite different approaches to the jurisdictional issue.

d) The Range of Regulatory Powers

Table 5 presents a portrait of the specific agency powers for health and safety enforcement.²³ These include the power to approve new operations, order special medical examinations, obtain access to worker medical reports, give police assistance to inspectors, and stop work. This is not an exhaustive list of powers but does include several important ones. They tend to be focused on the more moderate range of regulatory devices with the power to approve new operations (a pre-testing of new plants and workplaces similar to the pre-testing of specific chemicals) and the power to stop work being less frequently present.

The availability of powers is one thing; the extent to which they are used is quite another. Obviously, regulatory authorities cannot utilize their biggest regulatory clubs every day. The range of instruments they possess, however, is related to their ability to use any specific powers. Regulatory processes, the existence of

TABLE 5 - SPECIFIC AGENCY POWERS FOR HEALTH AND SAFETY ENFORCEMENT

PROVINCE Legislation	MAY REQUIRE APPROVAL FOR NEW OPERATIONS	ORDER SPECIAL MEDICAL EXAMS	ACCESS TO WORKER MEDICAL REPORTS	POLICE ASSISTANCE TO INSPECTOR	STOP WORK
NEWFOUNDLAND					
Workmen's Compensation Act				-	
Regulation of Mines Act		-		-	
P.E.I.					
Workmen's Compensation Act	-			-	
NOVA SCOTIA					
Industrial Safety Act	-	-	-	-	
Construction Safety Act	-	-	-	-	
Workmen's Compensation Act	-	-	-	-	-
Coal Mines Regulations Act	-	-	-	-	-
Metal Mines & Quarries Reg.Act	-	-	-	-	
NEW BRUNSWICK					
Industrial Safety Act			-	-	
Mining Act		-	-	-	
QUEBEC					
Loi des Etab. Ind. et Comm.			-		
Loi de la Qualite de l'Env.	a	-	-	-	-
Loi des Mines					
ONTARIO					
Industrial Safety Act			-	-	
Construction Act		toxic exposure only	-	-	
Mining Act		toxic workers only	-	-	
MANITOBA					
Employment Safety Act		-	-	-	
Public Health Act		b	-	-	-
Mines Act			-	-	
SASKATCHEWAN					
Occupational Health Act (proposed revisions to above)	-	-	-	c	
Mines Regulations Act					
ALBERTA					
Occupational Health & Safety Act					if danger
Coal Mines Safety Act					
BRITISH COLUMBIA					
Factories Act		-			
Worker's Compensation Act	-	-	-	-	
Coal Mines Regulation Act	-	-			
Mines Regulation Act	-	-			

Notes: a existing operations will require approval and a permit by January 1978
b communicable diseases only
c minister may order on recommendation of the chief occupational medical officer

Source: D.M. Chisholm, Preliminary Summary of Items and Concerns Regarding Occupational Health in Canada, Health and Welfare Canada, 1976.

TABLE 6 - WORKERS RIGHTS SPECIFICALLY PROVIDED

PROVINCE Legislation	NO REPRISAL		CONDUCT INSP.	INFORMATION		
	REFUSE DANG. WORK	COMPLY WITH ACT.		DANGEROUS SUBSTANCE	ACC. REPS.	INSP. REPORT VIOL.
NEWFOUNDLAND						
Workmen's Compensation Act	-	-	-		-	-
Regulation of Mines Act	-	-			-	-
P.E.I.						
Workmen's Compensation Act	-	-	-	-	-	-
NOVA SCOTIA						
Industrial Safety Act	-	-	-	-	-	-
Construction Safety Act	-	-	-	-	-	-
Workmen's Compensation Act	-	-	-	-	-	-
Coal Mines Regulations Act	-	-			-	-
Metal Mines & Quarries Reg. Act	-	-			-	-
NEW BRUNSWICK						
Industrial Safety Act	-	-	-	-	-	-
Mining Act	-	-	-	-		-
QUEBEC						
Loi des Etab. Ind. et Comm.	-	-	-	-	-	-
Loi de la Qualité de l'Env.						
Loi des Mines	-	-	-		-	-
ONTARIO						
Industrial Safety Act			-	lead	-	-
Construction Safety Act	-		-	benzol	-	-
Mining Act	-	-	-	asbestos	-	-
MANITOBA						
Employment Safety Act	-	-	-	-	-	-
Public Health Act	-	-	-	Pb, benz.	-	-
Mines Act			-			
SASKATCHEWAN						
Occupational Health Act (proposed revisions to above)			-		-	-
Mines Regulations Act						
ALBERTA						
Occupational Health & Safety Act			-		-	-
Coal Mines Safety Act						
BRITISH COLUMBIA						
Factories Act	-	-	-	-	-	-
Worker's Compensation Act	-	-				
Coal Mines Regulation Act		-	20 employees	-	-	
Mines Regulation Act	-	-	20 employees	-	-	-

Source: D.M. Chisholm, Preliminary Summary of Items and Concerns Regarding Occupational Health in Canada, Health and Welfare Canada, 1976.

TABLE 7 - EXPOSURE STANDARDS FOR AIRBORNE CONTAMINANTS

PROVINCE Legislation	GENERAL		SPECIFIC	
	"NOT HARMFUL"	ACGIH GUIDELINES	ACGIH	OTHER
NEWFOUNDLAND				
Workmen's Compensation Act		-		
Regulation of Mines Act	-			radon
P.E.I.				
Workmen's Compensation Act	-			
NOVA SCOTIA				
Industrial Safety Act	-			
Construction Safety Act	-			
Workmen's Compensation Act	-	-	-	-
Coal Mines Regulations Act	-			
Metal Mines & Quarries Reg. Act.	-			
NEW BRUNSWICK				
Industrial Safety Act	-			
Mining Act	-		(proposed)	
QUEBEC				
Loi des Etab. Ind. et Comm.			-	ACGIH modified
Loi de la Qualite de l'Env.				
ONTARIO				
Industrial Safety Act		-		
Construction Safety Act		-		
Mining Act			-	
MANITOBA				
Employment Safety Act	-			
Public Health Act	-			
Mines Act			-	
SASKATCHEWAN				
Occupational Health Act		-	-	
Mines Regulations Act				
ALBERTA				
Occupational Health & Safety Act		-		
Coal Mines Safety Act				
BRITISH COLUMBIA				
Factories Act			-	
Worker's Compensation Act				ACGIH modified
Coal Mines Regulation Act		-		
Mines Regulation Act		-		

Source: D.M. Chisholm, Preliminary Items and Concerns Regarding Occupational Health in Canada, Health and Welfare Canada, 1976.

standards to the contrary notwithstanding, always involve bargaining processes. The more a party (regulatory authority, industry, union) has to bargain with, the more influence it is likely to have in the process. It is the range of powers that helps determine what powers can be utilized and what can be traded away in specific circumstances.

In the regulation of the workplace the same applies to worker rights. Table 6 lists the workers' rights provided by current provincial legislation.²⁴ These include rights to refuse dangerous work without employer reprisal, rights to various forms of information on dangerous substances, accident reports, and inspectors' reports. They also include rights to conduct inspections. On paper the litany of rights seems impressive. In practice the individual worker has little leverage. The leverage he or she can acquire is dependent on knowledge about rights in the workplace, whether he or she works in a unionized plant, the knowledge and vigilance of the workers' union, both at the plant level and at the provincial level, the attitudes of inspectors, the frequency with which inspectors actually visit plant sites, and the degree to which workers actually participate in the regulation-making and compliance processes which affect their work lives.

e) The Derivation of Standards

Table 7 presents the types and sources of exposure standards for airborne contaminants.²⁵ It includes the extent to which general "not harmful" standards and ACGIH guidelines are used, as well as more specific mention of standards. In general the strongest tendency has been to rely on ACGIH guidelines particularly in the toxic substances field (as opposed to traditional safety issues), perhaps modified by local experience. There is almost a universal reluctance by provincial regulatory authorities to cast these guidelines in the form of legislated regulations.

The reluctance stems from a number of factors including a scientific caution about the adequacy of the standards, a belief that if the standards are legislated they will prevent progress to even better standards and will be time-consuming to change, an unwillingness to enforce tough standards because of their unpopularity in industry or among their political supervisors, and an awareness in some provinces that they simply do not have the resources to handle the problem.

Provincial (and federal) regulation-making and standard-setting (the latter usually not incorporated as statutory regulations but rather as guidelines) tend to rely heavily on such prestigious

bodies as the International Commission on Radiological Protection and the American Conference of Governmental Industrial Hygienists. Much of this reliance is essential since it would be pointless to ignore research and experience from other countries and other experts. The degree to which reliance is placed on such bodies, however, is important. It is a long way from the rarefied level of such bodies and from scientific and medical journals to the understanding of the meaning and the implementation of the standards in the workplace or in the communities in each province.

There are clearly two realms of experience in the standard-setting process. One is the realm of scientific exchange and communication. The other is the realm of workplace experience, particularly by workers and unions where the sequence of operation may first be WCB's, and then gradually union meetings and perhaps periodic wildcat strikes. In some provinces, this practical trans-scientific experience is reinforced and politically communicated by the role of opposition political parties, especially the NDP whose links to labour are close.

f) The Saskatchewan and Ontario Models

Some of the foregoing concerns and factors are illustrated by the Ontario and Saskatchewan models of regulatory organization for occupational health. They illustrate the different approaches in two provinces whose political economies are different. Ontario* has utilized a highly dispersed organizational model with regulatory authority split among the Ministry of Health, the Ministry of Natural Resources, the Department of Labour, and the Workers Compensation Board.²⁶ Saskatchewan in 1972 integrated most of the occupational health regulations under the Minister of Labour.²⁷ The Saskatchewan legislation also required the creation in all plants with 10 employees or more of compulsory labour-management health and safety committees, and gave to workers the explicit right to refuse to work without employer reprisal if the worker felt his or her health was endangered. The resolution of such health grievances and other issues was placed in the committee with the Labour department's regulatory and compliance role being to support and serve these committees through an integrated compliance and field staff. The Saskatchewan model was largely adopted in 1976 by the Manitoba government, and Alberta has also adopted an integrated approach although with a non-compulsory committee process.

* Late in 1976 Ontario moved to a more integrated organizational model.

In both Saskatchewan and Ontario, until the 1970's, the regulatory response had reflected the evolutionary ad hoc response to various health and safety issues each of which added to the several mandates of the labour, mines, health, and workers compensation board jurisdictions. Both provinces have been increasingly concerned with the inadequacy of past responses, but have selected different approaches reflecting the political realities and pressures as perceived by their respective governing parties.

Organizationally the Ontario government response has been typified by the "memorandum of agreement" (reproduced as Appendix B) between the Department of Labour and the Department of Health. It reflects a painstaking series of steps to be taken to determine the role of each department. It is almost like an international treaty. Although agreements between large government departments are not in themselves objectionable, the agreement does reflect the extent to which a jurisdictional minefield is created. Problems of co-ordination are not eliminated by the Saskatchewan model because many issues of co-ordination are merely transplanted to the new intra-departmental arena, and relations with other departments are still necessary. It is nonetheless true that putting old wine into new organizational bottles can have an important effect beyond superficial packaging. Officials can begin to see their mandate in different ways. A mines inspector in a labour department may see his role differently from when he was located in a mines department. The changes in perception and behaviour are not automatic but they can matter a great deal.

Canadian provinces frequently do learn from each other. The relationships among the Saskatchewan, Manitoba and Alberta legislation illustrate this. The Ontario approach in occupational health, as the report of the Ham Commission on the Safety of Workers in Mines amply illustrates, shows that organizationally there are better ways of mounting a concerted attack on the sickness of the workplace.

More integrated ministries, formal memoranda of agreement, inter-departmental committees, more decentralized plant level committees, and more equalized regulatory rights are all part of the possible areas of reform, but it is clear that inter-governmental (especially federal-provincial) mechanisms will have to be developed in more formal terms. At present the most concerted federal-provincial forum is to be found under the Conference of Deputy Ministers of Health whose sub-committee on environmental health contains federal-provincial working groups (middle level officials) on Occupational Health and on Radiation Surveillance. Even these mechanisms however, are viewed with some suspicion by the Labour and other federal and provincial departments not directly involved

(especially at the senior level). Obviously a great deal of day-to-day federal-provincial contact occurs primarily because of the interdependent compliance needs, but the lack of a federal-provincial focus mirrors the lack of focus within most provincial governments and within the federal government.

4. Industry

The specific roles of industry in the regulatory processes of each case study will be examined later, but it is important to summarize several of the issues that influence the industrial perspectives. These issues include the profit motive, the role of sunk capital costs, questions of inter-firm technology transfer, the roles of industrial associations, the number and relative size of firms in particular industries, the degree of foreign ownership, and the influence of the company town.

The private corporation (and many Crown Corporations, too) exist first and foremost to earn a reasonable return on investment for their shareholders. Occupational health (and other) costs, unless they can be passed on to consumers, are ultimately an expense which reduces profit, at least in the short run. This is not to suggest that occupational health is not considered in more social and human terms by corporate decision-makers or by other corporate professionals involved in day-to-day industrial safety. In occupational health terms, however, as in market economics, the margin or the incremental value of additional dollars spent is important. And, at the margin of occupational health, where degrees of change are important, the private firm has a built-in bias to err on the side of less costly changes. Thus, all protestations and assertions to the contrary, occupational and environmental health is a bargainable economic item.

In many areas of government regulation, e.g. tariffs, prices, industry, despite its general laissez-faire ideology, industry has actively sought state intervention in its own interests. However, the history of occupational health shows that in this area industry has not sought further state intervention. Most changes have resulted from outside pressures. At this fundamental level of institutions, therefore, it is naïve to speak of constructing a regulatory apparatus that is somehow not adversative or at least based on a different and conflicting ranking of priorities. To the question of "who pays?" and "who benefits?", industry, labour, and government will have different answers.

Part of a corporation's response to the suggestion of building better and safer production processes is influenced by the question

of sunk capital costs. A corporation is reluctant to invest new capital when it will only yield new costs rather than new efficiencies. Thus the standard response in matters concerning new safety technology is either to say it cannot be done (usually accompanied by scientific evidence to show that the new technology does not exist to attain suggested new standards) or that it cannot be done for several years or months. In some instances a time lag is clearly necessary. In others, time is merely another way of expressing the higher priority to be accorded capital as opposed to labour (or other bearers of the costs of inferior safety production technologies).

The industrial response cannot be understood merely by understanding these institutional market forces. The fact is that the industrial response in particular regulatory processes will vary according to the number and size of firms in the industry. Is the regulator dealing with one or two large firms and several smaller ones, or is it an industry characterized by several moderately sized firms? Chapter I has already pointed out that obstacles exist in the free transfer of production technology from one firm to another, both within the industry and from the multi-national parent firm to its branch plant. Although almost all industrial spokesmen argue that the industry should use the "best technology" in the industry, the fact remains that there are severe constraints to the transfer of this technology from firm to firm because safety technology is frequently tied to trade secrets and to the particular degree of the sunk capital situation that each firm faces.

These economic and production tradeoffs are a part of the reason why industrial associations, while useful for some forms of regulatory consultation, have severe limitations as vehicles of political communication in the regulatory field. They are usually only loose federations or even confederations which, although supported financially by their constituent corporations, are frequently viewed with suspicion. The extent to which these associations influence the regulatory process is therefore more general and symbolic. The widely varying economic realities within industries ensure that the critical day-to-day political exchanges occur on an individual firm versus regulator or individual firm versus union basis.

It is important to stress the remarkable extent to which the occupational hazards issue is tied to the company town. Thetford, Sudbury, Thompson, are synonymous with the concept of resource-based, largely foreign-owned company towns where one industry is the economic life blood of the area. This imposes further realities on the political economy of regulation in particular locations. The remoteness of many of these resource-based communities from provin-

cial and federal capitals, and thus from regulators, makes them easier to ignore.

Most existing legislation still places most of the formal responsibility for occupational health and safety on the management of the firm. The economic theory of the firm confers this historical mandate. There is considerable evidence to suggest that the responsibility should be more equally shared by government, management and labour, both as a matter of law and practice.

5. Labour

The word "bureaucracy" is usually reserved for government agencies, but corporations and union offices are also bureaucracies in their own way. Of the three however, labour in Canada is one sector about which it is most difficult to generalize because it has the least bureaucratic form of organization. This is not to suggest that labour has no common interest for it clearly has, but the aggregate characteristics of the Canadian labour movement strongly suggest the need to focus on its decentralized character.²⁸ A number of factors illustrate and contribute to that decentralizaion. These include the fact that:

- (a) Union membership accounts for only about one-third of all non-agricultural paid workers or only about one-quarter of the labour force;
- (b) About two thirds of Canadian unions are affiliated with international unions, and one third are national;
- (c) The major centres of union power at the macro levels are the Canadian Labour Congress (CLC) the Quebec Confédération des Syndicates Nationaux (CSN) and the FTO, all of which are loose confederations of strong local and constituent unions;
- (d) The union movement has generally not seen itself in open class terms but has practised a modified version of business unionism which has not fundamentally challenged the basis of capitalism or the market economy in Canada. This more conservative unionism has been practised despite, or perhaps because of, its formal association, through the CLC, with the New Democratic Party. This is not to suggest that labour has not pressed for and been responsible for, much of the historical change in the conditions of work. But the non-class or at least muted class ideology has contributed to the decentralized mode of operation and organization.

Each of the above characteristics tells us something about the roles which labour plays in the hazardous products regulatory process. First, organized labour has historically been the major element in exerting political pressure on federal and provincial political systems to adopt stronger legislation and compliance practices in the field of occupational safety and health, with the emphasis on safety. Only in the last few years, however, has organized labour elevated the question of toxic substances and their regulation in the workplace to a high priority level. The pressure has come from the bottom up, however, and only in 1976 resulted in a major resolution of the Canadian Labour Congress.²⁹ Several unions still feel, however, that the CLC's commitment to the issue is still more symbolic than real since it has devoted very limited resources in terms of research and staff to the field of occupational health. The CSN has also raised the issue strongly but some of its members criticize it for having settled for a study, the Beaudry commission on asbestos, rather than securing more effective results (see Chapter VI).

The occupational health issue is emerging as a priority, however, precisely at the time an even broader concern about the rights of labour and its role in the policy process has reached its zenith. The federal government's income controls program and labour's opposition to it may or may not aid the climate in which occupational health issues are considered. In the short-run, occupational health may simply succumb to an even greater concern for the restoration of traditional free collective bargaining. In the long-run, however, because the current debate about the "post-controls" period includes apparently serious discussions about the establishment of new tripartite (government, business and labour) forums of decision-making, it may well assist in the future resolution of occupational health problems. The growing influence of public service unions such as the Canadian Union of Public Employees (CUPE), and within the CSN may also greatly assist in future reform since they have been generally more interested in general issues of industrial democracy rather than the more traditional concerns of industrial relations.

The relatively fragile position of labour is worth stressing, however. Most workers in Canada, including many in small marginal, less safety conscious firms, are unorganized. Within organized labour the major lead has been taken by only a handful of large unions. Only the United Steel Workers of America, the Oil Chemical and Atomic Workers, the United Auto Workers and, more recently, the United Rubber Workers, have attempted to build up their own expertise and have exerted pressure within the labour movement. These unions have profited considerably from their international base because in the United States the same unions have taken the lead. Even within

these unions, however, the problems of internal communication are great. The national offices of these unions are also a federation of locals and thus cannot intervene in a heavy-handed way. Central union offices are dependent on locals to determine the actual conditions in the plant. Ignorance of problems at the plant level concerning specific hazards is enormous. There is a high degree of mobility among workers and a high percentage of immigrant workers which also adds greatly to the problems of communicating the problems within unions. There is, moreover, very little exchange between unions in English Canada and unions in Quebec, despite the fact that in several key industries they face the same regulatory problems and the same deplorable conditions of work.

Some of the more powerful unions have begun to incorporate occupational health clauses into collective agreements, including the provision of research programs. However, the use of the collective agreement has serious philosophical and practical drawbacks. First, unions are reluctant to treat health and safety as a bargainable issue, despite the fact that it effectively has been. Second, even where agreements concerning safety and health equipment or processes are agreed to, unions have little leverage to ensure compliance since such agreements usually involve longer term deadlines or phasing-in of production technology.

The Beaudry Commission in Quebec, the Gale Commission in Alberta and the Ham Commission in Ontario, and a number of other arenas of expression, have all demonstrated certain common traits which are emerging from organized labour on the issues of occupational and environmental health. Labour is suspicious of mines departments because it views industry to be the natural constituency of these departments. It tends to view health departments as being too research oriented and professionally aloof. It clearly sees the need for a consolidation of regulatory and compliance power under labour departments. It would prefer to see the research function brought more into public view, with perhaps more of it conducted by universities. It would like to see greater union roles in the plant, but is divided about the need for compulsory committees.

Above all labour is pressing for legislated standards instead of administrative guidelines. Unions would probably favour the argument that guidelines might be more useful in encouraging performance below, or better than, the guidelines, but they would support such an argument only if they trusted the enforcement capability, and the inspectors concerned. Otherwise, and certainly in the foreseeable future, they would place far greater stock in legislated, legally enforceable, standards. The labour movement also increasingly sees workplace standards as being intricately related to environmental standards but the latter is still seen as a secondary

concern, particularly because many unions still see the environment or jobs as alternative issues, and because the degree of union leverage on environmental issues is less.

6. The Scientific and Medical Community

It is difficult to describe or analyze precisely the regulatory roles of the scientific and medical community because it tends to be even more amorphous than labour or industry. The scientific community in particular has only a rudimentary capacity to express itself collectively.³⁰ The medical community, although politically well organized as a self-regulating profession through the Canadian Medical Association and its provincial counterparts, has not been significantly mobilized with respect to the problems of occupational and environmental health.

The scientific community's regulatory role comes through the activity and presence of science administrators and researchers either in regulatory bodies, universities and institutes or as expert witnesses for unions and public interest groups. In Chapter I we pointed out one overriding characteristic of the science advisory and science administration role, namely a strong tendency to be cautious about standards, about dose-effect relationships, about the adequacy of data, and about the existence of causal knowledge in any particular situation. We pointed out the natural built-in suspicions about "cases" and other forms of evidence and the collective penchant to postpone action until more evidence is in. In addition, Chapter I outlined the existence of gaps in knowledge of both a basic and applied kind, including the development of better compliance and monitoring technology.

We have stressed that the call for more research can frequently be nothing more than a cover for inaction; however, one cannot dispute the fact that in many areas of occupational and environmental health, much research is needed. An understanding of the research role in the regulatory process must therefore take account of the broad policies and practices which affect research funding. Of these policies and practices three seem to be especially germane: the so-called "little science" pattern of funding through granting bodies; the relationship among in-house research, the federal "make-or-buy" policy and the regulatory function; and the extent to which such research is freely exchanged with the affected public groups.

The pattern of little science funding through the major granting councils - the National Research Council, the Medical Research Council, and the Canada Council - is basically a passive

bottom-up form of research funding. It exists primarily to support good researchers and, through peer group assessment, to further the frontiers of applied and basic knowledge.³¹ In this major arena of university-based government funding, the emergence of research on issues of occupational health is dependent on individual initiatives by researchers. Discussions have been held in recent years to give a possible or active role to granting bodies to encourage research in areas where gaps exist, but the incentive system of science, in the granting councils domain, has not encouraged this idea. Occupational and environmental health is an area also where the grey areas between medical research (MRC), regular scientific research (NRC), and social science (the Canada Council) may be especially apparent. Individual research proposals on occupational health are funded through this system but the funding is intermittent, and the skills of grantsmanship of a high entrepreneurial order are required. All of the above has been exacerbated by the severe cuts in the rate of growth of recent federal science budgets.³²

Another possible area of funding is the so-called mission oriented R & D, either funded by departments or carried out by them in their own laboratories. The intent of recent federal policy, under the umbrella of the make-or-buy policy, has been to reverse the historic trend and have more and more research carried on outside government, particularly by industry.³³ The policy puts the onus on federal agencies automatically to contract out their research needs unless they can provide specific justification for doing it in-house. Among the possible justifications for doing the research in-house are security, or if the research is in direct support of a regulatory function.

The latter was mysteriously viewed by the drafters of the make-or-buy policy as being a rationale that could be used only in "exceptional" circumstances.³⁴ The occupational and environmental health field illustrates how unexceptional this exception is. Research in support of the regulatory function should not in principle be contracted out to the industry it is intended to regulate. In practice this is a difficult principle to apply in some areas. What it does suggest, however, is that the research must then be done in-house or be contracted out to universities or to other research establishments which are sufficiently, and are perceived to be sufficiently, independent and which openly transmit their findings.

The principles which govern the research role in the regulatory process, particularly where there is scientific controversy, are important. The make-or-buy policy glosses over these issues. The issues present important paradoxes for current federal policy.

First, it is likely that a great deal more rather than less in-house research could be justified. Second, federal policy toward the National Research Council, particularly the function of NRC's laboratories, may have to be redirected to utilize rather than gradually to dismantle NRC. NRC could be utilized as an in-house, open, and independent source of quality research (basic and applied), in concert with individual university researchers, in support of the regulatory function generally, including the regulation of occupational and environmental health. This would take the NRC well beyond its current role in these matters, a role largely confined to the periodic secondment of NRC scientists for other departmental research needs and to the activities of the NRC Associate Committee on Scientific Criteria for Environmental Quality.

The Associate Committee on Scientific Criteria for Environmental Quality was established by the NRC in response to the federal government mandate to develop scientific guidelines for defining the quality of the environment. The concern of the NRC Associate Committee is strictly with scientific criteria. Pollution standards and objectives are the responsibility of the regulatory authorities and are set for the purposes of pollution control. These may be based on scientific criteria as a starting point but they also take into account the optimal socio-economic impact of proposed measures as well as the state of existing technology.

The Associate Committee's program includes the quantitative assessment of risks to receptors from pollutants in the Canadian environment, together with the related fundamental principles and scientific knowledge. Members of the Associate Committee, its Subcommittee and Expert Panels, serve voluntarily and are selected for their individual competence and relevant experience with due consideration for a balance among all sectors in Canada.

Responsibility for the quality of study documents rests with the Associate Committee. Each report is carefully reviewed in accordance with to a four-stage procedure established and monitored by the NRC in order to preserve objectivity in presentation of the scientific knowledge. Publication and distribution of the reports are undertaken only after completion of this review process.³⁵

The publication policies of NRC are not aggressive and hence much of the Associate Committee work is merely exchanged among a small cadre of professionals. Reports, for example, are not automatically sent to unions. There can be no doubt that in-house research, and research done on contract by universities and industry is severely effected by the federal government's policies and practices concerning secrecy and information. The regulatory process

cannot begin to approach a more open stance until research is more freely exchanged and is seen to be freely exchanged.

The medical profession's relationship to occupational health has also been episodic. To their credit many individual physicians, because of their case work, or because of their role over many years as witnesses before WCB hearings, have become increasingly alarmed about the affects of hazardous substances. Others have gone into occupational health careers as company physicians.

Generally, however, the fee structure, the traditional models of private practice, and the nature of medical education do not stress or reward occupational health practices. Many medical schools are being urged by younger medical students to give emphasis to these fields, and some curricula are being changed to improve practitioner skills in recognizing occupationally related diseases, the medical profession role and that of the para-medical professions e.g. nursing, hygiene, need to be changed far more systematically for any major improvement to be felt. Other parts of the Science Council's Policies and Poisons Study will stress, for example, the extent to which the development of systematic medical record linkages could help detect abnormal incidences of disease among occupational groups. Such policies and practices require the medical profession as a focal point for effective implementation.

7. Public Interest Groups, Advisory Councils and the Media

To date, public interest groups, advisory councils, and the media tend to have been on the fringes of the regulatory process, at least in terms of direct influence. This indirect influence arises partly because the Canadian regulatory process is less oriented than the American process to permitting public interest groups to participate, and partly because the groups are still, despite considerable improvement in recent years, not well financed.

Public interest groups such as the Consumer's Association of Canada, Pollution Probe, Energy Probe, the Canadian Arctic Resources Committee, the Coalition for Nuclear Responsibility, and the Canadian Environmental Law Association have all been formed or reinvigorated in recent years. Some are dependent on government funding. These groups have developed a considerable expertise in their own right and have begun to establish day-to-day contact with environment and consumer departments, federally and provincially. Their knowledge of, and interest in, environmental health issues has been much stronger than their interest in occupation health issues, with the possible exception of the nuclear public interest groups. They tend, moreover, to have focused their attention more on the regulation-

making or rate-setting aspects of regulation rather than on day-to-day compliance issues.

The recent provincial public inquiries, the Ham Commission in Ontario, the Gale Commission in Alberta, and the Beaudry Commission in Quebec did not attract extensive public participation by these groups, indicating, at least in the short-run, that specific occupational health issues have not been a high priority. The above commissions were a focus for the expressiion of political views, but the occupational health field, as we have seen in earlier parts of this report, does not normally provide a single arena of participation. Thus the absence of interest, given the need to avoid spreading their limited resources too thinly, may again help explain the relative absence of the groups in the occupational health field. Only in the nuclear field, where the Atomic Energy Control Board does provide more of a focus, have some of the groups begun to emerge on occupational questions.

Regulatory authorities tend to view the public interest groups as being committed but somewhat amateurish participants. They tend to assess them by the extent to which they can assemble expertise. The need to assemble expertise presents the basis for internal conflicts within these groups as well. Most of them have had to struggle for a balance between expertise and active committed amateur participants, since all of them attempt to be internally democratic organizations.

Day-to-day participation in regulation-making requires a great amount of time, expertise, and commitment. These needs are tested even more in the compliance field. In the light of these realities the failure of public interest groups to align themselves with labour is surprising. Again part of the problem is the over-extended use of existing resources. The lack of a systematic alliance may also be attributed to the often noted antipathy between labour and young middle class professionals, the group which tends to be found most frequently in many public interest groups. Despite these problems, and internal pressures, the recently emergent public interest groups have a critical role to play in the occupational and environmental health field and there are ways, to be discussed in the final chapter, in which public policy can encourage their presence and effectiveness.

A number of long established and newer advisory councils, have also emerged at the federal and provincial levels to serve as a kind of intermediary buffer between interest groups (including labour) and governmental decision-making bodies. National umbrella bodies like the Canada Safety Council have played an important on-going role, albeit with a historic focus on the safety side. Advisory councils

on occupational and/or environmental health have been created in several provinces. The Science Council, the sponsors of this study, began to involve itself as well.

Advisory bodies have had the usual problems of inadequate staffing and of being in an arms-length relationship with government, but they have, more than most, operated in the public domain and have great value for that reason alone.

