THE DEVELOPMENT OF OCEAN INCINERATION LAW IN CANADA

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ABSTRACT

The present study is designed to examine the structure and development of international and Canadian laws which attempt to regulate the ocean disposal of toxic waste by at-sea incineration. It begins by describing some of the hazardous wastes which are creating dangerous environmental problems in Canada and other nations, by introducing the reader to the types of toxic materials subject to incineration and dumping at sea, and to the nature of the hazards these materials create. With this background in mind, the historical development of ocean dumping laws is then described, beginning with the major international treaties that presently regulate dumping activities. The Canadian laws, which emerged in order to implement the international treaty obligations, are then examined, together with an outline of how these laws are actually administered in the Canadian constitutional and political context.

Emerging political strategies to improve the management and disposal of toxic waste are examined, including the increased use of incineration technology. The actual use and legal regulation of ocean incineration is then described, in an attempt to determine whether this type of ocean disposal is a useful and controllable waste management option. Current Canadian policy and legal proposals on ocean incineration are examined in light of ongoing international controversy over the advisability of its use as a waste management strategy.
The study examines several jurisdictional, economic, scientific, and political problems which, in the Canadian context, cast doubt upon the ability of government to obtain either public acceptance of ocean incineration, or adequate legal control over at-sea incineration operations. In particular, the relevant legal, political and administrative decision-making processes are reviewed, to identify areas in which improvements are needed.

It is concluded that government should move away from incremental law and policy formation, and start to experiment with new forms of decision-making processes, in order to deal with such complex and difficult issues. It is recommended that the government seek to respond in new and innovative ways to these problems. Resolving the question of the desirability of ocean incineration is seen as a possible "pilot project" to test the ability of Canadian legal and political institutions to meet the future challenges posed by such environmental issues.

The policies and legislation discussed in the study are reported as of June 30, 1988.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>ii</td>
</tr>
<tr>
<td>Acknowledgement</td>
<td>vii</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>PART I: HAZARDOUS WASTES AND OCEAN DUMPING LAWS</td>
<td>14</td>
</tr>
<tr>
<td>2. Environmental Impacts of Waste Disposal Practices</td>
<td>15</td>
</tr>
<tr>
<td>3. International Law</td>
<td>29</td>
</tr>
<tr>
<td>a. Historical Development</td>
<td>29</td>
</tr>
<tr>
<td>b. Regional Conventions</td>
<td>32</td>
</tr>
<tr>
<td>c. Global Conventions</td>
<td>34</td>
</tr>
<tr>
<td>(i) London Dumping Convention</td>
<td>35</td>
</tr>
<tr>
<td>(ii) Law of the Sea Convention</td>
<td>39</td>
</tr>
<tr>
<td>4. Canadian Law</td>
<td>47</td>
</tr>
<tr>
<td>a. The Canadian Environmental Protection Act</td>
<td>47</td>
</tr>
<tr>
<td>b. Constitutional Jurisdiction</td>
<td>57</td>
</tr>
<tr>
<td>c. Administrative Policies and Canadian Dumping Practices</td>
<td>62</td>
</tr>
<tr>
<td>PART II: OCEAN INCINERATION AND ITS PLACE IN HAZARDOUS WASTE MANAGEMENT</td>
<td>76</td>
</tr>
</tbody>
</table>
5. Waste Management Strategies
   a. The Waste Management Hierarchy 77
   b. Ocean Incineration 81

6. The Use and Regulation of Ocean Incineration 90
   a. Historical Use 90
   b. International Regulation 97
   c. Canadian Legislation 102

7. The Policy Debate 122

PART III: CANADIAN LEGAL AND POLITICAL PROCESSES 136

   a. Jurisdictional Problems 138
   b. Analytical Problems 141
      (i) The Use of Economic Analysis 141
      (ii) The Use of Scientific Analysis 144
   c. Political Problems 147
   d. Summary 151

   a. Jurisdictional Issues 157
      (i) Interdepartmental Conflicts 157
      (ii) Federal-Provincial Cooperation 163
   b. Economic Issues 165
c. Scientific Concerns 169
   (i) Regulatory Standards 169
   (ii) The Treatment of Scientific Uncertainty 172
d. Public Participation 176
e. Summary 183

10. Summary and Conclusions 189
   a. Policy Review 192
   b. Implementation 198
      (i) Jurisdictional Issues 201
      (ii) Technical Concerns 203
      (iii) Public Participation 204
c. Conclusion 206

Bibliography 208

Glossary 226
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Chapter One: Introduction

The legal regulation of toxic waste disposal at sea is an area in which international marine pollution laws mesh with domestic laws controlling the disposal of hazardous substances. The present study is designed to examine the structure and development of international and Canadian laws which attempt to regulate the ocean disposal of toxic wastes, and to review the adequacy of the process by which such laws are developed and administered in the Canadian political context. The study also discusses the need to improve the management and disposal of hazardous substances, and considers the role of one particular technology - ocean incineration - in achieving this objective. Particular attention is paid to the examination of the existing law and policy formation processes in Canada, and to the identification of potential areas in which reform may be necessary in order for the Canadian government to make and implement the complex environmental decisions raised by the use of this waste management technology.¹

Traditionally Canadian environmental protection legislation has been of two basic types: pollution control legislation and resource exploitation legislation. Many of the pollution control statutes were promulgated in the late 1960's and early 1970's, and were characterized by a reactive and regulatory legislative approach which concentrated on how to dispose of pollutants once they were produced or how to
control, without necessarily prohibiting, the volume of pollutants that entered the environment.\(^2\)

By the 1980's, however, there was a growing awareness of fundamental defects in these environmental laws. The existing land, water, and air pollution legislation seemed deficient, largely ineffective, and with few exceptions, was allowing environmental quality to continue to deteriorate.\(^3\)

The reasons for such deficiencies were both subtle and complex, although the complexities were not immediately realized. Law reform efforts at first focussed on improving enforcement and compliance activities, then turned toward formulating ideas for improving economic incentives to comply with environmental laws. In addition to attempts to increase criminal penalties as deterrents and to provide economic incentives for compliance, law reform proposals were developed which sought to improve common law remedies as a method of permitting citizen enforcement of laws and of monitoring administrative decisions. Eventually, legal theorists began to examine the fundamental approach of environmental laws, questioning the basic philosophy upon which the legislation was based, and concentrating upon the law's failure to take into account the complex and integrated nature of the environmental problems they were attempting to address.\(^4\)

Ecological study has revealed that the living and nonliving components of the environment, including man, interact in complex ways. Non-resource components of the
environment may be vital to the survival of resource species. Pollutants may have cumulative or synergistic reactions, forming unpredictable combinations with new and potentially powerful effects. Some types of environmental degradation seem subtle and of uncertain impact, such as the loss of genetic diversity among resource species. Others, such as the destruction of the ozone layer, are of vast and potentially catastrophic effect, and there has been an increasing recognition of the global scale of many of these environmental impacts.

The recognition of such biological characteristics has resulted in a perceived need to reform the laws in order to take these complexities into account. Simultaneously, there has been an increasing recognition of the social, economic and health costs that are growing as environmental damage becomes more widespread. Law reform efforts are, therefore, promoting a philosophy which would place a higher priority upon the integration of environmental protection measures with industrial developments and the political decision-making process.

Recent law reform proposals are concerned with developing laws which: prevent the production of pollutants, encourage the recycling of wastes, promote the reclamation of degraded areas, encourage scientific research, prohibit the discharge of persistent toxic materials, identify the need for advance planning, allocate resources to environmentally preferable uses, make the polluter bear the costs of
polluting activities and recognize the international nature of the environment. Other important goals are to promote the education and involvement of the public, and to seek to alter societal concepts of what is acceptable behaviour in relation to the environment.

Two of the areas of the law in which such review and reform have begun are concerned with first, the control of toxic waste disposal, and second, the prevention of marine pollution. Due to the international nature of the oceans, law reform initiatives regarding marine pollution were initially developed in the international arena. Industrial plants that generate toxic or hazardous wastes, however, are primarily confined within national borders, and legal initiatives in the area of toxic substances control have been primarily developed on a national level. The focus of the present study is the legal regulation of an area in which these two sets of laws must be coordinated or combined, in order to obtain control over the deliberate disposal of toxic wastes at sea.

Toxic wastes are sometimes dumped at sea as contaminants in otherwise non-toxic substances, such as dredged materials, that are being discarded. They are also sometimes taken to sea on vessels equipped with high-temperature incinerators, which burn the wastes and allow the incinerator emissions to precipitate into the oceans. Both of these types of toxic waste disposal at sea, as well as the deliberate ocean discharges of non-toxic waste materials, are considered to be
forms of "ocean dumping." In legal terms, ocean dumping is generally defined as follows:

(a) "Dumping" means:
   (i) any deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea;
   (ii) any deliberate disposal at sea of vessels, aircraft, platforms or other man-made structures at sea.

(b) "Dumping" does not include:
   (i) the disposal at sea of wastes or other matter incidental to, or derived from the normal operations of vessels, aircraft, platforms or other man-made structures at sea and their equipment, other than wastes or other matter transported by or to vessels, aircraft, platforms or other man-made structures at sea, operating for the purpose of disposal of such matter or derived from the treatment of such wastes or other matter on such vessels, aircraft, platforms or structures;
   (ii) placement of matter for a purpose other than the mere disposal thereof, provided that such placement is not contrary to the aims of this Convention.
   (iii) The disposal of wastes or other matter directly arising from, or related to the exploration, exploitation and associated off-shore processing of seabed mineral resources will not be covered by the provisions of this Convention.

It has been estimated that approximately ten percent of the pollutants entering the marine environment are due to deliberate dumping. Although this seems relatively minor, in absolute terms the volume of material dumped is staggering. Estimates from the early 1980's placed the worldwide volume of ocean dumped material at about 250 million metric tonnes per year, and no data are available from countries which are not signatories to the major international treaties. Since that time the use of ocean disposal has increased, and projections for the continued expansion of ocean dumping are estimated at up to 40% per year. By 1985-86, Canada alone was dumping over eight
million metric tonnes of material into the ocean each year, and even then was lagging far behind countries such as the United States.

In theory ocean dumping, due to its intentional nature, should be amenable to a considerable degree of administrative, legal and technological control. In addition, alternative disposal methods exist for virtually all types of wastes that are dumped in the oceans except, perhaps, for polluted dredged materials. However, for reasons many authors consider to be primarily economic, the worldwide volume of material deliberately discharged into the oceans has grown steadily and shows no sign of decreasing. Compared to land-based disposal, ocean dumping is often relatively inexpensive, convenient, with fewer regulatory restrictions and less immediately observable adverse impact. As pressures on land-based disposal facilities have grown, the oceans have become increasingly attractive as cheap, politically expedient waste receptacles.

Both marine pollution generally, and the increasing use of ocean dumping in particular, are matters which merit considerable concern. The oceans, which cover approximately 71% of the Earth's surface and contain about 80% of all plant and animal life, are important to the global ecology, and thus vital to the survival of life on this planet. Most of the atmospheric oxygen has been produced by the photosynthetic processes of marine phytoplankton. The complex relationships between the atmosphere and the oceans...
are also vital to world temperature, cloud cover, rainfall, winds, tides and radiation levels. The seas act to balance both oxygen and carbon dioxide levels in the atmosphere and to stabilize the world climate. They are also an important source of water for the Earth's hydrologic cycle.

The oceans are a source of valuable resources for mankind. Much of the human population on earth relies upon fish for its dietary protein needs. In addition to the use of fish and other living resources of the sea as food sources, the oceans provide a vast potential for other uses, including: transportation, recreation, mineral exploitation, energy production, scientific research, tourism, and military use. Increasing utilization of the oceans for projects such as aquaculture, freshwater production by desalinization and expansion of coastal developments is also anticipated.

Ocean dumping, like other sources of marine pollution, is of concern because it threatens both man's utilization of the ocean resources, and the balance of the global ecology upon which all life ultimately depends. For many years it was assumed that the oceans had an unlimited capacity to receive, dilute and neutralize wastes, and some theorists continue to argue that the oceans are a viable location for deliberate waste disposal. As ecological knowledge has grown, however, it has become generally accepted that it is possible for man to have an adverse effect on the marine environment, at least on a local or regional basis, and that even the vast volumes of the oceans have a finite
capacity to absorb wastes.\(^{31}\) It has also become the prevailing view that many ecosystems can appear to absorb a deceptive amount of pollution until a certain saturation or threshold level is reached, but if the "assimilative capacity" is exceeded the result can be a sudden, possibly irreversible, ecological collapse.\(^{32}\)

A factor which complicates any attempt to predict how much waste can be absorbed before the assimilative capacity of the oceans might be exceeded is synergism. Synergistic or combined effects of pollutants are unpredictable and potentially very dangerous, creating unforseeable, multiple or cumulative results.\(^{33}\) Unfortunately the lack of scientific understanding of both marine ecology and the fate and effects of marine pollutants makes any accurate assessment or prediction of potential synergistic reactions virtually impossible at this time.\(^{34}\)

Concern over present and potentially adverse impacts of ocean dumping upon other uses of the oceans gradually led to the development of international and national laws attempting to control such activities, particularly where toxic wastes were involved. Canada has been an active participant in both the negotiation of international treaties and in the development of national controls over ocean dumping. One area in which Canadian laws are only now being developed, as the government increases its efforts to improve toxic substances control throughout the nation, is the regulation of toxic waste incineration at sea.
Part I of the present study begins by describing some of the hazardous wastes which are creating dangerous environmental problems in Canada and other nations, by introducing the reader to the types of toxic materials subject to incineration and dumping at sea, and to the nature of the hazards that these materials create. With this background in mind, the historical development of ocean dumping laws is then described, beginning with the major international treaties that presently regulate dumping activities. The Canadian laws, which emerged in order to implement the international treaty obligations, are then examined, together with an outline of how these laws are actually administered in the Canadian constitutional and political context.

Part II of the study turns to an examination of emerging political strategies to improve the management and disposal of toxic wastes, including the increased use of incineration technology. The actual use and legal regulation of ocean incineration is then described, in an attempt to determine whether this type of ocean disposal is a useful and controllable waste management option. Current Canadian policy and legal proposals on ocean incineration are examined in light of ongoing international controversy over the advisability of its use as a waste management strategy.

Part III of the study examines several jurisdictional, economic, scientific, and political problems which, in the Canadian context, cast doubt upon the ability of government
to obtain either public acceptance of ocean incineration, or adequate legal control over at-sea incineration operations. In particular, the relevant legal, political and administrative decision-making processes are reviewed, to identify areas in which improvements must be made if these difficult problems are to be resolved in a satisfactory manner.

Proper toxic waste management is a difficult and pressing environmental problem plagued by scientific uncertainty, huge human health risks, rapid technological change, complex public perceptions, substantial economic impacts, important foreign policy implications and, at present, a patchwork of legal and regulatory controls. The Canadian government, as part of its efforts to improve human health and environmental protection, is presently struggling to fashion new laws and policies which can address the overwhelming complexities and uncertainties that are now known to characterize such environmental problems. The many facets of these problems which must be dealt with and the maze of established institutions and processes which may require review and revision are well illustrated by the current need to evaluate ocean incineration technology and to devise a legal regime in which the use of ocean incineration can, perhaps, improve Canadian toxic waste control.
Chapter One: Notes

1. The policies and legislation discussed in the study are reported as of June 30, 1988. Subsequently, on October 6, 1988, Canada altered its policy position by agreeing to a complete ban on ocean incineration by 1994. The issues raised by the study are, therefore, of primary importance in the interim period, between 1988 and 1994. In addition, many of the concerns relevant to ocean incineration continue to be applicable to other environmental areas. "65 nations to ban burning of chemical waste at sea," Vancouver Sun, 7 October 1988, p. A5.


7. Ibid.

8. Ibid.


18. Reed, p. 4.


27. Ibid.


32. Hallman, p. 8; Kamlet, p. 12; Kindt, p. 4-5.


Before examining the existing international and national laws which regulate ocean dumping, it is worthwhile to have some perspective on the environmental and health impacts which those laws are designed to mitigate or avoid. In order to provide some background in this area, the following chapter first describes the types of materials which historically have been dumped in the oceans, and then outlines some of the environmental problems caused by current land-based disposal alternatives for toxic wastes. Some types of the toxic wastes which are now under consideration for ocean disposal by incineration are then described, to illustrate the extreme dangers posed by such wastes, and to emphasize why adequate regulatory control over the disposal of such substances must be obtained.
Prior to 1972 there was almost no control over the use of the ocean as a waste disposal site. Materials that were dumped included: radioactive wastes, nerve gas, arsenic, construction and demolition debris, sewage sludge, garbage, dredge spoils, acids, pesticides, explosives, biological and chemical warfare agents, heavy metals, fly ash, polychlorinated biphenyls, pharmaceuticals, ammunition, engine parts, handcuffs, driftwood, scrubber sludge, various hydrocarbons, seal carcasses, vessels, herbicides, weapons, benzene, organic wastes, poisons, fish offal, detergents and various solid objects.\(^1\)

Since harbour and canal dredging for coastal developments and navigational purposes is routine in most coastal states,\(^2\) approximately 80% of the material that has been and continues to be dumped is made up of dredge spoil.\(^3\) Much of this dredged material is clean silt and sand, and its disposal in ocean dump sites has a relatively minor degree of adverse impact on the marine environment by the burial of marine organisms, the alteration of ocean floor habitat, and the inhibition of light penetration due to the increase in suspended solids in the water column.\(^4\) With careful attention to the location of dump sites and the timing of dumping operations effects tend to be localized, with impacts outside the immediate area of the dump site creating little
risk of widespread harm.\textsuperscript{5}

For uncontaminated materials, alternative uses include shoreline restoration, road base, cement and concrete mixes, beach nourishment and cover for strip mines and quarries.\textsuperscript{6} Where the material is unwanted the two major alternatives to ocean dumping are shoreline disposal and landfilling.\textsuperscript{7} Shoreline disposal has the potential for severe localized impact, due to relatively high coastal and shallow water species diversity. Land-based disposal also can create problems, because the high salt content of the dredged material threatens soil quality and can contaminate groundwater.\textsuperscript{8} The vast quantities of dredged material destined for disposal can create problems too, as sufficient landfill sites could utilize large areas of costly and otherwise useful land. For clean dredge spoil, therefore, it seems that careful ocean dumping may well be an acceptable disposal option, and methods to minimize the impacts of open water disposal are under investigation.\textsuperscript{9}

About 10\% of the dredged material destined for disposal is contaminated, however, because it is dredged from sites close to municipalities and various industries.\textsuperscript{10} Contaminants in such dredged material have the potential to cause widespread damage well beyond the area of a dump site, particularly when the contaminant is a material which can bioaccumulate in the food chain. For example, agricultural chemicals, heavy metals and organic compounds are all common contaminants of dredged material, and may become more readily bioavailable when released by dredging operations.\textsuperscript{11} Such
substances are often extremely dangerous because they are carcinogenic, neurotoxic, mutagenic or poisonous, or because they tend to bioaccumulate or biomagnify in marine organisms. Other adverse effects include severe depletion of the available oxygen, and damage to the marine phytoplankton, a basic constituent of marine food webs which normally replenish atmospheric oxygen.

While dredged and other bulky materials constitute the majority of ocean dumped wastes, several other types of material which have been dumped in smaller quantities are considered even more dangerous due to their extreme toxicity and persistency in the environment. Notable examples of such substances are radioactive wastes and chemical warfare agents. Such materials, along with compounds such as those previously mentioned as common dredge spoil contaminants, fall within a category of wastes commonly referred to as "hazardous." Hazardous wastes may be defined as wastes composed of materials having fatal or dangerous properties, such as flammability, corrosivity, toxicity or radioactivity, and which accordingly may not be handled or disposed of safely by conventional waste management methods such as sewage systems, landfills and refuse incinerators.

One category of hazardous waste is toxic waste, which has been defined as:

A substance which can cause death, disease, behavioural abnormalities, cancer, genetic mutations, physiological or reproductive malfunctions, or physical deformities in any organism or its offspring, or which can become poisonous after concentration in the food chain or in combination with other substances.
Toxic wastes which are characterized by environmental persistence, mobility and indestructibility are often referred to as special wastes, although the terminology varies somewhat from one jurisdiction to another. As a result, the terms hazardous waste, toxic waste and special waste are often used interchangeably. Throughout this study, the term toxic waste will be used to describe substances having the characteristics set out in the preceding definition, and includes special wastes. The term hazardous waste will be used to describe the broader category, which includes both toxic wastes and wastes with other dangerous characteristics such as flammability.

Toxic wastes are produced by a number of major sources, including the pulp and paper, chemical, petroleum, pharmaceutical, textile, and electroplating industries. Traditionally such wastes were either discharged directly into the environment, theoretically becoming diluted to the point of harmlessness, or were dumped in landfills, holding ponds or abandoned wells.

The United States estimates that it produces over 264 million metric tonnes (71 billion gallons) of hazardous wastes annually, and over 80% is still being dumped into landfills or other types of containment facilities. As Piasecki observes, however, even the best dumps leak, and as a result there have been numerous dangerous incidents involving direct human exposure, environmental damage, landfill gas explosions, heavy metal contamination of croplands, and air, groundwater, and surface water.
contamination. Every American state has already had to abandon at least one regional groundwater supply due to hazardous waste contamination, and since groundwater provides approximately one-half of the drinking water consumed by United States residents, this has become an extremely serious problem.

Canada produces comparatively small amounts of hazardous wastes - approximately 3 million metric tonnes per year. Nevertheless, Canada faces the same problems as the United States and so must find a safe way to dispose of hazardous materials in order to minimize soil and groundwater contamination, and to protect both human health and environmental integrity. For example, in Prince Edward Island, a province which relies completely upon groundwater for its drinking water supply, approximately 25% of the groundwater is known to be contaminated by aldicarb, an acutely toxic pesticide implicated as a possible mutagen. Investigations of Canadian landfill sites used to dispose of dredged materials have also revealed that "...the generation of highly toxic leachates has become a regular and continuing feature of many disposal sites." The Canadian government, like its American counterpart, is faced with the need to accelerate the development and implementation of effective hazardous waste management strategies, including an evaluation of all ocean disposal options.

Two categories of toxic waste are of particular interest to the present study: organohalogens and heavy metals. Organohalogens are a large group of organic or carbon-based...
compounds containing fluorine, bromine, silicon, phosphorous, tin or chlorine. Those containing chlorine (the organochlorines or chlorinated hydrocarbons) form the major group of concern. This group of compounds includes such dangerous chemicals as:

1. polychlorinated biphenyls (PCB's) and related compounds;
2. organochlorine insecticides such as aldrin, endrin, dieldrin, heptachlor, chlordane, mirex, DDT, DDE and DDD;
3. organochlorine herbicides such as 2,4-D, 2,4,5-T, TCDD's (dioxins) and TCDF's (furans); and
4. low molecular weight chlorinated hydrocarbons such as carbon tetrachloride, chlorobenzenes, chlorophenols and vinyl chloride.

A few examples will serve to illustrate the type of health and environmental hazards created by such materials.

PCB's, marketed under the trade names Aroclor, Kaneclor and Clophen, are a group of about 200 related compounds widely used in the past in paints, inks, plastics, pesticides, carbonless copy paper, sealants, hydraulic fluids, lubricant additives and heat transfer fluids. Their most common use was as an insulating fluid in electrical equipment. PCB's are very stable compounds which are extremely resistant to decomposition and thus can persist in the environment for decades. They are bioaccumulative and highly toxic, particularly where there is chronic exposure.

In the marine environment PCB's are lethal in extremely low doses. Sublethal effects on aquatic organisms include
impaired reproductive capacity, immunological problems, behavioural deficiencies, body lesions, ragged fins and shell growth inhibition. There is also increased juvenile mortality.\textsuperscript{37}

In humans known effects of PCB exposure include jaundice, numbness, nausea, anorexia, abdominal pain, abnormal fatigue, coughing, acne and headaches.\textsuperscript{38} PCB's are probable carcinogens,\textsuperscript{39} and can also affect liver function and cause stillbirths.\textsuperscript{40}

In the late 1960's and early 1970's studies gradually revealed the dangers of PCB's, and by 1977 all manufacture of these chemicals had ceased.\textsuperscript{41} Their use has now been banned or severely restricted in most countries, including Canada.\textsuperscript{42} However, of the PCB's manufactured between 1929 and 1977, approximately 600,000 metric tonnes (1.3 billion pounds) are still in use,\textsuperscript{43} and due to past releases, widespread occurrence and extreme difficulty of disposal, they continue to create environmental hazards of immense proportions.\textsuperscript{44}

In Canada little data is available regarding environmental contamination by PCB's. Limited studies in freshwater fish and seabirds indicate that PCB levels declined somewhat in the 1970's and have levelled off in the 1980's.\textsuperscript{45} This decline is generally attributed to the regulatory restrictions that have been imposed. PCB levels in humans seem to be remaining relatively constant, however, and virtually nothing is known about the significance of the present contamination levels.\textsuperscript{46}

The organochlorine herbicides, such as 2,4-D and 2,4,5-
Another group of extremely dangerous compounds, particularly if contaminated by manufacturing byproducts such as dioxins. They are known to be toxic to marine phytoplankton and fish, and are bioaccumulative. 2,4-D may cause weakness, stupor, twitching, convulsions and dermatitis. Nevertheless, it is still widely used in Canada, with between 1.5 and 2.5 million kilograms sold each year in Saskatchewan alone. 2,4,5-T has been implicated in human birth defects, is a possible carcinogen and may cause metabolic disorders, skin irritation and cardiovascular disease. It is also in continued use in Canada, although it is now restricted or banned in Ontario, British Columbia and Saskatchewan.

The most notorious of the organochlorine products, which is a contaminant formed during the manufacture of many herbicides, is a group of compounds known as TCDD's or dioxins. A particularly toxic dioxin, 2,3,7,8-TCDD, is a common contaminant in 2,4,5-T. This dioxin is considered "...the most potent carcinogenic and teratogenic chemical known to man." It also causes stillbirths, mutations, skin disorders, immune system problems, cirrhosis, nervous system disorders, headaches, kidney inflammation, bladder bleeding, diarrhea, nausea, weight loss and depression. It is bioaccumulative and persistent and responses to exposure are often delayed. It is fatal in small amounts to aquatic and terrestrial organisms, including man. Limited monitoring of 2,3,7,8-TCDD in seabird eggs in the Great Lakes has shown that its levels seemed to have decreased to some degree
during the 1970's and then levelled off in the 1980's.\textsuperscript{56} Little other Canadian data are available, and the dangers posed by the existing contamination levels are unknown.

