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An assessment and comparison of hazardous waste management Hessen, FRG and Ontario, Canada

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AN ASSESSMENT AND COMPARISON OF HAZARDOUS WASTE MANAGEMENT SYSTEMS: *HESSEN*, FRG AND ONTARIO, CANADA

By

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THESIS

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ABSTRACT

Hazardous waste management has recently become an issue of great concern for governments in industrialized countries. In spite of this, no one country has established a successful framework which guarantees the safe handling and disposal of hazardous wastes. The ideal system would generate no hazardous wastes in the first place but this, of course, is wishful thinking for highly industrialized societies. The next best or "preferred" solution is a system which emphasizes reduction and recycling of hazardous wastes. The existing waste management systems in the world today, however, almost exclusively emphasize treatment and disposal. This thesis assesses the hazardous waste management system in the Federal Republic of Germany, reputed to be one of the most sophisticated in the world in terms of controls and proper disposal, and the fledgling system in Ontario, Canada. The systems are assessed on the basis of their effectiveness in safely dealing with its hazardous wastes and how they are promoting the "preferred" solutions. A comparison of the two systems illustrates the fact that Ontario has been attempting to model its hazardous waste management system after the German one before recent modifications had taken place. The ultimate purpose of the assessments is therefore to prevent Ontario from pursuing costly solutions that cannot be effective in the long term.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 The hazardous waste problem.

In the past 10-20 years, issues in hazardous waste management have surfaced worldwide. These issues involve the degradation of our environment from hazardous waste materials such that the public health and well-being is threatened as well as economic development. The majority of hazardous wastes are either carcinogenic, infectious, corrosive or combustible. Furthermore, many of these wastes are highly persistent, accumulate as they progress through the food chain and present serious complications when mixed with other hazardous wastes[1]. (Environment Canada, April 1986, p.4-7) It is becoming increasingly apparent with continuous development and population growth that past practices of disposal have not adequately dealt with the problem of how to safely deal with these toxic wastes. Incidents such as Love Canal, the Valley of the Drums in Kentucky and the ongoing saga of toxic wastes leaching from abandoned and active dumpsites into the Niagara River are just three of the more widely publicized examples of the

consequences of these practices in North America. There is also the imminent danger posed by the thousands of abandoned dumpsites across the continent, to consider. Dr. Bernd Wolbeck of the Federal Ministry of the Interior in the Federal Republic of Germany (FRG or West Germany), states that

> "in no other field of environmental protection is one faced at the same time with such high quantities and high concentrations of hazardous pollutants as in the form of solid and liquid hazardous waste arisings. Moreover, the dimensions of the problem are evident from the fact that the generation of hazardous wastes is an imminent consequence of many, if not most industrial activities. Even the intensive efforts to clean and safeguard the environment in terms of air and water pollution abatement lead to many and mostly negative consequences on the waste front. All this demonstrates that the hazardous waste problem is a permanent and in the long term probably still growing problem both from the point of view of generation and disposal." (Wolbeck, 1983, p.7)

Riegel explains why the problem has only recently emerged:

> "Environmental ignorance is part of the answer. We didn't know that most hazardous wastes were hazardous and we were not looking for the problem. Economics furnishes the rest of the answer.....Government policy and industrial practices generally favoured environmentally unsound disposal of wastes, hazardous or not, because the costs of environmental and human health damage did not appear in the expense ledgers of business or government." (Riegel, 1983, p.106)

1.2 Range of solutions.

Most international and Canadian sources agree that abatement is the only real solution to the hazardous waste problem in the following hierarchy of solutions:

(i) abatement
(ii) reduction
(iii) recovery
(iv) refining for recycling
(v) treatment and destruction
(vi) disposal

(adapted from Campbell & Glenn, 1982, p.5; Proctor & Redfern, 1982 and Ontario Research Foundation (ORF), 1983, p.1.6 - 1.10)

and logically so, for if the wastes are not being produced then they will not present any dangers. This is, of course, wishful thinking in a highly industrialized and developed world. The last two solutions are the most popular but far from the ideal, having inherent weaknesses and consequent harmful effects. There is, for example, no such entity as a safe hazardous waste landfill in the long term (Schwarzer, 1979 and Piasecki & Davis, 1984). The inevitable repletion of existing landfill sites, the limited capacities of existing treatment and destruction facilities, as well as current political problems in the siting of new landfills and facilities all add to the ineffectiveness of the last two solutions. In addition, hazardous content in the air emissions from treatment and destruction facilities can pose even greater problems because of the wider dispersion and areas affected (Toxic Waste Research Coalition, April 1987, p.3). Reduction, recovery and recycling are closest in effect to the ideal solution while still being feasible in modern industrialized societies and are, therefore, considered to be the "preferred" solutions[2].

As will be seen later on, the majority of waste management strategies accredit them with only informal policy status, in spite of their potential in effectively dealing with the hazardous waste problem.

1.3 Geography of hazardous waste regulation.

It seems that few industries are willing to ensure the safe treatment and/or disposal of their wastes on their own initiative and many feel that if environmental degradation is to cease, then governments will have to take more assertive action (Gibson, 1974, p.54; Lindner, 24 November 1986). The contemporary political trend of many nations towards "neo-conservatism", discussed by Paehlke (1985), with its anti-environmentalist tendencies and policies removing corporate restraints appears to go against this need.

Existing waste management strategies almost exclusively emphasize disposal methods. Furthermore, no one country has been able to come upon an overall successful strategy for waste management. Indeed, Müller states that "waste legislations are presently in a dynamic state of flux all around the world" (Müller, 1986, p.3). Added to this state of flux is the problem of international effects of inadequate disposal practices and the subsequent non-uniformity of waste management standards. Some attempts are being made to establish compulsory international precepts by organizations such as the North Atlantic Treaty Organization (NATO), United Nations Environmental Programme (UNEP), the

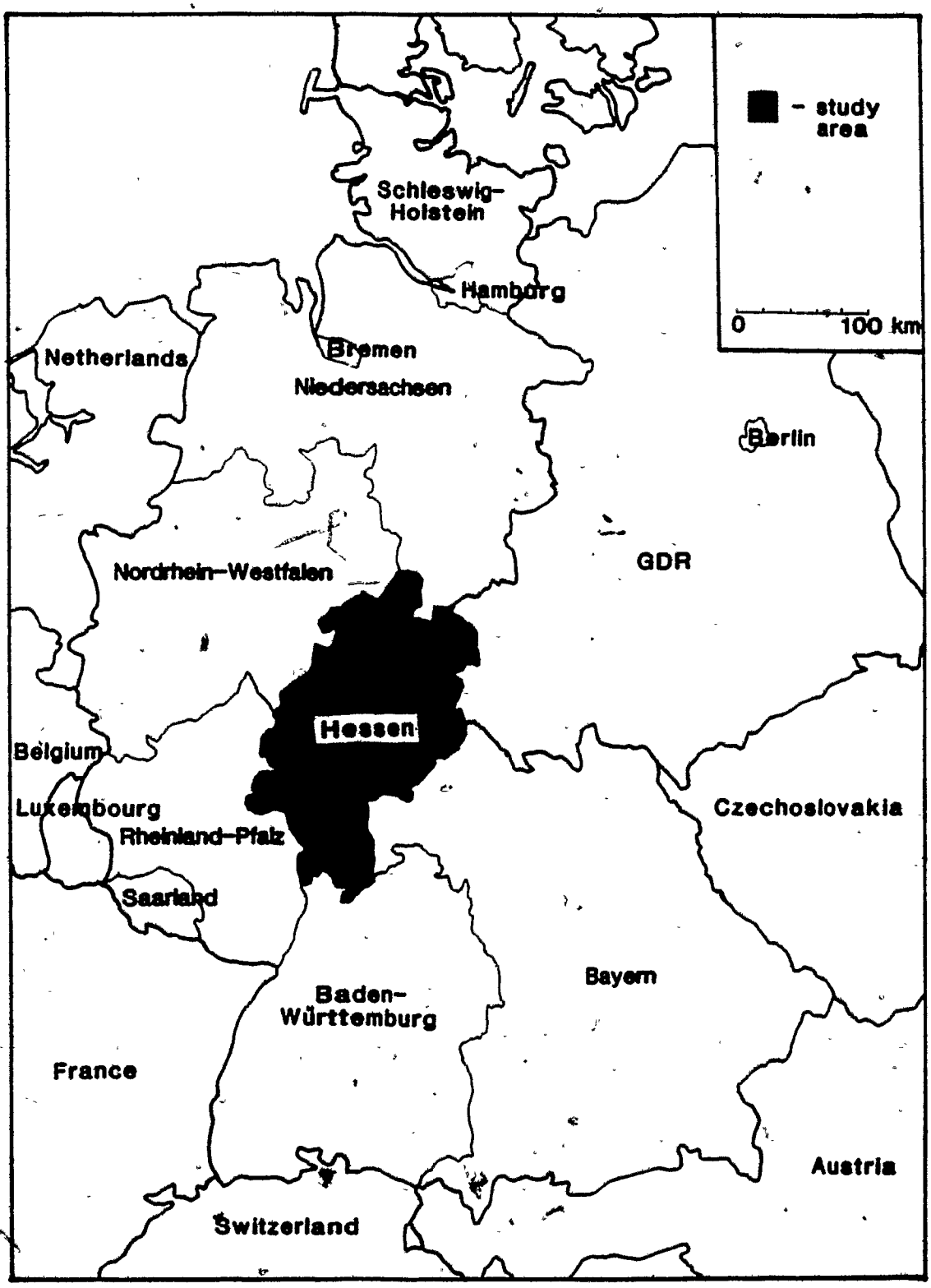
Organization for Economic Cooperation and Development (OECD) and the European Economic Community (EEC). These organizations are presently concentrating on issues such as a uniform definition of hazardous wastes and trans-boundary shipments, in spite of their distance from the heart of the problem (Müller, 1986, p.3).

1.4 Research proposition.

The main purpose of this thesis is to evaluate the waste management systems in two specific geographic areas in terms of their effectiveness in solving the hazardous waste problem. The first of the two study areas, the FRG, is reputed to have one of the most sophisticated hazardous waste management and disposal systems in the world, along with the strictest controls (Piasecki & Davis, June 1984, p.23 and Mangun, 1985). As such, it was assumed that the German system would exhibit superior and effective elements to deal with hazardous wastes. The initial research proposition was therefore to evaluate the German approach to hazardous waste management in terms of its effectiveness in safely dealing with its hazardous wastes and its promotion of the "preferred" waste management solutions. The State of Hessen was chosen as the specific study area in the FRG. (Figure 1a)

Conversely to the German case, Canada and Ontario are still struggling with unsafe dumping practices and not very successful attempts to establish hazardous waste treatment facilities and procedures. Ontario was selected as the

Figure 1a: Hessen, FRG



specific study area in Canada because it is the greatest producer of hazardous wastes and because of the author's familiarity with the issue in the Province and the obvious need for information and assessment there. (Figure 1b) The apparent direction of Ontario's fledgling system is compared with the German system and then assessed in terms of its assumed effectiveness in solving the hazardous waste problem. Ontario's promotion of the "preferred" solutions is also included in the evaluation.

1.5 Scope and limitations.

During the course of any research venture, the researcher will inevitably encounter certain circumstances that will force him or her to limit and refine the focus of the inquiry. In the case of this thesis, there were time and financial constraints experienced in obtaining comprehensive information to assess the German waste management system, not to mention the limitations and challenges experienced while carrying out research in a foreign country and in a foreign language. Furthermore, research in the field of hazardous waste management bears many peculiar prohibiting elements of which the most pervasive is probably its sensitive political nature. There is only limited statistical data available on hazardous waste generation in the study areas and even less data available on waste reduction. In addition, there are only a few previous analytic studies on the effectiveness of hazardous waste management systems in existence and these

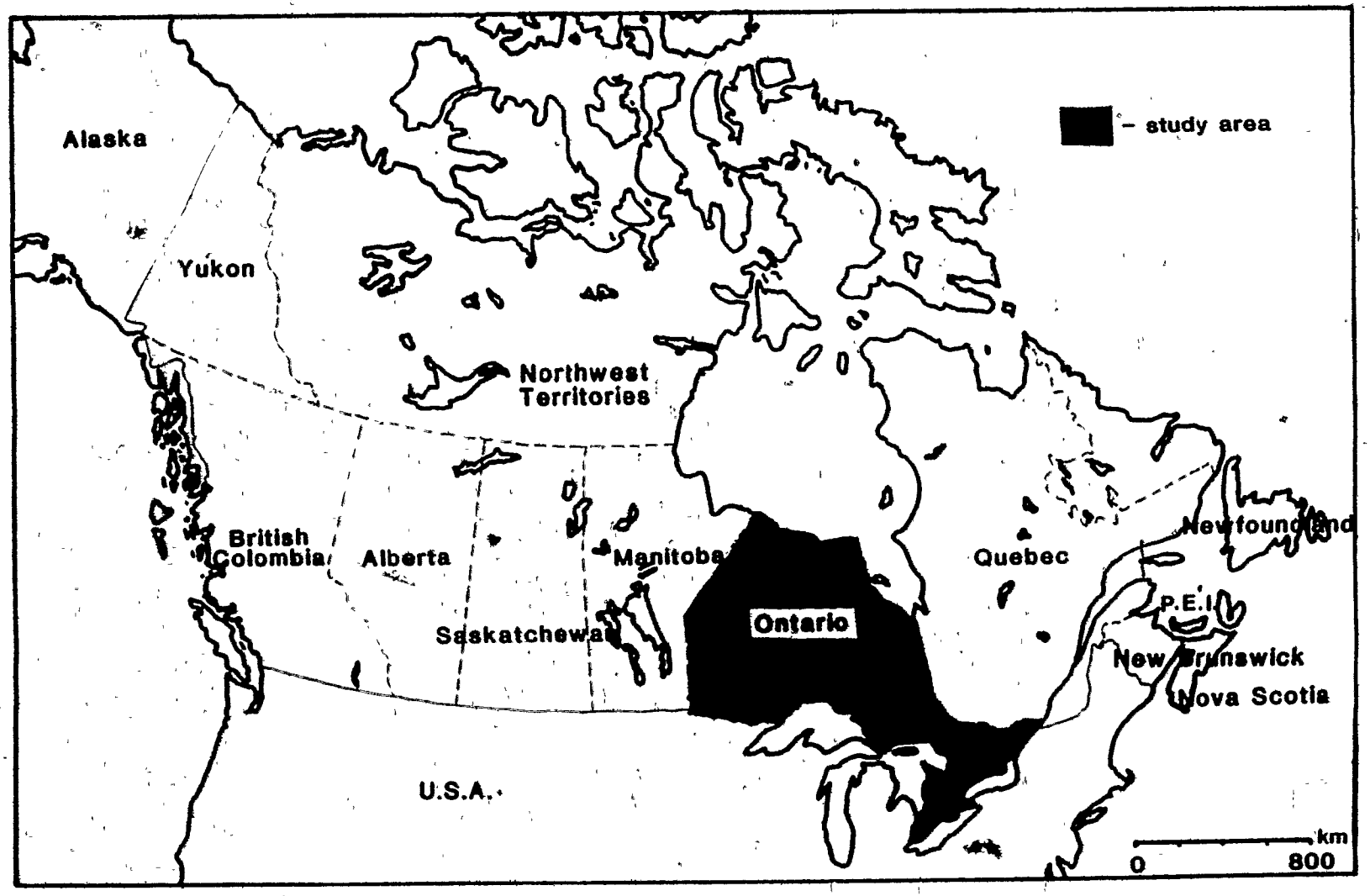


Figure 1b: Ontario, Canada

focus more on the control of hazardous wastes. As a result, this thesis is based on the logic inherent in the "preferred" waste management solutions for solving the hazardous waste problem and the analysis is predominately based on qualitative information obtained from a wide range of sources relevant to hazardous waste management.

1.6 Background characteristics of study areas.

There are several statistical differences between the two countries and lesser jurisdictions that should be acknowledged and taken into consideration when comparing the two systems. (Table 1) For example, the differences in size and population between the two countries is considerable. Furthermore, the FRG has a larger Gross National Product (GNP) than Canada but has fewer natural resources within its borders. In contrast Canada has abundant resources, a fact which will have greater significance later on in the thesis. At the state and provincial level of analysis, similar differences exist. (Table 2)

The two countries both have federal political systems. However, greater legislative authority is evident at the federal level in the FRG. Horn et al. (1982, p.19) note that the ability of the *Länder* to act autonomously has decreased in the past twenty years because "technological, economic and social changes have made it much more sensible to do the planning and set the goals at the federal level."

Table 1

FUNDAMENTAL CHARACTERISTICS OF THE STUDY AREAS

	FRG	CANADA
Area	248,577 km² (incl. West Berlin)	9,970,610 km²
Population	60,734,000 (July '86)	25,644,000 (July'86)
Population density	244/km²	2.6 km²
Gross National Product (GNP)	$616.1 billion (U.S. dollars)	$334.1 billion (U.S. dollars)
GNP per capita	$10,670 (U.S.)	$12,940 (U.S.)
Major industries	Among world's largest producers of iron, steel, coal, cement, chemicals, machinery, ships, vehicles, machine tools	Processed and unprocessed minerals, food products, wood and paper products, transportation equipment, chemicals, fish products, petroleum and natural gas
Natural resources	Iron, coal, potash	Nickel, zinc, copper, gold, lead, molybdenum, potash, silver, fish, forests, wildlife

(Source: The World Factbook 1986)

Table 2

ADDITIONAL CHARACTERISTICS

	Hessen	Ontario
Population	5,565,000 (1983)	9,064,200 (1983)
Area	21,114 km²	1,068,580 km²
Density	263.5/km²	8.5/km²

(Source: *Statistisches Jahrbuch 1984 für die Bundes-Republik Deutschland* and 1986 Corpus Almanac and Canadian Sourcebook)

In Canada, the Provinces have greater legislative powers in spite of many grey areas in jurisdiction and enforcement that still exist especially in environmental matters (Estrin & Swaigen, 1978, p.11).

Since German legislation was derived from the Law of Ancient Rome and therefore, orients itself on the absolute rule of the law, greater significance is given to legislation and the process of codification as "a source of law" (Horn et al., 1982, p.13). More recently, however, Horn et al. (1982, p.12) observe that it is becoming evident that absolute legislation is inadequate in regulating German society. After numerable changes and additions to the laws, "it is admitted that the judge must [frequently] fill in the gaps in the law and develop it as he applies it". They also state that, as of yet, no concrete methodology for actual legislative proceedings has been developed in the FRG.

In contrast, Canadian law originated with the Common Law which "embodies important rights and principles." Also termed as the "law of precedent", these rights and principles were utilized in "making decisions in disputes between people." (Estrin & Swaigen, 1978, p.4) Complexities in the interpretations of the law in Canada combined with the need for new principles to guide public conduct have necessitated the formation of new codified laws by Parliament or the provincial Legislatures (Chapman, 1965 and Estrin & Swaigen, 1978, p.4). These new laws can be called statutes, Acts or regulations, depending on how they were formed, and they manifest specific sets of instructions or rules. Municipal by-laws are another form of codified law in Canada although they apply in local jurisdictions only. Waste management is a good example of an area in which new statutes and regulations have had to be formalized. McKenney (27 February 1987) of Ontario's Ministry of the Environment (MOE) observes that, while the traditional legal perspectives in the two countries differ, the two are becoming more similar in present day reality.

1.7 Summary.

The hazardous waste problem has become the question of how these wastes can be safely managed so that the environment and the public well-being is not threatened. The consensus of opinion on the range of possible solutions identifies reduction, recovery and recycling as the "preferred" solutions to the problem. The specific purpose

of this study is first to assess the effectiveness of the well-reputed German waste management system in dealing with the hazardous waste problem and to note how it is promoting the "preferred" solutions. The German system was investigated primarily as it is manifested in the *Land* of *Hessen*. Secondly, Canada and Ontario's emerging waste management strategies are compared to the German system and assessed in terms of its assumed effectiveness in safely dealing with their hazardous wastes and how they are promoting the "preferred" solutions.

The next chapter consists of an overview and analysis of the literature relating to hazardous waste management, followed by a section describing the methodology employed in carrying out the main part of the research. Waste management arrangements and trends in the two study areas are reviewed in Chapters 4 and 5. The reviews include a brief discussion of industry's responses to waste management legislations from a selection of secondary sources. Both the German system, as it is manifested in the *Land* of *Hessen*, and its Canadian counterpart in Ontario are assessed in terms of their effectiveness in dealing with the hazardous waste problem and in promoting the "preferred" solutions. Chapter 5 includes, in addition to a review of Ontario's emerging system, comparisons of that system to the one in the FRG. Chapter 6 summarizes the evaluations made in the previous two chapters. Conclusions on the results of

the evaluations and recommendations for future study in the specific research area are also made.

CHAPTER 2.

LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to draw out significant aspects from the literature to provide a basis for the descriptions and evaluations of the existing waste management systems in the study areas. Environmental management theory, in general, is dealt with initially, followed by a presentation of various theories on hazardous waste management as well as several hazardous waste management models. The next section involves a discussion on approaches to public policy implementation. Subsequently, international opinions on possible solutions for the hazardous waste problem and approaches for the incorporation of hazardous waste reduction and recycling into waste management strategies are presented. An analysis of those opinions, based on the public policy implementation theory, is included.

2.2 Environmental decision-making and policy.

There is a wide range of possible approaches in environmental decision-making. It is beyond the scope of

this literature review to enter into a detailed discussion on environmental decision-making. However, some explanation of the mindsets relevant in the hazardous waste issue is necessary to set the stage for further discussions. The approaches occur in a spectrum with exploitation at one extreme and preservation at the other. A conservationist approach lies somewhere in the middle of these. (Cutter et al., 1985,p.7) O'Riordan (1981) has identified two modes of thought within the conservationist approach: "ecocentric" and "technocentric". Ecocentrism finds its roots in the early conservation movement in North America and is based on

> "the supposition of a natural order in which all things [move] according to natural law, in which the most delicate and perfect balance was maintained up to the point at which man entered with all his ignorance and presumption." (McConnell, 1965, p.190).

O'Riordan (1981) has modernized and expanded the philosophy to entail:

> "...the virtues of reverence, humility, responsibility and care; it argues for low impact technology (but it is not antitechnological); it decries bigness and impersonality in all forms (but especially in the city); and demands a code of behaviour that seeks permanence and stability based upon ecological principles of diversity and homeostasis." (O'Riordan, 1981, p.1).

Technocentrism, on the other hand, expounds "rational planning to promote efficient development and use of all natural resources." (Hays, 1959, p.2). Decision-makers in

this mode reason that humanity is justified in exploiting the environment in order to improve its well-being. Furthermore, Jacoby and Pennance (1972, as quoted in Lecomber, 1975, p.11) state that the subsequent prosperity achieved allows the development and implementation of new environmentally compatible technologies to occur more easily.

To suggest that certain actors involved in hazardous waste management are of the exploitation mindset may be a rather hard line of reasoning to take. However, it seems that industrial- and commerce-oriented groups or private regarding groups function from at least some degree of technocentrism. On the other hand, advocates of the "preferred" solutions are more inclined towards ecocentrism, especially according to O'Riordan's (1981) modern definition of the term. These environmental philosophies are recognizable in subsequent sections of the thesis and particularly in the discussions on the expression of values in the waste management systems. Regardless of the underlying philosophy on which environmental decisions are based, there are several areas of difficulty inherent in the actual decision-making process. O'Riordan(1977) deals with these from the perspective of four general themes:

1. problem identification and alternative solutions
2. the role of expert advice versus public-opinion
3. assumptions upon which evaluation is based
4. spatial and temporal impact of environmental decisions

(O'Riordan, 1977)

O'Riordan (1977) also notes that many environmental problems were caused by faulty decisions made in the past. These decisions were based on the expertise that was available at the time and it would have been impossible for the decision-makers to be experts in several areas in order to "foresee all the consequences" (O'Riordan, 1977, p.85) and side-effects. He goes on to identify several perspectives from which environmental decisions are based:

- national security
- environmental health
- economic growth
- equalization of economic opportunity
- equalization of social welfare and political opportunity
- environmental quality and ecological harmony

(O'Riordan, 1977, p.86)

O'Riordan states that, traditionally, the last three objectives have not figured significantly in decision-making because "they have not seemed necessary to the attainment of [the] three major priorities" (O'Riordan, 1977, p.86). In addition, "solutions which involve short-term sacrifice (whether it be financial or in terms of loss of individual freedoms) for uncertain long term gains are not politically popular" (O'Riordan, 1977, p.88).

2.2 Hazardous waste management decision-making and policy.

Policies relating to hazardous waste management experience similar difficulties and additional ones peculiar to the specific field of waste management. For example, uncertainty is always present and magnified due to the

relatively recent emergence of the issue and the corresponding lack of practical knowledge. Davis and Lester (p.47, 1985) observe that

> - problem complexity
> - an unwillingness on the part of many political decision-makers to consider policy options that are politically or economically risky
> - variations in states' political, administrative and financial abilities to deal with the disposal of toxic chemical wastes
> - disputes concerning the appropriate jurisdictional locus of decision-making authority

are also problems specifically associated with hazardous waste management. Lester (1983) elaborates on the complexity of the problem. He states that "multiple dimensions" adding to the complexity of the problem include the definition of hazardous wastes, standards for landfilling as well as treatment and transport controls. The legacy of abandoned dumpsites and unsafe management strategies from the past is an additional complication in the issue. Lester (1983) also stresses the problem of uncertainty in policy responses and the ultimate effectiveness of those policies. All of these complications are evident in the study areas.

