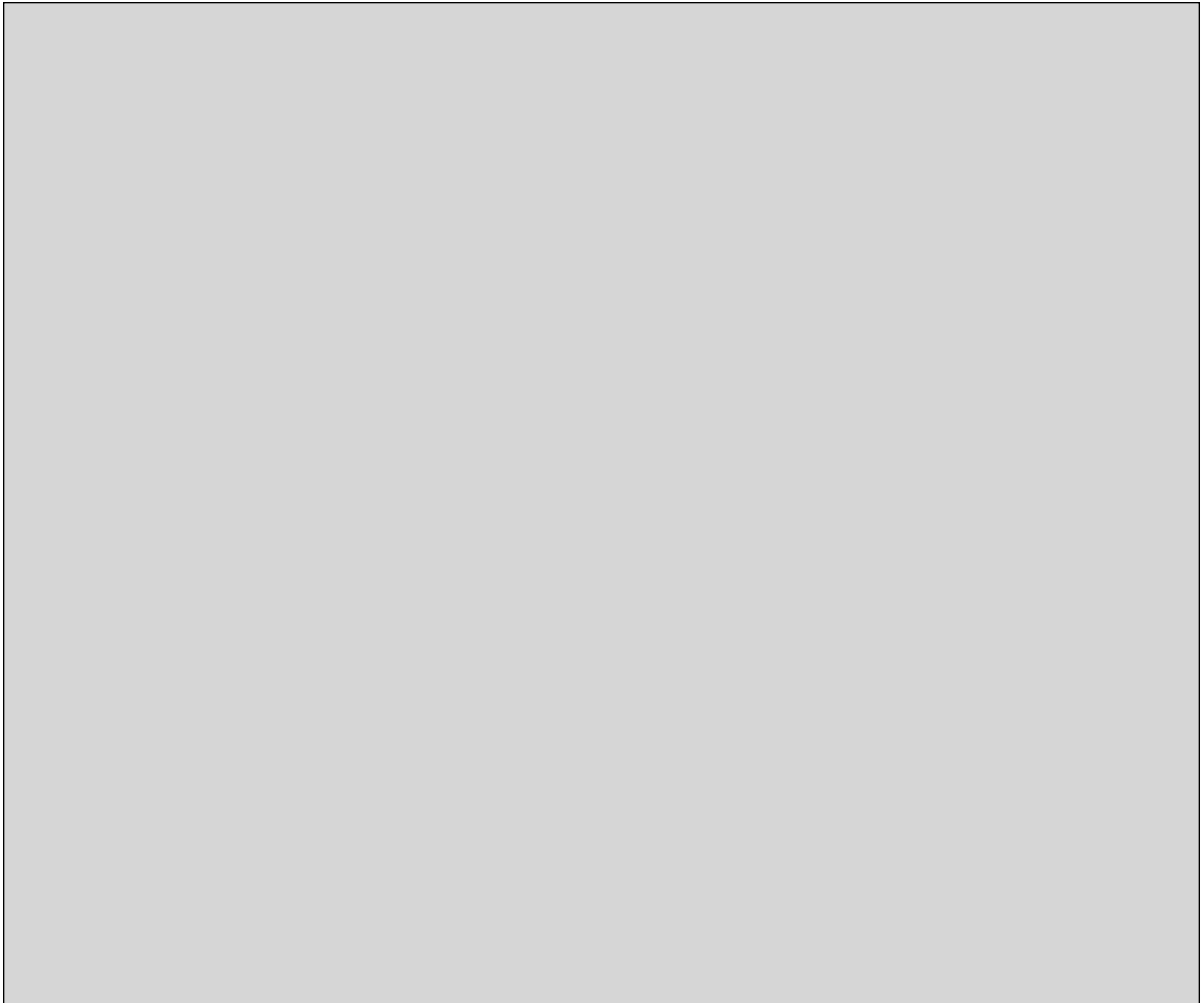


NWMO BACKGROUND PAPERS

7. INSTITUTIONS AND GOVERNANCE

**7-1 STATUS OF THE LEGAL AND ADMINISTRATIVE ARRANGEMENTS FOR
HAZARDOUS WASTE MANAGEMENT IN CANADA AND INTERNATIONALLY**

OCETA (Ontario Centre fo Environmental Technology Advancement)



NWMO Background Papers

NWMO has commissioned a series of background papers which present concepts and contextual information about the state of our knowledge on important topics related to the management of radioactive waste. The intent of these background papers is to provide input to defining possible approaches for the long-term management of used nuclear fuel and to contribute to an informed dialogue with the public and other stakeholders. The papers currently available are posted on NWMO's web site. Additional papers may be commissioned.

The topics of the background papers can be classified under the following broad headings:

1. **Guiding Concepts** – describe key concepts which can help guide an informed dialogue with the public and other stakeholders on the topic of radioactive waste management. They include perspectives on risk, security, the precautionary approach, adaptive management, traditional knowledge and sustainable development.
2. **Social and Ethical Dimensions** - provide perspectives on the social and ethical dimensions of radioactive waste management. They include background papers prepared for roundtable discussions.
3. **Health and Safety** – provide information on the status of relevant research, technologies, standards and procedures to reduce radiation and security risk associated with radioactive waste management.
4. **Science and Environment** – provide information on the current status of relevant research on ecosystem processes and environmental management issues. They include descriptions of the current efforts, as well as the status of research into our understanding of the biosphere and geosphere.
5. **Economic Factors** - provide insight into the economic factors and financial requirements for the long-term management of used nuclear fuel.
6. **Technical Methods** - provide general descriptions of the three methods for the long-term management of used nuclear fuel as defined in the NFWA, as well as other possible methods and related system requirements.
7. **Institutions and Governance** - outline the current relevant legal, administrative and institutional requirements that may be applicable to the long-term management of spent nuclear fuel in Canada, including legislation, regulations, guidelines, protocols, directives, policies and procedures of various jurisdictions.

Disclaimer

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EXECUTIVE SUMMARY

This background paper is part of an information base that summarizes the range of complex issues that relate to nuclear waste in Canada. Legal and administrative arrangements for hazardous waste management in Canada and internationally have parallels to nuclear waste management, and, where particular insights are relevant, comment is included on the connection.

The paper begins in Chapter 2 with general information about hazardous waste - definition, classification, quantity handled in Canada and transport and documentation required for hazardous waste. This is an overview, formatted so that individual sections may be readily examined for specific information and references. It takes time - ten to fifteen years, historically - for a country to develop a mature system of legal and administrative arrangements for hazardous waste management. Therefore, in Chapter 3, the key elements of the evolution of waste management are presented, and also a hierarchy for environmental protection is described in which Canada's approach is classified as between "Pollution Control" and "Pollution Prevention."

The federal, provincial and municipal regulatory and policy regime has been researched and a methodical review is presented in Chapter 4. There is a description of the main acts that form the legal framework, such as the *Canadian Environmental Protection Act (CEPA)* and the *Transportation of Dangerous Goods Act (TDGA)*, the Regulations pertaining to Export and Import of Hazardous Waste (EIHV), and also the Metal Mining Effluent Regulations (MMER). In addition, supporting arrangements are discussed such as the National Pollutant Release Inventory (NPRI) and the National Office of Pollution Prevention (NOPP). Key legislation is surveyed for each of ten provinces and three territories. The Canadian Council of Ministers of the Environment (CCME) plays an important role in hazardous waste issues and has worked to harmonize provincial approaches. To this end the CCME forms task groups, e.g. the Hazardous Waste Task Group. The CCME has developed and continues to revise national guidelines, and also develops and issues national standards, referred to as the Canada-Wide Standards. In nuclear waste management, the responsibility is primarily federal, so the harmonization and responsibility sharing between different jurisdictions is not a major issue. The municipal role in hazardous waste management is also described.

Public participation is reviewed, as the participation of civil society in Canada and elsewhere is becoming an important factor in developing policy.