Total herbicide, insecticide and pesticide use in Canada is presently unquantified, particularly since government expenditure data on forestry and roadside use is unknown.\textsuperscript{57} By the early 1980's, however, pesticide sales in Canada had reached $698 million dollars per annum, and an average of 9.6 million pounds of phenoxy herbicides alone were sold each year.\textsuperscript{58} Incidents of fish and wildlife kills, human poisonings and death, and widespread environmental contamination have already occurred.\textsuperscript{59}

Adding to the concern over the use and disposal of such organohalogens is their frequent contamination by inorganic substances, particularly heavy metals. Mercury, cadmium and lead are the metals of greatest concern, although arsenic, copper, zinc, beryllium, selenium, chromium, nickel and vanadium are also considered dangerous.\textsuperscript{60} Although many metals are essential nutrients at very low levels, they can be toxic at even slightly elevated concentrations.\textsuperscript{61} Because these metals are elements, they are virtually indestructible and are therefore extremely persistent. Many of the heavy metals bioaccumulate and human exposure can result by way of the food chain.\textsuperscript{62}

Mercury provides a typical example of the dangers of heavy metal contamination. Sublethal marine effects include reproductive disturbances, decreased growth, immune system problems and behavioural abnormalities.\textsuperscript{63} In humans mercury
poisoning has caused irreversible neurological damage, severe birth defects, blindness, deafness, tremors, ataxia, progressive degeneration and loss of reason.\textsuperscript{64}

In Canada high mercury concentrations have led to the closure of several commercial fisheries since the early 1970's.\textsuperscript{65} Although mercury concentrations in some areas of the country have since declined, in other areas the levels appear to be remaining relatively constant,\textsuperscript{66} and elevated mercury levels continue to be periodically detected near industrial and mine sites.\textsuperscript{67}

It can be seen from the preceding examples that organohalogen wastes are hazardous indeed, particularly if contaminated by heavy metals or other inorganic substances. They are dangerous to both marine and terrestrial life, including man, and can occur as contaminants in water, air, soil, sediments or plant and animal life. Problems created by their improper disposal are becoming widespread, posing an increasing threat to water supplies, food sources, and public health. As a result of such dangers, international laws have been gradually enacted to regulate the ocean disposal of these and other hazardous wastes, and the following section will trace the development of these laws from the early 1970's to the present.
Chapter Two: Notes


7. Ibid., chap. 7; Gorham, p. 2.


11. See generally Gorham.


30. Hoos, p. 5.


32. U.S. Congress, p. 60; Sittig, p. 737; Cuyvers, p. 86; Swiss, p. 16; Environmental Protection Service, Pacific and Yukon Region, Fact Sheet on Chemicals in the Environment: PCB's (Ottawa: Environment Canada, n.d.).

33. Cuyvers, p. 86.

34. Kindt, p. 775; Cuyvers, p. 86-87; Environmental Protection Service, Fact Sheet: PCB's.

35. Sittig, p. 737; Cuyvers, p. 87; Environmental Protection Service, Fact Sheet: PCB's.

36. Environmental Protection Service, Fact Sheet: PCB's.

37. Ibid.; Cuyvers, p. 87.

38. Sittig, p. 738; Cuyvers, p. 87.

39. Ibid.

40. Sittig, p. 738.

41. U.S. Congress, p. 60; Simon, p. 120.


43. U.S. Congress, p. 60.
44. Ibid.; Cuyvers, p. 87.
46. Ibid., p. 222-223.
47. Kindt, p. 771-772; Castrilli, p. 9.
51. Castrilli, p. 22.
52. Sittig, p. 835.
55. Ibid., p. 837.
58. Ibid., p. 7.
60. Cuyvers, p. 78-81; Gorham, p. 29.
61. Kindt, p. 803; Cuyvers, p. 73.
62. Gorham, p. 61; Kindt, p. 800; Cuyvers, p. 77.
63. Environmental Protection Service, Pacific and Yukon Region, Fact Sheet on Chemicals in the Environment: Mercury (Ottawa: Environment Canada, n.d.); Cuyvers, p. 79.
64. Sittig, p. 568; Gorham, p. 99-102; Kindt, p. 811.
66. Ibid.
67. Environmental Protection Service, Fact Sheet: Mercury.
Chapter Three: International Law

a. Historical Development

In 1969 a dumpsite was discovered in the Baltic sea that contained enough arsenic to kill the entire population of the world, three times over.¹ That same year, Danish fishermen were burned by fish contaminated with mustard gas that had been dumped in the ocean after World War II.²

In 1970 the United States disposed of 67 tons of nerve gas by dumping it into the ocean, provoking public opposition, court action and international protest.³ Within days of proceeding with the nerve gas dump, the United States conducted another ocean dumping operation and sank a ship containing 5000 tons of bombs off the Maryland coast. The bombs exploded when the ship hit bottom.⁴

In 1971, an American company proposed to dump 70 tons of arsenic into the Atlantic; it suspended operations after a court injunction was issued.⁵ Four months later, after a storm of international protest including a threat to intercept the vessel with warships, a Dutch chemical company recalled a vessel that was preparing to dump 600 tons of persistent toxic wastes at sea.⁶

The early 1970's was also a time of generally high public environmental awareness, so these and other similar incidents served to draw increasing public attention to the dangers of ocean dumping, particularly among Western European nations and the United States. The international community, which had previously concentrated its attention primarily on
vessel-source oil pollution and radioactive waste disposal at sea, was now examining a broader range of environmental issues, and preparing for the 1972 United Nations Stockholm Conference on the Human Environment.

There were three lines of response to this developing awareness of a need to control ocean dumping activities. In Europe, the problem was seen as likely to become critical, because of the number of shallow enclosed or semi-enclosed seas adjacent to highly populated and industrialized areas. Responding to public outcry and regional pressures, Norway therefore called a diplomatic conference to be held in Oslo in the autumn of 1971. This conference produced the first regional ocean dumping treaty which, though applicable mainly to the North Sea, became influential on the development of subsequent treaties.

A second initiative relating to ocean dumping began in the United States. The late 1960's and early 1970's was a period of intense American public pressure relating to environmental issues, and a large number of major environmental statutes were passed in response to these national pressures. Among the many developments which took place was the enactment of domestic legislation regulating ocean dumping. In an extension of these efforts, the Americans drafted an international ocean dumping convention, and tabled that draft with the Intergovernmental Working Group on Marine Pollution in 1971.

The Intergovernmental Working Group was then actively preparing for the 1972 Stockholm Conference, thus providing
the third initiative regarding ocean dumping control. Seizing upon the subject of ocean dumping, as one area in which the Conference could perhaps produce agreement on concrete action, the Working Group began a series of meetings to discuss the issue. Influenced by the American proposal, the regional convention signed in Oslo, and proposals submitted by Australia, Sweden, and Spain, the Working Group was eventually able to obtain a consensus on a draft ocean dumping treaty. Rather than concluding the treaty at the Stockholm Conference, however, a separate conference was convened in London in October of 1972, that finally produced an ocean dumping treaty of global application.

With the London and Oslo conventions in place, a series of further regional efforts followed. These included: the Helsinki Convention, the Barcelona Protocol, the Abidjan Convention, the Kuwait Convention, the Lima Convention, and the Cartanega Convention.

In the following sections the Oslo, London and Helsinki Conventions will be described, to illustrate the regional and international approaches that have been taken to the legal regulation of ocean dumping. The Oslo Convention is typical of most regional approaches to ocean dumping control and it served as a model for the global London Convention, to which Canada is a party. The Helsinki Convention is also briefly examined, as it offers an alternative, somewhat stricter approach to ocean dumping control.
b. Regional Conventions

Two of the major regional treaties are the Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft, 1972 (the Oslo Convention)\(^{14}\) and the Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1974 (the Helsinki Convention).\(^{15}\)

The Oslo Convention, the first international agreement to specifically regulate ocean dumping, was signed by twelve Scandinavian and Western European states. It applies to the North Sea, the Northeast Atlantic Ocean and a portion of the Arctic Ocean.\(^{16}\) The Oslo Convention developed the approach of having a "black list" of substances, the dumping of which is absolutely prohibited, and a "grey list" of substances which can be dumped only under limited circumstances.\(^{17}\)

Substances which are prohibited under the Oslo Convention include: organohalogens, organosilicons, mercury, cadmium, persistent plastics, and carcinogens.\(^{18}\) The grey list of substances includes: arsenic, lead, copper, zinc, cyanides, fluorides, pesticides, containers, scrap metal, tar-like substances, bulky wastes, acids, and alkalis.\(^{19}\) These substances may be dumped only if they are to be disposed of in a quantity specified as acceptable by a commission established pursuant to the Convention.\(^{20}\) The Convention also sets forth guidelines for the Commission to use in determining whether to grant permission for the dumping of waste at sea.\(^{21}\)

For all substances not included in either the black list or grey list, ocean dumping is permitted, but only if a
license is granted by a signatory state. This gives nations the ability to control the amount, location and conditions under which dumping may take place.

Exceptions to the prohibitions on dumping are also set out in the Convention. No liability for dumping a substance in contravention of the Convention will arise, if the dumping was necessary to avert an emergency situation. In addition, substances which are otherwise prohibited may be dumped if they are present in other waste as "trace contaminants." Despite some exhortations in the preamble to the Oslo Convention, stating the importance of the prevention of marine pollution and setting out the need to develop waste reduction processes, it is clear that the Convention is based on the approach that controlled ocean dumping is an acceptable waste disposal practice. Compliance with the permits which allow the dumping to take place may be enforced by the vessel's flag state, the state in which the vessel is loaded, and to a limited extent, by coastal states in their territorial seas.

The regulatory pattern established by the Oslo Convention has been fairly closely followed in most of the other ocean dumping treaties, including the London Dumping Convention. However, some of the treaties, such as the Helsinki Convention, are more restrictive. That Convention, signed in 1974 by seven states, regulates ocean dumping in the Baltic Sea.

The Helsinki Convention prohibits the dumping of all
substances except dredge spoil,\textsuperscript{27} which may be dumped only in accordance with a special permit, issued if the material to be dumped does not contain significant amounts of listed substances including: DDT, PCB's, mercury, cadmium, several heavy metals, phenol, phthalic acid, cyanides, halogenated hydrocarbons, pesticides, radioactive materials, oil, acids, alkalis, and lignin.\textsuperscript{28} The prohibition on dumping does not apply in the event of an emergency.\textsuperscript{29} As was the case with the Oslo Convention, the provisions of the Helsinki Convention are enforceable by the flag state, the port state in which a vessel is loaded, or by a coastal state in its territorial sea.\textsuperscript{30}

The Helsinki Convention approach is of particular interest due to the distinction that is drawn between dredged materials and other forms of waste. Since dredged material creates disposal problems on land, but dredging is necessary to maintain commercially important port and harbour facilities, ocean disposal of dredge spoil is continued subject to provisions that regulate contaminant levels. All other wastes, which are either hazardous or can be more carefully controlled by land-based containment or destruction, are completely prohibited. Arguably, this approach is both protective of the marine environment and economically feasible, and might well serve as a model to be studied during future efforts at international and national law reform.

c. Global Conventions
(i) **London Dumping Convention**

The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (the London Dumping Convention or LDC) is the leading international convention on ocean dumping, and operates on a global rather than a regional basis. It prohibits the dumping of wastes in all marine waters other than the internal waters of states, except in accordance with the terms of the Convention. The LDC also prohibits the sinking of vessels and other man-made structures at sea, and regulates at-sea incineration of hazardous wastes. It does not purport to regulate either the normal operational discharges of vessels or the disposal of wastes resulting from seabed mineral resource exploitation.

The LDC adopted the Oslo Convention approach of having a black list of substances that are absolutely prohibited, and a grey list of substances which demand special care in their disposal and, therefore, require a "special" permit. Disposal of substances not on either list is also restricted, requiring a "general" permit before any dumping of such substances may proceed.

Substances black-listed under the LDC include: organohalogenes, mercury, cadmium, persistent plastics, oil, high-level radioactive wastes, and chemical and biological warfare agents. The grey list includes: arsenic, lead, copper, zinc, organosilicons, cyanides, fluorides, pesticides, beryllium, chromium, nickel, vanadium, scrap metal, bulky wastes and all radioactive wastes not included
on the black list.\textsuperscript{38}

The Convention sets out factors which must be considered by states before granting permits.\textsuperscript{39} These mandatory considerations include: the characteristics and composition of the waste, its persistence, toxicity and bioaccumulative potential, the characteristics of the dump site, the disposal method to be used, the possible effects on marine life and man's other uses of the sea, and the practical availability of land-based treatment or disposal alternatives.\textsuperscript{40}

There are several exceptions to the prohibitions in the Convention, which in effect allow the dumping of prohibited substances. For example, the Convention does not apply to vessels entitled to sovereign immunity, such as military vessels, although states are to ensure that their sovereign vessels "act in a manner consistent with the object and purpose" of the Convention.\textsuperscript{41} Military wastes are, in fact, frequently disposed of at sea, but little public information is normally available.\textsuperscript{42}

Dumping is also permitted by the LDC in emergency situations, when it is "necessary to secure the safety of human life or of vessels," or in any case which "constitutes a danger to human life or a real threat to vessels," if it appears to be the only way to avert the threat and "there is every probability that the damage consequent upon such dumping will be less than would otherwise occur."\textsuperscript{43} Special permits may also be issued for the dumping of black-listed materials in emergencies "posing unacceptable risk relating to human health and admitting no other feasible solution."\textsuperscript{44}
Black-listed substances may also be dumped if they are "rapidly rendered harmless by physical, chemical or biological processes" in the ocean, as long as they will not endanger human health or the health of domestic animals, or make edible marine organisms unpalatable. Organohalogen, mercury, cadmium, persistent plastics and oil may also be dumped if they are present as merely "trace contaminants" in the waste destined for disposal. Special permits may also issue for the incineration at sea of organohalogen, pesticides, oil and grey-listed materials.

These exceptions have been subject to a great deal of criticism and discussion, primarily because of the ambiguity of phrases such as "trace contaminants." Consultative meetings of the parties to the treaty have attempted, with only limited success, to remove some of this ambiguity. McManus summed up the situation as follows: "(u)nfortunately, their attempts at clarification to date are no less baffling (and therefore no more useful in practice) than the original opaque phrase that has given rise to the effort." As that author points out, it is not particularly helpful to know that trace contaminants should not cause "undesireable effects," including the "possibility" of toxic effects to "sensitive marine organisms."

Regulation of ocean dumping by way of a permit system, and enforcement activities under the Convention, are the responsibility of both the vessel's flag state and the port state in which the vessel is loaded for dumping. This has also attracted some criticism, because states which issue
flags of convenience may not act responsibly in the issuance of permits or in the enforcement of permit terms and conditions. Indeed, such flag states are usually not even signatories to the Convention. To an extent these concerns may be met by the provisions of the LDC which provide for coastal state enforcement capabilities over vessels dumping within waters subject to their jurisdiction. This would include the territorial sea and probably, as a matter of customary international law, the continental shelf and any exclusive economic zone.

The LDC has thus provided a global ban on the dumping of wastes at sea, except as permitted by the flag state, port state or coastal state. The ability of contracting parties to issue permits is restricted or prohibited in relation to certain dangerous pollutants, subject to limited exceptions. The Convention provides a set of minimum international standards for the regulation of dumping activities which contracting states must implement. These states, and states which have joined in subsequent regional conventions, are free to enact more rigorous standards, and some, such as the signatories to the Helsinki Convention, have done so. As of 1987, sixty-one nations including Canada have ratified the LDC, making it the most comprehensive international marine pollution treaty in force. The signatories include the United States, Mexico, the Soviet Union, the Peoples Republic of China, Brazil, Argentina, Chile, the United Kingdom, almost all Western European nations, Japan and Australia. Thus North American, Eurasian, Australian and most South
American coastal areas are protected, and most of the highly industrialized dumping nations are signatories. Areas in which protection is lacking under the LDC include much of Africa, the Middle East, India, South-East Asia and the northwestern coast of South America, even though many nations in these areas are parties to regional conventions that deal, to a limited extent, with ocean dumping.

Regular consultative meetings of the participating nations have taken place since the Convention came into force in 1975. In addition to problems such as ambiguity of the Convention, discussion continues over issues such as waste export, radioactive waste disposal, changes to the black list and grey list, dredged material disposal options, ocean incineration, disposal of offshore platforms, enforcement in the high seas, responsibility for emergency dumpings and technology transfer. Also of interest to the parties is the potential effect of the 1982 Law of the Sea Convention, a global convention containing provisions relating to ocean dumping that is expected to come into force.

(ii) The Law of the Sea Convention

After the conclusion of the Stockholm Conference on the Human Environment of 1972, the Third United Nations Conference on the Law of the Sea was convened. In a series of consultations between 1972 and 1982, a draft Convention was finally developed which was intended to be global in scope and which would provide, inter alia, a comprehensive framework to deal with all aspects of marine pollution. The
Law of the Sea Convention (LOS)\textsuperscript{62} includes provisions governing land-based pollution sources, vessel-source pollution, atmospheric pollution, and seabed activities,\textsuperscript{63} as well as a commitment by the participating states to develop national and international laws to prevent, reduce and control ocean dumping.\textsuperscript{64}

The LOS Convention sets out a general obligation upon states to protect and preserve the marine environment from all sources of pollution,\textsuperscript{65} and includes an obligation to minimize the release of persistent toxic substances from the land, atmosphere or dumping.\textsuperscript{66} In taking pollution control measures, states must act so as not to transfer hazards from one area to another, or to transform one type of pollution into another.\textsuperscript{67}

Ocean dumping is defined in the LOS Convention in terms very similar to the definition in the LDC.\textsuperscript{68} Article 210 of the LOS treaty is the primary clause relating to the regulation of ocean dumping, requiring states to adopt national laws and take such other measures as are necessary to prevent, reduce and control pollution by dumping. National laws must be no less effective than global rules and standards, which should effectively oblige all parties to the LOS Convention to comply, at a minimum, with the standards set out in the LDC.

Article 216 of the LOS Convention provides that ocean dumping laws adopted in accordance with the Convention, and applicable international standards, may be enforced by the flag state, the state in which wastes are loaded, and by
coastal states. The LOS Convention provides for coastal state jurisdiction over pollution matters in a 12 mile territorial sea, a 200 mile exclusive economic zone, and the continental shelf. The Convention also provides that no dumping may take place within these areas without the express prior approval of the coastal state. 

Concern has been expressed that the expansion of coastal state jurisdiction over dumping might increase pressure to utilize areas of the high seas. The LOS treaty does provide for states to take measures against any ship voluntarily in their ports in order to address any illegal discharge occurring outside the states' jurisdiction. If one can assume that "discharge" includes dumping, this extension of port state jurisdiction should serve to bolster high seas enforcement where a ship flies a flag of convenience and seeks to evade global ocean dumping standards. In addition, the increased transportation costs of moving wastes to deep ocean dump sites may well preclude the economic viability of the majority of such activities.

At the present time the 1982 LOS Convention has not come into force, although it continues to slowly collect ratifications. Much of the delay has been attributed to the position of the United States, which has rejected those portions of the treaty governing deep-sea mining. While the treaty is not in force, much debate has occurred over the extent to which portions of the treaty are binding as a matter of customary international law.

Some legal concepts which had already enjoyed widespread
acceptance, and thus had in the absence of a treaty already achieved the status of binding customary international law, were simply codified by the LOS Convention. In other areas, the Convention sought to establish new legal concepts. For new concepts that have since received widespread approval, it would seem new customary laws have emerged. Such is the case with the exclusive economic zone idea, which has gained a substantial degree of customary acceptance.\(^7\) This selective acceptance of portions of the treaty, while rejecting other parts, may further jeopardize the ratification of the entire document which was originally negotiated as a "package deal." This has created a great deal of tension between countries pressing for acceptance of the entire treaty, such as third world nations interested in sharing in revenue from seabed mineral resource exploitation, and countries like the United States that reject those provisions. In the interim, the London Dumping Convention continues to govern ocean dumping activities in the global arena, and its widespread acceptance means that its standards have probably become customary law which is binding even on non-signatory states.
Chapter Three: Notes


2. Ibid.


4. Deese, p. 47.

5. Ibid., p. 48.


11. Ibid., p. 12; Letalik, p. 219.


17. Articles 5 and 6.

18. Annex I.

19. Annex II.

21. Annexes II and III.
22. Article 7.
23. Articles 8(1) and 9.
24. Article 8(2).
25. Article 15.
27. Article 9.
28. Annexes I, II and V.
29. Article 9(4).
30. Article 9(3).
32. Articles III(3) and IV.
33. Article III(1) and Annexes I and II.
34. Article III(1).
35. Article IV.
36. Ibid.
37. Annex I.
38. Annex II.
39. Article IV(2) and Annex III.
40. Annex III.
41. Article VII(4).
42. Deese, p. 45 ff.; Bruce, p. 316.
43. Article V(1).
44. Article V(2).
45. Annex I(8).
46. Annex I(9).
47. Annex I(10) and Annex II(E).
49. McManus, p. 126.

50. Ibid., p. 126-127.

51. Articles VI and VII.


53. Articles VI and VII.

54. Letalik, p. 224; Bruce, p. 304.

55. Article IV.


57. Bruce, p. 300-301.

58. McManus, p. 119.

59. For example, signatories to the Lima Convention of 1981 include Columbia, Chile, Equador, Panama and Peru.


62. Ibid.

63. Articles 207-209, 211, 212.

64. Article 210.

65. Articles 192 and 194.

66. Article 194.

67. Article 195.

68. Article 1.


70. Bruce, p. 306; Kindt, p. 1140.

71. Article 218.

Int. Law 355 at 372.


74. Ibid., p. 229.
a. The Canadian Environmental Protection Act

Canada has not yet either ratified or implemented the 1982 LOS Convention, but in 1975 the federal government implemented the London Dumping Convention by enacting the Ocean Dumping Control Act (ODCA). On June 30, 1988, that Act was repealed and replaced by Part VI of the Canadian Environmental Protection Act (CEPA).

The CEPA as a whole is designed to control toxic substances which might enter the environment and endanger human health, resource species or the environment itself. Its stated intention is to control such substances at all stages of their use, from their production to their ultimate disposal or destruction. The CEPA substantially increases penalties for pollution infractions, increases emergency powers and seeks to provide a framework for better enforcement and compliance measures. It also attempts to take a more preventive approach by providing for the assessment and regulation of both existing and new chemical substances. Although it proposes few remedial measures to deal with existing pollutants and their disposal, it seeks to increase public participation and to incorporate environmental concerns into government and industry decision-making processes.

The CEPA also tries to improve the coordination between federal and provincial pollution control measures, and it recognizes the problems that are created by the shared
constitutional jurisdiction in this area. It makes express provision for the use of joint federal-provincial advisory committees in the development of regulations governing toxic substances. It also provides for the negotiation of federal-provincial agreements regarding the administration of the Act, and permits provincial responsibility for toxic substances regulation by way of legislation equivalent to the CEPA provisions. Such "equivalency provisions" are expected to include testing and sampling methods, emission standards, enforcement and compliance policies, penalties and public participation procedures.

The CEPA is intended to govern air, water and land pollution. Part I of the Act deals with the establishment of national environmental quality objectives and practical guidelines. Part II specifically deals with the regulation of toxic substances, and is intended to replace and improve upon the Environmental Contaminants Act. It provides for three major initiatives:

1. development of a system to assess the toxicity of chemicals in an organized manner, with highest priority given to chemicals believed to constitute a significant potential danger;

2. the compilation of a list of all chemicals presently in use in Canada, together with a toxicity assessment of any new chemical before it is introduced into the country; and

3. the regulation and control of any substance which the assessment process determines is toxic.

Part II also contains provisions for controlling fuel
additives, the collection and disclosure of information regarding toxic substances, and the import and export of such materials. At present, however, Part II regulations exist in relation to only nine chemical groups, listed in Schedule I of the Act.\textsuperscript{11}

Strong political will is necessary for the Act to be comprehensively utilized, since the legislation provides that within the discretion of Cabinet any activities may be exempted from the application of the regulations.\textsuperscript{12} The Act is also inapplicable to any substances, such as agricultural chemicals, which are already regulated under other federal legislation.\textsuperscript{13} Assuming that the Act is fully implemented, however, there is the potential for the federal government, in cooperation with the provinces, to regulate the import, export, manufacture, use, sale, release, disposal, transportation, and testing of all existing and future toxic substances in Canada. Of particular importance is the ability of the government to take preventive action, by assessing and when necessary restricting the use of new chemicals, before an environmental or health hazard is created by the uninformed use and release of such substances.

Part III of the CEPA, which replaced Part Three of the Canada Water Act,\textsuperscript{14} deals with the release of nutrients. Part IV broadens the scope of environmental regulation pertaining to federal lands, Crown corporations and other federal works and undertakings, while Part V, which replaced the Clean Air Act,\textsuperscript{15} deals with international air pollution control measures.
Part VI replaces the ODCA, and deals with ocean dumping. Its inclusion in the CEPA indicates that ocean dumping legislation is now being viewed as a type of control measure for contaminants, rather than a form of marine pollution enactment. In terms of the environmental and health dangers created by the hazardous wastes of concern, aligning their regulation with the origins of the contamination rather than with the ultimate or end location of those substances is probably a more realistic approach to the control of ocean dumping activities. However, it is not clear that this same approach is logical when applied to the dumping or reuse of clean dredge spoil.

Dumping is defined in section 66(1) of the CEPA as:

"dumping" means
(a) the deliberate disposal at sea from ships, aircraft, platforms or other anthropogenic structures, including disposal by incineration or other thermal degradation, of any substance, or
(b) the disposal of any substance by placing it on the ice in any area of the sea referred to in paragraphs (2)(a) to (e),
but does not include
(c) any disposal that is incidental to or derived from the normal operations of a ship, aircraft, platform or other anthropogenic structure or of any equipment on a ship, aircraft, platform or other anthropogenic structure, other than the disposal of substances from a ship, aircraft, platform or other anthropogenic structure operated for the purpose of disposing of such substances at sea, and
(d) any discharge that is incidental to or derived from the exploration for, exploitation of and associated off-shore processing of sea bed mineral resources.