Lester et al. (June, 1983) employed a multi-variate analysis to determine the influence of four variables on State levels of hazardous waste regulation. The four variables were severity of the problem; resources; inter-party competition and partisanship; and bureaucratic capabilities. They tentatively concluded that problem

severity and bureaucratic capabilities were the most significant variables in determining the levels of American waste management regulation. Although "one of the most prevalent generalizations in [American] environmental politics literature" (Lester et al., June 1983, p.276) is that Democratic political systems are more conducive to environmental protection policies than their Republican counterparts, the researchers had to reject this premise because of geographical peculiarities in the American system. It was difficult to associate "liberal policy-making" with the eleven southern Democratic States since they "are, on the whole, decidedly more conservative in policy terms than their counterparts elsewhere" (Lester et al., 1983, p.276). From their analysis, the researchers were able to rank the states in terms of their levels of hazardous waste regulation. As it turned out, the State of California had the highest level of regulation.

Indeed, it seems that California is presently the only jurisdiction in the world to regulate the reduction and recycling of hazardous wastes. A law came into effect on 1 January 1986 which bans the land disposal of certain toxic wastes in California and requires industry to recover and/or recycle their wastes whenever it is economically possible. At the same time, firms disposing their wastes must justify their non-compliance with the regulation. (State of California, January 1987, p.1 and Schwarzer, 1979) The State has identified a variety of treatment technologies

which could be used to reduce, recycle, treat or destroy specific wastes (Morell, 1983) and a $1 million (U.S. dollars) grant program was initiated on 1 January 1986 to act as an economic incentive for the adoption of waste reduction technologies (State of California, January 1987, p.10-11).

Mangun (1985) has applied a model similar to that of Davis and Lester's in an analysis of regulatory levels in western Europe. In view of the difficulties experienced by Davis and Lester with the political variable and the greater political variations evident in the European setting, Mangun did not include this variable in his analysis. It was also somewhat problematic to quantify the dependent variable because of the extreme variations in regulatory responses. In the end, Mangun concentrated on three variables that determined the level of hazardous waste regulation in European countries; resources (economic and environmental concern); technological (severity of the problem) and administrative-organizational (environmental infra-structure). As a result of the problems encountered in quantifying the variables, Mangun was only able to establish whether a variable was greater or less than a mean value. He does not, however, establish where he got the data to determine the mean value. Although his analysis was somewhat crude, the results identify some useful characteristics in the European setting. He found that countries with higher combined scores for the resource and

administrative-organizational variables (France, Denmark, the FRG, the United Kingdom, the Netherlands and Sweden) seemed to have greater regulatory development and among these, those with greater wealth had the stronger controls (the FRG, France and Sweden). He concluded that overall

> "those countries that have greater individual wealth may tend to be better organized and hence, more likely to produce advanced policy approaches. Furthermore, those countries with the greatest volume of hazardous wastes may also be more inclined, out of necessity, to adopt formal mechanisms to deal with the problems." (Mangun, 1985, p.153)

The two analyses discussed above are important for this thesis in that they help to identify the variables involved in waste management regulation as well as demonstrating the relationships between those variables. In addition, the results of Mangun's (1985) analysis of European waste regulation levels supports the decision to utilize the FRG as a study area. An analysis of hazardous waste regulation levels similar to the one carried out by Lester et al. (1983), would have slightly different results when undertaken in Canada. In spite of the existing prosperity, the high level of bureaucratic capability, and even though the severity of the problem is greatest in Ontario, policies for hazardous waste management are still relatively new and incomplete in the Province at the present time.

Approaching the issue in terms of responsibilities, Davis and Lester (1985) identify four government levels with

a vested interest in hazardous waste management: local, state, federal and international. Lester (1983) also comments on the responsibilities of different groups. He quotes Getz and Walter, stating that the issue involves "at least four different actors [all responding] to different incentives" (Lester, 1983, p.9). The "actors" include federal, state and local authorities, industry and with increasing frequency, the general public. He also points out in the same article, that background characteristics and the perceptions of the groups, mentioned above, play an important role in hazardous waste policy implementation.

At the State level, Goetze and Rowland (1985) developed a model of evolving regulatory systems as a function of public or private group predominance combined with varying levels of public perception. Their model also identifies relationships in the waste management regulatory process but it is more dynamic than the previous ones. Table 3 portrays the possible relationships affecting the progress of waste management systems. From these, they identify four stages of evolution, where Stage One is characterized by a rapid growth in waste generating industries. Public awareness of the social benefits from these industries greatly exceeds their perception of the costs. Since few states would have anticipated the need for regulation, low levels would prevail throughout. At Stage Two, the distinguishing characteristics are an increase in competition for the "social benefits of waste-generating

TABLE 3

HAZARDOUS WASTE REGULATORY MODEL

VALUES, PUBLIC KNOWLEDGE AND ENVIRONMENTAL REGULATION

Balance of Public-regarding Group Favor	Balance of Private-regarding Group Favor	Public Perceptions of Problems and Severity	Expected Change in Levels of Regulation
(1) Environmental Protection	Environmental Protection	Low	Steep Rise
(2) Industrial Development	Industrial Development	Low	Steep Decline
(3) Environmental Protection	Environmental Protection	High	Steep Rise
(4) Industrial Development	Industrial Development	High	Steep Decline
(5) Environmental Protection	Industrial Development	Low	Modest Decline
(6) Industrial Development	Environmental Protection	Low	Modest Rise
7) Environmental Protection	Industrial Development	High	Modest Rise
8) Industrial Development	Environmental Protection	High	Modest Decline

(Source: Goetze and Rowland, 1985, p.113)

production" (Goetze and Rowland, 1985, p.116) and a decline in regulatory levels especially where industrial development is favoured. Public awareness of "waste externalities" has increased substantially by Stage Three. However, the levels of regulation have changed only minimally because public- and private-regarding group pressures cancel one another out. There is "a fear of losing producers while keeping their toxic legacy" (Goetze and Rowland, 1985, p.118) and the traditional tendencies of decision-makers to favour development over the environment still exist. Goetze and Rowland (1985) propose that in Stage Four, the need for federal intervention, in what was an area of State jurisdiction, becomes apparent. In spite of the resulting uniform minimum levels of regulation, there will still be variance due to differing "fiscal capacities" among the States. Furthermore, States will still be required to make decisions between economic development and environmental protection leaving the regulatory conflict at essentially the same position as in Stage Three. In their model, Goetze and Rowland (1985) state that when the interests of private and public groups are opposed, as in Stage Three and Four, public perception of "waste externalities" governs the regulatory process. The two researchers acknowledge that public action could conceivably favour industrial development over environmental protection but they also state that this is generally not the case in the United States.

Goetze and Rowland's (1985) model of evolving levels of hazardous waste regulation can be quite readily applied to the study areas. The FRG has reached Stage Four in the model while Ontario is still at Stage Three due to the lack of federal legislation. Both countries are experiencing pressures from both public- and private-regarding groups so that there has been little change in the levels of hazardous waste regulation. The relationship between levels of public awareness and hazardous waste regulation appears to be significant at this point but, in this thesis, it is only dealt with briefly in the review of Ontario's waste management situation. In any case, it is identified as a prime area for future study.

Rowland and Marz (1982) have modified Gresham's Law to fit modern day federal regulatory systems. The modified law states that "lax regulation of economic activities in one jurisdiction (state) tends to discourage or drive out stringent regulation of the same activities in neighbouring states" (Rowland & Marz, 1982, p.572). Lieber (1983) and Rappaport (1981) have expanded on this theory in their discussion of the problems in regulating hazardous waste management policy in the American federal system. In general, the difficulties involve variations in policy applications as well as competition between jurisdictions. Risch (1983), Lieben (1983) and Mangun (1985) write that similar difficulties are not only experienced in Europe but magnified by the lack of authority in international agencies

trying to achieve some degree of legislative standardization in Europe such as the EEC, the OECD and NATO. The difficulties are also magnified due to the number of industrialized countries located on a relatively small continent compared to North America. In addition to the common difficulties mentioned above, Canada experiences ones that are unique to its own federal system. Gibson (1973 and 1974) has written on specific problems encountered in environmental management because of the lack of specific directives in the Canadian Constitution. He identifies the problem areas related to environmental matters as: the "high degree of uncertainty" in the wording of the Constitution causing "overlapping jurisdictions"—and the immunity of federal activities and enterprises from provincial legislation.

2.4 Approaches to policy implementation.

Whatever policy decisions are made, there are a variety of implementation strategies to be considered. Williams (1976) describes two distinct approaches of policy implementation: the detailed packaging of programs and the broad directional guides approach. He has adapted Levine's (1972) "broad directional" approach to imply that "policy planners should lay out steps that show a probability of moving in [the] direction [of the policies established]" (Williams, 1976, p.544) and then allow traditional market forces to shape the results. In the other extreme, the detailed packaging approach, rigid controls are set to

achieve goals. Williams (1976, p.544) points out that this approach, while exhibiting more immediate and tangible results, can "stifle creativity or rule out an innovation when some elements are incompatible with local conditions". Therefore he advocates a certain degree of specified directives with inherent mechanisms to allow flexibility and modification (Williams, 1976, p.545). The two approaches identified by Williams (1976) are utilized in the analysis of expert opinion that follows as well as in the evaluations of the waste management systems in the study areas.

2.5 Expert opinion on approaches to waste reduction and recycling.

Given the discussion on the difficulties experienced in the regulation of hazardous waste management, it was decided to find out next the various opinions expressed in the literature on the policy approach that should be taken to incorporate the "preferred" solutions into waste management strategies. Literature from three geographic areas was looked at: the FRG and Europe; the United States and Canada. The authors, included in the review, were all involved in waste management in either a political, bureaucratic or commercial capacity. They were therefore considered to be well-informed in the field. Not only are these views on approaches to the "preferred" solutions highly significant to the research proposition but the author also wanted to see if there were any variations in the experts' viewpoints due to geographical area. Care was

taken by the author, whenever possible, to identify any biases relating to the researcher's or author's position if they existed. The initial material dealt with in this section does not specifically relate to waste management and is not included in the analysis of opinions. However, it is dealt with at this point because of its applicability to policy decision-making in general.

Writing on the possibilities for educational reform, Pincus (1974, p.129) suggests that "if present conditions are unsatisfactory, it is better to risk implementing innovations than to continue to pursue uncertain goals". One cannot dispute that the hazardous waste management situation is unsatisfactory in all industrialized regions in the world nor that regulating waste reduction would be considered an innovative policy.

Yang et al. (1981) advocate that before passing new legislation, the possibilities of compliance or non-compliance to that legislation should be considered as well as the feasibility and complexity of the problem. They state that strict standards do not automatically ensure the attainment of the prescribed goals, enforcement and penalty levels must also be considered. On the subject of tax evasion, Singh (1973) outlines three determining factors: probability of detection, penalty rates and the necessary resources to accomplish the deed. They point out "that lowering the tax rates is no guarantee of eliminating tax evasion. Whatever the tax rates, they have to be

implemented effectively." (Singh, 1973, p.263). Similarly, it will be seen later that strict waste management controls, on their own, are not the solution to the hazardous waste problem.

German authors are generally skeptical of the success of programs aimed at industrial waste reduction, reuse and recycling. Defregger (1983), of the *Landesregierug of Bayern*, devotes little space in his articles towards resource recovery, preferring to give lengthy accounts of *Bayern*'s sophisticated treatment and disposal facilities. He states that the obstacles facing firms wanting to recycle or reuse materials are considerable, especially obstacles concerning the quality and supply of the residuals. Also, the majority of resource recovery activity in the FRG appears to be carried out by industry rather than at a central treatment facility" (Defregger, 1983, p.20).

Müller (1985) delineates some of the more salient barriers to further use of recycling as an alternative waste management strategy in the FRG:

- transportation costs
- availability of the residue
- quality of the residue
- "loss of know-how to competitors or at least the fear thereof"
- increased pollution
- prohibitive legislation
- higher energy costs will promote use of residuals for fuel

(Müller, 1985, p.333-4)

Müller suggests that certain firms are more likely to use secondary materials in their manufacturing processes. For

example, "a large chemical company producing a wide range of products from relatively few starting materials" would be more inclined to reuse those materials than "a company that produces a restricted line of products (i.e. cars) and very specialized consumer goods from a host of starting materials" (Müller, 1985, p.334). The latter will obviously produce more residues than the former. He concludes that the feasibility of further recovery is debatable and it would never be a panacea anyway.

Mertens (1977) believes a recycling economy is possible but more research is needed. He stated that there did not seem to be any alternatives but it would not be necessary to regulate. Normal market forces should bring this about naturally and German industry has already made considerable progress on its own initiative. Vogl (1977) on the other hand, believes that regulation is necessary to bring about the reduction of waste volumes but it must be carefully implemented and monitored frequently. Bauer (1977) is in agreement with Vogl. Conceding that recycling and reduction are the only solutions, he offers two urgent arguments in favour of legislation requiring the reuse of certain materials. The first is the imminent scarcity of the corresponding primary materials in the FRG and the second is the unjustifiable environmental damage caused by the processing and development of those primary materials (Bauer, 1977, p.45). He states that initiatives have already been made and cites the *Abfallwirtschaftsprogramm*

(AWP'75) as an example. Unfortunately, Bauer also observes that these programs have had the tendency to become forgotten in the more immediate reality and bureaucratic complexities of hazardous waste management. Also, the realization of the goals of AWP'75 would have required many changes in production and consumption patterns.

In a study on the economics of recycling prepared for the EEC, Environmental Research Ltd. (1978) concludes that there are obvious benefits to recovery and recycling but that any measures to promote these practices "should be designed to achieve their objective with the minimum of unwanted side-effects" (Environmental Research Ltd., 1978, p.9). They advocate "fiscal measures" and regulation in the form of constructive action aimed at the use of secondary materials in the design, development and marketing stages of industrial processes. It should be noted that they direct their recommendations to wastes in general and not specifically to industrial wastes. It should also be noted that potential economic side-effects are more severe and harder to overcome for industrial wastes.

The American authors tended to be a little more optimistic. Dr. Paul Palmer, who operates a waste recycling business in California, agrees that regulation of waste reduction and recycling is needed as a solution to the hazardous waste problem and that the respective technologies are available. While his biases are evident, he is also in a position to know firsthand what is possible and what

exists in the field. Although Palmer (1980) states that there are many successful examples of the application of that technology, he laments the persistent over-emphasis on disposal and the traditional attitudes of avoiding responsibility for our waste. Schwarzer (1979) is enthusiastic about California's regulatory endeavours and optimistic about the benefits to be realized in the field of hazardous waste management. He admits that "not all materials are economically recyclable" but firmly believes that "land burial of hazardous wastes should be used only as a last resort" (Schwarzer, 1979, p.166). Riegel (1983) states that recycling and reduction were not used in the past because "energy, virgin materials and land were abundant and inexpensive" (Riegel, 1983, p.106). He believes that although the "reduction and reuse of wastes are as complex as the waste streams themselves" (Riegel, 1983, p.121) progress is being made in the field and in the subsequent evolution towards a conservor society.

Geiser (1983), along with many other sources, claims that up to 80% of the hazardous waste stream "could be reduced". He states that the practice of source reduction has not been adopted by industry because of

> "- a lack of comprehensive planning to encourage source reduction
> - a lack of institutions to assist industries wanting to treat their toxic by-products
> - an absence of capital for process and product changes"
> (Geiser, 1983, p.74)

Geiser supports the regulation of these practices along with the development of the necessary financial and institutional infrastructures.

Some more negative views were also found in the American literature. Although Senkan and Stauffer (1981) feel that the ideal solutions to hazardous waste problem are waste reduction and recycling, the present technological situation places conscientious firms at a cost disadvantage compared to those using unsafe practices. At any rate, as costs of treatment and disposal increase, the attractiveness of the more effective alternatives will increase anyway. Worthley and Torkelson (1983) suggest that "public-private sector conflict" and "intergovernmental tensions" will intensify in the immediate future but will ultimately equalize simply because there are no alternatives (Worthley & Torkelson, 1983, p.110). In lieu of regulating the more effective solutions, they advocate the development of "processes and mechanisms" that promote "positive interaction of industry and government" (Worthley & Torkelson, 1983, p.111). Combined with public mobilization to act as a control on governmental laissez-faire tendencies, they see this as the "only feasible solution".

Canadian authors writing about the hazardous waste problem tend to favour the regulation of reduction and recycling to a greater extent. The arguments and conditions proffered vary slightly depending on the time and from what perspectives they are writing. In a report

for Environment Canada on the Canadian regulatory response to hazardous waste management, Castrilli (June 1983) states that a regulatory program for reduction and recycling similar to California's should be considered although there are many barriers. These include the lack of consistent nation-wide disposal regulations; the low cost of disposal compared to recovery; inadequate economic incentives from government and business concerns about capital costs. In an article where he is able to give a stronger opinion, he concludes that provincial and/or federal governments should establish mandatory provisions for the reclamation, reuse and recovery of hazardous waste materials (Castrilli, 1982, p.56).

Moni Campbell of Ontario's Pollution Probe states that Canadian governments have essentially ignored waste reduction in their management strategies and notes that the present emphasis on disposal and facilities impedes any possible progress in the "fledgling field of waste reduction and recovery" (Campbell, 1982, p.60). Suggesting that reduction and recycling will ultimately be regulated in Canada, Campbell (1982) also counsels the continued importance of informal government action and public interest groups in directing industry towards waste reducing attitudes. She also advocates increasing economic incentives through government as well as the accessibility to technical information. These are especially important as incentives for small businesses.

Donald Chant (1982) of the Ontario Waste Management Corporation (OWMC) has obvious biases considering his position at that agency and the OWMC's primary mandate of establishing hazardous waste treatment facilities in the Province of Ontario. Naturally, he stresses the need for disposal facilities in Ontario but believes that policies and programs encouraging reduction and recycling are also needed. He states that these policies and programs would facilitate the siting of the facilities (Chant, 1982, p.38).

Virginia Adamson (1984), in another report prepared for Environment Canada, writes on the barriers to industrial waste reduction and recycling. She believes the legislation of those practices to be imminent. She states that such legislation will increase the visibility and credibility of the 4R's as well as hastening the attitudinal shift to more environmentally compatible lifestyles and processes. She delineates several areas that act as impediments to the realization of such a framework. In addition to the barriers established by Castrilli she identifies pollution control standards, the lack of legislation and the lack of awareness/information as barriers in the Canadian setting. In spite of these, she believes that a legislative system similar to California's could be developed in Canada once the waybill system is in place.

In spite of the acknowledged limitations, these opinions offer some interesting results when analyzed in terms of the two approaches to policy implementation

identified by Williams (1976). In the analysis, a score between one and four was given to each of the authors depending on his or her opinion on the approach to a policy decision on waste reduction and recycling. Advocates of the "detailed package" approach were assigned a score of four. In contrast, advocates of the "broad directional" approach were assigned a score of one. The analysis of opinion was, at times, a subjective process in light of a certain amount of vagueness on the part of some authors, in addition to difficulties encountered in the translation of the German texts. Scores of two and three were assigned to help compensate for this, depending on the general emphasis of the approach. Also, the number of viewpoints was taken into consideration by finding the mean score in each geographic area. The results (Table 4) exhibit a marked tendency for Canadian experts to be advocates of the "detailed package" approach with a mean score of 3.5. In contrast, German experts achieved a score of 2.33. They tended towards the other extreme of allowing market forces to work naturally in concert with informal programs to bring about the policy decision. The American experts achieved a score of 2.83 which falls between those of the previous two although it is closer to the "broad directional" approach and the German score. One final caveat on the results of the analysis should be stated: the opinions on approaches to hazardous waste management is that of the experts writing in the field

TABLE 4

ANALYSIS OF EXPERT OPINIONS
ON POLICY APPROACHES TO WASTE REDUCTION AND RECYCLING

	Score
German and European authors:	
Mertens (1977)	1
Vogl (1977)	3
Bauer (1977)	4
Müller (1985)	2
Defregger (1983)	1
Environmental Research Ltd. (1978)	3
mean	2.33
American authors:	
Senkan & Stauffer (1981)	1
Palmer (1980)	4
Worthley & Torkelson (1983)	1
Schwarzer (1979)	3
Riegel (1983)	4
Geiser (1983)	4
mean	2.83
Canadian authors:	
Castrilli (1983)	4
Campbell (1982)	4
Adamson (1984)	4
Chant (1982)	3
mean	3.75

of waste management and not necessarily that of policy decision-makers.

2.6 Summary.

The initial section of the literature review has attempted to identify possible approaches and the issues involved in environmental decision-making. The discussion becomes more focussed in the following section to identify the issues and variables involved in waste management decision-making. Some analyses of the relationships among these variables are included which serve to support the selection of the FRG as a study area.

The theory put forth by Williams (1976) on approaches to policy implementation is posited in the next section to provide the basis for the analysis of expert opinion immediately following as well as for the references to it in the evaluations of the waste management systems in the study areas.

The final section in the literature review deals with the opinions expressed in the literature on approaches to and the feasibility of waste reduction and recycling. The analysis of those opinions was based on the two basic policy approaches identified by Williams (1976) in the previous section and the geographic origin of the author. The results showed that the German and European authors favour the "broad directional" policy approach while Canadian authors favour the stricter "detailed package" approach. The American authors, whose score falls in

between that of the Canadians and the Germans, tend to favour the broad directional approach albeit with less vigor than the Germans.

The approach taken for this thesis contrasts with the existing waste management literature. Since even the existing waste management strategies in the world are acknowledged to be transitional, evaluations of those systems have been predominately theoretical in nature. Practical evaluations of the German system have had, to date, a very narrow emphasis on the effectiveness of the system in controlling hazardous wastes destined for treatment and disposal, neglecting the long term and wider aspects of the hazardous waste problem. No studies exist, to the author's knowledge, which evaluate the effectiveness of a waste management strategy in terms of the hazardous waste problem or the promotion of the "preferred" solutions.

CHAPTER 3

METHODOLOGY

3.1 Introduction.

The previous chapter examined waste management and other related theories to provide a basis for viewing the hazardous waste problem. The experts' opinion on policy approaches to waste reduction and recycling practices in waste management strategies was also analyzed. Initially, this chapter discusses established frameworks for the analysis of public policy as well as an organizational model to review environmental problems put forth by J.G. Nelson (1976). The research methodology for this thesis was adapted from these frameworks. A discussion on analytical approaches is also included along with a statement on the analytical approach employed in this thesis.

3.2 Research methodology.

Since the main purpose of this thesis is to assess hazardous waste management systems and the promotion of the "preferred" solutions in the two study areas, the research methodology was primarily derived from the public policy analysis literature. Little theoretical attention was

attributed to policy implementation directly until the mid 1970's. At that time, frameworks for research in the field began appearing, consisting of factors that influence the achievement of policy objectives. These and subsequent frameworks delineate a wide variety of research approaches that reflect the respective author's interests. A selection of policy analysis frameworks are discussed below followed by the methodology adapted for the research in this thesis.

R. Nelson (1977) discusses a traditional framework, in his paper, that consists of three components influencing the achievement of policy goals: the policy decision-making process, the related organizational structures, and the development of related technological aspects.

Policy analysis from the perspective of the policy decision-making process investigates the relationships between the selected policy alternative and the logic of that decision. Analyses of this type were well suited to the cost-benefit or cost-effectiveness approaches that were traditionally employed. It was assumed that a neutral decision-maker existed at a higher level to steer the policy process towards the ideal solution. However, R. Nelson (1974, p.389) states that "early policy analysts vastly underestimated the extent to which real progress towards goals they thought were important was blocked by entrenched political power and the innate difficulties of achieving certain kinds of goals."

The organizational perspective analyzes the effectiveness of policy decisions from the way they are carried out. The ability of organizational structures to meet the demands placed on them by the policy directives is of prime interest to the analyst. Specific factors such as the communication of policy objectives through the bureaucratic/political layers and the commitment of agency officials are involved.

The research and development tradition views the evaluation of policy effectiveness in terms of the knowledge available about the problem. R. Nelson (1974) observes that market conditions, rather than intellectualism, have traditionally determined the direction of the research and development in a field. For some problems, neutrally allocated research resources would provide more informed knowledge in the area and solutions would be better suited to achieving policy goals.

The framework proposed by Sabatier and Mazmanian (1980) also identifies three categories of factors influencing "the achievement of statutory objectives". The first of these, "the tractability of the problem" includes factors such as the knowledge available about the problem as well as the degree and type of behavioural change required to solve the problem. The second category involves factors which relate to the policy implementation process. Not only is the effectiveness of the actual implementing institutions of importance here but also the "validity of the causal theory"

behind the policy. The final category identified by Sabatier and Mazmanian (1980) consists of factors external to the actual policy such as relevant socio-economic conditions and public opinion.