The overview of international approaches to hazardous waste management in Chapter 5 concentrates on five selected countries that are large users of nuclear power - the United States, France, Great Britain, India, and China. By way of contrast, we have also reviewed countries that have no nuclear power generation - Denmark, Australia, Malaysia, Hong Kong and Thailand. For developed countries, legal and administrative arrangements are essentially the same as in Canada, although the terminology may differ considerably. For example the hazardous waste manifest is given different names in different jurisdictions. Developing countries such as Thailand, and countries in transition

such as India and China, are making serious efforts at environmental protection, adopting similar standards to those of western countries, although they are struggling with problems of capacity and public awareness.

Canada is a signatory to many international agreements that deal with hazardous wastes, discussed in Chapter 6. The major agreements in force, that relate to hazardous waste, are the following:

1. Canada-U.S.A. Agreement on the Transboundary Movement of Hazardous Wastes, 1986 (as amended in 1992)
2. United Nations Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989 (ratified by Canada in 1992)
3. Organization for Economic Cooperation and Development (OECD) Decision of Council on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations, C(92)39/Final, March 1992, Revised C (2001) 107 Version harmonized with the Basel Convention
4. Initiatives of the Radiation Protection and Radioactive Waste Management Division of the OECD Nuclear Energy Agency (NEA), 1958 and 1972
5. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention)
6. Stockholm Convention on Persistent Organic Pollutants (1998)
7. North American Agreement on Environmental Cooperation (NAAEC) (1994)

Following the review of each agreement, comments are made on the relevance of the agreement to nuclear waste. The number of signatories to the agreements discussed has grown considerably since they were launched with the first set of members. The International Atomic Energy Agency (IAEA) is a focus for scientific and technical support for countries that must deal with nuclear waste. The IAEA commissions new work and consolidates existing work. There is no organization comparable to the IAEA or the Nuclear Energy Association (NEA) in the hazardous waste area.

1.0 INTRODUCTION

“NWMO’s vision is to ensure the long-term management of Canada’s nuclear waste in a manner that safeguards people and respects the environment, now and in the future”

Adhering to this vision requires a carefully organized sequence of activities, the first being to develop a foundation for future decision-making. The present paper is part of an information base that will provide a background summary of the full range of complex issues that relate to management of nuclear waste. This paper is part of a series of background papers commissioned by NWMO to provide factual information on important topics related to radioactive waste management.

The legislative and administrative arrangements for the collection, transport, recycling, and/or disposition of hazardous wastes have parallels in the arrangements for nuclear waste, or could have in the future. The care that must be taken to protect human health and the environment is the common thread. Thus, the arrangements for either nuclear or hazardous waste will have areas of overlap in various jurisdictions - provincial, federal and international. In addition, it is anticipated that “lessons learned” from the regime of management of hazardous waste could have some application to nuclear waste. In Canada, the Canadian Nuclear Safety Commission (CNSC) is solely responsible for regulating waste resulting from activities related to nuclear energy production, whereas federal and provincial regulatory authorities share the responsibility for all other waste.

Nuclear power generation plants also generate non-radioactive waste from their operations, as well as mixed wastes that must be classified as both nuclear waste and hazardous wastes. In this review of hazardous waste management, the connection is made to the parallels in nuclear waste management wherever appropriate. For example, in 1998, the Seaborn Environmental Assessment Panel report “Nuclear Fuel Waste Management and Disposal Concept” provided a comparison with management of other wastes. (Appendix J of the Seaborn Report). This background paper provides a more detailed review of these “other wastes.”

The objective of this paper is to present a systematic summary of the legal and administrative arrangements for management of hazardous waste for a readership comprised of NWMO stakeholders and the public. The quantity of material to be summarized is exceptionally large, and, to be useful for the intended purpose, it needs to be condensed. This has resulted in an approach that asks “what do the stakeholders and public need to know in order to understand the issues of management, administration and legislation that apply to hazardous waste and thus may potentially transfer this understanding to the issues around the management of nuclear waste?”

The paper is structured systematically and hierarchically in that the review and discussion of the Canadian federal governments management of hazardous waste legislation and administration is followed by discussion of the approach of the provincial, the municipal government and the interrelationships between these levels of government. The paper describes aspects of international approaches that parallel information presented about the Canadian approach. Taking the view that countries that have nuclear power production

facilities would have waste management issues in common with Canada's situation, the analysis of international approaches is more detailed for such countries as United States, Great Britain, France, India and China. Finally, Canada is bound by a number of international environmental treaties, some of which are relevant to hazardous waste.

2.0 BACKGROUND

In Canada, the management of hazardous wastes is a shared responsibility between the federal and provincial governments, and to a lesser extent, the municipal governments. Since its inception in 1971, Environment Canada has been responsible for setting standards and regulating various facets of hazardous waste management activities in Canada, including the transportation of wastes across provincial or Canadian borders to off-site treatment and disposal facilities, and the management of wastes on federal lands and undertakings.

Transportation of hazardous waste is necessarily an important focus of legal and administrative arrangements in Canada and internationally because on-site, storage in the short-term, disposal, or treatment is not typical. In contrast, long-term on-site storage of nuclear waste is the norm.

While hazardous waste legislation may be broad, many of the rules and regulations with which it is applied are functional and systemic. Regulatory requirements for hazardous waste have many commonalities across all provinces and territories and address several issues: hazardous waste generation; siting, construction, operational performance, management, maintenance and closure of facilities for storage, use, treatment and disposal; reuse and recycling; and handling and transportation requirements.

The provinces have jurisdiction over the on-site management of hazardous wastes and the movement and treatment of wastes within provincial borders. For the majority of the country, provincial regulations are in place that provide an administrative structure for documentation, operating and facility approvals, and enforcement. In order to harmonize the activities of these two overlapping jurisdictions, the federal and provincial governments work together with through Canadian Council of Ministers of the Environment (CCME) to develop common guidelines on waste management that represent minimum national standards which the governments use to set their own regulatory framework within their particular jurisdiction [1].

2.1 Definition of Hazardous Waste

The federal *Transportation of Dangerous Goods Act* (TDGA) and associated Regulations define "waste" as any product no longer used for its original purpose. "Hazardous wastes" are those wastes that pose a potential danger to human health and/or the environment due to their nature and quantity. Definitions and legislated management practices for wastes vary according to the legislation that may apply to them [2].

More specifically, hazardous waste refers to any substance meeting the conditions for inclusion found in PART III of the Export and Import of Hazardous Wastes Regulations (EIHWR) made pursuant to the *Canadian Environmental Protection Act (CEPA)*. These substances may be imported or exported for the purpose of disposal, recycling, regeneration, treatment, incineration, repackaging or release. Although there is some overlap between the EIHWR and the TDGA, not all hazardous wastes are classified as dangerous goods nor vice versa [3].

Hazardous wastes may be in liquid, solid or sludge-like form and generally include certain residues from industrial production, including used solvents, acids and bases, leftovers from oil refining, the manufacture of chemicals, and metal processing. Hazardous wastes are classified by characteristics that they possess such as being corrosive, flammable, reactive or toxic. Common household products such as old car batteries, oil-based paints and leftover pesticides are also hazardous once they are discarded. The type and concentration of certain chemicals in many wastes makes them potentially hazardous to human health and to the environment. They may represent an immediate danger, such as burning skin on contact, or longer-term human health or environmental risks due to accumulation and persistence of toxics in the environment.

2.2 Classification of Hazardous Waste

Generally, for transportation purposes, hazardous wastes are classified in the same way as dangerous goods are in the TDG Regulations. When products are made, generally the manufacturer will know the composition of each batch of products as the material inputs that are used in the manufacturing process are well documented through Material Safety Data Sheets (MSDS) provided by the supplier. With waste there is less certainty surrounding its composition. A waste generator may have some idea of the waste's composition but concentrations could vary greatly from one batch to another or the waste may become contaminated with unknown pollutants. This makes it more difficult to classify wastes than products.