The CEPA applies to "the sea" as extensively defined in that Act. It includes the territorial sea, the internal waters of Canada other than inland waters, fishing zones,
Arctic waters, contiguous zones, any exclusive economic zone designated by Canada, areas of the sea under foreign jurisdiction (other than internal waters) and any area of the sea not included in the foregoing - that is, the high seas.\textsuperscript{16}

Section 67(1) of the CEPA provides that "no person shall dump any substance" in the sea, subject to section 67(2) which allows dumping to take place in accordance with the terms and conditions of a permit. Dumping without a permit is prohibited in Canadian waters. Also prohibited is the dumping without a permit by Canadian ships or by vessels loaded in Canadian ports, into foreign waters or the high seas. The CEPA thus provides for the control of dumping operations by way of a combination of coastal state, flag state and port state jurisdictions.

The CEPA also prohibits the loading of vessels in Canada for the purpose of dumping, unless a permit is first obtained, and prohibits Canadian ships from loading wastes in foreign ports unless they have obtained a permit granted in accordance with the LDC.\textsuperscript{17} In addition, no one is to dispose of any vessel or other anthropogenic structure at sea without a permit,\textsuperscript{18} which incorporates provisions governing ocean dumping regulated under the LDC. The CEPA, in section 68, also sets out an exception to the basic permit requirements, in cases where "the dumping is necessary to avert danger to human life at sea or to any ship, aircraft, platform or other anthropogenic structure."

The CEPA follows the basic format of the international conventions by having a black list (Schedule III, Part I) and
a grey list (Schedule III, Part II). Substances on the black list include: organohalogens, mercury, cadmium, persistent plastics, oil, high-level radioactive wastes and biological and chemical warfare agents. The grey list includes: arsenic, lead, copper, zinc, organosilicons, cyanides, fluorides, pesticides, beryllium, chromium, nickel, vanadium, scrap metal, bulky substances, all radioactive wastes not included in the black list, and non-toxic substances that may become harmful due to the quantities dumped.

The significance of the black and grey lists in the CEPA is obscure, however, and the Act has departed from the international conventions in this respect. The international treaties which regulate ocean disposal do so by prohibiting the dumping of black-listed wastes, prohibiting the dumping of all grey-listed wastes except in accordance with a special permit, and prohibiting the dumping of all other substances without a general permit. In certain exceptional circumstances, a permit for black-listed wastes may nevertheless issue; examples include cases where the wastes will be "rapidly rendered harmless" or are present as "trace contaminants".

The CEPA takes a somewhat different approach by prohibiting the dumping of any substance without a permit. Whether the substance is listed in Schedule III or is non-listed, no permit may issue unless, in the opinion of the Minister of the Environment:

1. the substance will be "rapidly rendered harmless by physical, chemical or biological process of the sea and does
not render normally edible marine organisms inedible or unpalatable or endanger human health or the health of animals;"

2. the substance does not contain another substance in a quantity that exceeds a maximum concentration prescribed by regulation;

3. the dumping is necessary to avert an emergency that poses an "unacceptable risk relating to human health and admits of no other feasible solution"; or

4. if the substance is to be incinerated, and the end product of incineration can be disposed of because it is "rapidly rendered harmless" or does not exceed the prescribed maximum concentration.

Since the same type of permit is issued for black-listed, grey-listed and non-listed substances, and all substances are prohibited unless they meet the criteria which, under the international treaties, must only be met by black-listed wastes, the significance of the lists in the Canadian legislation is minimized. The sole reason for retaining the black list/grey list approach seems to be the LDC treaty obligation to conduct international consultations prior to issuing a permit for the dumping of listed wastes in order to avert an emergency.22

Upon receipt of a dumping application, the Minister in deciding whether or not to issue a permit, must take into account the factors set out in Schedule III, Part III to the Act, and has the discretion to take into account any other factor.23 Schedule III, Part III sets out factors such as
toxicity, persistence and bioaccumulation of the wastes, dump site characteristics, whether an adequate scientific basis exists for assessing the consequences, possible effects on marine life, possible effects on other human uses of the sea and the practical availability of alternative waste treatment or disposal methods. No priority is assigned to any given factor or factors, leaving the relative emphasis to be given to each entirely within the Environment Minister's discretion. Section 72(2) simply provides that any permit "shall contain such terms and conditions as the Minister considers necessary in the interests of human life, marine life or any legitimate uses of the sea." Surprisingly, given the focus of the Act as a whole, the Minister of Health and Welfare is not provided with a role in ocean dumping permit procedures or in the setting of permit conditions to protect human life and health.

Applicants for ocean disposal permits must publish a notice of their application in a newspaper of general circulation in the locale where the dumping operation will take place. When granted or varied, permits are published in the Canada Gazette. Permit holders and applicants for permits are granted a right to appeal the Minister's decisions to a board of review, while members of the public may only have permit decisions and proposed regulations reviewed if the Minister, in his discretion, allows a board of review to be established. The board of review can make recommendations to the Minister, and the Minister may revoke or vary the permit if he considers it advisable to do
If a board is established, it must permit "any person" a reasonable opportunity to appear before it, and it must apply "the rules of procedural fairness and natural justice."

Conspicuously lacking in these procedures is an express mechanism to allow public input between the time notice of an application is published, and the making of a permit decision. Also lacking is a mechanism by which a member of the public could force a permit review, as permit-holders are able to do. Additionally, it is not mandatory that the Minister establish a board of review when objections to proposed regulations are received.

Breaches of the CEPA are treated as hybrid offences. On summary conviction, offenders are liable to a $300,000.00 maximum fine and up to six months imprisonment. On indictment, the maximum fine is $1,000,000.00 and up to three years imprisonment. Contraventions of the Act are deemed to be separate offences for each day they are committed.

In many cases the enforcement powers under the CEPA are much broader than those contained in the earlier legislation, and this is the main area in which the reenactment will make changes and improvements. Court orders available under the CEPA include directing the offender to remedy the harm to the environment, to perform community service and to pay money to support ecological research.

The CEPA also includes provisions which increase public involvement, including section 136 which creates a civil cause of action for any breach of the Act, and section 12(4)
which allows any person to petition the Minister to add substances to the list of materials intended to receive priority in their review and assessment. Unfortunately, the Bill does not provide for an environmental bill of rights, nor does it provide financial assistance to individuals who wish to take enforcement action.

The Act also contains provisions dealing with the jurisdiction of the Courts, the designation and powers of inspectors, the detention, seizure and forfeiture of ships and cargoes, and similar matters. If the Minister directs that action be taken to repair or mitigate damage caused by an offence under Part VI of the Act, the costs can be recovered from the offender by the Crown. Interestingly, Schedule III of the Act can be amended by the Governor General in Council on advice of the Minister, by executive rather than legislative action.

The Regulations promulgated pursuant to the ODCA are continued in force under the CEPA. They prescribe the application form to be used in seeking a permit to dump. They also define the maximum quantities of organohalogens, mercury, cadmium, persistent plastics and oil that are considered trace amounts, so that a permit may issue under section 71(3)(b). A definition to distinguish high level radioactive waste from all other radioactive matter is also included in the Regulations.

The Crown is bound by the provisions of the Canadian legislation. This, unlike the situation under the LDC, serves to eliminate any blanket exclusion of military
operations from the need to comply with the CEPA.

b. Constitutional Jurisdiction

Canada is a federal state, with constitutional authority divided between the federal and provincial levels of government. In 1867, when the Canadian Constitution\textsuperscript{39} was drafted, the problem of environmental degradation was virtually unknown, and the scale of waste production which has been reached by modern society was virtually unimaginable. As a result, a thoughtful allocation of legislative power between the two levels of government to ensure adequate environmental protection was never made. Over the years legislative responses to various environmental crises have therefore emerged in a piecemeal fashion, and have been justified by various heads of legislative power, both provincial and federal.

The legislative jurisdiction of the federal government regarding environmental affairs has been based upon its enumerated powers over: interprovincial works and undertakings,\textsuperscript{40} trade and commerce,\textsuperscript{41} agriculture,\textsuperscript{42} seacoast and inland fisheries,\textsuperscript{43} navigation and shipping,\textsuperscript{44} taxation,\textsuperscript{45} the criminal law,\textsuperscript{46} and the power to legislate for the peace, order and good government of Canada.\textsuperscript{47} The provincial governments have, likewise, been granted legislative jurisdiction in relation to environmental protection based on their specified powers over: the management and sale of public lands,\textsuperscript{48} municipal institutions,\textsuperscript{49} local works and undertakings,\textsuperscript{50} property and
civil rights, and matters of a local or private nature in the province. The provinces also have jurisdiction over the conservation and management of non-renewable natural resources and forestry and shared jurisdiction over agriculture. In addition to their other powers each level of government has the prerogative power to manage its own property and assets, and the associated power to legislate in relation to such property.

One might imagine that jurisdiction in international affairs, such as the implementation of an ocean dumping treaty, would be specifically allocated to one or the other level of government. In fact, the law in Canada is not clearly supportive of exclusivity of jurisdiction in foreign affairs. The federal Parliament, pursuant to section 132 of the Constitution Act, 1867, does have full power to implement all treaties entered into by the British Empire on Canada's behalf. However, the Courts have held that since achieving sovereignty, Canadian powers relating to treaties are no longer to be based on section 132, and nowhere in the Constitution is there any other grant of a foreign affairs power.

The prevailing view is that the federal level of government has the undisputed right to enter into or make treaties which are binding on Canada in international law. The delegation of this treaty-making power was confirmed in the 1947 Letters Patent pertaining to the office of the Governor General. Because the treaty-making power is a Crown prerogative, the authority to exercise that power rests
with the executive branch of the federal government, and neither Parliament nor the provincial Legislatures have any legal role to play in the signing or ratification of treaties.\textsuperscript{59}

In order to perform the obligations of a treaty, the treaty must be implemented by domestic legislation. In Canada this treaty-implementing power is not coextensive with the treaty-making power, due to the decision of the Privy Council in the \textit{Labour Conventions} case.\textsuperscript{60} In that ruling the Court decided that it is necessary to look at the subject matter of a treaty in order to decide which level of government has the authority to enact legislation to implement that treaty. If the subject matter falls within a federal head of legislative power, Parliament can implement the treaty; within their own spheres of legislative power the provinces have exclusive power to enact treaty-implementing legislation. This continues to be the authoritative case in Canada, although over the years the decision has been much criticized, and numerous authors have pointed out indicia in recent Supreme Court of Canada cases which hint that the decision may be reconsidered.\textsuperscript{61}

In the absence of a clear federal constitutional mandate to implement treaties, legislation such as the ODCA was as vulnerable to provincial jurisdictional challenges as any other environmental law in Canada. In 1982 a corporation in British Columbia challenged the constitutional validity of the ODCA, after it was charged with violating its dumping permit.\textsuperscript{62} The area of the ocean in which the dumping took
place was within the boundaries of the Province, and there was no pollution of extra-provincial waters. The Provincial government joined the action and argued that legislative jurisdiction belonged to it, although no Provincial legislation had been enacted.

The Supreme Court of Canada disagreed, and in a four to three split decision it upheld the legislation as a valid exercise of federal legislative jurisdiction over matters of national concern relating to the peace, order and good government (POGG) of Canada. The Court undertook an extensive review of the extent of the POGG power as set out in various Privy Council and Supreme Court decisions since 1896, clarifying and reconciling a number of legal principles. After outlining the requirements which a matter must have in order to qualify as a subject of national concern, the Court held that "...marine pollution, because of the differences in the composition and action of marine waters and fresh waters, has its own characteristics and scientific considerations that distinguish it from fresh water pollution." In addition, the Court held that this salt water/fresh water distinction met the requirement "...that in order for a matter to qualify as one of national concern falling within the federal peace, order and good government power it must have ascertainable and reasonable limits, in so far as its impact on provincial jurisdiction is concerned," even though the actual marine pollution took place entirely within provincial boundaries and had no extra-provincial effect. After noting the international "character
and implications" of marine pollution problems, the Court went on to conclude that marine pollution generally, and the ODCA in particular, was within the legislative jurisdiction of the federal Parliament.

While the dissenting justices would have supported federal marine pollution legislation governing areas of the sea outside the provinces, or even if the dumping within a province had the effect of polluting other provinces, they vigorously disagreed about the validity of the legislation in areas entirely within one province. They expressed strong concern over the "potential breadth" of federal pollution control powers, and did not see ocean pollution as a "sufficiently discrete subject" upon which to found federal legislative jurisdiction.

Notwithstanding this strong dissent, it is clear that marine pollution, and specifically ocean dumping, is a matter of national concern and thus within federal legislative jurisdiction under the POGG power. Unfortunately, this does not resolve all of the possible constitutional problems relating to ocean dumping activities. As just one example, one may examine the case of transportation of dangerous goods from an industrial site to a port facility where they would be loaded for ocean dumping. Depending upon whether the transportation is international, interprovincial or wholly intraprovincial, different levels of government would have legislative jurisdiction. One must bear in mind, therefore, that questions of constitutional jurisdiction have continued relevance to marine environmental policy issues, even after
the Supreme Court decision upholding the ODCA. One further problem is whether the recent inclusion of the ODCA in the CEPA will reopen the possibilities of a constitutional challenge. While the ODCA was upheld as valid federal legislation, this was largely because ocean pollution was a subject matter with a sufficient singleness, distinctiveness and indivisibility to clearly distinguish it from matters of provincial concern, and with an impact on provincial jurisdiction reconcilable with the distribution of legislative power in the Constitution. The new CEPA, attempting to deal with air, land, freshwater and marine toxic substances regulation from creation to disposal, may well fail to meet this test. On the other hand, Part VI of the CEPA is arguably severable from the remainder of the Act, and thus may be immune from such challenges even if other Parts of the Act were eventually to be struck down as ultra vires.

c. Administrative Policies and Canadian Dumping Practices

The basic structure of the ODCA was clear, and its constitutional validity has been upheld. Part VI of the CEPA which replaced it is extremely similar in design. One might, therefore, suppose that the practical implementation of the legislation would be straightforward, following precisely the rules laid down in the enactments. Instead, like most Canadian statutes, the administration of the ODCA involved a number of guidelines and procedures that were often internal, unofficial, discretionary and publicly unavailable, and one
can anticipate that these practices will continue under the CEPA.

The CEPA provides that the Minister of the Environment has the discretion to grant, withhold, vary and rescind ocean dumping permits, and attach to such permits such terms and conditions as he deems necessary. In practice this ministerial discretion is delegated to administrative officials, and it would be an extremely rare case indeed in which the Minister of the Environment personally reviewed a permit application.

Permit applications are normally reviewed by administrative officers working for the Ocean Dumping and Contaminants Control division of the Environmental Protection, Conservation and Protection (EPCP) Service regional office. EPCP is a branch of Environment Canada, the federal department of the environment. If the permit application is complete and passes initial screening by EPCP staff, the application is generally circulated for comment to the federal department of Fisheries and Oceans, the Canadian Coast Guard, and the relevant provincial Ministry of the Environment.

Once this consultation process is complete, the permit application is reviewed by the Regional Ocean Dumping Advisory Committee (RODAC), which consists of a panel made up of staff from Environment Canada and Fisheries and Oceans Canada. RODAC either recommends that the permit be issued subject to specified terms and conditions, or recommends that the permit be denied. In most circumstances this is the
administrative level at which a decision about the dumping permit is actually made.\textsuperscript{72}

RODAC's recommendation is made to the Director of the regional Environmental Protection Service, who is the administrative officer that actually signs the permits. Rarely would a permit application be taken up at higher administrative levels, such as the Head of the Ocean Dumping Program, Ottawa officials of Environment Canada, the Deputy Minister or the Minister himself.\textsuperscript{73}

Since the enactment of the ODCA in 1975, over 1800 permits have been issued in Canada for the ocean disposal of various wastes.\textsuperscript{74} From 119 to 204 permits per year have been issued for dredged material disposal, while 13 to 32 permits per year have been issued for other types of wastes.\textsuperscript{75} The percentage of permits for non-dredged material disposal has gradually increased over the years, from approximately 10% to about 25% of total permits issued.\textsuperscript{76} For example, in 1985 75.2% of the permits issued were for dredged material disposal, while other substances dumped included vessels, fish and crab offal, scrap metal, surfactant, brine solution, weapons and ship galley refuse, as well as experimental discharges of oil and radioactive material.\textsuperscript{77} Permit conditions generally govern matters such as handling, storage and loading of wastes, the timing of the disposal operation, and the method of placement at the disposal site.\textsuperscript{78}

The total quantity of wastes disposed of in the Canadian oceans in 1985 was approximately 8 million metric tonnes.\textsuperscript{79} Canadian wastes are generally disposed of in six major sites,
each of which receives over 140,000 tonnes of material annually. There are 164 additional dump sites in Canadian waters, in which the balance of the wastes are dumped. Limited monitoring of six of the minor dump sites has indicated that dumping operations are being restricted to the prescribed locations by the permit process. In addition, approximately 30% of the loading and dumping operations were inspected in the 1985-86 year, and no permit infractions requiring legal action were discovered. One may, however, question the adequacy of such a limited monitoring and compliance program, particularly since only four prosecutions were ever undertaken for infractions of the ODCA in the thirteen years it was in force.

There is continuing and increasing pressure, both on a global scale and within Canada, to utilize the oceans as a waste receptacle for ever greater volumes of material. Industrial expansion, population growth and a shortage of land-based disposal facilities are all contributing to this growing pressure. The possibility of ocean disposal is also becoming increasingly attractive economically, as more stringent environmental standards begin to increase the costs of land-based disposal. In Canada, pressures continue to mount to use the oceans to dispose of solid wastes, such as fuel drums, electrical appliances, scrap metal, vehicles and machinery, to dump industrial wastes such as aluminum smelter and construction debris, and to dispose of fish offal, sewage sludge and incinerable organochlorine wastes.

As Environment Canada seeks to develop domestic policies
that will balance economic practicality with environmental acceptability, the administrative response to such pressures has been mixed. Internal management guidelines state:\(^86\)

In those cases where it can not be shown that increased environmental damage can or will result from ocean disposal of a treated or untreated waste and this represents the least cost disposal option then ocean dumping should not be opposed on the basis of "principle."

A few examples will help to illustrate how policy guidelines have been developed "unofficially" under the ocean dumping legislation, whenever administrative difficulties have been encountered, in order to accommodate the need to continue to process dumping applications without legislative amendment or the promulgation of official regulations.

Approximately 10% of the Canadian dredge spoil that is dumped is contaminated by potentially dangerous materials, including oil and grease, synthetic organics and heavy metals.\(^87\) For oil, the regulations fix the maximum permissible concentration as "any quantity that yields more than 10 mg per kg of n-hexane soluble substances."\(^88\) So long as hydrocarbons are present at less than this level, the CEPA allows the waste to be dumped despite contamination by these black-listed substances.\(^89\)

Actual applications for permits to dump oil-contaminated wastes have ranged from material with concentrations well within these limits to materials which have grossly exceeded the specified levels.\(^90\) On average, the concentrations have been consistently above the regulatory limit (approximately 1465 mg/kg to March, 1978),\(^91\) and a government sponsored
review has concluded that the regulatory limit should be changed.\textsuperscript{92} In the interim, Environment Canada has adopted an unofficial "screening guideline" for allowing oil in sediments at a level of 1500 ppm,\textsuperscript{93} and it is stated policy to permit disposal of contaminated dredge spoils if they do not exceed the background concentrations of the same contaminants at the proposed dump site, a policy referred to as the "like-on-like" concept.\textsuperscript{94} The rationale for this policy is that such dumping involves disposal of material that is "rapidly rendered harmless," because it is being dumped into an area which is already equally polluted.

Some authors argue that to allow the dumping of black-listed substances at all, much less in amounts exceeding trace levels and specified regulatory limits, is contrary to the spirit and intention of ocean dumping laws.\textsuperscript{95} On the other hand, it is clear that the like-on-like policy stems from the underlying attitudes exhibited in both the LDC and Part VI of the CEPA, which seek merely to control or regulate the disposal of existing wastes and are not designed to actively promote the reclamation of degraded areas or discourage the use of ocean dumping as a waste disposal method. In this regard it is worth noting that the LDC was initially developed largely by dumping states, although non-dumping nations now form a majority of participants.\textsuperscript{96}

Environment Canada takes a similar approach in relation to dredge spoils contaminated with organohalogenes or heavy metals. If specified regulatory levels are exceeded, these materials are nevertheless permitted to be dumped if they
will be rapidly rendered harmless either under the like-on-like concept or in some other manner. The regulatory level set for organohalogen compounds is an amount not exceeding 0.01 parts of a concentration, shown to be toxic to marine organisms in a test "carried out in accordance with procedures established or approved by the Minister." As no such procedures have ever been established or approved, the department adopted an unofficial guideline of 1 ppm for PCB's.

The allowable regulatory limit for mercury is 0.75 mg/kg in the solid phase of wastes, and 1.5 mg/kg in the liquid phase. This has been criticized because the liquid phase is thought to be more readily bioavailable than the solid phase and, therefore, it ought to be restricted to a greater degree. In fact the suitability of either value is virtually unknown, as the type of bulk chemical analysis used to detect metal contamination levels reveals nothing about the actual bioavailability of the particular mercury compounds in the sediments, or their potential release during and after disposal operations. Recommendations have now been made to change the regulations in order to require the use of bioassays and on-site examinations of marine organisms in order to determine actual toxicity.

Similar problems exist with the regulatory limits for cadmium, which are set at 0.6 mg/kg in the solid phase and 3.0 mg/kg in the liquid phase. Limited scientific information regarding the adverse aquatic effects of cadmium aggravate the regulatory problems. Cadmium also creates
regulatory difficulties in some offshore locations because it routinely occurs in natural concentrations higher than the legislated limits, averaging 0.8 mg/kg.\textsuperscript{105} In order for dumping to continue, permits are issued based on the like-on-like principle. In addition, cadmium-contaminated materials have been dumped in the deep ocean, on the theory that the dilution at such a site would rapidly render the materials harmless.\textsuperscript{106}

A further difficulty is that no regulatory limits were ever established in the legislation regarding grey-listed substances. Environment Canada, therefore, uses unofficial guidelines of 500 ppm for lead and pesticides, and 1000 ppm for all other grey-listed contaminants, as a method to "pre-screen" the suitability of a waste for ocean dumping.\textsuperscript{107} In addition, no permit is required for non-listed substances if the material to be dumped is below a minimum level of 2000 metric tonnes of clean dredge spoil.\textsuperscript{108} Unfortunately, nothing was done to implement or review any of these unofficial policy or screening guidelines when the ODCA was incorporated into the CEPA.

Generally speaking, while the inclusion of the ODCA in the CEPA has improved public participation to some degree, strengthened enforcement powers, and altered the perception of the ocean dumping legislation from a vessel-source pollution enactment, to an Act controlling land-based pollution, the fundamental concept of the legislation has not changed. Dumping continues to be viewed as an acceptable waste disposal option and is being regulated rather than
prohibited. Rather than trying to prevent wastes from being generated and encouraging the treatment and recycling of wastes, the Act attempts to manage wastes as produced and to limit associated impacts.

Given the dangers which are involved in the dumping of toxic and persistent wastes, including those mentioned earlier in this discussion, an argument can be made that during the recent amendments the legislation should have been completely reorganized to preclude the deliberate ocean dumping of all such hazardous wastes. As a legislative alternative the Helsinki Convention approach seems attractive. It prohibits the dumping of all substances but dredged materials, and treats dredge spoil as needing special care because of the possible presence of hazardous contaminants. Such an approach could have been given serious consideration as a method of improving toxic waste control in Canada. Amendments could also have been considered to make the legislation more preventive and to actively promote the use of better waste management options, particularly for toxic substances.
Chapter Four: Notes

1. S.C. 1974-75-76, c. 55 as am. SOR/81-721.


4. Section 6.
5. Section 98.
6. Section 34(6).
7. S.C. 1974-75-76, c. 72, as am.
8. Sections 12 to 14.
9. Sections 25 to 32.
10. Sections 33 to 40.

11. PCB's, mirex, polybrominated biphenyls, polychlorinated terphenyls, chlorofluorocarbons, asbestos, lead, mercury and vinyl chloride.
12. Section 34(2).
13. Section 34(3).
15. S.C. 1970-71-72, c. 47, as am.
16. Section 66(2).
17. Section 69.
18. Section 70.

20. Sections 67 and 71.
21. Section 71(3).
22. Section 71(4).
23. Section 72(1).
24. Section 71(1).
25. Section 73(1).
26. Sections 74(1) and 89(4).
27. Section 89(1)(3).
28. Section 96.
29. Section 72(4).
30. Section 91.
31. Section 113(m).
32. Section 118.
33. Section 130.
34. Section 77.
35. Section 86(2).
37. Section 88.
38. Section 4.
39. Constitution Act, 1867, 30 & 31 Victoria, c. 3 (U.K.) as am.
40. Section 91(29) and 92(10)(a)(b).
41. Section 91(2).
42. Section 95.
43. Section 91(12).
44. Section 91(10).
45. Section 91(3).
46. Section 91(27).
47. Preamble of section 91.
48. Section 92(5).
49. Section 92(8).
50. Section 92(10).
51. Section 92(13).
52. Section 92(16).
53. Section 92A.
54. Section 95.
55. Sections 91(1A) and 92(5).
59. Hogg, p. 244; Williams, p. 351.
60. Labour Conventions, supra note 36.
61. Hogg, p. 251-254; Williams, p. 357.
63. Preamble of section 91, Constitution Act, 1867, supra note 19.
64. Zellerbach, p. 412.
65. Ibid.
66. Ibid., p. 417.
67. Ibid., p. 419.
68. Ibid., p. 426.
70. Sections 71 and 72.
72. Ibid.
73. Ibid.


75. Ibid., p. 32.

76. Ibid., p. 12.

77. Ibid., p. 4-6, 19, 29.

78. Ibid., p. 2.

79. Ibid., p. 29.

80. Ibid., p. 8.

81. Ibid.

82. Ibid., p. 7.

83. Ibid., p. 14.


88. C.R.C. 1978, c. 1243, section 5(e).

89. Section 9(5)(b).


91. Ibid., p. 51.

92. Ibid., p. 5, 51.

93. Ocean Dumping Program, p. 10.

95. For example, see Kindt.


98. Nelson interview.


100. Nelson interview.

101. Swiss, p. 3.


103. C.R.C. 1978, c. 1243, section 5(c).

104. Swiss, p. 4.

105. Ibid., p. 1.

106. Nelson interview.

107. Ibid.

PART II: OCEAN INCINERATION AND ITS PLACE IN HAZARDOUS WASTE MANAGEMENT

Within the existing national and international legal framework regulating ocean dumping activities, special provisions have been developed to control the at-sea disposal of toxic wastes by incineration. The destruction of toxic wastes by incineration is thought by many to be a preferred method of disposing of these substances, although there is a great deal of ongoing controversy about the use of this technology at sea.