In contrast, Van Meter and Van Horn (1975) view the policy implementation process as a system with six components:

(1) an environment that both stimulates government officials and receives the products of their work;

(2) demands and resources that carry stimuli from the environments to policy makers;

(3) a conversions process, including the formal structures and procedures of government, that transforms (converts) demands and resources into public policies;

(4) the policies that represent the formal goals, intentions, or statements of government officials;

(5) the performance of the policy as it is actually delivered to clients; and

(6) the feedback of policies and performances to the environment, which is transmitted back to the conversions process as demands and resources of a later point in time.

J.G. Nelson (1977), in developing an organizational model from which to view environmental issues, has employed some strikingly similar elements to those posited in the frameworks discussed in the preceding paragraphs. Nelson's model involves four basic elements: ecology; strategies and institutional arrangements; perceptions, values and attitudes; and technology. The ecology perspective merely identifies the "elements and processes in [a] system" (J.G.

Nelson, 1977, p.174), encompassing both physical and cultural phenomena. Strategies and institutional arrangements refer to "human goals" and "forms of government, agencies, civil and criminal laws, legislation and other means of influencing human behaviour and land use." (J.G. Nelson, 1977, p.176) Schiff (1971, p.7) states that perceptions are "concerned with the impression one has of a social stimulus or set of stimulus". This impression may change, as it is determined by

> "the perceiver's past experience in general, his previous experience with the same or similar stimuli and the individual's state at the moment he is viewing the stimulus." (Schiff, 1971, p.7)

Closely associated to perceptions but less specific and less subject to change, values are the expression of "relative worth, utility or importance" (Webster's International Dictionary, 1976) attributed to something. For example, some people might value financial and technological development while others place greater importance on nature and ecology. Attitudes, on the other hand, are stronger reactions to something and are usually based on emotion and opinions. J.G. Nelson (1977, p.177) defines technology as the "organized use of knowledge for practical purposes."

Some of the components discussed above have little relevance for a meaningful study on hazardous waste management systems and are therefore discarded in the formation of a research methodology for this thesis. For example, an analysis based on the research and development

tradition from R. Nelson (1974) or J.G. Nelson's (1977) technological perspective or the "tractability" category from Sabatier and Mazmanian (1980) would not yield results that are not already known. Furthermore, these aspects are not at the heart of the problem. Other perspectives such as ecology, perceptions and attitudes were considered to be beyond the scope of this thesis.

There are, however, two common perspectives, evolving from the above frameworks, that were selected for analysis and comparison of the hazardous waste management systems in the two study areas. The selected research perspectives are from the point of view of the institutional arrangements (which includes the policies themselves) and the external socio-economic values inherent in the systems. These perspectives, as evident in the literature review on hazardous waste management and as will become more evident in the following two chapters, are highly significant in dealing with hazardous wastes. It was decided to include the influence of values in the waste management systems rather than perceptions of attitudes since their expression in the system would be more uniform and easier to investigate at the level of inquiry employed. As a result, the selected research foci would produce the most meaningful assessments of the waste management systems in the study areas, given the resources available to the author.

J.G. Nelson (1976) coined the term "institutional arrangements". His definition, discussed above, corresponds

with Sabatier and Mazmanian's (1980) second category of factors which contribute to the policy implementation process. Van Meter and Van Horn (1975) deal with these aspects in the conversions process component of their system. R. Nelson (1974), on the other hand, conceptualizes institutional arrangements as being two separate traditions, one relating to the policies and the other relating to the organizational structures.

Values would be included in the category of factors operating external to the actual policy, according to Sabatier and Mazmanian (1980), and in the environmental and demands components from Van Meter and Van Horn (1975). Similarly, J.G. Nelson (1977) deals with values in combination with perceptions and attitudes. In contrast, the influence of values is integrated with each of the three areas in the framework developed by R. Nelson (1974).

The actual research in the study areas was primarily focussed on the functions of two main groups involved in hazardous waste management: governmental and other waste-related agencies. Government agencies contacted and responsible for waste management in the FRG include: *Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit* at the federal level and *Der Hessische Ministerium für Umwelt und Energie* at the State level. Correspondingly, the Canadian government agencies dealt with in this thesis include: Environment Canada at the federal level and the Ministry of the Environment (MOE) in the

Province of Ontario. At both levels of government, waste legislations and programs as well as investment help programs were looked at in terms of the research question.

Other waste-related agencies in the FRG that were dealt with in this thesis are the *Umweltbundesamt*; the two German waste exchanges, at the *Deutsche Industrie- und Handelstag* (DIHT) and the *Verband der Chemischen Industrie e.V.* (VCI) the *Hessische Landesanstalt für Umwelt* and the *Hessische Industriemüll GmbH* (HIMG). Other Canadian waste-related agencies include: the Canadian Waste Materials Exchange, the Ontario Waste Exchange and the OWMC. The aim of the research involving these agencies was to establish their respective functions in the waste management process and their respective influence in promoting the "preferred" solutions.

The influence of values is, for the most part, assimilated with the information presented on the institutional arrangements. It was also considered important for the purpose of this thesis to investigate the position of industry in the hazardous waste management issue. There were several possible approaches to obtain data of this nature. A survey involving on-site interviews has been acknowledged as the most effective means, in most cases, to secure expedient information of this nature (Canviro & Simcoe Engineering Ltd., April 1982, P.6). Due to the sensitive nature of the issue, a survey applied to the industry in any other fashion would not have been as

accurate as would be desired. Furthermore, the recent enactment of Ontario's waste legislation precluded the acquisition of expedient results from a survey conducted in that region. Instead, several reports and articles dealing with industry's responses to the German waste management system were obtained from the *Bundesverband der Deutschen Industrie* (BDI), an association which represents all German industries. In Ontario, two studies on industrial responses have been carried out on this subject in the Regional Municipality of Waterloo and the other, in the Regional Municipalities of Halton, Metropolitan Toronto and the County of Simcoe. The above-mentioned reports and the BDI literature have varying degrees of bias but they posit a general picture of some of the other dimensions in the issue. Combined with the responses to Ontario's Blueprint for Waste Management, opinions from interviews with relevant authorities and newspaper articles, they were considered to be a reasonably accurate statement of values. In any case, the main focus of this thesis is placed on the institutional arrangements in waste management and not on the values of industry.

3.3 Analytic approach.

Moroney (1981) has identified two approaches to policy evaluation research: one that emphasizes process and a second that emphasizes the purpose. The former approach has predominated in analytic research up until quite recently and assumes the formation of rational policy has preceded

the evaluation. Moroney also states that "traditionally [the] criteria [applied to evaluating processes and their alternatives] have tended to be grounded in economic analysis with specific emphasis on efficiency and cost effectiveness" (Moroney, 1981, p.81). Benefit-cost analysis is a good example of an approach in process analysis. However, Dror (1970) claims that this traditional approach has been ineffective in solving modern issues because of its narrow perspective. The process approach fails to "deal with basic value issues and often inadequately explicates the value assumptions" that lie behind the analysis itself. In addition, the process approach to evaluation prohibits "the invention of radically new alternatives" (Dror, 1970, p.140). On the other hand, the evaluation of policy goals provides for "the identification and evaluation of alternatives [while assuming] rationality and intellectualism are appropriate foundations of policy analysis" (Dror, 1970 in Moroney, 1981, p.82). Other authors such as Blair and Maser (1978) also laud the benefits of policy analysis using logic and axiomatic premises in lieu of a positivistic approach.

R. Nelson (1974) agrees that more modern and complex policy problems cannot be solved by traditional rational analysis. Environmental issues, including waste management, are good examples of modern-day complex problems. They involve substantial conflicts of interest and have consequently developed into political battles. He also

states that "for some problems, the best we can expect of rational analysis is that it lay out the morphology of political impass and highlight the arena of political battle." (R. Nelson, 1974, p.376) This is therefore one of the main accomplishments achieved as a result of the assessments of the waste management systems carried out in this thesis.

Some statistics on hazardous waste generation, disposal and waste exchange activity in the study areas are posited within the thesis. The statistics on hazardous waste generation and disposal were obtained from a one-time waste inventory carried out in each of the study areas. Comprehensive quantitative data on hazardous waste generation over time to evaluate the effectiveness of existing waste reduction and recycling practices was not available in the FRG or Ontario. For this reason, the evaluations are primarily qualitative in nature and based on the intellectual premise that the "preferred" solutions are the more logical alternatives. The bulk of the information in the analysis was obtained through personal interviews and observation. The analyses ignore the political and economic feasibility of a "preferred" system. While these aspects are of great importance in the issue, they would introduce a whole new avenue of research and are also beyond the scope of this thesis.

3.4 Summary.

The basic research methodology for this thesis was adapted from the policy analysis literature and J.G. Nelson (1977). The waste management systems in the two study areas are assessed in terms of their institutional arrangements and inherent values. Since the nature of the hazardous waste problem does not conform to the criteria necessary for traditional rational analysis and in an effort to preserve a valid comparative approach, the analytical approach is primarily qualitative. In the process, the more salient problem areas in the waste management systems are highlighted.

Chapter 4 posits the body of the information obtained in the course of the research in the FRG and evaluates the German system on the basis of its effectiveness in dealing with its hazardous wastes. Chapter 5 posits the information obtained in Ontario, compares it to the German system and then evaluates Ontario's system on the basis of its assumed effectiveness in dealing with its hazardous wastes. Chapter 6 summarizes the evaluations and makes recommendations for future study in the specific ares of waste reduction and recycling.

CHAPTER 4

HAZARDOUS WASTE MANAGEMENT TRENDS IN *HESSEN*, FRG

4.1 Introduction.

This section of the thesis reviews and assesses the institutional arrangements for waste management in the FRG, focussing specifically on their manifestation in the State of *Hessen*. The institutional arrangements are assessed in terms of their effectiveness in safely dealing with hazardous wastes as well as their effectiveness in promoting the "preferred" solutions. Initially, a general overview of the German political forum with respect to environmental issues is posited to give the reader an indication of the political realities in the FRG. A discussion on the geography of hazardous waste generation, existing facilities and the subsequent hazardous waste situation in the FRG is presented next. The main body of the chapter consists of a description of the institutional arrangements for waste management in the FRG. The descriptions include the functions, legislation and programs at the two levels of German government responsible for hazardous waste management, the *Bundes-* and *Landesregierungen* as well as

the functions and activities of the various other waste-related agencies. Inherent social and political values are included in the discussion wherever they are relevant. Following that, the response of German industry to the waste management system, as stated in the BDI literature, is presented. Finally, the assessment of the German waste management system and its promotion of the "preferred" solutions is posited.

4.2 Environmental politics in the FRG.

Presently, there are four main political parties in the FRG; the *Christlich-Demokratische Union* (CDU), the *Sozialdemokratische Partei Deutschland* (SPD), the *Freie Demokratische Partei* (FDP) and *die Grünen*. A coalition consisting of the CDU and FDP was in office in the Fall of 1986. An election was held at the end of January 1987 but did not change this. The most significant aspect of the election results was that *die Grünen* increased their portion of the vote from 5.6% to 8.3% (Fraser, 26 January 1987, p.A11). A review of the specific platforms of the four main parties, regarding environmental matters at the time of the election referred to above, follows.

A wide range of viewpoints are represented in German political parties, from the conservative laissez-faire of the CDU to the more regulated position of *die Grünen*. The CDU asserts that as little as possible regulatory control, as precautionary measures against polluters, should exist. Instead, this party feels that environmental regulations are

most effective when they are general enough to be applied to a broad consensus of economic sectors. The other party involved in the coalition government, the FDP, feels that more control of the environment should occur at the federal level. Other than the stated institutional changes, it appears that the above two governing parties have no real desire to change the existing situation in environmental issues. In contrast, the SPD specifically advocates the replacement of dangerous chemicals in production processes and fundamental change in the prosecution of environmental crimes. Instead of the burden of proof being placed on the government and the victims, they feel that the probable instigators should be required to prove their innocence. Also, conservation-oriented measures adopted by industries should be honored with tax concessions. *Die Grünen* advocate a more radical approach to environmental issues. They propose the complete change of environmental law to an ecologically based system. They specifically advocate banning the production of certain insecticides and herbicides as well as the closure of waste incineration facilities in the FRG (*Der Spiegel*, 15 January 1987, pp.89-93).

The political environment is similar in *Hessen* although a coalition of SPD and *die Grünen* was in office at the end of 1986. It should be noted, however, that this situation changed with a state election held on 5 April 1987. At this time, the CDU managed to achieve a slight majority and

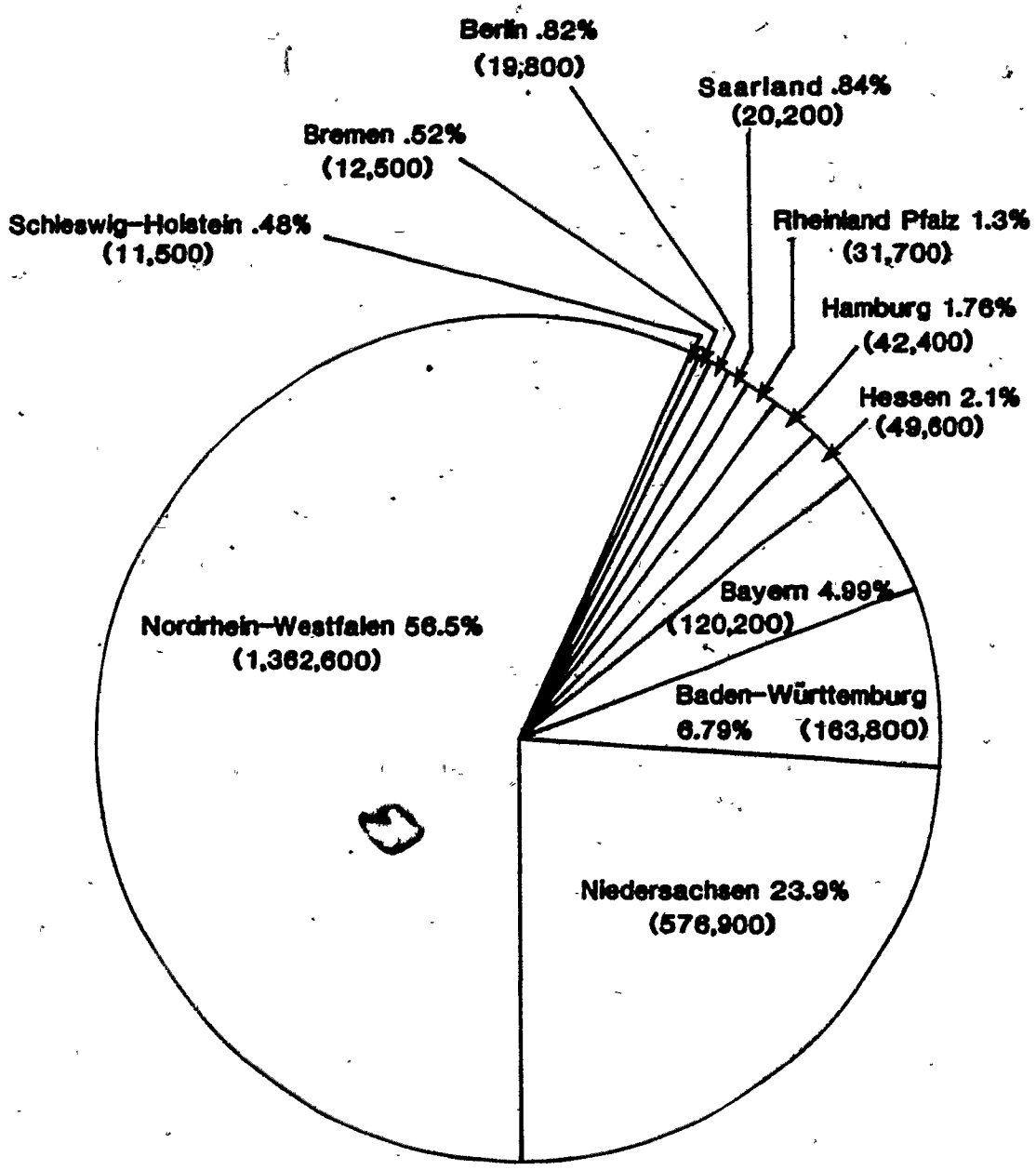
subsequently formed a coalition with the FDP to hold office (*Der Spiegel*, 13 April 1987, p.17).

4.3 Geography of hazardous waste generation and facilities.

The majority of the data utilized in this section is from a one-time waste survey taken from the required waybill documentation for hazardous wastes in the FRG in 1983. Figure 2 shows the distribution of hazardous waste generation in the FRG by *Länder*. More than half, or 56%, of hazardous wastes are produced in *Nordrhein-Westfalen* where the most heavily industrialized area in Germany, the *Ruhrgebiet*, is found (*Umweltbundesamt*, 1986, p.410) and 58.7% of the total volume originates from the chemical industry (*Frankfurter Rundschau*, 13 December 1986, p.18). While the proportion of hazardous waste generated in *Hessen* seems insignificant in comparison to the volume generated in *Nordrhein-Westfalen*, this *Land* still takes its wastes seriously and is striving to deal with them effectively. Furthermore, the degree of federal involvement in the system ensures that hazardous waste management systems in the individual states are basically uniform regardless of the volume of waste generated.

Figure 3 shows the location of hazardous waste facilities in the FRG. It is significant to note the sheer number of these facilities. *Hessen* has several waste management facilities in its jurisdiction in spite of the relatively small proportion of hazardous waste generation. Among these, are hazardous waste treatment and incineration

Figure 2: Hazardous Waste Generation in the FRG by Länder 1983

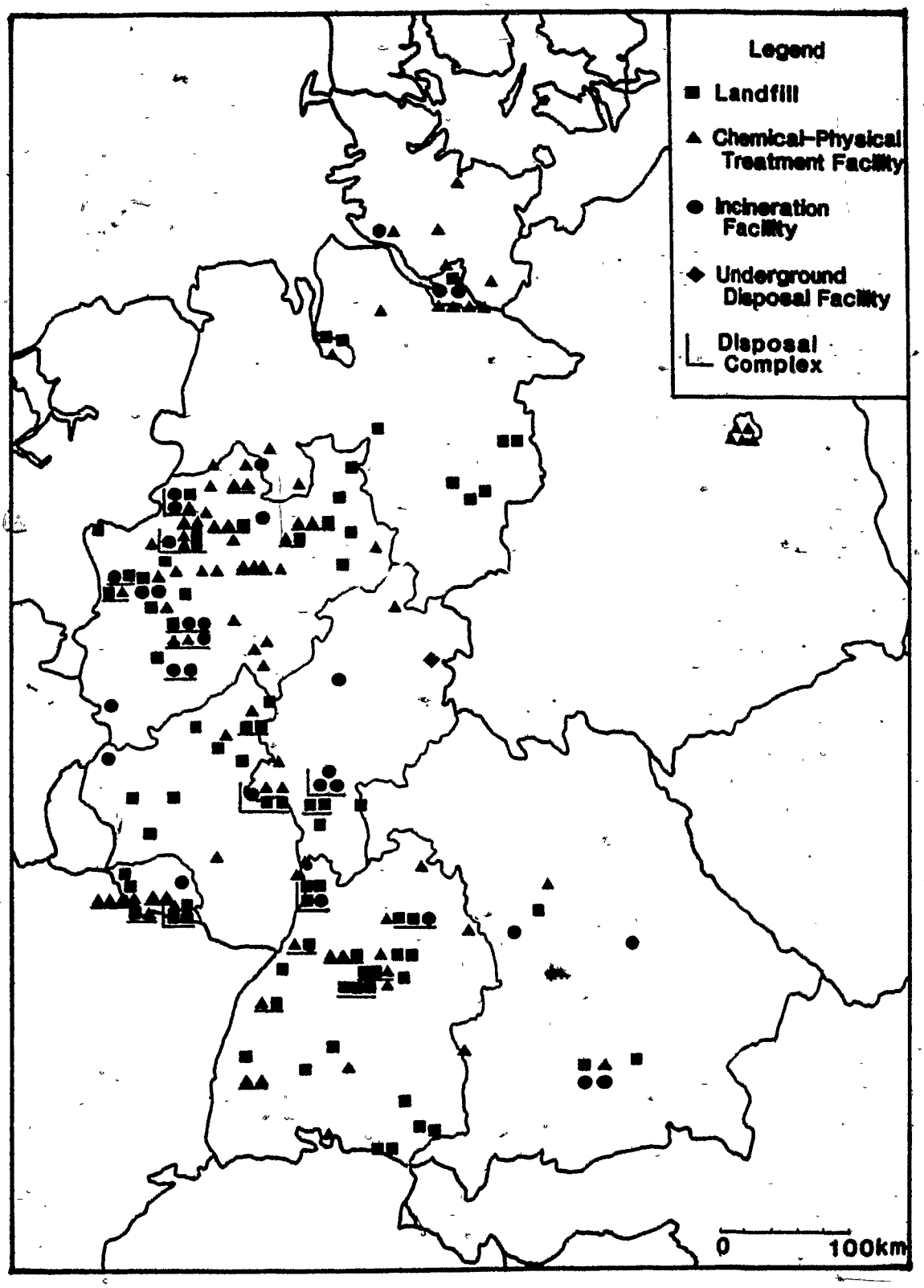


Total volume: 2,411,200 metric tons.

State volumes shown in parentheses.

(Source: Umweltbundesamt, 1986, p.410)

Figure 3: Hazardous Waste Facilities in the FRG

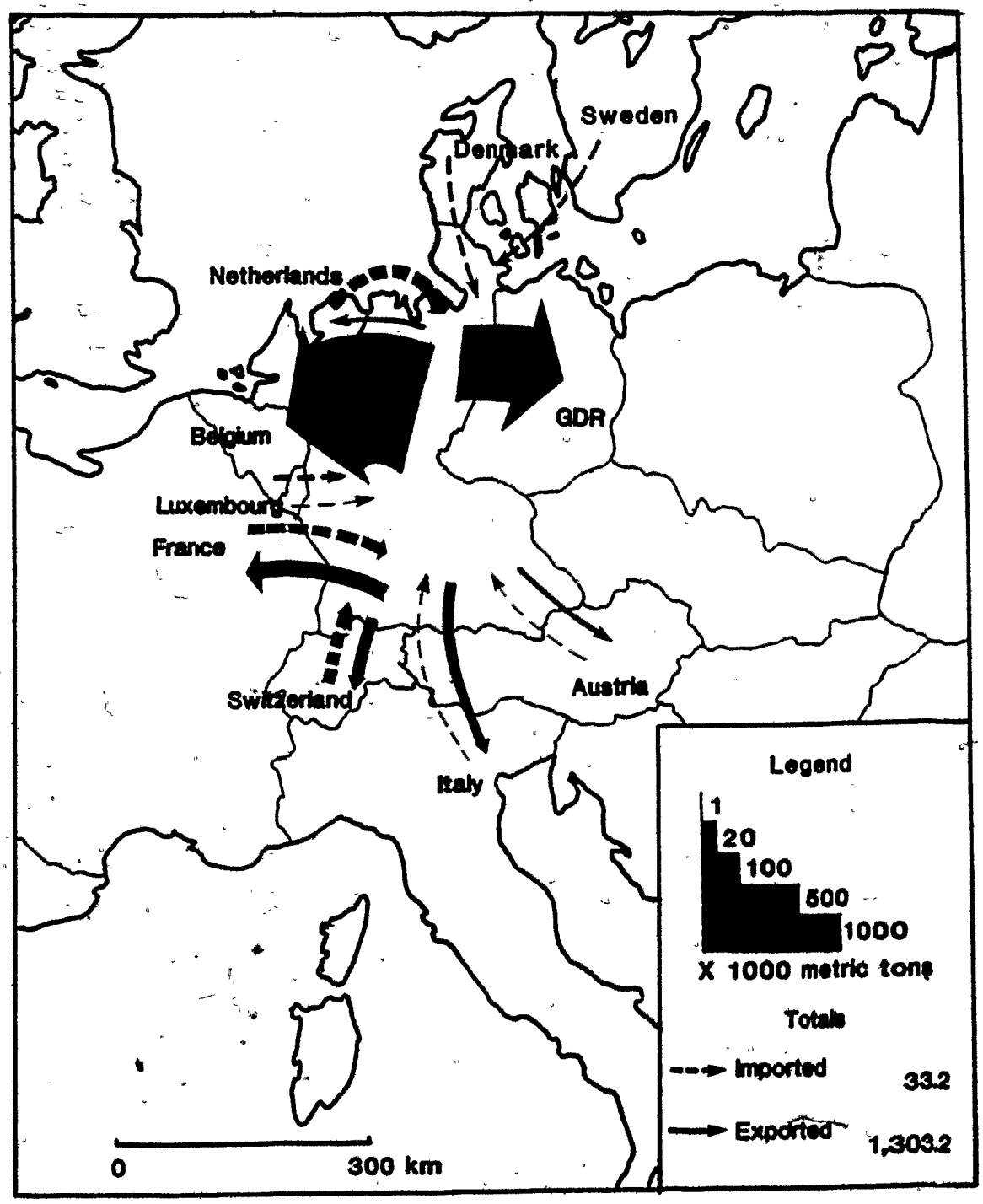


(Source: Umweltbundesamt, 1986, p.417)

facilities as well as several hazardous waste landfills and disposal facilities. The waste management authorities are presently attempting to site additional facilities within *Hessen*'s borders (Wagner, 8 December 1986, p.1). The *Umweltbundesamt* (1986, p.416) estimates that existing disposal facilities in the FRG have the capacity for another 10-15 years of use.