In the TDG Regulations, classification is a system that divides hazardous waste into classes and divisions based on the hazard criteria described in Part III of these regulations. Under these regulations, wastes are divided into nine different hazard classes (Appendix A). Each hazardous waste will have one of these nine classes as its primary classification. The primary classification describes the main characteristic of a particular hazardous waste.

A hazardous waste may also have one or more subsidiary classifications. The subsidiary classification describes other properties of a given waste. These properties are considered to be of secondary importance for transportation safety when compared to the primary hazard class.

In Schedule II, List II of the TDG Regulations, the classification column (Column III) has the primary classification listed at the top immediately followed by any subsidiary classification(s) for each hazardous waste. For international shipments, hazardous wastes

are also subject to the Export and Import of Hazardous Wastes (EIHW) Regulations. Additional criteria must be used to determine a waste's notice ID number and International Waste Identification Code (IWIC). These codes make Canadian waste classification compatible with that of other countries [4].

Hazardous waste disposal capacity in Canada is very limited, with only a few commercial facilities operating in Ontario and Quebec, and those largely dating from the 1960s. Various provincial efforts, including the Ontario Waste Management Corporation (OWMC), no longer in existence attempted to establish additional disposal capacity in the 1980s but met with mixed results in face of strong public opposition. However, new facilities were established in Swan Hills, Alberta and Blainville, Quebec [5].

2.3 Quantity of Hazardous Waste

Every year, approximately 6 million tonnes of hazardous waste are generated in Canada. Fifty-five percent of hazardous waste generated in Canada is destined for recycling. Approximately 5% of this amount is exported out of Canada. Canada imports hazardous waste in amounts approximately equal to 10% of its generation [6].

Table 1 below summarizes provincial exports and imports of hazardous waste in 1999. It was estimated that 267,931 tonnes of hazardous waste were exported from Canada, almost sent entirely to the United States. Ontario accounted for 46 percent (123,859 tonnes) of these exports, followed by 34 percent from Quebec (91,405 tonnes), and 7.5 percent from Manitoba (20,191 tonnes). Conversely, more than twice this amount was imported in 1999, almost entirely from the United States [5]. The Texas Center for Policy Studies suggests that since 1994, Ontario has experienced rapid acceleration of imports, due to “relaxed” legislation permitting the establishment of facilities to manage hazardous waste. The largest increases in imports were to landfills (+275% growth between 1994 and 1998), processing (+129%), and incineration (+113%). In terms of exports, those hazardous wastes sent to the United States tend to be those suitable for thermal destruction in hazardous waste incinerators or specially retrofitted cement kilns. These are often liquids or sludges with high British Thermal Unit (BTU) value. Hazardous wastes imported into Canada from the United States tend to be those more suitable for disposal in specially equipped landfills [5].

Table 1 – Provincial Exports and Imports of Hazardous Waste, 1999 [5]

	Exports	Imports	Net
British Columbia	13,476	3,270	+10,206
Alberta	8,152	226	+7,926
Saskatchewan	910	0	+910
Manitoba	20,191	75	+20,116
Ontario	123,859	324,554	-200,692
Quebec	91,405	333,147	-241,742
New Brunswick	9,759	1,621	+8,138
Nova Scotia	179	0	+179
Totals	267,931	662,893	-394,962

2.4 Administrative Arrangements Associated with Hazardous Waste

Inter-provincial movements of hazardous wastes in Canada require manifest tracking and classification. The manifest has been used in Canada as a means to track shipments of hazardous waste since 1985, when it was first introduced under the TDG Regulations. Both the manifest and the classification process under the TDG Regulations have been used as important references for several other federal and provincial regulations on hazardous wastes and hazardous recyclable materials.

The introduction in *CEPA 1999* of new authority to control the movement in Canada of hazardous wastes and hazardous recyclable materials signaled the intention of the Government of Canada to transfer the manifest tracking requirements from the TDG Regulations to regulations under *CEPA 1999*. This approach is reflected in the new TDG Regulations [7].

Canada is committed to ensuring the proper control of imports and exports of hazardous waste in order to meet its international obligations, such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Among the various obligations imposed by these international agreements is the requirement that imports and exports of hazardous waste be accompanied by a movement document such as a manifest. This document ensures proper tracking from the point of origin until they are received at a facility that is authorized to dispose of or recycle the material in question [7].

2.5 Canadian Environmental Assessment Act (CEAA)

When an activity is planned that has an environmental impact, regulatory compliance is required with the federal *Canadian Environmental Assessment Act, 1992 (CEAA)*.

Environmental assessment (EA) is a tool used during the early stages of planning to address environmental concerns related to a project. The level of effort required for an EA report depends on the project's nature, scope and location. The objectives of conducting an EA are:

- Identify and assess environmental effects
- Develop mechanisms for reducing or eliminating adverse effects
- Integrate environmental concerns into follow-up programs
- Involve the public where appropriate.

For example, an EA would be conducted for the siting of a new hazardous waste landfill, or the establishment of a deep geological disposal of nuclear fuel wastes. In the case of the Environmental Assessment Panel on the latter topic, chaired by Blair Seaborn, the public was involved from the beginning. An Environmental Impact Statement (EIS) was prepared after scoping meetings in 14 communities. Draft guidelines were then released for public comment, and finally a period of public review of the EIS began (several years

after the start of the scoping meetings). Then public hearings were held in three phases over a period of about one year, and finally consideration of all written and oral information was utilized in the preparation of the Seaborn Report. Similarly, a major hazardous waste disposal concept and plan would be given a proportionate amount of attention through this regulatory process.

Provincial jurisdictions are involved as well, given that the federal government has concluded bilateral agreements with provinces on environmental assessment cooperation. The Canada-wide Accord on Environmental Harmonization (1998) was designed to lead to improved cooperation and better environmental protection across Canada. A sub-agreement on EA was signed as part of the Accord and is concerned with the effective use of EA where two or more governments are required by law to assess the same proposed project. In such cases, a single assessment and review process would take place, which would be designed to meet the requirements of all the governments involved.

3.0 EVOLUTION OF WASTE MANAGEMENT IN CANADA

3.1 Key Elements

3.1.1 From Waste Management to Pollution Prevention and Resource Recovery

While the evolution of waste management standards and approaches may be slow, there is recognition by Canadian governments and the public of the value of moving management or treatment of waste after its been produced, to one that looks to prevent or reduce pollution before it becomes waste.

In most countries, the development of environmental programs follows a similar pattern. Early efforts concentrate on direct threats to public health, such as contaminated drinking water and air pollution. Only after these problems are addressed does the issue of improving the day-to-day management of wastes deemed “hazardous” rise to the top of the nation’s environmental agenda [8].

It takes a long time to develop an effective hazardous waste management program. Programs evolve through a complex process subject to the particular economic, political, legal and cultural context of individual countries. As programs evolve, however, they typically pass through five major stages:

- Identifying the problem and enacting legislation
- Designating a lead agency
- Promulgating rules and regulations
- Developing treatment and disposal capacity
- Creating a mature compliance and enforcement program [8].

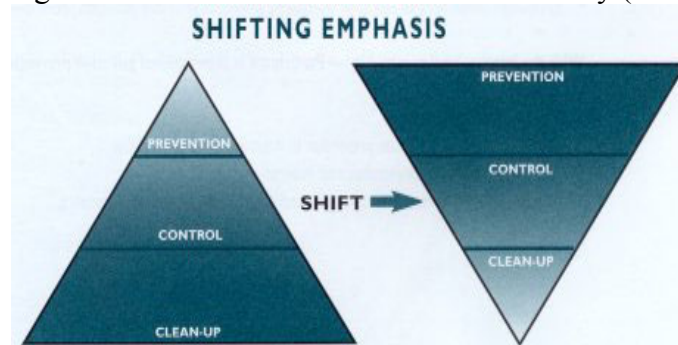
Canada began the process of program development during the 1970s and for the most part, the regulatory programs were fully operational by the end of the 1980s. Subsequent

laws and policies have focused mainly on encouraging waste minimization and recycling but today, some Canadian environmental policy is looking to move beyond the 4Rs (reduce, reuse, recycle and recover) to include pollution prevention and resource recovery - the idea that waste is avoided altogether by preventing its creation at the source.