The media's role in the regulatory processes of occupational and environmental health has been growing remarkably. However, it suffers from the usual short run time and attention span which it can devote to general or specific problems, and also from the relative lack of science journalists in Canada. The CBC has run televised documentary specials on the question of mercury poisoning and lead. The print media, especially the Globe and Mail, the closest thing Canada has to a national newspaper, has almost daily stories on various aspects of radiation, asbestos, lead and other contaminants.

There are many other media in Canada whose record is spotty or even non-existent in their coverage of national and even local issues affecting occupational and environmental health. There is an obvious need for the media to improve their role, which is critical not only because of their unique powers to urge policy reform but also because they are for many people the only source of information on hazards.

Summary

This Chapter has presented a portrait of the main jurisdictional issues and regulatory participants, including international and foreign bodies, federal and provincial governments, organizations in industry, labour, and the scientific and medical communities, public interest groups, advisory councils and the media. It is intended to provide a general background against which to describe and assess the regulatory and compliance processes in each of the six case studies presented in Chapters III, IV, V and VI.

PART II

CASE STUDIES

Introduction

The six case studies on radiation, vinyl chloride, asbestos, lead, mercury and oxides of nitrogen will begin with a brief account of the political economy of the hazard. The scientific and medical aspects of each case are examined in detail in other papers prepared for the Science Council's Policies and Poisons Study. We will refer to these aspects only briefly and to the extent that the degree of scientific or medical controversy seems significantly to affect the regulatory processes in each case.

In each case a list of the key agencies, jurisdictions and participants will be presented. These will not be described in detail because there are usually many actors in each case and many of the key agencies have been described in Chapters 1 and 2. We shall focus on an analysis of the regulation-making and the compliance process and of the relationship between them.

The reader of this study should note the cumulative nature of the description and analysis as we move from case to case. As we deal with the last five cases, it will be clear that the same major government departments are involved. In these instances we will not repeat the descriptive parts of the cases. Some of the issues in each case also can be repetitive; the analysis in one case may therefore refer the reader to the points raised in the previous or earlier cases. In many of the case hazards we present, in effect, a case within a case. Thus brief analyses of the Uranium Miners case, the Matachewan Asbestos Mine case, the Toronto Lead Plant case, and the Whitedog and Grassy Narrow Mercury case, are presented to illustrate regulatory processes and issues. In general, however, we deal with each case on its own by presenting the basic information. We leave the major analysis of the implications of all the cases to the last Chapter of the Study.

CHAPTER III - RADIATION

1. Introduction

The regulation of radiation in Canada differs uniquely from the other five cases to be studied because its regulation is more firmly in federal hands and is centred, relatively speaking, in a single authority, the Atomic Energy Control Board (AECB), aided by other bodies such as the Radiation Protection Bureau of the Department of National Health and Welfare. To understand the regulatory processes in the radiation field both as they affect the workplace and the environment we must focus on the AECB.¹

In general, the AECB is authorized by the Atomic Energy Control Act to control atomic energy materials and equipment in the national interest and to participate in measures for the international control of atomic energy. The AECB is authorized to make regulations to control atomic energy materials and equipment and to make grants in support of atomic energy research.

Although the AECB has been in existence for almost 30 years, it is only during the 1970's that it has achieved a visibility and public exposure commensurate with its importance. This growing visibility is a direct outcome of the growing importance of nuclear energy as an alternative or complementary source of energy to oil, gas, coal and hydroelectric power, and of the growing public concern about the environmental and health consequences of the nuclear alternative. The evolution and functioning of the AECB is also conditioned by the high-technology politics and economics of CANDU Canada, Deuterium and Uranium, a Canadian designed and built reactor.² In economic terms CANDU represents technology with important export potential developed largely by a federal state enterprise, Atomic Energy of Canada Limited (AECL). In political terms CANDU involves increasingly complicated relationships between federally and provincially owned crown corporations, as well as extremely important international policy issues regarding Canada's commitments to the non-proliferation of nuclear weapons and to the peaceful development of nuclear energy.

It is important to stress at the outset that the AECB's roles, structures, and processes are especially affected by the fact that the AECB, far more than most federal regulatory boards (the National Energy Board, the Canadian Transportation Commission, the Canadian Radio-Television and Telecommunications Commission, etc.) has a mandate which is characterized by great technological complexity and

even scientific mystery. It deals with a realm of activity not easily comprehended by laymen or the general public.

The nuclear regulatory process in Canada is also complicated by the fact that the nuclear industry in Canada is dominated by state-owned enterprises. Although a significant and growing privately owned nuclear components and parts industry exists, it is clear that federal state enterprises such as AECL, and Eldorado Nuclear Limited, and provincial utilities such as Ontario Hydro, Hydro Quebec, and the New Brunswick Electric Power Commission are the dominant components. Thus regulatory authorities are brought into complex and conflicting political pressures which arise when a federal nuclear entrepreneur (AECL) becomes involved with provincial utilities. The problems of regulating in this environment cannot be underestimated.

This case study deals primarily with processes and procedures rather than with substantive policies. It is impossible (and indeed undesirable) to separate policy totally from process, however, thus the policy background and mandate of the AECB will be described and analyzed insofar as it effects processes and procedures.

2. The Atomic Energy Control Act

The primary role of the AECB is set out in the Atomic Energy Control Act 1946 (S.C. 1946, Chapter 37 - now the Atomic Energy Control Act RSC, 1952, Chapter 11 as amended) and is influenced by other policy statements (non-statutory) such as those on Uranium Policy and Safeguards Policy, by several related federal statutes and regulations on transportation regulation, and by some provincial statutes and practices.

The Act authorizes the AECB to control atomic energy materials and equipment in the interests of safety and physical security, to control atomic energy materials, equipment and information in the interests of national and international security, to award grants in aid of atomic energy research, and finally to administer certain aspects of the Nuclear Liability Act (on proclamation).

The Act arose out of the post-World War II period when concern for strategic security was paramount. Accordingly, the Act confers on the AECB and on the cabinet a great array of control powers including the power to regulate, to licence, to revoke or suspend licences, to expropriate, to create crown enterprises, to require the submission of information and reports, and to give grants for research and development. There are no statutory provisions for hearings. The division of these powers between the AECB and the

Cabinet will be specified later. As a general statement, however, the statute conceived in a post-war security conscious environment gives extraordinary powers to regulatory authorities.

The constitutional validity of the Atomic Energy Control Act was tested in Pronto Uranium Mines Ltd. vs Ontario Labour Relations Board (1956) O.R. 562, and reaffirmed in 1972 by the Ontario High Court in Denison Mines Ltd. vs Attorney General of Canada (1972) 32 D.L.R. (3d) 419.³ Although the formal constitutional authority seems clear, the AECB has trodden carefully in areas where health beyond the immediate perimeters of the nuclear facility are concerned, and in fields such as uranium mining where its powers run into aspects of provincial jurisdiction over health and resources. In general terms, however, both constitutionally and legally, the AECB and the cabinet can be said to be well armed with a wide array of regulatory powers.

3. The Atomic Energy Control Regulations

The AECB exercises control through its Atomic Energy Control Regulations (P.C. 1974-1195 30 May, 1974), which include a comprehensive licensing system. Strategic or security controls are exercised over a number of prescribed substances and strategic materials (uranium, plutonium, thorium, heavy water) and equipment through a permit system operated with the co-operation of the departments of Industry, Trade and Commerce (exports) and National Revenue (imports). International commitments are also met by co-operating with international inspectors from the International Atomic Energy Agency who carry out safeguards inspections under the international agreements to which Canada is a party.

Control over prescribed substances for purposes of safety is secured by the provision in the Regulations that no person shall "produce, mine, prospect for, refine, use, sell or possess for any purpose prescribed substances except in accordance with a licence issued by the AECB." The licensing process requires the prospective user to provide information on "the prescribed substance, its proposed application, operational, safety, and physical security procedures and equipment; qualifications and experience of users, radioactive wastes management plans and environmental considerations". If a licence is issued the licensee is subject to the compliance inspections of the Board's inspection officers. Approximately 5000 licenses are now in force with approximately 2000 licenses (primarily radioisotopes) or amendments processed in 1974-75.

The regulation of designated nuclear facilities and equipment (nuclear reactors for research and for power production, particle

accelerators, mines, heavy water plants, large scale industrial and medical irradiators, uranium processing and fabrication plants, and radioactive waste management facilities) requires the prospective user or owner to secure a licence to construct and to operate such equipment and facilities. The user or owner must submit information on siting, design, construction, commissioning and testing, operation, operator qualifications, safety and physical security equipment and procedures, radioactive waste management, and environmental effects, and is subject to AECB inspection if a licence is issued. Major nuclear facilities now licensed include power reactors in the Ontario Hydro, Hydro Quebec, and New Brunswick Electric Power Commission systems as well as research reactors at McMaster University and the University of Toronto.

The AECB identifies two formal licensing stages, construction approval and approval to commence operation. Preceding these stages, however, is a site approval stage which is not regarded by the AECB as a formal stage but which will be regarded as such in our analysis. After receipt of an official letter of intent from an applicant the AECB will create a Reactor Safety Advisory Committee composed of experts and technical representatives of relevant federal and provincial departments and local medical officers of health. No reactor has been licensed by the AECB without first being favourably reviewed by such a committee. The committee reviews and comment the adequacy of the submission and information submitted by the applicant at each stage of the licensing process, site approval, construction approval, and operating approval. Between the period of site approval and construction approval the AECB requires the applicant to conduct a public information program.

Other than identifying the above stages it is difficult to generalize about the typical licensing process. Depending on the nature of the facility the process can be fairly rapid or can extend over long period.

The more routine licensing of radioisotopes, on the other hand, does not go through elaborate committee processes. They are handled more routinely by delegating them to the Administrative Division of the Board which must ensure that the licensing information and requirements are fulfilled. About 2000 routine licensing decisions of this kind have been handled annually by the AECB in recent years.

The AECB's processes and procedures are partly governed by statutory requirements, but largely the AECB has been left free to develop its own procedures. Thus, Section 8 of the Atomic Energy Control Act empowers the AECB to:

- a) make rules for regulating its proceedings and the performance functions;
- b) with the approval of the Minister, disseminate or provide for the dissemination of information relating to atomic energy to such extent, and in such manner as the Board may deem to be in the public interest.

In addition Section 9 enables the AECB with the approval of the Governor-in-Council (cabinet) to make regulations "for the purpose of keeping secret information respecting the production, use and application of, and research and investigations with respect to, atomic energy, as in the opinion of the Board, the public interest may require".

The AECB is not a court of record and does not hold public hearings as part of its regulation making or licensing functions. Its regulation-making functions are governed by the advance publication (in the Canada Gazette) of provisions of the Statutory Instruments Procedures Act. The Atomic Energy Control Regulations (Section 27) require that the AECB give notice in writing to the holder of any licence which it is going to revoke or suspend, or amend the conditions and terms thereof. Emergency provisions can permit the AECB to act without notice if public safety warrants, but after this, a licensee may request an inquiry. Reasons for the revocation, suspension or amendment must be given in writing and the licensee must "have been given reasonable opportunity to be heard by the board" after receiving the information and reasons before a notice can be issued. The hearings by the Board are not public. It should be stressed that this procedural provision has only been in existence since 1974 and has been rarely used.

The degree of statutory silence on these procedural issues is no doubt partly a product of the AECB's origins in which strategic and security issues were paramount and are still important. They are, of course, not the only procedural norms under which the AECB operates. Less formal processes (in a statutory sense) are required and will be examined later. The degree of statutory silence on procedures is, however, important in that it stands in stark contrast to the American nuclear energy regulatory processes which have more stringent and more public processes both for regulation-making and for licensing.⁴ The U.S. processes are derived both from nuclear statutes and from the more general procedural requirements of the American Administrative Procedures Act. The American regulatory process model is more formally open and its validity as an alternative model is very much a central issue.

The Atomic Energy Control Regulations set out the licensing procedures and requirements but also set out the maximum health and safety limits for the radioactivity released by the prescribed substances and facilities. The health and safety limits are largely derived from the recommendations of the International Commission on Radiological Protection (ICRP). The release limits are based on a maximum radiation dose permitted to an individual. The AECB has recently established for all licensable activities a design and operating target of 1% of the maximum permissible exposures for the public whether acquired through gaseous effluents or liquid effluents.⁵

The transportation of radioactive prescribed substances is regulated both directly and indirectly by the AECB. It is directly controlled through the Atomic Energy Control Regulations which require shippers to comply with the regulations of the transportation safety regulatory authorities, or where such regulations do not exist, with the AECB's prescribed requirements. The AECB's role regarding transportation is also that of a technical advisor to the Railway Transport Committee of the Canadian Transportation Commission (CTC), the Marine Safety Branch of the Ministry of Transport (MOT), the Flight Standards and Regulations Division of MOT, and the Canada Post Office for rail, marine, air and postal modes, respectively. Roadtransport is currently handled by the AECB in an acting role pending the promulgation of detailed road regulations by provincial authorities.

The regulations developed by these transport regulatory authorities require that packages for radioactive materials meet certain performance criteria relative to normal and accident conditions of transport without significant loss of shielding and containment. Shipping procedures must also comply with certain regulatory criteria.

By far the largest portion of the AECB's budget has been spent in fulfilling its statutory mandate to establish grants in aid for research in atomic energy. These grants are awarded annually on the basis of recommendations by the Joint NRC/AECB Visiting Committee. Because of a growing feeling that these research grants have been oriented too much towards pure or basic (high energy physics) research as opposed to more applied research in support of its regulatory function, the AECB has recently decided to hand over this basic research granting role to the NRC and will henceforth devote its own R & D funding to work needed for its regulatory role.

The AECB will also have responsibilities arising out of the Nuclear Liability Act when it is proclaimed. This Act makes the operators of nuclear installations absolutely liable for injury or

damage resulting from nuclear incidents and requires them to carry \$75 million of insurance against such liability. The Act also provides for the creation of a Nuclear Damage Claims Commission in the event of a major nuclear incident. At time of writing several problems about the insurance are unresolved and so Act has not been proclaimed.

4. The Radiation Emitting Devices Act and The Radiation Protection Bureau

The regulation of radiation in Canada, and the role of the AECB is also effected by the Radiation Emitting Devices Act (hereafter referred to as the RED Act) which is administered by the Radiation Protection Bureau of the federal Department of National Health and Welfare. The RED Act empowers the Department, through the Bureau, to set radiation safety standards for any device and to stop the import or sale of any device which does not qualify. The Bureau also derives its authority from the National Health and Welfare Act and has responsibility under the Food and Drugs Act for control of any radio-pharmaceutical. It also serves as the main administrative arm of the AECB in reviewing and assessing all submissions for acquisition and use of radioactive materials, and carries out safety inspections for radiation work in federal establishments regulated by the Department of Labour.

The Radiation Protection Bureau has evolved from its origins in 1950 as a part of an Occupational Health Division concerned with the occupational safety of X-ray technicians to an organization with a total staff of about 90 people, including about 30 professional and 40 technical personnel. In size it therefore rivals the AECB although both remain quite small in total numbers. The Bureau expanded rapidly in the period from the late 1950's to the mid-1960's primarily because of the then general concern about radioactive fallout from the testing of nuclear weapons. In recent years the Bureau has begun regulating radiation of other kinds including microwaves, lasers and ultrasonics, although its staff has not increased significantly.

Thus, in day-to-day terms, the Bureau is an important element in the regulatory process. Its Nuclear Safety Division conducts environmental radioactivity monitoring and research, and controls commercial, industrial and medical uses of radioisotopes. The Radiation Devices Division deals with the hazards of X-rays and non-ionizing radiations. The Radiation Medicine Division carries out regulatory control of radio-pharmaceuticals and conducts bio-effects research. The Radiation Documentary Service monitors the exposure received by about 35 000 radiation workers in Canada.

The RED Act gives the Bureau's inspectors a wide range of powers to examine devices and materials and to seize those which they reasonably believe to be in violation of the RED regulations. The RED Act provides that all regulations must be developed after a reasonable opportunity has been afforded to "manufacturers, distributors and other interested persons" to make representations to the Minister of National Health and Welfare (Section 110). The Act is generally silent about the practices and procedures for publicly releasing reports and other data on which its regulatory activity might be based.

5. Cabinet and Ministerial Policies

The above statutory mandates formally influence and determine the conduct of the AECB. In addition to the above, the Board is influenced by ministerial and cabinet policies. In recent years two such statements, the policy on uranium and the policy on safeguards, have affected the AECB's role in a direct sense.⁶ In an indirect sense they have helped condition and reflect the broader political and economic environment within which the AECB must function. These policy statements do not appear in regulatory form but have the same effect and are derived from the AECB's duty to comply with any general or special direction given by the Minister.

The policy statements not only influence the AECB'S behaviour but also give the Board the role of advisor to the departments of External Affairs and Energy Mines and Resources. The delicate domestic and foreign policy balance which characterizes the environment in which the AECB functions was characterized in the Prime Minister's speech of 17 June 1975 to the Canadian Nuclear Association. He summarized Canada's nuclear policy obligations in terms of assisting developing countries, ensuring stringent safeguards, and supporting domestic technological capability in a Canadian industry in which Canada has an important international comparative advantage. The Prime Minister said:

- "By caring for others, by sharing what we possess and others need, we are fostering the spirit of hope and easing the quest for social and economic justice now so prevalent in so many countries."
- "By insisting on the most stringent of safeguards and precautions we are attempting to ensure that the nuclear genie will not escape from the constraints demanded of it and bring suffering to future generations."

- "By encouraging Canadians to engage in what they do best, by supporting initiative and competence in technologically advanced fields, we are contributing confidence to a new Canada, one that I have described as being on the threshold of greatness".⁷

6. Organization of the AECB

The Board consists of one full-time and four part-time members. It reports to Parliament through a designated Minister, in recent years the Minister of Energy, Mines and Resources. As of 31 March 1975, the AECB had a staff of 68 scientists, engineers and administrative officers. The AECB's legal advisor is seconded from the Justice Department. All but seven of the staff are located in the Ottawa headquarters. The seven field officers are located in field offices at nuclear power plant sites. Recently an eighth field officer has been placed in Port Hope. A major reorganization occurred late in 1975 (described below).

The Board's staff was organized until 15 October 1975 into four functional units, the President's Office, Administration Division, Material and Equipment Control Directorate (MECD) and the Nuclear Plant Licensing Directorate (NPLD). Of the 68 staff members, five are in the President's Office, 14 in the Administration Division, 20 in the MECD and 28 in the NPLD. The AECB also relies heavily on appointed federal and provincial health authorities and inspection officers who have responsibilities under the Atomic Energy Control Regulations, the former to advise on requirements for atomic energy workers and the latter to inspect, report and act on behalf of the AECB with regard to compliance of licensees. The inspection officers are largely part-time in terms of their duties to the AECB, but in total they would constitute the equivalent of about 20 full-time people, almost all operating in the compliance end of the board's functions.

The AECB is also assisted by the co-operative advisory efforts of officials from other federal, provincial and municipal government departments. These officials are involved in inter-departmental and inter-governmental relationships. Advisors are appointed as individual experts to serve on ad hoc or standing safety advisory committees and to provide advice to the AECB on its on-going regulation-making and licensing functions.

In total, therefore, the AECB remains a relatively (indeed remarkably) small organization, even though its professional staff has grown from 49 in 1972 to 68 in 1976. It utilizes staff from

other departments and jurisdictions; indeed, the latter constitute the hidden part-time staff of the AECB on which the board relies and depends far too heavily.

In recent years the AECB has become very conscious of the changing environment in which its regulatory activities must be carried out. The media, for example, have only in the past 2 years begun to pay any attention to the AECB's role. Public interest groups have begun to involve themselves in a heretofore closed regulatory process. The AECB recently announced a reorganization of the Board's staff functions. The reorganization has obviously resulted from many of the issues described earlier.

Chart 2 indicates that the former NPLD and MECD Directorates have been replaced by a Directorate of Licensing and a Directorate of Research and Co-ordination. The licensing directorate will bring together all licensing functions (including radioisotopes) under a single Director. The new Research and Co-ordination Directorate will be involved in "the increasingly important areas of mission-oriented research and development and of co-ordination of the AECB's relations at international, inter-departmental and federal-provincial levels".⁸

It remains to be seen how the reorganization will effect real changes in behaviour, but it is a clear indication of the Board's own awareness of the general changes in direction required by the current forces in nuclear regulation.

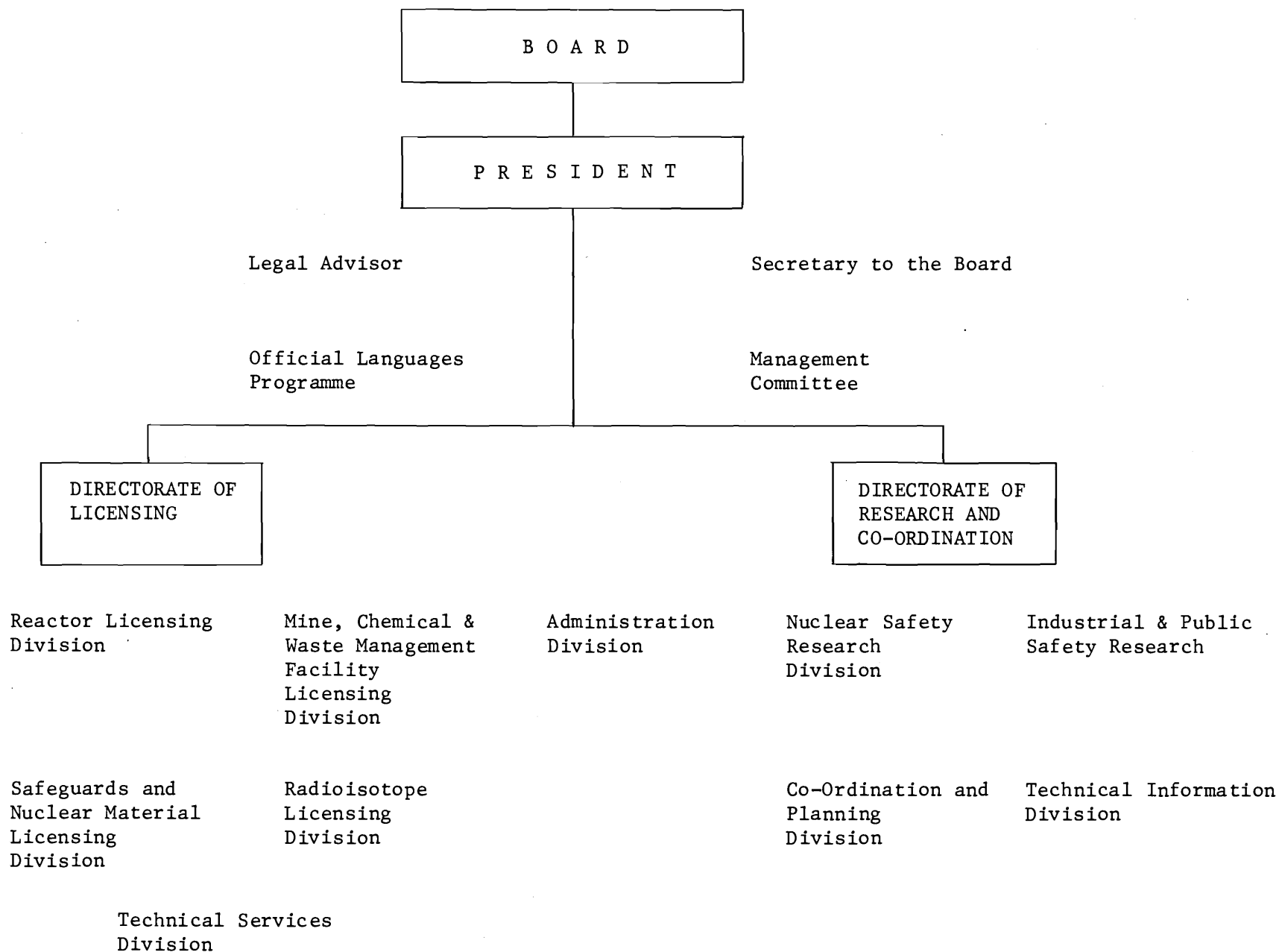
7. The President and the Board Members

The President is the chief executive officer of the AECB and the only full-time member of the Board. The other four members are part-time appointments. The Atomic Energy Control Act provides that the Board "shall consist of the person who from time to time holds the office of President of the National Research Council and four other members"⁹ appointed at the pleasure of the Governor-in-Council. Generally, the part-time appointments are for 3-year terms. Until the early 1970's, the Board consisted almost entirely of the heads of other government agencies involved in the nuclear industry and/or in nuclear research. In addition to the President of the NRC, the membership included the President of AECL and of Eldorado Nuclear Ltd. Only in recent years has the membership been broadened. The current board members believe that the heads of AECL and Eldorado Nuclear Ltd. should not be members of the board. The current membership of the AECB, accordingly, now consists of:

Dr. A.T. Prince, President

Dr. W.G. Schneider, President, NRC

CHART 2 - ORGANIZATION CHART - ATOMIC ENERGY CONTROL BOARD, 15 OCTOBER 1975



Professor L. Amyot, Director,
Institute of Nuclear Engineering
Ecole Polytechnique, Montreal
Miss S.O. Fedoruk, Director of
Physics, Saskatchewan Career Commission,
Saskatoon, Saskatchewan
J.L. Olsen, President and Chief Operating Officer,
Phillips Cables Ltd.,
Brockville, Ontario.

The Board meets about six times each year with meetings lasting one day. A quorum of three is required. Board members usually receive their agenda and supporting material about one to two weeks before the meeting. Part-time members tend to spend about 2 or 3 days before the meetings reading agenda material and preparing for the meeting. Typical meetings in recent years may deal with about 20 agenda items. Additional time may be spent as members of the Board's advisory committees. The meetings are usually held in Ottawa, but in recent years, some meetings have been held outside the capital, e.g. to coincide with visits to nuclear facilities. In principle, and overwhelmingly in practice, the board does not hold formal votes to reach its decisions. All Board meetings are held in camera, as are the meetings of its advisory committees.

As much as possible the Board has sought, particularly in recent years, to confine itself to broad issues of policy and to the making of decisions on the siting and licensing of major facilities, e.g. nuclear power plants. A great amount of routine licensing, e.g. isotopes, is delegated to first and second level staff members.

8. Relationship to Cabinet and Minister

In formal terms the designated Minister has the power to order the AECB to do his bidding. The power to make regulations is also shared with the Cabinet. For much of the AECB'S life, when it was not under much public scrutiny, the Minister-AECB relationship was reasonably arms-length and confined to regular but infrequent consultations between the President and the Minister of Energy, Mines and Resources. In recent years, and particularly since 1973, the need for close policy contact has been obvious. It was made more necessary partly because the Department of Energy, Mines and Resources did not have a great deal of expertise in the nuclear field and partly by the controversies surrounding the uranium and safeguards policies described earlier. The appointment in 1975 of Dr. A.T. Prince as President of the AECB (the first President to come from a largely non-AECL background) also signalled greater

ministerial and Cabinet interest in the board's role. It is probably fair to say that ministerial policy influence on the Board is as great as the formal statutory influence. It would be quite inaccurate to argue that the AECB is a blatant promoter of the nuclear industry; however, its research grants program for universities, and its policy advisory and strategic functions do require it to tread a fine line as it both advises the Minister of Energy, Mines and Resources and the Secretary of State for External Affairs, and at the same time regulates the industry. This will have a growing importance when assessing the appropriate procedural independence which the Board should have.

9. The Role of Advisory Committees

As noted earlier the AECB relies heavily on an elaborate network of advisory committees. Typically these committees consist of individual experts and representatives of federal, provincial and some municipal departments and agencies. There are basically three types of committees: Safety Advisory Committees (SAC's), Technical Advisory Committees (TAC's), Grant Advisory Committees (GAC's).¹⁰ The committees bring to the AECB a diverse range of expertise on nuclear design, health and safety and nuclear research.

Although the committees have no statutory basis, many have virtually de facto decision-making roles in that an adverse judgment by a committee would probably mean that certain proposals would not be approved by the Board. This is particularly the case for the Reactor Safety Advisory Committee (RSAC) for Ontario, Quebec and New Brunswick. No approval of site, construction, or operation has been given by the AECB without a positive recommendation from the relevant RSAC. Other committees may be created in response to a particular need for regulation-making advice. In 1974 for example, a Mine Safety Advisory Committee was created to advise on safety aspects of uranium and thorium mining and milling operations.

The use of the advisory committees undoubtedly has many advantages for the AECB. It facilitates inter-governmental representation, and gives the Board access to scarce expertise. As an organization of scientists and engineers, it is a mechanism which parallels the committee approach developed over the years by the NRC. In professional terms it is a process of peer-group assessment. Thus far the concept of representativeness on these committees has not been extended to other constituencies such as labour unions. A serious question arises as to whether the cumulative effect of the use of committees, when coupled with the small size of the AECB staff, has left the Board in a vulnerable and excessively dependent position. These issues are always questions of balance and

trade-offs, but the advisory committee process constitutes an important element of the AECB organization, especially the hidden part-time staff of the organization, for that, ultimately, is what advisory committee members are.

10. The Clientele of the AECB

As Table 8 demonstrates, the AECB must interact with a wide range of clientele groups and organizations.¹¹ These include the nuclear industry (the large state enterprises and the smaller nuclear parts and components industry), other federal departments, provincial and municipal departments, international agencies (particularly the International Atomic Energy Agency), public interest groups and unions.

The AECB was conceived in a post-war era in which the dominant concern was strategic security of atomic energy. The Canadian nuclear community was basically a very small governmental community, confined to NRC and later AECL. The regulatory apparatus was, and probably had to be, a closed professional shop. The membership of the Board, and the career patterns of its staff, reinforced and reflected the closed shop.¹² As the nuclear community expanded from AECL into Ontario Hydro, and into physics departments of Canadian universities, a position was reached, probably as early as the 1960's, when the closed shop characteristics need not have existed.¹³ The security environment has moderated and the community was of a sufficient size that the Board could have been composed of a much higher proportion of non-governmental agency representatives and experts. In fact, the closed shop characteristics did not really begin to break down until the early and mid 1970's. It was also only in the 1970's that the CANDU nuclear program began to have real commercial viability.

The AECB has thus had to evolve from a position where it was a combination of a strategic regulator and a benevolent patron of nuclear research in Canadian universities, to a position where it must assume both the appearance and the substance of an independent regulator. Such independence is never absolute but it can certainly be sought with greater vigour than the AECB has demonstrated, historically speaking. All regulatory boards in the Canadian system of cabinet parliamentary government are dependent on some ministerial and cabinet authority and power. Although standards are set by the boards, all boards tend to rely to a significant extent on the detailed "front-line" requirements developed and carried out by the utilities, industries, or sectors they are regulating. All boards must secure the co-operation of a host of other governmental agencies to carry out their tasks effectively.

The question of independence is clearly one of degree, but the burden of this study is to indicate that the AECB, despite recent movements in this direction, has not nearly achieved the appropriate degree of independence.