Wagner (8 December 1986) states that the FRG's disposal deficit for hazardous wastes amounted to 1.5 million tonnes in 1986. These figures are an area of considerable concern in German waste management since they state that more than half of the hazardous wastes generated in the FRG are not going to a certified German facility. Wastes that are not dealt with in the FRG are either dumped illegally or exported to Belgium or the German Democratic Republic (GDR) (*Frankfurter Rundschau*, 13 December 1986, p.18). The *Umweltbundesamt* estimates that in 1982, 180,615 tonnes were exported compared to only 24,000 tonnes in 1980. Of the more recent figure, approximately 140,000 tonnes were shipped to the GDR and 40,000 tonnes went to EC member countries (Italy, France and Belgium) (*Umweltbundesamt*, 1984, p.240). By 1983, the total volume of waste exported had mushroomed to 1,303,200 tonnes. The bulk of the increase was accounted for by an astronomical increase in exports to Belgium and by almost three times the previous year's volume in exports to the GDR. (Figure 4) The Schönberg Landfill, just inside the GDR, is one of the more

Figure 4: Hazardous Waste Flows in and out of the FRG, 1983



(Source: Umweltbundesamt, 1986, p.420)

frequently used and it accepts "any waste from any country at cut rate prices designed to lure hard western currency" (Piasecki and Davis, 1984, p.27). The rates are considerably cheaper than the same facilities in Hessen for example. Dr. Schöner, the Technical Manager at HIMG, stated that while costs of disposal in Hessen vary from $150-300(Cdn)/tonne, not including transportation, the same service can be obtained at Schönberg for $125(Cdn)/tonne including transportation (Schöner, 5 November 1986).

In addition, substantial volumes of hazardous wastes are brought into the FRG for treatment and disposal predominately from Switzerland, the Netherlands, Belgium and France. In 1982, waste imports amounted to 39,715 tonnes. This volume had increased by 22% from 32,500 tonnes in 1980. (*Umweltbundesamt*, 1984, p.240) By 1983, imports had decreased to 33,200 tonnes (*Umweltbundesamt*, 1986, p.420). (Figure 4) The practice of transporting highly toxic wastes to distant locations is highly controversial in the FRG at the present time.

4.4 Federal waste management arrangements.

At the top of the hierarchy for regulating waste management is a federal government department, the *Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit*. Although the *Grundgesetz* delegates a large portion of legislative authority in waste management to the *Länder*, there are still some areas where the *Bund* has "exclusive" authority. Trans-boundary shipments of

wastes and national security inasmuch as the well-being of the general public is threatened are examples of areas in waste management where the federal government has "exclusive" power. In addition, the minimum waste management policy is determined at the federal level in a general waste law, by the *Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit* with the assistance of the *Umweltbundesamt*, an advisory body. The *Länder* may then add to the basic legislation, in order to better accommodate their individual circumstances. (Horn et al., 1982, p.17-19) For example, more specific regulations are needed for generators, shippers and facilities depending on the nature of the hazardous waste. The *Länder* may only over-ride the federal law in certain cases (Appendix 1, Article 4, Para.(4)).

The first general waste law, *Abfallbeseitigungsgesetz* (Waste Disposal Law), was passed by the federal government in 1972. The basic principle of the legislation was to ensure that all wastes were safely disposed of at only certified facilities so that human health and well-being as well as other aspects of the environment were not threatened or impaired. To accomplish this, waste generators, collectors and shippers as well as the facilities certified to receive the wastes were required to provide documentation on request and were subject to periodic investigations. Additional requirements for the disposal of hazardous wastes were to be laid down by the competent State waste management

authority in accordance with the stipulations already established for regular wastes in the general waste law (Appendix 1, Article 6). As will be seen in the review of institutional arrangements at the state level, the regulations for hazardous wastes are much stricter and more specific.

There have been several amendments and modifications made to the original waste legislation (Müller, 1985, p.3). Up until the most recent modification, the federal legislation had been concerned mainly with the adequate disposal of hazardous wastes. As early as 1974, however, the federal government realized that the waste law, as it stood, could not ensure the safe management of the increasing volumes of hazardous wastes generated and that a new waste management approach was required. Reluctant to regulate a new management approach that would go against traditional economic practices, the federal government designed and introduced an informal program, AWP'75, to promote the "preferred" solutions to the hazardous waste problem. Four general management aims were formalized for the program:

(i) the reduction of wastes at production and consumption levels in the following aspects

- reduction of wastes produced
- application of environmentally compatible production proceedings
- examination of material input with regard to output
- increasing durability of goods
- increasing multiple use of products

(ii) the increase of waste utilization through

- use as raw materials in production processes
- exploitation of energy content

(iii) safe disposal of wastes

(iv) attribution of costs to principle causes

(*Bundesministerium des Innern*, 1981, p.8)

At the same time, the *Bundesregierung* realized that the fulfillment of these goals would be a long process involving considerable rethinking and relearning of industrial and political principles. As a result, the AWP'75 was to operate primarily as an information centre for both government and industry on matters relating to waste management. These included technology, regulation and financial assistance. In addition, the program was designed to promote research and development to improve the procurement of statistical data on waste generation and to improve the market situation for secondary materials. Although the major part of the program's activities have involved domestic wastes, it also deals with hazardous wastes. In an account of its activities from 1975-1980, however, the program clearly had made more significant accomplishments in the field of domestic wastes. In the field of hazardous wastes the program carried out systematic research on the potential for incorporating hazardous wastes back into production processes and to reduce the volume of wastes produced. It has also cooperated with international organizations such as the EEC, the OECD and NATO in the

exchange of information. (*Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit*, 1981) The more recent status of the program is not known. Although it is still operating, its importance is assumed to have diminished in the face of more immediate and critical concerns.

The fourth and most recent modification of the general waste law was passed in the Fall of 1986. At this point, the title was changed from *Abfallbeseitigungsgesetz* to *Gesetz über die Vermeidung und Entsorgung von Abfällen*. The basic principle of the new law remained the same (Appendix 1, Article 2) except that the word *Entsorgung* replaced *Beseitigung* throughout the law. In addition, and for the first time, the revised law states that waste recovery and avoidance, the "preferred solutions", should be given priority over all other disposal methods

> "if they are technically feasible, if the additional costs as compared with other disposal routes are not unreasonably high and if a market for the materials or energy produced exists or may be developed" (Appendix 1, Article 3, Para.(2)).

Other new areas addressed by the most recent version of the waste law include stipulations for the marking of vehicles transporting wastes, trans-frontier movements within the European Community, marking and labelling on products, separate management and the return of certain goods.

4.4.1 Waste exchange organizations in the FRG.

While reduction and recycling are not regulated in the FRG, it should be noted that two of the most successful waste exchanges in the world operate from there, namely the waste exchanges of the DIHT and the VCI.

The DIHT is the head organization of the local *Industrie- und Handelskammern* (IHK). The *Kammer* in Frankfurt, which is the largest branch in *Hessen*, has ten different sections with various functions. The Industry Section is the most relevant to this thesis and has the following mandates; it

- is responsible for principle questions regarding industrial support and settlement
- supports undertakings in location planning
- advises on basic issues in the industrial field
- works with questions on environmental care such as waste disposal, handling of hazardous wastes, methods of maintaining air and water quality, noise prevention and conservation
- operates waste exchange, publishing offers and requests for wastes
- arranges operational cooperation at a national and international level
- provides the contact spot for research and technological questions as well as patent advice

(IHK, Frankfurt, general information pamphlet, no date)

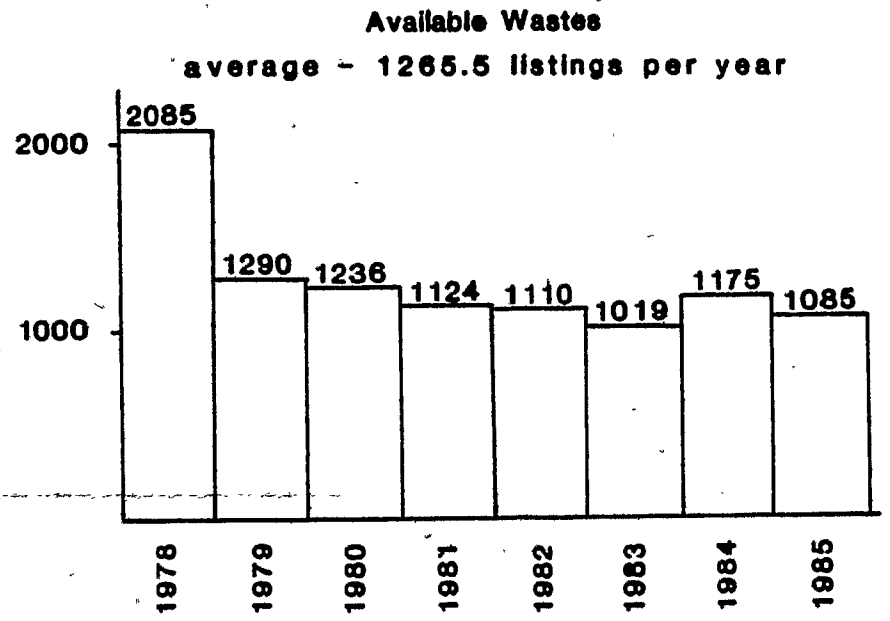
The waste exchange program at DIHT is passive in that it only accepts listings and publishes them without cost to the firm. It does not get involved with the actual

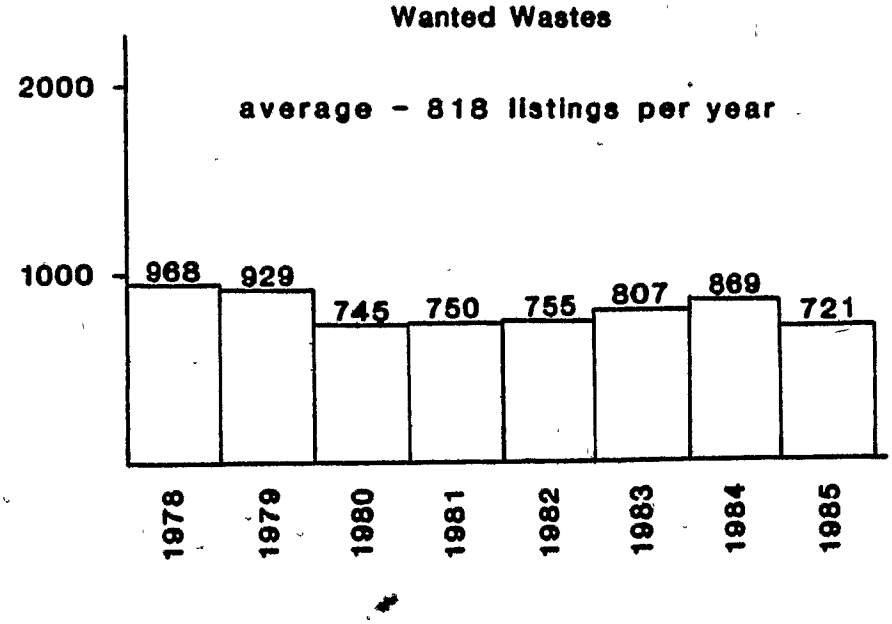
connections between buyers and sellers. All announcements are contained in a bulletin that is published monthly and is available at each of the IHK branches. In addition, relevant and particularly interesting announcements are published in a special section in the DIHT's monthly publication, *Mitteilungen Industrie- und Handelskammer*. (IHK-Frankfurt, general info sheet, January 1977)

Since 1980, the DIHT has coordinated international waste transactions with other European waste exchanges. Italy, Austria, France, the Netherlands, Switzerland and Belgium have especially been actively participating. In 1983 approximately 2600 listings from these countries were published in the DIHT bulletin compared to 485 listings in 1975. To facilitate trans-boundary transactions and to overcome language barriers, the bulletin is published in French and Italian four times per year. (IHK-Frankfurt, 1984)

The waste exchange at DIHT was initiated in 1974 and during the initial period of operation, the number of offers was quite high, 2,850 in 1975, approximately 1,800 in 1977 and 2,085 in 1978. However, the number of offers dropped drastically to 1,290 in 1979 and has remained relatively constant since then (Laughlin and Golomb, 1977, p.121; DIHT, 23 January 1986). (Figure 5) The explanation given for this turn of events is that production processes have improved considerably, reducing the volume of production residuals (DIHT, 1984). Wagner (9 December 1986) added to

Figure 5: Listings at DIHT Waste Exchange





(Source: van Holleben, 17 January 1986)

this explanation by suggesting that certain firms may have established permanent supply connections and would no longer need the services of the exchange.

It is difficult to determine the actual success of the exchange because of its passive nature but there is statistical information available on interested enquiries for a specific listing. In 1975, there was an overall average of 1.7 enquiries per offer were recorded and 3.2 enquiries per request (Laughlin & Golomb, 1977, pp.121-2). By 1983, the average number of enquiries per offer had risen to 2.9 but the average number of enquiries per request had decreased to 2.5 (DIHT, 1984). Piasecki (1984) states that the DIHT exchange had a 36% success rate. Von Holleben (23 January 1986) has shown in a report that *Kunststoffe* represents the most frequently listed material and, excluding only a few years, its listings have been increasing in number. Chemicals also figure significantly in the number of listings but the trends for this category are more erratic and the listings of wanted chemicals have decreased since 1982.

Wagner (9 December 1986) stated that participation in the exchange is usually unsuccessful only as a result of volumes that are too small or because the chemical content is too specific or the quality of the material does not meet the required standards.

From the statistics on listings available in 1977, Laughlin and Golomb (1977) concluded that the DIHT operated

the most successful waste exchange. Wagner (9 December 1986) was not positive that the exchange was still the most successful but he did state that the use of the exchange had become very consistent in the past few years. Wagner (9 December 1986) attributes the popularity of recycling in the FRG to three main factors; the lack of raw materials within the country, the size of the country and the fact that it is densely populated.

The waste exchange at the VCI, an association for the chemical industry, began operating in January 1973. Like the waste exchange at the DIHT, it is passive and only publishes the offers or requests for wastes. Anybody may use its services although its bulletin, published 8-9 times per year, is sent specifically to members of the association. (Mclaughlin & Golomb, 1977, pp.125-130). Total listings at the VCI exchange to date have amounted to over 600 for available wastes and over 100 for wanted wastes. Consistent yearly records were not available from the exchange but a general idea of the number of listings per year is given from a synthesis of two data sources (Table 5). The figure for December 1986, which seems rather large, includes all listings since the previous date that statistics were taken, July 1976. From the statistics presented in Table 5, it would appear that the VCI exchange has experienced similar trends to the exchange at the DIHT, i.e.a large number of listings in the initial stages of operation with a subsequent decrease and relatively

consistent maintenance of the lower rates from then on. The smaller number of listings is understandable considering the specialized nature of the VCI exchange.

Table 5

LISTINGS AT VCI WASTE EXCHANGE

1973	1974	JULY'75	JULY'76	DEC'86
Available wastes:				
185	95	20	55	>245
Wanted wastes:				
21	21	4	10	>44

(Source: adapted from Laughlin & Golomb, 1977, p.126 and VCI, 6 April 1987)

The exchange does not follow up on its services to see if actual contacts were made and if successful transactions resulted. Nonetheless, two surveys conducted earlier by the exchange have estimated the success rate of transactions to be around 20% (VCI, 6 April 1987). They also note that once established, contacts may be continued but the particular listing would no longer appear in the VCI publication.

4.4.2 Federal financial incentive programs.

There are several government financial incentive programs at the federal level to help industries incorporate the "preferred" waste management solutions. Only those programs that relate to waste management are

discussed in this thesis and programs in the *Land* of *Hessen* will be dealt with later on in this chapter.

At the federal level, there are four relevant programs; the *Ergänzungsprogramm (ED) III der Deutschen Ausgleichsbank*, the *ERP-Abfallbeseitigungsprogramm* and -*Abwasserreinigungsprogramm* as well as the *Kreditanstalt für Wiederaufbau*. These programs offer low-interest loans with varying terms of payment.

The *Ergänzungsprogramm (ED) III der Deutschen Ausgleichsbank* is specifically for projects designed to avoid or reduce wastes. The *Deutschen Ausgleichsbank* is the German bank that handles and apportions federal funds to the various government programs. All businesses in trade and industry are eligible for these loans which are offered at 5.5% interest for up to 50% of the needed capital. Only 97% of the principal sum must be paid back. The loan period is up to 20 years of which the first 10 years are at a fixed interest rate. If the total loan period is to be 12 years, fixed interest rates may be obtained for the total time the loan is active. In either case, up to 3 years are payment free. These loans may be applied for at any *Kreditinstitut*, a generic term for any bank that provides loans, or directly at the *Deutsche Ausgleichsbank*.

The *ERP-Abfallbeseitigungsprogramm* is available to help finance the construction or enlargement of waste disposal or re-utilization facilities and for other conservation oriented production arrangements. Any business concern in

trade or industry is eligible as well as municipal business enterprises. The *ERP-Abwasserreinigungsprogramm*, similar in many respects to the *Abfallbeseitigungsprogramm*, is available to help finance projects aimed at reducing wastes in sewage or waste waters. The above-mentioned enterprises are also eligible for the loans as well as farmers and free-lance operations. Both programs offer loans at 5% interest per year with no fixed maximum principal amount. The loans are available for 10 years or 15 years for building projects of which up to 2 years can be payment free. Interested parties can apply for up to $725,500 (Canadian dollars - Cdn)[3] at any *Kreditinstitut*. Larger amounts must be applied for at the appropriate State department. The loans for both of these programs are provided by the *Deutsche Ausgleichsbank*. (*Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit*, 1986, pp. 33-4) A report on the outcome of these programs for 1986 stated that more than $2.1765 billion (Cdn) was paid out in low interest loans. It is noted in the same article that the funds for the ERP environment programs were depleted by August even though the amount available was doubled from approximately $355.5 million (Cdn) in 1985 to approximately $856.09 million (Cdn) in 1986. (*Umwelt*, Nr. 1, 30 January 1987, p.1 in correspondence from Lindner, 5 March 1987)

There also exists a *Kreditanstalt für Wiederaufbau* in Frankfurt which provides low-interest loans specifically for reconstructions or renovations that would reduce volumes

of sewage and thereby reducing the strain on municipal sewage systems. The maximum principal amount is approximately $3.6275 million (Cdn), payable at 5.5% interest in up to 10 years. The first 2 years are payment free and 96% of the principal sum must be paid back. (*Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit*, 1986, p.26).

Federal grants are also available for research and development in waste management. An example of some relevant available amounts follows:

$1,668,650	for innovative developments in the avoidance and utilization of wastes (includes hazardous wastes and others)
2,176,500	for research and development pertaining to safe waste disposal
2,539,250	for research and development in the evaluation, measurement, prognosis supervision of wastes
3,990,250	for research and development for the prevention of water pollution
1,233,350	for research and development in water management law

(*Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit*, no date)

It is specifically noted that priority is given to research and development making it possible to refine the waste statutes. (*Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit*, no date, p. 321, 328, 333)

4.5 Waste management arrangements in *Hessen*.

The ultimate regulations which determine the treatment and handling of the wastes are enacted at the state level. In *Hessen*, there are three main agencies involved in waste management; the *Ministerium für Umwelt und Energie*, the *Hessische Landesanstalt für Umwelt* and *Hessische Industriemüll Gmbh* (HIMG), the treatment facilities for hazardous wastes.

The state waste legislation is created by the *Ministerium für Umwelt und Energie* in *Hessen*, (Appendix 2) with the assistance of the *Landesanstalt für Umwelt* and is more explicit and prescriptive in addressing similar aspects to its federal counterpart. It should be mentioned here that the above Ministry was formed after the election in *Hessen* on 13 December 1985 when a Green Party member was installed as the Minister. As mentioned earlier, however, the political situation in *Hessen* has changed with the election on 5 April 1987. It is not known how this event has affected the waste management situation.

Prior to 1986, the state waste legislation in *Hessen* more closely resembled the federal waste law, emphasizing disposal and control of wastes. In the mid 1980's, the *Landesregierung* of *Hessen* also realized the need for a new and more effective approach to deal with its hazardous wastes and embarked upon steps to initiate that a "New Orientation" for waste management. In a news release, outlining the aims of the "New Orientation" for waste

management, the *Hessische Ministerium für Umwelt und Energie* (March 1986) state that, in the past, waste management had been biased towards disposal. They also state that, to date, there has been a paucity of definite, concrete direction on how hazardous wastes should be handled and the organizational framework is itself inconsistent. It is also stated that, in comparison to the expenditures for the production of economic and consumer goods, the financial and human resource expenditures for waste management technologies for a modern industrialized nation such as the FRG is shameful. Although they admit that there has been much talk about waste reduction and reuse, little has been done to actively promote the "preferred" waste management solutions to date. They also recognize that industries only become active when it is economically favourable to do so. (*Hessische Minister für Umwelt und Energie*, March 1986, pp.3-5) Therefore, the "New Orientation" advocates improved waste management practices but, there is still a discernible reluctance to alter the traditional economic regulatory framework. The news release also states that interference with industry, in the form of increased waste regulations and disposal costs, runs the risk of the neglect of some production steps and cuts in required safety standards but the "New Orientation" will provide more opportunities for fundamental changes in overall outlook. Where, exactly these developments will occur depends on the seriousness of the initiatives and what areas receive pressure from

required political reforms. For example, in the Fall of 1986, much attention was being given to existing and required regulations with respect to chemical spills, water quality and the location of new landfill sites in *Hessen* and the rest of the FRG. The *Ministerium für Umwelt und Energie* also realized that industry and the public must cooperate and be understanding of one another if an effective waste management system is to be reached. The specific examples of public cooperation in the best siting for disposal and treatment facilities, public conservation attitudes and the social responsibilities of industry are cited in the news release. The greatest possibilities for waste reduction occur at the production level and the actual processes should be carefully examined. At the same time, the *Hessische Landesanstalt für Umwelt* was restructured with the objective of a closer connection and therefore more effective cooperation between government, the municipalities and the public. (*Hessische Ministerium für Umwelt und Energie*, March 1986)

The *Ministerium für Umwelt und Energie* acknowledges in the news release that a perfect system cannot be established overnight though because antiquated economic attitudes are too ingrained and the mistakes and deficiencies of the past are too great. These mistakes, unfortunately, require immediate attention because of their seriousness and thus a lengthy transitional period, before significant changes are realized, is required. The *Hessische Ministerium für Umwelt*

und Energie proposed a step-concept with gradual concrete achievements towards a better management system. Specifically, the basic requirements for the "New Orientation" are as follows:

- materials and facilities relative to avoidance and re-use of hazardous wastes, then attention can be given to the reduction of toxic backlogs
- material and facilities specific to the treatment, removal and destruction of hazardous wastes
- integrated supervision of hazardous waste field with other environmental fields
- at the same time, orientation from transition solutions to these new principles

(*Hessische Minister für Umwelt und Energie*, March, 1986, p.7)

In addition and to complement reduction processes, HIMG should only be obliged to accept wastes if all possibilities for avoidance, reduction and reuse have been considered and all conditions for removal are fulfilled. (*Hessische Minister für Umwelt und Energie*, March 1986, pp.8-10) - Dr. Schöner (5 November 1986) stated that, at present, such information must be entered on the waste acceptance application but gave the impression that little importance is given to this in reality. HIMG is, after all, a lucrative business operation.

The new waste management orientation in *Hessen* resulted in the enactment of a new version of their waste management law in the Spring of 1986 before a similar movement occurred at the federal level in the Fall of 1986. Perhaps the most

obvious contrast between the old and the new legislations is in the statement of goals. The new law states that its goals are to reduce the volume of wastes generated as much as possible, re-use wastes generated to the greatest extent possible and finally, to dispose of the unrecoverable wastes "without danger to the environment and the health of the general public" (Appendix 2, Article 1).

Another important waste disposal problem is the treatment of liquid wastes and sewage and a separate law exists for it in *Hessen*. The law pertaining to liquid wastes and sewage states that all fluid residues that are disposed of into the municipal sewage systems or directly into rivers and lakes must be authorized through a separate set of laws or decrees called the *Wasserhaushaltsgesetz* (WHG) and the *Abwasserverwaltungsvorschriften*. (*Staatsanzeiger für das Land Hessen*, No. 52, 1981, p.2443) The WHG requires that firms having hazardous substances in their sewage to treat it as fluid wastes and/or build their own waste water treatment system. In addition to this, there are separate standards for the waste water properties for individual industry types. These standards would apply to firms using municipal sewage facilities as well as those discharging directly into rivers and lakes. The waste water standards for firms such as Hoechst AG are fixed individually by higher authority levels.

All industries discharging into either municipal sewage facilities or directly into the rivers or lakes must be

registered and supervised . The information from these forms is compiled in the *Abwasserkataster* which is, in essence an inventory of firms discharging into the sewer systems or water bodies. Van de Loo (10 December 1986) also stated that a problem in regulating new compounds exists in *Hessen* and the FRG in general. The government does not have the necessary resources to keep up with all new developments in this area. Consequently, much emphasis is placed on the responsibility of individual firms to analyze and declare their respective wastes although the authorities are continually attempting to supplement the research of individual firms in hazardous compounds with their own research.