3.1.2 Environmental Protection Hierarchy

The “Environmental Protection Hierarchy,” (Figure 1) is a concept officially adopted by the Canadian federal government under the *Canadian Environmental Protection Act (CEPA)*. The government believes that pollution prevention is the most effective means of protecting the environment, eliminating costly waste and promoting sustainable development. Pollution prevention focuses on avoiding the creation of pollutants rather than trying to manage them after they have been created [9]. The Canadian Council of Ministers of the Environment (CCME) has also committed to use this framework to assist each jurisdiction in furthering pollution prevention. Within this hierarchy, waste avoidance, reduction, reuse, recycling and recovery (energy) are preventative strategies that are highly preferred, while waste treatment and disposal to landfill are control strategies that are least favoured.

Figure 1 – Environmental Protection Hierarchy (CEPA)



At the top of the hierarchy is pollution prevention and while avoiding the creation of pollution entirely is the ideal, reuse and recycling are not far behind and are still far preferable to controlling or cleaning up waste after it is created. Reuse is the re-employment of products or materials, in their original form or in new applications, with refurbishing to original or new specifications as required. Recycling is the extension of the effective life span of renewable and non-renewable resources through changes to processes, practices and the addition of energy inputs.

The second level of the hierarchy includes pollution control or treatment and is the addition of processes, practices, materials, products or energy to waste streams to reduce the risk posed by pollutants and waste before their release to the environment.

The third level of the hierarchy is disposal and destruction, which is the secure placement or breakdown by thermal, chemical or other processes. These practices should only be

applied to those pollutants and wastes that are not amenable to pollution prevention or treatment. Remediation and clean-up activities are "last resort" elements of environmental protection. Remediation is the use of processes, practices, materials, products or energy to restore to a healthy state, ecosystems that have been damaged by human activity. It is often the most expensive and least efficient method of environmental protection [10].

In terms of where Canada is currently in the waste hierarchy, we are likely somewhere around the second and third levels, although making in-roads towards the first level. The primary approach still tends to be control oriented, with significant use of end-of-pipe technologies, although government and industry alike are recognizing the environmental and economic benefits of pollution prevention.

3.2 Hazardous Wastes Excluded from the Background Paper

Hazardous wastes are those wastes that pose a potential danger to human health and/or the environment due to their nature and quantity. This widely accepted definition encompasses a full range of hazardous characteristics. This paper covers the legal and regulatory framework for hazardous waste that can be related to the specific type of hazardous waste that is generated at a nuclear power generation facility.

There are other areas related to hazardous waste that are not covered here. They include:

- Infectious substances - substances or wastes containing viable microorganisms or their toxins that are known or suspected to cause disease in animals or humans. This biomedical waste would be generated at institutions such as hospitals
- Waste from military bases or military operations
- Waste related to weapons of mass destruction (WMD) and the manufacture of WMD - this includes nuclear, biological and chemical weapons
- Nuclear weapons - transport of weapons-grade material; safeguards to protect against access by terrorists to materials from power plants, including used nuclear fuel, and other materials from civilian use of radioactive materials
- Biological weapons - safeguards to prevent manufacture and transport of biological weapons materials, and to protect stored materials from spills or unauthorized access
- Chemical weapons - safeguards to prevent manufacture and transport of chemical weapons materials, and to protect stored materials from spills or unauthorized access.

All of the above types are extensive topics on their own and are covered by international conventions committed to by Canada under the United Nations (UN) system. The concerns about non-proliferation and radiological weapons should be an integral part of the NWMO's agenda.

4.0 REGULATORY AND POLICY CONTEXT IN CANADA

The federal government has responsibility for national policies, strategies and regulations for managing hazardous waste from all sources - typically industrial operations, but also energy production. However provincial and municipal governments also have their own regulatory regimes, which are administered in such a way as to harmonize with federal requirements. This is in contrast to responsibility for management of nuclear waste, which is primarily a federal responsibility, and where the regulatory requirements are consolidated. The *Nuclear Fuel Waste Act (June, 2002)*, an example of such consolidation, mandated the creation of a waste management organization by the nuclear utilities, which has the responsibility for recommending options to the Government of Canada for the long-term management of nuclear waste. The government will then decide on a preferred approach and the NWMO will implement it. There is no parallel Act relating to hazardous waste.

The following sections, 4.1, 4.2, and 4.3 describe in general the federal, provincial, and municipal regulatory and policy context for hazardous waste. The relevant statutes and legislation are summarized and supplemental information is provided in the Appendices.

A well-structured hazardous waste management program is one in which environmentally responsible waste management is the norm and uncontrolled disposals (spills or dumping) are the rare exception. To achieve this, waste should be managed in licensed facilities, compliance with regulations should be well enforced, and generators should pay the cost of disposal and have incentives to minimize both the use and disposal of hazardous substances. The management system should encourage minimization of hazardous materials at the source, or recycling these wastes into non-hazardous products or compounds. Regulators should have accurate and available information on waste generation and disposal as well as contingency procedures to deal with spills and enforcement to handle dumping and accidents. This leads to public confidence in the effectiveness of the regulatory system. The legislative and policy framework as it is summarized in the next sections should be examined in light of these criteria.

An important part of the policy framework is voluntary activity among individual corporations, associations or institutions of those sectors that are regulated. Voluntary activity allows considerable flexibility of choice on how the desired waste management goal is to be achieved. The Accelerated Reduction/Elimination of Toxics (ARET) Program was a voluntary challenge program (described in section 4.1.11) that achieved a significant reduction in total releases of toxic substances to the environment. Similarly the Voluntary Challenge and Registry (VCR) is a program that has contributed to significant reduction in the emission of green house gases, potentially a factor in achieving Canada's compliance with its commitment under the Kyoto Protocol (1997). More recently, the federal government has another tool, Environmental Performance Agreements (EPAs) that commit certain industrial sectors or companies to specific challenges or performance levels (see 4.1.10) for GHG reductions. The National Office of Pollution Prevention (NOPP) is an administration arrangement that analyzes and recommends both regulatory and voluntary initiatives (see 4.1.9).

4.1 Federal

Overseeing federal environmental policy is Environment Canada, established as the Department of Environment in 1971. There are sections of a number of federal Regulations and Codes that have a bearing on hazardous waste management. The most relevant are highlighted below [2]. Some of the voluntary arrangements are also reviewed.

4.1.1 *Transportation of Dangerous Goods Act & Regulations (TDGA)*

TDGA was the first law to specifically regulate hazardous waste at the federal level – it was passed in 1980 after public outcry about a train and tanker car accident involving liquid chlorine. *TDGA*'s regulations, promulgated in 1985, established federal definitions for hazardous waste (leaving some discretion to provinces and territories) and established a system of manifests and notification for tracking inter-provincial waste transfers [8]. The Act is administered by Transport Canada. Environment Canada provides technical advice and recommends regulatory initiatives on matters related to hazardous waste.

4.1.2 *Canadian Environmental Protection Act (CEPA)*

In March 1998, the Minister of Environment introduced legislation, Bill C-32, amending the *Canadian Environmental Protection Act (CEPA)* (Appendix B). The new *CEPA* came into effect in 1999 and moves away from a command and control regulatory approach to more of a pollution prevention, voluntary environmental measures (VEM) approach. In part, this Act allows Environment Canada to create national regulations on the management of toxic substances and wastes [4].

CEPA 1999 requires the establishment of an Environmental Registry of information published under, or related to, the Act. The goal of the Registry is to make it easier to access public documents such as:

- Proposed administrative and equivalency agreements
- Regulations
- Ministerial notices
- Inventories such as the National Pollutants Release Inventory

The Environmental Registry can be found at: www.ec.gc.ca/CEPARRegistry.