In the following sections, the legal and political strategies which have been developed to improve toxic waste control are examined, focusing on the use of incineration technology and some of its associated environmental and health risks. The history of the use of incineration technology at sea is described, following which the international laws are briefly reviewed. The current and proposed national regulation of this activity in Canada is then described, to provide an overview of the complex legislative framework within which Canadian ocean incineration operations would be required to operate. Finally, the ongoing international debate over the advisability of the use of ocean incineration is discussed, to provide a context within which Canadian law and policy development in this area can be examined.
a. The Waste Management Hierarchy

In an effort to move away from purely reactive approaches to pollution problems, and to develop a more preventive approach, the industrialized nations of the world have reached widespread agreement on the need to evaluate the acceptability of available management options for hazardous wastes, on land and at sea, and to promote preferred options. The underlying goal is to reduce the environmental and health risks caused by hazardous wastes, and thus the waste management alternatives are generally arranged in a hierarchy according to the degree to which they reduce the risk and degree of harm.¹

The details of the waste management hierarchy vary from one jurisdiction to another. Nevertheless there is a general consensus on an hierarchy in which the preferred waste management strategy is to change industrial processes in order to eliminate or reduce the amount or the toxicity of the waste being created. The other options, in order from most to least desirable, are:²

1. recovery, recycling and reuse of wastes;
2. treatment or destruction of the waste before disposal to reduce its hazardous character;
3. storage, isolation or containment; and
4. dispersal into the environment.

Governments are, accordingly, looking to develop laws
and regulations which will promote the preferable waste management options, and discourage the use of less preferable strategies. In addition, varieties of new waste management techniques are now being tested and developed, including biological and chemical treatments, recycling processes, thermal and chemical destruction, and secure methods of landfilling.

A brief review of Part VI of the Canadian Environmental Protection Act, and the London Dumping Convention upon which it is based, reveals that the dumping laws are generally designed merely to regulate the use of the least desirable disposal option, that of dispersal in the environment. For example, under the LDC the dispersal of only a few types of hazardous waste is prohibited or restricted (the black and grey lists), and even for these wastes there are several exceptions in which discretionary decisions may be made to allow dispersal by dumping.

While the old ODCA had no preventive provisions, the CEPA does provide in Part II for the assessment of toxic substances and their prohibition or restriction. The CEPA provisions, therefore, grant some assurance that new hazardous waste streams are not introduced into Canada, thus avoiding the creation of new disposal problems. As long as some care is taken to integrate Part II restrictions with the Part VI black and grey lists, it may be possible to restrict the ocean disposal of many substances or, by Part II regulations, to require the use of preferred disposal techniques.
The London Dumping Convention requires that states, before issuing permits, give "careful consideration" to the twenty-one factors set out in Annex III, one of which is "the potential availability of alternative land-based methods of treatment, disposal or elimination." Similarly the CEPA requires the Minister of the Environment to "take into account" the twenty-one factors set out in Schedule III, Part III to the Act in determining whether to grant a permit. These factors also include "the practical availability of alternative land-based methods of treatment, disposal or elimination, or of treatment to render the matter less harmful for dumping at sea." However, no priority need be given to this consideration over any of the other twenty factors. It is also unclear what is meant by the need to "take into account" available alternatives, but it is obviously not mandatory for the Minister to require the use of a preferred management option in every case where such an option exists. It would also seem that the qualification, that the alternative be "practical" is not limited to technological feasibility, but can include economic considerations. Thus, the best available technology, or even the mere use of a better technology, is not actively encouraged, and may even be discouraged if it is more costly, and thus less "practical."

From an industry viewpoint, the "imposition of environmental considerations" on such ocean dumping activities as dredging programs has caused delay, increased costs, and created a "significant expansion of the planning
This is viewed by industry as a negative development, resulting in complaints that environmental concerns tend to "dominate the decision-making process," and calls for the promotion of "equal and thorough treatment of socio-economic (considerations)." Given, that the Part VI CEPA requirements generally permit the least desirable waste management strategies to be carried out and fail to actively encourage any preferred options, this is a dangerous pressure on attempts to improve waste management and control. Complicating the attempt at implementing government waste management policies is the fact that two of the largest industry proponents are Public Works Canada and Transport Canada. Other federal and provincial departments are also involved in dredging and dumping activities on a smaller scale.

At the international level there has been and continues to be discussion about the meaning of the "practical availability" criterion. Some nations interpret this phrase as a method to actively promote preferred recovery and treatment options, and refuse to issue ocean dumping permits if any land-based alternative exists. Other nations take the position that sea disposal should be prohibited only if it poses a greater human health or environmental risk than practicable land-based alternatives. Guidelines developed in 1984 by the parties to the LDC, in order to determine if land alternatives are more practical, require those nations to make a comparative assessment of: the human risks, environmental costs, economics, hazards associated with
transport and disposal, and the exclusion of future uses of disposal areas.\textsuperscript{14}

Environment Canada's position is that:\textsuperscript{15}

The following waste management operating principles will be taken into account whenever the sea disposal option is considered:
1. Whenever possible, recycle and reuse waste products.
2. Wastes that cannot be recycled or reused should be treated at the source to the extent possible.
3. Wastes that cannot be avoided or reused at a reasonable cost must be disposed of safely.
4. Sea disposal should only be used if it poses less or no greater human health and environmental risks than practicable land-based alternatives.

Again, because these policy statements are merely guidelines and not law, and are discretionary rather than mandatory, it is difficult to ensure that they are given active consideration in every case, and impossible to ensure that they are given priority. There is nothing in the guidelines to require the use of future improvements in technology. Since the reasonableness of the cost of disposal alternatives is an express consideration, short term economic viability can be expected to have a major influence. There is nothing to guarantee that the potentially huge future costs of environmental cleanups are balanced against the short term costs of initial improvements in waste management.\textsuperscript{16}

Additionally, since the ocean dumping administration is only triggered once wastes exist and an application is made for their disposal, the ocean dumping bureaucracy can do little to implement the first two of these stated principles.

b. Ocean Incineration
One area in which the ocean dumping legislation directly deals with a waste management option other than dispersal is the area of incineration at sea. High temperature incineration is one of the leading destruction technologies currently available for hazardous wastes, and as a form of waste destruction it falls into a middle tier of the waste management hierarchy (less desirable than recycling and treatment, but more desirable than dispersal practices).

According to American studies, approximately 20% of all hazardous solids, liquids and sludges are suitable for destruction by high temperature incineration. There are at least six different types of incineration technologies in current use in land-based facilities, each with varying ability to handle different types of wastes. These technologies are relatively well tested and well established methods of hazardous waste destruction.

The two most common types of incinerators currently available are rotary kiln incinerators and liquid injection incinerators. Rotary kiln incinerators are capable of handling a wide range of wastes, including solids and sludges, and they are the most common type of incinerator in American land-based commercial facilities. This is also the type of incinerator proposed for the Ontario and Quebec hazardous waste disposal facilities. Liquid injection incinerators are capable of handling only liquid hazardous wastes, which form approximately one-half of all incinerable wastes. Nevertheless, they are the most common, privately used (on-site) land-based incinerator technologies in the
United States. These incinerators are also the only type of high temperature incinerators that have been mounted on ocean-going vessels for use at sea.

Generally, only organic wastes are suitable for destruction by incineration, including waste oils, solvents, organohalogenes and other organic liquids. Liquid hazardous wastes which have been incinerated on vessels at sea include PCB's, Agent Orange (2,4-D and 2,4,5-T), mixed chlorinated hydrocarbons, ethylene dichloride tar, organophosphorous compounds, organofluorines, and vinyl chloride manufacturing waste.

When organochlorine toxic waste is subjected to such high temperature incineration, the primary products of complete combustion are water, carbon dioxide and gaseous hydrochloric acid. If heavy metal contaminants are present in the wastes, the vast majority of them remain as particulates, although their physical and chemical form may be altered, affecting characteristics such as their solubility. However, some dangerous metals such as mercury, cadmium and lead, are capable of partial or complete volatilization. Depending upon waste composition, various oxide gases may also be formed, including sulfur, nitrogen and phosphorous oxides.

In addition, no incineration process is 100% effective. Where combustion is incomplete, carbon monoxide may be present, and chlorine gas and hydrogen gas may also be produced. One of the standards by which incinerator performance is evaluated and monitored is the examination of
the combustion efficiency (CE). This is a measure of the amount of carbon monoxide and carbon dioxide produced during incineration, and thus is indicative of the percentage of the hydrocarbons destroyed.\textsuperscript{34} Combustion efficiencies during at-sea incineration operations are generally 99.97 to 99.99\%\textsuperscript{35}

As a result of incomplete combustion there will be a small fraction of the total emissions made up of unburned waste.\textsuperscript{36} Steps are, therefore, normally taken during incinerator operations to monitor the destruction efficiency (DE), which is a measure of the percentage of any given waste compound that is incinerated. Destruction efficiencies are generally 0.01 to 0.03\% higher than CE's, and normally exceed 99.99\%.\textsuperscript{37}

Emissions from incinerator operations may also contain new organic compounds formed during the combustion process. Such products of incomplete combustion, or PIC's, are known to include extremely dangerous organic compounds such as dioxins.\textsuperscript{38} Due to the uncertainties inherent in current sampling and analysis methods, it is thought that as much as 1\% of the waste feed may be emitted as PIC's and unburned waste, so that actual destruction efficiencies may be only 99.0\%.\textsuperscript{39}

The uncertainties in measurements of DE's translate into a significant variation in the environmental contamination that could result from incinerator operations. For example, the United States Congress Office of Technology Assessment (OTA) worked out a hypothetical case in which ocean incinerator vessels would burn 50,000 metric tonnes of waste
containing 35% PCB's per year.\textsuperscript{40} If the DE was 99.9999\%, the quantity of unburned PCB's released each year would be only 0.0175 metric tonnes (17.5 kilograms).\textsuperscript{41} Extrapolating from these figures, if DE's were as low as only 99.0\%, 175 metric tonnes of PCB's per annum could be released into the area of the ocean in which an incinerator vessel conducted its waste burns. The OTA concluded that the significance of such releases to the environment is "unresolved."\textsuperscript{42}

With 600,000 metric tonnes of PCB's still in use, and 10 to 21 million metric tonnes of liquid incinerable wastes produced every year in the United States alone,\textsuperscript{43} the potential environmental releases of unburned wastes from incinerators seems dangerous indeed. However, if one recalls that the quantity of waste is being decreased by at least 99\%, and that the most usual alternative for disposal of such wastes is landfilling (with a maximum retention time of about forty years before the full volume of wastes could be released to freshwater and groundwater supplies),\textsuperscript{44} incinerator technology does seem to substantially reduce the degree of risk involved. Simultaneously, however, the attractions of laws and policies which promote even better waste management alternatives, such as recycling and reduced production, become more obvious.

The implementation of such preferred waste management strategies by changes in laws and policies is a long and difficult process, however, and the policy and regulatory decisions that are made are often controversial. In the following chapter, the actual use and regulation of ocean
incineration in an international context is described, after which the existing and proposed Canadian legal framework is outlined, in an attempt to identify areas in which regulatory control over such activities may be deficient.
Chapter Five : Notes


3. Article IV(2).


5. Section 72(1)(a).


9. Ibid.

10. Ibid., vol. 1, p. 4.1.


13. Ibid.


17. Sections 66(1) and 71(3)(d).

18. U.S. Congress, p. 3.

19. Ibid.
21. Ibid., p. 96-98.
22. Ibid., p. 93-94.


24. Ibid., p. 6; U.S. Congress, p. 3.

25. Envirochem Services, p. 8; U.S. Congress, p. 3.


30. U.S. Congress, p. 58, 120.

31. Ibid.

32. Ibid.

33. Nauke, p. 38; Ackerman and Venezia, p. 56.


37. Ibid., p. 179-182; Karau, LDC/OSCOM, p. 2.

38. U.S. Congress, p. 119-120.

39. Ibid.
40. Ibid., p. 145.

41. Actual PCB test burn results (27.5% PCB waste) showed a DE of 99.99989%. Ibid., p. 181.

42. Ibid., p. 145.

43. Ibid., p. 63.

44. Peter Montague, "The Limitations of Landfilling" in Piasecki, supra note 2, p. 5.
Chapter Six: The Use and Regulation of Ocean Incineration

a. Historical Use

By the late 1960's the combination of continual corrosion problems in land-based incinerators when faced with highly chlorinated wastes, and the unacceptable environmental impacts of dumping such wastes (unburned) directly into the ocean caused a number of European countries to turn to ocean incineration as an interim method of managing their highly chlorinated organic hazardous wastes. The first commercial ocean incineration operation was in the North Sea in 1969, by a converted West German tanker named the Matthias I.

In 1972, when the London and Oslo Conventions were being developed, over 60 thousand metric tonnes of waste were being incinerated each year, and two other ships (the Matthias II, a converted tanker, and the Vulcanus I, a converted cargo ship) were operational. Nevertheless, ocean incineration operations were not initially regulated by the ocean dumping conventions, and no international laws existed that specifically addressed at-sea incineration control.

By 1974 over 80 thousand metric tonnes of waste were being incinerated each year, and occasional operational difficulties had begun to be identified. For example, the Matthias II had encountered problems with the maintenance of its combustion efficiency, and the Vulcanus I had attracted other ships into the vicinity of its incineration plume, as they sought to assist what appeared to be a ship on fire and
in distress. A further problem which caused gradually increasing concern was the possible regional increase in acid rain caused by the emissions from the incinerator stacks.

The United States conducted its first test burns aboard the Vulcanus I in the Gulf of Mexico in October and December of 1974, destroying 8400 tonnes of mixed chlorinated hydrocarbons, with an average chlorine content of 63% and trace contamination by mercury and cadmium. Although DE's during the operations averaged 99.95%, there were several problems with the first burn including sampling problems, disputes over monitoring methods, equipment failures and communication difficulties. During the second burn efforts were made to rectify these problems, although there were further equipment failures and problems with the accuracy of measurements. Despite such drawbacks, these initial test burns were rated "a success" and ocean incineration was declared to be "an environmentally acceptable practice when closely monitored and regulated." Although these conclusions have since been questioned, due to the number of "experimental and systematic errors" that occurred during the burns, a further 8400 tonnes of waste were incinerated in early 1975.

In 1975 the Matthias I was decommissioned and another converted tanker, the Matthias III, was brought into use. However, technical problems with the incinerator design were encountered, and there were difficulties related to the vessel's combustion efficiency. As a result, in 1978 the Matthias III was also decommissioned.
By this time the international community's response to ocean incineration activities had finally begun to evolve, starting with the enactment of the 1976 Barcelona Protocol. Incineration was now considered to be a type of ocean dumping because the stack emissions from the incinerator eventually precipitated from the atmosphere on to the ocean surface, and therefore, all residual waste products were effectively "dumped" into the ocean. By early 1977, the members of both the London Dumping Convention and the Oslo Convention began to develop guidelines and regulations to govern ocean incineration and amendments to these treaties were in place by 1978.

Simultaneously, the U.S. had been conducting further tests in an attempt to determine whether ocean incineration was an acceptable waste management technology. In March and April of 1977 a second series of burns of organochlorine waste was conducted in the Gulf of Mexico by the Vulcanus I. DE's ranged from 99.991% to 99.997%, although trace amounts of unburned waste were detected in the stack emissions and DE's for the principal waste constituent were as low as 99.92%. Some evidence of measurable biological effects was also obtained, as fish exposed to surface water in the path of the incinerator plume exhibited signs of stress. Other problems included sampling problems, difficulties in temperature measurement, and questions concerning the reliability of the calculation of the destruction efficiencies.

In July and August of 1977 another United States test
burn series took place, this time near Johnston Atoll in the South Pacific. The wastes burned were over 12,000 tonnes of Agent Orange, a mixture of the herbicides 2,4-D and 2,4,5-T contaminated with 2 ppm dioxin. Environmental testing was "very limited," but CE's averaged 99.99% and DE's for total hydrocarbons averaged 99.985%. DE's for the two main herbicides were over 99.999%, but the DE for dioxins was as low as 99.88%. Again a number of difficulties were encountered, including instrument problems, spills, bilgewater contamination, crew exposure, flameouts and corrosion, with the result that 270 pounds of Agent Orange had to be dumped directly into the water.

By 1979 ocean incineration had stabilized at its present levels of approximately 100,000 metric tonnes per year. A new incinerator ship, the Vesta, had joined in the North Sea operations. Nevertheless, problems including leaking cargo tanks and excessive stack emissions continued to be encountered, and in Europe some such incidents resulted in the occasional closure of ports to incinerator ships. In addition, a 1981 organofluorine test burn showed DE's as low as 99.4%, substantially below the London Dumping Convention's specified minimum efficiency of 99.9%.

Despite ongoing uncertainty, by 1982, fifteen nations had engaged in ocean incineration: Australia, Austria, Belgium, Finland, France, the Federal Republic of Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the U.K. and the U.S.A. Yet another incineration vessel, the Vulcanus II, had also begun operations in the North
Most of the wastes that had been incinerated were organochlorine wastes with 60 to 70% chlorine content, and metal contents in the parts per million range. In 1982, the United States conducted its fourth and last series of test burns. This time the 7000 tonnes of wastes burned were made up of 27.5% PCB's and 7% chlorobenzenes, containing trace amounts of furans. DE's of over 99.99989% for PCB's were reported, but again the burn was not without problems including unreliable sampling and spills.

The United States Environmental Protection Agency (EPA) concluded that their permit requirements had been met or exceeded and that no adverse environmental impact had been exhibited during incinerator operations, despite continued criticism of the measurement and sampling methods used and the accuracy of the analysis of the results. Yet public attention had begun to focus on ocean incineration, and the negative reaction eventually led the EPA to delay the issuance of further incineration permits.

In 1983, while making changes to its criteria for permit issuance in order to meet these public concerns, the EPA monitored another burn which was taking place in European waters. This burn involved organohalogen wastes with an extremely high chlorine content of 84%, and the lowest destruction efficiency obtained was 99.998%.

The EPA, having monitored a successful burn and revised its permit criteria, then prepared to issue further permits for PCB and DDT burns in late 1983. However, at the largest public hearings in EPA history, intense opposition to further
ocean incineration was encountered, and the EPA cancelled plans to issue the permits pending further study and the formulation of more specific regulations. The same year Canada received its first application for a permit to incinerate wastes at sea, and the Canadian government also delayed the issuance of a permit pending the development of specific operating procedures.

In 1985 the EPA finally proposed new rules to govern ocean incineration, and conducted public hearings to obtain a response. Concurrently, a research strategy designed to review ocean incineration technology was developed. However, just as the U.S. and Canada were developing guidelines to permit ocean incineration to commence, the international community was beginning to reconsider its position.

The LDC Scientific Group on Dumping met in 1985 in an attempt to arrive at a consensus on a number of unresolved issues regarding ocean incineration, including sampling problems and problems due to the production of PIC's during incineration. In 1985 the Commission of the European Communities also made a proposal that all ocean dumping and incineration by EEC nations should be reduced and terminated as soon as possible. Further discussions of the London Dumping Convention were then scheduled for a joint meeting with the Oslo Commission in 1986-87.

By late 1985 the EPA made another tentative decision to permit a PCB test burn in the North Atlantic. Again there was intense public opposition, which escalated into litigation. Among the many reasons for protest was the
poor environmental record of the incineration company, which
had by then been fined $17 million for a variety of
infractions of U.S. legislation.\textsuperscript{50} In May of 1986 the EPA,
therefore, denied the incineration permit and announced that
no further permits of any kind would issue for ocean
incineration until the revised regulations were finalized.\textsuperscript{51}

Debate continued to escalate, and by late 1987
confrontations between incinerator vessels and protest groups
had resulted in the crippling of the Vulcanus II in Danish
fishing nets during a commercial burn, a multimillion dollar
lawsuit over the resulting damages, an interim injunction
banning Greenpeace vessels from approaching the incinerator
ships, the injunction's violation, and the resulting
impoundment of the Greenpeace vessels.\textsuperscript{52}

In November of 1987, eight European nations agreed to
decrease ocean incineration by 65\% no later than 1991, and to
end all incineration in the North Sea by 1994,\textsuperscript{53}
thereby
implementing a long-standing Oslo Commission policy.\textsuperscript{54} Then
on December 31, 1987, the major American proponent of ocean
incineration announced its decision to abandon attempts to
obtain an incineration permit due, in part, to continued
delays by regulatory authorities.\textsuperscript{55}

Thus it appears that, until the technical and political
problems surrounding ocean incineration are resolved, the
practice seems destined to be phased out in Europe and
indefinitely postponed in North America. However, as Watson
points out:\textsuperscript{56}

\textit{(G)iven the nature of the current crisis in hazardous}
waste management, achieving further delay on the issue without making some concrete progress toward developing a greater capacity of liquid hazardous waste disposal was a somewhat hollow victory.

With predicted continuing shortfalls in land-based disposal facilities throughout Europe and North America, a reversion to storage or landfilling of these hazardous wastes, instead of destroying them, seems to be a step backward in the implementation of preferred waste management policies. To ensure that a dangerous management error is not made, government regulators must somehow come to terms with the difficult problem of public opposition in the face of scientific uncertainty, and achieve some consensus on the proper place of ocean disposal in the waste management hierarchy.

b. International Regulation

The existing international laws governing ocean incineration are primarily contained in the ocean dumping treaties, but due to the nature of ocean incineration operations, other international rules, such as standards for the design and construction of vessels transporting dangerous goods, are also relevant.

The leading international legal controls over ocean incineration are contained in the London Dumping Convention, which was amended in 1978 to include regulations governing at-sea incineration operations. The amendments were adopted as of December 1, 1978, and came into force on March 11, 1979. The first of these amendments was to the black list,
which provides that the ban on dumping of organohalogens and oil does not apply to their disposal at sea by means of incineration.\textsuperscript{59} Such ocean incineration now requires a special permit, and in issuing a permit signatory states must apply the Regulations that were also added to Annex I of the Convention. LDC nations must also "take full account" of the Technical Guidelines developed by the contracting parties in 1980.\textsuperscript{60} The second amendment was to the grey list. It provided that contracting states must apply the Regulations and take account of the Technical Guidelines, "to the extent specified in these Regulations and Guidelines," when issuing special permits for the incineration of grey-listed substances.\textsuperscript{61}

The Regulations for the Control of Incineration of Wastes and Other Matter at Sea, which have been added to Annex I of the LDC by amendment, are binding rules to be followed by the parties to the treaty, unlike the Technical Guidelines which must simply be "taken into account." In rather convoluted language, Part I of the Regulations provides that:\textsuperscript{62}

1. Part II of the Regulations applies to organohalogens and to pesticides and their by-products not covered in the black list;

2. oil and all grey-listed materials except pesticides shall be controlled "to the satisfaction of the Contracting Party issuing the special permit;" and

3. all other wastes to be incinerated are subject to a general permit.
Thus mercury, cadmium, persistent plastics, high-level radioactive wastes, and biological and chemical warfare agents are still completely banned. Organohalogens and pesticides must meet Part II regulations, while oil and other grey-listed substances require a special incineration permit, and non-listed substances can be incinerated under a general permit. This set of Regulations has caused some interesting legal manoeuvring as, for example, when the United States decided to incinerate the defoliant Agent Orange. Since many regarded it as a chemical warfare agent, the dumping of which was completely banned, the Americans took the position that it was the combustion products that were being transported for dumping, not the Agent Orange itself.

Part II of the Regulations, which applies to the incineration of organohalogenics and pesticides, provides for the approval and survey of incineration systems at least every two years, special monitoring of wastes where there are doubts as to their thermal destructibility, mandatory data recording, information to be specified in permit applications, and factors to consider in the designation of incineration sites. The Regulations also set out some specific operational requirements, including:

1. minimum flame temperature of 1250 degrees Celsius;
2. minimum combustion efficiency of 99.995 +/- 0.05%;
3. no black smoke or flame extension from incinerator stack; and
4. destruction efficiencies in excess of 99.9% in an initial survey.
However, there is nothing in the regulations to require the use of air emission control devices, to limit the content of metals or other inorganic contaminants in the waste, to monitor the type of PIC's that may be produced, or to ensure that the required destruction efficiencies for waste compounds be continually maintained. The United States EPA now takes the view that the LDC requirements are merely minimum standards, and "that a more stringent standard is both attainable and necessary."  

Three major areas of the law which are also relevant to ocean incineration operations are standards for vessel design and construction, occupational health and safety, and emergency response systems. At the international level much of the law which developed in these areas arose as a result of oil tanker accidents, although many of the conventions have since been extended to vessels carrying other types of dangerous cargoes.

The leading international treaty in this area is the Convention on the Prevention of Pollution from Ships, 1973 (MARPOL)\(^{71}\) and its 1978 Protocol, which are designed to control and regulate ship design, equipment and safety features relevant to pollution prevention. They also govern discharges of toxic chemicals, oil and other pollutants carried in bulk. Other treaties of importance include the 1969 Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties\(^{72}\) and its 1973 Protocol, which outline the rights of states to intervene in the event of a spill, and the International Convention for the Safety
of Life at Sea, 1974 (SOLAS),\textsuperscript{73} which includes provisions on fire protection and emergency response and sets out specifications for mechanical and electrical equipment.

The Marine Environmental Protection Committee of the International Maritime Organization (IMO) has also adopted an International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), which has provisions applicable to incinerator ships.\textsuperscript{74} In addition, the IMO Sub-Committee on Bulk Chemicals developed a code of practice entitled "Guidelines for the Construction and Equipment of Ships Carrying Hazardous Liquid Wastes in Bulk for the Purpose of Dumping at Sea," which has been approved by the IMO Maritime Safety Committee.\textsuperscript{75} These guidelines encompass a number of occupational health and safety provisions, including rules relating to personnel training, firefighting and necessary protective equipment.\textsuperscript{76} Also, guidelines for the "Surveillance of Cleaning Operations Carried Out at Sea on Board Incineration Vessels" have been prepared and referred to the IMO, in an attempt to harmonize the LDC and MARPOL provisions.\textsuperscript{77} Vessel design and construction are also specifically dealt with in the LDC Technical Guidelines.\textsuperscript{78}

The international community is thus continuing to make some progress in addressing concerns relevant to ocean incineration, particularly in the areas of vessel design and construction, and attempts are being made to harmonize these provisions with the requirements of the LDC.
c. **Canadian Legislation**

In a commercial land-based incinerator operation, wastes are normally transported by truck or rail from the waste generator to the incinerator, where they are destroyed. Legal and regulatory controls generally apply to the industry which generates the waste, to the transporter and to the actual incineration operation.