As can be expected, difficulties are faced by the authorities with this system of self-registration. The discharge of waste waters is checked only two times per year by official authorities and in the interim periods, the system of self-control is imposed on the firms. Major industrial firms such as Hoechst and Mercke are officially checked four times per year and the government would like to make this particular type of supervision monthly. The isolation of specific firms for more frequent supervision depends on their permit, volume and the hazardous content in their waste waters. In addition, if production proceedings are changed, a firm is required to notify the concerned authorities. This reliance on the compliance of individual firms to declare their wastes obviously poses problems. Van

de Loo (10 December 1986) stated that firms are not always willing to divulge information regarding their production processes for competitive reasons. In addition, there are the problems of overlapping jurisdictions and the lack of communication between authoritative agencies.

The problem of diluting concentrations of toxic substances does exist in Germany but Van de Loo (10 December 1986) stated that it was not a big problem. The reason for this is that firms must pay a tax in proportion to volumes discharged into sewer systems as well as the natural hydrological system. The tax has also been rising steadily since 1979 and would act as an encouragement for incorporating the "preferred" solutions into industrial processes.

The *Land* of *Hessen* also has investment assistance programs although, obviously, the available funds are less than the corresponding federal programs. They are in the form of grants which should not exceed 50% of the total expenditures for projects involving the demonstration and execution of innovative processes to avoid the generation of wastes, to re-use residues and for new methods of environmentally compatible disposal of remaining wastes. These grants are available to communities, *Landkreise* and other legal public corporations as well as small- and middle-sized commercial enterprises and private agencies. (*Hessische Minister für Umwelt und Energie*, January 1985) The total financial assistance from the *Landesregierung* for

waste management projects in 1986 amounted to approximately $68,922,500 (Cdn) (Zubiller, 25 March 1987).

The *Hessische Landesanstalt für Umwelt* functions as a technical advisory body in various environmental matters as well as a medium for public information. As such it is assigned the task of ensuring the harmonious assimilation of the new government's position in environmental matters. The commitment for this has diminished since the "break-in" period for the new *Ministerium für Umwelt und Energie* but they still act as an advisory body for both the public and the government. (*Hessische Landesanstalt für Umwelt*, 1986, pp.1-4)

There exists a separate department at the *Landesanstalt* exclusively for waste management. Theoretically, this group is responsible

- for the collection, analysis and interpretation of fundamental waste data such as type, volume and production as well as costs and charges;
- for the conceptualization of possible uses for separated wastes as economic goods;
- to advise community and industry on ways to avoid and reuse wastes;
- to work cooperatively with HIMG by supervising and controlling industry;
- to advise inquirers on fundamental matters related to landfill and disposal techniques
- for the identification and evaluation of old waste treatment facilities.

(*Hessische Landesanstalt für Umwelt*, 1986, pp.147-8)

In reality, the author observed and was told by Mrs. Fincke-Schmidt (4 November 1986), a member of the waste management department staff at the *Landesanstalt*, that the predominate responsibility of the Waste Management Department lies in advising private organizations of the proper treatment and handling for their wastes. For example a firm would need to know which of the three categories of hazardous waste their particular waste falls into in order to proceed with the proper handling. The respective classification depends on the hazardous characteristics of the waste and determines the way in which it must be handled and disposed. (Appendix 2, Article 4, Para.(4)) If necessary, the agency has laboratory facilities to determine the composition of wastes not already classified in the *Abfallkatalog*.

When asked whether she or her fellow workers frequently advised firms that they should consider recycling as a method of treating their wastes or reducing the volume that is generated, Mrs. Fincke-Schmidt (4 November 1986) admitted that this approach was rarely taken primarily because inquiring firms were not receptive to this type of advice. She did have on hand a reference list of commercial industrial waste recyclers although the current validity the list was questionable. An attempt to correspond with these commercial recyclers in the Fall of 1986, resulted in only a few successful replies and several more replies expressing different commercial interests.

The third organization important in waste management at the state level is the *Hessische Industriemüll GmbH* (HIMG). Established in December 1972, it is responsible for the treatment and disposal of all wastes that cannot be disposed of in a domestic landfill. A major share (74%) of the operation is owned by 20 large industrial firms with the remainder being owned by the State of *Hessen* (Maurer & Muckenheim, September 1984, p.2). If the *Landesanstalt für Umwelt* determines that the waste generated is in Category II or III, the firm must then obtain an acceptance for its waste from HIMG and then apply for a permit to transport the waste to the facility (HIMG, 11 April 1986, p.3). Dr. Schöner (5 November 1986) stated that the sole purpose of this organization is to dispose of these special wastes in a safe and proper manner.

All of the German federal laws are published in a special paper called the *Bundesgesetzblatt*. There are two possible publications for legal notifications at the state level in *Hessen*, the *Staatsanzeiger für das Land Hessen* and the *Gesetz- und Verordnungsblatt für das Land Hessen*. These publications must be requested by the individual firms. Mrs. Fincke-Schmidt (4 November 1986) stated that most firms find it advantageous to obtain copies of laws pertinent in their field. She also stated that the *Abfallkatalog* is a frequently requested item.

The *Länder* are also responsible for at least initiating enforcement procedures for environmental crimes. Depending

on the magnitude of the infringement, the federal authorities could be required to take over the case (Van de Loo, 10 December 1986). In any case, German corporations cannot be prosecuted for environmental crimes, not even for infringements due to regular industrial processes. Instead, a specific individual must be found and then it must be proven that this person was negligent in his or her duties. Even then, the maximum fine is $72,500 (Cdn). (Appendix 1, Article 18, Para. (2) and Appendix 2, Article 22, Para. (2)) Between 1981 and 1983, more than 20,000 environmental crimes were registered in German courts. Of these, only 67 prison sentences were issued and a further 48 were placed on probation. Almost all of the cases pursued, however, were for seemingly trivial matters. Nevertheless, at least the crimes are being registered and the number of registrations had increased five times from 2,321 in 1975 to 12,875 in 1985. (*Der Spiegel*, 1 December 1986, p.34)

Governmental authorities have found that undesirable publicity, so far, is the most effective means of regulation and enforcement. In other words, the publication of supervisory investigation proceedings which may seriously effect a firm's business proceedings is more likely to force them to comply to the regulatory frameworks than any other existing enforcement procedures. (van de Loo, 10 December 1986)

The main reason for the lack of enforcement and commitment in the FRG is that the existing governments are

reluctant to upset the economic sector to any great extent by imposing more regulations or stricter enforcement of the present legislation. There is an added fear that the industry will react by transferring more jobs out of the country. At the same time, the federal government believes that the initiative and accomplishments within the industry have been significant and it is therefore considered more advantageous to allow them to continue conducting themselves in a similar manner. *Der Spiegel* (11 December 1987, p.31) is of the opinion that hope for any real change in this situation does not exist.

4.6 Response of German industry to waste management arrangements.

A report on the topic of industrial responses to government intervention in waste management by the BDI, the head organization of all the separate industrial associations in Germany was utilized in the investigation of this aspect of the research. The BDI represents 35 parent organizations, more than 500 trade and regional associations as well as approximately 80,000 private industrial enterprises of varying sizes. Its function is, in essence, to act as an intermediary body between government and industry and to facilitate the communication of pertinent information. As such an agency, the BDI must be politically neutral. (BDI Information Booklet, January 1981)

As would be expected, the view of German industry is that it does not need more regulations to ensure adequate

management of its wastes. The association states that further regulation of waste reduction would be superfluous. Instead, a more stable economic environment in which proper waste management is achieved sensibly and safely, can be attained by allowing normal market forces to operate while ensuring safe and therefore expensive disposal. They realize that, in the short term, regulations to avoid and reduce wastes would have an immediate and visible effect on waste volumes but in the long term, the added bureaucratization would hamper waste management efforts and entrepreneurial motivation within the German economy. German industry feels that it has shown a responsible cooperation in environmental matters and has made significant efforts to reduce the wastes it produces. These achievements, it claims, have been possible because of the relatively small amount of regulation in the German waste management framework. The BDI report also mentions that rising energy and resource prices are playing an important role in the transformation to more sensible waste management policies. (Troge, 06 March 1986) In spite of this, Wagner (9 December 1986) stated that the primary motivation for firms incorporating waste reduction into their industrial processes is the waste laws and ordinances. If a firm has not implemented any of these waste management alternatives, it is because the volumes of waste generated are too small to make it feasible for them to do so. He also stated that there are many agencies available to give information on

waste reduction possibilities. They may contact the state ministries responsible for waste management, the *Umweltbundesamt* in Berlin, the *Landesanstalt für Umwelt* in *Hessen*, any IHK, the various industrial associations, private consultants or the *Umwelttechnologiezentrum* in Frankfurt.

4.7 Evaluation of German waste management arrangements.

The present disposal system and the control of hazardous wastes in the FRG, from an examination of the waste laws, appears to be quite sophisticated and well-established. All of the more obvious aspects in waste generation, transport and disposal are placed under strict control in the legislation in an effort to ensure that hazardous wastes are properly and safely dealt with. There are, however, serious obstacles to its effectiveness as a solution to the hazardous waste problem. The lack of enforcement, as described in the media and also mentioned in an interview with a waste management official, is one of the more salient reasons for this ineffectiveness. The deficiency stems from social and political values placed on economic development and was evident in the media, government reports and the BDI report. Also, the fact that the disposal deficit, if not increasing, is certainly a considerable and controversial amount is reason enough for concern and for intensifying efforts to promote more effective solutions. This is especially so in view of the current capacity estimates for disposal facilities and the

difficulties experienced in siting new facilities. Furthermore, hazardous waste generating industries are not likely to disappear in the foreseeable future, even in developed societies.

The waste management authorities in the FRG, both at the federal level and in *Hessen*, have recognized the realities of the problem and hence, the recent changes in policy approach. Given the qualifications attached to the incorporation of the "preferred" solutions, at both the state and federal levels of authority, however, it is clear that the commitment to this waste management approach is still some distance from being firmly ensconced in the German system. Furthermore, it remains to be seen if the innovative waste management policy, introduced in *Hessen* in 1986, can withstand the change to a more conservative government.

The conflict between public and private sectors in the FRG seems to have reached a stalemate at the present time with neither side willing to make concessions or become more aggressive. Given the perceived, but not authenticated, absence of strong informed public action to influence the situation, there would appear to be little immediate relief in the foreseeable future. Furthermore, externalities such as the escalating effects of population and development pressures; international competition; the proximity and non-uniformity of waste legislations in the rest of Europe, add

to the complexities encountered in dealing with the hazardous waste problem in this particular study area.

As in the past, there is still an inherent tendency to pursue Williams' "broad directional" approach in implementing the "preferred" solutions in hope that normal market forces will bring about the required changes in economic behaviour. This approach is evident in the lack of regulatory status attributed to the "preferred" solutions in the waste laws. At the same time, consolidated business connections and improved industrial processes, producing less waste, may be responsible for some of the decrease in activity at the waste exchanges but the complete absence of effort allotted for expedient analysis to improve the situation is also evidence of a lack of commitment to the "preferred" solutions.

In spite of the lack of commitment accredited to the "preferred" solutions, the informal policies and programs, which includes investment help programs and the waste exchanges, to promote the "preferred" solutions are well-developed and -established in the FRG. The AWP'75 has functioned well as an information centre for hazardous waste technology but it is regrettable that it could not have done more to improve the statistical deficiencies. For example, comprehensive statistical data on hazardous wastes is still only available for 1983. The information presented in the review on the investment assistance programs and the waste exchanges attest to their extent and sophistication. It is

also true, that there is published proof of some significant expenditures on the part of the larger German corporations to incorporate environmentally compatible technologies into their industrial processes, reducing waste volumes or toxicity and the BDI literature claims this trend is common among other industries as well. Unfortunately, there is no existing reliable method to verify their claims. The investment help programs seem to be well-utilized or, at least, the funds made available and granted to industry are considerable. Furthermore, data on the absolute change in hazardous waste volumes generated over time, which would be necessary to assess the effectiveness of these programs properly, does not exist. As a result, there is really no way of evaluating the effectiveness of this approach other than from a broad perspective of the overall situation, as this thesis attempts to do. If the "broad directional" approach, employed in the FRG to promote the "preferred" solutions, has had some effect on waste volumes, that effect appears to have been negated by the previously-mentioned inefficiencies in the system and the various externalities.

4.8 Summary.

In view of the information obtained during the course of the research, it seems that the German waste management system, as it was before the most recent modifications, has not been effective and would not be effective in the long term in safely dealing with its hazardous wastes. The most serious impediments to the realization of the waste

management goals stated in the waste laws is the bias towards economic development and the subsequent lack of enforcement of the waste regulations. Furthermore, the present system cannot keep up with demand, a situation which is worsened by the difficulties experienced in siting new facilities. As a result, the situation is not satisfactory and does not seem likely to improve greatly even with the recent changes in waste management policies.

While the "broad directional" approach, used to promote the "preferred" solutions, has had some impact or at least the programs have been popular with industries, it seems that a stricter approach is required if the hazardous waste situation is to improve in the long term. With the most recent version of the federal waste law and *Hessen*'s "New Orientation", the German waste management authorities have already initiated moves towards a stronger emphasis on the "preferred" solutions and away from the disposal emphasis. This is in itself the strongest argument to support the evaluation made on the effectiveness of German institutional arrangements for waste management.

CHAPTER 5

HAZARDOUS WASTE MANAGEMENT TRENDS IN ONTARIO, CANADA

5.1 Introduction.

The main purpose of this chapter is to review and assess the institutional arrangements for hazardous waste management in Canada, focussing specifically on the Province of Ontario. The assessments are in terms of the overall effectiveness of the system in dealing with hazardous wastes and in promoting the "preferred" solutions. Comparisons with the *Land* of *Hessen* and the FRG are made throughout the chapter to aid in justifying the assessment of Ontario's system.

Initially, a discussion on the political situation in Ontario with respect to environmental issues is presented. As will be seen, the federal government has very little involvement in waste management in Canada, compared to the *Bundesregierung* in the FRG. Therefore, the political situation in Ontario is of greater importance than the political situation in *Hessen*, and it is given more emphasis in the discussion below. The political discussion is followed by an overview of the geographical distribution of

hazardous waste generation and facilities in Canada and Ontario. These initial elements are provided to give the reader some pertinent information for the subsequent review and assessment of Ontario's institutional arrangements for waste management. The review includes discussions on the functions of the federal and provincial Ministries responsible for waste management as well as the waste legislations and related informal programs. The response of Ontario's industries to the existing waste management system, in light of the findings of various secondary sources, is presented next.

It was previously pointed out that Ontario is still struggling to find acceptable strategies from which to deal with its hazardous wastes. Consequently, the regulatory framework for waste management in the Province is not complete at the present time and there are also a few proposed programs that have yet to be implemented. For this reason, the assessment of Ontario's waste management arrangements that follows, is based on its assumed effectiveness in safely dealing with its hazardous wastes but its promotion of the "preferred" solutions is assessed on as much of its real effectiveness as can be ascertained.

5.2 Environmental politics in Ontario.

In Canada, presently, there are three predominate political parties; the Progressive Conservatives (PC's) and the Liberal party and the New Democratic Party (NDP). In

the Spring of 1987, the PC's were in office at the federal level and a coalition of Liberal and New Democratic parties was in power in Ontario. The provincial coalition was replaced by a Liberal majority government in September 1987. In a newspaper article, prior to the elections, environmentalists rated the NDP the highest in concern for the environment among Ontario's political parties (Calgary Herald, 17 August 1987, p.C1). The NDP specifically stated the need for waste reduction and for corporations to take responsibility for their wastes by contributing to a Superfund for cleanup costs. The Liberals tended to dwell on their past record of achievements in environmental matters rather than to put forth new ideas for change during the election campaign. Their past reforms include MISA and the progressive enforcement legislation, Bill 112, both of which are discussed below. They were criticized for this position and rated as having the least concern for environmental matters. The environmentalists stated that the "significant [environmental] reforms during [their] first year in office" were due more to the efforts of the Environment Minister, Jim Bradley and his department than the party itself (Calgary Herald, 17 August 1987, p.C1). While the Conservatives had little to offer in environmental issues other than promises of financial assistance to clean up specific problem areas (Loree, 7 September 1987, p.6), it should be noted that the Blueprint for Waste Management, a document of recommendations for a new waste management

strategy in Ontario, was initiated by the previous Conservative government.

Public participation is playing an increasingly important role in the determination of environmental and waste management policy in Ontario as well as in the other Provinces. The Toxic Waste Research Coalition is one of the more prominent of the public interest groups specifically involved in waste management issues in Ontario. Originally set up to organize public opposition to the siting of a hazardous waste treatment and disposal facility in Southwestern Ontario, the group is now pressing for the more effective policy alternatives of waste reduction and recycling as well as for smaller and more practical regional hazardous waste facilities. (Globe & Mail, 28 April 1987, p.D10 and Toxic Waste Research Coalition, 1987) While they have not experienced any great victories in the siting conflict, the group has slowed down the process of the site approval considerably. It is not known whether public interest groups, similar to the Toxic Waste Research Coalition, are present and active in waste management issues in the FRG.

In general, the German political parties appear to be more involved in environmental matters and these issues are key components in election campaigns. In any case, information on the German party platforms was more readily available. Their positions on environmental matters are more developed than in Ontario, most likely due to the

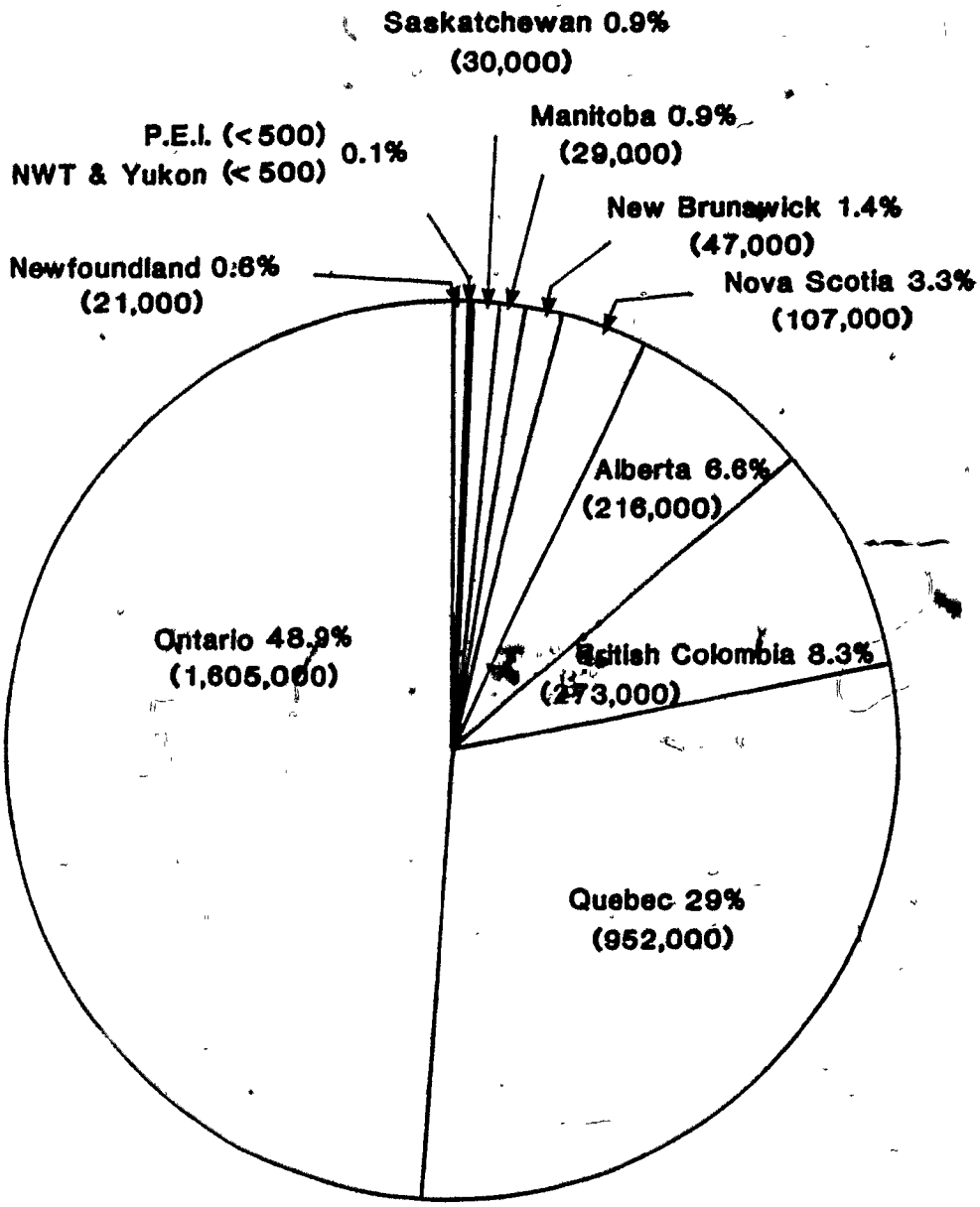
different political processes and out of necessity in a country of such small size and high population density.

5.3 Geography of hazardous waste generation and facilities.

There is even more limited data available on hazardous waste quantities generated in Canada and Ontario than in the FRG. Similar to the majority of German waste management data, the data that is available in Ontario is only for one specific time period, obtained in the course of a national survey carried out by Environment Canada and therefore, like the German data, does not allow for the assessment of strategies on the basis of change in volumes generated over time. Geiser et al. note that the Environment Canada data is now more than three years old and that there are "no new plans for a national waste survey" but that Statistics Canada proposes to incorporate waste generation and reduction categories into "its annual industrial survey" (Geiser et al., 1986, p.97-8).

As would be expected, given the distribution of Canadian industry and population concentrated in central Canada, Canada exhibits a marked skewness in its geography of hazardous waste generation that also favours central Canada. The OWMC (1985, p.4) estimated from the waste inventory survey conducted in 1985 that at least 3.2 million tonnes of hazardous wastes are produced yearly in Canada. Of that figure, 1.5 million tonnes are generated in Ontario (OWMC, 1985, p.4). (Figure 6) Ontario's hazardous waste generation distribution is also very much skewed with 70% of

Figure 6: Hazardous Waste Generation in Canada by Province and Territory



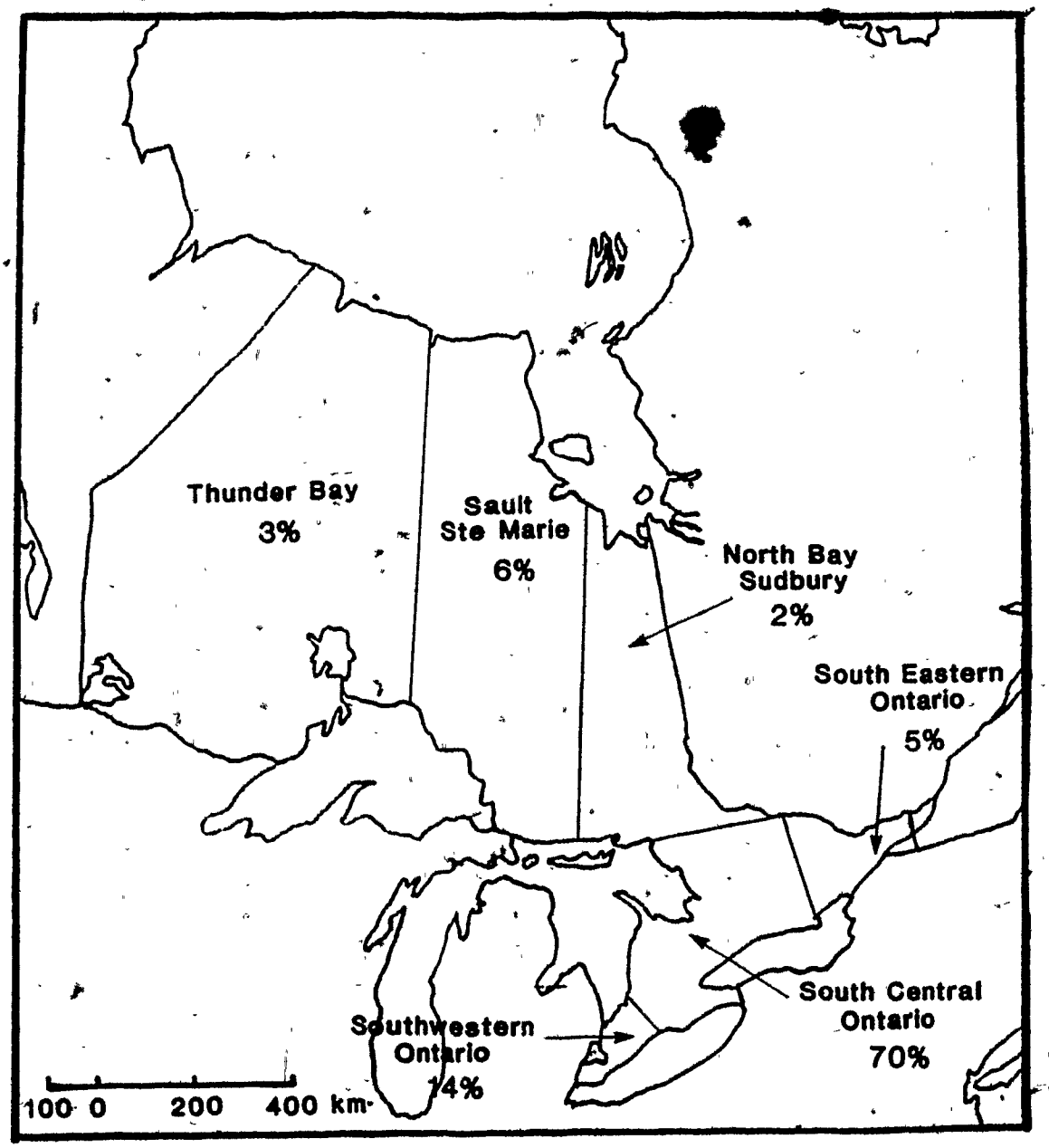
Total volume: 3,280,000 metric tons per year (wet weight).
Provincial volumes shown in parentheses.