Every organization develops its own standard operating habits. It needs such habits to help it pursue goals and also to reduce the areas of uncertainty presented both by its statutory and policy mandate and by its organizational environment. An examination of these habits helps tell us how the organization perceives and defines its own role. Several observations about the AECB's standard operating habits are important in this regard.

First, in general terms, the Board has historically perceived its primary constituency to be the utilities, other government departments, and nuclear experts. From 1970 to 1974 the AECB embarked on a major comprehensive revision and consolidation of its regulations. This was a major regulation-making and review exercise but it was carried out largely within the confines of its traditional habits and constituencies. Little thought was given to holding broader public hearings or meetings despite the fact that nuclear issues were already of growing concern, that such consultative processes were in use by other regulatory authorities such as the CRTC, and that the Board has the power to change procedures of this kind. Somewhat similarly, the Board has relied on its advisory committee process almost exclusively as a device for inter-governmental and expert (peer-group) representation but for no other form.¹⁴

Second, if one examines only the budgets of the AECB, in the absence of other information, one would be forced to conclude that the AECB was primarily a benevolent patron of the basic nuclear physics research community in Canada. About 80% of the AECB's budgets have gone to its basic research-oriented granting program. It is this function which has contributed greatly to the Board's historic image of being a quasi-promoter of the industry. This exists despite the fact that the disposition of the granting budget takes scarcely a few days of the Board's time, whereas 99% of the Board's time is taken up with its regulatory functions on which the other 20% of its budget is spent.

The informal characteristics of the AECB described in this case study have been presented from the advantage of hindsight. In spite of this, the Board, in historical terms, does not measure up well to contemporary standards concerning regulatory processes. It can control most of its own processes and procedures and thus it can reform them in the public interest. In the past two years the AECB

TABLE 8 - SUMMARY OF THE AECEB CLIENTELE RELATIONSHIPS

Clientele Department or Group	Relationship
<u>Federal</u>	
Energy Mines and Resources	Mutual policy and technical advice
National Health and Welfare	Mutual advice, staff support from Radiation Protection Bureau
Environment	Environmental assessment of federally funded or initiated projects (e.g. Le Preau Station)
National Research Council	Research grants, technical advice to AECEB
External Affairs	AECEB advises on technical aspects of nuclear policy matters, safeguard policy, non-proliferation treaty
Industry, Trade and Commerce	Mutual advice. Export licensing of uranium and other substances and equipment
Royal Canadian Mounted Police	Security and physical protection
Atomic Energy of Canada Ltd.	Technical advice from AECL experts; AECL is licensee
Eldorado Nuclear Ltd.	Advice on mining - Licensee of Board
Canadian Transportation Commission	Transportation of nuclear substances
Ministry of Transport	Transportation of nuclear substances air and marine
Department of National Defence	Defence and nuclear powered submarine
Interdepartmental Committee on Atomic Energy	Co-ordination at deputy minister level chaired by Privy Council Office
<u>Provincial and Local</u>	
Variously, Departments of Health, Labour, Environment	Representation on Advisory Committees; Provision of inspectors appointed by board; environmental assessment processes
Provincial hydro utilities	Licensees; source of technical advice on standards and regulations
Urban and local medical health advisors, and emergency planners	Local health and emergency provisions

International

International Atomic Energy
Agency (U.N.)

International safeguards inspection
and development of peaceful uses
of nuclear energy

Nuclear Energy Agency (OECD)

Research and exchange of information

International Energy Agency

Research

International Committee on
Radiological Protection

Standards, mutual advice

United Nations Scientific
Committee on Effects of Atomic
Radiation

Advice, information

Industry

Atomic Energy of Canada Ltd.

Licensee (in process); main source
of recruitment for AECB personnel

Eldorado Nuclear Ltd.

Licensee

Ontario Hydro

Licensee

Hydro Quebec

Licensee

New Brunswick Electric Power
Commission

Licensee

Uranium mining companies

Licensee

Canadian Nuclear Association (CNA)

Advice on standards; many members
of CNA are licensees.

Unions

United Steel Workers of America

Advice on standards and compliance
re: uranium miners.

Universities and university
researchers

Recipients of AECB research
grants (recently transferred to NRC)

Public Interest Groups

Energy Probe
Coalition for Nuclear
Responsibility
Candu
Maritime Coalition of Environ-
mental Protection Association

Participants in the licensing
process

has begun to adjust its habits but further changes need to be encouraged and/or required.

Some of the difficulties in the regulatory process are reflected in the case of regulating the health and safety of uranium miners. To help illustrate the AECB role we will briefly discuss this within the larger context of our case study on radiation.

11. The Uranium Mining Safety Case

This case reflects both an old and a new issue for the regulation of radiation.¹⁵ At the time of writing the AECB is actively engaged in a reassessment of its regulating processes and standards regarding uranium mining. The case illustrates some of the serious inter-governmental (especially federal-provincial) difficulties and pressures regarding regulation-making and compliance. The historical background events and stages will be described very briefly, followed by an analysis of the issues raised by the case regarding regulating processes and procedures.

1) Background Events and Stages

Most of the key events in the regulation of uranium mining were summarized in the AECB's brief presented on 3 June 1975 to the Royal Commission on the Health and Safety of Workers in Mines in Ontario. The brief dealt with federal-provincial arrangements, the incorporation of radiological protection provisions into the Atomic Energy Control Regulations, health and safety management of the miners, and the establishment in June 1974 of the Mine Safety Advisory Committee.

i) Federal/Provincial Arrangements

Shortly after the passage of the Atomic Energy Control Act in 1946, representatives of the Province of Saskatchewan visited the Board to point out that Saskatchewan had detailed regulations governing mining operations, and confusion would result if the Board were to attempt to set out special rules for prospecting, staking, development, and mining of uranium deposits. The Board agreed that Provincial rules regarding prospecting and staking should apply, but a Board licence would be required during the development and mining stages.

In the early 1950's private operators in Ontario were anxious to develop and mine some previously known uranium deposits in that Province. The AECB held discussions with officials of the Ontario

Department of Mines concerning licensing arrangements. At this time, the Board's interests were directed to the security of the uranium and information regarding its reserves, production and disposition, and it was understood that the Provincial authorities would take responsibility for the safety of the mines and the health of its workers. It was also agreed that the Board in its exploration and mining licences would impose a condition requiring compliance with provincial laws respecting mine safety. The actual wording agreed on was as follows:

"That, subject to the Atomic Energy Control Regulations, any applicable provincial statutes and regulations, or the regulations affecting mining in the Northwest Territories and the Yukon, as the case may be, in so far as they deal with mine safety and cognate matters, are to be observed and complied with in relation to the said property and to all operations undertaken in connection therewith."

The above wording has been included as a condition of all licences issued by the Board to mine uranium to this date.

During the 1960's there were repeated requests from provincial mine ministers for the federal government to transfer to the provinces jurisdiction over uranium mines. At the Conference of the Provincial Ministers of Mines in September 1968, the Honourable J.J. Greene, then Minister of Energy, Mines and Resources, reiterated that except in matters related to national security and foreign policy uranium mines should be subject to the same rules as those which the provinces exercise over other mines. He also expressed the wish and intention of the federal government that the provinces continue to be able to apply such controls. More explicitly, he indicated that although the Atomic Energy Control Act established federal government jurisdictional in matters relating to national security and foreign policy, in no way should it hinder or limit provisions to ensure the application of the rules applicable to other mines under provincial jurisdiction. He also referred to the AECB mining permits being conditional on the licensee obtaining from the province concerned the necessary property rights and, subject to the Atomic Energy Control Regulations, compliance with all applicable provincial and territorial regulations. He further stated that, wherever possible, the AECB would appoint provincial officials as inspectors under the health and safety sections of its regulations. These guidelines, which are still in operation, presupposed the existence of adequate regulatory provisions by the province and systems for maintaining them.

ii) Incorporation of Radiological Protection Provisions Into the Atomic Energy Control Regulations

Since health and safety matters were traditionally the concern and responsibility of the provinces, the Board urged provincial authorities through the Dominion Council of Health (composed of deputy ministers of the federal and provincial health departments) to issue radiological safety regulations. For various reasons, no province was prepared to take such action and, as an alternative, the Board proposed to the provinces that it would amend the Atomic Energy Control Regulations to include provisions applicable to radiological protection. These amendments were to be based on the advice of the Dominion Council of Health, taking into account the recommendations of the International Commission on Radiological Protection (ICRP) and would involve the direct participation of the provinces in their implementation.

A committee was appointed to draft the necessary radiological protection provisions, and, after their approval by the provinces, they were recommended to the Board and incorporated in its 1960 Regulations. The amended Regulations stipulated requirements for protective procedures, instruments and equipment as well as the maximum permissible dose of ionizing radiation. Federal and some provincial health departments nominated officers to serve as inspectors in connection with the use of radioactive material other than in mines, and the Ontario Department of Labour nominated some of its Factory Inspectors to supervise the use of radioactive materials in Ontario industrial concerns, and the Ontario Department of Mines nominated (in 1961) some of its Mines Inspectors to supervise radiation safety aspects of uranium operations. The foregoing officers were appointed as inspectors by the Board under its Regulations.

iii) Health and Safety Managements of the Mines

When large-scale uranium companies were aware of the potential hazards of radon daughters, most of the companies provided considerable forced ventilation for their mines. A radon daughter concentration of "One Working Level"* (1.0 WL) was generally accepted as the target for use in Canadian uranium mines although most mines were operating at concentrations that were well above that level. In Ontario, the uranium mining companies were required by the Provincial Department of Mines to submit periodic reports on their measurements of air contamination in different parts of the mine.

* One Working Level is defined to be any combinations of numbers of atoms of the first three daughters of Rn-222 in a litre of air, such that the total α -energy to complete decay to RaD is 1.3×10^5 MeV.

Although the Board continued to depend on the provinces to oversee the health and safety of uranium miners, the radon daughter hazard remained of special concern and it maintained close contact with radiological protection experts in the Ontario Department of Health and Atomic Energy of Canada Limited's Chalk River Nuclear Laboratories which were concerned with the radon daughter problem.

In 1959, the International Commission on Radiological Protection (ICRP) published a recommendation as to the maximum permissible concentration of radon in air for occupational exposure corresponding to an equilibrium concentration of radon daughters of 0.3 WL. The Ontario Department of Mines and Health called a meeting in 1960 to consider what should be done in the light of this recommendation and to assess the difficulty the Ontario uranium mines were having in reaching the generally accepted target of 1.0 WL. Experts from AECL's Chalk River Nuclear Laboratories and the US Public Health Service were invited to the meeting to give their views on these matters but AECL was not consulted. It is understood that the meeting ended with the consensus that the ICRP recommendation of the equivalent of 0.3 WL should be adopted as a target to be attained within the next five years.

By 1964, only three uranium mines remained in operation in the Elliot Lake Area. Although Rio Algom (Nordic) had substantially reduced radon daughter concentrations in its mines, the Board was concerned about the continuing high levels that existed in the Denison and Stanrock mines. Formal reports on radiation levels had not been received by AECL, but the president visited these two mines to emphasize the Board's concern.

In 1967, the US Public Health Service published the results of a detailed survey of the hazards in uranium mines in the US which showed that the frequency of deaths from lung cancer among former uranium miners was much greater than the frequency among the population at large and varied with the radon daughter concentration to which the miners had been exposed. Acting on the advice of the Federal Radiation Council, the US Government set 1.0 WL as the standard to be enforced by all federal agencies having authority in this field.

In view of the US Public Health Service report, the situation in Ontario mines was reviewed at a meeting held at the Ontario Department of Mines in mid-1967. This meeting was attended by officers of the AECL Ontario Department of Mines and Health, and experts from the Department of National Health and Welfare and AECL (crn10). At this meeting, the AECL expert expressed his concern over

concentrations prevailing in the Canadian mines, re-emphasized his belief that the 1960 decision to work towards the ICRP recommendation of the equivalent of 0.3 WL was correct, and recommended that as an intermediate step the regulatory authorities should insist on all mines meeting a 1.0 WL requirement. This meeting of officers and experts was followed by a visit to the Elliot Lake area by those who attended the meeting, to discuss the problem with the three operating mines. The mining companies outlined their plans for reducing the concentrations in their mines and it was believed that further improvement was possible through their efforts.

Following the 1967 meeting, the President of the AECB wrote to the Deputy Minister of the Ontario Department of Mines to state that the Board viewed the radon daughter problem very seriously and urged the Department to require the mines to improve the situation.

At the request of the mines' representatives attending the 1967 meeting, the President of the AECB recommended to the federal Department of Energy, Mines & Resources that a radiation instrument calibration facility be established at the Department's mining research laboratory at Elliot Lake. The calibration facility was established in 1968.

Late in 1967, the Chief Engineer of Mines of the Ontario Department of Mines issued a mine Order requiring occupational exposure to radon daughters in Ontario mines to be controlled to 12 Working Level Months (WLM) per year. In 1972, the control level was reduced to 8 WLM for 1973 and 6 WLM for 1974, and in 1974 the control level was further reduced to 4 WLM for 1975.

In 1969, an AECB officer accompanied by officers of the Ontario departments of Mines and Health, met with representatives of Denison Mines to review progress in controlling the radon daughter hazard. At that time 90-95% of the mine working areas were at concentrations below 1.0 WL and over the year ending July 1969, 9 out of 417 underground workers had received over 12 WLM exposure and the majority had received less than 6 WLM exposure. An officer of the AECB visited Rio Algom (Quirke) and Denison again in 1971 and noted that progress was being made in reducing radon daughter levels.

(iv) AECB Mine Safety Advisory Committee

With the issuance in June 1974 of the revised Atomic Energy Control Regulations, the Board, in November 1974, reviewed its procedure for the licensing of uranium mines and established the Mine Safety Advisory Committee. This Committee, which includes experts from appropriate federal and provincial departments, has the mandate to

consider related health and safety aspects and recommend conditions for licensing purposes. The Committee is also expected to make recommendations to the Board with regard to the adoption of appropriate health and safety standards.

Under the revised Regulations of 1974, applicants for mining licences are required to submit pre-licensing safety reports describing:

- a) the procedures and equipment to be used to mine and mill the ore and to manage the waste products that are generated in these operations; and
- b) the measures to be taken under routine and abnormal operating conditions to protect the health and safety of the workers, and members of the public who may be affected by the proposed operations.

This information is considered by the Mine Safety Advisory Committee which specifies conditions as required for licensing purposes.

When mining operations have commenced, licensees are required to submit periodic operating reports to include:

- a) summaries of radiation and dust counts in the mine and mill and employee exposures to these contaminants;
- b) a record of the amounts of contaminant released to the environment;
- c) a description of any unusual occurrences that may have affected the health and safety of the workers or members of the public; and
- d) a description of any changes in procedures or equipment that may affect the safety of the operations.

This information is reviewed by the Board staff and the Mine Safety Advisory Committee as appropriate.

The foregoing safety-related information is in addition to the ore reserves and uranium and thorium production information that the Board currently requires of a licensee as Condition (2) of the mining licence.

(v) The Regulation of Uranium Mines - The AECB's Current Program

The AECB's brief went on to stress that its regulatory involvement both in degree and nature was developed in response to government policy directions. Thus it noted that,

"The dominant policy direction was to make administrative arrangements whereby the provincial agencies were asked to be operationally responsible for health and safety under their regulations and the federal government, through AECB asserted its control in licensing for purposes of security control over the disposition of ores and concentrates. During the past 20 years or more, there has been continuous pressure from the provinces to place all aspects of the control of uranium mines completely under provincial jurisdiction with no federal involvement. The annual Mines Ministers Conferences have repeatedly urged the federal government to vacate the uranium mining field but the senior level of government refused and maintained a position of co-operative control."

Current AECB policy seeks to ensure that the AECB can be more directly involved in seeing that fully effective measures are implemented to protect the health of miners. It candidly acknowledges that its heretofore advisory interventions have had limited impact because of the division of responsibility under former policy guidelines.

2) Socio-Economic Fluctuations In the Uranium Industry

The AECB brief tends to stress federal-provincial jurisdictional issues, but it fails to deal adequately with other socio-economic dimensions of the regulatory environment in which both the AECB and the provincial authorities operated. The uranium industry was characterized by widely fluctuating periods of economic activity. By the middle 1950's almost a dozen mines were rushed into production primarily to meet American contracts. The regulatory environment was thus characterized by pressures which resulted in some short-cuts being taken. Then the uranium industry almost collapsed when markets declined rapidly in the late 1950's and early 1960. By 1961 all but three mines had closed.

A second and partly related characteristic of the regulatory and industrial environment is that a significant number of foreign and migrant workers worked in the uranium mines. Thus, the perceived impact on Canadian labour and labour unions was also temporary and

subject to wide fluctuations in interest. Labour unions in the uranium mining industry have always expressed great concern about work conditions but they have not uniformly and persistently pressed the issue because of the unstable nature of the uranium industry.

In recent years, the unions have been persistent critics of the state of occupational health and safety, criticism which helped in the creation of the Royal Commission on the Health and Safety of Workers in Mines in Ontario.

3) Issues Regarding The Regulatory Process

Once again, as with the other cases, it is important to stress that the above account of the events is brief and superficial. Despite its brevity the case illustrates still other important issues about the regulatory processes pursued by the AECB. These issues include the following:

a) The case indicates that higher standards of tolerance levels have been established in regulatory form over the years but that there are still major compliance problems arising from the technical difficulties of testing how much radiation exposure workers are receiving. Compliance also depends on adequate baseline data and cumulative monitoring of the exposures. The AECB and provincial authorities in 1967 had to react to an American study which showed strong correlations between cancer and prolonged periods of exposure by uranium miners. This has not been appreciably improved since 1967, reflecting the inadequacies of the compliance program and the research and development capacities of the AECB and of provincial authorities. Only in the last year or two have some steps been taken to improve both the scientific and the compliance base on which the AECB regulates uranium mining. The Board seems much more prepared to assert federal jurisdiction in both the regulation-making and compliance processes.

b) In addition to the actual processes of making regulations the AECB has again used the committee approach in this case. The composition of AECB'S advisory committee on mine safety does not directly include labour representatives, although the committee has established relationships with labour unions to which it will send draft recommendations for comment. The AECB decided not to invite direct labour representation; it is nonetheless questionable why labour, among others, could not be directly represented on the committee (not to mention on the AECB itself). The AECB's committee process has tended to reflect almost exclusively only two constituencies: experts in the area under discussion, and

representatives of other federal, provincial, and local government departments and agencies.

It is also difficult to see why public meetings, whether of the committee or of the AECB could not be held to open the regulation-making processes to greater public scrutiny by labour unions and others who are interested in, and affected by, the decisions reached by the Board.

Precisely because the regulation of radiation does have a focal centre, its processes are easy to study and understand and its strengths and weaknesses are apparent. The other cases do not afford us the same analytical luxury. We will comment further in the final Chapter on the regulatory reforms that might be feasible in the radiation case, and comment also on the possible applicability of the "board" model to other specific hazards or to the occupational and environmental health field generally.

CHAPTER IV - VINYL CHLORIDE AND ASBESTOS

1. Vinyl Chloride

Vinyl Chloride (VC) is a chemical used in the synthetic production of polyvinyl chloride (PVC), a plastic material used widely in plastic containers, house-siding, phonograph records, cables, flooring, swimming pool liners and a host of other products. As the other Science Council papers, by M.J. Phillips and E.J. Arnold, point out, VC has been regulated for some time, initially because of its flammability.¹ Until recently vinyl chloride was considered to be one of the safest industrial chemicals. In December 1973, B.F. Goodrich in the United States announced that three of its workers had died of angiosarcoma, a rare form of cancer. Vinyl chloride tends to be viewed (so far) more as an occupational hazard than as an environmental hazard.

a) The Political Economy of the Vinyl Chloride Regulatory Processes

The only producer of VC in Canada is Dow Chemical of Canada in Sarnia. Dow has announced plans, however, to expand their vinyl chloride monomer (VCM) manufacturing capacity with a new plant at Fort Saskatchewan, Alberta, to be completed in 1978. Polyvinyl chloride resin is manufactured by two companies, Esso Chemical Canada at Sarnia, and B.F. Goodrich Canada at Niagara Falls, Ontario and Shawinigan, Quebec. Approximately 100 million pounds of PVC resin is imported. About 100 firms across Canada are engaged in PVC fabrication into end-use products.

Approximately 90 workers are employed in VC manufacture, 300 in PVC manufacture, and about 50 000 in PVC fabrication. The principal unions involved are the Oil, Chemical and Atomic Workers International Union, the United Steel Workers, the Quebec Confederation of National Trade Unions and the United Rubber Workers.

To date Canadian VCM personnel exposure limits have been set (or are in the draft stage) in four provinces. The standard is (or will be) 5, 1, 10 and 1 ppm (8 h time-weighted average) in Alberta, British Columbia, Ontario, and Quebec respectively. Ambient air standards in Ontario are in the proposal stages, and effluent water standards for VC are in the study stage. Environment Canada is in the process of developing emission standards.

Vinyl chloride was selected as a case partly because the three B.F. Goodrich cases involved the industry "blowing the whistle" on itself, so to speak. It was also selected because, although only a few workers are exposed to it (as far as one can tell) and it is not yet a major environmental problem, it raises the question of what action can be taken and by whom, when a substance is discovered to be toxic and carcinogenic after exposure over a number of years and frequently after workers have left the industry.

Table 9 attempts to portray the main regulatory and jurisdictional participants in the vinyl chloride case. The regulatory and jurisdictional processes in the case include a wide variety of organizations and individuals, including federal and provincial agencies, corporations and industry associations, labour unions, political parties, universities, individual researchers and physicians and medical organizations.

b) The Regulatory Response

In one important sense Table 9 is misleading because it lists the American and International participants at the end when in fact the Canadian chronology of vinyl chloride regulations begins with American events.² The B.F. Goodrich cases and the American regulatory response triggered the recent Canadian regulatory response. The linkages occurred between American regulators and Canadian regulators, between American parent firms and their Canadian branch plants, and between international unions and their Canadian components. Thus, at first glance, the vinyl chloride case illustrates a regulatory process in which the American presence provides a potential early-warning system.

But how soon is soon enough? Some have argued that in the pre-1973 period research information from Europe was not expeditiously circulated and was withheld by both industry and by American regulatory authorities (NIOSH).³ The general Canadian response, however, awaited the B.F. Goodrich announcement. Once the announcement had been made, the several Canadian regulatory authorities responded in different ways. Two or three examples of the response will help illustrate the process.

In general terms, all the regulatory authorities with a potential role were alerted to the problem by the media coverage as well as by scientific publications and exchanges. They initiated various forms of action (from decisions to study the problem to decisions to set standards) more because of these broader, largely international exchanges than from domestic pressure, although the latter came quickly.

Alberta's response occurred partly in the midst of the development of negotiations over Dow's proposed plant at Fort Saskatchewan. The lower standard proposed (5 ppm) perhaps reflects the easier politics that exist when new plants are being constructed in contrast to a situation which involves changing the production technology in mid-stream (as is the case in Ontario and Quebec). Labour in Alberta also tended to see the new plant in the context of more jobs, hence the degree of political pressure was different.

In Ontario, the total economic stakes are greater so that the bargaining over standards is more difficult. Imperial Oil has argued that a standard of 10 ppm is the best that current knowledge and technology will allow. It, and other industry spokesmen, have resisted suggestions that the standard be lowered to 1 ppm. The Ontario regulatory response is centred in the Health and the Environment ministries with the Labour department apparently playing a subordinate role. Assuming that the state of knowledge or the state of controversy about knowledge is the same in both of these jurisdictions, and even that both are governed by the Progressive Conservative party, there is some evidence to suggest that the different standards are caused by the different political, economic and organizational configurations in place in the mid-1970s in each province.

The Quebec response has been somewhat similar in the initial stages but the Quebec politics of vinyl chloride have been influenced by the fact that deaths of Shawinigan vinyl chloride workers have occurred there. So long as substances are "merely" toxic and have not demonstrably cost lives, the politics will be markedly different. Surprisingly, however, even the deaths in Quebec did not result in speedy action. The B.F. Goodrich plant in Shawinigan is older and its workforce more influenced by the company-town dependence than the Sarnia plant.⁴

Although the environment agency in Quebec (whose jurisdiction at first glance seems to extend more readily into the workplace than most other provincial environmental authorities) has responded to the point of developing a 1 ppm standard, the Quebec experience has shown that jurisdictional problems with the Minister of Labour and the Minister of Social Affairs abound. Other forms of leverage and/or pressure have been present.⁵ Individuals such as Dr. Fernand Delorme, chief pathologist at the Centre Hospital Regional in Shawinigan Sud; were among the first to link the deaths of workmen from vinyl chloride, after he had heard about the three American cases. Delorme then became involved in pressing the Quebec Commission des accidents du travail and in research work carried out in connection with Laval University, University of Montreal and McGill University.

TABLE 9 - REGULATORY AND JURISDICTIONAL PARTICIPANTS IN THE VINYL CHLORIDE CASE

Federal Government

Department of National Health and Welfare (Chemical Hazard
Bureau of the Health Protection Branch)
Department of Consumer and Corporate Affairs (Product Safety
Branch)
Environment Canada (Air Pollution Control Directorate and Water
Pollution Control Directorate)
Science Council of Canada
Department of Labour (Accident Prevention and Compensation
Branch, Occupational Safety and Health Division)

Provincial Government

Alberta Department of Labour
British Columbia Workers Compensation Board
Ontario - Ministry of Health (Occupational Health Protection
Branch)
Quebec - Ministère du travail
- Ministère des affaires sociales
- Commission des accidents du travail
- Services de protection de l'environnement

Unions

Oil, Chemical and Atomic Workers
United Steel Workers
United Rubber Workers of America
Quebec Confederation of National Trade Unions

Industry

Dow Chemical
Imperial Oil
B.F. Goodrich Canada
Society of the Plastics Industry of Canada
Plastics Industry Council
Canadian Manufacturers Association

Other

Canadian Association of Pathologists
Canadian Tumour Reference Centre
New Democratic Party
Laval University
McGill University
University of Montreal
Le Devoir
Globe and Mail
Publications e.g., Chemical and Engineering News
Chemical Week
Quebec Science

American and International

B.F. Goodrich (US)

Manufacturing Chemist Association

American Conference of Governmental Industrial Hygienists
(ACGIH)

Occupational Safety and Health Administration (OSHA)

Environmental Protection Agency (EPA)

National Institute of Occupational Safety and Health (NIOSH)

United Rubber Workers

Oil, Chemical and Atomic Workers Union

Consumer Product Safety Commission

Society of Plastics Industry

At the federal level, partly because of the more limited jurisdiction over occupational health, the response has been both less urgent and more arms-length, politically speaking. All of the agencies immediately became aware of the problem through the media and through their professional counterparts in American agencies. The most substantive response came from the Product Safety Branch in the Department of Consumer and Corporate Affairs. The Branch knew about the three B.F. Goodrich cases. It also learned of the decision early in 1974 from its US counterpart, the Consumer Product Safety Commission, about the harmful effects of household sprays using VC as a propellant. The Americans subsequently banned its use.

The Product Safety Branch immediately consulted (by telephone) the Canadian aerosol industry to determine if VC was being used. When informed that it was not being used, the Governor-in-Council, on the advice of the Branch, immediately banned the importation, sale and advertising of aerosol packaged chemical products which contained vinyl chloride as a propellant gas.

The Bureau of Chemical Hazards of the Department of Health and Welfare also responded in 1975. After its researchers discovered traces of VC in plastic containers for vinegar and peanut oil, it asked the packaging industry to modify their packages and then banned the use of packaging in which VCM could be found.

In terms of the political economy of the vinyl chloride regulatory process, the federal response has occurred in situations where the economic stakes were not great. This fact should not itself imply criticism of federal authorities because the recent vinyl chloride story shows some successes. It could even be argued that the absence of formal participation processes (on the American model) enables federal authorities to move with relative swiftness if they wish to do so. It seems more likely, however, that the swiftness of the federal response is somewhat illusory precisely because the immediate economic stakes were not great. This reality was perhaps best illustrated by the fact that the Plastics Industry Council, a division of the Plastic Industry of Canada, tended to confine its activity to the release of press statements which sought to clarify any confusion between VCM and PVC. It should be pointed out, moreover, that the aerosol and packaging issues, although they involved some considerable scientific doubts about the real potential hazard of VCM, were quickly resolved in favour of banning the products. No one argued that we need more research, precisely because the economic stakes were not high and thus the politics of research did not have to be vigorously played.

Is the vinyl chloride story since 1973 a success story or not? It is a partial success story but it would be naïve to view it as a model response. It does show how federalism and different configurations of economic and organizational power result in different standards and responses. It does not tell us much (yet) about actual compliance practices to enforce workplace standards, since most of the new recently lowered standards are just being implemented.⁷ Public interest groups and even unions have tended, until recently, to operate on the periphery of both the regulation-making and the compliance processes, perhaps because as the process has unfolded so far, the vinyl chloride case is perceived to affect only a few workers. Labour's role in Canada, on vinyl chloride at least, has not been nearly as vociferous, or effective, as has its American counterpart.

2. Asbestos

Asbestos is a fibrous silicate mineral with unique physical properties which make it valuable in a wide range of industrial applications.⁸ In addition to being incombustible it is virtually immune to corrosion and decay under almost every condition of temperature and moisture, and to almost all chemical reactions. It is used in about 3000 industrial products including building materials, textiles, and electrical products. It is also a deadly hazard whose adverse and irreversible health effects, particularly on workers, have been known for decades.

a) The Political Economy of Asbestos Regulatory Processes

Of the more than 30 generic types of asbestos only six are of economic importance. Of the six, chrysolite constitutes 95 per cent of the world production. Canada produces over 40 per cent of the world's production of chrysolite, 95 per cent of which is exported. Canada also imports about 6000 tons of asbestos annually, primarily crocidolite from South Africa.

The Province of Quebec accounts for about 80 per cent of Canadian production with 6 per cent produced in British Columbia, 6 per cent in the Yukon, 5 per cent in Newfoundland and 2 per cent in Ontario.

There are 10 corporations involved in mining asbestos at 15 mine sites, mostly surface mines, including the mine recently opened (and then temporarily closed down) at Matchewan, near Kirkland Lake, Ontario. The industry is largely foreign-owned and produces mainly for export. The largest firms are Asbestos Corporation Limited at

Thetford Mines, Quebec, and Canadian Johns-Manville Company Limited which operates in Quebec and Ontario. Other companies include Cassiar Asbestos Corporation Limited (operating in British Columbia and the Yukon), Advocate Mines Limited (Newfoundland), and Bell Asbestos Mines Limited, Carey-Canadian Mines Limited and Lake Asbestos of Quebec Limited, all operating in Quebec. The mills in production include a few started in the 1880's but most have begun operations since the 1950's.⁹

About 6500 workers are employed directly at risk in the mining and milling of asbestos in Canada. The recent report of the federal-provincial Asbestosis Working Group found it difficult to number the workers employed in the production of asbestos products, but settled on a figure of about 3500 workers, working for about 40 manufacturing companies or firms otherwise involved with asbestos, e.g., insulation and construction workers.¹⁰ These firms are concentrated equally in Ontario and Quebec with a few in British Columbia. The report also observes that about 10 000 dockyard workers in Canada are undoubtedly exposed to asbestos dusts. It is known, however, that the spouses of workers have been affected by virtue of their contact with dust from workers' clothing. The even broader environmental consequences are not well documented or known.