Due to environmental concerns and proximity to human populations, all land-based incinerators used for the disposal of hazardous waste should, ideally, be equipped with air pollution control equipment called "scrubbers." Inorganic matter, such as heavy metal particulates, which are not destroyed by incineration can be removed from incinerator stack emissions by such scrubbers. They also act to neutralize most acid emissions. Scrubbers are, however, relatively ineffective at removing volatilized metals, unburned organic compounds, PIC's, and nitrogen oxides. In addition, highly chlorinated wastes with over 30% chlorine content may exceed scrubber capacity, in which case both chlorine gas and hydrochloric acid may be emitted. The use of scrubbers also generates "scrubber waste," which along with the ash residue from incineration is, itself, a hazardous waste that requires careful disposal.

An at-sea incineration operation involves the collection of the wastes from various waste generators and their transportation to storage tanks in a port facility. From a national viewpoint, ocean incineration laws must, therefore, regulate these land-based aspects of hazardous waste.
management, in addition to the actual at-sea operations with which the international conventions are concerned.

Once sufficient wastes have been collected they are pumped on board the incineration vessel, which then sails to a designated location in the ocean called the burn site, and conducts the incineration. Again, national laws must deal with the regulation of port facilities and activities in internal waters, which are outside the scope of the international laws.

During the process of incineration the plume settles or precipitates on to the ocean surface and this, in legal terms, constitutes the ocean dumping. At-sea incinerators lack scrubbers, and thus particulates, metals and acid emissions are directly discharged into the receiving environment, along with organic compounds and volatilized inorganics that would normally evade the scrubbers. Due to the buffering capacity of seawater, the acid emissions are neutralized within a few hours as the atmospheric discharges contact the ocean surface. Unfortunately, any wastes not affected by the incineration operation, such as metals, will be deposited directly into the marine environment with the potential of eventual bioaccumulation in the food chain. The only real method of controlling metal emissions into the marine environment from ocean incineration, unless scrubbers are to be required, is to control the amount of metal contamination in the wastes initially accepted for destruction.\(^{82}\) At present the LDC contains no such controls, while several Oslo Convention nations have set unofficial
guidelines on metal content in wastes.\textsuperscript{83}

Unburned hazardous waste residues which remain in the incinerator ships storage tanks, and other contaminated materials resulting from the cleaning of the incinerators, must either be retained on board for future incineration, or returned to land for proper land-based disposal.\textsuperscript{84} They are not directly discharged into the ocean.

Part VI of the CEPA, as the primary piece of Canadian legislation regarding ocean dumping, governs the basic aspects of ocean incineration, and in the Act's present form, incineration is defined as a form of dumping.\textsuperscript{85} It is thus regulated via the same permit system as other types of ocean disposal, and the Regulations specify the form of application to be used to obtain a permit for incineration operations.\textsuperscript{86}

Under the CEPA permits for incineration may not be issued unless, in the Minister's opinion, the end products of incineration are either "rapidly rendered harmless,"\textsuperscript{87} or will not exceed the concentrations prescribed by regulation.\textsuperscript{88} Where there is no other feasible solution, incineration could also take place in emergencies that pose an unacceptable risk to human health.\textsuperscript{89}

The LDC incineration regulations and guidelines have not been implemented by Canadian legislation, and were not included as part of the new CEPA. The current intention is, instead, to incorporate the LDC regulations as part of a set of technical guidelines for ocean incineration.\textsuperscript{90} The proposed method of regulating at-sea incineration is simply to refuse to issue a permit unless these policy guidelines
are met, and then to issue permits only subject to terms and conditions identical to the LDC regulations. The treaty obligations will thus be implemented not by legislation, but by discretionary administrative policy, and it is not intended to enact standards which are stricter than the minimum international requirements.

Not all aspects of ocean incineration operations are dealt with by the draft technical guidelines. Numerous other enactments, both federal and provincial, are also relevant to many aspects of ocean incineration activities. In some areas there is legislative overlap, while in others there is a lack of regulatory activity. Unfortunately, such regulatory control as exists is scattered not only among several enactments, and split between the two levels of government, but is also divided among several departments or ministries within each level of government.

On the broadest scale, the first activity relating to ocean incineration that attracts regulatory activity is the identification of wastes as hazardous, and the assumption of control over the indiscriminate disposal of such wastes. In the late 1970's the federal government made several efforts to enact statutes designed to identify or control toxic substances, including the Pest Control Products Act, the Canada Water Act, the Fisheries Act, and the Environmental Contaminants Act. As of 1988, the Environmental Contaminants Act and Part Three of the Canada Water Act have been repealed and replaced by the CEPA.

The Canada Water Act is, in theory, a sweeping enactment
applicable to all federal waters, international waters, interjurisdictional waters and boundary waters. It is the responsibility of the Minister of the Environment. It provides for the designation of water quality management areas, within which the deposit of waste would be prohibited or controlled. Unfortunately, due to reservations about the constitutional validity of the Act, and political considerations involving the maintenance of amicable federal-provincial relationships, no such management areas have yet been created. The only part of the Act ever fully implemented, and subsequently repealed and reenacted as part of the CEPA, is the section restricting the use of substances containing nutrients in excess of prescribed amounts.\footnote{93}

Part II of the CEPA, which replaces the old Environmental Contaminants Act, is a potentially broad scale regulatory enactment under the joint administration of Environment Canada and Health and Welfare Canada. As previously discussed, it provides for the collection and evaluation of information to determine whether a substance is toxic, the restriction of toxic substances new to Canada, and extensive regulation of substances found to be toxic, from their creation to their ultimate disposal. Given sufficient political will, the CEPA should gradually come to regulate a vast number of toxic wastes, either directly or by way of equivalent provincial enactments provided for in the Act, although the initial toxic substances list governs only nine chemical groups: PCB's, polychlorinated terphenyls, chlorofluorocarbons, mirex, polybrominated biphenyls,
asbestos, lead, mercury and vinyl chloride. All of these substances (except asbestos) are either organohalogens or metals that are scheduled under the CEPA ocean dumping provisions. The CEPA also provides for the creation of a list of priority substances, which are to be given the earliest assessment as to their toxicity.  

One of the areas in which departmental jurisdiction has resulted in some conflict is that of agricultural chemicals. This area is complicated by the express shared constitutional jurisdiction of the two levels of government. Vast numbers of toxic chemicals are used primarily for agricultural purposes, and are thus governed at the federal level by the Pest Control Products Act, and at the provincial level by agricultural rather than environmental enactments.

The Pest Control Products Act, under the authority of the federal Minister of Agriculture, governs the assessment of the health and environmental safety of pesticides by way of a registration system. The federal Ministry thus regulates the manufacture, use, import, storage and sale of pesticides in Canada, although a referral procedure involving Environment Canada, Health and Welfare Canada, Fisheries and Oceans Canada and the Department of National Defence has been developed. Agricultural chemicals are thus exempt from the regulations produced under the CEPA.

Although there are numerous other federal and provincial statutes that regulate the discharge of toxic substances and wastes, the major enactment of relevance to ocean incineration is the federal Fisheries Act. That Act applies
to the territorial seas, fishing zones and internal waters of Canada, and because of the clearcut constitutional jurisdiction of the federal government over fisheries, it has proved to be the leading water pollution control enactment in Canada wherever there is a direct link between prohibited emissions and an actual or potential harm to fish.

The primary pollution control measure in the Fisheries Act is section 33(2), which prohibits the deposit of deleterious substances in water frequented by fish, or in areas where such materials could enter such waters. Accordingly, most or all ocean dumping offences would also be contraventions of the Fisheries Act. No offence is committed under the latter Act if the deposit is made in compliance with the regulations promulgated under the Fisheries Act, or of any other Act, and fisheries Regulations permitting discharges exist for six industries. The Act is primarily the responsibility of the Minister of Fisheries and Oceans, although by agreement Environment Canada administers the section 33 pollution provisions.

The provinces have also made efforts to enact legislation controlling the use and disposal of toxic substances. Much of this legislation exerts important controls over waste generators, including the siting, operation and inspection of pollution control systems in many industries. Provincial jurisdiction is, however, always geographically limited and efforts to deal with offshore, interprovincial and international matters are, therefore, constrained. Nevertheless, provincial roles in this area may
gradually increase, due to the sections in the CEPA which provide for toxic substance control by way of equivalent provincial laws.  

Land transportation of dangerous goods to port facilities is another area relevant to ocean incineration operations. Again constitutional jurisdiction is divided, with international and interprovincial matters generally falling within the federal sphere and intraprovincial transport generally within the provincial sphere. However, transport within ports and transportation at sea fall within federal legislative jurisdiction over public harbours, navigation and shipping.

The major federal legislation in this area is the Transportation of Dangerous Goods Act (TDGA), which applies to all handling and transportation of dangerous and toxic goods originating from or destined for any place in Canada, and to all ships and aircraft registered in Canada. It applies to both land and sea transport, except for the case of the vessel transportation of dangerous goods in bulk, which is governed by the Canada Shipping Act. The TDGA sets out a number of safety standards which must be met before anyone may transport hazardous materials, and applies to a long list of dangerous substances, including explosives, flammable materials, infectious materials, corrosives, radioactive wastes and toxics. Although the Crown is bound by the Act, there are exemptions made for the military. The Minister of Transport is the responsible official.
The federal TDGA was designed to set standards for adoption and implementation by way of agreements with provincial governments. Most provinces have passed enabling and complementary legislation. The overall intention of the enactments is to set standards for the safe handling of hazardous materials, as well as to create a "paper trail" to keep track of the movement of toxic wastes, to ensure that the quantities of waste which leave any given factory actually arrive at a disposal facility, without any "midnight dumping" having taken place. The TDGA also contains provisions for emergency response in the event of spills.

The storage and handling of hazardous wastes in port facilities and the loading and transportation of those wastes in ports and harbours also involve a mixture of provincial and federal legislation. The federal government has constitutional authority over public harbours, and the enactment which governs most major ports is the Canada Ports Corporation Act (formerly the National Harbour Board Act), pursuant to which activities which could endanger life or health may be regulated. The transport of dangerous goods in the port is also strictly controlled.

The Harbour Commissions Act enables the assumption of federal regulation over harbours not governed by the Canada Ports Corporation Act, and a number of harbours have been placed under the control of such Harbour Commissions. The Commissions regulate all uses of the land, buildings and wharves, and control the use of dangerous substances in the harbour.
Part VIII of the Canada Shipping Act\textsuperscript{107} also gives the federal government the power to proclaim a harbour to be a public harbour, and such a harbour is then subject to regulations pursuant to that Act.\textsuperscript{108} The use and transportation of dangerous cargo is again strictly regulated.

The federal Public Harbours and Port Facility Act (formerly the Government Harbour Act)\textsuperscript{109} governs all harbours except those regulated under the Canada Ports Corporation Act and the Harbour Commissions Act. The National Fire Code is also potentially applicable to port facilities, while municipal bylaws may also be relevant in some cases.

As if this were not enough of a regulatory maze, the federal government has developed the "Code of Recommended Standards for the Safety and Prevention of Pollution for Marine Transportation Systems and Related Assessment Procedures (TERMPOL)" as a nonbinding set of guidelines relating to bulk oil, chemical and gas terminal systems, including port facilities, berths and vessel approaches from seaward. The Coast Guard is the principal agency involved in administering TERMPOL.\textsuperscript{110}

The CEPA itself specifies that a permit is required before a ship may be loaded with wastes for dumping or incineration at sea. The Canada Shipping Act also authorizes the development of rules regarding precautions during loading, the stowing of goods and the quantities to be carried.\textsuperscript{111} Once the goods are loaded, their transportation is regulated by the TDGA when the wastes are in containers,
and by the Canada Shipping Act when the goods are in bulk.

Requirements for incinerator vessel design and construction, as well as operational requirements, are not part of Canada's national laws. All such requirements are contained in the international instruments previously mentioned, including MARPOL and the LDC amendments. It is presently intended to implement these conventions by way of amendments to the Canada Shipping Act and the ocean dumping legislation. However, no such amendments were actually made to the ODCA provisions upon its recent inclusion in the CEPA. Enabling amendments to the Canada Shipping Act to implement the MARPOL and SOLAS Conventions and Protocols, as well as the IMO Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, 1971 (BCH Code), have been enacted, but have not yet been proclaimed in force. As a result, the international regulations remain unenforceable guidelines in relation to Canadian vessels or vessels operating in Canadian waters.

Many of the same Conventions are also important because they contain provisions relating to the health and safety of the crews working on board incinerator vessels. At the national level, regulations governing the occupational health and safety of Canadian workers on Canadian vessels have recently been promulgated under Part IV of the Canada Labour Code. For land-based activities relating to occupational health, the Provinces would have primary legislative jurisdiction.

Even if the LDC and other international treaties were
fully implemented in Canada, there are areas of concern where regulation is lacking, primarily in relation to the control of incinerator stack emissions. There are no proposed limits on metal content in wastes, and scrubbers are not required. Part V of the CEPA, which recently replaced the Clean Air Act,\textsuperscript{116} has fixed no enforceable standards, although some "interim national emission criteria" for PCB destruction have been put forward.\textsuperscript{117} The CEPA and its regulations have limits on the quantities of materials "dumped" in air emissions set largely at the discretion of permit-granting authorities. The existing restrictions on the exercise of this discretion are, as previously discussed, virtually meaningless. As an example, one may examine the "rapidly rendered harmless" criterion.\textsuperscript{118} "Rapidly" is not defined. It is unclear if "harmless" means totally harmless, harmless given acute exposure, or harmless given chronic exposure. It is unclear what must be harmed before a substance is considered harmful. In addition, stack emissions can contact seabirds, endangered species, downwind vessels or (in shifting wind conditions) even the crew of the incinerator vessel,\textsuperscript{119} before ever contacting the sea in order to be rendered harmless. There can also be acute toxicity to ocean surface microlayer plankton\textsuperscript{120} even though commercial and edible species such as fish may be unaffected. These standards seem imprecise at best, and as previously mentioned the international attempts at clarification have provided little assistance, particularly in relation to some of the concerns unique to incineration operations.\textsuperscript{121}
Regulation of the choice of an ocean dumping site is governed largely by the CEPA. Again, however, the LDC amendments which set out additional criteria for incineration sites were not incorporated in the CEPA upon its recent replacement of the ODCA. A further consideration for such operations in Canada is the existence of the Arctic Waters Pollution Prevention Act. That Act prohibits the discharge of all wastes into Arctic waters, except as permitted by regulations, and most ocean dumping would fall within this prohibition. Responsibility for the Act is retained by Cabinet, except as delegated to the Ministers of Transport, Indian and Northern Affairs or Energy, Mines and Resources. Particularly in the North, native land use requirements arising from land claim settlement agreements may also need to be taken into consideration.

Emergency responses and contingency plans are a further area of concern to ocean incineration operations, and the application for a permit to incinerate at sea requires the applicant to have an approved contingency plan. Municipal, provincial and federal authorities may all be involved in different phases of emergency responses to either spills or fires. Some of the international conventions previously mentioned also provide for emergency procedures.

The preceding discussion reveals the type of jurisdictional conflict, deficiencies, overlap and confusion that must be managed in dealing with ocean incineration operations. In any given situation, one could conceivably involve the Coast Guard, Transport, Agriculture, Environment,
National Defence, Fisheries and Oceans, Health and Welfare, Indian and Northern Affairs, Labour, Energy, Mines and Resources, provincial authorities, native leaders, port or harbour authorities, and municipalities. Even within this regulatory framework there are aspects of ocean incineration which are only now being developed, including vessel design and construction standards. Moreover, there are aspects which are not yet subject to any formal legal regulation at either the national or provincial level, such as incinerator performance standards. Surprisingly, the few amendments to the ODCA upon its incorporation into the CEPA did not attempt to implement these controls or incorporate them into Canadian law.

In this climate of regulatory fragmentation and jurisdictional conflict, there is some real uncertainty over the ability of government to formulate and implement adequate regulatory control over ocean incineration operations, to ensure that proper sites are selected, to minimize emissions, and to ensure that environmental impacts are mitigated and safety standards are maintained. With these concerns in mind, the risks associated with ocean incineration, their acceptability, and some of the potential impacts of ocean incineration operations which must be debated before a decision to permit its use is made, form the next subjects of discussion.
Chapter Six: Notes


2. Ibid., p. 36.


6. Bond, p. 149A.

7. Ibid.


12. Bond, p. 149A.


14. Bond, p. 150A.


16. Ibid., p. 149A.

17. Ibid.

18. 15 I.L.M. 285; see also U.S. Congress, p. 193.


22. Bond, p. 150A.


27. U.S. Congress, p. 184; Kamlet, p. 308; Bond, p. 150A-151A.


29. Ibid., p. 195-196.


31. Watson, p. 3.

32. Ackerman, History, p. 117.


36. Watson, p. 3; U.S. Congress, p. 181.


39. Watson, p. 3.

40. Bond, p. 151A-152A.

41. Watson, p. 3.


43. Watson, p. 3; U.S. Congress, p. 182.


47. "Joint meeting to be held on incineration," (1986) 4 IMO News 15.

48. Watson, p. 3.


50. Watson, p. 4.

51. Ibid., p. 3; U.S. Congress, p. 183.


55. Ibid., p. 182; 73(2) Sierra 10.

56. Watson, p. 4.


59. Annex I(10).

60. Walker, p. 165.

61. Annex II(E).

62. Regulation 2.


64. Regulation 3.

65. Regulation 4.
67. Regulation 7.
68. Regulation 8.
69. Regulations 3 and 5.
70. Walker, p. 179.
71. 12 I.L.M. 1319.
72. 9 I.L.M. 25.
73. Cited in Envirochem Services, Glossary p. 4.
74. Envirochem Services, Glossary p. 2; Bruce, p. 313.
75. Ibid.
76. Envirochem Services, p. 56.
78. Annex VII.
80. Ibid., p. 127.
81. Ibid., p. 15, 57.
82. U.S. Congress, p. 12.
83. J. Karau, "Summary of OSCOM Meeting on Incineration at Sea May 4-6, 1987" (Ottawa: Environment Canada, 1987), p. 3.
84. Envirochem Services, p. 36-38.
85. Section 66(1).
86. C.R.C. 1978, c. 1243, section 3(3); CEPA, section 88.
87. Section 71(3)(a).
88. Section 71(3)(b).
89. Section 71(3)(c).
90. Envirochem Services.

93. Phosphorous Concentration Control Regulations, C.R.C. 1978, c. 393; CEPA Part III.


95. Constitution Act, 1867, 30 & 31 Victoria, c. 3 as am. (U.K.), section 95.


97. Section 34(3).


100. Section 98.

101. S.C. 1980-81-82-83, c. 36, as am.


103. Transportation of Dangerous Goods Regulations, SOR/85-77, as am.

104. R.S.C. 1970, c. N-8, as am.

105. C.R.C. 1978, c. 1064, as am.


108. C.R.C. 1978, c. 1461, as am.


111. Section 450, and Dangerous Goods Shipping Regulations, C.R.C. 1978, c. 1419, as am.

112. Envirochem Services, p. 37.


115. R.S.C. 1970, c. L-1, as am.

116. S.C. 1970-71-72, c. 47, as am.

117. Envirochem Services, p. 48.

118. Section 71(3)(a).


120. Ibid., p. 12, 165.


122. R.S.C. 1970 (1st Supp.), c. 2, as am.


124. Envirochem Services, p. 57 et seq.
Chapter Seven: The Policy Debate

There are risks, both environmental and to human health, associated with ocean incineration. Risks associated with the handling, land transportation and storage of toxic wastes, including the risks of spills, leaks and other "fugitive emissions" must be considered. There are risks of spills during loading and unloading on land and in ports, and risks of collisions, groundings or other spills at sea. There is the risk of fire. Potential problems exist with crew exposure, incinerator stack drift and on-board leaks or spills. Incinerator stack emissions can include acid emissions, heavy metals, unburned organic compounds and PIC's, with associated environmental and resource-use impacts. There are also risks of possible incinerator malfunction or "upset" during a burn. One of the major problems with which legislators must deal is whether adequate regulatory control can be attained and maintained over ocean incineration operations, so that such risks are minimized and justifiable.

There is a temptation, after reciting such a litany of potential dangers, to assume that the risks associated with ocean incineration must simply be too high. Yet there is no known absolutely safe way to deal with these toxic wastes, and one must keep the relative risks of other options in mind when assessing alternative disposal methods. For example, land-based incineration also carries with it risks of spills, leaks, fires, fugitive emissions, operator exposure and
incinerator malfunction. Although acid and metal emissions are minimized by scrubbers, one must find an adequate method to dispose of scrubber waste. Materials not well managed by scrubbers, such as PIC's and unburned organic compounds, will be emitted closer to human populations and agricultural land. Comparable risks are associated with other treatment and disposal options still under development.¹

The only other major alternative at the present time is storage and containment of such wastes, pending the result of further research. With the sheer volume of wastes being produced, the shortage of secure landfills and the severe and probably irreversible dangers of groundwater contamination, this alternative has now been clearly relegated to a less preferred status on the waste management hierarchy, as was previously discussed.

If one accepts that destruction or treatment of wastes is preferable to their attempted storage, one must then examine which is the least dangerous destruction option. The problem becomes one of determining whether ocean disposal is preferable to land disposal, and whether ocean disposal will serve to assist in or detract from efforts to implement even better waste management options, such as waste recycling and recovery.

There are three alternative answers to this debate. First, one may conclude that the risks of ocean incineration are so high, or so incapable of adequate regulation, that it should not occupy the same tier in the waste management hierarchy as land-based treatment and disposal options.
According to this view ocean incineration is less desirable than land-based destruction, and therefore ought to be prohibited or used as a last resort, with all one's efforts being devoted to improving land-based capacity and waste recovery.

A second view is that, while ocean incineration is less desirable than land-based alternatives, it is a useful interim measure while land-based capacity is being developed. Ocean incineration is encouraged over the short term, as its risks are not seen as prohibitive, while plans are made for its eventual phasing out as better alternatives are established.

The third view is that ocean incineration is the best option for wastes which are difficult to dispose of in land-based incinerators, such as highly chlorinated wastes which can exceed scrubber capacity. This viewpoint considers ocean incineration as a preferred waste management strategy in some cases, and as an activity that should be continued indefinitely as there will be a continuing demand for this alternative.

There are members of the international community who take each of these views of ocean incineration. For example, the United Kingdom regards ocean incineration as the "best practicable environmental option" for wastes which present special problems for scrubber-equipped land-based incinerators. They are opposed to the establishment of a fixed date for the termination of all at-sea incineration activities, and consider that ocean incineration may be a
preferred waste management option in some cases. There is a belief that not all wastes lend themselves to land-based treatment or recycling and that ocean incineration will, therefore, meet a continuing demand, providing for sound waste management without detracting from the incentives to develop better alternative technologies. The use of ocean incineration by the United Kingdom has been increasing, although, generally speaking, landfilling of hazardous wastes remains an easily available and inexpensive option, and there are few incentives for waste recycling and reduction in the United Kingdom.

At the other extreme are countries such as Denmark that are strongly opposed to the use of ocean incineration. They are of the view that ocean incineration is an option of last resort and that all such activities should be halted as soon as possible. Although incinerator technology is considered acceptable for use on land, the use of this technology at sea is considered to be too difficult to control in order to ensure the proper destruction of the wastes, and is thought to involve unacceptable risks of catastrophic toxic waste release should there be a spill. Other reasons for concern include the aggravation of regional acid rain problems, and the interference with other uses of large areas of the ocean caused by incinerator operations. Denmark has a well established publicly administered hazardous waste management program which relies primarily upon land-based incineration. As a member of both the Oslo and London Commissions, it has never issued a permit for ocean incineration.
Most other countries which have used or considered ocean incineration have adopted policies which view the practice as acceptable only on an interim basis. While not yet prohibited, the use of this option is anticipated to continue only on a short-term basis, with every effort being made to develop land-based capacity and to phase out ocean incineration in the near future. For example, Switzerland considers land-based incineration to be "environmentally preferable," because of the greater ability of regulatory authorities to control land-based operations. Sweden considers ocean incineration an option of "last resort during a transition period" if no land-based alternative is available. Norway considers that "ocean incineration should be terminated as soon as possible." The Federal Republic of Germany evaluates ocean incineration applications on a case-by-case basis, using the presence or lack of land-based capacity as the "major criterion."

The influence of these varying views is seen in the policies of the commissions established pursuant to the London Dumping and Oslo Conventions. The Oslo Commission, dominated by countries which either view ocean incineration as environmentally unsound or less preferable than land-based alternatives, had a long standing policy that it would establish by 1990 a fixed date for the termination of ocean incineration, and in 1987 eight nations agreed to a complete ban on ocean incineration by 1994. Contracting nations which currently permit incineration must do so only if no practical land-based treatment method is available.
While maximum heavy metal concentrations are not formally regulated by the Oslo Commission, some parties such as the Netherlands and Belgium have set metal concentration limits. Restrictions on the type of wastes accepted for incineration have been set by other nations, such as the Federal Republic of Germany which prohibits ocean incineration of waste containing PCB's, polychlorinated terphenyls, dioxins, DDT and furans.

The parties to the London Dumping Convention, while heavily influenced by the Oslo Commission on the incineration issue, are not dominated by it. The regulations governing incineration under the LDC are less strict than those of the Oslo Convention, requiring contracting parties to take account of alternative means of disposal, but not prohibiting ocean incineration automatically when practical land-based alternatives are available. Permit decisions are made on a case-by-case basis and are based on a waste management hierarchy in which incineration on land and at sea occupy the same middle tier. No heavy metal concentration limits have been set, even on an informal basis. No fixed date for the termination of ocean incineration is being considered.

Attempts have been made to compare the risks of ocean incineration with those of land-based incineration in order to resolve, on a scientific or technological basis, the debate over the suitability and safety of the ocean incineration option. Unfortunately, current data and assessment methods "simply do not allow firm or highly accurate quantitative predictions of risks and/or their
actual impacts for either the land-based or at sea incineration options." Many of the risks "cannot be quantified at all" and "the fundamentally different nature of the risks often precludes comparison" between the two options. American studies have concluded that the choice between ocean and land-based incineration cannot be resolved on a purely technical basis, and that "analysis does not lead to an unambiguous choice."

With such limited and probably unreliable scientific data, it would seem that nothing conclusive can be said about the relative dangers of ocean or land incineration, although a few generalizations are possible. First, ocean incineration involves an increased risk of spills due to the additional loading at port facilities and the additional transportation at sea. Second, ocean incineration increases the direct exposure of the marine environment by acid and metal emissions, unless scrubbers are to be required. Third, direct exposure of humans to incinerator emissions is lessened by ocean incineration, because of the remoteness of the operations. Fourth, ocean incineration operations will release approximately 15% more waste into the environment than land-based operations.