(Source: "Fact Sheet on Hazardous Waste" , Ottawa, 1985, p.7 in Geiser et al., 1 August 1986, p.83)

hazardous wastes being produced in the South Central Region. (Figure 7) It should be noted that Canada generates almost 50% more hazardous wastes than the FRG and Ontario generates slightly more than *Nordrhein-Westfalen*, the *Land* generating the largest portion of hazardous wastes in the FRG.

An additional factor in the subsequent waste management strategies in Canada is the geographic distribution of hazardous waste treatment facilities. There are only a few facilities in Canada at the present time; in Blainville and Ville Mercier, Quebec; in Alberta and in Sarnia, Ontario (OWMC, 1985, p.7 and Redhead, 5 November 1987). The hazardous waste facilities in Sarnia consist of a secure landfill and an incineration facility operated by Tricil Ltd., a private commercial organization. The landfill began accepting hazardous wastes around 1965 and the incineration facilities were started up in 1970. In February 1985, Tricil applied for permission to expand the landfill. The proposal was approved in August 1986 (Tricil Ltd. September 1986, p.3). Tricil had operated a similar facility in Mississauga until 1977 when it was decommissioned. The site now functions as a transfer station. (Redhead, 5 November 1987) The MOE has been attempting to establish an additional hazardous waste landfill and incineration facility in West Lincoln in Southwestern Ontario for some time now. If they are successful, these would be the second of such facilities in Ontario. John Richmond (4 November 1987) of the OWMC,

Figure 7: Hazardous Waste Generation in Ontario by District



(Source: OWMC, 1985, p.4)

however, states that the facilities could not possibly begin accepting wastes until 1992. In comparison with the FRG (Figure 4), the small number of facilities in Canada and Ontario is shameful, especially when considered in relation to the volume of hazardous wastes generated in the two countries.

There is no data available on the obvious disposal deficit in Ontario but wastes that are not disposed of in Sarnia would either be treated in-house; shipped to other provinces or the United States; or stored or disposed of illegally in regular landfills.

5.4 Federal waste management arrangements.

The Federal government in Canada has only marginal involvement in hazardous waste management. There is a waste management division at Environment Canada but there is no comprehensive regulatory framework for managing hazardous wastes at the federal level. The only regulation stemming from Environment Canada is for the transportation of hazardous materials and the trans-boundary shipments of those materials (The Transportation of Dangerous Goods Act - TDGA). Other federal regulatory activities deal indirectly with the management of wastes in relation to marine environments and federal lands. In addition, there are provisions under the Criminal Code, prohibiting acts in the interest of the well-being of the general public. The Environmental Contaminants Act can affect the management of wastes, directly or indirectly, depending on the specific

type of controls stipulated (Monteith, 1976, p.477). The Pest Control Products Act, the Customs Act, the Explosives Act and the Hazardous Products Act regulate the handling of certain hazardous materials as consumer goods or wastes (Environment Canada, 1981, p.2-3; Geiser et al., 1986, p.86; Monteith, 1976, p.478 and Castrilli, June 1983, p.43-45). The Excise Tax Act affects the promotion of the "preferred" solutions in waste management, indirectly and adversely, by re-taxing secondary materials, making their costs comparable to virgin material and thereby discouraging their use (Adamson, 1984, p.29-30). The absence of a general waste law and the lack of control of the relevant provincial legislations at the federal level is one of the more salient contrasts in waste management arrangements between the two countries.

Although it has not produced any specific regulations for hazardous waste management, Environment Canada has a "stated objective" to promote and encourage waste reuse and recycling (Environment Canada, October 1981, p.2 and Adamson, 1984, p.53). Their subsequent activities in this area focus on funding programs to promote awareness, research and development for waste minimization as well as the operations of a waste exchange (Geiser et al., 1986, p.94). The activities of Environment Canada in waste management are more comparable to the *Umweltbundesamt* than the *Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit*.

The Federal government also participates in the development of joint items with the provinces (Mysiicki, 17 February 1987). The Canadian Council for Resource and Environment Ministers (CCREM) is an example of a joint activity with the Provinces. It was formed in 1984 to provide information on resource and environmental issues that the respective Ministers felt was needed. A discussion group was formed to identify priority areas, one of which was hazardous wastes. A national hazardous waste action plan was created to fill in gaps in existing information and regulations. The plan was approved by the federal government in 1986, concluding a two year process. The following issues were dealt with in the plan:

- definition of hazardous waste
- review of legislation to try to harmonize the regulating process across Canada
- development of guidelines for facilities
- regulatory responsibilities for waste generators and transporters
- decommissioning of facilities
- harmonizing guidelines from an international perspective
- cleanup of abandoned facilities
- promotion of recycling
- information exchange and public information

(Dopp, 19 February 1987)

The highlights of the recycling section were:

- reducing barriers
- potential for wider use and productivity of waste exchanges
- identifying and targeting specific waste streams for opportunities with the 4R's
- providing government with information on this subject

(Dopp, 19 February 1987)

Steven Dopp (19 February 1987), a member of the CCREM Secretariat, felt the plan was taken seriously at both the federal and provincial levels. Although it is too soon to tell if it will result in any concrete action such as new legislation in the field, Dopp also stated that it was a significant development to get eleven governments together and talking about these issues. In addition to this, the plan also marks an increase in cooperation in environmental issues.

There are a number of federal programs and services directed at promoting waste minimization through financial incentives or investment assistance, although none are specifically aimed at waste management or the "preferred" solutions. The most important for industrial processes are the Development and Demonstration of Resource and Energy Conservation Technology (DRECT) and the Accelerated Capital Cost Allowance (ACCA) programs (Environment Canada, 1985). The DRECT program provides financing for up to 50% of projects demonstrating "new technology, material recovery and energy recovery". The total value of funds allotted to this particular program amount to approximately $1 million/year. (Geiser et al., 1986, p.95) The ACCA program applies primarily to equipment installed to reduce pollution directly or to induce process modifications that "reduce or control pollution" and enables a firm to write-off the cost of the equipment over a three year period. The eligibility

of projects is determined by "corporate ruling ... from the Corporate Rulings Directorate of Revenue Canada." (Environment Canada, 1985, p.28) The Canadian Institute for Scientific and Technical Information, the National Research Council and the Waste Water Technology Centre all provide funding and technological information for industry and government but their respective interests tend to be quite broad and rarely deal with the "preferred" solutions specifically (Adamson, 1984, p.63). The monetary value of the ACCA program is not known.

The overall monetary value of the federal financial assistance programs is considerably less than the funds made available by the *Bundesregierung*. The greater overall wealth of the FRG in comparison with Canada and the greater concern for the environment due to higher population density in the FRG (Table 1) are probably of major explanatory significance here. The lack of specification for waste management in the Canadian programs as well as the restricted variety and number of programs available also contrasts unfavourably with their German counterparts. It is interesting to note, however, the differing thrust of investment assistance programs in the two countries. Programs in the FRG tend to be aimed at the development of technological alternatives for the destruction and disposal of hazardous wastes whereas Canadian programs, that can be applied to waste management, tend to be aimed at the

development of environmentally acceptable industrial processes.

The Canadian Waste Materials Exchange was initiated in 1978, four years later than the exchange at the DIHT. Like the German exchanges, it is passive, merely listing available and wanted wastes in its bulletin. Interested parties must arrange their own transactions. Jointly funded by the Provinces and Environment Canada, it publishes a bulletin every two months (Forrestal, 9 March 1987). Wastes of all types, hazardous and non-hazardous, are listed in the bulletin by general category and region. Listings from the Ontario Waste Exchange are also included in the bulletin. Requests for wastes as well as listings of available wastes are present in the bulletin. (ORF, October 1985) Initially, Forrestal (9 March 1987) stated that mass mailings of the bulletin were conducted to foster awareness of the exchange. Now the organization relies primarily on word of mouth advertising, presentations and some advertising in trade journals. The bulletin is presently subscribed to by around 4,000 firms across Canada and any interested parties, having somehow acquired a copy of the bulletin, may subscribe through the form provided in the bulletin or they may contact the ORF directly. This method of promotion would seem to be less effective than that of the DIHT or VCI exchanges which have compulsory membership and the listings are published in regular publications sent to members of the organization. Consequently, the German exchanges would have

increased visibility compared to their Canadian counterparts.

Tables 6 and 7 posit statistical information on the cumulative listings of available and wanted wastes from the startup of the operation in 1978 to December 1986. The overall number of listings is relatively small, 2,049 listings for available wastes and 494 for wanted wastes, considering the length of time the exchanges have been in operation. Since the exchange has been in operation for 9 years, the average number of listings per year is 227.67 for available wastes and 54.89 for wanted wastes. These figures are considerable smaller than at the DIHT waste exchange where the average number of listings per year since 1978 is 1265.5 for available wastes and 818 for wanted wastes. However, it should be noted that enquiries per listing at the Canadian Waste Materials Exchange exhibit significant interest in the exchange (Tables 6 and 7). These figures are considerably higher for the Canadian exchange than for the DIHT exchange. The overall average is seven enquiries per listing for available wastes and 9.1 for wanted wastes at the Canadian waste exchange while the average number of enquiries per listing of available and wanted wastes is between one and three at the DIHT exchange.

The exchange monitors the actual transfers of the wastes in a fashion by requesting that the firms notify them of a transaction so that they can remove the listing from the bulletin. Statistics on the actual transfers of wastes

TABLE 6

ANALYSIS OF ENQUIRIES AND TRANSFERS OF AVAILABLE WASTES IN BULLETINS 1-53 BY CATEGORY

Category	No. of Wastes (A)	No. of Wastes Enquired About (B)	No. of Enquiries (C)	Enquiries Per Listing (C)/(A)	Transfers (D)	Transfers Per Listing (D)/(A)
1. Organic Chemicals and Solvents	260	228	1,434	5.5	69	0.27
2. Oils, Fats and Waxes	100	91	993	9.9	35	0.35
3. Acids	71	63	481	6.8	7	0.10
4. Alkalis	74	72	599	8.1	10	0.14
5. Other Inorganic Chemicals	202	175	1,147	5.7	28	0.14
6. Metals & Metal Containing Sludges	230	213	1,965	8.5	52	0.23
7. Plastics	186	168	2,123	11.9	36	0.19
8. Textiles, Leather and Rubber	216	204	1,574	7.3	36	0.17
9. Wood and Paper Products	342	314	2,504	7.3	58	0.17
10. Miscellaneous	265	217	1,234	4.7	39	0.15
Lab Chemicals	103	103	321	3.0	103	1.00
Totals	2,049	1,855	14,375	7.0	473	0.23

(Source: ORF information packet, no date)

TABLE 7

ANALYSIS OF ENQUIRIES AND TRANSFERS OF WANTED WASTES IN BULLETINS 1-53 BY CATEGORIES

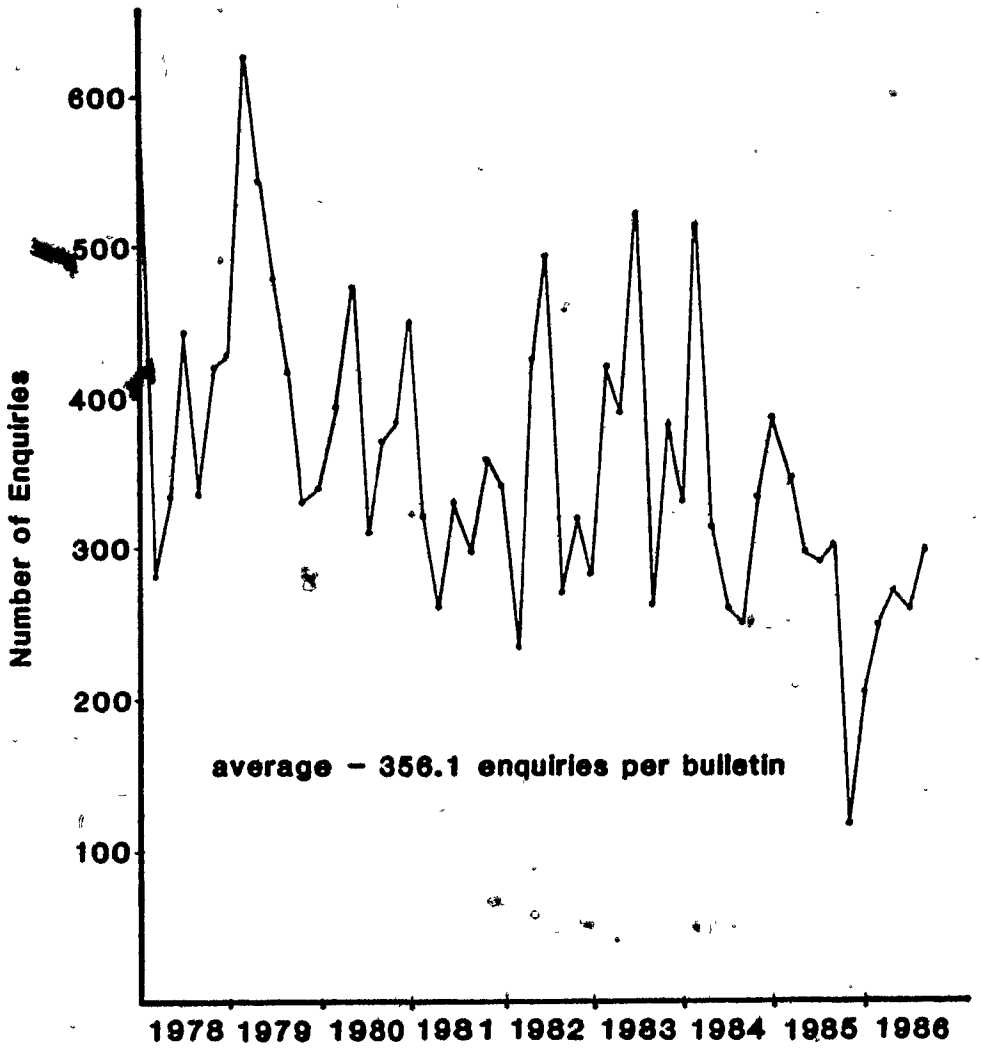
Category	No. of Wastes (A)	No. of Wastes Enquired About (B)	No. of Enquiries (C)	Enquiries Per Listing (C)/(A)	Transfers (D)	Transfers Per Listing (D)/(A)
1. Organic Chemicals	40	31	351	8.8	2.	0.05
2. Oils, Fats and Waxes	41	37	264	6.4	3	0.07
3. Acids	9	8	114	12.7	2	0.22
4. Alkalis	11	12	99	9.0	0	0
5. Other Inorganic Chemicals	42	39	344	8.2	0	0
6. Metals & Metal Containing Sludges	95	89	759	8.0	0	0
7. Plastics	51	49	739	14.5	2	0.04
8. Textiles, Leather and Rubber	62	58	579	9.3	8	0.13
9. Wood and Paper Products	90	87	766	8.5	6	0.07
10. Miscellaneous	53	49	491	9.3	6	0.11
Totals	494	459	4,506	9.1	29	0.06

(Source: ORF Information Packet, no date)

are included in Tables 6 and 7. The rate of successful transfers per listing is approximately 20%. (Laughlin, November 1986, p.5). This is comparable to the VCI exchange but lower than the 36% success rate of the DIHT exchange. From the monitoring of the transfer of wastes at the Canadian Waste Materials Exchange, Environment Canada has estimated "that about 10% of hazardous wastes are recycled (Geiser et al., 1986, p.105). There was no comparable data on hazardous waste recycling available in the FRG. An analysis of the reasons for unsuccessful participation in the Canadian Waste Materials Exchange showed that the major reason for failure was that the waste was technically unacceptable, similar to the explanation for unsuccessful participation at the DIHT exchange. Other reasons stated for the Canadian exchange were that the distance for the waste to be transported was too great or that the waste was too expensive.

Since temporal data for the Canadian exchange only exists for enquiries per listing and not the actual listings, as at the DIHT exchange, it is not possible to make direct comparisons of operations over time. However, the Canadian data (Figure 8) shows similar trends to the data on listings per year at the DIHT. Both sets of data show considerable initial popularity followed by a general decline in activity.

Figure 8: Enquiries per Bulletin – Canadian Waste Materials Exchange



(Source: ORF, information packet on waste exchange, no date)

5.5 Waste management arrangements in Ontario.

The Provinces have the primary responsibility for waste management within their jurisdictions, similar to the *Länder* in the FRG but they are not obligated to follow any established federal guidelines (Myslicki, 17 February 1987). In Ontario, the MOE is ultimately responsible for establishing, reviewing and enforcing environmental policy which includes waste management. (Figure 9) The goal of the MOE in this task is

> "To achieve and maintain a quality of the environment, including air, water and land, that will protect human health and the ecosystem and will contribute to the well-being of the people of Ontario." (MOE, June 1983)

Regulation 309, under the Environmental Protection Act of 1980 is the primary legislation in Ontario regulating handling and disposal procedures for generators of hazardous wastes via a waybill system. In addition, it regulates the operation of hazardous waste disposal sites in Ontario. (Appendix 3) In June 1983, the MOE came out with a comprehensive waste management plan for the Province in a document called Ontario's Blueprint for Waste Management in the 1980's. Although the paper was only a discussion document, it identified several objectives in the creation of a "logical, organized and effective overall waste management program for Ontario". Briefly, those objectives were

"- active public participation;

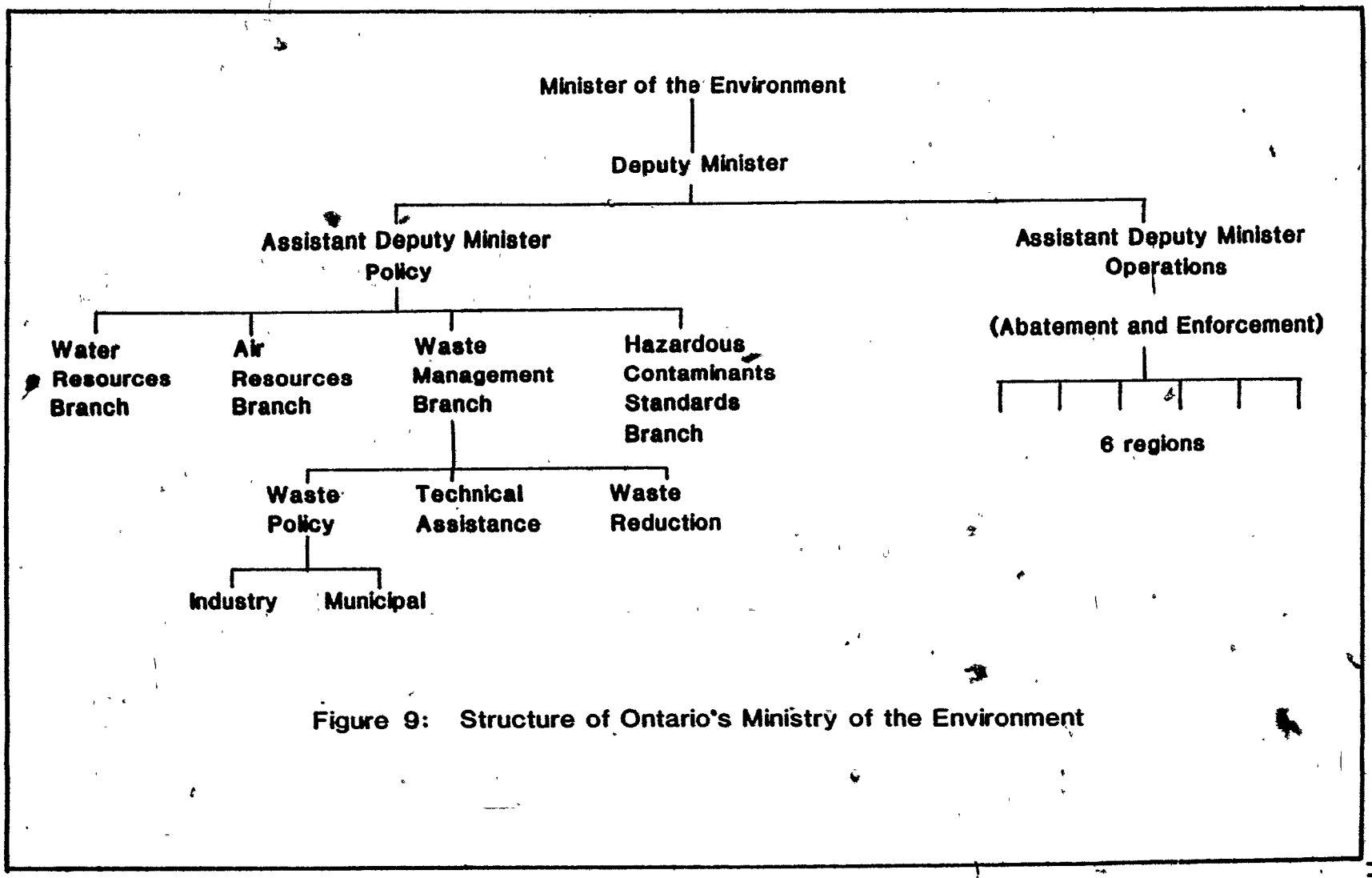


Figure 9: Structure of Ontario's Ministry of the Environment

(Source: Breeze, 27 February 1987)

- consistent, long-term planning, co-ordinated with overall land use planning;
- a minimum use of landfill;
- perpetual care of all waste sites;
- firm control through legislation, regulation and guidelines, consistent with maximum flexibility and accountability;
- research and optimum use of up-to-the-minute world-wide scientific knowledge; and
- processes that ensure that waste, once disposed, does not damage the environment or put the public at risk through human interference or natural processes."

(MOE, June 1983, p.3)

In the objective to "minimize the need for landfill disposal" the plan recommended "promoting measures" to incorporate the "preferred" solutions into waste management strategies. Although most of the recommendations were aimed at the municipal solid waste stream, one of the measures was the exemption of hazardous wastes to be recycled from the registration procedures required for other hazardous wastes (MOE - Appendix 6, June 1983, p.11). The waste regulation was subsequently revised and passed on June 17, 1985 reflecting the changes recommended in the Blueprint. Effective as of September 17, 1985 with a one year "grandfather" period to allow waste generators a chance to register their wastes (Breeze, 27 February 1987), the new legislation allowed for the exemption of recyclable materials from registration requirements but only if the materials went directly to the user and did not have to be treated before they were used. Breeze (27 February 1987) explained that if a waste is used as a raw material, it should be treated as such. He also stated that the

regulation was purposely made narrow so that once the situation was better known, further exemptions could be made with greater efficacy. It should be noted that, as they stand now, the strict exemption conditions in the regulation may act a dis-incentive for the "preferred" solutions.

The waybill system for the registration and control of hazardous wastes in the above legislation, bears a striking resemblance to the German controls on hazardous wastes. Indeed, many research teams from Ontario and other parts of Canada, have travelled to *Hessen* and the FRG to observe the German system of waste management (Schöner, 5 November 1986; Martini, 4 April 1986 and Environment Canada, August 1981).

The dissemination of legislative information regarding hazardous waste disposal has been quite energetic. The MOE carried out one of the most active advertising promotions for Regulation 309. Breeze (27 February 1987) stated that they (MOE) wanted to make sure that firms were aware of the legislation. Many seminars were held with the various industrial associations and advertisements were placed in trade journals and newspapers. In addition, the legislation was announced in The Ontario Gazette, a publication containing specific legislation and usually subscribed to by lawyers. The methodologies employed for disseminating waste minimization technologies have not received the same emphasis and the responsible agencies have been openly criticized (Campbell, 1982, p.64) for this strategic weakness. Although similar gazettes exist in the FRG, it is

not known what the initial publicity for the waste legislation was. There did not appear to be any intensive publicity programs for waste reduction in the FRG.

The Waste Reduction section at MOE is involved in programs to promote the 4R's or "prefefred" solutions. The majority of emphasis in the section and in the programs, however, has been placed on municipal waste management up until quite recently and Ontario is well known for these municipal programs (Ontario Recycling Update, January/February 1986). The proportion of staff allotted to the respective aspects gives evidence of this emphasis; there are six staff members involved with municipal aspects compared to three in industrial aspects of waste management (Ahlberg, 3 June 1987). The Waste Reduction section is presently involved in a "comprehensive funding program" which is aimed at waste management development in industry and will be discussed in greater detail below. It should be noted here that, unlike the most recent German waste laws, Ontario has yet to declare any official policy to reduce the volumes of hazardous wastes generated.