The principal unions involved to date in the asbestos field in Quebec are La Centrale des syndicats démocratiques (CSD), La Confédération des syndicats nationaux (CSN), Les Metallurgistes unis d'Amérique (Metallos), and Le Syndicat des travailleurs unis de l'automobile, de l'aéronautique, de l'astonautique et des instruments aratoires d'Amérique (TUA-FTQ). The CSN and other elements of the increasingly militant Quebec labour movement were the chief forces in pressing for worker rights. Their pressure resulted in the creation of the Quebec judicial inquiry into the asbestos industry headed by Provincial Court Judge René Beaudry. In Ontario, the United Steel Workers have pressed their case before the Ham Commission on mining, health and safety.

With respect to standards, the present standards for asbestos exposure (influenced by the ACGIH, as well as the British Occupational Hygiene Society, the International Labour Organization, OSHA, and NIOSH) are based on acceptance of a certain degree of asbestosis. The Federal-Provincial Working Group recently recommended a standard of 2 fibres/cm³, eight hour time-weighted average.¹¹ Strangely enough the report does not directly mention what the current standards are in the main provinces concerned. In Quebec,* the government announced a new standard of 5 fibres/cm³ but

*At time of writing the new Quebec government headed by René Levesque had just been elected. Its policies towards the asbestos industry are likely to be markedly different including the possible nationalization of the industry.

it is not yet in force.¹² The Ontario standard is 2 fibres/cm³, but there is evidence, at least in the case of the Matchewan plant (to be discussed later), that it has not been enforced.

Among the six cases discussed in this report and in the Science Council's Policies and Poisons study, the asbestos case is perhaps most indicative of the inadequacies of the Canadian regulatory process, both at the regulation-making and the compliance levels. Table 10 lists a fairly elaborate cast of regulatory characters, but it is clear that the regulatory process, thus far, has been simpler than the table would indicate. The evidence of regulatory inadequacies seemed, moreover, to be overwhelming, much more so than in almost any other case.

In one important sense the political economy of the asbestos regulatory process is much more focused than in the other cases, including radiation. The radiation regulatory process had a focus because there was one central agency (the AECSB). The asbestos regulatory process has had a focus primarily because it has been centred in Quebec and is rooted, both substantively and symbolically, in the political economy of Quebec. This is not to suggest that the current and future regulatory processes do not, and will not, involve actions in other quarters (federal, provincial, international), but the politics of asbestos has special meaning in the Quebec context.

In Quebec the asbestos industry contains the classic pattern of a foreign-owned, resource-based, hinterland-located industry producing for foreign markets. In the late 1940's the famous asbestos strike was a major historical point at which both a more secularized and militant Quebec labour movement emerged (centred in the CNTU), as well as the first stirring of what was, a decade later, to be known as Quebec's quiet revolution. It marked the beginning of the political careers of Pierre Trudeau and Jean Marchand. It is important to point out, however, that the asbestos strike was not about occupational health or hazards but about traditional collective bargaining rights, rights basically won in other provinces at a much earlier stage.

Occupational hazards were known at that time by the mining industry and by government officials to be associated with asbestos, but the political issues were centred on more immediate bread-and-butter union rights and working conditions.¹³

The CSN has since increasingly pressed for improved health standards, but did not elevate these issues to a top priority until

TABLE 10 - REGULATORY AND JURISDICTIONAL PARTICIPANTS IN THE ASBESTOS CASE

Federal Government

Department of National Health and Welfare (Health Protection Branch)
Department of Consumer and Corporate Affairs (Product Safety Branch)
Environment Canada (Air Pollution Control Directorate and Water Pollution Control Directorate)
Science Council of Canada
Department of Labour (Accident Prevention and Compensation Branch, Occupational Safety and Health Division)
Working Group on Asbestosis, Subcommittee on Environmental Health
International Joint Commission

Provincial Government

Quebec - Department of Social Affairs
Labour Department
Environment Protection Services
Commission des accidents du travail
Department of Natural Resources
Ontario - Ministry of Health (Occupational Health Protection Branch)
- Ministry of Natural Resources
- Ministry of Labour
- Workmen's Compensation Board
Other Provinces - variously through labour, health, worker compensation boards, and environment departments

Industry

Advocate Mines Limited	Hedman Mines Limited
Asbestos Corporation Limited	United Asbestos Co.
Bell Asbestos Mines Limited	Cassiar Asbestos Corp. Ltd.
Canadian Johns-Manville Co.	Quebec Asbestos Mining Association
Carey-Canadian Mines Limited	
Lake Asbestos of Quebec Limited	

About 40 other secondary users or manufacturers

Labour

La Centrale des syndicats démocratiques (CSA)
La Confédération des syndicats nationaux (CSN)
Les Metallurgistes unis d'Amérique (Metallos)
Le Syndicat des travailleurs unis de l'automobile, de l'aéronautique, de l'astronautique et des instruments aratoires d'Amérique (TUA-FTQ)
United Steel Workers of America
International Association of Heat and Frost Insulators and Asbestos Workers

Other

Beaudry Inquiry (Quebec)
Ham Commission (Ontario)
New Democratic Party
Montreal Gazette
Le Devoir
Toronto Star
Globe and Mail
La Chambre de commerce d'Asbestos
McGill University
Mount Sinai School of Medicine
Institute de recherches appliques sur le travail

very recently. In March 1975, the asbestos workers in the Thetford Mines area went on strike not only for the usual reasons of pay, but also to secure in their collective agreement a clause which would enable workers to stop work if the asbestos TLV in their work environment exceeded 5 fibres/cm³. The strike lasted for 7 months and the occupational health provisions were dropped as a settlement was reached on the eve of the federal imposition of wage and price controls in October 1975. In exchange for dropping the health provisions and in response to other pressures from Quebec labour, the Quebec government agreed to the establishment of the Beaudry Commission.

During 1975, the CSN had cited mounting evidence of regulatory inadequacies and neglect. It pointed out dust measurements taken by officials of the Ministry of Natural Resources in August 1974 which showed exposure rate several times above the 5-fibre level. The report was sent to the owners of the Asbestos Hill Mine but not to the unions or workers affected.¹⁴ The CSN had, earlier in 1974, received a study it had commissioned by a team of the Mount Sinai School of Medicine in New York under the direction of Dr. I. Selikoff. The study had shown strong links between asbestos and lung cancer not only among Quebec asbestos workers but also effects on the general population. The study was developed by the CSN to refute earlier epidemiological studies done at McGill University which had been funded by the Quebec Asbestos Mining Association. The McGill study had traced over 11 000 miners and millers who were born between 1891 and 1920 and who had worked for the two largest mines in the area for at least one month at any time before 1 November 1966. The cause of death appearing on each certificate of each of the 2500 of the above 11 000 who had died before 1966 was recorded. The McGill group concluded that their "findings suggest that our cohort of workers in the chrysolite mining industry had a lower mortality rate than the population of Quebec of the same age"¹⁵ although the lung cancer death rate for those most exposed to asbestos dust was five times greater than those least exposed.

Both the CSN and the surrounding Thetford community were suspicious and critical of the McGill study. The study is still cited by the Asbestos Mining Association in a recently published pamphlet, "Asbestos and Your Health". The recent Quebec experience illustrates some of the difficulties which may be caused partly by the incomparability of existing studies (such as the two above) and partly by absence of public research data which can be utilized. It should be stressed, however, that the mere existence of independent research is an insufficient condition for regulatory reform.

The bald economics of the Quebec asbestos regulatory process are central to any understanding of the standard-setting and compliance processes. When the Quebec government announced the standard of 5 fibres to be met by 1978, the Quebec Asbestos Mining Association director, Paul Filteau, agreed but suggested that it would be "unrealistic" to set the limit at 2 fibres, as in Ontario, because it would cost the companies too much.¹⁶ The profits of several firms were substantial in 1975 despite the 7-month strike. For the 1975 year, Asbestos Corporation had an operating profit of \$7.6 million, United Asbestos \$4.5 million. Cassiar profits for the first 9 months were \$7 million.¹⁷

Because unemployment has been higher in Quebec than in other parts of Canada, the Quebec labour movement has had to view the issues in the context of jobs and employment. These pressures are especially strong in company towns such as Thetford Mines where alternative employment is virtually non-existent. The economic stakes are thus extremely high and this has been reflected in the current standard being discussed by the Quebec government. In this direct occupational context the federal government has been a relatively passive bystander.

Both the interim report of the Quebec Beaudry inquiry, and the federal-provincial working group (referred to earlier) have been extremely critical of the Quebec and the total regulatory environment. The Beaudry interim report was critical in very explicit ways. The working group report was critical in more implicit ways.

The interim Beaudry report basically upheld the main thrust of the criticisms raised by Quebec labour in recent years; stating that:

"Working conditions in the asbestos industry, as much in the mines and mills as in processing plants, are not equipped with adequate means of keeping dust within levels safe to health. It is obvious after our study that technical means to ensure a healthy working environment do exist and are readily available."¹⁸

It also said that asbestos companies intentionally keep "available information about the dangerous effects of exposure to asbestos dust away from the workers and the unions".¹⁹ It severely criticized the existing inspection and compliance procedures and recommended that the exposure standard be dropped to 2 fibres/cm³. It asserted that:

"Une philosophie social sur le plan de la santé professionnelle doit transformer le concept fataliste et négatif 'due danger inhérent au travail' en une doctrine positive 'd'intégrité physique au travail'. En pratique, le travailleur ne doit plus se renfermer au travail et en revenir avec l'idée que son gagne-pain l'expose inévitablement à la maladie ou à l'insécurité physique; au contraire, il doit pouvoir exercer son 'métier' avec l'assurance que sa santé lui est assurée."²⁰

The Beaudry inquiry has been a valuable and open part of the overall regulatory process, but whether it results in major changes is still problematical since its recommendations must traverse the jurisdictional and political forces of the Quebec cabinet, and of the competing claims of the labour, natural resources, and social affairs departments as well as the environment service, previously noted in the vinyl chloride case.

The Report of the Asbestosis Working Group focused its criticism on the broader regulatory environment with emphasis on the general research and monitoring inadequacies. It stressed the following problems associated with the assessment of the incidence and prevalence of asbestos-related diseases in Canada;

- (1) no required registration of all asbestos workers at risk, but work categorization;
- (2) no required registration of industries and commercial establishments producing or using asbestos products;
- (3) no formal mechanism with responsibility for collection of data on occupational diseases;
- (4) no uniform requirement for notification of asbestosis and asbestos-related diseases;
- (5) no general requirement for autopsy/inquest on deaths of individuals known to be suffering from occupational disease (whether or not the occupational disease was the cause of death);
- (6) inability to link morbidity and mortality data with occupational histories;
- (7) lack of uniform reporting systems, regulations and procedures pertaining to workmen's compensation;
- (8) confusion in terminology, e.g. workmen's compensation grouping "asbestosis" under silicosis";
- (9) inadequate surveillance, with no general requirement for medical assessment (periodic examinations), particularly for those not employed in mining or milling operations;
- (10) poor standards of diagnosis at all levels of the medical profession;

- (11) lack of uniform methodology for assessing functional disability;
- (12) inadequate environmental surveillance of the asbestos exposure risk.²¹

The Quebec experience, and the asbestosis working group's litany of regulatory inadequacies, tells us much about the current regulatory process, but recent experience in Ontario with the new Matachewan plant illustrates other configurations of the asbestos political economy and different (though equally inadequate) regulatory processes.

b) The Matachewan Case

The United Asbestos Company's \$33 million plant at Matachewan, near Kirkland Lake, Ontario, was a major source of employment to the area. The workers attracted to the jobs were largely new to asbestos mining and therefore fairly ignorant about some of the hazards, at least until the United Steel Workers' central offices alerted them to the problems. The owners of the company, and the Ontario Ministry of Natural Resources were not new to the asbestos problems. The evidence of hazards, both from abroad and from Quebec, was overwhelming.²² The Ministry of Natural Resources had an initial role in approving the mine construction although this did not extend to all aspects of safety but focused more on electrical apparatus and other aspects of immediate physical safety. The Ministry implied that modern equipment was being used but the United Steel Workers are strongly suspicious that the mine owners used a considerable amount of old equipment purchased in Quebec and elsewhere.

In September 1975, the mine was visited by inspectors from the health and natural resource ministries. A report prepared by the health ministry inspector and sent to the resources ministry in October 1975 was extremely critical of the operation.²³ The report was apparently made available to the company but not to the union or workers concerned. Four months later, in late February 1976 the regulatory process moved to a broader public stage involving the NDP leader, Stephen Lewis, and the Toronto press. Lewis had earlier been in contact with Dr. Irving Selikoff, a major American authority on asbestos hazards, and had obtained a copy of the above noted health ministry report.²⁴

In response to Mr. Lewis's public charges, Natural Resources Minister, Leo Bernier, produced his own Department's readings taken on 29 September 1975 which he said showed that only two of 10 locations sampled in the mine had readings in excess of the 2 fibres/cm³ standard.²⁵ At this stage, Lewis seemed to have a clearer

understanding of local conditions in the mine than did the headquarters of the United Steel Workers. Communication between the union local and headquarters was initially affected by the newness of the workers and by their initial reluctance to create problems since many were on probationary employment arrangements with the company.

By late February 1976, however, the union was pressing for a major clean-up of the plant. On 8 April 1976, after improvements continued to be non-existent, the workers at Matachewan staged a "health walk-out".²⁶ In response to these developments, acting Health Minister Bette Stephenson said a letter had been sent on 2 March with a list of directives to clean up the plant or be closed. On 12 April the Ontario government, through the apparent personal intervention of Premier William Davis, ordered the plant closed after further tests showed no improvement (an average reading of 12 to 14 fibres).²⁷ Production was not to resume until an eight-page list of improvements and technological changes had occurred. Later in May 1976, a similar threat to close down another Ontario mine owned by Hedman Mines in Matheson, Ontario, was issued following high fibre count readings.²⁸

The media coverage of the Matachewan case was extensive. The NDP leader's leverage was increased by the existence of a minority government. The plant was closed down but again the closure must be seen in the context of the relatively weak position of asbestos production in the total Ontario economy. The Matachewan case illustrates the problems. It was a newly created plant (but with some apparently old equipment). The inter-agency problems of the two main ministries involved were resolved only through intervention from the top. Workers in a new plant have not only been exposed unnecessarily to hazards but, also had to bear enormous costs in bearing the burden of closure. Science, knowledge and research were not the immediate problem, although the non-disclosure of the inspectors' reports was.

The Ham Commission report devoted only a small part of its study to asbestos but pointed out that Ontario regulatory processes were clearly inadequate. It stated:

"The Mines Engineering Branch has not issued any code of requirements for dust measurement in the asbestos mines, although written instructions have been issued from time to time by the engineers of the Branch. The Ministry of Health, at the request of the Mines Engineering Branch, has periodically taken dust surveys. The voluntary system of dust measurement introduced by the Mines Accident Prevention Association (an industry association) was not, and has not been, applicable to the asbestos mines...".²⁹

Thus not even a self regulatory system about which the Ham Commission was so critical was in operation in the case of asbestos mining in Ontario.

c) The Federal Response

Because the immediate crisis problems were at the workplace mining level, beyond immediate federal jurisdiction, the federal role has tended to be more passive. Recent events in the asbestos regulatory process have generated concern at the federal level and all the main federal departments with a potential or existing role, Health and Welfare, Labour, Consumer and Corporate Affairs, and Environment have begun the process of reviewing the issues and changing regulations. There is ample indication that federal jurisdiction over selected workers, e.g. dockworkers, the use of asbestos in households (Consumer and Corporate Affairs), and other possible environmental hazards will require a more vigilant federal (and provincial) action.

In December 1975 the federal Department of Environment announced a standard of 2 fibres/cm³ in the air surrounding bestos mining, mill and dry rock storage operations. These standards were promulgated under the provisions of the Clean Air Act, after consultation with provincial governments. In the case of Quebec and British Columbia, these measures created a common paradox of regulation, namely that the workplace standard in these provinces is 5 fibres/cm³ (where research on hazards is well known) while the environmental federal standard is two fibres/cm³ (where research hazards is far less conclusive).

The federal Department of National Health and Welfare, in addition to developing its general study by the Working Group on Asbestosis, was also involved in the decision to ban blue asbestos in 1975 through the Hazardous Products Safety Act, administered by the Department of Consumer and Corporate Affairs. It has also been involved in analysis under the Food and Drug Act of the levels and distribution of asbestos dust in drinking water. A 1974 report to the International Joint Commission had shown high asbestos levels in water samples of large industrial centres bordering on the Great Lakes.³⁰

The processes of drafting regulations at the federal level have been characterized by considerable involvement of industrial spokesmen and scientific experts but little involvement of labour. Only in the most recent processes in 1976 for the development, by the Consumer and Corporate Affairs Department, of regulations for the use

of asbestos in secondary manufacturing products (as opposed to household use) have a few labour unions been consulted. This occurred only at the instigation of the unions themselves, not from the departments.

The federal Department of Labour has not been strongly pressured by the asbestos unions since the latter sees the provincial level as its focal point for pressure. Dockworker and other unions in the secondary asbestos field have not been particularly active, nor has the federal Labour Department made major regulatory changes, at time of writing.

CHAPTER V - LEAD AND OXIDES OF NITROGEN

1. Lead

As the reports by Dr. Stopps and Dr. Jervis and numerous other studies make clear, lead has been a known hazard for centuries and its immediate severe effects have been reasonably well regulated for some time.¹ What is less clear is the adequacy of the regulatory response in respect of the more subtle, sub-clinical and longer term health effects of lead. Both the direct and the indirect effects occur in the workplace and in the environment and greatly complicate the regulatory and jurisdictional issues and processes in Canada. This case study cannot possibly describe or evaluate all of the regulatory processes at the federal and at the provincial and local levels. To develop a reasonable understanding of these processes, however, we will present first a general description and analysis of the political economy of the regulation of lead, including the main jurisdictional actors, and then examine, somewhat more specifically, the "Toronto Lead Case" as an example of the regulatory and jurisdictional problems and processes.²

a) The Political Economy and the Regulation of Lead

A natural background level of lead exists in the environment. To this natural level man has added more lead exposure. Lead is released to the workplace and to the environment in the smelting of the ore to produce the metal, in the manufacture of lead into useful products and forms, and by the final user of lead when he or she discards it in a form no longer economically useful. The majority of Canadian lead and ore concentrates occurs in British Columbia, the Yukon, the Northwest Territories and New Brunswick (although it is mined in virtually all provinces). About 60% of all lead processed in Canada is exported. Secondary lead recovery is concentrated in Ontario (Toronto) with smaller amounts in Quebec, Alberta and Manitoba.³

By far the largest proportion of lead conserved in Canada is used in automobiles for lead-acid batteries and for chemicals including ethyl lead additives for gasoline. Other lead is consumed in the use or manufacture of brass, bronze and other alloys, solders, cable coverings, steel, pipe, ammunition, etc. These consumption patterns mean that automobiles are the largest single source of lead emissions despite the fact that much larger quantities of lead are handled in primary lead production. More people are exposed through automobiles than through any other source.

The pathways of lead absorption into the body are primarily through the air, as suspended particulate, and through the mouth. In the workplace the air is the most important pathway while in the general community the diet is the major pathway.⁴

These characteristics point to the fact that the regulation of lead (in comparison with most of the other hazardous substances being studied in the Policies and Poisons project) takes in far more diverse and scattered regulatory terrain. The existence of background levels, the dispersion of primary production, the general use and mobility of the automobile, and the technical dimensions of monitoring exposure, in multiple locations, presents difficult regulatory problems. These problems are compounded by the general feeling among regulatory authorities that lead is a problem generally under control and hence not as urgent a priority as might be imposed by other hazards.

The regulatory process is also complicated by the fact that the industry consists of several hundred firms in different parts of the country whose size ranges from General Motors to small, often very marginal, secondary battery manufacturers and users. Similarly, on the union side, there are a large number of unions whose workers are at varying degrees of risk. The economic circumstances of these numerous participants varies greatly and so do the health and safety standards of performance. For example, in contrast to most of the other hazards, there are some parts of the lead industry where the capital costs of entry are quite low and it is easier for some very marginal (albeit only a few) operators to function. Virtually every lead regulatory authority has had to deal with firms of this fly-by-night kind.⁵

The regulatory process is aided by the existence of such international and national bodies as the International Lead Zinc Research Organization, the Canadian Chemical Producers Association and the Canadian Battery Manufacturers Association. A vacuum exists, however, in that no such similar bodies have attempted to exercise influence on the labour side. Even if these bodies operated on both sides of the regulatory process, it is doubtful if they would provide adequate means of communication between regulators and the regulated. The industry is too diverse, and its political economy too varied to rely exclusively or even mainly on these formal associations.

Table 11 attempts to set out the regulatory and jurisdictional participants. Again it is important to stress that the table is selective insofar as provincial governments are concerned. We have listed Ontario and Quebec in somewhat more detail, since a complete listing for every province would merely lengthen the table without

adding much to our general understanding of the regulatory dynamics. Our analysis has also been aided by the fact that the Ontario situation has been recently analyzed in the Robertson report on the Effect on Human Health of Lead from the Environment.

In recent years the primary regulation-making activity at the federal level has been centred in the Department of the Environment's Air Pollution Control Directorate under the provisions of the Clean Air Act, and in the Ministry of Transport (MOT) under the Motor Vehicle Safety Regulations. The former has regulation-making responsibility while the latter has the main compliance responsibility. The compliance monitoring program is intended to ensure that all new motor vehicles offered for sale in Canada conform to current emission standards as certified by the manufacturers; MOT selects a representative sample of all vehicles for testing. The lead content of both leaded and unleaded gasoline has been specified by regulations under the Clean Air Act.⁶

Although considerable improvement in regulations has occurred the field compliance capability remains limited. The Department of the Environment (DOE) has limited personnel in this aspect as does the Ministry of Transport (MOT).⁷ Motor vehicle emissions are monitored at the provincial level, with the Ontario program being the most extensive.

The typical regulation-making process of DOE is to convene successive inter-departmental, federal-provincial and industry task forces to develop the regulations. Labour unions are rarely involved. Proposed regulations are then published in the Canada Gazette and 60 days are usually given for receipt of objections and/or opinion from interested parties. DOE relies on the Health Protection Branch of the Department of National Health and Welfare for advice on health effects and, as noted above, on MOT and the provinces for enforcement.

The processes and outcomes of federal-provincial regulatory activity have recently been criticized by parts of the lead industry. The proposed federal regulations for secondary lead smelter emissions have involved a conflict between the federal and the Ontario philosophies of environmental control, the former stressing control at source, and the latter stressing effect at point of impingement.⁸ Industry feels it has not been sufficiently consulted and that it is unfairly caught between standards and/or philosophies on which the two levels of government cannot agree. The secondary lead smelters situation is of course tied to the Toronto lead case (described below). At the level of regulation-making, however, the recent experience shows the advantages and disadvantages of federalism. On the one hand, industry has a right to expect co-operation and

TABLE 11 - REGULATORY AND JURISDICTIONAL PARTICIPANTS IN THE LEAD CASE

Federal Government

Department of Environment (Air Pollution Control Directorate,
and Water Pollution Control Directorate)
Department of Consumer and Corporate Affairs (Product Safety
Branch)
Ministry of Transport (Motor Vehicle)
Department of Labour (Occupational Safety and Health Division)
Department of National Health and Welfare (Health Protection
Branch)
National Research Council (Associate Committee on Scientific
Criteria for Environmental Quality)
Science Council of Canada (Policy and Poison Study)
Department of Agriculture

Provincial Government

Ontario - Ministry of Environment
- Ministry of Health
- Ministry of Labour
- Workmen's Compensation Board
- Environmental Hearing Board
- Local Boards of Health
Quebec - Services de protection de l'environnement
- Affaires sociales
- Travail
Other Provinces - variously through labour, health and
environment departments, and workers' compensation boards.

Industry

- Several hundred firms involved in: lead smelting and mining,
battery manufacture and use, automobile manufacture, gasoline
manufacture and use, secondary lead industry.
- Association of Canadian Lead Industries
- Canadian Battery Manufacturers Association
- International Lead Zinc Research Organization
- Canadian Chemical Producers Association

Labour

- United Steel Workers
- Metallurgistes unis d'Amérique
- Ontario Federation of Labour
- Manitoba Federation of Labour
- Saskatchewan Federation of Labour
- Labour Council of Metropolitan Toronto

Other

- University of Toronto, Institute for Environmental Studies
 - Environmental Law Association
 - The "Robertson" Committee to Enquire into the Effect on Human Health of Lead from the Environment (Ontario Ministry of Health)
 - Chemical Institute of Canada
 - Toronto Board of Education
 - City of Toronto Planning Board
 - Toronto Board of Health
 - Toronto Newspapers
 - Stephen Lewis, New Democratic Party
-

co-ordination between levels of government so that it has some predictability in its operating environment. On the other hand, some degree of federal-provincial competitiveness may work to force a higher standard of technology and safety. It is to be noted that, as with other areas of regulation, the involvement of labour in the development of secondary lead smelter standards was virtually non-existent.

Some other aspects of federal involvement in the regulation of lead are somewhat more established. Since 1969 the Food and Drug Directorate has routinely monitored both total diet samples and particular food samples for lead and other contaminants. Responsibility for the regular monitoring of lead in drinking water has been left largely in provincial hands despite the fact that it could be viewed as a food under the Food and Drug Act. The extent of provincial monitoring of lead in drinking water at the point of use varies greatly from province to province and community to community. The federal Department of Consumer and Corporate Affairs, through the Hazardous Products Act, has prohibited the sale, advertising or importation of kettles and ceramics that release amounts of lead in excess of prescribed standards. The "lead in electric kettles" standard arose out of American studies and resulted in an immediate response by the Department of Consumer and Corporate Affairs.

The federal Department of Labour utilizes ACGIH guidelines on lead for industries under federal jurisdiction. The exposure to lead in occupational areas such as welding, ship repair and railways is considerable, but the lead problem has been largely regarded as a low priority issue. As noted in Chapter II, the Labour Department's own inspection capability is quite limited, and is heavily dependent on provincial inspection capability.

As the study by Franson and Lucas points out, standards for lead in the workplace and in the environment are in place in all provinces although not all are in direct regulatory form.⁹ In some provinces the preference is for guidelines utilizing ACGIH standards. The regulation-making processes involve informal, usually closed, processes of consultation. Normally consultation is with industry although the degree of consultation with labour is greater if the regulatory authority is a labour department, e.g. as in the three prairie provinces. Provincial regulatory spokesman as well as labour union representatives stressed that compliance and enforcement are the main problem.¹⁰ The degree of overall provincial concern also varies according to the extent to which the lead industry is important in the province concerned. For example, Saskatchewan has a very small direct lead industry whereas Manitoba has a considerable lead industry, both directly and indirectly.

The Robertson report in Ontario illustrates some jurisdictional problems at the provincial level. The degree of departmental dispersal of responsibility for regulating the workplace is greater in Ontario than in many provinces. However, the Ontario problem of jurisdiction between the health, labour, mines and environmental departments, especially as they seek to bridge the workplace and the environment, is quite typical of most provinces (other than Saskatchewan). The general professional opinion is that Ontario's environment Ministry is the most capable and well-developed of the provincial environment ministries and thus the environment versus workplace linkages are weaker in most of the other provinces (though obviously far from ideal in Ontario either).

The Roberston report cited the jurisdictional malaise which made it difficult to identify responsibility.¹¹ It properly linked these to difficulties in providing for the citizen any central point of access to secure information and action. It also sought clarification of the citizens' right to be informed about health effects in the workplace. Since the Robertson report was commissioned by the Ontario Health Ministry, it is not surprising that jurisdictionally it opted for centring the administrative machinery in the Ministry of Health. The Ham report on the safety of workers in mines identified similar problems but carried its conclusions and analysis to a much more catholic and logical conclusion.¹² It suggested that organizationally the focus should be on the Labour Ministry, but that behaviourally, regulatory reform had to be in the workplace with a judicious mixture of legal compulsion and labour-management operation. Both reports stressed the absence of adequate research and monitoring.

The Robertson report on lead, and the Ham report on health and safety in mines are themselves important aspects of the recent regulatory process both on lead and in the more general context. They do not always result automatically in change, but they do reflect the value of public inquiry and scrutiny.

The Toronto Lead case also warrants a brief presentation and analysis since it brings to bear a larger number of regulatory actors and processes; industry, labour, community groups, scientists, local officials, public hearings, the media, and the courts, than has previously been the norm. Its advantages and disadvantages as a normal regulatory process can be usefully illustrated.

b) The Toronto Lead Case

The Toronto Lead case began in June 1972, when a citizen complained about dust from a nearby secondary lead smelter falling on his

backyard table.¹³ The chronology of the main events in the case have been set out in some detail in a recent 1975 unpublished paper made available to the Science Council by the Toronto Board of Health.¹⁴ This chronology is presented below and is augmented by further information on the events in the cases that have occurred in 1976. The case focused on lead emissions from three secondary lead smelters in Toronto and on the elevated blood lead levels in children and adults living in the vicinity of the plants. The companies were Toronto Refiners and Smelters Limited, Canada Metal Company Limited, and the Prestolite Company, referred to as plant A, plant B, and plant C. Plants A, B and C are located in different parts of the city but their smoke stacks are all located very close to residential areas. Plants A and B played a major role in the events of the case, while Plant C played a smaller role.

Plant A operates a smelting and refining process to produce ingot lead and lead alloys from spent automobile batteries. Lead emissions originate from the processing equipment and the yard operations. Plant B manufactures lead and lead alloys for solder and lead oxide for eventual use in batteries and as paint and ink pigments. The lead is derived from the melting of scrap battery plates in a blast furnace. Lead emissions originate from the blast furnace building and from the lead melting and alloying operations. Plant C manufactures lead-acid batteries. The required lead is purchased in pig form. Lead oxide is made on the premises and lead emissions occur similarly to Plant B.