The United States EPA concluded that ocean incineration would pose a substantially lower risk to human health than land-based incineration, although their analysis has been criticized for a number of reasons by the United States Congress Office of Technology Assessment. Comparative environmental impact assessments are even more controversial,
although a marine spill is generally thought to be the most serious of all risks, with a potentially catastrophic impact.\textsuperscript{33}

For policy decision-makers the economic viability of ocean incineration is also an important consideration. The first economic factor of importance is shared with all other destruction, treatment and preferred waste management options: landfilling continues to be the cheapest alternative, and if its cost is increased or availability decreased there is the potential that some waste generators will turn to illegal dumping.\textsuperscript{34}

While the cost of incineration is generally greater than landfilling, estimates of the comparative costs of ocean and land incineration are extremely variable and unreliable. Factors which influence the cost of each option include the transportation mode, the physical state of the waste, the degree of regulation, and the cost of liability insurance.\textsuperscript{35} Wastes which have a high energy content and which do not require supplementary fuel can also be incinerated at lower cost.\textsuperscript{36}

There is also a great deal of uncertainty about how ocean incineration would affect the economic viability of land-based incineration operations. Much of the liquid waste suitable for ocean incineration can be used as fuel to burn solids and sludges on land, and thus land-based operations might have to purchase replacement fuel at a higher cost if these liquid wastes were diverted to at-sea operations.\textsuperscript{37} Liquid wastes are also amenable to recovery processes, and
thus the expected volume available for ocean incineration is eventually expected by many to decrease.\textsuperscript{38} Perversely, many recycling processes produce liquid waste by-products which are suitable for ocean incineration, and recovery processes are developing most rapidly for solids and sludges, so that the amount of waste available for ocean incineration is expected by others to increase.\textsuperscript{39}

The economic effects of ocean incineration are not limited to effects on land-based incinerator operations. There is also a great deal of concern about the effect of ocean incineration options on the development of preferred management alternatives. If ocean incineration is not developed, there is concern that shortages of land-based capacity will result in price increases which, as previously discussed, produce a greater temptation to use illegal disposal methods.\textsuperscript{40} Others are concerned that if ocean incineration is developed, its availability will impede or slow the development of preferred practices.\textsuperscript{41}

If ocean incineration is developed, and its later phasing-out is required, there are further economic problems. Incinerator vessels require a substantial capital investment, and potential operators will be discouraged if there is too much uncertainty over the regulatory and economic future of the industry.\textsuperscript{42} As well, the implementation of waste reduction and other preferred practices may reduce the amount of waste available for ocean incineration to commercially uneconomical amounts, before adequate land-based capacity to handle the remaining wastes
exists. This problem has been the subject of discussion by the Oslo Commission, which is seeking to phase out ocean incineration in the near future and which is, therefore, considering options such as subsidies, the prolongation of commercial viability by increasing the number of wastes permitted to be incinerated at sea, and long term land-based storage.

Canada has not yet issued any permits for toxic waste incineration at sea. However, the Canadian government has received a request by a commercial incineration corporation for permission to conduct ocean incineration in Canadian waters. The government is thus faced with a major policy decision relating to whether the risks of such activities are acceptable, and whether this technology can form a useful part of Canada's hazardous waste management strategy.

The initial Canadian position is that Environment Canada is "committed to fully exploring all environmentally sound options for managing hazardous wastes," including properly controlled shipboard incineration. The government considers that, to date, the foreign test burns on incinerator ships have indicated that there are only minimal negative health and environmental impacts, and that there is, accordingly, no clear preference between ocean and land-based incinerator technology. Although gaps in scientific knowledge and control indicate there are unknown risks which make a comparative assessment of the options difficult, if not impossible, both nationally and internationally Canada has maintained the position that the careful use of all hazardous
waste disposal methods would be acceptable "if it poses less or no greater human health risks than practicable land based alternatives," or if there "are no practicable alternatives that are environmentally preferable." When considered from the point of view of the waste management hierarchy, the central policy question is whether allowing ocean incineration to proceed will involve the promotion of preferred strategies, and discourage the use of less preferable options. While Environment Canada considers ocean incineration to be equivalent to other destruction technologies, the controversy among other nations casts doubt on this position. Since much of the opposition to ocean incineration revolves about concerns regarding the ability of government to assume adequate regulatory control over incinerator vessel operations, the fragmented Canadian legal and regulatory jurisdiction creates cause for additional concern.

In the following sections, these jurisdictional conflicts, as well as various political, economic and scientific problems will be examined in greater detail, to determine whether the Canadian political-legal process is capable of generating sound and balanced policies and laws to govern the use of ocean incineration.
Chapter Seven: Notes


2. Ibid., p. 201.


5. Ibid.


11. Ibid.

12. Ibid., p. 199-201.


14. Ibid.

15. Ibid.

16. Ibid.; Williams, 190-191.


20. Ibid., p. 3.


24. On October 6, 1988, Canada altered its policy position by agreeing to a complete ban on ocean incineration by 1994. The issues raised by the study, which are reported as of June 30, 1988 are, therefore, of primary importance in the interim period, between 1988 and 1994. "65 nations to ban burning of chemical waste at sea," Vancouver Sun, 7 October 1988, p. A5.


27. Ibid., p. 11.


29. Ibid.

30. Ibid.

31. Ibid., p. 64.

32. U.S. Congress, p. 159.

33. Ibid., p. 162-163.


36. McCann, p. 121.


38. Ibid.

39. Ibid., p. 43.

40. Ibid., p. 19.
41. Ibid., p. 16.
42. Ibid., p. 20.
43. Ibid., p. 17; Karau, OSCOM, p. 2.
44. Ibid.
47. Ibid., p. 11.
Environmental problems are an inevitable by-product of desired economic growth, development and human activity. Such problems, nevertheless, constitute a growing threat to both ecological integrity, and human life and health. Governments have a role to play in both the encouragement of economic development and the protection of social values related to the quality of life. The balancing of these interests is reflected in the policy decisions that governments make, and the legal and regulatory instruments that are used to both make and implement those choices. When decision-makers are confronted with environmental issues, one of the greatest difficulties encountered is the extent of the jurisdictional, economic, scientific and political uncertainties inherent in every possible policy option. This is particularly true in the Canadian legal and political context.

Examination of the nature of ocean incineration practices and their current international and national legal regulation, reveals that ocean incineration is an activity comprised of many complex and uncertain variables. Among these are uncertainties as to its environmental impact, its health effects, its amenability to legal regulation and its proper place in the waste management hierarchy.

Canadian decision-makers are faced with some difficult policy choices to make in relation to ocean incineration. First, it must be decided whether ocean incineration should
be permitted, and if so, it must be decided whether it is to occupy the place of a preferred or interim waste management strategy. Second, if the technology is chosen for use, then decisions must be made regarding the proper method of achieving adequate legal and regulatory control over ongoing operations.

In the following section, the current Canadian policy formation processes, together with the legal and administrative institutional structures, are examined to determine what specific difficulties will almost certainly be faced by Canadian decision-makers in attempting to deal with these uncertainties, and to identify areas in which improvements could be made to existing legal and political processes.
Chapter Eight: Canadian Law and Policy Formation Problems

a. Jurisdictional Problems

Government in Canada engages in a multitude of roles, and the protection of public health and environmental quality are only two of its many responsibilities. Other major government initiatives include the promotion of regional development and the pursuit of economic growth. Particularly in the 1980's, economic recovery and the promotion of business and investment have been primary concerns of government, while environmental concerns have been of secondary importance. Environmental agencies have, therefore, often competed unsuccessfully with economic priorities in government and in administrative policy decision-making and budget allocations.

With limited financial resources and a relatively weak political mandate, environmental agencies have been constrained in their ability to take strong leadership and enforcement actions. When compared to the industries being regulated, the relative shortage of resources has often translated into an inability of government to conduct independent research and investigations, hence an over-reliance on cooperation with industry. This close agency-industry relationship creates a degree of reluctance on the part of regulatory officials to take a tough negotiating position in attempting to establish and enforce environmental standards. In addition, to avoid a perception of excessive
government intervention in private industry, coercive methods of implementing policies, such as legislation, may be avoided in favour of less coercive methods, such as tax incentives or other fiscal measures.  

Adding to the conflicting attitudes of government toward industry is the government's own reliance on a flourishing business climate to maintain its revenue base. Moreover, in many cases, such as when Public Works Canada applies to Environment Canada for a dredged material disposal permit, government is both the industry proponent and the regulator.

Conflicts also occur among government departments due to unclear, shared, or overlapping jurisdictions. Often the agencies involved in a given problem have separate or conflicting mandates, priorities and objectives. This creates not only problems of public accountability, but confusion among the federal officials over which statute to use and who is responsible in any given situation. The resulting tendency is for elaborate committees and cumbersome referral procedures to develop.

Environment Canada often attempts to perform a leadership and coordinating role among the many competing departments. However, with "no authority to command or to direct resources or to set priorities for other government departments," little can be done except to prevent duplication of effort. The setting of priorities and allocation of resources within each department is done by that department, and each department jealously guards both its jurisdiction and budget. This autonomy, however, often
works against comprehensive and effective management of many environmental problems.\textsuperscript{11}

Adding to the complexity of environmental control problems is the uncertain constitutional jurisdiction in many fields which may be divided or shared between the federal and provincial governments. Such federal-provincial differences in legislative jurisdiction and political priorities, coupled with great disparities in spending powers, have often adversely affected the consistency of environmental standards and compliance activities.\textsuperscript{12} Increasingly, such problems have been dealt with by cooperative agreements between the two levels of government, but as a result political and legal accountability are often obscured.\textsuperscript{13}

Traditionally, the provinces have seen environmental matters as closely tied to issues of natural resource development, and have viewed attempts by the federal government to provide environmental leadership as an intrusion into provincial jurisdiction over such resources.\textsuperscript{14} Since short-term economic benefits on a local and provincial level are often in conflict with long term environmental protection,\textsuperscript{15} the federal government is frequently forced to choose between strong environmental measures and an unwanted increase in political tension with provincial governments or with municipal authorities.\textsuperscript{16} Over time, environmental problems have also grown in size and complexity, and many problems are now global or transnational in scope.\textsuperscript{17} The federal government is thus faced with increasing pressure to enter into and fulfill international and bilateral
environmental commitments that may intensify the jurisdictional conflicts with provincial and local governments. At the same time, the international economic climate may increase the pressure on the federal government to intervene in resource regulation. This not only increases the potential provincial and industry conflicts, but increases the tension among the federal government departments, with their varying priorities. Consequently, the federal government is increasingly caught between internal or national pressures, and international and bilateral pressures, with associated problems for both domestic and foreign policy formation.

b. Analytical Problems

(i) The Use of Economic Analysis

In an effort to resolve many of the internal conflicts between the promotion of economic development and the preservation of environmental quality, governments have made an increasing use of economic analysis. It was thought that such analysis would provide a method to simplify policy decision-making, and allow officials to select or choose among the best available alternatives, using a neutral or objective criterion. In fact, economic analysis has been criticized because, although it is a seemingly-neutral technique, it actually involves the use of a number of unstated assumptions, value judgments and ethical decisions. Economic theory lacks its own value system, and simply assumes that a positive market outcome is a
The use of purely economic "efficiency criteria" to select environmental standards implicitly assumes that there are no reductions in environmental quality which could not be compensated, and that the market result will be satisfactory to society. Wealth maximization or the growth ethic is treated as a suitable criterion for the choice of environmental standards.

These assumptions about the suitability of economic criteria as a means to make policy choices about matters such as public health and environmental quality have been the subject of strong criticism. Some feel that it is morally or ethically wrong to price human suffering, and others suggest that there exist social values which demand that people ought not to have to pay for some types of goods. Similarly, it is argued that many people have ideals and moral convictions about environmental quality that are economically inefficient, but which they are willing to have supported by government even if this involves a sacrifice in individual benefits. For example, many environmental laws, although economically inefficient, are strongly supported by the public and have been chosen for use even though they are not economically optimal. Attempts by economists to measure willingness to pay for the promotion of these beliefs may measure the strength of persons' convictions, but may be irrelevant as to whether those convictions are morally right or wrong. Some values are, perhaps, priceless.

In addition, in order to apply economic analysis to environmental problems, many costs and benefits that would
not normally be priced are assigned a dollar value, often in a rather arbitrary manner. This includes placing a dollar value on: human life, human health, aesthetic benefits, ecosystem effects, pain and suffering and the quality of life. Unfortunately such benefits cannot be accurately estimated, and many future occurrences are so unpredictable that valuation becomes a meaningless guessing game. Also, the analyst may judge only some values to be worthy of pricing, and factors which might be considered a benefit by some (such as the mere existence of wilderness) might be unpriced or underpriced by the economist. In many cases cost estimates will be provided by industry, and studies have shown such estimates to be unreliable and inflated, which can further skew a cost-benefit ratio. Some have argued that the arbitrary nature of pricing in environmental matters is such that almost any policy decision can be justified by merely picking the correct price for these values.

A further difficulty with the use of economic analysis in environmental affairs is the problem of the distribution of risks and benefits. While the analysis that is conducted looks at the aggregate costs and benefits to society as a whole, the individuals who bear the costs may not be those who receive the benefits or who have the ability to pay the costs. The result of an economic analysis may thus be efficient, but also highly inequitable. In addition, the market is not operating as a free market where people, such as those persons whose health or quality of life will be adversely affected in the future by industrial emissions,
have no power to decline to "sell" at any price.  

Despite such shortcomings, the use of economic analysis is a common way of making regulatory decisions in Canada. While its use is in fact a helpful tool in many circumstances, it is clear that in many environmental areas it may be necessary to base policy decisions on broader criteria and values.

(ii) The Use of Scientific Analysis

Some feel that, rather than trying to resolve environmental issues using economic analysis, one should make such decisions relying mainly on technical or scientific evidence. This attitude is reflective of a commonly held misconception that science and technology can solve all environmental problems, and that nature can be controlled and dominated by man.

In fact science progresses very slowly, and scientists are careful about the conclusiveness of the statements they make. They try to avoid errors, such as claiming a material is dangerous when it is not, in favour of stating that there is not enough evidence to show conclusively whether a material is hazardous, when it actually may be. Scientists look to establish strong proof of causality, or at least a reasonable probability that their results are correct, and are careful to point out factors that may influence the validity of their conclusions, such as uncertainty over natural background levels and problems of multiple causality. For most identified hazards, there is a lack of
scientific agreement as to the degree of risk or danger, and some uncertainty will probably always exist.\textsuperscript{40}

Often this scientific attitude of requiring a high standard of proof of damaging effects is incorporated into public policy decisions without an express consideration of the consequences. If government permits the use of chemicals and technologies until such time as they are proven to be harmful, a potentially dangerous substance can in the interim create health and environmental hazards of severe consequence.\textsuperscript{41} Industry, however, argues that to control or prohibit the use of new technology and materials until they are proven to be safe would unduly limit economic growth and development, and that a firm scientific basis is needed before government regulatory controls are imposed.\textsuperscript{42} The fundamental issue is how scientific uncertainty is to be treated in public policy and law-making decisions. This involves moral, ethical and political judgments regarding the acceptability of the risks, their priority for regulatory control, and whether it is better to err on the side of protecting human health and environmental integrity, or to err on the side of economic growth.\textsuperscript{43}

Science is unable to set precise, rational environmental standards. There is, therefore, a tendency for policy decision-makers to make "non-decisions" about the treatment of scientific evidence.\textsuperscript{44} Often decision is delayed "pending further research," as a way to avoid both conflict with industry and the need to impose controls, but such delay amounts to a choice to err on the side of exposing humans and
the environment to dangerous materials until they can be proven harmful. 45

In part this is a response to societal desires for the material benefits of immediate economic development. 46 There is, in the development of new technology, always the potential to achieve net social benefits. 47 In addition, while government is aware of the need to assess hazards and to set priorities for such risk assessment, political imperatives mean that such problems do not maintain a consistently high priority on political agendas. 48 Often governments are caught between trying to act rationally in such matters, and trying to respond to the latest crisis which has caught media and public attention. 49

Examination of scientific evidence cannot solve equity or risk distribution problems either. Whenever a political decision is made as to the acceptability of a risk, the costs are normally borne by some members of society and not by others, particularly when the risks of different choices are not directly comparable. 50 The lack of interdepartmental coordination of environmental hazard identification aggravates the decision-makers' attempts to make rational choices in this area.

A final problem related to scientific uncertainty is the need to incorporate new technology into society. Often decision-makers must choose between using an older, perhaps obsolete technology and a newer, possibly inadequately-tested technology. 51 There is also the problem of how to encourage industry to incorporate technological improvements into
development proposals, when large expenditures may be involved and scientists are uncertain as to the degree of environmental improvement involved.

c. **Political Problems**

With only limited assistance available from economic or scientific analyses, government decision-makers are often left making important value judgments in response to perceived political pressures. Frequently these pressures are provided by the international community or by lobby groups, both industrial and environmental, but sometimes these pressures come from the electorate after an issue has received widespread media attention.

One of the difficulties faced by politicians in responding to these pressures is the difference between expert evaluations of risks and the public perception of those risks. Generally speaking, experts assess risks by statistical comparisons of the number of deaths or injuries caused by a facility (such as a hazardous waste incinerator) over a given period of time. Studies have shown, however, that to the general public, annual mortality is only one factor to consider in assessing the risk of an activity. Public perceptions of risk are also affected by such factors as: the seriousness and frequency of potential accidents, whether people have voluntarily exposed themselves to the risk, whether the risk is familiar or unknown, the distribution of benefits associated with the activity, the degree of exposure to the risk, the source of the risk, the
controllability of the risk, the degree of delay in consequences of exposure, the threat to future generations, the amount of dread felt toward the consequences, the potential for plant and animal mortality and the degree of uncertainty involved in the risk assessment process. Public perceptions of risk are also biased in at least two ways. First, there is a tendency to overestimate the frequency of sensational or serious accidents, while underestimating the frequency of common but undramatic hazards. Second, erroneous perceptions about the relative frequencies of adverse consequences are strongly ingrained, particularly in relation to underestimating personal risks from familiar sources of danger.

In responding to public opinion about technological risks, policy decision-makers must, therefore, take into account the fact that lay persons define risks differently than do scientists. At the same time, they must bear in mind long term and future social interests, economic considerations, and the ethical problems caused by uneven risk distribution. All these factors influence the social acceptability of the risk under consideration. Current public opinion will not necessarily reflect the best social policy decision, but at the same time societal values need to be articulated and expressly considered during law and policy formulation. Unfortunately, current environmental laws are generally lacking in specific processes by which such public input could be attained, and offer little guidance to regulators as to which of many conflicting values should be
One result of the failure of the legal and political processes to provide for adequate public participation is the "not-in-my-back-yard" or NIMBY phenomenon. Almost without exception, whenever regulatory authorities have decided to permit the development of a risk-bearing facility, such as a hazardous waste disposal site, members of the general public residing in the vicinity have disagreed about the acceptability of the risks involved, and have vigorously opposed the development. Two of the major reasons for this NIMBY reaction are public overestimations of the degree of risk involved (the perception bias), and a local feeling of injustice at being asked to bear the risks of disposing of wastes generated by the entire region (the equity distribution problem). Combined with concerns over potential declines in both property values and the quality of life, and a general distrust of both industry proponents and government regulators, these perception biases and equity distribution problems create a strong incentive for intense local resistance to hazardous waste facilities.

Proper hazardous waste disposal facilities are desperately needed, however, to protect long term environmental and societal interests. The siting problem created by the NIMBY reaction has, therefore, caused a great deal of concern and study. Although ocean incineration was originally thought to be an attractive solution to the NIMBY problem, since the disposal takes place at sea and is in no-one's back yard, the American experience has shown this
assumption to be false. Intense local opposition has continued to be encountered, and has simply been focussed on the siting of port facilities and transportation routes rather than on the location of the actual disposal site.\textsuperscript{63}

In the United States several attempts were made to enact statutes which would preempt the ability of local opponents to prevent the siting of hazardous waste facilities.\textsuperscript{64} However, these attempts to impose sites on particular communities have been largely ineffective. Although the preemption statutes were able to override municipal powers to obstruct facilities by changing zoning requirements, road uses or bylaws, they were unable to deal with other forms of local resistance, such as litigation to delay a project until it became uneconomical and acts of civil disobedience.\textsuperscript{65}

The failure of preemption statutes led some states to enact legislation providing for a structured negotiation or arbitration process, whereby local authorities and the developer were required to enter into an agreement in which the community would be compensated for bearing adverse consequences and costs.\textsuperscript{66} In theory, a developer can provide a compensation package sufficient to convince a community that a project will be more of a benefit than a burden, but in practice some difficulties have been encountered. For example, different interest groups in the community may disagree as to an acceptable type of compensation, and those who are dissatisfied may not consider themselves bound by any development agreement.\textsuperscript{67}

Despite potential problems, negotiated agreements hold
some promise as a method for resolving such siting concerns, particularly since negotiation and bargaining are already characteristic of the environmental regulatory process in Canada. As attempts have been made to develop legal processes to make and implement hazardous waste management decisions, it has become clear that some form of active public participation is necessary in order to provide an opportunity to address perception biases, to ensure all societal values are articulated and given consideration by decision-makers, and to permit an opportunity for equity distribution problems to be negotiated and resolved.

d. Summary

The preceding discussion has illustrated the diversity of problems that may be encountered by the Canadian government when attempting to make and implement environmental regulatory decisions. These problems are of three basic types: jurisdictional, analytical and political.

The many jurisdictional problems arise primarily from the constitutional and institutional structures of Canadian government. The constitutional allocation of legislative powers between two levels of government creates ongoing uncertainty over the extent of legislative authority in environmental affairs. Simultaneously, the structure of government institutions within each level of government causes interdepartmental conflict and a lack of coordinated action.

Governments also face great difficulty in choosing and
using appropriate analytical techniques as aids to rational
decision-making. Both economic analysis and the use of
scientific or technical information have a number of
shortcomings that affect their suitability as methods to make
decisive choices about environmental issues.

Finally, government decision-makers must constantly bear
in mind the political acceptability of the environmental
policies they choose to implement. Obtaining public
acceptance of risk-bearing activities is a complex and
difficult problem that is complicated by the lack of direct
public input into the decision-making process under existing
laws and administrative procedures.

The following section will examine how such law and
policy formation problems are affecting the development of
laws designed to regulate the use of ocean incineration in
Canada. During the discussion, some ideas for reform will be
put forward, and an attempt will be made to determine whether
the existing legal and political processes can cope with the
challenges posed by this difficult environmental issue.
Chapter Eight: Notes


3. Ibid., p. 13.

4. Ibid., p. 21.


7. Ibid., p. 15.


10. Ibid.

11. Ibid., p. 181.


15. Ibid., p. 38.


22. Ibid., p. 44.

23. Ibid., p. 51.

24. Ibid., p. 45.


26. Ibid., p. 1397.

27. Ibid., p. 1412.

28. Ibid., p. 49.

29. Ibid., p. 41; Thompson, p. 231; Ashford, 427.

30. Thompson, p. 234; Ashford, p. 429; Sagoff, p. 1408.


32. Sagoff, p. 1396.

33. Schrecker, p. 45; Ashford, p. 431.

34. Schrecker, p. 52.

35. Ibid., p. 46.


38. Ibid.; Schrecker, p. 27.

39. Doern, Politics of Risk, p. 3.3-3.5.

40. Ibid., p. 1.21.

41. Schrecker, p. 31.
42. Ibid., p. 27, 31.

43. Ibid., p. 28, 31; Doern, Politics of Risk, p. 3.21-3.22.


45. Doern, Politics of Risk, p. 3.4; Schrecker, p. 35-37.

46. Leiss, p. 256.


48. Doern, Politics of Risk, p. 1.3-1.4.

49. Ibid., p. 4.25.


51. Ibid., p. 39.


54. Renn, p. 54-57; Slovic, p. 3; Stenzel, p. 390.

55. Renn, p. 53; Slovic, p. 5.

56. Slovic, p. 6.

57. Miller B. Spangler, "The Role of Interdisciplinary Analysis in Bridging the Gap Between the Technical and Human Sides of Risk Assessment" (1982) 2(2) Risk Analysis 101 at 106.


60. David Morrell, "Siting and the Politics of Equity" in Lake, p. 119-121.


64. Morrell, p. 123; Bacow, p. 270.

65. Morrell, p. 123; Bacow, p. 272-274.


Ideally, what is needed to resolve the many jurisdictional, analytical and political problems associated with environmental laws and policies is a decision-making process which takes account of scientific uncertainties, permits public participation, resolves equity distribution problems, meets international obligations and balances environmental values with the need for economic development. These policies must then be implemented by legal instruments and regulatory procedures which provide for accountability, clear jurisdictional mandates, flexibility and the promotion of preferred waste management options.

In the preceding discussion, the present policies of the Canadian government toward ocean incineration and the proposed method of legal implementation have been outlined. In the following section, these policies and laws will be reviewed to determine whether they are designed to meet the many jurisdictional, analytical and political concerns raised by the use of such a technology, or whether they require rethinking and revision before they can begin to incorporate adequately such concerns into the process of hazardous waste management.

a. **Jurisdictional Issues**

   (i) **Interdepartmental Conflicts**

   The long title of the Canadian Environmental
Protection Act, "An Act respecting the protection of the environment and of human life and health," suggests that this statute is designed to be a comprehensive piece of public health and environmental legislation governing a broad range of issues. In fact the legislation is primarily directed at the control of toxic substances, and even within this area it is not comprehensive. Although the legislation has replaced the Environmental Contaminants Act and consolidated the Clean Air Act, the Ocean Dumping Control Act and Part Three of the Canada Water Act, many major federal enactments which control pollution discharges have not been included. For example, vessel-source pollution provisions contained in enactments such as the Canada Shipping Act and the Arctic Waters Pollution Prevention Act are absent, even where these statutes control the discharge of toxic substances. In addition, the federal Environmental Assessment and Review Process was not given a statutory basis by incorporation into the CEPA, although it could still be applied to any activity regulated under that Act.