In the Spring of 1987, the MOE was in the process of developing province-wide sewer-use standards, a program better known as Municipal Industrial Strategy for Abatement (MISA). MISA is discussed in greater detail below. Until MISA is officially in place and with the present lack of any comprehensive directives for liquid waste discharges, each municipality has its own sewer-use by-laws which specify

concentrations that may be discharged into sewers and water bodies. Under this system, surcharges would be administered for exceeding the volumes or concentrations allowed. (Isles, 9 March 1987) The existing method of individual control of liquid effluents by municipalities, in Ontario, differs considerably with the more centralized control in the German system.

The Regional Municipality of Waterloo's sewer-use by-laws were examined as an example of the existing regulatory procedures for waste water discharges. They originated from those set out by the City of Kitchener in 1965 and specify permissible content concentrations for waste waters. Concentrations are specified for waste waters being discharged into the sewer system as well as directly into the Region's water bodies. The allowable concentrations for direct discharges into water bodies are logically more stringent than for discharges to the sewer system. A novel aspect of the Region's by-law is the surcharge formula which was designed to gauge the surcharge for excess concentrations in waste waters. Although the Region is actively trying to encourage the reduction to by-law standards, Thompson (17 March 1987) stated that most firms pay a surcharge on their waste water discharge.

The Region has laboratory facilities with six people testing wastes, some others testing materials such as gravel and three people testing wastes in the field. Industries that generate toxic waste waters are tested once a month and

there would be no prior notification for this testing. When test results vary significantly from by-law standards, the Region's Engineering Committee would be notified. If the laboratory discovers excess contaminants in the sewer system or in a water body, the most likely culprit is not difficult to pinpoint and be brought to the attention of the Committee, since the nature of the Region's wastes by industrial category is well known by technical staff. The Engineering Committee is a political group of representatives from area municipalities and has the authority to fix deadlines for the particular firm to clean up its waste waters as well as to levy a surcharge on the firm. If the firm does not clean up its wastes, the Committee may also decide to make the case public knowledge through a delegation procedure which Thompson (17 March 1987) stated was the most effective method of enforcement albeit lengthy and a political one. Conflicting trade-offs are often involved and the environmental results are rarely immediately apparent. Similar remarks were made regarding the enforcement of environmental legislation in the FRG but this enforcement method seems to be less effective than the legal method. A lengthy time period is still required before the case is resolved and improvements are still not ensured.

When questioned about the handling of new toxic compounds present in the waste stream, Thompson (17 March 1987) was somewhat vague. He stated that they did not have

the necessary facilities to test these compounds at the municipal level and that it should be the responsibility of higher levels of government. He also mentioned that the Province's MISA program would provide a methodology to incorporate this aspect.

Since the Region's by-law regulates waste water discharge through the concentration of toxic substances, Thompson admitted that a firm could theoretically dilute their waste waters to meet the by-law standards. However, he also stated that this has not seriously affected the effectiveness of the system as it is indirectly controlled through taxes paid for the use of the sewer system fixed in proportion to the volume of water used and the rising costs of the water itself. At the same time, the Region realizes the finite qualities of present water supplies within its boundaries and tries to encourage water-use reduction. (Thompson, 20 March 1987)

The absence of a consistent form of regulation for hazardous substances in sewage and waste waters in Ontario is a serious deficiency in the control of those substances in the environment. Ontario proposes to rectify that situation with MISA. MISA will entail new and stricter standards for contaminants in industrial effluents. Those standards will be in the form of absolute permissible content, replacing the concentration methodologies applied up until now. In addition, the strategy will require that firms, discharging directly into water bodies, use the "best

available abatement technology". Industrial and municipal effluents will be periodically inspected, at which time, even stricter standards will be imposed if necessary and if the technology is available. Finally, MISA will obligate firms to "analyze its own effluent" instead of the onus being placed on municipalities and other authorities. (Ontario Conservation News, June 1986, p.1) The program should be in place by 1990 (Isles, 9 March 1987) and will render Ontario's waste management system even more similar to its German counterpart. The fact that MISA provides province-wide consistent regulation for waste water discharges and that corporations will be required to analyze their own waste waters, with periodic inspections from government, are two of the more prominent similarities with the German system. There are, however, also some dissimilarities. For example, while MISA will specify absolute content of toxic substances in waste waters, the German system employs the concentration method in spite of the potential for diluting waste waters before discharge into the sewer system of a water body. The German system seems to have lessened the likelihood of this occurrence by strictly taxing the volume of fluid discharges. The difficulties faced by authorities in both countries in dealing with new toxic substances and the subsequent need to rely on companies to analyze and register their own discharges is similar.

The OWMC is a provincial crown agency, established in 1981 with the following mandates:

> "- [determine] the types and quantities of wastes in Ontario that are not receiving proper treatment and the nature and size of treatment and storage facilities required to manage these wastes safely
>
> - [select] a site for the facilities which will provide maximum protection for human health and the environment
>
> - [develop] ways and means to assist Ontario industries to reduce the volume of wastes requiring final treatment and disposal"
>
> (OWMC, September 1985, p.8)

It funds the Ontario Waste Exchange as part of its mandate to further waste reduction and recycling (OWMC, information pamphlet). The Ontario Waste Exchange was initiated in 1984, ten years after the exchange at the DIHT. As of 1 April 1987, the exchange became equally funded by MOE and OWMC. From that time, it operated, officially, as an active exchange although it had attempted to find uses for certain wastes in the past. In this aspect, the Ontario exchange contrasts with the German exchanges. Handling only industrial wastes, the Ontario Waste Exchange listings are published in the Canadian Waste Materials Exchange bulletin. (Forrestal, 9 March, 1987)

For the most part, however, the agency's endeavours are focussed on the siting of a hazardous treatment facility in Ontario. Detailed information on the structure of the agency was not available although it was requested. A brief description, however, was given to the author by Ken Bradley

of that organization. Of the thirty five total full-time employees at the OWMC, only three specifically deal with waste reduction. There are also some contracted staff and services involved in this area (Bradley, 27 April 1987). The Waste Reduction section at the OWMC is involved with the waste exchange and in actively advising industries on methods to reduce their wastes.

The OWMC is the primary information agency in Ontario for waste management and, in this aspect, resembles the *Hessische Landesanstalt für Umwelt*. Given the OWMC's primary mandate to establish disposal facilities and the fledgling status of Ontario's waste management system, however, its advisory function is less developed than that at the *Landesanstalt*. The fact that the OWMC has a waste reduction section to advise industry, at all, contrasts with the *Landesanstalt* where the advisory staff rarely suggest such practices to industry.

Enforcement of environmental legislation in Ontario prior to 1981 was carried out on an ad hoc basis. McKenney (27 February 1987) stated that this subjective policy did not enforce legislation if it would have "rocked the boat". In 1981, a special investigation unit was formed, composed of thirteen supervisors and investigators. The original mandate of the unit was to enforce legislation concerned with liquid waste transport and hazardous waste spills but it quickly became involved in every other aspect of environmental enforcement. Obviously the load was

unmanageable and this resulted in the formation of the Enforcement Branch at the MOE in 1985. Incorporating the previous unit, the branch consists of 63 staff members and 43 investigators. The Branch is concerned with all aspects of environmental legislation enforcement. McKenney (27 February 1987) stated that the size of the organization is significant and novel compared to enforcement organizations in other jurisdictions. These accomplishments served to centralize enforcement operations and make them more objective. Now a firm in northern Ontario will receive the same treatment as a firm in the south. McKenney (27 February 1987) stated that, in the past year, 2,500 environmental infringements have been investigated. Of those, 200-250 have been taken to court. Approximately half of the court cases have been related to waste management.

New legislation for enforcement (Bill 112) was passed on 17 December 1986. Under the previous system, judges had complained that the prosecution mechanism for corporations was too lenient. With Bill 112, the system made more severe for corporations as well as for private individuals. For example, a firm is now fined a minimum of $2,000 for each first environmental offense and can be fined up to $50,000. Each next offense is fined a minimum of $4,000 up to a maximum of $100,000. Specific enforcement procedures are provided for hazardous content in wastes where fines can be as high as $250,000 for the first offense and $500,000 for each next offense. It should be noted here that

environmental infringement cases usually involve more than one offense. It is also possible with the new legislation, to impose fines in relation to monies saved by polluting or not installing the equipment required to keep waste effluents and emissions at suitable levels. In these cases, the Branch would carry out a forensic audit on the infringing company. It is also possible that offenses be punished with prison sentences although there have been no such cases as of yet. The courts may also issue prohibition orders in certain cases if it is deemed adequate. The person(s) aimed at for prosecution could be the corporation itself, a senior executive, a plant manager etc. depending on the particular case. Although municipalities have jurisdiction in enforcing their sewer-use by-laws, the Province could conceivably and has in the past, prosecuted municipalities because their sewage is not up to standard. (McKenney, 27 February 1987)

Enforcement supervision is carried out through three main avenues. All departments at MOE are obligated to refer all infringements they encounter to the Enforcement Branch. Some investigations are carried out on a project-type basis, targeting specific problems. In addition, the investigators in the field are always on the lookout for infringements. While other jurisdictions have been reluctant to get tough with the enforcement of environmental legislation, Ontario does not seem to be afraid of threats that corporations will leave the Province, taking away jobs, because they cannot

afford to clean up their processes. McKenney (27 February 1987) stated that this would rarely happen and where it does occur, usually non-lucrative or badly managed operations are involved. It should be noted that a certain degree of agency-related bias might be involved here to make the enforcement situation appear strict and effective but, undoubtedly, trade-offs between government and industry still occur. At any rate McKenney (27 February 1987) stated that Ontario is trying to create a visible deterrent system for environmental crimes with its progressive environmental and enforcement legislation and agreed with the author's observation that there have been few budget cutbacks in this specific area.

The arrangements for the enforcement of environmental legislation in Ontario, especially with Bill 112, is considerably more developed than comparable arrangements in the FRG. Although it is not possible to compare enforcement statistics directly between Ontario and the FRG because of differing time spans employed, it would seem that there are more infringements reported in the FRG but a much greater proportion of reported infringements are actually prosecuted in Ontario. Furthermore, the maximum fine levels for infringements are greater in Ontario.

A significant deficiency in the provincial system is the lack of financial incentives to encourage the "preferred" solutions. At present, the Province of Ontario has no financial programs aimed at industrial waste

reduction which contrasts greatly with the many programs available in *Hessen*. The funding available at the provincial level for waste reduction is presently aimed at the municipal solid waste stream although the MOE has jointly funded some Energy from Wastes (EFW) programs with the Ministry of Energy. Neil Ahlberg (5 March 1987 and 3 June 1987) of the Waste Reduction Branch at MOE stated that they are presently in the process of expanding their financial support programs. A special unit was formed in November 1986 to explore this area. The aim of the group is to provide "seed money" for demonstration projects, for the development of technology and for projects designed to increase awareness of available opportunities. This "comprehensive funding program" is destined to come into effect in June 1987 and has budgeted approximately $1 million for industrial aspects.

5.6 Response of Ontario's industries to waste management arrangements.

Although documentation of the reaction of firms to the latest version of Regulation 309 is not available yet, Breeze (27 February 1987) feels that, in general, the reaction is positive. Breeze also stated that most firms prefer the clear definitions and directives in the Regulation, in spite of the strictness, from the vagueness existing before the revisions.

Responses to the Ontario's Blueprint for Waste Management, which recommended the incorporation of the

"preferred" solutions into Ontario's waste management strategies, were solicited after the emergence of that document in 1982. It should be noted that the responses on file did not represent an exhaustive survey and were predominately from municipalities, commercial waste treatment operations, industrial associations and a few large corporations. The large corporations were concerned about the effects the "preferred" waste management solutions would have on the economic viability of some firms. They argue that there is no need to regulate waste reduction since there was already considerable activity going on within the industrial sector. (Blueprint for Waste Management submissions, 1983-84) The Ontario Mining Association (BP215, 1 November 1983 in "Blueprint for Waste Management Submissions", 1983-84) was also concerned about the effects of the "preferred" solutions on industry if they were imposed too quickly or strictly although they agreed that industry must take responsibility for the management of its wastes. The Canadian Chemical Producers' Association (BP271, 30 January 1984 in "Blueprint for Waste Management Submissions", 1983-84) congratulated the MOE on its approach in encouraging the "preferred" solutions without resorting to regulation. They state that as long as the costs of "a safe and approved form of disposal" is lower than for the "preferred" solutions, "disposal should continue to be an acceptable option" (BP271, p.4 in "Blueprint for Waste Management Submissions", 1983-84)

In general, the responses to the Blueprint for Waste Management are similar to the response of German industry to their waste management arrangements. The responses to the Blueprint, however, seem to suggest that Ontario's industry is more concerned about an adequate transition period before the "preferred" solutions are regulated, than the actual practice of those solutions. Although this can be explained, in part, by the overall fledgling status of Ontario's waste management policies, there is a less defiant tone apparent in the response of Ontario's industry to the "preferred" waste management solutions when compared to the same response from German industry.

A study on industrial responses to the waste management arrangements was carried out in 1982 by RIS in the Regional Municipality of Halton, Metropolitan Toronto and the County of Simcoe. The study surveyed a total of 48 firms in these regions. A breakdown of the size and location of the firms is shown in Table 8. Even though the statistical validity of the sample may be questionable, considering its small size and the proportion of industries in the three geographic areas sampled does not seem truly representative, the conclusions made are useful in the context of this thesis.

The study found that economic considerations played the most important role in waste management decisions but that concern for social and environmental responsibilities were also significant. The study also discovered that relatively

Table 8

INDUSTRIAL WASTE ATTITUDINAL SURVEY SAMPLE
PLANT SIZE AND LOCATION

Plant size a# of employees	Location			
	Toronto	Region of Halton	Simcoe County	Totals
1-50	11	6	2	19
51-100	1	4	4	9
101-200	1	1	4	6
201 or more	4	6	4	14
Total	17	17	14	48

(Source: RIS, 1984, p.6)

few firms are aware of the limited number of financial incentive programs designed to encourage environmentally compatible waste management strategies, that do exist at the federal level of government. While there are many agencies that have this type of information on hand, there also appears to be, at the time of the study and even now, a lack of industry initiative to make the necessary contacts. On the other hand, the passive nature of many of the agencies is "not necessarily conducive to the rapid dissemination of new ideas or approaches" (RIS, 1984, p.15). The study also found that responses and values differ depending on the size of the firm. Smaller firms obviously have a more limited perspective on the management of their wastes due to the smaller volumes generated and the more restrictive financial capabilities. They tended to prefer financial assistance in

the form of grants and low-interest loans while larger firms preferred tax write-offs. Many of the firms interviewed were not opposed to stricter government regulation in this area as long as it was decreed and enforced in an objective manner. They were concerned, however, about sufficient transition time for the assimilation of the regulations. It was concluded that the main barrier remaining to increased waste reduction practices in Ontario's industry was the lack of awareness of technical and financial assistance opportunities. (RIS, 1984) The study, discussed above, uncovers values and responses to waste management of a more responsible nature than the responses to the Blueprint. The findings also contrast considerably with the response of German industry to their waste management arrangements.

5.7 Evaluation of Ontario's waste management arrangements.

In general, the Province of Ontario is working hard to establish a comprehensive system from which to manage its hazardous wastes. From the comparisons made with the German waste management arrangements throughout the chapter, it is also evident that Ontario has been attempting to model some of its waste management policies after the German system prior to the most recent versions of its waste laws. The newly established Regulation 309 with its requirements for generators, carriers and facilities as well as parts of the proposed MISA program closely resemble components in the German system. Even though these components are essential to an efficient waste management system, based on the

assessment of the German waste management arrangements, the intended direction of Ontario's system to emphasize disposal and control will also ultimately be ineffective in dealing with hazardous wastes. The continued effort being applied to the establishment of additional hazardous waste treatment and disposal facilities in Ontario supports the intention to emphasize disposal. It seems ludicrous, however, to think that Ontario could possibly deal with all of its hazardous wastes safely with even two hazardous waste facilities when the FRG is finding it difficult to deal with approximately 50% more wastes with many many more facilities. Even if the Province should succeed in its proposal to build a second hazardous waste treatment and disposal facility in Southwestern Ontario, the chances of constructing any more facilities in the area are extremely slim.

There are a few obvious deviations that are for and against Ontario's waste management system and that affect the above assessment. First of all, the population densities in the FRG are much greater than in Canada and Ontario. As a result and due to high volumes of hazardous waste generated, a consistent sophisticated waste management system was established relatively early in the FRG compared to other industrialized countries. Still, while generating more hazardous wastes than the FRG, Canada does not even have a federal waste law. The absence of a general federal waste law, however, should not and has not deterred Ontario from pursuing innovative waste management arrangements. The

non-uniformity of waste regulation among the Provinces does not seem to pose as much of a problem in Ontario because of its lucrative location in the heart of Canada and the great distances to other Provinces. There is, however, its proximity to the United States and the potential for shipping hazardous wastes south of the border to consider.

Another serious deviation from the German system is the absence of provincial waste management investment assistance programs and the non-specificity of federal programs. Whether or not the MOE will come through with the necessary and proposed investment help programs to promote waste minimization is an area of crucial importance which remains to be seen. In addition, the absence of province-wide standards for waste water discharges represents a deficiency in the system which contrasts with the FRG.

On a more positive note, Ontario's innovative environmental enforcement strategies, at least in theory, are an integral part of effective waste management and contrast with the German situation. Whether or not they will be strictly adhered to is a condition in the final assessment of Ontario's waste management arrangements made below.

The values expressed by government and industry in Ontario, in relation to waste management are, on the whole, not as blatantly pro-development as those in the FRG but the pro-development tendencies are still apparent, especially in the quest for treatment and disposal solutions as opposed to

the more responsible "preferred" waste management solutions. Since the expression of these values depends on socio-economic conditions and they are not fixed, they also stand as a condition in the final assessment made below.

At the same time, more than a token effort has been committed to the "preferred" solutions in Ontario at, for example, the Ministry branches, the waste exchanges and to a lesser degree, at the OWMC. The majority of this commitment, however, has only been in the form of passive information exchange or for the municipal solid waste stream. As such, Ontario has been pursuing a "broad directional" approach to promote the "preferred" solutions and has yet to establish any formal policy on the "preferred" solutions. Furthermore, dis-incentives for the "preferred" solutions, such as in the federal Excise Tax Act and Ontario's Regulation 309, still exist and go against the above-mentioned effort.

While the statistics show that the DIHT exchange is more popular and has higher success rate, the Canadian and Ontario exchanges appear to be operating in an established manner. Higher visibility and promotion of the Canadian exchanges would undoubtedly increase their popularity. The decision to transform the Ontario exchange to an active operation Ontario and the advisory functions of the waste reduction section at the OWMC are steps in right direction, showing additional commitment to the "preferred" solutions than to what is apparent in the FRG at the present time. It

is, however, difficult to assess the real efficacy of the promotions of the "preferred" solutions since the necessary data, on hazardous waste volumes generated over time, is not available and there is presently no reliable method to obtain that data from industry or even from the waste exchanges.

From the above discussion, it becomes more difficult to administer a concrete evaluation of Ontario's waste management arrangements. There are too many variable circumstances and deficiencies in Ontario's fledgling system. The recent enactment of the environmental enforcement legislation as well as Regulation 309 leaves their real effectiveness open. Other programs such as the provincial investment assistance program and MISA are still in the planning stages. In addition, the tenuous expression of values by public and private groups in Ontario can easily be altered by a change in socio-economic conditions. Furthermore, the "preferred" solutions, even with the additional commitment evident in Ontario, are far from being ensconced in the existing system considering the continued effort being allotted to disposal. If the three variable conditions, discussed above, evolve in a manner favourable for waste management and the commitment to the "preferred" solutions as recommended in the Blueprint for Waste Management, is continued and increased, then Ontario's system would be more likely to be effective in dealing with its hazardous wastes.

5.8 Summary.

The initial assessment on the assumed effectiveness of Ontario's waste management arrangements, based on the assessment of the equivalent waste management arrangements in the FRG, was that the system would be ineffective in safely dealing with the hazardous wastes generated in the Province. The ineffectiveness of Ontario's strategic emphasis is even more apparent when one takes into consideration the number of facilities that exist in the Province to deal with hazardous wastes.

However, considering the deviations from the German arrangements and the incompleteness of Ontario's system, that assessment is not adequate. If recent legislations for the control of hazardous wastes and environmental enforcement prove effective and if the proposed MISA and investment assistance programs materialize as planned, a solid foundation for an efficient waste management system would be established. Furthermore, if the existing commitment to the "preferred" solutions is continued and reinforced with concrete goals stated in the waste legislation then Ontario would be well on its way to realizing a "logical, organized and effective" waste management system.

CHAPTER 6

SUMMARY AND RECOMMENDATIONS FOR FUTURE STUDY

6.1 Introduction.

The purpose of this chapter is to summarize the evaluations of the hazardous waste management systems in the two study areas made in the previous chapters and to make informed suggestions for future study in the specific field of waste reduction and recycling.

6.2 Summary.

From the information presented in this thesis, it seems that the German system of hazardous waste management has not been effective in safely dealing with its hazardous wastes nor will it be effective in the future if the present policies are pursued. The more salient reasons for this assessment are the past emphasis on disposal and control, the bias towards economic development and the resulting lack of enforcement of environmental legislation. Although it is acknowledged that some form of registration and subsequent control of hazardous waste is necessary, and the German system's sophistication in this area would be more effective

if enforcement of the regulations were stricter, these aspects are not at the heart of the problem. The real problem is that there is simply insufficient space available to deal with the ever-increasing volumes of hazardous waste being generated and even if there were sufficient space, the disposal solution cannot be guaranteed safe in spite of the present level of technology. The emphasis placed on facilities and technological solutions in the FRG combined with the lack of enforcement of those solutions has been ingrained in attitudes and policy that shifts responsibility for dealing with one's wastes away from the generator and diminishes the visibility accorded to the "preferred" solutions. Indeed, it is also apparent that the "broad directional" policy approach, utilized in the FRG to promote the more logical "preferred" solutions has not been effective in improving the hazardous waste situation. More effort and commitment is required. Perhaps the most significant argument for the purpose of this thesis is that the Germans themselves are beginning to realize the ineffectiveness of past strategies and have already initiated policy changes.

From the comparisons made between the two systems, it is evident that Ontario, with some deviations, has been utilizing the German system as a model for their approach to hazardous waste management. The deviations include aspects that act as impediments to an effective waste management system as well as some that work in the system's favour.

The recent enactment of pertinent waste and environmental legislations and the gaps in the system, which includes a paucity of related facilities, investment assistance programs and a lack of province-wide waste water standards, also act as impediments to the overall effectiveness of the system. Furthermore, Ontario has not stated any official policy involving the "preferred" solutions.

On the other hand, Ontario's innovative environmental enforcement strategies, if adhered to, will encourage industry to be more environmentally responsible. Ontario's industry already seem to be more inclined towards or, at least, not as opposed to the "preferred" solutions than its German counterpart appear to be. In addition, Ontario has accorded their "broad directional" policy approach in promoting the "preferred" solutions with additional commitment. This additional commitment is evident in the active status of the Ontario Waste Exchange and the waste reduction sections at the OWMC and MOE.

Even if Ontario's waste management system were to evolve to realize the intended strict controls on hazardous wastes and the existing "broad directional" approach to promote the "preferred" solutions was expanded and reinforced, there is still the problem of what to do with the wastes destined for disposal. With only one existing hazardous waste treatment and disposal facility and another waiting to be approved in the Province, the system cannot even hope to be effective in dealing with its hazardous

wastes, especially given the assessment of the German situation. Therefore, it may be advantageous for the pursuit of the "preferred" solutions to the hazardous waste problem that Ontario has, so far, been unable to establish an acceptable location for an additional hazardous waste disposal and treatment facility since the demand for a solution to the hazardous waste problem is all the more urgent and the Province does not have such a strong reliance on technological solutions simply because the facilities are already there. In addition, the waste reduction and recycling infrastructure is already established in Ontario, with the exception of the proposed investment assistance programs. It could easily be expanded whereas the disposal infrastructure is incomplete and even if the authorities succeed in the siting of the proposed facility, future expansion would certainly be fraught with greater difficulties. In light of this and the fact that the German waste management system recently initiated policy changes to incorporate the "preferred" solutions, it would, therefore, seem more logical for Ontario to start now with a more concerted approach to the "preferred" solutions rather than to suffer through a gradual transition process in which there is greater potential for the loss of perspective, commitment and effectiveness or come to the realization, ten years down the road and after considerable expenditures, that the selected approach has not been effective.

Furthermore, Ontario is already noted for its sophistication in other areas of waste management. For example, its programs for the recycling of solid municipal wastes are well-developed and respected internationally. Ontario's population has also demonstrated commitment and a mature perspective in environmental issues, an example of which can be seen in the Toxic Waste Research Coalition. In addition, the study carried out on responses to the waste management regulatory system among Ontario's industry also exhibits some responsible perspectives. In light of this general atmosphere, it seems incongruous for Ontario to be pursuing outdated disposal strategies.

6.3 Future study.

It is almost always possible, as the research activity in a specific area evolves, to identify new elements to be explored. The field of hazardous waste management is no exception, if not more susceptible due to its relatively recent emergence as an issue to be contended with. Several areas are identified from the research of this thesis alone. They include further research in specific areas of waste management including waste reduction and recycling, industry's response to the various waste management strategies, additional comparisons with other jurisdictions as well as research in the mechanisms and effects of political and public involvement in the issue.