The provincial Ministry of the Environment in July 1972 issued a "stop order" to Plant A to close down part of the battery top crushing operations. The first interest group to be actively involved was a residents' association in the area of Plant A. After numerous communications with various government officials, the association approached the Toronto Board of Health at a meeting in January 1973. A municipal alderman from the plant A area, Daniel Heap, and counsel for the Canadian Environmental Law Association, David Estrin, appeared to support the requests of the association. Dr. D. Parkinson, involved with blood lead level testing at the Hospital for Sick Children, also presented a submission on the need for epidemiological studies to be undertaken on residents in the plant A area. The Toronto Board of Health had embarked upon what was to become a major role in the issue.

In early March 1973 the Board approved of a working group of six physicians to initiate blood testing for lead levels in residents of the plant A area. On 22 March after lengthy meetings with involved groups including legal counsel for plant A, the Board decided to utilize its legal option and gave notice to plant A that stock-piling of raw materials and partially processed residue in the

yard constituted a nuisance under The Public Health Act R.S.O. 1970 s. 94(1). The company was ordered to abate the nuisance within 14 days.

On 26 March 1973, the Ministry of the Environment sent a communication to the Board that plant A was complying with a Ministry programme. By 16 April the Board also received a communication from the legal counsel for plant A referring to the Certificate of Approval of operations by the Ministry of the Environment. The Board decided to eliminate the abatement order and requested the Ministry of Health to handle the case and to make inspections. The Board also asked the Ministry of Labour for information and assistance about blood lead level testing of labourers in lead plants.

On 2 May the Minister of Health stated to the Board that it was difficult to determine whether a nuisance existed from just a visual inspection. He recommended that it would be profitable to continue the blood lead testing underway by the physicians from the Public Health Department, Ministry of Health, Hospital for Sick Children, and University of Toronto. Once the results of these tests were compared with the changes in company operations then the lead contamination could be appropriately reduced. Such comparisons could not be undertaken until at least August. The Ministry of Labour deferred the matter to a later date.

The first request for scientific research was made in April 1973 to a special research group from the Institute for Environmental Studies at the University of Toronto by Toronto residents in the Plant A area. They requested an independent analysis of the lead levels in the soil, vegetation, and dustfall around the residences in the area. The researchers tested for lead in the areas of plant A, plant B, and at a control site. After a second request by local residents' associations for further lead testing, the group conducted a programme of lead analysis of hair and blood samples from residents of a control area. A summary of these tests was made available in September 1973 to the government of Ontario, the lead companies, the local Board of Health and the residents' associations. At the request of the Board of Health, the results were quickly made available by November in the form of two reports.

Blood tests were conducted from 14 May to 15 June on 266 persons by the six physicians from several groups.

In early July 1973, the Ministry of the Environment lifted the "stop order" on plant A, stating that the plant had met the required changes. At the same time, the preliminary results of the blood tests, which had been sent to a United States laboratory, started to arrive. A special meeting on 13 July 1973 was called by the local

Board of Health. The City Council adopted the motion put forward by the local Board of Health to instruct the city solicitor to apply for a Supreme Court order for abatement under Section 96(1) of The Public Health Act R.S.O. 1970, for plant A. The Board approached its first scientific consultant, a lead toxicology expert, Dr. J. Chisholm from Johns Hopkins University medical school, to assist in the Board's application to the Supreme Court.

The unpublished report by the Institute brought to light the lead levels in the plant B area. By 15 October, 720 persons had volunteered for blood lead testing in the plant area. By 19 October, the lead companies had hired as consultants Dr. H. Sachs, former director of a lead clinic in Chicago and Dr. Dick, head of the Chemistry Department at Sir George Williams University. They both publicly stated that the blood lead levels reported to date were not cause for alarm. Dr. D. Barltop, from the University of London, was later hired by the companies as a consultant.

On 27 October, after the results of the 720 blood samples were received which at first showed that at least three residents had unacceptably high readings, a branch director of the Ministry of the Environment issued a "stop-work order" to plant B. A "stop-work order" can be issued under The Environmental Protection Act R.S.O. 1971 (EPA) when a branch director believes "on reasonable and probable grounds" that a contaminant constitutes "an immediate danger" to human life, health or property. The company immediately appealed the order and the Supreme Court lifted it on 30 October. The judge stated that three high levels out of 720 did not constitute an emergency situation.¹⁵ The lead companies called on various consultants to testify; the Ministry of the Environment did not call any testimony.

The Ministry of Labour was called into the issue at this point in connection with the effect of the plant B shutdown on workers. It was discovered that workers in the Province have no financial protection if their companies are closed by the Ministry of the Environment. The strict interpretation of The Employment Standards Act R.S.O. 1970 did not force companies under "stop orders" of the EPA, passed in 1971, to have to financially compensate the workers. Amendments to the Act were made by the Ministry of Labour by 5 December to comply with the EPA regulations.

At this time, an opposition party leader, Stephen Lewis, criticized the new amendments because they did not extend to The Public Health Act or any other legislation that could directly or indirectly cause work stoppage. At this same time, plant C area and residents were being tested for lead levels.

In late November and early December 1973, presidents, vice-presidents, consultants, and legal counsel for the lead companies, Ministry of Environment representatives, and scientific experts from the Institute were attending the local Board of Health meetings.

In late November, the Ministry of the Environment announced the appointment of a 10-man inter-ministerial working group on lead to assess the data collected on lead levels in Toronto, to determine the effect of these levels on public health and to recommend studies to the Ministry. The working group studied the lead content of the air and soil around three secondary lead smelters and two battery manufacturers and compared it with selected control areas. The working group compared blood lead levels in persons in the lead plant areas and in the control areas and found a strong correlation between proximity to smelters and elevated body burdens of lead.¹⁶

In early January 1974 Ann Johnston was appointed Chairman of the local Board of Health. Daniel Heap, alderman in the plant A area was appointed a new member, along with Dr. D. Parkinson from the Hospital for Sick Children who was appointed the mayor's representative. All three members had been previously involved and were to continue to receive considerable media coverage as spokesmen for the local Board of Health.

In late January 1974 the CBC was served an injunction by plants A and B to halt broadcasting of a radio programme entitled "Dying of Lead". The companies stated that parts of the programme implied improper conduct on the part of the companies which they claimed to be erroneous. Parts of the script were then appropriately deleted. The programme dealt with lead in the general environment with specific attention being focused on the lead issue in Toronto. The injunction issue dominated events for the next month. In late February, the injunction was lifted but the companies appealed the case to the Supreme Court. A newspaper article which pointed out and discussed the radio programme deletions caused its writer and the newspaper to be brought to court for breaking the injunction, along with the writer and producer of the radio programme and the CBC. By this time, an opposition party leader, Stephen Lewis, demanded a Royal Commission inquiry into the Ministry of the Environment and its conduct in all matters relating to lead pollution.

In late February, the Board of Health hired another expert, Dr. B. Carnow from the University of Illinois, to examine existing data on lead from the affected areas. By this time citizens' associations from all three plant areas were actively involved in the events.

While the legal and procedural sparring between the lead firms and the Ministry of the Environment continued, the Ministry of Health, early in 1974, established a three-man committee headed by Locke Robertson to conduct a general inquiry into the effect on human health of lead in the environment. The Robertson committee reported in October 1974. There was no public participation in the committee's study process. Its report concluded that there was little evidence of direct lead poisoning but expressed concern about possible sub-clinical effects.¹⁷ As already mentioned, the report also criticized the lack of a central jurisdictional authority.

On 2 April Dr. Carnow presented a report on his analysis of the lead data to the local Board on Health. On 19 April the Medical Officer of Health presented a report on "New Standards for Ambient Air Lead" containing new lead emission criteria. On the same date the Board recommended an intensive epidemiological study to be carried out in accordance with the recommendations of Dr. Carnow. The Medical Officer of Health was authorized to conduct blood tests of all children up to age four who lived within a radius of one mile of the smelting plants.

Five residents' associations, in conjunction with the Labour Council of Metropolitan Toronto and plant union representatives, produced a brief on the control of industrial lead pollution. The brief was presented to the Ministers of Health, Environment and Labour on 2 May 1974.

In December 1973, the Air Resources Branch of the Ministry of the Environment prepared a report of findings to date on lead in the environment in the vicinity of secondary lead smelters in Toronto. The report was issued in late January 1974 by the chairman of the new working group on lead. The report had been mainly intended for internal use but the Medical Officer of Health had received a copy. The report was made public in the legislature by Hon. W. Newman on 10 June 1974. The Ministry again received severe criticism for withholding the report until this time. The local Board of Health members were also upset that they had not seen a copy of the report.

On 20 June 1974, the local Board of Health, Ann Johnston, Daniel Heap and Dr. D. Parkinson received notice of legal action to prevent them from having any future role in matters related to plants A and B, on the grounds of bias, exceeding jurisdiction and lack of notice to the applicants of Board meetings.

In July, a newly formed Canadian Lead Association presented a brief to the government claiming that the lead issue had been over-dramatized. The brief disagreed with the Labour Council for

aligning itself with residents who were considered by the Association to be biased and subjective. The brief asked that no programme should be forced on lead companies until they were proven to be the source of the elevated blood lead levels and that no legislation be enacted until the relationships between dustfall and human health was established.

In the latter part of August the results of a study financed by plants A and B were made public. At the same time the report of the working group on lead was published. The final Institute for Environmental Studies report was published in October. The Robertson report commissioned by the Ministry of Health was published in late October.

The uncertainty of the research findings, the criticism by both community groups and the industry that opportunities for public involvement had not been provided by either the working group or the Robertson committee, and perhaps a general unwillingness to take any more precipitous action, all seemed to be factors which prompted the Ontario cabinet to submit both reports to the Environmental Hearing Board (EHB). The EHB held intermittent public hearings from January to October 1975.

The EHB hearings brought forward a frequently raucous, but nonetheless important, public debate about the issues. Briefs were received from unions, industry, public interest groups (such as the Consumers' Association of Canada and the Environmental Law Association), local community groups, and local government bodies such as the City of Toronto Planning Board, the Toronto Board of Health, and the Toronto Board of Education. The hearings were extensively covered by the local media, especially the press. The full range of views and perceptions of the problem were in evidence.

Industrial spokesmen continued to challenge the conclusiveness of the data and research and were critical of the calibre and methods of some of the environment department inspectors.¹⁸ Public interest groups urged immediate control and clean-up measures, better zoning laws, and more open access to government studies and information. The Toronto Board of Health expressed its quite legitimate exasperation at the lack of a single or central regulatory authority. The Board also pointed out the vulnerability of its own members who were the objects of legal suits by the smelters for alleged bias. Board members did not enjoy the freedom from prosecution which is extended to local medical officers of health. Union spokesmen stressed the need to enshrine legally and enforce the workers' right to be given information on health effects and tests, and of the compliance steps taken by companies. Labour was also insistent on the need to have the monitoring of lead emissions become

a government rather than a company responsibility.¹⁹ Local community groups pressed for immediate clean-up measures and also criticized the hearing process itself as a stalling device.²⁰

The EHB reported in May 1976. Its recommendations have led to the creation of a steering committee which will oversee the stripping of polluted soil from residential properties. The steering committee will include officials of the Environment Ministry, the City of Toronto's Board of Health and Planning departments, industry officials, and community groups.²¹ The EHB recommended that the lead industries be required to replace cover soil having more than 3000 ppm lead in publicly accessible areas until further research on the bio-availability of lead in soil is carried out. This standard was adopted despite evidence in the Toronto epidemiological study that there was a statistically significant increase in blood level of residents in areas where soil was 600-1000 ppm lead.²² The fate of other EHB recommendations on lead is uncertain at time of writing but will undoubtedly be affected by the larger framework provided by the release in August 1976 of the Ham commission recommendations on mine health and safety (and occupational health).

The EHB's recommendations gave evidence of an attempt to seek a middle ground between the industry and the other groups involved in the controversy.²³ For example, rather than recommending that the companies be required to use backup baghouses as suggested by the Working Group, the EHB took the position that the companies should be allowed to meet the standard by whatever means they prefer.²⁴

With respect to jurisdictional issues the EHB rejected the idea of creating a separate new control agency for regulating toxic substances. It suggested instead a strengthening of the Standing Committee on Occupational and Environmental Health, a general review of existing legislation, and the establishment of the Ministry of Health as the "unequivocal" lead agency.²⁵ On compliance issues the EHB urged the need for better interdisciplinary training programs for inspectors, the need for joint ministerial inspections, and closer government-industry consultation.

The Toronto Lead Case is still unfolding but some tentative observations can be offered. First, the case shows the need for some definitive public authority which can subject existing analysis to critical public scrutiny, conduct analysis, and makes its findings publicly available as a matter of right to all parties. Both the court case and the public debate demonstrated this need. This should not suggest that the mere presence of more definitive and more public research and data will eliminate conflict. The case shows the natural bargaining positions which each party will take. It shows that the resolution of some conflicts may be aided by better

independent public analysis, but that the resolution of others must depend on other forms of legal compulsion and incentive.

The need for openness is amply demonstrated, but the case also shows the need for a more normal and less raucous (but still open) process where companies, unions, community groups, and public authorities can deal with, and resolve, real problems backed by both publicly stipulated rules of the game and a larger measure of goodwill. The EHB phase came far too late in the regulatory process.

The media played a central role in the Toronto Lead Case although it was largely a reactive role. The unpublished paper referred to earlier generally gave the media high marks. As the case unfolded, the media, especially the Toronto press, gave increasingly detailed accounts of the scientific controversies as well as the political and economic manoeuvres.²⁷

The case also demonstrates the need to develop compliance and regulatory mechanisms which involve local participants, including the specific companies, unions, community groups, and local government officials. The lead case illustrates the strong convergence of interests that should emerge between unions and community groups when a hazard affects (as do most hazards eventually) both the workplace and the local or even the broader environment.

In general, both the Toronto Lead Case and the broader examples of lead regulation illustrate that there is little room for complacency and much room for real regulatory reform that produces observable results both in the workplace and in the environment.

2. Oxides of Nitrogen

The reports on the scientific and medical aspects of oxides of nitrogen indicate that there has been much less medical and scientific concern about its direct and secondary effects on humans than about the other five hazards examined in the Policies and Poisons Study.²⁸ The hazard is similar to lead insofar as it is diffuse and pervasive in nature, and is related to the automobile as the primary source of the pollutants. If anything, it is an even more diffuse pollutant than lead, since oxides of nitrogen occur wherever internal combustion occurs.

The degree of attention by researchers and the degree of knowledge about the effects of exposure to oxides of nitrogen seem to be greater on the environmental side than on the workplace side, despite the fact that the earliest known populations to be at risk

were welders and agricultural silo workers. Smokers are also at risk since NO_x is produced by smoking, particularly some brands of cigarettes. On balance more is known about direct environmental hazards than about direct workplace hazards, or about the secondary environmental effects in which oxides of nitrogen are linked to the formation of ozones.

The Political Economy of the Regulation of Oxides of Nitrogen

A natural background level of NO_2 exists in the environment. To this natural level man has added more exposure to oxides of nitrogen. Because the hazard arises primarily from internal combustion processes, oxides of nitrogen are, in a very direct sense, endemic to the modern industrial economy. Fortunately, direct control of the hazard is aided by the fact that NO_2 has a strong pungent smell, and by the fact that carbon monoxide and other combustion gases are usually created concurrently thus necessitating proper ventilating processes.²⁹ Thus devices to control the latter help control the former. In this sense also it can be argued that the hazard is known by the industries and unions involved with internal combustion technology.

In almost every other respect, however, the hazards of oxides of nitrogen are by far the least known to the general political process including industry and unions. The diffuseness of the political economy, and thus the greater political difficulty in legitimizing oxides of nitrogen as a high priority hazard, is illustrated by the pattern of emissions for the hazard. Almost half of the emissions arise from gasoline engines, especially those utilized by motor vehicles. About 25% are accounted for by emissions from industrial and commercial stationary fuel combustion sources, from utilities, and from power generation. Another significant amount arises from industrial and municipal solid waste disposal, from petroleum refineries and nitric acid industrial processes.³⁰

The industry consists of thousands of firms, including a significant proportion of public or state enterprises (especially in power generation). The firms range in size from industrial giants like INCO and the oil companies to very small firms, and are distributed throughout the 10 provinces.

The hazard has been perceived much more as an environmental hazard and hence the role of unions has been limited, if not non-existent. The United Steelworkers of America and the Oil, Chemical and Atomic Workers unions have complained from time to time about inadequate compliance in the use of diesel powered vehicles in underground mines, but, generally speaking, the unions have not been actively

concerned about oxides of nitrogen.³¹ Railway and airline unions, for example, have not been actively involved, despite the potential workplace and environmental hazards of oxides of nitrogen.³²

The union standpoint generally reflects the context in which oxides of nitrogen are viewed. The hazard has generated scarcely any media attention in comparison with other hazards such as radiation, mercury, and asbestos; oxides of nitrogen are simply not perceived to be a major hazard. The regulation of it has, therefore, been a fairly quiet close-to-the-vest affair.

Table 12 shows, that, in general terms, the formal cast of regulators for oxides of nitrogen, is similar to that of lead. The Canadian regulatory response has been focused on the automobile through the federal Clean Air Act. As noted earlier in this Chapter, the Clean Air Act is a general federal statute administered by the federal Department of the Environment, but with major monitoring and compliance responsibilities resting with the federal Ministry of Transport and the several provincial environment ministries or agencies. Through a process of industrial task forces and federal-provincial committees, a national air quality objective for nitrogen dioxide was established in the early 1970's.³³ There was virtually no union involvement and only limited involvement by consumer groups.

The federal maximum acceptable level is 0.21 ppm for one hour average, 0.10 ppm for a 24-hour average, and 0.05 ppm for a one year average. This standard was based on and derived directly from studies of NO₂ levels in North American cities and from a 1970C hat-tanooga study on effects on school children. The Ontario and US objectives are similar. The longer term federal "maximum desirable level" is 0.03 ppm for a yearly average. In August 1976, new "tolerable" ranges were proposed which "require abatement without delay to avoid further deterioration of conditions to an air quality than endangers the prevailing life-style, or ultimately to an air quality that poses a substantial risk to public health".³⁴

The federal Air Pollution Control Directorate of the Department of the Environment co-ordinates the assembly of national monitoring data, and the surveillance and monitoring is carried out by the federal MOT (in respect of motor vehicles) and by provincial environment agencies. Data with respect to NO_x began to be published only in 1973 since a higher priority had to be given other emissions such as carbon monoxide and hydrocarbons. Gradually more and more provinces have begun NO_x monitoring programs. By the end of 1975, 44 cities were being regularly monitored for a number of emissions including NO₂.³⁵

TABLE 12 - REGULATORY AND JURISDICTIONAL PARTICIPANTS IN THE OXIDES OF NITROGEN CASE

Federal Government

Department of Environment (Air Pollution Control Directorate)
Ministry of Transport (Motor Vehicle Branch)
Department of National Health and Welfare (Health Protection Branch)
Department of Labour (Occupational Safety and Health Division)
National Research Council (Associate Committee on Scientific Criteria for Environmental Quality)
Science Council of Canada (Policy and Poisons Study)

Provincial Government

Primarily Environment, Health and Mines departments

Industry

Thousands of firms involved with internal combustion, including automobile, electric power generation, oil and chemical industries

Unions

Numerous unions including United Steel Workers of America, Oil and Chemical and Atomic Workers Union, Railway Brotherhoods

Others

Canadian Environmental Law Association
Chemical Institute of Canada
Canadian Welding Development Institute
Ontario Research Foundation
Pollution Probe

At this general environmental level there seems to be considerable confidence among regulators that the hazard is under control and that the degree of compliance is good. Aggregate data on emission levels are published but it is difficult to say what kinds of action are taken, or should be taken when readings in particular cities exceed the objective. The objectives are just that and seem to have limited legal effect. Prosecutions of individual automobile owners have taken place but the application of the standard to the general community (entire cities) is not clear.

The level of regulatory concern and response on the workplace side is difficult to judge. On the one hand labour departments and mines departments can be said to be dealing with the direct toxic effect of NO_x when they deal with related ventilation requirements for carbon monoxide and other emissions from internal combustion processes. Thus the federal, and most provincial labour ministers deal with NO_x in this indirect way. On the other hand, they have not, to date at least, perceived NO_x to be a hazard deserving of particular attention on its own accord. Nor have these ministries been pressed by labour unions to behave any differently. There is also little evidence of pressure to conduct more research on the specific workplace hazards of oxides of nitrogen.

In summary it can be said that oxides of nitrogen have not been generally perceived to be a high priority hazard and where concern has been expressed about their hazardous effects there appears to be confidence, at least with respect to automobile sources, that the hazard is being reasonably well monitored. For those knowing of the political life histories of other hazards, this apparent sense of quiet normality may itself be cause for concern, particularly when combined with the fact that, on the research front, we have large gaps in our knowledge about the secondary and synergistic effects of oxides of nitrogen.

CHAPTER VI - MERCURY

Mercury is a metal widely distributed, usually in forms and amounts that are not harmful. It has, however, been known to be extremely harmful in the redistributed and more concentrated forms which result from industrial and subsequent biological processes.¹ As the other Science Council reports on the scientific and medical aspects of mercury point out, the harmful effects of mercury were first impressed on the modern industrial world in the early 1950's when fishermen and their families around Minimata Bay in Japan were stricken by a mysterious neurological illness. Since then, high mercury readings have been found among farmers utilizing grain seed which had been treated with mercurial fungicides. Wildlife had been similarly affected by the eating of grain seed. In 1970, high mercury concentrations were discovered in fish in Lake St. Clair, resulting in restrictions on the sale of fish in Canada.

Mercury has therefore been a known hazard for some time. It is at one and the same time a hazard of the workplace and of the environment, in that not only is it used in traditional workplace production facilities, but it also directly affects those whose workplace is the environment, e.g. fishermen, Indians, hunters, guides, etc. The Canadian response to this hazard will be briefly examined, first by placing the mercury question in the context of its political economy and then by analyzing the regulatory response. Finally we will examine the Grassy Narrows and White Dog Reserve case as a specific case study in the regulation of mercury.

1. The Political Economy of Mercury Regulatory Processes

Mercury is used primarily in chlor-alkali plants in the production of chlorine and caustic soda from a salt solution. In 1970, 32% of the mercury emissions (about 82 tons) were accounted for by the 15 chlor-alkali plants, located primarily in Ontario and Quebec.² Mercury compounds are also used in agriculture as fungicides and as seed treatments. Significant emissions also occur in petroleum combustion, paints, refuse incineration and in the recovery of zinc, copper and lead. The direct mercury industry is therefore reasonably diffuse in total, but the chlor-alkali industry has been the focal point for recent regulatory politics and action.

The larger firms in the chlor-alkali industry, such as Dow Chemical, Domtar, Cominco and the Dryden Chemical Co. (a subsidiary of Reed Paper), have all encountered different configurations and have different economics in the age and economic value of their plants and in the adoption of their production technology. Once the mercury issue emerged in Canada in 1970, Dow felt itself able to convert fairly quickly to new chlor-alkali production technologies, whereas Dryden Chemical had not begun to convert until 1975 - 5 years after the hazard was clearly known. The CIL plant in Hamilton, and the Dow plant in Thunder Bay closed down in 1973.³ The compliance philosophies and practices of the Federal Department of the Environment under the Fisheries Act have been to differentiate these differing production economies on a firm by firm basis. There is much ground for criticizing this excessive flexibility in that it establishes both the fact and the appearance of a regulatory process far too closely aligned with industry.

The 1972 mercury emission standards in chlor-alkali plants significantly improved the situation and reduced the level of emissions, but the relative political weakness in those sectors which might otherwise counterbalance direct industry influence has reinforced industry's influence on the regulatory processes and practices. Table 13 for example, lists organizations representing the tourist outfitters and resort owners, as well as fishermen associations, as part of the "industry". In a sense, of course, they are, but they are clearly not in the same industrial league. They are generally very small operators whose degree of political influence is weak in relation to firms like Dow and Dryden Chemical.

A further political weakness exists in that, unlike the other five cases examined in the Policies and Poisons study, there has been very little direct and strong union pressure, despite the fact that workers in pulp and saw mills, for example, are at risk. Some union concern has obviously been present but not as a matter of high or urgent priority. The one "union", or more accurately general interest group, which has operated, albeit with only limited influence, has been the Indian associations and groups, particularly the National Indian Brotherhood and the Treaty No. 3 Indians of the Grassy Narrows and White Dog Reserves, and, in Quebec, the Grand Council of Crees of Quebec. No understanding of the mercury regulatory process can make sense except in the context of federal and provincial policy toward Canada's native population and of the political emergence of the native population and its severe and quite warranted mistrust of white politicians, bureaucrats and industrialists.

The final report of the Department of National Health and Welfare's Task Force on Organic Mercury in the Environment, completed

in December 1973, showed the extent to which the Indians at the Grassy Narrows and White Dog Reserves in Ontario had had their entire life and economy altered by the impact of industrial policy and practice, including the mercury hazard, and how federal and provincial authorities had not responded to the total social context in which the mercury hazard had to be viewed. It is worth quoting the report directly, both to stress this context and to serve as background to our later analysis of the Grassy Narrows and White Dog case.

"In approximately 1962, the Grassy Narrows people were relocated a few miles south-east of their former location, whereas the One Man Lake people were moved to the White Dog Reserve about 1956. They were moved because the Ontario Hydro wanted to flood the One Man Lake area. The shifting of these two bands of native people changed a contented and pleasant way of life to one of frustration and bewilderment. Three very significant factors seem to be the cause of the problems which fell on these people and they will be told here in sequence as they happened.

"First, the reminiscence of a life which was enjoyed by the people must be told. This life was lived prior to relocation and before the damaging consequences of pollution and the closure of the fishing waters, which affected the livelihood of the people. The life was enjoyed by the people in their own habitat and environment. The problems which came about in recent years, in the form of welfare and non-employment, were unknown in former times. The natural resources, on which these people depended, and their people before them, such as game, fowl, and fish were plentiful. So were the other necessary natural foods such as wild rice and blueberries. To augment the accumulation of all necessary natural foods, many people of both bands grew such vegetables as potatoes, cabbages, turnips, corn, carrots, and tomatoes. These were grown in amounts sufficient to last the winter season and were stored in carefully made storing pits in the ground. Want was little known in those years for these people. As was the custom, if a family went in need, there was always a friend to help. The Indian people had no other methods of preserving meat, fish, berries, etc. than their own way.

"Within areas near to hunting and trapping, some families acquired a good source of living from the trapping and

selling of furs. It was the custom of some of the trappers to move to the trapping areas for the winter and bring in their furs periodically during the trapping season.

"One of the main sources of food supply was fish which was processed into forms of fillets and smoked and stored. Sturgeon was a principal source of food. Such was the state in the way of these people when relocation was suddenly imposed upon them.

"There is no need here to repeat the proposed changes and compensations which were promised to these bands upon the final transfer of their communities as these have been recorded elsewhere. Because of a happening not foreseen and unavoidable perhaps, the two bands underwent a very trying experience of having to lose way of life (that of fishing for a living), and the discouragement resulting from the adverse effects of mercury contaminated fish in the rivers where these people previously did their fishing. The commercial fishing was curtailed. Affecting another line of livelihood was the closure of tourist camps where many of these particular people were employed. With these two sources of income cut off, and with no immediate alternatives to replace them, one could only imagine the lost feeling these people experienced."⁴

Table 13 lists the regulatory and jurisdictional participants in the mercury case. The perception of the hazard as being largely an environmental hazard is reflected in the absence of direct roles for labour departments, although clearly they could be much more actively involved since it is also a workplace hazard.

The federal role is centred in the environment, health and welfare, agriculture and Indian affairs and northern development departments. The Department of Regional Economic Expansion (DREE) deserves specific mention since in the Grassy Narrows and White Dog case DREE was involved with the Ontario government in providing Reed International (the parent firm of Dryden Chemical) with incentives to expand its operations, while the issue of tougher standards and new production technology was being negotiated. Thus, although DREE is not a regulatory department, in a direct sense, it clearly influenced the political climate in which regulation and compliance took place in the early 1970's.

TABLE 13 - REGULATORY AND JURISDICTIONAL PARTICIPANTS IN THE MERCURY CASE

Federal Government

Department of Indian Affairs and Northern Development
Department of National Health and Welfare (including Task Force
on Organic Mercury in the Environment)
Department of Consumer and Corporate Affairs
Department of Environment (Fisheries and Marine Service and
Environmental Protection Service)
Department of Agriculture
Department of Regional Economic Expansion
Science Council of Canada
International Joint Commission

Provincial Government

Ontario - Ministry of Environment
- Water Resources Commission
- Ministry of Health
- Ministry of Natural Resources
Other Provinces
- Primarily environment and health ministries but also
resources, tourism ministries

Industry

Dow Chemical
Dryden Chemical Company
Dometar Limited
Lake St. Clair Commercial Fisherman's Association
Northern Ontario Tourist Outfitters

Interest Groups and Others

Treaty No. 3 (Grassy Narrows and White Dog Reserves)
National Indian Brotherhood
Grand Council of Crees of Quebec
Kenora Social Planning Council
Minimata Disease Patients Alliance
New Democratic Party
House of Commons Standing Committee on Fisheries and Forestry
University of Saskatchewan
University of Rochester Medical School
Canadian Broadcasting Corporation
Globe and Mail

At one level of action, the governmental regulatory response has been fairly swift, at least in comparison with some of the cases described in earlier chapters. At first, the Japanese and Swedish experience had little impact. Early concern in Canada seemed to arise after studies in Canada had been conducted first at the University of Saskatchewan and then at the University of Western Ontario. The latter study, prepared by a PhD student from Norway, showed a high mercury level in fish near the Dow Chemical plant.⁵ In March 1970 the federal government closed Lake St. Clair, the St. Clair River, and the western basin of Lake Erie to fishermen. The Ontario government ordered Dow Chemical to cease its mercury discharge. Dow did so and gradually changed its production to non-mercury processes. Since then the monitoring and control program of the Environmental Protection Service and the Fisheries and Marine Service of Environment Canada has shown a marked decline in mercury levels found in fish in Lake St. Clair, albeit still generally above the acceptable limits.⁶ Similar reductions have also occurred in western Canada.⁷ Later, tests in northern Ontario showed high mercury levels in the Wabigoon and English river systems, downstream from the Dryden Chemical plants (to be discussed as a case in the final section of this Chapter). In March 1971, the Ontario government also launched a \$25 million damage suit against Dow Chemical of Canada. The suit has still not been heard, partly because of the need to assemble complex documentation, and partly because of the problems of legally proving that Dow was responsible for the pollution in Lake Erie and the Detroit River.⁸ While this delay has gone on, the other private suits have been held back because of the government control of any evidence for its own case.