From the perspective of ocean dumping control, particularly in relation to ocean incineration operations, the failure of the CEPA to include the Pest Control Products Act and the pollution control provisions of the Fisheries Act are of particular interest. For example, the Fisheries Act is presently being used to regulate discharges of several substances, such as mercury and persistent plastics, that are also listed in the ocean dumping Schedule. There is, however, an ongoing interdepartmental jurisdictional conflict
between Fisheries and Oceans Canada and Environment Canada. In addition, the Meech Lake Constitutional Accord has raised the possibility that provincial responsibilities over fisheries will be expanded or altered. A separate review of the Fisheries Act is now contemplated, and the possibility of using equivalency provisions similar to those contained in the CEPA is being investigated. Nevertheless one can anticipate that some overlap with ocean dumping prohibitions will be almost certain to occur.

The failure of the CEPA to regulate agricultural chemicals is even more important, as it means that many organohalogenes and pesticides are subject to a different system of legal and regulatory control than other waste products, such as PCB's, which might be subject to incineration. Because these agricultural chemicals are not subject to the same toxicity screening process, the ability of government to prevent new toxic waste disposal problems from being introduced is comparatively limited. However, since "inter-departmental problems proved insurmountable,"¹ a single scheme to manage such toxic chemicals under the CEPA has not been developed, and is not currently being considered.

Indeed, it seems that the consolidation of statutes under the CEPA has only marginally improved the existing situation of legislative overlap and inconsistency, and has not decreased interdepartmental jurisdictional conflict. All the enactments concerned were already under the jurisdiction of either the Minister of the Environment or the Minister of
Health and Welfare. While the CEPA increases the role of the latter Minister in the assessment of toxic substances, only the Minister of the Environment continues to have jurisdiction in relation to ocean dumping and its potential consequences. Thus, although the CEPA does make some effort to provide a comprehensive approach by attempting to coordinate provincial efforts and provide national standards, it seems to have made little progress in resolving federal interdepartmental conflict.

The current method of dealing with such conflicting interdepartmental interests and jurisdictional overlap is to utilize referral procedures, so that an application for a pollution discharge permit (such as a request to conduct ocean incineration operations) is circulated among various interested federal and provincial agencies. Where possible, it is Environment Canada's policy to implement federal regulations by way of provincial licensing requirements, although in the case of ocean dumping the federal Environment department directly sets the permit terms and conditions. While such referral procedures provide a degree of simplicity, since industry usually has only one agency to deal with when attempting to meet permit and licensing requirements, it also obscures public accountability. Additionally, it is difficult to determine whether all aspects of concern are being given adequate consideration, and impossible to ensure that concerns are being addressed in any particular priority.

For example, an ocean incineration application would
normally require a review of matters such as transportation, storage, port facilities, vessel design and construction, emergency response, occupational health, air emissions and incinerator design and operation, in addition to the usual economic, environmental and resource-use issues raised by an ocean dumping operation. The existing referral procedure among various departments might well review all these concerns, and certainly the officials involved would normally make their best effort to ensure that this occurs. Nevertheless, there is no mechanism in place to guarantee that a single well-developed policy, such as the promotion of preferred waste management options, will be vigorously pursued by each of these agencies. There is no opportunity for public participation in the process, and little opportunity for the public to even determine which concerns are being addressed by each department. There is no guidance offered to decision-makers as to what values should be given priority in judging permit applications, and nothing to provide guidance as to the manner in which the inevitable scientific uncertainties should be treated.

To assist in decision-making and resource allocation issues, the federal government has in the past attempted to provide some coordination of policy development and management in relation to toxic chemicals by the formation of interdepartmental committees. However, these programs fail to provide for the integration of foreign policy considerations and the actions of provincial agencies, industry, the environmental lobby or members of the
community. They also contain no mechanism to ensure that the departments involved maintain a high level of commitment to the program objectives.

Short of an extensive government reorganization, which seems a practical impossibility, it is unlikely that any one agency will obtain full responsibility for ocean incineration operations. Indeed, due to the necessary provincial role in land-based aspects of ocean incineration, nothing less than a constitutional amendment might achieve such an objective. Since the present referral practices do have inherent flexibility and provide access to diverse expertise and resources, the existing administrative regime is perhaps desirable and suitable to the complexity of the scientific, technological and jurisdictional issues involved.

However, improvements could be made. Clearcut final responsibility and public accountability for decisions relating to ocean incineration operations should rest with a single agency; Environment Canada is the obvious choice. The specifics of the referral procedure, and the terms of reference within which each federal and provincial agency must operate, should be clearly defined and made readily available to the public. To prevent problems in areas that might not fall clearly within the jurisdiction of any single agency, a thorough review should be conducted to ensure each issue of importance is assigned to a responsible department. A comprehensive policy imperative should be developed, in consultation with the public, so that perception biases, economic concerns, ethical values and equity distribution
problems can be addressed. This policy imperative should thereafter, be used to establish and set priorities among the criteria which each referral agency should use when evaluating ocean incineration applications, with some mechanism for administrative or judicial review of questionable decisions. As part of the effort to streamline interdepartmental workings, some method to focus scientific resources and conduct technology assessments should also be implemented.

(ii) Federal-Provincial Cooperation

Even if the federal interdepartmental conflicts can be remedied or reduced, the possibility of conflict with provincial governments remains. Although offshore aspects of ocean incineration operations are clearly within federal jurisdiction,^{8} and the federal government retains a prominent role in relation to toxic substances of national concern,^{9} land-based aspects of waste management activities including transportation, emergency response, and regulation of waste generators are primarily provincial responsibilities.

Traditionally, the provinces have assumed jurisdiction over local and intraprovincial environmental affairs, while the federal government has assumed control over national, interprovincial and international environmental matters.^{10} Negotiation of agreements and accords between the two levels of government have largely served to reduce conflicts and overlaps.^{11} In many areas, the federal government has set national guidelines and standards, while the provinces
control the actual enforcement and regulatory activities. Even where the federal government has clear constitutional jurisdiction, such as offshore development, cooperative agreements have been negotiated for political reasons.

The CEPA provides a statutory enshrinement of joint federal-provincial management of toxic substances by way of negotiated agreements and "equivalency provisions." For example, section 34(6) provides that regulations regarding the release and disposal of toxic substances can be declared inapplicable in any province, if there is written agreement that there are in force provincial "provisions that are equivalent" to the requirements of such federal regulations.

This and similar equivalency provisions in the CEPA have already generated considerable controversy. Some critics have taken the view that this statutory procedure involves a "risky devolution of federal power to the provinces" and that it "could result in a patchwork quilt of regulations across the country." Others have taken the view that the entire Act is "yet another federal incursion into an area of traditional provincial constitutional authority" and that it should "not be implemented at all in provinces to the extent that equivalent provincial laws already exist." Negotiations to establish federal-provincial agreements pursuant to the Act are presently under way, however, and given a new willingness to take political action, some consensus can be expected.

Although federal constitutional jurisdiction over ocean incineration operations is clear, political and economic
considerations should ensure extensive provincial input into policy and regulatory development in this area, and one can anticipate that a federal-provincial cooperative arrangement will be necessary. The possibility of interprovincial regional agreements also exists. There are two areas in particular in which express coordination of federal and provincial waste management objectives seems imperative: the economic impact of ocean incineration on the viability of land-based hazardous waste disposal facilities, and the equity distribution problems created by interprovincial or international imports of wastes for ocean incineration.

b. Economic Issues

There is much uncertainty over the potential effect of ocean incineration on the economic viability of land-based hazardous waste disposal facilities. As discussed in chapter seven, some analysts predict that the volume of waste suitable for ocean incineration will exceed indefinitely the land-based capacity, so that both at-sea and land-based operations will remain viable, while others are concerned that the existence of ocean incineration will slow the development of land-based alternatives, and also increase the cost of such alternatives since land operators will need to replace combustible liquid wastes with extra fuel.¹⁷

In Canada there is an additional consideration which arises because of the federal-provincial division of power. If ocean incineration is developed, its regulation, administration and associated compliance activities will be
primarily a federal government responsibility. If land-based hazardous waste disposal facilities are developed, their regulation and control will be primarily a provincial responsibility. The provinces, with comparatively limited financial resources, will not all be in a position to provide an equal level of waste management service. If some provinces are unable to develop proper waste disposal alternatives, there are two possible solutions: the federal government will find it necessary to provide funding to some or all provinces (perhaps linked to an equivalency agreement under the CEPA) or waste import and export between provinces will become necessary.

Ocean incineration operations, like other hazardous waste facilities, raise this issue of waste import and export. Canada produces relatively small quantities of liquid incinerable hazardous waste, especially in coastal provinces. For ocean incineration to be economically viable, therefore, wastes would need to be collected from the producing provinces such as Ontario and Quebec, and transported to a port facility in a coastal province. Alternatively, wastes might need to be imported from or exported to the United States for ocean disposal.

Unfortunately, waste imports aggravate equity distribution problems, and thus increase the local resistance to the siting of a disposal or port facility. When news of possible ocean incineration off Canada's east coast received media attention, the federal government was quick to announce that no wastes would be imported from the United States for
disposal in Canada,\textsuperscript{19} even though such imports would be
acceptable pursuant to international agreements.\textsuperscript{20} Similarly, provinces seeking to develop land-based disposal
facilities are trying to minimize local resistance by refusing to accept extra-provincially generated wastes. While it is doubtful that the provinces have the constitutional jurisdiction to block interprovincial or international imports to port facilities of wastes destined for ocean disposal, as a political reality, local agreement would be essential to a successful operation. Participation rather than preemption seems the better way to deal with the NIMBY phenomenon.

Even if wastes are not imported from the United States, the American position on ocean incineration is of importance to Canadian policy. Delays by the United States Environmental Protection Agency have caused the major North American commercial proponent of ocean incineration to announce it has abandoned plans to conduct at-sea operations in American waters.\textsuperscript{21} Without the vast American market, it is doubtful whether the maintenance of an incinerator vessel in North American waters is economically viable.\textsuperscript{22} This may preclude the use of this technology by Canada even if it is viewed as desirable, since the only other alternative is to require European vessels to make occasional trips to Canadian waters, at what one would anticipate to be a prohibitive cost. If Canada should choose to pursue ocean incineration, it may be necessary to do so by way of a bilateral agreement with the United States.
Present American and Canadian policy toward ocean incineration is very similar; both nations are delaying the issuance of permits pending the development of regulatory measures. Both nations also take the view that ocean incineration has a valid place in the proper management of hazardous wastes. Although these stated policies appear to amount to positive commitments to allow ocean incineration to proceed, the de facto delays have converted government policies into non-decisions, with the status quo prevailing indefinitely and without positive steps being taken either to implement ocean incineration or to foreclose its use.

In the face of the many uncertainties expressed by the international community about ocean incineration, and the many scientific uncertainties regarding its impact, there is some doubt over the ability of national governments to assume adequate regulatory control over this industry. In such a situation it may indeed be wisest not to foreclose any policy options. However, this state of regulatory uncertainty makes it impossible for industry to make long term plans, particularly since a substantial capital investment in incinerator vessels is required. The effect of the regulatory climate may be such that ocean incineration is prohibited without any substantial improvement in hazardous waste management having been obtained. The resulting failure to increase the use of preferred waste management techniques is probably the worst policy possible.

If hazardous waste management is to be improved - and this seems imperative - the Canadian government should either
choose to implement ocean incineration, and quickly devote
the necessary time and resources for developing that industry
and its legal and regulatory controls, or divert those same
resources to the development of land-based capacity. It
should not inadvertently foster a climate of regulatory and
economic uncertainty, while the environmental and health
hazards caused by toxic wastes steadily increase.

The initial policy choice of whether to permit or ban
ocean incineration will be influenced in part by the impact
such a decision will have upon provincial waste management
efforts, and in part by the measure of public acceptance of
the industry that can be attained if waste imports or exports
are required. Because this process will raise issues of
federal-provincial cooperation as well as equity distribution
concerns, this decision might best be subject to a
consultative process involving not only both levels of
government and industry, but also interested members of the
public. This consultative process could also help create a
unified policy perspective from which regulatory authorities
could work and from which foreign policy could be developed.
In the latter respect, it could also ensure that provincial
concerns and waste management objectives are coordinated with
federal foreign policy decisions, particularly if regional
arrangements with the United States relating to ocean
incineration are to be developed.

c. **Scientific Concerns**

   (i) **Regulatory Standards**
Assuming that a decision to allow ocean incineration is made, adequate regulatory control over incinerator vessel operations must be attained in order to ensure that associated risks are minimized. No Canadian laws or regulations exist which specify technical and operational requirements for at-sea incinerators. Instead, the proposed method of regulation is to prepare technical guidelines which incorporate the LDC regulations, and to issue incineration permits only subject to terms and conditions identical to those regulations. While an incinerator operator could have its permit revoked if it failed to comply with these conditions, there is no automatic mechanism by which affected members of the public can intervene to force such a revocation to take place, or to require permit terms and conditions to be varied if unsatisfactory effects are observed. The existing statutory review mechanisms, which provide for an administrative board of review, are subject to discretionary Ministerial control unless it is the permit-holder who objects to the permit variation or revocation.

Even if the LDC Regulations and Technical Guidelines are fully incorporated into dumping permits, such regulations are considered by many to be merely minimum standards. Since more restrictive standards are technologically feasible, are routinely achieved, and appear to decrease risk, there would seem to be no reason why they should not be required. In addition, the LDC regulations fail to impose requirements on incinerator vessels in several known areas of concern, and the parties to that Convention are, therefore,
considering revisions of their rules. These concerns include: the possible need to decide on environmentally acceptable levels of total emissions, the need to set metal concentration limits in wastes, the need to specifically incorporate the waste management hierarchy into the guidelines, the possible use of scrubbers on incinerator vessels, and the possible need for continuous measurements during operations. For example, the proposed United States rules for ocean incineration operations are in some respects more stringent than the existing LDC regulations, requiring a 99.9999% DE for PCB's, dioxins and furans, setting a limit on acid emissions, requiring waste concentrations in waters exposed to the incineration plume to meet water quality criteria, and prohibiting the incineration of certain substances. There would seem to be no reason why Canada should not incorporate similar requirements into its draft regulations, yet no such standards have been proposed. This may be of particular importance if Canada becomes interested in negotiating a bilateral arrangement with the United States regarding ocean incineration operations.

The international incineration standards have been established by a broad-ranging consultation of nations that are parties to the major dumping Conventions, including parties that engage in incineration and those who do not. These meetings have also received input from non-party shipping states with interests in the area, such as Liberia, and many non-governmental organizations, both environmental and industrial. The Regulations and Technical Guidelines
which have been enacted represent economically feasible and technologically possible standards, which have been routinely used for a number of years. One may assume that such standards could, accordingly, be implemented in Canadian laws and regulations as mandatory minimum rules, without industry complaint. This would provide some limits on the exercise of discretion in the administration of ocean incineration permit issuance, and a sufficient degree of certainty to make possible the judicial or administrative review of regulatory decisions. This could be done without a loss of flexibility, as more stringent standards could still be attached to individual permits to deal with special circumstances such as difficult wastes, improved technology or ecologically sensitive burn sites.

(ii) The Treatment of Scientific Uncertainty

Another major issue relating to the technological control of ocean incineration operations is the way in which scientific uncertainty is to be treated in environmental decisions. Under the old Environmental Contaminants Act, new chemicals were normally permitted to be used until such time as the government was satisfied that a chemical was being released and that it constituted a "significant danger" to public health or the environment. Once that occurred, the chemical's use could be restricted or banned.\textsuperscript{33} The CEPA, which will regulate the use of new chemicals in Canada, takes a different approach to the control of toxic substances. Prior to allowing new chemicals to be introduced, the
government can require that information and toxicity tests be submitted, so that an evaluation of the potential hazards of a new substance can be made before allowing its use. The regulation of toxic chemicals is now similar to the food and drug enactments in this respect, which seems logical given the public health concerns that are central to both types of legislation. Although a degree of scientific uncertainty continues to exist, toxic substances are now being treated as potentially hazardous until proven safe. Over time, this policy should prevent the creation of large quantities of new types of hazardous waste, which would then require disposal at sea or on land.

Nowhere in the Act, however, is a similar preventative policy specifically applied to the use of ocean incineration technology. The Act makes no provision for conducting a scientific technology assessment of this waste management option, or a comparative assessment of ocean and land-based alternatives. It is a given that ocean dumping, including incineration, will continue under a permit system as it did under the old ODCA. The advisability of such a policy is uncertain, however, particularly in light of the American conclusions that the risks of land and ocean incineration are not directly comparable, and given that there are numerous outstanding scientific uncertainties and technical concerns over the use and impact of ocean incineration.

Policy judgments about the use of a new technology, such as ocean incineration, and how one should treat the associated scientific uncertainties, are judgments about the
acceptability of inevitable risks, and involve the need to balance economic and social interests. Some feel that all risks and benefits must be quantified to the greatest extent possible, and a decision made based on the course which will provide "the greatest good to the greatest number." To others, the best choice is to pursue the economic concept of the Pareto optimum - that is, any course of action that benefits some, without leaving other people in a worse position. Alternatively, some argue that the best choice is the one which is, at the moment, the most equitable to all concerned, even if it may prove more costly.

The new CEPA, in its approach to the regulation of the introduction of new chemicals, has moved toward the latter type of "equity now" approach. Although the sections of the Act which will be used to evaluate new chemicals are not yet in force, if the Act is fully implemented, industrial expansion and technological change could be slowed, at a potentially huge dollar cost. Nevertheless, this is now seen as a justifiable option in the interests of improved human health and environmental protection. Unfortunately, this attitude has not been extended throughout the Act, to include the assessment of new hazardous waste disposal technology, such as ocean incineration. Some other process, as yet undeveloped, will be needed to evaluate this technology, and to provide a forum for the articulation of non-economic social values regarding the acceptability of its associated risks.

To avoid biases and misunderstandings when dealing with
scientific and technical matters, however, careful thought regarding the access to and use of information about technological matters will be necessary. There is a tendency for parties to seize upon scientific evidence which supports "their" view, to oversimplify and polarize issues, and to actively defend one viewpoint as correct even where there is genuine scientific controversy and doubt. 40 If policy decision-makers are to seek public input regarding the acceptability of technological risks in the face of scientific uncertainty, they must constantly be seeking a rational compromise, which might best be done in a non-adversarial forum to minimize such polarization. 41 They must simultaneously ensure that accurate scientific data is available and put to use, while guaranteeing that the public has access to the decision-making process, so that ethical and social considerations are not overridden by purely technical ones. 42

The attempt to provide such a forum raises many difficult issues. Public hearings tend to be costly and very adversarial. Existing permit procedures tend to involve extensive government-industry negotiations with minimal public comment, and little opportunity for administrative or judicial review. The role that the Courts should play in the review of administrative decisions must also be addressed, to establish whether judicial review should be substantive or merely procedural. Whatever the forum, there are problems with deciding who has official standing to appear, what role interest groups should have, and whether funding should be
provided to groups which wish to prepare representations. A framework for controlling expenditures of time and money during the review process must be established. There are also difficult problems providing adequate representation for unenfranchised interests, such as those of future generations, aesthetic values and non-human interests. While a detailed examination of possible solutions to each of these problems is beyond the scope of the present study, such concerns are all part of the need to provide for input into legal and policy decisions by those affected by the outcome of the decision-making process. Among the areas in which improvements can be made to the existing process are the provision of technology assessments, improved access to scientific information, and a non-adversarial public forum for discussions about the range of scientific uncertainties and outcomes.

d. Public Participation

Throughout the preceding discussion several areas have been identified in which the policy formation process, and the legal implementation of public policy, exhibit a failure to provide for public participation in the political-legal process. Among these are the need for public involvement in determining the acceptability of risks associated with alternative technologies, the balancing of economic and environmental values, and the need to resolve equity distribution concerns.

Two other areas in which public input would be desirable
are the development of regulatory standards and the setting of permit terms and conditions. These procedures, as previously discussed, are presently subject to very broad Ministerial discretion and governed largely by way of administrative policy guidelines. In practice, decisions are delegated by the Minister to administrative officials, and referred to various agencies, thus obscuring political accountability. Since standards are often set by internal departmental agreement, the ability of the public to monitor industry compliance is minimal. Procedures under the CEPA to permit public review of administrative decisions and to require government enforcement of standards are limited, and subject to discretionary Ministerial control.

One of the major difficulties created by the lack of public input into such decisions is the aggravation of problems in obtaining public acceptance of risk-bearing industries, such as hazardous waste disposal facilities. The Canadian government's approach to ocean incineration may already be encountering problems in this area. The first application for an ocean incineration permit was received in 1983, yet it was not until 1987 that the issue began to attract public attention and media coverage. Throughout this period government policy was being developed, but without public input into the decision-making process. The failure to provide public access to information early in the decision-making process has been identified as a major reason for the NIMBY syndrome. Inadequacies in providing public information may also result in the need to "sell" a decision
that has already been made, which is another aggravating factor.\textsuperscript{45}

At the time of the initial media reports, Environment Canada's stated position was that it was "prepared to consider issuing" a permit, so long as the regulatory requirements were met and there were no environmentally preferable practical alternatives.\textsuperscript{46} A spokesman for the incineration company then indicated that wastes would be brought from the eastern United States and Canada to a Canadian port, and that the company intended to choose the port best suited to its purposes once the federal government decided where the chemicals could be burned.\textsuperscript{47} This combination of a complete lack of public input into the decisions to permit ocean incineration, to select a burn site and to choose a port facility, and the aggravation of equity concerns by waste imports, would seem virtually guaranteed to produce a NIMBY reaction.

Within 24 hours the government reacted by announcing that no American wastes would be imported into Canada for incineration here, and a government spokesman acknowledged soon thereafter, that even if at-sea incineration is considered by scientists to be environmentally safe, "public acceptance will be required."\textsuperscript{48} Although the government is not making the error of assuming that scientific or technical information is decisive, this may be an example of trying to provide a fast and easy solution to a public concern rather than letting the affected persons set the agenda for discussion. Such an approach can also provoke a NIMBY
reaction. 49

Two other factors which aggravate siting problems are the tendency to provide extremely technical information of little interest to the affected parties, and an over-reliance on a public hearing process to resolve all concerns. 50 Although the Canadian government has not yet moved toward public hearings regarding ocean incineration, such a step is possible. If poorly managed, it could serve to increase rather than decrease public resistance. Alternative methods to achieve public input into the legal process are, however, sorely lacking in the legislative framework and existing administrative procedures. The potential result is that members of the public adversely affected by the regulatory decisions, because they feel that they have been poorly informed and given no opportunity to participate in the decision-making process, will react in the typical adversarial NIMBY manner to such decisions, regardless of their technical merits. 51

In the United States several attempts have been made to develop statutory mechanisms for ensuring adequate public participation in hazardous waste facility siting decisions, and these methods may, therefore, be applicable to the siting of ocean incineration operations. The Massachusetts Hazardous Waste Facility Siting Act 52 is perhaps the best studied example of such an enactment, although Wisconsin, Rhode Island and Kentucky have also developed similar statutory procedures. 53 These statutes establish processes by which communities are required to set up bargaining committees and
enter into negotiations directly with the developer in order to produce a siting agreement. The agreement must cover matters such as the compensation payable to the community, the mitigative measures to be taken by the developer and the facility's operating terms and conditions. Procedures such as binding arbitration are specified to resolve any impasse in negotiations, and local government powers to block facility siting may be preempted by the legislation.\textsuperscript{54}

Such mandatory negotiation statutes are, in theory, capable of circumventing the NIMBY reaction. Unlike other public participation methods, such as public hearings, they ensure that local concerns will actually be accommodated, rather than merely articulated.\textsuperscript{55} The requirement that a compensation package be negotiated leads to greater equity, as the people bearing the added costs also receive benefits beyond the general societal benefits of improved hazardous waste management.\textsuperscript{56} If sufficient compensation is offered, the local incentive to oppose a facility is reduced, and the development may even be seen as a desirable addition to the local economy.\textsuperscript{57} Compensation agreements also ensure that a developer will take full account of the costs of a facility, which helps discourage inappropriate development and increases the economic efficiency of siting.\textsuperscript{58}

To date most efforts to site hazardous waste facilities using mandatory bargaining legislation have failed.\textsuperscript{59} The very existence of the siting statutes has often increased the opportunities for legal challenges and delays, as actions have been taken over ambiguities in the legislation, the
nature of the arbitration decisions, the adequacy of decisions by the various committees, the enforceability of the siting contracts, and the constitutionality of the enactments. Interestingly, the Wisconsin statute has been more successful than the better known Massachusetts Act. There is some speculation that the relative success of the Wisconsin legislation is due to the fact that public input was sought when the statutory process was being drafted, while the Massachusetts Act was written without such participation. This may indicate that public input into decision-making must take place at the earliest stages of policy formation and siting processes in order for eventual acceptance to be demonstrated.

In Canada, this type of detailed statutory framework to require developer-community negotiations has not been attempted. The legislative approach taken by Canadian provinces, such as Ontario and Alberta, has been to establish Crown corporations charged with the duty of establishing and operating hazardous waste facilities. These statutes provide that the provincial governments may establish policies that must be followed by the corporations in carrying out their objectives. Details of the actual methods to be used to involve the public in the decision-making processes were not incorporated into the legislation itself, as was done in the American cases, although public participation and negotiation-based approaches have in fact been utilized.

To date only Alberta has been successful in actually
siting a hazardous waste disposal facility. The Alberta approach was characterized by a two-stage process involving first, the development of government policy and second, the siting of the facility. Prior to each stage of the process, extensive public consultations were undertaken, including committee studies, technical evaluations, public hearings and public information sessions. Public input was sought in both the development of government waste management policy, and the criteria which would be used for site selection. The result has been the successful establishment of an operating facility at Swan Hills, Alberta.

It is interesting to speculate whether the Alberta approach, like the Wisconsin experience, has been a success because of the extensive public involvement prior to government policy finalization and the development of a legislative framework. This may be an area in which further study of public participation processes could prove fruitful. Indeed, ongoing efforts to assess the effectiveness of different public participation techniques should be actively encouraged, and government-sponsored study in this area is recommended. In particular, it seems desirable to determine whether the current political, legal and administrative structures have the capacity to respond to the NIMBY phenomenon in an institutionalized manner, by designing a single legal or administrative scheme that will ensure the reasonable disposition of siting attempts. If not, while it may be possible to meet public participation concerns successfully in an ad hoc, case-by-case manner, a broader
solution to provide for the equitable and sound balancing of environmental, social, and economic interests as a routine part of public policy formation and legal development will remain elusive.

e. **Summary**

The preceding discussion has reviewed many of the specific problems which the Canadian government faces in making and implementing laws governing the ocean incineration of toxic wastes. The issues which will require resolution are of four basic types: jurisdictional, economic, scientific and participatory.