The original *1988 CEPA* introduced new rules on the transboundary movement of hazardous waste. Under *CEPA*, Canada promulgated the Export and Import of Hazardous Waste Regulations (EIHWR) in 1992, which allowed the country to ratify the Basel Convention, an international treaty concerning the movement of hazardous waste between countries. EIHWR, along with the 1985 *TDGA* regulations and the various provincial waste management acts and regulations, currently forms the core legislation for controlling hazardous waste in Canada. The Basel Convention is discussed in greater detail later in this paper.

4.1.3 Fisheries Act (Sec. 38)

The *Fisheries Act* obliges the owner or manager of a hazardous substance to report the deposit or possible deposit of a deleterious substance into water. “The Act also requires that all reasonable efforts are made to minimize damage to fish or fish habitat in the event of such a deposit.”

4.1.4 Regulation - Export and Import of Hazardous Waste

The Export and Import of Hazardous Waste Regulations (EIHWR) provide legislation and controls for the import and export of hazardous wastes for the purpose of recycling and disposal. This regulation is written under the *Canadian Environmental Protection Act (CEPA)*.

Key to the regulations is a notification and manifest system. This system requires that a “Notice,” of Proposed Export, import or transit be submitted to Environment Canada prior to shipment. This allows the receiving jurisdiction to review the hazardous waste or hazardous recyclable material in relation to its destination and to provide consent to Environment Canada before shipment. Each “Notice” is valid for up to a year and may represent a number of shipments over that period [11].

Once a “Notice” has been approved, shipments are accompanied by a Canadian Waste Manifest, which describes the hazardous waste along with a copy of the Notice and confirmation letter issued by Environment Canada. A copy of the Manifest is sent to Environment Canada by the exporter when the shipment leaves a facility and a copy is dropped off at Customs when crossing the border. This copy is also to be forwarded to Environment Canada. A third copy is to be sent to Environment Canada by the receiver of the waste/recyclable material.

4.1.5 Regulation - Storage of PCB Material

In September 1988, Environment Canada issued the Storage of PCB Wastes Interim Order under the *Canadian Environmental Protection Act* to establish proper storage methods for PCB wastes. The Interim Order was reissued by the Storage of PCB Material Regulations on September 9, 1992.

The original Interim Order was written as part of a national action plan in response to the PCB fire at Saint-Basile-le-Grand, Quebec. The main intent of the Interim Order and the subsequent Regulations is to ensure that PCB materials in Canada are stored in a manner and under conditions that pose no threat to human life or health or the environment [12].

The Regulations apply to PCB wastes as well as to PCB materials that are not being used daily and to PCB equipment that is shut down for longer than six months.

4.1.6 National Pollutant Release Inventory (NPRI)

The National Pollutant Release Inventory (NPRI) of Environment Canada was established in 1993 and is the only legislated, nation-wide, publicly accessible inventory of its type in Canada¹ [13].

Under the authority of the *Canadian Environmental Protection Act, 1999*), owners or operators of facilities that manufacture, process or otherwise use one or more of the NPRI-listed substances under prescribed conditions are required to report annually to the NPRI. The NPRI collects information for on-site releases and off-site transfers of pollutants from more than 2500 facilities across Canada. For the 2001 reporting year, reports for 202 of the 266 NPRI-listed substances were submitted by 2617 facilities. The total number of substance reports produced by those facilities in 2001 was 11808 [14].

These substances were reported under the following classifications:

- Part 1A: Core Substances
- Part 1B: Other Substances
- Part 2: Polycyclic Aromatic Hydrocarbons
- Part 3: Hexachlorobenzene and Dioxins / Furans
- Part 4: Criteria Air Contaminants

Substances to be considered for inclusion in the NPRI list, and other NPRI changes are jointly discussed by the NPRI Multi-Stakeholder Group on Substances. Environment Canada reports on these potential inclusions and they are publicly available.

Environment Canada and the Ontario Ministry of the Environment are in a pilot project that has the objective to harmonize the reporting requirements of the NPRI and Ontario Regulation 127/01 on Air Emission Monitoring and Reporting. This is of particular importance as NPRI and Regulation 127/01, deal with virtually the same reporting clientele.

4.1.7 Workplace Hazardous Materials Information System (WHMIS)

The Workplace Hazardous Materials Information System (WHMIS) is Canada's hazard communication standard. The key elements of the system are cautionary labelling of containers of WHMIS "controlled products", the provision of material safety data sheets (MSDSs) and worker education programs.

WHMIS is implemented through coordinated federal, provincial and territorial legislation. Supplier labelling and MSDS requirements are set out under the *Hazardous Products Act* and associated Controlled Products Regulations. The *Hazardous Products Act* and its regulations are administered by the Government of Canada Department of Health, commonly referred to as Health Canada. The Controlled Products Regulations establish a national standard for the classification of hazardous workplace materials. In

¹ A comparable inventory in the United States is known as the Toxics Release Inventory (TRI).

addition to setting out criteria for biohazards, chemical and acute hazards, the regulations specify criteria for chronic health hazards including mutagenicity, carcinogenicity, embryo and reproductive toxicity, respiratory tract and skin sensitization.

4.1.8 Mine Tailings

The first regulation concerning the management of hazardous effluent from mine tailings was brought about in 1979 with the Alice Arm Tailings Deposition Regulation (AATDR). The AATDR produced in April 1979 allowed the Kitsault Mine to deposit mine tailings into Alice Arm, a deep fjord in northwestern British Columbia. The Kitsault Mine was an open-pit molybdenum mine that operated from January 1968 to late 1972 and from April 1981 to November 1982 [15].

The AATDR has been repealed in a recent round of changes to the Metal Mining Liquid Effluent Regulations (MMLER). New regulations under the *Fisheries Act* replace the existing MMLER and will be called Metal Mining Effluent Regulations (MMER). They apply to all operating metal mines in Canada (approximately 100), while the MMLER only applied to about one third of Canada's metal mines — those that began operation after 1977, and those which do not use cyanide in the milling process. Changes include:

- The addition of cyanide as a regulated substance
- Gold mines are now subject to the regulation
- A reduction in the allowable limits of Total Suspended Solids from a monthly average of 25 mg/l to a monthly average of 15 mg/l
- The addition of an upper limit for pH of 9.5, to an existing lower limit for pH of 6
- A requirement that mine effluent not be acutely lethal to rainbow trout (50% of test trout must survive 96 hours of exposure to non-diluted effluent)
- A requirement for environmental monitoring and reporting through the Environmental Effects Monitoring (EEM) process in accordance with prescribed requirements
- The revocation of the Alice Arm Tailings Deposition Regulation, and the introduction of a new process mining companies will have to go through if they want to use marine disposal of mine tailings in the future; a process that will require an amendment of the MMERs, approval by Governor in Council and Cabinet, review under the *Canadian Environmental Assessment Act* and provincial environmental assessments. This new process provides greater transparency and greater opportunity for public comment [16].

With the addition of the metal mining Environmental Effects Monitoring (EEM) program, based on the EEM program developed and implemented under the 1992 Pulp and Paper Effluent Regulations, the new MMER regulations become more environmentally focused. This program evaluates the effects of mining effluent on the aquatic environment, specifically fish, fish habitat, and the use of fisheries resources. The effectiveness of current and future pollution prevention and control technologies, practices and programs within the mining sector will in turn be evaluated. The results will be used to determine if better protection of fish, fish habitat and fisheries on a site-

specific basis is required. Each mine owner or operator will be required to develop, conduct, and report the findings of a site-specific Environmental Effects Monitoring program that monitors key components of the aquatic ecosystem [17].