The federal government seemed to defer politically to provincial (particularly Ontario) authorities. It did not intervene when the Manitoba government's effort to prosecute Dryden Chemical under a Provincial statute was struck down by the courts because Manitoba could not sue a company located in Ontario.⁹ In 1972, the federal Environment Minister enunciated a "polluters must pay" policy, and confidently said that "we have caught our mercury problem in time".¹⁰ At the same time, Environment Canada, in consultation with the industry, developed new chlor-alkali regulations under the Fisheries Act. The regulations limited emissions in any day to .005 pounds per ton of chlorine product.¹¹ In 1976, new regulations have been proposed to limit emissions to 5.3 g/1000 kg of chlorine.¹² The 1972 regulations require a reporting system to be carried out by the companies. There is no requirement that these reports be made public. Environment Canada has its own monitoring capability but it must also rely heavily on provincial departments for other enforcement and inspection capabilities.

A further area of fairly swift federal response was in regulating the use of mercury in treating seed and grains. In 1970

the Department of Agriculture banned the sale of mercurial seed dressing products. Earlier, the practice of colouring mercurial treated grains had been adopted. Grains are regularly inspected at major terminal elevators. Some mercurial products can still be used in the cultivation of vegetables but agricultural policy is to eliminate these as soon as suitable substitutes become available.

The Foods Directorate of the Health Protection Branch of the Department of National Health and Welfare has exercised jurisdiction over mercury under the Food and Drug Act. In 1971 it issued a guideline in consultation with the Department of the Environment forbidding the sale or consumption of fish containing more than 0.5 ppm of mercury. Compliance and monitoring is the responsibility of the Inspection Branch, Fisheries and Marine Services of the Department of the Environment.

Federal action has also occurred under the Hazardous Products Act. The Governor-in-Council, on the advice of the Department of Consumer and Corporate Affairs' Product Safety Branch has banned the use of any compound of mercury that might be used as a decorative or protective coating for children's toys or equipment. Recently action under the Ocean Dumping Control Act, administered by the Department of the Environment, forbade the discharge of mercury into coastal waters. Compliance practices in this aspect of regulating mercury are too new to judge effectively.

Apart from the above regulatory action, the federal response has been largely in the realm of research and analysis and in the provision of incentive grants and tax write-offs (for pollution equipment). The role of the Department of Indian Affairs and Northern Development has been equally ambivalent. Despite its mandate, it has had little direct regulatory control. It has been involved in programs aimed at educating Indians about the dangers of mercury and has also funded alternative fish supply and food programs for Indians affected by mercury pollution. It has also agreed to assist in the costs of litigation that may be undertaken by native groups. As we shall see in the Grassy Narrows case, the Department has attempted to use its control over national parks as a further instrument of control. These extremely indirect ways of involvement have served to reinforce a growing alienation between Indian groups and the Department.¹³ Although department officials feel that they have genuinely tried to develop better consultative mechanisms, this is not generally perceived to be the case by the Indian associations and their view of the Department as a paternal bureaucracy is sustained.

The Department of National Health and Welfare has acted as health adviser to Environment Canada and has responded to the Grassy Narrows and White Dog Reserve situation, as well as to that in the

Quevillon area of northwestern Quebec, by sending health teams and task forces.¹⁴ The 1973 Task Force on Organic Mercury in the Environment was a departmental initiative, but the report itself was not made public until long after its completion. It urged further clinical tests on the populations at risk, that better means of participation in future programs by local native people was required, and that the federal government should institute a "program of economic and social development" which would consider new avenues of employment.¹⁵ It also pointedly referred to a need to have an unrestricted flow of information and data on mercury between federal and provincial scientific groups and individuals, a condition which had not existed and still apparently does not exist.

It is difficult to judge the degree of follow-up to these recommendations. Clinical tests on Indians with high blood mercury levels have been conducted, under federal-provincial co-operation, in Ontario and Quebec. These tests were made public. A January 1976 study by Dr. Tom Clarkson was also commissioned (and made public) following further readings in both northern Ontario and northern Quebec which continued to show high blood levels of mercury.¹⁶

At the federal and provincial levels, a considerable amount of jurisdictional confusion and timidity has been in evidence. The Ontario Government 4th Report of the Mercury Task Force (21 March 1973) noted:

"Just as varying arguments and opinions are proffered as to the reasons for the social situation of the Indians, it may be equally unclear as to where related responsibilities lie in terms of appropriate government agencies assuming responsibility for and administering corrective measures. It may be suggested, logically, that the federal government is responsible for the most part for the general conditions... and that Ontario should deal only with the mercury pollution aspects. But this segment of the overall complex situation cannot be separated easily, and its rectification involves consideration of the whole social situation."¹⁷

The situation in other provinces is only marginally better than that in Ontario. Manitoba, as noted above, attempted to respond through its Fisherman's Assistance and Polluters Liability Act. In Quebec, the James Bay project has resulted in direct negotiation of native land claims and compensation, and in an agreement with the Grand Council of Crees of Quebec which included specific funds for research and monitoring of the mercury problem. It should be stressed that in the Quebec case the degree of political cohesion among the Crees was much greater than that in evidence between the bands at White Dog and Grassy Narrows.

2. The Grassy Narrows and White Dog Reserves Case Background

The members of the White Dog and Grassy Narrows Indian Bands in northwestern Ontario have traditionally derived the greater part of the protein in their diets from fish caught in the Wabigoon and English Rivers. Many band members have also been employed in commercial fishing and as fishing guides for tourists in the area. In fact, fishing has been an integral part of the native way of life in the area for generations.

In 1970, the Ontario Water Resources Commission, in one of its routine water quality checks, reported high levels of methyl mercury in fish taken from these rivers.¹⁸ The Honourable George Kerr, Minister responsible for the Commission, made the warnings public and named the Dryden Chemical Company, a subsidiary of Reed Paper Company, as the source of the pollutant.

The way in which the methyl mercury was introduced into the river system was by the use of mercury in the paper manufacturing process. In the manufacture of paper products, conditions are extremely favourable to microbial growth. Such conditions include an abundant supply of nutrients, such as wood fibre, in an atmosphere of high humidity and high temperature. If the microbial growth is uninhibited, large accumulations of slime build up, filters and sieves become clogged and the dislodged slime becomes incorporated into the pulp. When the pulp is rolled into paper, the slime leaves discoloured and weakened areas in the paper. These areas cause the rapidly rolling paper to rip and the machines to break down. The quality of the paper produced is also inferior. Various compounds of mercury can be added to the pulp as a slimicide and inhibitor of fungal growth. Generally speaking, the compounds remain in the finished paper to prevent subsequent deterioration. In the US, because of potential toxic effects, the FDA has banned the use of these slimicides in any paper product intended to come in contact with food. After the paper manufacturing process is complete, the methyl mercury is discharged along with other waste products into the river system.

Another source of mercury contamination in the paper-making process relates to the bleaching methods used. Caustic soda and chlorine compounds are usually used as the most simple and least expensive bleaching agent. Some plants produce both these chemicals on site. The continuous mercury cathode-cell method is commonly used. Caustic soda produced may contain up to 7 ppm of mercury. This is lost through the flushing process into the river system, although some can remain in the final product.

Various mercury compounds occur naturally in rock formations, and the atmosphere, and some natural mercury can be found in rivers as a result of leaching. Natural biotic processes will tend to ensure that traces of mercury are found in most plant and animal life. The quantities are small and clearly not harmful. Industrial processes such as the ones at the Dryden Chemical plant on the Wabigoon tend to concentrate mercury on the river beds. Biotic processes at work in the river concentrate mercury compounds in the plant life on which the fish feed. The fish in turn further concentrate the compounds. When a diet is excessively dependent on fish, the mercury levels accumulating in the blood can be extremely high.

After the OWRC warnings were made public, the inhabitants of the White Dog and Grassy Narrows Reserves were told not to eat fish. No alternative source of protein was suggested. Not surprisingly the warnings were largely ignored. Resort operators in the area became alarmed and, within a few months, Barney's Ball Lake Lodge was closed because of possible danger to guests and guides. A second lodge followed suit within a few weeks. The Ontario Ministry of Natural Resources which controls the licensing of commercial fishing under the Fish and Game Act, began erecting posters throughout the area exhorting "fish for fun but do not eat". The assumption that fishermen would throw back their catch proved to be unfounded. Also, the Ministry of Industry and Tourism became concerned over the adverse effects such advertising was having on tourism. Within a short time the signs were removed and the Ministry of Natural Resources instead rubber-stamped fishing licenses with a warning that the fish were a possible health hazard.

In February 1972, the Director of Environmental Health for Ontario wrote to one camp operator saying that it was quite obvious that eating fish from the English River would be hazardous to the health of camp guests. After receiving this letter, Barney Lamm (the owner of Barney's Ball Lake Lodge) sued the Dryden Chemical Company for \$3.7 million. This action is still before the courts. The government of Manitoba banned commercial fishing in the Winnipeg River and in Lake Manitoba and began a program under the Fishermen's Assistance and Polluters Liability Act, of compensating the fishermen whose livelihoods had been affected. Manitoba also launched a suit against Dryden Chemical claiming \$2 million in damages. This suit was dismissed because of the jurisdictional problems of Manitoba suing an Ontario firm for damages allegedly occurred in Manitoba.

A number of indirect consequences are generally believed to have resulted from the contamination of the Wabigoon and English Rivers. Unemployment on the two reserves has jumped from 20% to 80% since the danger was made known. This statistic is widely quoted in the press but the cause and effect relationship has yet to be demonstrated in a rigorous way. The high incidence of violence and

violent death among native people in the area is often linked by the media to the high levels of mercury found in blood samples taken from this population. From a medical point of view, violence and aggression are symptomatic of mercury poisoning. Here again, media accounts are highly speculative. The specific links have yet to be established in a satisfactory way.

The amount of mercury contamination determined by the OWRC as early as 1970 was 30 times the acceptable level. By 1973 the amounts in fish were even greater and the blood samples taken from members of the White Dog and Grassy Narrows Bands had concentrations of up to 300 ppb (100 ppb is considered the basis for a diagnosis of Minamata disease in Japan).

Dr. Peter Newberry was commissioned by the National Indian Brotherhood, through a grant from the Department of National Health and Welfare, to conduct a study of the situation. He reported that "he is now convinced that the first stage of a Minamata epidemic at Grassy Narrows has already begun". Also, Dr. Tadao Takerichi, a pathologist at Kumamoto University examined the "brains of cats who died after eating fish from the river system and he found that the cats' brains were ripe with cellular destruction from mercury."¹⁹

The Canadian Medical Association Journal of 6 March 1976, considered the question of mercury poisoning on the two reserves and said:

"The question (of) whether some Canadians are being poisoned by mercury is not easy to answer but there is sufficient evidence that methyl mercury is harmful and that some Canadians do have unacceptably high whole blood concentrations of mercury. Because of the possibility of mercury-induced irreversible brain damage, the current situation demands our full attention. Action is required. Officially, we need a mature philosophical approach to the management of environment problems of which mercury contamination is but one... Canada lacks the aggressive environmental philosophy of a country like Sweden which puts teeth into its environmental legislation and muscle into the actions required."²⁰

What becomes clear from this and other evidence is that the Indian population at the White Dog and Grassy Narrows Reserves is in substantial danger from previous as well as future consumption of fish caught in the Wabigoon/English River system. Given the economy of two reserves, it is also clear that any ban on fishing must be accompanied by an alternative source of protein and/or income to purchase protein alternatives. Under the circumstances, government has been under considerable pressure to deal with the situation.

Politically this pressure was led by Stephen Lewis, Leader of the New Democratic Party.²¹

On March 8, 1973, it was reported that the government of Ontario had sent a letter to the Indian residents of the two reserves saying:

"From this measurement and our conversations with you there is no suggestion that mercury is affecting your health but experts on the effect of mercury would agree that your level is somewhat too high and that as a safety precaution it would be wise to lower it."²²

Needless to say, the Indian leadership of the area was not satisfied with the government response. The various governmental agencies involved in health, environment, natural resources, and Indian Affairs have all responded to what they considered to be their own area of responsibility within the overall problem. As one Toronto paper described it:

"A Task Force (of experts within the Ontario government) recommendation that people who depend on the fish as a source of protein receive help in replacing the fish with a non-contaminated fish or other food of equal dietary value has been rejected by Bernier (the Ontario Minister of Natural Resources) on the grounds that, 'We do not want to set up a bread line up there.' He explains that mercury pollution isn't really his problem as Minister of Natural Resources anyway - he is responsible for fishing and non-renewable resources - it's a problem for Health Minister Richard Potter. 'No', says Potter, his responsibility is to, warn people about the dangers of indulgence but not to stop them from eating fish and besides, Indians are the responsibility of the federal government.' A spokesman for the Department of Indian Affairs in Ottawa says 'there will probably be some top level advice from Ottawa when discussions now underway with the two Indian Bands are completed.' 'One reason we are not able to do more is that the Provincial Government is not always helpful.' And while we all procrastinate, the Indian gets screwed. Bernier, Minister of Natural Resources, agrees. He says 'the reason I commissioned the Task Force in the first place was to bring all these bloody Ministers together. The departments were running around, each going their (sic) own separate directions.'"²³

The confusion and frustration evident in the quotes outlined above, are clearly a major indication of the inadequate regulatory response.

Late in 1975 the Ontario government and the federal authorities created a Joint Task Force to review the problem once more and recommend a co-ordinated solution. At the time of writing, the recommendations had not been made public. However, the Globe and Mail on 21 June 1976, published the main items as follows:

1. that the Wabigoon/English River system be closed to fishing. In particular this would protect the (Indian) fishing guides who are the population most at risk;
2. that a clinical and epidemiological study of the White Dog and Grassy Narrows Bands along with a control group, be made at once;
3. that realistic tolerance levels for mercury be medically established;
4. that the most severely contaminated river-bed sediment be removed by dredging as is being done in Minamata Bay;
5. that legislation, making possible citizen-initiated legal action against polluters, be passed;
6. that a politically autonomous Institute of Environmental Health be established; and
7. that any continuing discharge of mercury, however small, be stopped.²⁴

Again, the frustration of politicians was publicly evident. Frank Miller, Ontario Minister of Health, is quoted as saying:

"I have come closer to quitting politics over this issue than anything else. I get so frustrated." ... "There is a tremendous desire for politicians to do what appears to be a solution but I don't think that closing the river to stop fishing would save one Indian."²⁵

In a similar vein, René Brunelle, the chairman of cabinet and the Ontario Minister responsible for native affairs, rhetorically asked,

"(do you) honestly think that no-one is going to fish and that no-one is going to eat any of these fish in those contaminated waters" (if the government prohibits fishing?).²⁶

The jurisdictional morass necessitated a special meeting of the appropriate federal and provincial ministers which was held on 9 July 1976. Also present at the meeting were the President of the Grand Council of Treaty No. 3, two spokesmen for the Northwestern Ontario tourist operators, and a representative of the National Indian Brotherhood.²⁷ A direct meeting between the relevant ministers and the groups concerned may be the only way to resolve certain jurisdictional conflicts and might serve as a model to be used more frequently. It is doubtful, however, that meetings at this level should be necessary, or would be utilized frequently, since it would be an admission that regular co-ordinative mechanisms do not

work. The ministerial meeting resulted in a federal proposal that a new national park be created to provide the framework for a renewed social economy for the Indians of the Grassy Narrows and White Dog Reserves. A new national park would presumably take several years to develop.

The Indian groups' reaction has been mixed. The idea clearly does not coincide with the proposals submitted by the two reserve councils to the ministers of the Ontario government at a meeting on 29 September 1975. In their memorandum, the Indians accused the government of Ontario and Reed Limited of poisoning their food and water supply and of destroying their way of life. They demanded (a) that the reserves be declared a disaster area and that a federal-provincial action group be established to have the power to allocate funds on the local level for measures to protect health, and to restore socio-economic well being; (b) that the river system be closed to all fishing - commercial, sport and food; (c) an immediate declaration in principle that the government of Ontario is willing to enter into negotiations with the band councils to provide compensation; (d) that legal action by the government of Ontario against the polluter commence; (e) that immediate action to clean up the environment of the English/Wabigoon River system be taken; (f) that a long-term epidemiological survey of the populations be directed by the Research Department of the Hospital for Sick Children in Toronto; (g) that the collusion among the various levels of government and Reed Limited cease, and (h) that any abrogation of Indian rights be rectified.

The Indians have also urged the concept of community ownership and control and that more monitoring and inspection programs should be carried out by Indians.²⁸

The political realities of northwestern Ontario are as complicated and as immune to rational understanding and analysis as is the case anywhere else. The difficulty of reconciling these realities to the rational administration of existing programs is immense.

The pulp and paper industry is in reality and in popular perception a mainstay of the regional economy. The companies insisted that pollution abatement would threaten their profitability and ultimately their capacity to continue as local employers. The Indian population is less articulate at the local political level and has neither the votes nor the ability to mobilize the votes to improve its position. A racial bias exists in the Kenora area against Indian people. Its origins have nothing to do with the influence of Indians on this issue. Also important is the role of the local MPP. He is also the Minister of Natural Resources and is therefore in a very high profile position in the area. Virtually all

major economic activity in the area is dependent on the programs administered by his Ministry. The major employers depend on his Ministry's timber leases, mining licences, and crown land allocations.²⁹ His position vis-à-vis the activities of the ministers of Highways, Government Services, and others, make the reality, and even more importantly the perceptions, of his influence most important. He is often referred to as the "Czar of the North". His relative lack of enthusiasm for aggressively resolving the mercury problem is undoubtedly caused by these local political factors and thus inhibits the enforcement of existing regulations.

The economic interests of Reed International have also been central to the case. Reed International is an English owned and controlled multi-national corporation. It is one of the largest producers of paper and paper packaging products in Europe, and also has a publishing and printing business which includes the London Daily Mirror. It has 80 000 employees throughout the world, of whom 17 000 are outside England. Besides its international status and power, Reed owns and controls Dryden Paper Company and Dryden Chemicals Limited in Dryden. Reed's Canadian holdings are its biggest foreign operation, and it owns or has substantial interests in four other Canadian companies. According to the Annual Report of 1974, Reed pays the wages of 2834 employees in Quebec, 4653 in Ontario and 2056 in British Columbia. Geographically, its operations are located in northwestern Ontario, an area heavily dependent on it because of the limited opportunities for alternative employment. The company has also been the recipient of DREE grants and is thus a vehicle of both the federal and provincial governments' regional economic development programs, a factor which cannot help but influence their overall regulatory response in the mercury cases. Dow Chemical changed its production technology in a year, but Dryden Chemical did not change until 1975 despite the fact that the superior technology was available.

Next to the asbestos case, the regulation of mercury tends to demonstrate the most serious inadequacies among the six cases being studied. Although some response has clearly occurred, the regulatory response to the needs of the group most directly affected, Canada's native population, has been grossly inadequate. The regulation of mercury is thus intricately linked with the general policies respecting native policy, and the resolution of land and other native rights.

CHAPTER VII - CONCLUDING OBSERVATIONS

Two forms of concluding observations will be presented. First, we shall comment on the most important tendencies or generalizations about the regulatory process which seem to emerge from the six case studies and from the literature on occupational and environmental health, including the recently published Ham and Beaudry Commission reports. Then we shall present some observations about possible areas of regulatory and jurisdictional reform in each of the areas discussed below. Thus it is important to stress that the suggestions for regulatory reform are derived partly from the case studies and partly from the evidence of the literature and the interviews conducted by the author.

Case studies have inherent limitations as a basis for developing generalizations, even when six cases are analyzed. It is difficult, moreover, to find precisely measurable criteria for regulating regulatory results to regulatory process. The relationship between the two is a seamless web rather than a set of discrete means and ends.

The cases, literature, and interviews in total however, have been persuasive, at least in this author's view. Most officials, union leaders and businessmen concede that there are serious inadequacies in both regulatory process and performance. The need for more knowledge about risks, for greater openness and participation in the regulatory process, and for a more precise system of accountability and responsibility in the regulatory process is overwhelmingly evident. So also is the need to place a far greater burden of proof as to risk on the economic unit introducing the hazard.

Table 14 attempts to portray, in summary form, the author's assessment of the main regulatory factors in the six case studies. It presents a ranking (by the author) of the rough degree (high, moderate, low) to which factors operated in each case. The subjective nature of these rankings means that the views expressed can only be regarded as tentative. Nonetheless, it is precisely such relative judgments that ultimately characterize most of the regulatory decision-making processes. It is hoped that the table will help others evaluate the cases. The main factors identified are the degree (high, moderate or low):

1. of clarity or focus of government jurisdiction;

2. of concentration of the hazard in a small number or in particular provinces;
3. to which the hazard is viewed to be a workplace hazard;
4. to which the hazard is viewed to be an environmental hazard;
5. of union involvement;
6. of industry involvement;
7. of media involvement;
8. of public interest groups' involvement;
9. of academic involvement;
10. to which causal knowledge is lacking;
11. to which control technology is lacking;
12. of compliance capability by regulatory authorities;
13. of reliance on international and foreign standards and agencies;
14. of general openness of regulatory processes.

Brief observations on each of these factors will be presented along with some of the possible areas of regulatory reform associated with, or arising from, each factor.

1. Jurisdictional Focus

The cases illustrate the considerable jurisdictional confusion that exists within and among governments, which is accentuated by the regulators themselves. Only in the case of radiation has there been a central focus and a fairly clear jurisdictional authority, namely the AECB (although AECB's performance respecting uranium miners has been grossly inadequate). There is ample evidence to indicate that the recent provincial trend toward consolidating regulatory authority over the health and safety of the workplace in labour departments needs to be continued and accelerated. Labour departments ought to be the most natural locus for such authority since the human concern for the health of the worker ought to be the paramount operating principle. Similarly, there is ample evidence to indicate that federal regulatory authority ought to be focused more on the federal labour department, except perhaps in the radiation field where efforts to consolidate the AECB's role are already underway.

The processes of governmental organizational change have always had to respond to calls for the elevation of new functions and values to a higher level of priority. The glaring inadequacies of the current system in most jurisdictions suggests that, organizationally, putting old wine in new departmental bottles can have an important impact in persuading regulators to act more cohesively and to perceive their constituencies in different ways.

Functional consolidation will obviously not be enough. Regular inter-agency mechanisms will still be required. In

particular it is essential that both senior and operating level inter-agency committees on occupational and environmental health be created or strengthened in all eleven governments to help bridge the workplace and environmental aspects of the regulatory equation.

2. Degree of Concentration of Hazard in Provinces

The asbestos case, and perhaps also the mercury case, illustrate the extent to which the regulation of a hazard is influenced by the degree to which an industry (in which the hazard is located) is concentrated in one or two provinces. It is obviously difficult to generalize on the basis of only a few cases, but it seems that the federal government is much less aggressive in exercising whatever political and regulatory muscle it has when the hazard is concentrated in one province, particularly if the province is Ontario or Quebec. It seems to be politically, and perhaps philosophically, easier for the federal government to intervene when the hazard is a nationally dispersed one rather than a provincially concentrated one. Undoubtedly, constitutional factors influence the postures adopted, but the federal reticence displayed in the asbestos and mercury cases seems to be more readily explained by historic balances of political power in the Canada-Quebec-Ontario political triangle.

This study, for very practical reasons of time and resources, has tended to focus on Ontario and Quebec. However, it is important to stress a point made in Chapters I and II regarding the degree of regional and provincial disparities that exists in the capacity of provincial governments to regulate effectively. Both the numbers and the qualification of regulatory staff, particularly in the less wealthy provinces, need to be upgraded. Federal incentives to aid training and education may help remove at least part of this disparity in public administration. More open policies of disseminating information on hazards would further assist this process.

3. Union, the Workplace and the Responsibility System

The Ham Commission in Ontario properly placed the highest emphasis in its report on how labour unions and individual workers have been largely excluded from what the report called the "responsibility system" for regulating occupational health. The six cases studied in this report overwhelmingly confirm this view, although they give some evidence that more union participation has been recently sought out by regulatory authorities. Among the six cases, union interest and pressure has been greatest in the radiation and asbestos regulatory processes. The cases also show that the more a hazard is perceived to be an environmental hazard the less has been labour's interest and

TABLE 14 - SUMMARY OF REGULATORY FACTORS FOR THE SIX CASE STUDIES

	Radiation	Vinyl Chloride	Asbestos	Lead	Oxides of Nitrogen	Mercury
1. Degree of focus of government jurisdiction	XXX	X	XX	X	X	X
2. Degree of concentration of hazard in province	XX	XX	XXX	X	X	XXX
3. Degree to which hazard is workplace	XX	XXX	XXX	X	X	X
4. Degree to which hazard is environmental	XXX	X	X	XX	XX	XXX
5. Degree of union involvement	XXX	X	XXX	X	X	X
6. Degree of industry involvement	XXX	XX	XXX	X	X	X
7. Degree of media involvement	XXX	X	XXX	XX	X	XXX
8. Degree of public interest group involvement	XXX	X	X	XXX	X	XXX
9. Degree of academic involvement	XXX	X	XX	XX	X	XX
10. Degree to which causal knowledge is lacking	X	X	X	XX	XXX	X
11. Degree to which control technology is lacking	XX	X	X	X	XX	X
12. Degree of compliance capability by regulatory authorities	XX	X	X	X	XX	X
13. Degree of reliance on international and foreign agencies	XXX	XXX	XX	XX	XX	XXX
14. Degree of openness of regulatory process	X	XX	X	XX	X	XX
Code: XXX High XX Moderate X Low						

involvement. The reverse is true for the environmental and public interest groups.

Both the cases and the literature illustrate the compelling truth that the regulation of both occupational and environmental hazards should begin in the workplace. The bald realities of the production cycle and industrial economies make this so. Hence it follows that regulatory reform and the reform of the responsibility system must begin there too. Labour and management are at the core of the system, and effective regulation depends on their joint co-operation based, however, on an institutional background in which both parties possess the necessary political, economic and legal "carrots and sticks". The carrot and stick are necessary because there is little evidence to indicate that benevolent co-operation is itself a sufficient condition for regulatory success (although it is a necessary condition).

Thus, to complement the previously suggested consolidation of governmental regulatory authority, it is essential that a regulatory and legal policy based largely, though not exclusively, on the main features of the recently adopted Saskatchewan, Alberta and Manitoba legislation be adopted both provincially and federally. This would incorporate:

- a) compulsory labour-management health and safety committees with a capacity jointly to monitor compliance with regulations and to resolve other issues of health and safety that occur in the plant;
- b) the right of workers to refuse to work, without financial penalty, if they feel that the work environment endangers their health;
- c) the right to receive information on compliance or other conditions of health produced by or with regulatory authorities and management; and
- d) legislated standards as opposed to guidelines.

The above features of the responsibility system will help ensure a more balanced sense of responsibility and involvement from those most directly affected by industrial hazards. They could also help to avoid, or at least restrain, the need for a larger army of inspectors. Thus philosophically, politically, and practically the above workplace regulatory reforms warrant adoption in Canada.

Such reforms will obviously not come easily since attitudes and even the ideological stereotypes possessed by labour, management, professional regulators, and politicians take time to adjust and conform to new pressures and realities. Occupational health issues are in one sense part of the second historical phase of the reform of industrial relations. The first phase dealt with traditional economic needs and the right to bargain collectively. The second and

current phase is concentrated on concern for overall industrial democracy, including economic health rights and how to take them out of the raw bargaining environment in which they have been historically (but regrettably) lodged.

4. Industry, Economics and the Responsibility System

The six cases illustrate quite clearly that investment trade-offs between capital and labour are central in determining how quickly industry will respond to demands for more rigorous standards and for the necessary installation of new production technologies. The age and economic value of existing production technology, the absolute profitability of the firms and the relative profitability of other firms, the demands and pressures of foreign parent companies, all enter the calculations of individual corporations (including state-owned enterprise) as to how rapidly they feel they can invest in new safer production technologies.

Industrial spokesmen are reluctant to discuss their response in these blunt economic terms. Far more often, and to their own detriment, they cloak their arguments in the politics of research by arguing almost ritualistically that there is insufficient causal knowledge or that the technology is not available. Although in some instances there may be genuine scientific and technological dispute, the six cases tend to show that lack of causal knowledge and/or production technology is not the main problem, nor is it the real reason for most industrial responses.

The Canadian industrial system consists of capitalist enterprise and considerable state enterprise and regulatory intervention. There can be no doubt that the political system based on liberal democracy legitimizes and encourages a large area where market forces predominate. A majority of Canadians, at least as expressed through electoral politics, generally agree with and support this system. Immediate reform proposals, moreover, will be considered in the light of this system. Given this fact, it is all the more surprising why many firms and industries have been reluctant to discuss their response more candidly and have consistently permitted themselves to be seen as the villains of the piece.

The behaviour of some firms has been inexcusable on any grounds, but there are clearly some difficulties for industry-wide responses. Governments usually have to regulate on an across-the-board basis. They cannot usually have different regulations for different firms (although they have certainly been known to adopt different compliance schedules for different firms). Thus, to develop general regulations governments usually seek out, partly

through industrial trade associations, a regulatory base that will meet most of the circumstances of most of the firms in that industry. There is obviously, however, considerable discrepancy in the relative economic state of different firms and thus enormous pressure is exerted to adopt the lowest common denominator of standard or compliance technology. These practical issues are frequently underestimated both by critics of industry and by regulators.

5. Media Involvement

In the six cases, media interest and involvement have been high in radiation, asbestos, lead and mercury and low in the other two cases. That the role of the media is important to the regulatory process seems obvious. Although regulators and industry are extremely suspicious of the media and often accuse it of distorting or simplifying reality, it is this author's view that the media have far more frequently revealed the truth than obscured it.

It is also clear from the six cases, as well as from interviews, that workers and individual citizens usually first hear about hazards and subsequently learn more about them through the media, particularly the press. There can be no doubt therefore that a vigorous media is essential to further regulatory openness and reform. The capabilities of different newspapers and other media in this regard vary greatly, however, and thus there is considerable room for greater investment by the media to develop journalists, and science writers, who can work full-time in the occupational and environmental health field.

6. Public Interest Group Involvement

The degree of involvement by public interest groups has been highest in the case of radiation, mercury, and lead, and low in the case of vinyl chloride, asbestos and oxides of nitrogen. Generally speaking, as noted earlier, the public interest groups have expressed greater concern about environmental hazards than about workplace hazards. Surprisingly, they have tended not to seek out alliances with labour unions or to see their interests as being closely related. The Toronto lead case showed some collaboration and, more recently, individual labour leaders have begun to align themselves with the National Indian Brotherhood over the mercury issue.

Many public interest groups now find it somewhat easier than five years ago to obtain co-operation from regulatory officials but they remain very critical of the general absence of openness, and of proper forums through which their views might be expressed. The

Ontario Environmental Assessment Board, whose predecessor, the Environmental Hearing Board, was called in belatedly to hear the Toronto Lead Case, has no real counterpart at the federal level or in most of the provinces. Even in the case of radiation, where there is a central regulatory authority, the AECB has not generally (despite recent improvement) embraced public participation. Indeed there is no direct legal requirement in the Atomic Energy Control Act that public hearings must be held in the regulation-making or licensing processes.