First and perhaps foremost, as improved statistics become available, more credible evaluations of waste

management frameworks can be made. An analysis of the effects of Gresham's Law on waste management policies would also be extremely useful for the relevant authorities in the decision-making process. In addition, the whole area of waste exchange operation opens up significant research avenues to improve and solidify the efficacy of those agencies. Considerable improvements to the recordkeeping activities at the exchanges is required so that patterns can be identified and resources could be more effectively allocated to encourage less popular transfers or to mitigate existing shortcomings that prohibit successful transfers.

The effectiveness of the hazardous waste management strategies of the State of California and the reaction of industry to those strategies would be a research area of prime importance for Ontario's situation since California is the only jurisdiction in the world to regulate innovative waste reduction policies.

Further analysis of the political variable would also be extremely beneficial since it seems that political decisions are instrumental in determining the level of waste management efforts. Furthermore, if, as Goetze and Rowland claim, public group activities and awareness have such a profound effect on hazardous waste regulation, then this area certainly, warrants further attention. It would be interesting to investigate how the Germans deal with this aspect. Geographic comparisons on levels of public awareness in hazardous waste management could provide useful

information for governments seeking to implement new policies. If public awareness and pressure is the key then how can that be encouraged in a field that, in the past, has not been perceived of where any real changes in behaviour can be effectuated? On the other hand, is partisanship the more important variable and if so, how does one effectuate change in a country like the FRG? Perhaps the latter question would be better left to the consideration of political scientists.

Finally, additional research on specific aspects of the theories on corporate responsibility proffered by Stone and their application to waste management would be extremely beneficial. From the discussion of the reaction of Ontario's industry to waste regulations and the subsequent conclusion that most firms profess to be concerned about environmental and social responsibilities, it would seem that these traits warrant more detailed analysis. For example, and perhaps more importantly, an investigation on how these concerns are dealt with in daily business routines would prove beneficial.

APPENDIX 1.0:

Excerpts from Waste Avoidance and Waste Management Act of 27 August 1986, (English version)

The Federal Republic of Germany

Table of Contents

Article 1
Definition and Scope of Application

(1) For the purpose of the present Act, "waste" means movable property of which the owner wishes to dispose of or the proper management of which is necessary in the public interest, especially for the protection of the environment. Movable property left to the corporation responsible for waste management by the owner or a third party commissioned by him are also defined as "waste" if they are recycled, up to the moment this waste of the materials recovered or energy produced from them are returned to the production cycle.

(2) The term "waste management" includes the recovery or production of materials or energy from waste (reuse and recycling of waste), depositing of waste as well as the necessary collection, transportation, treatment and storage.

(3) The provisions of this Act shall not apply to

...

6. materials with the exception of those covered by Articles 2, Para. 2 and Articles 3, 5, 5a and 15, the proper reuse or recycling of which is ensured by the collection through non-profit making organizations;

7. materials with the exception of those covered by Articles 2, Para. 2 and Articles 3, 5, 5a and 15, the appropriate reuse or recycling of which is ensured by commercial collection to the extent this is notified to the corporations responsible for waste disposal and does not conflict with over-riding interests of the public;

...

Article 1a
Avoidance, Reuse and Recycling of Waste

(1) The generation of waste shall be avoided in conformity with corresponding statutory ordinances pursuant to Article 14, Paras. 1, Nos. 3 and 4 and Para. 2, Sentences 3, Nos. 2 to 5. This shall not affect the obligation of the operators of plants subject to licensing to avoid the generation of waste through the application of low-waste manufacturing processes or reuse/recycling of residual materials pursuant to the provisions of the Federal Emission Control Laws.

(2) Waste shall be reused/recycled pursuant to Article 3, Para. 2, Sentence 3, or to the extent this is prescribed by statutory ordinance, pursuant to Article 14, Para. 1, Nos. 2,3 and Para. 2, Sentence 3, Nos. 2 to 4.

Article 2
Basic Principle

(1) Wastes generated within the area of application of this Act shall be managed in that area if Article 13 does not provide otherwise. They shall be managed so that the public interest is not impaired by avoiding, in particular, that

1. human health is threatened and human well-being is impaired
2. livestock, birds, game and fish are threatened
3. water bodies, soil and crops are affected
4. harmful environmental impacts are caused by air pollution or noise
5. the interests of nature conservation, landscape management and town planning are not considered adequately or
6. public safety and order are otherwise threatened disturbed.

Article 3
Waste Management Obligation

(1) The owner shall make wastes available to the party responsible for waste management.

(2) Public-law corporation under *Länder* law shall dispose of the wastes generated within their area of competence. They may employ third parties to carry out this obligation. Reuse and recycling of wastes shall be given priority over other disposal routes if they are technically feasible, if the additional costs as compared with other disposal routes are not unreasonably high and if a market for the materials or energy produced exists or may be developed, especially by commissioning third parties. Wastes shall be collected,

transported, treated and stored so that the possibilities for reuse and recycling can be exploited.

...

Article 4
Organization of Waste Management

(1) Waste may be treated, stored and deposited only in plants or installations licensed for this purpose (waste management facilities).
(2) In individual cases the competent authority may grant revocable exceptions if the public interest is not impaired thereby.
(3) Waste within the meaning of Article 2, Para. 2 may be made available for collection or transportation only to persons authorized for this purpose under Article 12 and only where the operator of the waste management facility has certified that he is prepared to receive the type of waste in question; such certificate shall also be required where the owner of the waste transports it himself and makes it available to the operator of a waste management facility for management.
(4) *Land* governments may by statutory ordinance permit the management of certain wastes or certain quantities of such wastes outside waste management facilities - provided there is a need for this and provided there is no reason to fear an impairment of the public interest -, and they may determine the prerequisites and the method and manner of such management. The *Land* governments may be statutory ordinance either fully or partially transfer the licensing authority to other authorities.
(5) The Federal Government, after hearing the parties concerned and with the consent of the *Bundestag*, shall issue general administrative regulations on requirements for waste management, especially for the wastes specified in Article 2, Para. 2, according to the best available technology. At the same time, procedures and methods shall be laid down for the collection, treatment, storage and depositing of wastes that may be expected to ensure their environmentally compatible management.

Article 6
Waste Management Plans

(1) The *Länder* shall draw up, for their regions, plans for waste management from a supralocal point of view. Such waste management plans shall designate suitable sites for waste management facilities. The waste management plans of the various *Länder* should be coordinated. Special consideration shall be given in the waste management plans to waste as specified in Article 2, Para. 2. It may also be specified in the plans which responsible agency is envisaged and which waste management facility is to be used by parties responsible for waste management. The details laid down in the waste management plans may be declared binding on parties responsible for waste management.

(2) The *Länder* shall regulate the procedure for the establishment of these plans.

(3) Pending the establishment of a waste management plan, existing waste management facilities appropriate for treating, storing or depositing waste as specified in Article 2, Para. 2, shall be included in a provisional plan. Paras. 1 and 2 shall not apply.

Article 11d
Opinion on Investment Decisions

(1) Before any decision is taken on investments likely to be of importance for waste management, the operator shall obtain the opinion of the Waste Management Officer.

(2) The opinion shall be obtained early enough to allow adequate consideration to be given to it when the investment decision is taken; the opinion shall be submitted to the body responsible for deciding on the investment.

Article 14
Marking/Labelling, Separate Disposal, Mandatory Return of Certain Goods, Obligation to Accept Returned Goods

(1) To avoid or reduce noxious substances in waste or to ensure their environmentally compatible management, the Federal Government is herewith authorized to provide by statutory ordinance, after hearing the parties concerned and with the consent of the *Bundesrat*, that

...

2. waste with a particularly high content of noxious substances, the appropriate reuse/recycling or other disposal routes of which require special treatment, shall be kept, collected, transported and treated separately from other wastes and that corresponding records and documentation shall be submitted (obligation of separate disposal);

...

(2) To avoid or reduce the quantities of waste produced and to promote reuse and recycling, the Federal Government, after hearing the parties concerned, shall specify objectives to be reached within an adequate period of time for avoiding, reducing or reusing/recycling waste arising from certain products. It shall publish these objectives in the *Bundesanzeiger*. To the extent this is required for avoiding or reducing the quantities of wastes produced or for environmentally compatible management, especially to the extent this is not possible by specifying objectives pursuant to the first sentence of this Para., the Federal Government, after hearing the parties concerned, may provide by statutory ordinance, with the consent of the *Bundesrat*, that certain products, especially packings and containers,

1. shall be marked/labelled in a specified manner;
2. shall only be put into circulation in certain form which shows considerable advantages for waste management, especially in a form which makes it possible to use it more than once or which facilitates reuse/recycling;
3. shall be taken back by the manufacturer, distributor or third parties acting on their behalf to ensure environmentally sound reuse, recycling or other management and that return must also be ensured by appropriate reception and deposit systems;
4. after use, shall be delivered by the owner in a certain manner, especially separate from other wastes, to facilitate their reuse/recycling or other environment-

ally compatible management as waste;
5. shall only be put into circulation for certain purposes.

Article 18
Administrative Offenses

...

(2) The administrative offenses listed may be punished by a fine of up to DM 100,000.

APPENDIX 2.0:

Excerpts from *Gesetz über die Vermeidung und Entsorgung von Abfällen - Hessen*, FRG
(Law for Waste Avoidance and Management)

as amended on 11 December 1985

Translated from the German version by the author
with the assistance of Dr. Herminio Schmidt
(Wilfrid Laurier University)

Table of Contents

Article 1
Waste Management Goals

The aims of waste management are that,

(1) the volume of wastes through

a) the development and adoption of ecologically beneficial proceedings will be avoided or reduced

b) waste deficient production, treatment and fabrication of products

c) the increasing product-life and of product durability and the increase in their multiple use

and

d) waste deficient distribution of products by the producer and his agents

be kept as small as possible insofar as it is technically possible, and the costs are reasonable and not out of proportion (waste avoidance)

(2) Accrued wastes are to be recycled into the materials system to the greatest extent possible (waste utilization)

(3) Unrecoverable wastes are to be disposed of without danger to the environment and the health of the general public (waste disposal).

Article 4

Hazardous Wastes

(1) Waste from industry, trade and the service industry which are not included in the disposal statutes and Article 3, para.(3) of the Waste Disposal Laws are classified as hazardous wastes. They must be kept separate from other wastes and from each other according to the state of present

technology, to facilitate the retrieval or their environmentally compatible treatment or disposal. Before disposal, these wastes must be treated as required in the individual disposal proceedings. The Minister responsible for waste management has decreed technical stipulations for pre-treatment and for environmentally acceptable storage so that the wastes can be retrieved.The technical stipulations are announced in the *Staatsanzeiger für das Land Hessen*.

(2) Hazardous wastes are to be relinquished to the agency responsible for hazardous waste disposal as described in para.(3). This excludes firms, according to Article 3, para.(4), with their own disposal and treatment facilities provided that the facilities are authorized and not contradictory to the goals of waste management plans, as described in Article 7, para.(1). The hazardous waste agency is obligated to accept the wastes. The agency is responsible for the organization and disposal as well as the construction and operation of the facilities with the exception of existing and approved facilities. The agency may use appropriate subcontractors for individual technical aspects.

(3) The Minister responsible for waste management determines, through statutes, the hazardous waste agency and decrees in which ways the hazardous wastes must be entrusted to them. Otherwise, the responsibilities of the responsible agency are not changed.

(4) Hazardous wastes are to be classified, at their place of origin, in order to make possible an environmentally acceptable utilization or disposal, as follows:

1. hazardous waste that only because of their physical properties or its amount cannot be disposed of together with domestic wastes (Category I)

2. hazardous wastes, whose treatment and disposal because of its type or properties requires special and additional status (Category II)

3. dangerous hazardous waste that because of their type or properties involves special dimensions in dangers to health, air or water, is explosible, combustible or causes the transmission of contagious diseases and that must be disposed of at a facility certified for this danger potential (Category III)

The responsible Minister decrees through legal statute in which category the wastes should be classified (in the Waste Catalogue) and according to which safety standard they should be disposed of.

(5) Wastes that are not hazardous wastes in the sense of para.(1), sentence 1 but to which dangers corresponding to those described in para.(4), Nr. 2, 3 are to be treated and disposed of as hazardous wastes. Para.(2). is valid accordingly.

(6) Wastes that accrue in households and in small amounts in industry and commerce and whose dangers correspond to those described in para.(4), Nr. 2 and 3 are to be collected separately (by the various administrative districts in Hesse), stored and entrusted to the responsible hazardous waste agency as in para.(3). The [various administrative districts] should leave the collection and the storage of the wastes described in Sentence 1, totally or partially, up to the individual or associated communities, if requested and if the safety of the general public is not endangered and the appropriate agency agrees to it. Para. (2), 8 and 9 are valid accordingly.

More detailed instructions are set by the Minister responsible for waste management in the legal statutes.

Article 21

Technical Authorities

The *Landesanstalt für Umwelt* is responsible as the technical authority for the execution of these laws and the waste disposal laws. Furthermore, the water management office is involved as the technical authority in waste disposal and treatment as well as in water management affairs and inquiries about water conservation. The supervisory agencies for industry assist with the supervision of the ;law specified in Article 11, Para.(1), sentence 1; Para.(2), sentence 2 and Para.(4), sentence 1-3 of the Waste Disposal Laws as far as the Mining Authorities are not responsible.

Article 22

Imposition of Fines

(1) Infringements are when someone deliberately or negligently

1. contrary to Article 4, para.1, sentence 2 does not keep hazardous wastes separate from other wastes

2. contrary to Article 4, para.2. sentence 1 does not entrust hazardous wastes to the hazardous waste agency

3. contrary to Article 5, para.4, does not keep records of their waste

4. contrary to Article 5, para.6, relinquishes wastes to another waste disposal facility without the consent of the competent authority

5. contrary to Article 5, para.7, does not inform or does not promptly inform the competent authority of disruptions in facility operations

6. contrary to Article 5, para.8, sentence 1, does not employ experienced personnel or contrary to sentence 2, does not adequately instruct them

7. contrary to Article 7, para.5, sentence 1, without consideration to the established collection area for a particular facility disposes hazardous wastes there

8. contrary to Article 7, para.6, disposes hazardous wastes without permission from the competent authority

9. contrary to Article 15, para.2, sentence 2, before the inspection of a newly-built or modified facility, operates without consent of the responsible authority

10. contravenes legal statutes as per Article 2, para. 2, sentences 3 and 4; Article 4, para.1, sentences 5 and 6; and Article 6, para.2 inasmuch as the specific case refers to these fine stipulations or

11. contravenes a legal directive decreed in these laws inasmuch as the specific case refers to these fine stipulations or

12. contravenes an executable regulation, decreed in this law

(2) The infringement can be punished with fines up to 100,000 DM.

(3) The administrative authority according to Article 32, Para.1, Nr.1 of the Laws for Infringements is the *Regierungs-Präsident* inasmuch as the competent departmental Ministers in agreement with the *Minister des Innern* have appointed no others through legal statute.

Article 23

Legal and Administrative Procedures

The Minister responsible for waste management decrees the required statutes and administrative stipulations for the realization of these laws.

APPENDIX 3.0:

Excerpts from Regulation 309
(Revised Regulations of Ontario, 1980
as amended to O. Reg. 322/85)

June 1985

Table of Contents

General - Waste Management

Interpretation

1. In this Regulation,

1.

...

53. "recyclable material" means waste transferred by a generator and destined for a site,

(i) where it will be wholly utilized, in an ongoing agricultural, commercial, manufacturing or industrial process or operation used principally for functions other than waste management and that does not involve combustion or land application of the waste,

(ii) where it will be promptly packaged for retail sale, or

(iii) where it will be offered for retail sale to meet a realistic market demand,

but does not include hazardous waste of liquid industrial waste unless the transportation from generator to site is direct;

...

Designation and Exemption of Wastes

...

3. The following wastes are exempted from Part V of the Act and this Regulation:

...

7. Recyclable material. R.R.O. 1980, Reg.309, s. 3; O. Reg. 322/85, s. 3.

Generator Requirements

15. - (1) Every generator shall submit an initial Generator Registration Report in Form 2 to the Director in respect of the waste generation facility and each subject waste he produces, collects, handles or stores or that he is likely to produce, collect, handle or store.

...

Manifests - Generator Requirements

16. - (1) No generator shall permit subject waste to pass from his control or to leave the waste generation facility except by transfer of the subject waste to a waste transportation system operating under a certificate of approval and unless the generator has completed a manifest in respect of the waste in accordance with this Regulation.

..

GLOSSARY OF ABBREVIATIONS AND GERMAN TERMS

Abbreviations

ACCA	Accelerated Capital Cost Allowance
AWP'75	*Abfallwirtschaftsprogramm*
BDI	*Bundesverband der Deutschen Industrie*
CDU	*Christlich-Demokratische Union*
CCREM	Canadian Council for Resource and Environment Ministers
DIHT	*Deutsche Industrie- und Handelstag*
DM	*Deutschmark*
DRECT	Development and Demonstration of Resource and Energy Conservation Technology
e.v.	*eintragene Verband*
EEC	European Economic Community
EPA	Environmental Protection Agency (U.S.)
FDP	*Freie Demokratische Partei*
FRG	Federal Republic of Germany (West Germany)
GDR	German Democratic Republic (East Germany)
GmbH	*Gesellschaft mit beschränkter Haftung*
GNP	Gross National Product
HIMG	*Hessische Industriemüll GmbH*
IHK	*Industrie- und Handelskammer(n)*
MISA	Municipal Industrial Strategy for Abatement
MOE	Ministry of the Environment (Ontario)
NATO	North Atlantic Treaty Organization
NDP	New Democratic Party
OECD	Organization for Economic Cooperation and Development
ORF	Ontario Research Foundation
OWMC	Ontario Waste Management Corporation
PC's	Progressive Conservatives
RIS	Resource Integration Systems
SPD	*Sozialdemokratische Partei Deutschland*
UNEP	United Nations Environmental Programme
VCI	*Verband der Chemischen Industrie*
WHG	*Wasserhaushaltsgesetz*

German Terms

Abfallbeseitigungsgesetz	Waste Disposal Law
Abfallkatalog	Waste Catalogue - categorizes specific hazardous wastes into the three categories

	referred to in the State legislation
Abfallvermeidung, -Verwertung und -Verringerung	Waste avoidance, re-use and reduction
Abfallwirtschaftsprogramm	Waste Management Program
Abwasserkataster	Sewage Registry
Abwasserverwaltungsvorschriften	Sewage Management Regulations
Bayern	Bavaria - State in the FRG
Bund	Federation
Bundesanzeiger	Official Gazette of the Federal Republic of Germany
Bundesgesetzblatt	Federal Law Gazette
Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit	Federal Ministry for the Environment, Conservation and Nuclear Safety
Bundesrat	Federal Council
Bundesregierung	Federal government
Bundesverband der Deutschen Industrie (BDI)	Federation of German Industry
Christlich-Demokratische Union (CDU)	Christian Democratic Union - German political party
Deutschen Ausgleichsbank	German bank that handles and apportions federal funds to the various government programs
Deutsche Industrie- und Handelstag (DIHT)	Umbrella organization for the German Chambers of Commerce
Deutschmark	Currency used in the FRG
eintragene Verband (e.V.)	registered association
Ergänzungsprogramm	Supplementary Program
ERP-Abfallbeseitigungsprogramm	Waste Disposal Program
ERP-Abwasserreinigungsprogramm	Sewage Purification Program
Freie Demokratische Partei (FDP)	Free Democratic Party - German political party
Gesetz über de Vermeidung und Entsorgung von Abfällen	Waste Avoidance and Management Act
Gesetz und Verordnungsblatt für das Land Hessen	Law and Statute Gazette for the State of Hesse
GmbH	limited liability company
Gründgesetz	Basic Constitutional Law in the FRG
die Grünen	The Green Party - German political party
Hessen	Hesse - State in the FRG

Hessische Industriemüll GmbH	Hessian Industrial Waste Limited
Hessische Landesanstalt für Umwelt	Hessian State Environmental Agency
Hessische Ministerium für Umwelt und Energie	Hessian Ministry for the Environment and Energy
Industrie- und Handelskammer(n) (IHK)	Individual Branch(es) of the Chamber of Commerce
Kreditinstitut	any German Bank that provides loans
Kreditanstalt für Wiederaufbau	Credit Institute for Reconstruction
Kunststoffe	synthetic product
Land(ä-er)	German state(s)
Landesregierung(en)	State government(s)
Landkreis(e)	Administrative district(s)
Minister des Innern	Minister of the Interior
Mitteilungen Industrie- und Handelskammer	Chamber of Commerce News
Niedersachsen	Lower Saxony - State in the FRG
Nordrhein-Westfalen	North Rhine Westphalia - State in the FRG
Regierungs-Präsident	Administrative District President
Rheinland-Pfalz	Rhineland Palatinate - State in the FRG
Ruhrgebiet	Ruhr region - major industrial region located in *Nordrhein-Westfalen*, FRG
Sozialdemokratische Partei Deutschland (SPD)	German Social Democratic Party
Staatsanzeiger für das Land Hessen	Official Gazette for the State of Hessen
Umweltbundesamt	Federal Environment Agency
Umwelttechnologiezentrum	Environmental Technology Centre
Verband der Chemischen Industrie e.V.	Association of Chemical Industries
Wasserhaushaltsgesetz	Water Management Act

NOTES

[1] The actual definition and classification of hazardous wastes has been a central issue for governments and international agencies for some time now, with no uniform or comprehensive system having been agreed upon. Most classification systems, however, stem from a broad definition such as the following one established by Environment Canada:

> "those wastes which are potentially hazardous to human health and/or the environment due to their nature and quantity and which require special disposal techniques." (Environment Canada, 1987, p.2)

This definition, of course, leaves many areas open for interpretation and confusion. As a result, most countries then specify, through legal statutes at the state or provincial level of authority, specific wastes that are hazardous and must therefore be registered.

Hazardous wastes can be residues in the form of a solid, sludge or liquid. The following list gives some examples of the types of industries that generate hazardous wastes:

metal processing and fabrication
electroplating
manufacture of paints and coatings
chemical manufacturing
petrochemical manufacturing
dry cleaning
photofinishing
manufacture of pesticides

A discussion of the dry cleaning industry follows to provide the reader with an example of how hazardous wastes arise out of an industrial process. "Dry cleaning establishments include industrial dry cleaners, commercial dry cleaners and coin-operated facilities." (Campbell & Glenn, 1982, p.25) The Ministry of Industry, Trade and Commerce estimated in a 1977 study that 13,800 Canadians are employed in this area (as quoted in Campbell & Glenn, 1982, p.26). The dry cleaning process involves the cleaning and/or degreasing of garments in a non-aqueous solvent. There are three main solvents presently in popular use

today; perchlorethylene or tetrachlorethylene (a halogenated solvent), petroleum solvent and Fluorocarbon 113 (a non-halogenated solvent). Perchlorethylene is the most commonly used but also the most hazardous of these, causing cancer in mice and harmful side-effects in humans as result of exposures greater than 200 ppm (Laundry Cleaning Council, 1980 as quoted in Campbell & Glenn, 1982, p.26). Campbell & Glenn (1982) report that 75 to 80% of commercial dry-cleaning in Canada and 50% of industrial dry cleaning establishments in the U.S. use perchlorethylene. Most coin-operated establishments also use this solvent.

Solvent loss into the environment is possible through three different avenues in the dry cleaning process. The solvent can enter the environment directly during accidents in the transfer and storage of the solution, or from leaks due to faulty equipment. Indirect solvent loss occurs because of inefficient separating processes. In this case, solvent that is missed in the separating process would enter the sewage system. The final possibility for solvent loss into the environment occurs in the disposal of sludges from filters used in the dry cleaning process. These sludges contain solvent residues and "can emit potentially hazardous vapours or leach into the ground" if disposed of in a regular landfill (Campbell & Glenn, 1982, p.28).

[2] Like the definition of hazardous wastes, there is considerable variation in terminology employed between countries and lesser jurisdictions, to imply the "preferred" solutions in waste management. Environment Canada defines waste reduction to include any process which "[reduces] the quantities of hazardous waste requiring treatment and disposal. The German system uses the terms *Abfallvermeidung, -Verwertung* and *-Verringerung.* The English term, recycling, is also used in the FRG. As it is employed in the German waste laws, *Abfallvermeidung* can be favourably compared to the Environment Canada definition. Similarly, the EPA defines waste minimization as

> "any source reduction or recycling activity that is undertaken by a generator that results in the reduction in total volume of hazardous wastes or the reduction of quantity or toxicity of hazardous waste that is either generated or subsequently, stored or disposed" (Berlow, 1986, p.V-5 as quoted by Geiser et al., 1986, p.6).

The Province of Ontario employs the acronym, the 4R's, to imply similar processes to those included in the broad

terminology discussed above. The 4R's stands for waste reduction, recycling, re-utilization and recovery (MOE, 1983, p.13).

The exchange rate utilized in this thesis between the German *Deutschmark* (DM) and the Canadian dollar is

1 DM = $ 0.7255 (Cdn)

(The Royal Bank of Canada, 23 March 1987)

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