The Canadian Nuclear power producers have depended largely on domestic uranium production. Uranium mining in Canada has been located mainly in Ontario and Saskatchewan, and earlier in the Northwest Territories. Cumulatively, over 200 million tonnes of uranium mine and mill tailings exist, comprising about 2% of all mine and mill tailings in Canada. The waste is held in containment areas close to the mine and the producers must commit to long-term maintenance of the containment areas. Nineteen of twenty-two tailings sites are no longer receiving waste. The Canadian Nuclear Safety Commission (CNSC) requires that financial assurances be provided by the producer or owner regarding responsibility for decommissioning mines. In cases where the owner cannot be identified, located, or is unable to pay, the financial responsibility rests with the federal and provincial governments. In 1996, the federal and Ontario governments signed a Memorandum of Agreement (MoA) on cost-sharing for management of abandoned uranium mine tailings, and a similar MoA exists with Saskatchewan.

4.1.9 National Office of Pollution Prevention (NOPP)

While NOPP is not a policy or regulation per se, it is an example of an administrative arrangement that helps to achieve federal government policy objectives. NOPP's mission is to promote, through regulatory and voluntary initiatives, the shift to a preventative approach to environmental protection throughout Canadian society, and to influence this shift internationally. NOPP is Environment Canada's focal point for the management of toxic substances, implementation of federal pollution prevention policy and legislation, and the development of new concepts and policy instruments that facilitate the transition to pollution prevention in Canada.

Management of toxics and other substances of concern is a common thread in the majority of the activities of the National Office of Pollution Prevention. Its activities are driven by legislated requirements (*CEPA and the Fisheries Act*) and federal Cabinet decisions. NOPP makes recommendations on management of specific toxic substances that lead to regulations, guidelines, standards, codes of practice, voluntary agreements and other non-regulatory initiatives that result in clean air and water. The Office is responsible for the development and implementation of these instruments, and for reporting on results. The Office has the management and technical resources to undertake analyses, stakeholder consultations, negotiations, and to develop responses, policies and programs that lead toward environmental sustainability in key industrial sectors of the Canadian economy [18].

4.1.10 Environmental Performance Agreements

Environment Canada uses a range of tools to protect the environment, including regulations, guidelines, codes of practice, economic instruments, challenge programs and educational campaigns. More recently, they are using agreements with industry that

commit certain sectors or companies to specific challenges or performance levels. Termed as “environmental performance agreements (EPAs),” these have core design criteria negotiated among parties to achieve specified environmental results. For industry participants, an EPA will stipulate clear and measurable performance standards and include effective accountability mechanisms. Environment Canada assumes certain obligations as well that may include supporting agreements by facilitating information exchange and performance monitoring, incentives such as public recognition for good performance or relief for participating parties from other management and control tools [19].

4.1.11 Accelerated Reduction/Elimination of Toxics (ARET)

Accelerated Reduction/Elimination of Toxics (ARET) was an industry-led voluntary challenge program that ran from 1994 through 2000. ARET attracted the participation of 318 facilities from 171 companies representing 8 major Canadian industrial sectors. Collectively these participants achieved a total reduction in releases to the environment of almost 28,000 tonnes of toxic substances. Since the 1994 ARET Program came to a close in 2000, Environment Canada has been working with many stakeholders to design a successor program, ARET 2. It is expected that ARET 2 will challenge participants to reduce or eliminate both uses and releases related to their operations.

4.2 Provincial

4.2.1 Harmonization of Provincial Regulations – Role of the Canadian Council of Ministers of the Environment (CCME)

While lists, criteria, and definitions laid out in national legislation form the basis for a national definition of hazardous waste, historically, provinces had significant discretion in determining which wastes to regulate as hazardous. In the late 1990s, Canada undertook a major effort to harmonize hazardous waste lists, exemptions, and classification criteria across all provinces and territories through the Canadian Council of Ministers of the Environment (CCME).

The CCME, composed of all provincial, territorial, and federal environment ministers is the main body that works to promote effective intergovernmental cooperation and coordinated approaches to inter-jurisdictional issues such as air pollution and toxic chemicals. CCME members collectively establish nationally consistent environmental standards, strategies and objectives so as to achieve a high level of environmental quality across the country. While it proposes change, CCME does not impose its suggestions on its members since it has no authority to implement or enforce legislation. Each jurisdiction decides whether to adopt CCME proposals [20].

The CCME goal for hazardous waste management is a consistent Canada-wide approach to the regulation of hazardous wastes and recyclables. Since the mid-1990s, many provincial and territorial jurisdictions across Canada have been working through the CCME to develop national standards entitled “Canada-Wide Standards” (CWS). These

standards are the outcome of a consensus-based process with multi-stakeholder consultation. Canada-Wide Standards will be implemented by the “best-placed” jurisdiction. For example standards that are “emissions” limits are typically being implemented by the provinces/territories whereas standards for products are primarily the responsibility of the federal government. Each standard includes a numeric limit/target, time-line for attaining the limit/target, and requirements for reporting to the public. An important aspect of CWS is public accountability and transparency, and each jurisdiction is required to make public all implementation plans and progress reports [20].

The CCME Hazardous Waste Task Group (HWTG) mandate is to identify significant national issues in hazardous waste management requiring a coordinated national approach and to provide guidance to the CCME's Environmental Planning and Protection Committee on these issues and/or national guidelines or codes of practice [20].

The HWTG is currently revising and updating the CCME National Guidelines for the Landfilling of Hazardous Wastes, and collecting information to aid in the possible development of a harmonized national waste code and the establishment of scientifically-based aquatic toxicity values for Class 9.2 CEPA substances. The HWTG is also providing input into the development of *CEPA* hazardous waste and hazardous recyclables regulations, as an ad hoc advisory committee, on request by Environment Canada.

Future work includes revising the CCME National Guidelines on Physical-Chemical-Biological Treatment of Hazardous Waste, Hazardous Waste Incineration Facilities – Design and Operating Criteria, developing CCME guidelines for the management of identified priority waste streams, and providing input to a users’ guide to regulatory changes under CEPA (as an ad hoc advisory committee, on request by Environment Canada).

In July 2000, the Federal Minister of Environment issued a call to action to the provinces and territories urging them to work with Environment Canada to strengthen the standards for all facilities that accept hazardous waste, including landfills. As a result, an action plan to establish a national regime for environmentally sound management (ESM) was developed in cooperation with the provinces and territories by a working group under the CCME [21].

4.2.2 Survey of key regulations for Canadian provinces and territories

Much of Canada’s environmental policymaking is shared with the provincial and territorial governments. In general, provinces regulate hazardous waste activities that occur solely within their boundaries, while the federal government is responsible primarily for establishing national guidelines and regulating inter-provincial and international transport of hazardous waste.

Following, is a general survey of key provincial and territorial regulations associated with hazardous waste. A summary table is also included at the end of this section (Table 2)

and further details can be found by reviewing the references provided and selected documents of relevance that have been included in Appendix C.

British Columbia

In British Columbia, hazardous wastes are also referred to as “special” wastes. Special wastes are governed by the *Waste Management Act (1982)* and the Special Waste Regulation (SWR) that was created under the act in 1988. The SWR specifies requirements for waste facilities, including storage, treatment, and disposal and applies to generators and transporters of special waste. The main goals of the SWR include providing:

- The definition and management of special wastes
- A cradle-to-grave tracking-system framework
- Market information for proponents developing special waste management facilities
- The minimum standards for the construction, operation, and closure of a special waste management facility
- Minimum standards for transportation

In summary, the SWR specifies requirements for proper management of special waste. It specifically prohibits various practices, such as mixing and diluting special waste, injecting underground, and treating or incinerating special wastes in floating facilities (i.e., barge operations). It also prescribes minimum standards and criteria for handling certain wastes before disposal or reuse. There are also minimum requirements to ensure that containers of special waste are handled safely, without risk of leakage, spills or reactions with other materials [22].