Interdepartmental jurisdictional conflicts have obscured public accountability and decreased the ability of government to promote preferred waste management policies in a comprehensive and consistent manner. A thorough review of interdepartmental referral procedures relating to ocean disposal activities, and an increase in the ability of the public to review administrative decisions, are two areas in which improvements should be considered.

The need for federal-provincial cooperation in environmental matters is well established in the Canadian context. Of particular importance in relation to ocean incineration is the need to evaluate the impact that the development of this industry could have on provincial waste management efforts, and the associated need for coordinated action between the two levels of government. An additional concern is the influence of American policy on the economic
viability of ocean incineration operations in Canada. Particularly if waste import or export becomes necessary, the possibility of bilateral negotiations with the United States to enter into regional arrangements must be considered.

The need to set fixed regulatory standards for ocean incineration operations is also a matter requiring further consideration. Such a development could, conceivably, provide some limits to the exercise of discretionary decisions, and serve to increase public accountability. Simultaneously, the treatment of the scientific uncertainties associated with ocean incineration technology must be examined. Systematic technology assessment and improved access to, and use of, accurate scientific information are matters which should be addressed as part of any ocean incineration policy development.

A major factor related to the potential use of ocean incineration is the necessity for public acceptance of the siting of both port facilities and burn sites. Public resistance to such risk-bearing activities is an extremely complicated problem with which governments have been struggling for some time. Solutions remain elusive, but new ideas to increase public participation in decision-making hold some promise, and government experimentation and involvement in this area is encouraged.
Chapter Nine: Notes


2. Canadian Environmental Protection Act, S.C. 1988, c. 22, Part VI.


4. Ibid.


7. Ibid., p. 182.

8. R. v Crown Zellerbach Ltd.,(1988) 3 W.W.R. 385; Section 91, Constitution Act, 1867, 30 & 31 Victoria, as am.


11. Thompson, p. 23.


20. IMO, "Export of Wastes for Incineration at Sea" (IMO Resolution LDC.II(V)).

21. "Waste Management Inc., the only U.S. Company with incinerator ships, has abandoned its plan to burn toxic wastes at sea" (Mar/Apr 1988) Sierra 10.


32. See IMO, "Group of Experts" for a list of participants.

72 as am., section 7.

34. Canadian Environmental Protection Act, Part II.

35. U.S. Congress, p. 159.

36. Ibid., chapters 1 and 9.


38. Ibid.

39. Ibid., p. 277.

40. Ibid., p. 276.


45. Ibid., p. 11-13.


47. Ibid.


50. Ibid.

51. Ibid., p. 11.


56. Ibid., p. 479; Burchard, p. 156.

57. Bacow, p. 275; Bingham, p. 479; Burchard, p. 158.

58. Bingham, p. 479; Burchard, p. 146-147.


63. Flett, p. 7-10.

64. Bacow, p. 304.
Chapter Ten: Summary and Conclusions

The existence of toxic chemicals and hazardous wastes creates public health and environmental dangers of vast and potentially catastrophic proportions. In an effort to protect human health and environmental integrity, government and regulatory agencies are continually attempting to create and improve legal and administrative controls over the use and disposal of such substances. One of the toxic waste disposal methods currently being evaluated by the Canadian government, and for which legal controls are now being devised, is the use of ocean incineration technology.

The preceding discussion has outlined many of the dangers caused by toxic wastes, and has described the international treaties and national legislation which regulate the dumping of such wastes at sea. It has outlined current political and legal strategies designed to encourage better management and disposal of such wastes, and examined the controversial role of ocean incineration in promoting such strategies.

Current and proposed laws regulating the use of ocean incineration have been examined and found to be lacking in their capacity to address adequately the many scientific, jurisdictional, economic and political uncertainties that are raised by the potential use of this technology. In particular, there are three areas in which Canadian institutional structures and law and policy formation processes seem inadequate, if safe and effective ocean
incineration laws are to be developed:

1. the ability to deal with interjurisdictional conflicts;
2. the rational use of scientific and technological information; and
3. the achievement of meaningful public participation.

What seems to be needed, if these many concerns are to be met, is something of a departure from the usual tendency of government to make marginal changes to existing laws and policies. Instead, there exists a need to formulate a rational and comprehensive policy to deal with hazardous waste disposal, including a method to assess ocean incineration technology and its place in promoting waste management objectives. A process by which this policy can be fully implemented must also be developed.

Many public policy analysts feel that in fact governments do not, and perhaps cannot, develop the capacity to conduct such comprehensive analyses and make rational choices which accommodate a variety of societal interests. Instead, they feel that the complex bureaucracy, conflicting pressures from interest groups and limits to existing planning and evaluation processes combine to produce a limited number of incrementally different policy alternatives which seldom, if ever, result in a radical policy choice. Instead, small changes to the status quo are made by "muddling through" with a few possible variations on past policy.

Although historically incrementalist policy decision-
making has served to meet changing societal demands, it may be that problems of environmental deterioration will provide increasing pressure on government to be more innovative and to respond with bold new policy initiatives. There is now an international recognition of the world scale of environmental problems and their associated adverse societal impacts, and this has created a new sense of urgency about the need to take effective steps to deal with environmental issues. As environmental degradation becomes more severe, and its effects more widespread and dangerous, governments may be forced by such problems to make political and institutional changes toward more comprehensive, forward-thinking approaches to policy decision-making, in order to deal with this increasingly critical state of affairs. One may anticipate, that as environmental crises and accidents become more commonplace, there will also be a growing political constituency willing to support such changes.

Canada is in an ideal situation to make such a policy departure when it comes to dealing with the ocean incineration option. There are at present no established industrial facilities, employees, disposal contracts or other economic ties to the industry in Canada. There are no established bureaucracies, administrative procedures, budget allocations or regulatory standards in active use. The existing ocean dumping laws and administration will need to be added to or amended, whether the policy process which formulates the needed changes is traditional or innovative. Within the framework of existing international obligations,
Canada is, therefore, free to accept or reject ocean incineration using whatever decision-making and law-making processes it can fashion. Canada has nothing to lose by experimenting with new approaches to law and policy formation in dealing with ocean incineration.

The nature of the jurisdictional, economic, scientific and participatory problems associated with the ocean incineration option suggest that the best way to avoid incrementalist decision-making, and its associated inadequacies, is to develop a two-stage process for law and policy formation. This process would involve first, a comprehensive policy review and second, the development of a method for implementing the resulting policy decisions. At each stage of this process, the existing problems of interjurisdictional conflict, the use of scientific information and the need for public participation can be addressed.

a. Policy Review

The fundamental policy issue requiring resolution is the proper role, if any, that ocean incineration can play in the promotion of preferred waste management practices. This issue actually involves two subsidiary questions: whether ocean incineration should be used at all, and if so, whether it should be pursued as a preferred or interim strategy.

In order to answer these questions, it may be necessary to look at the broader issue of the role of ocean disposal generally in attaining federal and provincial waste
management objectives. Canada has developed a dual system of waste management regulation, where non-toxic wastes are controlled almost exclusively at the municipal and provincial levels, while hazardous waste disposal is increasingly viewed as a matter of national concern, requiring and justifying federal intervention. However, due to international influences and federal jurisdiction over marine pollution control, the ocean disposal of both toxic and non-toxic wastes has been controlled exclusively by the federal government.

This division of waste management responsibilities might be the first issue requiring reexamination at the policy level. The development of an integrated waste management policy on a national scale might well produce a more unified and comprehensive system to prevent environmental deterioration caused by poor waste disposal practices. The development of such a system, however, would involve further federal intrusion into areas of provincial jurisdiction, and would, accordingly, be subject to constitutional and political challenges. Federal leadership in this area would, therefore, certainly need to be implemented by way of negotiated federal-provincial arrangements.

If the division of federal and provincial waste management responsibilities is to be reconsidered, and perhaps changed, the current ocean dumping laws may need restructuring. The Helsinki Convention provides a useful model for discussion. The ocean disposal of all substances except dredge spoil is prohibited by that convention, and
limits on contaminant levels in the dredged material are imposed. Such an approach could be used to strengthen federal control over ocean dumping. Alternatively, if dredged material dumping is viewed as a matter of non-toxic waste disposal with largely local impact, such ocean dumping control efforts could perhaps be allocated to provincial regulators. The use of ocean incineration, which might then be treated as a separate issue involving the control of toxic substances of national concern, could be subject to a different system of federal or joint regulation. This type of restructuring of Canadian ocean dumping laws could promote preferred waste management objectives, by placing stronger restrictions on the disposal of wastes through dispersal in the environment, while allowing separate decisions to be made pertaining to the controlled use of destruction technologies.

If the role of ocean incineration in promoting preferred toxic waste management is considered separately from other types of ocean dumping, a more intensive federal policy review focussed on concerns relating to that technology can take place. Fundamental to the decision-making process regarding ocean incineration is the development of some consensus on the treatment of scientific uncertainty. In dealing with hazardous wastes, there is increasing agreement that new materials and technologies should be assumed to be dangerous until they are demonstrated to be safe, or at least until the risks associated with their use are assessed and found to be acceptable. Policy decision-makers must expressly consider this approach in making choices about the
use of ocean incineration.

Those involved in making decisions regarding ocean incineration will need accurate and complete information about the risks associated with the technology. A commitment of time and resources will be necessary to provide for adequate technology assessment, and the use of comparative environmental and economic impact assessments of land-based and ocean options should also be considered. Although one can predict from the international experience that such studies will be controversial rather than conclusive, those involved in the process will know the extent of the uncertainties with which they must deal, and be aware of the range of associated economic and environmental impacts. Interested parties will also be sure that a systematic attempt to gather available technical, scientific and economic knowledge has been made.

Bearing in mind the limitations of economic and scientific analyses, government decision-makers should not rely exclusively on these tools. The acceptability of the risks associated with ocean incineration will also be influenced by social and political considerations, and it is here that the role of the public in policy formulation must be examined. Public biases in how risks are perceived, as well as problems created by the uneven distribution of risks, need to be articulated. Public input at this early stage in the decision-making process seems essential in order to ensure that non-economic social values are taken into account in policy development, and to enable decision-makers to
balance such values against economic and industrial concerns. Policy-makers must also be aware that the eventual result of the decisions that are made may be the need to site port facilities and transportation routes, and that early public input may be vital to the eventual acceptance of such developments. Of particular importance is the possible need for public input into the formulation of the actual process by which site selection will be made, and the criteria which will be used. In this regard, it may be necessary for the government to direct further resources toward evaluating previous efforts at hazardous waste facility siting, to determine what techniques for facilitating public participation are most likely to be successful.

The fragmented nature of existing laws, due to interdepartmental and interjurisdictional conflicts at both levels of government, creates further uncertainty over the use of ocean incineration and the acceptability of its associated risks. At the policy review stage, it is perhaps most useful to ensure that all potentially involved parties, from both levels of government, have an opportunity for input and discussion. The possibility of regional arrangements may need to be considered, particularly if interprovincial waste import or export is likely. If bilateral arrangements with the United States seem desirable, input from American representatives should also be obtained. The policy review process must be structured in a manner that will enable it to address some of these basic jurisdictional issues, so that the role of ocean incineration in regional and local waste
management programs can be clearly defined.

Designing a process for this type of policy review will be difficult. Logically, however, the first stage seems to be the designation of some agency as a responsible coordinator, with a clearcut mandate and well defined terms of reference. The clear federal constitutional jurisdiction over ocean pollution provides a strong basis for federal leadership in the establishment of such an agency, and several possibilities suggest themselves. These include the creation of a task force or committee, the designation of an existing agency such as Environment Canada, or the use of a Royal Commission to inquire into the matter.

Whatever agency is utilized, it seems imperative that two basic powers be granted to that entity. First, the agency should be given a strong mandate to formulate comprehensive ocean incineration policies and to develop methods for the implementation of those policies. Such a mandate would permit the agency to make clear, rational recommendations to the federal government, that one can anticipate would be environmentally, socially and economically acceptable and would, therefore, provide a solid foundation for concrete action at the political level. Second, it is necessary that the agency be given a sufficient budget to accomplish its purposes and the power to allocate those funds as it deems necessary. These powers seem fundamental to enable the responsible agency to conduct the research necessary to obtain proper technology assessments, to obtain useful environmental and economic impact studies,
to investigate and experiment with methods of public participation and communication, and to engage in multilateral discussion with interested foreign and domestic parties.

Given sufficient authority and resources, the responsible agency should be capable of fashioning an innovative series of programs for policy review that will provide it with the necessary input from scientists, environmentalists, industry, members of the public, local and regional governments, affected federal agencies and international interest groups. With such input, it can then make clear recommendations to government about the role that ocean incineration should have in the Canadian waste management hierarchy, and suitable methods for the implementation of this fundamental policy decision.

b. Implementation

Once a unified policy perspective has been developed, and impact assessments have been conducted, the second stage of the legal development process can begin. If ocean incineration is to be prohibited, appropriate legislation which includes penalties and enforcement provisions can be developed. Alternatively, if ocean incineration is allowed, careful thought must be given to the structure of the legislation to ensure that adequate regulatory control over operations can be maintained. Alternatives include the design of entirely new legislation, or the amendment of the existing CEPA provisions.
One possibility is the establishment of an independent agency charged with developing an integrated federal/provincial program for hazardous waste management, and having final authority over waste management decisions. Such an agency could seek to coordinate air, land, freshwater, and marine discharge controls which regulate hazardous waste disposal practices. It could direct resources for environmental and technical research, establish public information programs, and act as a liaison among interested federal agencies, provincial departments, interest groups and industry. By controlling the waste management efforts of these various groups it could simultaneously attack the problem of proper hazardous waste disposal on many fronts.

Arguably, the national dimensions of the hazardous waste disposal problem justify further federal intervention in waste management programs which have, to date, been subject to primarily provincial control. The clear constitutional jurisdiction of the federal government over ocean pollution provides further authority for federal leadership in this area. While there is reason to be hesitant regarding the need for a further expansion of government bureaucracy, a careful reallocation of existing resources and personnel from departments presently administering many of the current regulatory programs could reduce adverse financial and institutional impacts. Certainly, it seems that the magnitude and seriousness of the hazardous waste disposal problem justify substantial changes to the existing
administrative institutions, and it is recommended that the federal government immediately proceed with further initiatives in this area. Powerful federal leadership in hazardous waste management need not preclude provincial participation; instead, such leadership can strengthen and improve the control of toxic substances at every level of concern, by increasing the efforts and involvement of local, regional, national, and international entities. Particularly at the provincial level, cooperation and input from interested parties can be invited and encouraged.

If such federal leadership is provided, and a waste management authority established, the personnel charged with the supervision of marine affairs could then provide some much needed coordination of the regulations controlling marine pollution from various sources. Acting in concert with those responsible for land-based waste disposal and airborne pollution discharges, better controls over ocean pollution from these sources could be attained. Specific efforts could also be directed toward the improvement of regulatory control over direct marine discharges from shipping activities, offshore resource exploitation, and ocean dumping operations, including incineration.

New federal legislative initiatives will be required in order to establish such an agency and to permit it to exercise its functions. For example, to provide the agency with comprehensive authority over offshore marine discharges, new legislation could be drafted governing vessel-source pollution, discharges from offshore mineral exploration
activities, and ocean dumping. This would consolidate or replace the pollution control provisions of many existing federal statutes, including the Canada Shipping Act, the Arctic Waters Pollution Prevention Act, the CEPA, and the Oil and Gas Production and Conservation Act. For ocean incineration activities, such legislation would provide an opportunity for a single authority to regulate all at-sea aspects of incineration operations, including vessel design and construction standards, air emissions, and emergency procedures. Because the agency would also be coordinating intraprovincial hazardous waste management efforts, land-based activities relevant to ocean incineration operations could also be expressly controlled as part of a unified regulatory program.

However, this type of radical change to the present administration may prove impossible to achieve. If this is the case it should, nevertheless, be feasible to implement some changes to the existing ocean incineration legislation. Jurisdictional conflicts, scientific issues, and the question of public participation in environmental decisions are all important concerns which could be addressed in a more comprehensive manner under the existing laws. Fundamental to any changes that are contemplated is the need to actively promote improvements in hazardous waste control, and some specific recommendations can be made in that regard.

(i) Jurisdictional Issues

It is recommended that the following steps be considered as methods to improve the current state of
jurisdictional conflict and fragmentation in ocean incineration laws.

1. The Minister of Health and Welfare should be given a role in the review of ocean incineration permit applications.

2. The factors which the Ministers must consider before deciding whether to grant, vary or revoke ocean incineration permits should be arranged in some priority, with more emphasis placed on those factors which promote preferred waste management practices.

3. Existing procedures for referring permit applications to various federal and provincial agencies should be reviewed, to ensure that each aspect of ocean incineration operations and ancillary land-based facilities will be examined.

4. Each agency responsible for the review of an aspect of ocean incineration operations should be provided with clearly defined responsibilities, specific terms of reference and guidelines as to the criteria they should be utilizing in the assessment of permit applications.

5. The public should be provided with clear information regarding which agency is responsible for each aspect of permit review, and the authority having final decision-making responsibility should be readily identifiable.

6. Recent amendments to the Canada Shipping Act should be proclaimed in force, to allow the establishment of enforceable provisions governing matters such as incinerator vessel design and construction.

7. When other marine pollution legislation, such as the
Fisheries Act, is reviewed efforts should be made to coordinate the legislation and its regulations with the ocean dumping standards.

8. A review of related chemical control legislation, such as the Pest Control Products Act, should be initiated, in order to coordinate the legislation and its regulations with Part II of the CEPA, particularly in relation to the introduction of new chemicals.

9. For aspects of ocean incineration operations involving provincial jurisdiction, such as the transportation of wastes to ports and emergency response measures, federal-provincial cooperative agreements should be negotiated. In particular, it may be necessary to establish national standards and implement such standards by way of equivalency provision under the CEPA, or by way of reciprocal or "mirror" legislation at the provincial level.

10. Negotiation of regional or interprovincial agreements to deal with issues raised by the possible import or export of wastes for incineration should also be investigated.

(ii) Technical Concerns

It is recommended that the following steps be taken to improve the legislative framework as it relates to the attainment of regulatory control over technical matters, including emissions.

1. At a minimum, the LDC regulations controlling incineration operations should be given the force of law by enactment in the form of regulations under the CEPA.
2. Information obtained during technology assessments should be used to enact more rigorous standards, including regulations governing metal contents in wastes and maximum acceptable levels of total emissions.

3. More precise standards should be developed in relation to the legislative provisions governing situations in which the dumping or incineration of wastes is acceptable; in particular, the "rapidly rendered harmless" criterion should be defined.

4. The trace contaminant definitions set out in the current regulations should be reviewed so that acceptable concentration limits are specified, testing procedures are defined, and the present use of unofficial "screening guidelines" is discontinued.

5. A mechanism should be established to provide for the periodic review of the ongoing suitability of the use of ocean incineration, as future technology is developed.

(iii) **Public Participation**

It is recommended that the following measures be taken to expand the role of the public in the assessment and control of ocean incineration operations.

1. The legislation should be amended to provide a process by which the affected public can comment on permit applications before decisions are made to grant or refuse the applications.

2. When permits are varied or revoked, the public should have rights equal to those of industry proponents. This means that the establishment of a board of review under
the CEPA should be mandatory, rather than discretionary, when members of the public object to permit variations and revocations.

3. When questionable agency decisions are made regarding permit issuance, the designation of burn sites, or in setting the terms and conditions attached to permits, there should be a mechanism for administrative or judicial review.

4. The role of the board of review under the CEPA should be strengthened. Consideration should be given to making the board's recommendations final and binding, rather than subject to Ministerial discretion.

5. Data collected from monitoring ongoing incineration operations should be published, and if unsatisfactory conditions are observed the public should have access to a mechanism to initiate a permit review.

6. In all administrative decisions and public review processes, officials should be required to observe the rules of procedural fairness and natural justice. These principles should not be limited in application to formal review processes, such as boards of review.

7. When regulations are being developed to control ocean incineration, and members of the public object to the proposals, the establishment of a board of review under the CEPA should be mandatory, rather than discretionary.

8. Public concerns relative to the siting of port facilities and transportation routes must be addressed. While the complexities of facility siting problems are beyond
the scope of the present study, it seems that the use of a combination of participatory procedures holds some promise in resolving such concerns. There is a pressing need for further evaluation of past efforts at facility siting to determine which combination of participatory techniques offers the greatest potential for success.

c. Conclusion

Environmental problems are rapidly increasing in scale and severity, and toxic waste management provides one example of the difficulty that public institutions face in attempting to bring such problems under control. Technological solutions to environmental problems have their own environmental risks which are often difficult to assess. Progressive environmental regulation is often in conflict with other societal values, such as the benefits of economic growth and development. To deal with these complex and difficult issues, government needs to move away from incremental law and policy formation and start to experiment with new forms of decision-making processes. As new issues arise, government should seek to respond in new and innovative ways, and the present question of the desirability of ocean incineration could easily be used as a "pilot project" to test the ability of our legal and political institutions to meet the future challenges posed by such environmental issues.
Chapter Ten: Notes


2. Ibid., p. 5-6


BIBLIOGRAPHY


An Act to Amend the Canada Shipping Act and to Amend the Arctic Waters Pollution Prevention Act, the Maritime Code Act and the Oil and Gas Production and Conservation Act, S.C. 1987, c. 7.


Arctic Waters Pollution Prevention Act, R.S.C. 1970 (1st Supp.), c. 2, as am.


Canada Labour Code, R.S.C. 1970, c. L-1, as am.
Canada Ports Corporation Act, R.S.C. 1970, c. N-8, as am.
Canada Shipping Act, R.S.C. 1970, c. S-9, as am.
Canada Water Act, R.S.C. 1970 (1st Supp.), c. 5, as am.
Canadian Environmental Protection Act, S.C. 1988, c. 22.
Clean Air Act, S.C. 1970-71-72, c. 47, as am.
Constitution Act, 1867, 30 & 31 Victoria, c. 3 as am. (U.K.)


Environmental Contaminants Act, S.C. 1974-75-76, c. 72, as am.


"EPA Aims to Open Fire on Oceans." (1986) 16(1) Not Man Apart.


Fisheries Act, R.S.C. 1970, c. F-14, as am.


Gibson, Dale. "The Constitutional Context of Canadian Water


Harbour Commissions Act, R.S.C. 1970, c. H-1, as am.


Harding, L.; Langford B.; and Swain L. "Water Quality Management in Coastal British Columbia." Proceedings of Coastal Zone '87 at p. 2897. (Mimeographed.)


Hoos, Richard A.W. Ocean Dumping: the Canadian scene.


"Incineration experts meet at IMO." (1987) 3 IMO News 16.


"Joint meeting to be held on incineration." (1986) 4 IMO News 15.


______. "Summary of LDC/OSCOM Meeting on Incineration at Sea, April 27 to May 1, 1987." (Mimeographed.)

______. "Summary of OSCOM Meeting on Incineration at Sea, May 4-6, 1987." (Mimeographed.)

Kester, D.R. et al. Wastes in the Ocean Volume 5: Deep-Sea


"The Canadian Environmental Protection Act" (1987)


MacDonald v Vapor Canada (1977) 2 S.C.R. 134.


Nauke, Manfred K. "Development of International Controls for Incineration at Sea." In Wastes in the Ocean Volume 5: Deep-


Northern Inland Waters Act, R.S.C. 1970 (1st Supp.), c. 28, as am.


Ocean Dumping Control Act, S.C. 1974-75-76, c. 55, as am.


Pest Control Products Act, R.S.C. 1970, c. P-10, as am.


R. v Gulf Canada Corporation, unreported, 13 August 1987, Yellowknife. (N.W.T. Terr. Ct.)

R. v Tahsis Co. Ltd. and Westview Dredging Ltd., unreported, 10 May 1982. (B.C. Prov. Ct.)


Rogers, James A. "Ocean Dumping" (1977) 7 Env. Law 1.


Territorial Lands Act, R.S.C. 1970, c. T-6 as am.

Territorial Sea and Fishing Zones Act, R.S.C. 1970, c. T-7, as am.


"U.S. firm seeks permit to burn toxins off N.S." **Chronicle Herald,** 25 September 1987, p. 21.


"Waste Management Inc., the only U.S. company with incinerator ships, has abandoned its plan to burn toxic wastes at sea." (1988) **Sierra** 10.


"We neglect our magic kingdom." **Vancouver Sun,** 2 July 1988, p. A8.


assimilative capacity

The capacity of ecosystems to absorb pollutants without adverse consequences.

bioaccumulation

The process by which living organisms absorb and store pollutants within their bodies.

biomagnification

The process in which organisms higher in the food chain store progressively greater levels of pollutants than organisms lower in the food chain.

carcinogen A substance capable of producing cancer.

CE Combustion efficiency; a measure of the efficiency of the combustion process in destroying hydrocarbons.

CEPA Canadian Environmental Protection Act, S.C. 1988, c. 22.

2,4-D 2,4-dichlorophenoxyacetic acid; an herbicide and plant growth regulator.
DDT  Dichlorodiphenyltrichloroethane; an insecticide.

DE  Destruction efficiency; the fraction of a particular waste compound destroyed by incineration.

dioxin  See 2,3,7,8-TCDD.

EPA  United States Environmental Protection Agency.

hazardous waste
Waste with fatal or dangerous properties including flammability, corrosivity, toxicity or radioactivity.

heavy metal
Elemental metals including mercury, lead and cadmium.

Helsinki Convention

IMO  International Maritime Organization.

LDC  Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London


mutagen A substance capable of producing genetic mutations.

NIMBY "Not in my back yard;" the name given to public resistance to the siting of hazardous industrial facilities.

ocean dumping The deliberate disposal of waste at sea.

ODCA Ocean Dumping Control Act, S.C. 1974-75-76, c. 55, as am. (repealed June 30, 1988).

organohalogen Organic or carbon-based compounds halogenated with elements such as chlorine, bromine or fluorine.

OTA United States Congress Office of Technology Assessment.

PCB's Polychlorinated biphenyls; a group of insulants used for a number of industrial and manufacturing purposes.

phytoplankton Free-floating marine plants, generally microscopic in size.

PIC's Products of incomplete combustion; organic compounds formed during an incineration operation when combustion is not 100% efficient.

synergism The joint action of substances, which when acting together increase each other's effects.

2,4,5-T 2,4,5-trichlorophenoxyacetic acid; an herbicide and pesticide.

2,3,7,8-TCDD 2,3,7,8-tetrachlorodibenzo-p-dioxin; one of a group of dioxins that is a byproduct of chlorophenol production.

teratogen A substance capable of producing birth defects.
toxic waste

Waste which can cause death, cancer, disease, mutations, behavioural abnormalities, deformities, or physiological or reproductive malfunctions.