In Chapter I two models of the regulatory process were discussed, the "professionally open" and the "democratically open". Although some movement has occurred in Canada toward the second model, the regulatory process still operates overwhelmingly in the context of the first.

That current mechanisms of, and attitudes toward, public participation are inadequate seems patently clear. Public hearing processes will consume the time and energy of regulatory authorities but there can be little doubt that the case studies demonstrate the need for more legally enshrined requirements for hearings both to improve public trust of the regulatory process, and to improve the substantive effectiveness of regulatory outcomes.

The question of the relative efficacy of departmental and so-called "independent" commissions as forms of regulatory organization can be related both to public interest group involvement and to the openness of the process. It was stressed in Chapter 1 that there is no ultimate magic in organizational forms. The history of regulation, however, is replete with cases where, at certain points in time, greater public confidence in both regulatory process and performance has been gained by utilizing a more collective "commission" model in which interests can be directly represented.

It must be candidly acknowledged that such representation can be mere window-dressing, particularly if it is secured only through the appointment of part-time commission members and not full-time members. On balance, however, and at the current stage of evolution of the regulation of occupational and environmental hazards, this author is persuaded that greater use of the collective "representative" commission form of organization is warranted. Thus there would seem to be a marginal gain both in legitimacy and openness, as well as in potential future regulatory performance, if labour unions were directly represented on existing boards such as the AECB as well as on federal or provincial "occupational health and safety commissions".

Questions of public participation are obviously closely related to other elements of the responsibility systems. The media's role is vital to the process as is the role of elected opposition critics. For example, in Ontario, there can be no doubt whatever that the rigorous and persistent criticism by the then Opposition Leader, Stephen Lewis, has been a major part of the regulatory reform process. Participation can also be enhanced by the consolidation of responsibility for occupational health under labour departments and by the development of labour-management mechanisms at the plant level, and labour-management-community mechanisms at the community level.

7. Academic Involvement

The degree of academic involvement has been highest in the regulation of radiation, mercury and lead, and low in the other three cases. Again it is possible to detect a tendency for academic researchers to be involved more in environmentally-oriented hazards than in workplace hazards. As stressed in Chapters I and II, the basic granting and funding system of the natural sciences does not tend to encourage research in occupational and environmental health. Institutes of environmental studies have begun to emerge but few, if any, institutes of occupational health exist in Canada.

Relationships between the natural and social sciences are also episodic at best, or non-existent at worst. The cases show, for example, that there is little systematic analysis which would attempt to link the incidence of occupational and environmental health hazards to different economic classes, and similarly to assess the redistributive effects of different regulatory strategies on various income and socio-economic groups. The broad thrust of research, except perhaps in the case of mercury, has been to analyze aggregate causal relations on general populations rather than on particular sub-populations and the disproportionate burdens they undoubtedly bear.

8. The Adequacy of Causal Knowledge and Control Technology

The role of academic researchers leads directly to the important question of the adequacy of causal knowledge and control technology in the six cases as well as in the general regulatory process. The several papers by experts on the scientific, medical, and technical aspects of each of the six hazards examine these questions in detail. In general, however, the six cases tend to show that lack of causal knowledge and/or lack of control technology is not the major variable preventing regulatory reforms. There is far more evidence to

indicate that basic economic and political factors and pressures are the key to real reform (or the lack of it) and to improved occupational and environmental health.

The degree to which this is true obviously differs from case to case. This author's interpretation of the views of medical and scientific experts suggests that lack of causal knowledge is greatest in the environmental aspects of lead and oxides of nitrogen, and lack of control technology is greatest in the case of radiation (especially waste disposal) and oxides of nitrogen. The cases also seem to demonstrate a strong tendency for both regulators and industry to argue that more research is necessary in direct proportion to the economic stakes involved. The fact that more research can be simply an alternative to action needs to be more candidly acknowledged by regulators and the scientific community.

Acknowledging these realities of the politics of research, it is nonetheless obvious that more research is necessary. More extensive epidemiological studies, and studies tied to medical record linkage seem to be essential to any future regulatory strategies, both to resolve current problems and to help anticipate others.

The cases demonstrate that the question of who does the research and how it is organizationally related to the performance of the regulation-making and compliance functions is extremely important. There are obviously a number of important principles and trade-offs to be considered here. For example, the professional regulator is most likely to want to have the research, regulation-making and compliance function organizationally integrated under one roof so as to better manage the process in an integrated fashion. The research scientist is most likely to prefer an organizational arrangement in which the research function is more arms-length and does not constantly succumb to the nuts and bolts of the daily operational demands of regulation. To attract and retain a good core of research scientists, this is an important consideration.

On the other hand, outside groups such as labour unions are far more inclined to want to see an organizational separation of the research function, or to have it performed by a university or research institute on an open public basis. Even regulatory field personnel and inspectors may prefer to see the research function separated from other regulatory activities simply because they may tend to perceive researchers as being insufficiently practical people who do not understand the real regulatory world.

In general, and at the current stage of Canadian development, this study stresses one principle which ought to govern the performance of the research function in the occupational and

environmental regulatory processes. There is obviously a need to have a close integration between the regulation-making and compliance functions, but it is important that the research function should be, and should be seen to be, as open and as independent as possible. This objective can be promoted by any one, or a combination of, policies and changes, including:

- a) the allocation of the research function to a separate government organization (such as the NRC) with obligations to publish and disseminate its findings as a matter of public right;
- b) the firm adoption of the principle that government research in support of the regulatory function will not be contracted out to the industries it is attempting to regulate;
- c) contracting the research on an open public basis to universities and recognized research institutes; and
- d) the conduct of the research directly by the regulatory body provided it is prepared to publish fully and expeditiously its research findings.

It is argued that these steps are essential to establish an open democratic basis for public regulation generally. However, we also argue that there is a marginally greater obligation to promote the openness of research in the occupational and environmental health field precisely because it is an area where the issues of scientific controversy (and/or the appearance of scientific controversy) are greatest, and where the questions of "hypothetical" standard of proof (as discussed in Chapter I) are more characteristic of these real or perceived scientific controversies.

9. Compliance Capability

The cases do not provide evidence on which one can be terribly confident about the adequacy of compliance capability and practice. Relative to the other four cases, the radiation and oxides of nitrogen cases seem to be more moderately effective. Assessments of compliance are obviously difficult judgments to make; even in the radiation and oxides of nitrogen cases we have also pointed out that the adequacy of control technology and causal knowledge was lowest. Thus, it is probably fair to say that compliance in each hazard is effective in certain aspects but weak in others. It is also essential to stress that what may be just as important as actual compliance activity and results is the appearance of compliance action and the need to show that compliance activity is being openly carried out.

It is difficult to examine the six cases or the literature without reaching the conclusion that governments in Canada will have to be prepared to increase significantly the size of the monitoring

and inspectorate staffs of most regulatory authorities in the hazardous substances field. Although one does not need an army of inspectors, one does need a "platoon" if regulatory compliance is both to be done and to be seen being done. Current regulatory authorities are clearly not overstaffed. The practice of piggy-backing one agency's inspecting and monitoring functions on those of another has carried the practice of the administrative proverb of "avoiding duplication" to absurd heights.

More staff, however, is not in itself a sufficient response. Of far greater importance is the need to marry the platoon with the workplace level committees suggested earlier. The workplace is the front line of regulation. The assignment of many monitoring and compliance activities to the workplace can both increase confidence in compliance processes and, at the same time, enable government regulators to spend more time on general co-ordination and, hopefully, anticipation of occupational hazards. That responsible self-regulation at the plant can help prevent the government regulatory platoon from becoming an army also seems clear.

Experience shows, however, that if previously diverse inspectorates composed of different occupational and professional groups are merged into single departments, and their functions are altered, then governmental personnel and training policies and programs will have to be carefully structured and planned so as to provide the necessary day-to-day incentives and working climate.

Needless to say, public confidence in compliance processes can also be enhanced by the public and open dissemination of information, particularly on monitoring and research results. Compliance is the weakest link in the regulatory chain and each of the above aspects is essential if real reform is to occur in both compliance processes and results.

10. Degree of Reliance on International and Foreign Agencies

On balance there are far more advantages than disadvantages in the reliance which Canadian regulatory authorities place on the standards and practices of international and foreign agencies operating in the occupational and environmental health field. Among the six cases the degree of reliance seems to have been greatest in the regulation of radiation and vinyl chloride, but there is a consistently strong and general tendency to utilize guidelines such as those provided by the ACGIH. Asbestos and mercury are two cases where some Canadian regulatory authorities have regrettably not adopted the best practice and information available in other countries.

Although it is important that regulators do not become excessively dependent on international and foreign authorities, the general tenor of the cases suggests to this author that, if anything, Canadian regulatory authorities have not adequately utilized, and paid attention to, the existing international flow of information.

11. The Openness of Regulatory Processes and the Capacity to Anticipate Future Hazards

The capacity to anticipate and overcome the consequences of hazardous products and the openness of the regulatory process are inextricably linked. Chart I portrays the main theoretical production and regulatory stages for hazardous products. In general terms, it is fair to say that public policy and practice have historically been preoccupied with the late stages of the production pattern rather than the earlier stages. We experience difficulty in anticipating problems because we have not spent much time intervening in the front end of the production process. More openness at the very earliest stages of the production cycle, and at all subsequent stages, is thus a central feature of any future capacity to anticipate and more intelligently regulate hazardous substances. In each of these stages the experience of other countries, of international and foreign bodies, and of international unions is essential.

We have stressed that the workplace is the front line of regulation, but Chart I obviously suggests an even earlier front line, namely the industrial processes of developing and testing new chemicals, products and substances. The federal Environmental Contaminants Act is a welcome statutory mechanism for intervention at this early stage but, as pointed out in Chapter II, it does not possess the legal teeth provided by the recently passed American Toxic Substances Control Act. The Canadian Act can and should be greatly strengthened particularly in narrowing the areas of ministerial discretion. Even this will be an insufficient response, however, unless the Department of the Environment's Environmental Contaminants Control Branch is given vastly increased financial resources and manpower to do its job.

Although increased staff resources are essential, it should be stressed that the long-run value of a greatly strengthened Environmental Contaminants Act does not lie in the actual assessment that might be reported to, and evaluated by, environmental officials. The real regulatory effect is likely to be hidden; it would be felt within the industrial firms where the firm itself would be more careful and selective when making decisions on whether to develop and market new or significantly modified chemicals, substances and

products. Thus, some of the products which now reach the market would not see the light of day.

A speedier and partly anticipatory regulatory response can also be developed by the reforms in the workplace, as outlined earlier in this Chapter. As one moves into the secondary industry, community and environmental phases, the role of broad or selective epidemiological studies and the better utilization of existing medical records and medical diagnoses, become important. Compensation programs obviously take us well beyond the stage where one is anticipating hazards, nonetheless there are ways in which the experience of past and current worker compensation controversies can help the regulatory process avoid the repetition of mistakes and, at the same time, respond more humanely and compassionately to those who are already the victims of past regulatory, political and economic injustices and inadequacies.

The six case studies, as well as the broader analysis, examined in this study leave little doubt that the processes of reform will be difficult and will be vigorously contested. That major reform is necessary is also abundantly clear.

APPENDIX A

LEGISLATION RELATED TO OCCUPATIONAL HEALTH AND SAFETY

(Major injury and illness prevention legislation is underlined)

Province	Department or Agency	Act
Alberta	(Department of Health and Social Development)	Public Health Act*
	Department of Highways and Transport	Radiation Protection Act
		Highway Traffic Act
	Department of Labour	Boiler and Pressure Vessels Act
		Electrical Protection Act
		Elevator and Fixed Conveyance Act
		Fire Prevention Act
		Gas Protection Act
		Lighting Rod Act
		<u>Occupational Health and Safety Act</u>
British Columbia	Department of Mines and Minerals	Quarries Regulation Act
	(Workers' Compensation Board)	<u>Coal Mines Regulation Act</u>
	Department of Agriculture	Workers' Compensation Act
		Agricultural Chemicals Act
	Attorney General's Department	Fire Marshall Act
	Department of Transport and Communications	Industrial Transportation Act
		Pipelines Act
		Railways Act
	Department of Health	Health Act
	Department of Highways	Highway Act
	Department of Labour	<u>Factories Act</u>
		<u>Department of Labour Act</u>
	Department of Mines and Petroleum Resources	<u>Coal Mines Regulation Act</u>
		<u>Mines Regulation Act</u>
	Department of Public Works	<u>Safety Engineering Service Act</u>
		<u>Workers' Compensation Act</u>

Province	Department or Agency	Act
Manitoba	Department of Health and Social Development	<u>Public Health Act</u>
	Department of Highways	Highway Traffic Act
	Department of Labour	Elevator Act
		Gas and Oil Burners Act
		Department of Labour Act
		Steam and Pressure Plants Act
		Fire Prevention Act
	Department of Mines, Resources, and Environmental Management	<u>Mines Act</u>
		Clean Environment Act
	Department of Consumer, Corporate and Internal Services	Gas Pipe Lines Act
New Brunswick	Workers' Compensation Board	Workers' Compensation Act
		<u>Employment Safety Act</u>
	Department of Health	Health Act
	Department of Labour and Manpower	Boiler and Pressure Vessels Act
		Electrical Installation and Inspection Act
		Elevators and Lifts Act
		<u>Industrial Safety Act</u>
		Lightning Rods Act
		Workmens' Compensation Act
		Fire Prevention Act
	Department of Natural Resources	<u>Mining Act</u>
	Department of Highways	Highway Act
	Department of Health	Department of Health Act
Newfoundland	Department of Transportation and Communications	Highway Traffic Act
	Department of Manpower and Industrial Relations	Boiler and Pressure Vessels Act
		Elevator Act
	Workmen's Compensation Board	<u>Workmen's Compensation Act</u>

Province	Department or Agency	Act
	Department of Mines and Energy	<u>Regulation of Mines Act</u>
	Department of Provincial Affairs and Environment	Pesticides Control Act
	Department of Municipal Affairs and Housing	Building Standard Act
	Department of Justice	Fire Prevention Act
Nova Scotia	Department of Highways	Motor Vehicle Act
	Department of Labour	<u>Construction Safety Act</u> Electrical Installation Inspection Act Elevators and Lifts Act Fire Prevention Act Industrial Safety Act Lightning Rod Act Steam Boiler and Pressure Vessels Act
	Department of Mines	<u>Coal Mines Regulation Act</u> <u>Metalliferous Mines and Quarries Regulation Act</u> Mines Act
	Department of Public Health	Public Health Act
	Workmen's Compensation Board	<u>Workmen's Compensation Act</u>
Ontario	Ministry of Consumer and Commercial Relations	Boilers and Pressure Vessels Act Elevators and Lifts Act Energy Act Gasoline Handling Act
	Ministry of Energy	Power Corporation Act
	Ministry of the Environment	Pesticides Act
	Ministry of Health	Public Health Act <u>Silicosis Act</u>
	Ministry of Labour	Ministry of Labour Act <u>Construction Safety Act</u> <u>Industrial Safety Act</u> Construction Hoists Act Workmen's Compensation Act

Province	Department or Agency	Act
	Ministry of Natural Resources	<u>Mining Act</u>
	Ministry of the Solicitor General	Lightning Rods Act
	Ministry of Transportation and Communication	Highway Traffic Act
Prince Edward Island	Department of Health	Public Health Act
	Department of Agriculture and Forestry	Fire Prevention Act
	Department of Labour	Steam Boiler Act
	Department of Public Works and Highways	Highway Traffic Act
	Department of Community Services	Elevators and Lifts Act
		Electrical Inspection Act
		Lightning Rod Act
	Workmen's Compensation Board	<u>Workmen's Compensation Act</u>
Quebec	Department of Justice	An Act Respecting Explosives
	Department of Labour and Manpower	Electricians and Electrical Inspection Act
		<u>Industrial and Commercial Establishments Act</u>
		Lightning Rod Act
		Pressure Vessels Act
		Scaffolding Inspection Act
	Department of Municipal Affairs	Fire Prevention Act
		Quality of the Environment Act
	Department of Natural Resources	<u>Mining Act</u>
		Electricity and Gas Board Act
	Department of Social Affairs	Public Health Protection Act
	Department of Transport and Communication	Highway Code
	Workmen's Compensation Commission	Workmen's Compensation Act

Province	Department or Agency	Act
Saskatchewan	Department of Highways and Transportation	Highways Act
		Boiler and Pressure Vessels Act
	Department of Labour	Electrical Inspection Act
		Licensing Act
		Fire Prevention Act
		Gas Inspection and Licensing Act
		<u>Occupational Health Act</u>
		Passenger and Freight Elevator Act
		Radiation and Health Safety Act
	Department of Mineral Resources	<u>Mines Regulation Act</u>
		<u>Pipe Lines Act</u>

Occupational Health and Safety provisions of these acts and their regulations are being administered by Department of Labour until new Occupational Health and Safety Act fully in place.

SOURCE: LABOUR CANADA

APPENDIX B

Memorandum of Agreement Between the Industrial Safety Branch, Department of Labour and the Occupational Health Service, Department of Health

This memorandum amends and replaces the memorandum of November 28, 1969 from Dr. V.L. Tidey, M.D. to Dr. E. Mastromatteo, Director, Environmental Health Services Branch, Department of Health.

Method of Handling Requests for Visits

(1) Union Complaints

If request for visit is received by the Occupational Health Service from the Union by telephone, the Occupational Health Service will try to ascertain if the Union has discussed the problem with the employer. If the Union has not, Occupational Health Service will suggest that this be done immediately to see if action can be taken by the employer forthwith to resolve the problem without the action of the Occupational Health Service.

If Management has been made aware of the problem, or if the Union does not wish to follow the suggested procedure, then the Occupational Health Service will inform the person who writes or telephones that such matters are dealt with by the Department of Labour. A request for an investigation is to be sent, in writing, to the Director, Industrial Safety Branch, Department of Labour, 44 Victoria Street, Toronto, signed by an officer of the Union and preferably on the Union letterhead. It is to be suggested that a copy of this letter be sent to the employer.

On request of the Industrial Safety Branch, the Chief, Occupational Health Service, will assign a member of his staff to investigate. A joint visit will be made with the Industrial Safety Branch. Three copies of the report will be sent to the Director, Industrial Safety Branch only.

(2) Department of Labour

The Industrial Safety Branch will initiate requests for visits by a telephone call from the Director's office to the Occupational Health

Service, confirmed in writing on a standard request form (copy attached). Industrial Safety Branch requests for a visit by a member of the Occupational Health Service will be a joint visit with the Industrial Safety Officer. Three copies of the Occupational Health Service report will be sent to the Director, Industrial Safety Branch. The report may contain recommendations, directions or both.

Any confidential information (medical and/or technical) will be put on a confidential memo and will remain on file at the Occupational Health Service.

At the discretion of the Occupational Health Service, but as a general rule, a copy of the Occupational Health Service report shall be forwarded by the Occupational Health Service to a suitable senior official of the management of the employer involved.

(3) Employer

If the employer is making the request on its own initiative, the Occupational Health Service may deal with it directly. The Occupational Health Service will notify the Industrial Safety Branch and, where possible, a joint visit will be made with the Industrial Safety Officer. However, if it is learned that the request arises as a result of a union complaint, the request will be referred to the Industrial Safety Branch.

If the Occupational Health Service report contains recommendations only, one copy may be sent to Management and two copies will be sent to the Industrial Safety Branch.

If directions are requested, three copies will be sent to the Industrial Safety Branch and, at the discretion of the Occupational Health Service but as a general rule, a copy of the Occupational Health Service report shall be forwarded by the Occupational Health Service to a suitable senior official of the Management of the employer involved.

(4) Workmen's Compensation Board

In general, there are two types of visits made by the Occupational Health Service.

- (a) Investigation of an individual claim to assess the occupational exposure. The Occupational Health Service will not notify the Industrial Safety Branch that they are planning to make a visit to the plant. These are usually priority visits.
- (b) A review of the industrial hygiene programme followed in the plant. The Occupational Health Service will notify the Industrial Safety Branch and arrange for a joint visit.

Following visits under each of the above headings, the Occupational Health Service will forward a copy of the report to the Director, Industrial Safety Branch. If directions are recommended by the Occupational Health Service, three copies will be submitted, and at the discretion of the Occupational Health Service, but as a general rule, a copy of the Occupational Health Service report shall be forwarded by the Occupational Health Service to a suitable senior official of the Management of the employer involved.

(5) Medical Officer of Health, Private Physicians and Hospitals

The Chief of the Occupational Health Service will handle these. The Industrial Safety Branch will be notified that a visit to the plant is planned and a joint visit arranged.

A copy of the Occupational Health Service report will be sent to the Industrial Safety Branch and a copy to the Medical Officer of Health or private physician.

If directions are requested, three copies will be sent to the Industrial Safety Branch and, at the discretion of the Occupational Health Service, but as a general rule, a copy of the Occupational Health Service report shall be forwarded by the Occupational Health Service to a suitable senior official of the Management of the employer involved.

(6) Visits on Occupational Health Service Initiative

Where it is desired by the Occupational Health Service to visit a plant for the purpose of research or information, the Industrial Safety Branch will be notified of the project involved and as these will generally be long-term projects, a list of the plants involved will be supplied to the Industrial Safety Branch by the Occupational Health Service, but no joint visits will be necessary nor will the

Industrial Safety Branch be advised of the dates of the proposed visits.

(7) Requests from Individuals

The Chief of the Occupational Health Service will deal with these as the situation demands.

Union Requests for Educational Talks

The Occupational Health Service will comply with these requests but will talk in general terms and will not answer specific complaints.

Requests for Plan Examinations

It is anticipated that the Occupational Health Service will be given adequate notice of the place, date and time of the plans examination. The Chief Engineer will make arrangements by telephone with Occupational Health Service, and confirm using a standard request form (copy attached).

Air Sampling Reports

Except where the air sampling is done as a result of a Union Complaint, at the discretion of the Occupational Health Service, but as a general rule, a copy of the Occupational Health Service report shall be forwarded by the Occupational Health Service to a suitable senior official of the management of the Industrial Safety Branch only.

Follow-up Reports

Where Occupational Health Service Reports require that directions be issued with regard to -

- (1) A Medical Supervision Program
- (2) Medical Examinations
- (3) X-rays or other lung function tests
- (4) Blood, urine or other tests

A copy of the report issued by the Industrial Safety Officer giving these directions shall be sent to the Occupational Health Service.

These directions will be "ON-OFF" directions in the Industrial Safety Branch System and any follow-up will be done by the Occupational Health Service. If no action is taken by the employer, the Occupational Health Service will request the Industrial Safety Branch to re-issue the directions not complied with.

Medical Supervision Programme

In addition to the procedures outlined in Follow-up of Reports, the Occupational Health Service will, upon receipt of the copy of the report issued by an Industrial Safety Officer giving directions regarding Medical Supervision Programme, contact the plant physician regarding the programme, and where the name of the plant physician is not known will contact the employer to obtain the name.

The medical programme will be kept under review by the Occupational Health Service with direct communication to the plant physician.

All Occupational Health Service Reports

The Occupational Health Service Reports will be identified by the File Number of the premises provided by the Industrial Safety Branch.

NOTE: Requests by Industrial Safety Branch to Occupational Health Service on all the above matter to be addressed to the Chief, Occupational Health Service.

Requests by Occupational Health Service on all the above matter to be addressed to the Director, Industrial Safety Branch, through

- (1) Administrator, Field Services
 - in the case of joint visits with Industrial Safety Officers, and
- (2) Chief Engineer, Engineering Services
 - in the case of Plan Examination.

Selected Bibliography

- Advisory Committee on the Biological Effects of Ionizing Radiations, The Effects on Populations of Exposure to Low Levels of Ionizing Radiation, National Academy of Sciences, National Research Council, Washington, D.C., 1972.
- Allen, Glen, "Poly-killer", Macleans April 19, 1976, pp. 32-33.
- Arnold, E.J. "Technical Aspects of Vinyl Chloride in the Environment" Ottawa: Science Council of Canada, October 1976.
- Assad, J.R. and G. Rajahns, "The Technical Aspects of Asbestos" Ottawa: Science Council of Canada, October 1976.
- Atomic Energy Control Board, Radioactive Waste Locations in Canada. (Ottawa, February 19, 1976).
- Aucoin, Peter, "The Role of Functional Advisory Councils", in G.B. Doern and Peter Aucoin (eds.) The Structures of Policy Making in Canada Toronto: Macmillan of Canada, 1971.
- Brodeur, Paul, Expendable Americans, New York: Viking Press, 1973.
- Bulletin of the Atomic Scientists, Vol. XXX, No. 8, (October 1974) pp. 5-40.
- Butler, G.C., "Health Hazards From Nuclear Sources" Symposium on Energy Resources, Royal Society of Canada, January 1974.
- Canadian Labour Congress, "Policy Statement on Occupational Health and Safety". Document 21. Ottawa.
- Canadian Nuclear Association, Nuclear Power in Canada Questions and Answers Toronto: Canadian Nuclear Association, 1975.
- Cardinal, Harold. The Unjust Society. Edmonton: Hurtig, 1971.
- Clark, I.A. "Expert Advice in the Controversy About Supersonic Transport in the U.S.", Minerva, Vol. XII, No. 4, Oct. 1974, pp. 414-432.
- Comite d'etude sur la salubrite dans l'industrie de l'amiante, Rapport Preliminaire Quebec City: Province of Quebec, April 1976.

- Crispo, J., International Unionism: A Study of Canadian-American Relations. Toronto: McGraw-Hill, 1967.
- Davis, K.C. Discretionary Justice. Baton Rouge: Louisiana State University Press, 1969.
- Decision Making for Regulating Chemicals in the Environment
Washington: National Academy of Sciences, 1975.
- Department of the Environment, Air Pollution Emissions and Control Technology Secondary Lead Smelter and Allied Industries. Ottawa, July 1975.
- Department of the Environment, Ambient Air Levels of Mercury in the Vicinity of Selected Chlor-Alkali Plants. Ottawa, July 1973.
- Department of the Environment, Canada's Motor Vehicle Pollution Control Program. Ottawa, June 1974.
- Department of the Environment, Environmental Contaminants Inventory Study No. 3, the Production, Use and Distribution of Lead in Canada. Ottawa, 1975.
- Department of the Environment, National Inventory of Sources and Emissions of Asbestos, Beryllium, Lead and Mercury, 1970. Ottawa, January 1974.
- Doern, G. Bruce, Science and Politics. Montreal: McGill-Queen's University Press, 1972.
- Doern, G. Bruce, The Atomic Energy Control Board: An Evaluation of Regulatory and Administrative Processes and Procedures. A Report prepared for the Law Reform Commission, Ottawa, March 1976.
- Doern, G. Bruce, "The Political Economy of Regulating Occupational Health: The Ham and Beaudry Reports", Canadian Public Administration. March 1977.
- Doern, G. Bruce, "The Political Economy of Research: Regulating the Health of Canadian Uranium Miners" Ottawa: School of Public Administration, 1976.
- Doern, G. Bruce, (ed) The Regulatory Process in Canada. Toronto: Macmillan of Canada, 1977.

- Doern, G. Bruce, Ian A. Hunter, D. Swartz and V.S. Wilson, "The Structure and Behaviour of Canadian Regulatory Board and Commissions: Multi-disciplinary perspectives", Canadian Public Administration (Summer 1975), Vol. 18, No. 2, pp. 189-215.
- Doern, G. Bruce and V.S. Wilson (eds) Issues in Canadian Public Policy. Toronto, Macmillan Co. of Canada, 1974.
- Doerr, Audry, "Indian Policy in G.B. Doern and V.S. Wilson eds. Issues in Canadian Public Policy Toronto: Macmillan of Canada, 1974. Chapter 2.
- Environment Canada, The Clean Air Act Annual Report 1974-75, Ottawa, Information Canada, May 1975.
- Environmental Hearing Board, Summary Public Hearing on Lead Contamination in the Metropolitan Toronto Area. Toronto 1975.
- Franson, R.T. and A.R. Lucas. Legal Control of Hazardous Substances. Ottawa: Science Council of Canada.
- Frideres, James S., Canada's Indians: Contemporary Conflicts. Toronto. Prentice Hall, 1974.
- Gibbons, M. and R. Voyer, A Technology Assessment System: A Case Study of the East Coast Offshore Petroleum Exploration: Ottawa, Science Council of Canada, No. 30, 1974.
- Goldstein, Carl, "The U.S. Nuclear Experience", Paper presented to Canadian Nuclear Association Seminar. Public Concern and Nuclear Energy. Toronto, September 22-23, 1975.
- Goldwater, L.J., "Mercury in the Environment", Scientific American. Vol. 224 No. 5 (May 1971) pp. 15-21.
- Green, Harold P., "Nuclear Power Licensing and Regulation", The Annals of the American Academy of Political and Social Science (March 1972), pp. 116-126.
- Hafele, W., "Hypotheticality and the New Challenge: The Path Finder Role of Nuclear Energy", Minerva, Vol. XII, No. 3 (July 1974), pp. 314-5.
- Hanlon, Joseph, "Mercury and Trees", New Scientist, October 28, 1976. pp. 226-229.

- Harvey, H.H. "Inflation: A Powerful Tool in Government Science Policy", Canadian Public Policy, 111 (Summer) 1976, pp. 439-50.
- Health and Welfare Canada. Final Report Task Force on Organic Mercury in the Environment, Grassy Narrows and White Dog Ontario, Ottawa: December 1973.
- Hearings of the Royal Commission on the Health and Safety of Workers in Mines. Toronto: Court Clerk, 1975.
- International Atomic Energy Agency Bulletin, Treaty on the Non-Pro-liferation of Nuclear Weapons. Review Conference (May 1975).
- Jennekins, J.H.F., "The Role of Advisory Committees in the Licensing of Nuclear Facilities in Canada". Paper presented to the IAEA Study Group, Athens, Greece, December 1974.
- Jervis, R.E. "Scientific Aspects of Lead". Ottawa: Science Council of Canada. August 1976.
- Kahn, Alfred E. The Economics of Regulation, Vol. 1 and 11. New York: John Wiley & Sons, 1970.
- Kasowski, M.A. and M.J. Kasowski, "Environmental Health Issues: Industrial Lead Pollution in Toronto". Canadian Medical Association Journal, Vol. 114, April 3, 1976, pp. 639-646.
- Knelman, F., Nuclear Power, the Unforgiving Technology. Edmonton: Hurtig Publishers, 1976.
- Knight, L. and Peter T. Macklem, "Biological Effects of Exposure to Oxides of Nitrogen". Ottawa: Science Council of Canada. October 1976.
- Kubo, A.S. and O.J. Rose, "Disposal of Nuclear Wastes", Science, Vol. 182 (21 December 1973) pp. 1205-1208.
- Laxen, Robert. Canada's Unions. Toronto: James Lorimer & Co., 1976.
- MacDonald, Mani, "Massacre at Grassy Narrows", Macleans, October 20, 1975, p. 30.
- Mackay, D., M. Medir, and A. Lawson, "Technical Aspects of Oxides of Nitrogen", Ottawa: Science Council of Canada. October 1976.