Alberta

The *Environmental Protection and Enhancement Act (1992)* created a new framework in a single act that takes an integrated approach to the protection of air, land and water. The Act strengthens and clarifies Alberta's environmental laws, and also eliminates duplication among existing Acts. The Act consolidates the following Acts: the *Agricultural Chemicals Act, Beverage Container Act, Clean Air Act, Clean Water Act, Ground Water Development Act, Hazardous Chemicals Act, Land Surface Conservation and Reclamation Act, Litter Act* and some sections of the *Department of the Environment Act* [23].

The *EPEA* deals with the management and control of waste in various provisions and provides Alberta Environment with the ability to address hazardous waste matters through regulations. The most relevant of regulations is the Waste Control Regulation (AR 129/93) that deals in detail with the identification of hazardous wastes, as well as setting out the requirements related to handling, storage, treatment and disposal of such wastes as well as recycling of hazardous recyclables. The type and quantity of all hazardous waste moved within the province is tracked through the Hazardous Waste

Manifest System. Overall volumes of hazardous waste generated and by whom are not made available to the public. However, requests for general information regarding hazardous waste generation can be made to Alberta Environment [24].

The *EPEA* also provides a framework for enforcement. The Enforcement Principles for the Act were outlined in, *A Guide to the Environmental Protection and Enhancement Act* (Alberta Environment, April 1993). These have since been updated and are available from Alberta Environment. The purpose of the Enforcement Principles and Enforcement Program is to ensure compliance with the Act and its regulations by providing a clear understanding of how the legislation will be enforced to achieve compliance. This Enforcement Program outlines the implementation of investigation and enforcement functions associated with the administration of the legislation [23].

Saskatchewan

In Saskatchewan, the *Environmental Management and Protection Act, 2002 (EMPA)*, amalgamates the content of the former *Ozone-depleting Substances Control Act*. The *EMPA* includes specific sections dealing with unauthorized discharges, contaminated sites, protection of water, environmental protection orders, ozone-depleting substances, enforcement powers and administrative penalties.

The management of hazardous wastes are governed by the Hazardous Substances and Waste Dangerous Goods Regulations (effective April 1, 1989 and amended 25/92, 107/92, 28/94, 3/95, and 63/2000). The Regulations set out rules for the designation of hazardous wastes and waste dangerous goods and define the characterization of these substances. In addition, all new and existing fuel, chemical and waste storage facilities must comply with the regulations that set out approval requirements for storing hazardous substances, constructing as well as decommissioning a facility for hazardous wastes and for the transfer of a category known as waste dangerous goods [25].

Manitoba

In Manitoba, the departments of Natural Resources and Environment were joined to form Manitoba Conservation. Programs from each were amalgamated resulting in the streamlining of responsibility lines. The management of hazardous waste is handled through the Environmental Approvals Branch (EAB) and the Pollution Prevention Branch (PPB). The EAB administers development approval requirements through *The Environment Act (1987)* and *The Dangerous Goods Handling and Transportation Act (DGHTA, 2003)* which set out requirements for controlling municipal, industrial and hazardous waste sources of pollutants; minimizing the environmental impact of development proposals; and minimizing adverse effects to the environment and public health from pesticide use.

The PPB promotes a shift in Manitoba's approach to environmental protection, from control and remediation, to prevention. PPB manages *The Waste Reduction and Prevention Act (1990)* and *The Ozone Depleting Substances Act (1990)*, and leads

promotion of practices that avoid the creation of waste and pollutants at source. The specific regulation for hazardous waste is *The Dangerous Goods Handling and Transportation Regulation* that falls under the Act of the same name [26]. This regulation defines provisions for the generation, handling, disposal and generation of hazardous wastes and associated administrative requirements such as obtaining the appropriate approvals, permits, licenses and manifest for these wastes.

Ontario

In Ontario, the main piece of legislation to control hazardous pollution is *The Environmental Protection Act 1992 (EPA)*. Section 6. 6.(1) of the EPA says that "No person shall discharge into the natural environment any contaminant, and no person responsible for a source of contaminant shall permit the discharge into the natural environment of any contaminant from the source of contaminant, in an amount, concentration or level in excess of that prescribed by the regulations" [27].

Two key sections of the Ontario EPA are of particular relevance. These include: *Part V: Waste Management*, that regulates how all wastes, including hazardous wastes, are to be managed in Ontario and requires approval for transportation, processing and disposal of wastes; and *Part X: Spills*, that makes it mandatory to report any spills occurring in Ontario to the Spills Action Centre.

The regulation that is most relevant to the management of hazardous waste under the Ontario EPA is Regulation 347 on General Waste Management. It covers the management of hazardous and liquid industrial waste and requires generators to register their facility and wastes generated with the MOE, to use registered carriers to ship their waste, to manifest their shipments, and to maintain records.

In January 2002, the MOE introduced a new system for registering, tracking and monitoring hazardous wastes, which, when fully implemented, will provide immediate knowledge on the location and movement of hazardous waste in the Province. This system is known as the Hazardous Waste Information Network (HWIN) and is the first large-scale electronic manifest system in North America. HWIN allows hazardous waste generators, carriers, and receivers to register their activities with the Ministry of the Environment online. It also enables users to create and process electronic manifests over the web.

HWIN is expected to improve the quality and accessibility of hazardous waste information in Ontario, as well as offering significant benefits to industrial users in the form of reduced costs for manifest transactions, record-keeping and reporting [28].

In December 2001, the Ministry announced an overall waste plan that is currently being implemented. Some elements include:

- A pollution prevention program that will include specific reduction targets for hazardous wastes; a technical assistance program to help industry reduce their

- hazardous waste; diversion programs for used oil, electronic equipment, fluorescent tubes and special household wastes; and requirements for specific industries to develop pollution prevention plans
- A new legislative framework for wastes and recyclables to foster increased recycling of materials
 - Enhanced inspection, abatement and enforcement activities
 - Regulatory changes to clarify requirements and encourage proper management and recycling, while maintaining environmental protection
 - The phasing out of other waste management activities such as deep well disposal of hazardous wastes and the use of landfarms to treat and dispose of hazardous wastes [29].

In Ontario, another important piece of legislation is the *Environmental Bill of Rights (EBR)* that was enacted in 1993. While the Government of Ontario retains the primary responsibility for environmental protection, the *EBR* provides every resident with the formal right to play a more effective role. The *EBR* gives individuals access to the government's activities relating to the environment, and describes the history, purpose and content of the legislation. It explains the environmental rights of Ontario residents under the law and shows, step-by-step, how they can be used to protect the environment [30].

Quebec

Under the Environment Quality Act (2002) in Quebec, the Hazardous Materials Regulation replaced the previous Hazardous Wastes Regulation in December 1997. This regulation promotes the creation and implementation of solutions aimed at reusing and recycling hazardous materials instead of simply stockpiling these residues. The main regulatory provisions, applicable to all hazardous materials, prohibit the release of a hazardous material into the environment; require measures to be taken in case of an accidental spill; require measures to be taken in case of cessation of activities or dismantling of buildings; and prohibit the use of oil to settle dust [31].

The regulation also sets out requirements for the use of residual hazardous materials for energy generation purposes, storage and final disposal. It also details provisions for the registering of hazardous materials, obtaining a permit for certain activities related to hazardous materials and for transporting materials.

New Brunswick

In New Brunswick, the *Clean Water Act (1989)*, *Clean Environment Act (1996)*, and *Clean Air Act (1998)* are the three key Acts providing broad powers to the Minister of the Environment and Local Government in that they require anyone discharging a contaminant to obtain approval from the Minister. A contaminant is very broadly defined and essentially includes anything that is in excess of the natural constituents of the environment. Order-making powers are also given to the Minister through these Acts which provide a means of controlling or stopping the discharge of contaminants, or of

requiring the clean-up of contaminated sites. Regulations under these Acts provide administrative procedures for various systems of approvals, permits, registrations, and other authorizations which the Department of Environment issues, as well as providing for the establishment of solid waste commissions, water and sewer commissions, and the New Brunswick Tire Stewardship Board [32].