- Mazur, A., "Opposition to Technological Innovation", Minerva, Vol. XlII, No. Spring 1975, pp. 58-81.
- Meekison, J.P. ed. Canadian Federalism: Myth or Reality. 2nd Ed. Toronto: Methuen, 1973.
- Meyboom, P., "In House vs Contractual Research", Canadian Public Administration, Vol. 17, No. 4, pp. 563-585.
- Miller, R., and F. Ibister, Canadian Labour in Transition. Toronto: McGraw-Hill, 1971.
- Ministry of Environment, Report of the Lead Data Analysis Task Force. Toronto, 1975.
- National Research Council, Lead in the Canadian Environment. Report of the Associate Committee on Scientific Criteria for Environmental Quality. Ottawa: NRC, December 1973.
- National Research Council, Photochemical Air Pollution: Formation, Transport and Effects. Ottawa, 1974.
- Nelkin, D., Nuclear Power and Its Critics, Ithica, N.Y.: Cornell University Press, 1976.
- Nuclear Power and the Environment, International Atomic Energy Agency, Vienna, 1973.
- Ontario Department of Health. The Public Health Significance of Methyl Mercury. Toronto, February 19, 1972.
- Ontario Ministry of Health. Report on the Effect on Human Health of Lead from the Environment. Toronto: Queen's Printer, October 1974.
- Organization for Economic Cooperation and Development, Mercury and the Environment. Paris, OECD, 1974.
- Ostiguy, G., "Health Hazards of Asbestos Exposure". Ottawa, Science Council of Canada, October 1976.
- President's Advisory Council on Executive Organization, A New Regulatory Framework, Washington, D.C.: USGPO, 1971.

- Rabinovitch, Victor, "Occupational Safety and Health, The Saskatchewan Approach - How Relevant for Manitoba". Report Prepared for Planning Secretariat, Government of Manitoba, January 1976.
- Rea, K.J. and J.T. McLeod, eds. Business and Government in Canada. Selected Readings, Second Ed. Toronto: Methuen, 1976.
- Report of the Asbestosis Working Group, Subcommittee on Environmental Health, Ottawa, Health and Welfare Canada, 1976.
- Report of the Industrial Health and Safety Commission, Edmonton, Government of Alberta, 1975.
- Report of the Royal Commission on the Health and Safety of Workers in Mines, Toronto: Ontario Government, 1976.
- Rowland, Wade, Fuelling Canada's Future, Toronto, Macmillan of Canada, 1974.
- Royal Commission on Environmental Pollution, Sixth Report, Nuclear Power and the Environment. London: H.M.S.O. CMND. 6618, 1976.
- Safety and Health at Work, Report of the (Robens) Committee, 1970-72. London: H.M.S.O. Cmnd. 5034, 1972.
- Ashford, N., Crisis in the Workplace: Occupational Diseases and Injury. Report to the Ford Foundation. Cambridge, Mass. MIT Press, 1975.
- Science Council of Canada, Special Study No. 21, Basic Research, Ottawa, Information Canada, 1971.
- Science Council of Canada, University Research and the Federal Government, Report No. 5, Ottawa, Queens Printer, 1969.
- Scott, Rachel, Muscle and Blood, New York: E.P. Dutton & Co., 1974.
- Shepherd, D.A.E., "Methyl Mercury Poisoning in Canada", Canadian Medical Association Journal, Vol. 114, March 6, 1976.
- Stellman, Jeanne M., "Industrial R & D Role in Occupational Safety and Health - A Labour Union View", Research Management, May 1975, pp. 8-10.

- Stellman, J.M. and Susan M. Daum, Work Is Dangerous to Your Health, New York: Vintage Books, 1973.
- Stigler, G., The Citizen and the State: Essays on Regulation. Chicago: University of Chicago Press, 1975.
- Stopps, G.J., "Public Health Aspects of Lead". Ottawa, Science Council of Canada. August 1976.
- Teeple, G. ed. Capitalism and the National Question. Toronto: University of Toronto Press, 1972.
- The Make or Buy Policy: 1975-1975. Ottawa: Ministry of State for Science and Technology. November, 1975.
- "The Relationship Between Scientific Information and Public Response: The Case of Lead Pollution in Toronto" (Author unknown), Unpublished paper, York University, Toronto, 1975.
- Patterson, Walter C., Nuclear Power, London: Penguin Books, 1976.
- Phidd, R.W. and G. Bruce Doern, The Politics and Management of Canadian Economic Policy. Toronto: Macmillan Co., 1977 (forthcoming)
- Phillips, M.J., "Medical Aspects of Vinyl Chloride". Ottawa, Science Council of Canada, June 1976.
- Polanyi, J.C., "Rationalizing Research in the Universities: the Bonneau Corry Report", Science Forum, Vol. 6, No. 1, pp. 3-6.
- Posner, R., "Theories of Economic Regulation", Bell Journal of Economics and Management Science, 5., 1974, p. 335.
- Wilford, John N., "Science Considers Its Own 'Court'", The New York Times, February 29, 1976, p. 8.
- Williams, Roger, "Government Regulation of the Occupational and General Environments in the U.K., U.S.A. and Sweden with Particular Reference to Six Selected Hazards." Report to the Science Council of Canada. Ottawa, August 1976.
- Willrick, Mason, Nuclear Thefts: Risks and Safeguards. Cambridge, Mass., Hallinger, 1975.
- Wilson, James Q., "The Dead Hand of Regulation", The Public Interest, No. 25, (Fall 1971), pp. 39-58.

NOTES

Chapter I

1. For an overview of these characteristics see K.J. Rea and J.T. McLeod, Business and Government in Canada. Selected Reading 2nd Ed. (Toronto: Methuen, 1976), especially pp. 1-11, and pp. 334-345, G. Teeple (ed.) Capitalism and The National Question (Toronto: University of Toronto Press, 1972) and R.W. Phidd and G. Bruce Doern, The Politics and Management of Canadian economic Policy (Toronto, Macmillan Co., 1977)
2. See N. Ashford, Crisis in the Workplace: Occupational Diseases and Injury. A Report to the Ford Foundation (Cambridge, Mass: M.I.T. Press, 1975).
3. These issues are discussed in the Canadian context in G. Bruce Doern (ed.) The Regulatory Process in Canada (Macmillan of Canada, 1977).
See also Michael J. Trebilcock "Winners and Losers in the Modern Regulatory State: Must the Consumer Always Lose?" Paper presented to the Institute of Public Administration of Canada National Conference, Ottawa, September, 1975, G. Bruce Doern and V.S. Wilson, Issues in Canadian Public Policy (Toronto: Macmillan Co. 1974) Chapter 1, and James Q. Wilson "The Dead Hand of Regulation", The Public Interest, No. 25 (Fall, 1971), pp. 39-58.
4. See Rea and McLeod, op. cit., pp. 334-345. For a critical view see L. Panitch, "Corporatism in Liberal Democracies", Paper presented at American Political Science Association, Chicago, 1976.
5. See Ashford, op. cit., passim. See also Decision Making For Regulating Chemicals In the Environment (Washington: National Academy of Sciences, 1975).
6. See R. Miller and F. Isbister, Canadian Labour in Transition (Toronto: McGraw-Hill, 1971) pp. 84-165. See also John Crispo. International Unionism: A Study of Canadian-American Relations (Toronto: McGraw-Hill, 1967) and Robert Laxer, Canada's Unions (Toronto: James Lorimer & Company, 1976) especially Part 11, pp. 43-108.

7. See J.P. Meekison (ed.) Canadian Federalism: Myth and Reality, 2nd Edition (Toronto: Methuen, 1973).
8. See Doern and Wilson, Issues In Canadian Public Policy, Chapter 1.
9. See G. Bruce Doern, Ian A. Hunter, D. Swartz and V.S. Wilson, "The Structure and Behaviour of Canadian Regulatory Boards and Commissions: Multi-disciplinary perspectives", Canadian Public Administration (Summer, 1975), Vol. 18, No. 2, pp. 189-215.
10. This is a more subjective view on my part but it is based on the interviews conducted for this study as well as extensive discussions with officials of several government departments over the past several years. The most conspicuous growth in numbers and salary has been in the policy and planning branches rather than in operating personnel. Recent concern about decentralization has also reflected, in part, a concern about the weaknesses and neglect of field-level operating capability.
11. On the economic and expenditure consequences of regulation see Alfred E. Kahn, The Economics of Regulation, Vols. 1 and 11 (New York: John Wiley & Sons, 1970), and R. Poser, "Theories of Economic Regulation" Bell Journal of economics and Management Science 5, 1974, p. 335.
12. On the American regulatory process see K.C. Davis, Discretionary Justice (Baton rouge: Louisiana State University Press, 1969) and the President's Advisory Council On Executive Organization, A New Regulatory Framework (Washington, D.C.: USGPO, 1971).
13. W. Hafele, "Hypotheticality and the New Challenge: The Pathfinder Role of Nuclear energy, Minerva, Vol. X11, No. 3 (July, 1974) pp. 314-315.
14. On the general question of science, expertise, and public decisions see A. Mazur, "Opposition to Technological Innovation", Minerva, Vol. X111, No. Spring 1975, pp. 58-81, and Clark, Ian D., "Expert Advice in the Controversy about supersonic Transport in the U.S.A, Minerva, Vol. X11, No. 4, Oct. 1974, pp. 414-432.

15. See Gibbons, M. and R. Voyer, A Technology Assessment System: A Case Study of the East Coast Offshore Petroleum Exploration; Ottawa: Science Council of Canada, No. 30, 1974.
16. See John N. Wilford, "Science Considers Its Own 'Court'", The New York Times, February 29, 1976, p. 8 and Nicholas Wade, "Control of Toxic Substances: An Idea Whose Time Has Nearly Come", Science, Vol. 191 (13 February, 1976) pp. 541-544 and Decision Making for Regulating Chemicals in the Environment, op. cit.
17. This is the constant reality in the cases analyzed in Paul Brodeur, Expendable Americans, (New York: The Viking Press, 1973) and in Rachel Scott, Muscle and Blood (New York: E.P. Dutton & Co. 1974).

Chapter II

1. See N. Ashford, Crisis In The Workplace for a description and analysis of the American bodies. See also Brodeur, op. cit., and Scott, op. cit.
2. A report currently being developed by Dr. David Chisholm, of the Long Range Health Planning Branch of Health and Welfare Canada, estimates that nearly 200 legislative acts and over 400 sets of regulations and codes apply to occupational health and safety in Canada at the federal and provincial levels.
3. Interviews. Departmental descriptions are also based in part on Organization of the Government of Canada (Ottawa: Information Canada, 1975).
4. Interviews.
6. See "In a Safety Conscious Marketplace - Whither Plastics?" Paper presented by J.W. Black, Director, Product Safety Branch, Consumer and Corporate Affairs, to the 33rd Conference, Society of Plastics Industry of Canada, May 18, 1976, Ottawa.
7. Interviews.
8. Environment Canada, The Clean Air Act Annual Report 1974-75 (Ottawa: Information Canada, May 1975), pp. 2-4.
9. Ibid., pp. 4-5.

10. Ibid., pp. 33-34; interviews.
11. Ibid., p. 23.
12. Interviews.
13. Interviews.
14. See Victor Rabinovitch, "Occupational Safety and Health, The Saskatchewan Approach - How Relevant For Manitoba?" Report prepared for the Planning Secretariat, Government of Manitoba, January, 1976.
15. Interviews.
16. A good overview of provincial practices is to be found in Report of The Industrial Health and Safety Commission, Industrial Health and Safety Commission, Edmonton, 1975.
17. Interviews.
18. Report of the Royal Commission on the Health and Safety of Workers in Mines (Toronto; Ontario Government, 1976), p. 6.
19. See Comité d'étude sur la salubrité dans l'industrie de l'amiante, Rapport Préliminaire. Quebec City, April, 1976.
20. These tables are based on a report being prepared by Health and Welfare Canada. See note 2, this chapter.
21. See for example Heather Mitchell and J. Swaigen, "Fighting a new battle for a clean scene", Globe and Mail, October 6, 1976, p.7.
22. On the Saskatchewan experience see Bob Saas, Address to Meeting of Staff of the Occupational Health and Safety Branch, February 26, 1976.
23. Unpublished Health and Welfare Canada report. See note 2, of this chapter.
24. Ibid.
25. Ibid.
26. See Proceedings of the Hearings of the Royal Commission on the Health and Safety of Workers in Mines in Ontario. These

proceedings include department, union, and industry briefs and extensive cross examination. See also Report of the Royal Commission, op. cit., note 18, Chapter 1.

27. See Rabinovitch, op. cit. See also Robert Saas, "Occupational Hazards, Safety and Health", Speech given to Ontario Federation of Labour Conference, March 13, 1976.
28. See Miller and Isbister, Canadian Labour in Transition, (Toronto: McGraw-Hill, 1971) Chapter 3.
29. Canadian Labour Congress, "Policy Statement On Occupational Health and Safety", Document 21. Ottawa, 1976.
30. See G. Bruce Doern, Science and Politics In Canada (Montreal: McGill-Queens University Press, 1972, Chapter 5.
31. See Doern, ibid. See also Science Council of Canada, Special Study No. 21, Basic Research (Ottawa: Information Canada, 1971). Polyaní, J.C., Rationalizing research in the universities: the Bonneau-Corry report, Science Forum, Vol. 6, No. 1 (February, 1973) pp. 3-6; Aucoin, Peter "The Role of Functional Advisory Councils", in G.B. Doern and Peter Aucoin, Eds. The Structures of Policy Making In Canada (Toronto: Macmillan Co. of Canada 1971). pp. 154-178; and Science Council of Canada, University Research and the Federal Government, Report No. 5 (Ottawa: Queens Printer, 1969).
32. See H.H. Harvey, "Inflation: A Powerful Tool in Government Science Policy", Canadian Public Policy, 111 (Summer) 1976, pp. 439-450.
33. Meyboom, P. "In House v. Contractual Research", Canadian Public Administration, Vol. 17, No. 4, pp. 563-585. See also The Make or Buy Policy, 1973-1975 (Ministry of State for Science and Technology, November, 1975).
34. Office of the Ministry of State for Science and Technology, News Release, "New Contracting Out Policy", August, 1972.
35. See National Research Council of Canada, Lead in the Canadian Environment. Report by the Associate Committee on Scientific Criteria For Environmental Quality (Ottawa: December 1973), p. 1.

Chapter III

1. For a much more detailed analysis of the AEBC see G. Bruce Doern, The Atomic Energy Control Board: An Evaluation of Regulatory and Administrative processes and Procedures, a Report prepared for the Law Reform Commission, Ottawa, March, 1976. The report includes three case studies of AEBC regulatory decision processes.
2. For a layman's introduction to the CANDU see Canadian Nuclear Association, Nuclear Power in Canada Questions and Answers (Canadian Nuclear Association, Toronto, 1975) pp. 1-7, and Wade Rowland, Fueling Canada's Future (Toronto: Macmillan of Canada, 1974), Chapter 4.
3. Interview with legal advisor to AEBC.
4. See Harold P. Green, "Nuclear Power Licensing and Regulations", The Annals of the American Academy of Political and Social Science (March 1972) pp. 116-126; Dorothy Nelkin, Nuclear Power and Its Critics (Ithaca, N.Y.: Cornell University Press, 1971). For an industry view see Carl Goldstein, "The U.S. Nuclear Experience", paper presented to Canada Nuclear Association Seminar, Public Concern and Nuclear Energy, Toronto, September 22, 23, 1975.
 5. Interviews.
6. See statement by The Honourable Donald S. Macdonald, Minister of Energy, Mines and Resources, on Canada's Uranium Policy, September 5, 1974 and Canada's Nuclear Safeguards Policy.
7. Office of the Prime Minister Press Release, "Notes for Remarks by the Prime Minister to the Annual Meeting of the Canadian Nuclear Association", Ottawa, June 17, 1975, p. 11. For basic analyses of some of the major nuclear regulatory issues see, for example, Advisory Committee on the Biological Effects of Ionizing Radiations, The Effects on Populations of Exposure to Low Levels of Ionizing Radiation (National Academy of Sciences, National Research Council, Washington, D.C., 1972); The Bulletin of the Atomic Scientists, Vol XXX, No. 8 (October 1974), pp. 5-40; Mason Willrich and Theodore B. Taylor, Nuclear Theft: Risks and Safeguards (Cambridge, Mass: Ballinger, 1974); G.C. Butler, "Health Hazards From Nuclear Sources" Symposium On Energy Resources, Royal Society of Canada, January, 1974; Nuclear Power and the Environment. International Atomic Energy

Agency, Vienna, 1973; A.S. Kubo and D.J. Rose, "Disposal of Nuclear Wastes", *Science*, Vol. 182 (21 December, 1973) pp. 1205-1208; "Signing of Nuclear Cooperation Agreements," (Statements by Liberal, Progressive Conservative and NDP spokesmen) *House of Commons Debates* (January 30, 1976) pp. 10489-10496; *International Atomic Energy Agency Bulletin, Treaty on the Non-Proliferation of Nuclear Weapons*, Review Conference (May, 1975); Atomic Energy Control Board, "Radioactive Waste Locations in Canada", (Ottawa, February 19, 1976); and W. Hafele, *op. cit.*, Chapter 1, note 3.

8. Atomic Energy Control Board, Information Bulletin 75-1 "AECB Staff Reorganization", November 4, 1975, pp. 1-2.
9. Atomic Energy Control Act, Section 4(1).
10. Atomic Energy Control Board, Annual Report, 1974-75.
11. These clientele groups are described and analyzed in more detail in Doern, *op. cit.*, pp. 36-50.
12. On career patterns see Doern, *op. cit.*, pp. 60-70.
13. For a case study of these evolving relationships in the 1960's see G. Bruce Doern, Science and Politics in Canada, (Montreal: McGill-Queens Press, 1972), Chapter 4.
14. J.H.F. Jennekins, "The Role of Advisory Committees in the Licensing of Nuclear Facilities in Canada", paper presented to the IAEA Study Group, Athens, Greece, December, 1974.
15. On the Uranium Mining Safety Case see Atomic Energy Control Board, Brief Presented to the Royal Commission on the Health and Safety of Workers in Mines In Ontario (June 3, 1975); United Steel Workers of America, "Submission to the Royal Commission on the Health and Safety of Workers in Mines in Ontario", 1975. See also the verbatim hearings, testimony, proceedings, and cross-examination of the above Royal Commission, especially pages 602-854, the Denison Mines Ltd. brief and cross examination; pages 5115 to 5261, Ministry of Natural Resources; pages 5394 to 5476, AECB; and pages 4248 to 4366; Rio Algonia Ltd.

Chapter IV

1. The analysis of this vinyl chloride case is based on interviews as well as on the published sources noted below. On the technical aspects of vinyl chloride see E.J. Arnold, "Technical Aspects of Vinyl Chloride in the Environment", paper prepared for the Science Council (May 1976) and M.J. Phillips "Medical Aspects of Vinyl Chloride", a preliminary paper prepared for the Science Council, June, 1976.
2. A basic chronology of these American events is presented in Louise Dandurand, "Vinyl Chloride Monomer in Polyvinyl Chloride Plants: Some Notes on an Occupational Health Hazard", draft (mimeo) background paper prepared for the Science Council, August, 1975.
3. See Paul Brodeur, The Expendable Americans (New York: The Viking Press, 1974), especially pp. 249-274. See also Jeanne M. Stellman, "Industrial View", Research Management (May 1975), pp. 8-10; "R & D's Role in Occupational Safety and Health - A Labour Union".
4. See Glen Allen, "Poly-Killer", Macleans (April 19, 1976) pp. 32-3.
5. See Lorne Giroux and Patrick Kenniff, "Politiques et Poisons Chlorure de Vinyl Aspects Juridiques", preliminary paper prepared for the Science Council (July 1976).
6. See Plastics Industry Council Press Release "Some facts about Vinyl Chloride Monomer and Polyvinyl Chloride" (March 15, 1975).
7. The Ontario regulations now require the maintenance of medical records.
8. On the medical and technical aspects of asbestos-related diseases see Report of the Asbestosis Working Group (hereafter cited as "Asbestosis Working Group") Subcommittee on Environmental Health (Ottawa: Health and Welfare Canada); see also Asbestos, 1974 (Education and Research Branch, Occupational Health and Safety Division, Department of Labour, Regina, Saskatchewan), Jeanne M. Stellman and Susan M. Daum, Work is Dangerous to Your Health (New York: Vintage Books, 1973) pp. 172-173, G Ostiguy, "Health Hazards of Asbestos Exposure", paper prepared for the Science Council of Canada,

October 1976; and J.R. Assad and G.S. Rajhans, "The Technical Aspects of Asbestos", paper prepared for the Science Council, October 1976.

9. See "Asbestosis Working Group", pp. 14-16.
10. Ibid., pp. 5-6.
11. Ibid., p. 11.
12. Reported in The Gazette, Montreal, June 12, 1975, p. 1.
13. See Robert Laxer, Canada's Unions (Toronto: James Lorimer and Co., 1976), Chapters 19 and 20. See also Miller and Isbister, Canadian Labour in Transition (Toronto: McGraw-Hill, 1972).
14. The Gazette, (June 9, 1975).
15. Quoted in Health /PAC Bulletin, No. 61, 1974, p. 22.
16. The Gazette, June 12, 1975, p. 1.
17. Globe and Mail, March 27, 1976.
18. The Gazette, April 2, 1976, p. 1.
19. Ibid., p. 1.
20. Comité d'étude sur la Salubrité dans l'industrie de l'amiante, Rapport Préliminaire, Avril 1976, p. 380.
21. "Asbestosis Working Group", pp. 3-4.
22. On the American asbestos experience see Rachel Scott, Muscle and Blood (New York, E.P. Dutton and Co. Inc., 1974), pp. 174-204, and P. Brodeur, op. cit., pp. 3-72.
23. Reported in The Toronto Star, February 26, 1976, p. 12.
24. Dr. Selikoff later, in June 1976, addressed an Ontario NDP Convention held in Kingston, see Globe and Mail (June 14, 1976), p. 1.
25. Reported in The Toronto Star, February 27, 1976, p. 3.
26. See Globe and Mail, February 28, 1976, p. 3 and April 9, 1976, p. 1.

27. See Globe and Mail, April 13, 1976 , p. 1.
28. See The Toronto Star, May 12, 1976, p. 10.
29. Report of the Royal Commission on the Health and Safety of Workers in Mines (Toronto, August 1976) p. 214.
30. Globe and Mail, December 17, 1974.

Chapter V

1. See Dr. G.J. Stopps, Public Health Aspects of Lead, Report prepared for Science Council of Canada (August 1976); R.E. Jervis, Scientific Aspects of Lead, Preliminary Report to Science Council of Canada (August 1976); Ontario Ministry of Health, Report on the Effect on Human Health of Lead from the Environment (Toronto, October 1974), hereafter cited as the Robertson Report; and National Research Council Associate Committee on Scientific Criteria for Environmental Quality, Lead in the Canadian Environment (Ottawa, December 1973).
2. In addition to the sources cited, the analysis is based on confidential interviews with federal, provincial and local government officials and with spokesmen of unions, industry and public interest groups.
3. See Department of Environment, Environmental Contaminants Inventory Study No. 3, The Production, Use and Distribution of Lead in Canada, Revised Draft, 1975, pp 20-32.
4. See Stopps, op. cit., pp. 2-5.
5. This includes accidents where marginal firms are known to expose men to high blood levels, lay them off until the levels are reduced and then hire them again. Legally proving these cases has been difficult but regulators know such practices exist.
6. See Environment Canada, Air Pollution Control Directorate, Canada's Motor Vehicle Pollution Control Program (Ottawa, June 1974).

7. Interviews.
8. For some background on the technological dimensions see Environment Canada, Air Pollution Control Directorate, Air Pollution Emissions and Control Technology, Secondary Lead Smelter and Allied Industries (Ottawa, July 1975).
9. See Robert T. Franson and Alastair R. Lucas, Legal Control of Hazardous Substances, report prepared for the Science Council (preliminary draft) July 1976, addendum on lead.
10. Interviews.
11. Robertson Report, pp. 67-78.
12. See Report of the Royal Commission on the Health and Safety of Workers in Mines (Toronto, Government of Ontario, 1976), especially Chapters 1, 5 and 6.
13. A useful compendium of material on the Toronto Lead Case is to be found in M.A. Kasowski, "Environmental Lead Background Information File", prepared for Science Council, May 1976. See also M.A. Kasowski and W.J. Kasowski, "Environmental Health Issues: Industrial Lead Pollution in Toronto", Canadian Medical Association Journal, Vol. 114 (April 3, 1976), pp. 639-646. See also the proceedings of the Ontario Environmental Hearing Board.
14. "The Relationship Between Scientific Information and Public Response: The Case of Lead Pollution in Toronto". Unpublished paper (author not named) made available to me by Anne Johnston, Toronto Board of Health. The chronology, as revised, is based on the over 300 newspaper accounts used in the above cited paper as well as in published reports, and interviews conducted by me. I wish to acknowledge with gratitude the above study and its author. Its chronology largely corresponds to one which I had developed before knowing about its existence. The chronology from this 1975 study has been cited extensively however because it contained more detail than my own draft chronology.
15. See Franson and Lucas, op. cit., 111. p. 9.
16. See Ministry of the Environment, Report of 16 Lead Data Analysis Task Force, Toronto, 1975, p. xvii.

17. The Robertson Report, pp. 5-7.
18. See for example, Globe and Mail, February 12, 1975, p. 5, and September 10, 1975.
19. Kasowski and Kasowski, op. cit., pp. 643-644.
20. Globe and Mail, February 10, 1976.
21. Globe and Mail, July 23, 1976, p. 2.
22. Jervis, op. cit., pp. 13-14.
23. See Environmental Hearing Board Summary Public Hearing on: Lead Contamination in the Metropolitan Toronto Area, Toronto 1975.
24. Ibid., p. 8.
25. Ibid., p. 9.
26. Ibid., p. 10.
27. "The Relationship Between Scientific Information and Public Response" (see note 14 above), pp. 32-40.
28. See Donald Mackay, M. Medir and A. Lawson, "Technical Aspects of Oxides of Nitrogen", paper prepared for Science Council of Canada October 1976; and L. Knight and Peter T. Macklem "Biological Effects of Exposure to Oxides of Nitrogen", paper prepared for the Science Council of Canada, October 1976.
29. See National Research Council, Associate Committee on Scientific Criteria for Environmental Quality, Photochemical Air Pollution: Formation Transport and Effects. See Chapters 1 and 3.
30. Environment Protection Service, A Nationwide Inventory of Air Pollutant Emission 1970, Ottawa, EPS 3-AP-73-2.
31. Interviews.
32. The Ham Commission listed NO_x as merely one of several other hazards (about which little is known) that affect miners in

Ontario. See Report of Royal Commission on the Health and Safety of Workers in Mines, Toronto, 1976, Chapter 5.

33. Environment Canada, The Clean Air Act Annual Report 1974-75, pp. 21-23.
34. Canada Gazette, August 7, 1976, p. 3897.
35. "Canada's Air Pollution Control Program", Environmental Protection Service. Report EOS2-Ap-751 (September 1975).

Chapter VI

1. See Leonard J. Goldwater, "Mercury in the Environment, Scientific American, Vol. 224, No. 5 (May 1971), pp. 15-21 and D.A.E. Shepherd, "Methyl Mercury Poisoning in Canada", Canadian Medical Association Journal, Vol. 114 (March 6, 1976). See also Organization for Economic Cooperation and Development (OECD), Mercury and the Environment (Paris: OECD, 1974).
2. See Environment Canada, National Inventory of Sources and Emissions of Asbestos, Beryllium, Lead and Mercury, Summary of Emissions for 1970 (Ottawa, January 1974), pp. 15-19; Environment Canada, Ambient Air Levels of Mercury in the Vicinity of Selected Chlor-Alkali Plants (Ottawa, July 1973); and Ontario Department of Health, "The Public Health Significance of Methyl Mercury", unpublished report, February 19, 1972.
3. See House of Commons, Debates, May 7, 1976, p. 13312.
4. Health and Welfare Canada, Final Report, Task Force on Organic Mercury in the Environment, Grassy Narrows and White Dog, Ontario (Ottawa, December 1973), Appendix A, pp. 2.
5. See London Free Press, July 12 and July 14, 1975.
6. Globe and Mail, January 13, 1976.
7. Globe and Mail, July 23, 1976.
8. Globe and Mail, March 4, 1976.
9. Canadian Environmental Law News, Vol. IV, No. 4 (August 1975), p. 110.

10. Quoted in House of Commons Debates, May 7, 1976, p. 13296.
11. Environment Canada, Chlor-Alkali Mercury Regulations (Ottawa, April 1972).
12. Globe and Mail, June 1, 1976.
13. See James S. Frideres, Canada's Indians, Contemporary Conflicts (Toronto, Prentice-Hall, 1974); Harold Cardinal, The Unjust Society (Edmonton, Hurtig, 1971); A. Doerr, "Indian Policy", in G.B. Doern and V.S. Wilson eds., Issues in Canadian Public Policy (Toronto: Macmillan Co. of Canada, 1974), Chapter 2; and Mani MacDonald "Massacre at Grassy Narrows", Macleans, October 20, 1975, p. 30.
14. See House of Commons Minutes of Proceedings and Evidence of the Standing Committee on Fisheries and Forestry, (April 8, 1976, pp. 57.6 to 57.10).
15. See Task Force on Organic Mercury, op. cit., p. 20.
16. See T.W. Clarkson, "Exposure to Methyl Mercury in Grassy Narrows and White Dog Reserves, Interim Report", January 1976.
17. See Government of Ontario, 4th Report of the Mercury Task Force. Unpublished report (March 21, 1973).
18. See Shepherd, op. cit.
19. Quoted in G. Singer and B. Rodgers, "Mercury: The Hidden Poison in the Northern Rivers", Saturday Night, November 1975.
20. Shepherd, op. cit.
21. See for example, Stephen Lewis, speech to the Kenora NDP Club, May 29, 1976.
22. Toronto Star, March 8, 1973.
23. Toronto Star, June 4, 1973.
24. Paraphrased from Globe and Mail, June 21, 1976, p. 7.
25. Globe and Mail, June 21, 1976.

26. Globe and Mail, June 22, 1976.
27. Globe and Mail, July 10, 1976, p. 1.
28. Grassy Narrows and White Dog Bands "Memorandum to the Minister", mimeo, September 29, 1975.
29. See Joseph Hanlon, "Mercury and Trees", New Scientist (October 28, 1976), pp. 226-229.

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