Nova Scotia

The *Environment Act* became law in Nova Scotia in January 1995. Since that time nineteen sets of regulations have been passed. In Nova Scotia, the terms “hazardous goods” and “hazardous wastes” have been replaced with “dangerous goods” and “waste dangerous goods”. The term “dangerous goods” refers to substances designated as such by the regulations (s.3(1)). There are numerous sets of regulations that have designated substances as dangerous goods and that deal with the management of dangerous goods.

These include:

- Dangerous Goods Management Regulations
- Asbestos Waste Management Regulations
- PCB Management Regulations
- Petroleum Storage Regulations
- Pesticides Regulations
- Used Oil Regulations
- Motive Fuel and Fuel Oil Approval Regulations

The most relevant to this discussion is the Dangerous Goods Management Regulations that specify requirements for the handling, storage, and disposal of hazardous wastes [33].

Prince Edward Island

The Pollution Prevention Division of the Department of Fisheries, Aquaculture and Environment in Prince Edward Island administers a wide range of programs, legislation and activities that are designed to protect the environment in the Province. Areas covered include: air quality, protection of the ozone layer, management of hazardous wastes, litter, beverage containers, petroleum storage tanks, used oil, tires, lead-acid batteries, derelict vehicles, excavation pits, unsightly properties and special projects.

Most of the hazardous waste produced in PEI is shipped out of PEI to be incinerated, landfilled, or recycled. PEI has no hazardous waste management facility. The majority is sent to New Brunswick (for battery disposal), Quebec (to cement kilns) and Ontario [24]. In 1998, these shipments totaled close to 490 metric tonnes and were composed of a variety of items including: tetrachloroethylene, flammable liquids, naphtha petroleum, corrosive liquids/solids and pesticides, etc. When companies producing hazardous waste need to dispose of the material, they must contact a licensed hazardous waste disposal service to pick up the waste. They must also request a generator number from the

Department of Fisheries, Aquaculture and Environment that gives them permission to produce the waste [34].

Newfoundland and Labrador

The Environmental Protection Act (2002) is the key piece of legislation covering the management of hazardous wastes in Newfoundland and Labrador. The *EPA* provides legal authority to require that the persons responsible prevent or correct adverse environmental effects. This is achieved primarily by means of: approvals of undertakings and releases of substances based on national standards for environmental quality, and enforcement through inspections, monitoring, reporting, and in the event of a contravention, ministerial orders and Court action.

Part VIII of the *EPA* relates to “dangerous goods” and gives the Minister broad powers to control such goods and wastes. Authority extends to classifying and designating toxic substances and curtailing or banning their manufacture, use and release. The Minister may stipulate concentration and manner of release of goods and wastes, stipulate monitoring and reporting requirements, establish codes and require contingency plans and direct responsible persons on handling, storage, training, site de-contamination, and treatment and disposal [35]. The relevant regulation under this Act is the Dangerous Good Transportation Regulation.

Yukon Territory

The Government of Yukon’s Department of Environment has an *Environment Act (1991)* that includes thirteen sets of regulations developed since 1991. For managing hazardous wastes, there are Special Waste Regulations. Most of the Yukon’s special waste is used motor oil, although others include: used anti-freeze, dead batteries, leftover cleaners, solvents, paints, pesticides, industrial chemicals and petroleum products; and biomedical wastes. Exact figures for the generation of special waste in the Yukon are not available but the annual collection program removes 25 tonnes alone. This does not include quantities that are disposed of or returned to manufacturers during the remainder of the year. The Regulations prohibit the unauthorized release of special wastes into the environment and establish a tracking and reporting system [36].

Northwest Territories

The Environment Protection Service of the Department of Resources, Wildlife and Economic Development in the Northwest Territories the *Environmental Protection Act (1988)*. Under this Act, the General Management of Hazardous Waste has been developed with the intent to provide information for the proper management of hazardous waste in the NWT, to increase awareness, and to establish a “cradle to grave” monitoring system [37]. In the NWT, approximately 260 tonnes of hazardous waste are generated each year from residential, business, and institutional sources. In 2000, there are a further two million litres of waste oil and fuel generated annually in northern communities. The two millions litres generated, come in part from accidental spills and occur especially in

communities located near major roads or highways. The mining and petroleum sectors were responsible for 60 percent of the spills [24]. Oil and gas exploration also contribute to hazardous waste generation in the NWT, and the main sources are discharge from drilling wastes, atmospheric emissions and accidental spills. In 1997, it was estimated that over 20,000 tonnes of solids contaminated with a variety of drilling additives and more than 250,000 litres of oil had been discharges over “many years,” containing an undisclosed amount of mercury, lead, and cadmium [24].

Nunavut

Nunavut’s *Environmental Protection Act (1988)* is based on the same act as that used by the Northwest Territories’ authority. The Spill Contingency Planning and Reporting Regulations under this Act is most relevant to hazardous wastes and details provisions for spills, spill reporting and contingency plans. The Transportation of Dangerous Goods Regulation under the Act of the same name details requirements for the handling, storage and disposal of hazardous wastes.

Table 2 – Summary of Canadian Provincial and Territorial Acts and Regulations Related to Hazardous Waste

Province/Territory /Ministry Responsible	Relevant Acts	Relevant Regulations	Summary of Acts(s) and Regulation(s) Requirements	Summary of Selected Administrative Arrangements Related to Regulatory Requirements
British Columbia Ministry of Water, Land and Air Protection	<p>*Waste Management Act (1982/1996)</p> <p>*Environment Management Act (1996)</p> <p>* May 13, 2003 Min. introduced the new Environmental Management Act, replacing the to old Acts sited above</p>	Special Waste Regulation (B.C. Reg. 63/88)	Regulates the siting, construction, operation, performance, management, maintenance and closure of facilities for storage, use, treatment and disposal of special waste – also regulates handling and transportation requirements.	Any person, partnership or company in British Columbia that produces or stores more than a prescribed quantity of special waste must register, or update their existing registration, with the Ministry of Water, Land and Air Protection within 30 days. For the transportation of special wastes, consignors of the waste are required to complete a form called a Manifest. The manifest form tracks the movement of special waste within, into or out of Canada. It documents the type and amounts of waste, who shipped it (the consignor), who transported it (the carrier), who received it (the consignee) and how it was handled. The quantity and description of waste recorded on the manifest must match the waste on the shipment vehicle to be in compliance with the law.
Alberta Alberta Environment	Environmental Protection and Enhancement Act (1992)	Activities Designation Regulation (AR 211/96) Waste Control Regulation (AR 129/93)	Part 9, Division 3 of the EPEA deals with hazardous waste, establishing requirements for manifests and personal identification, numbers. Part 1, Division 2 of the Waste Control Regulation details the requirements for identifying hazardous wastes and the handling, storage and disposal of these wastes.	Alberta Environment maintains a manifest system to provide beginning-to-end tracking on the movement of hazardous waste from where it was generated to where it is received. The regulatory requirement on manifesting is specified in section 191 of the Environmental Protection and Enhancement Act (EPEA), which states that, "no person shall consign or transport or accept for transportation, storage, treatment or disposal any hazardous waste unless the waste is accompanied by a manifest".
Saskatchewan Saskatchewan Environment	Environmental Management and Protection Act (2002)	Hazardous Substances and Waste Dangerous Goods Regulation (Chapter E-10.2 (Reg. 3, 1989))	All new and existing fuel, chemical and waste storage facilities must comply with the regulations that set out approval requirements for storing hazardous substances, constructing as well as decommissioning a facility for hazardous wastes and for the transfer of waste dangerous goods.	Transportation of waste needs to be properly documented using a waste manifest, which indicates the generator and receiver of the waste. If possible, the waste generator should obtain a certificate of destruction from the treatment facility.

Manitoba Manitoba Conservation	The Environment Act (1987) The Dangerous Good Handling and Transportation Act (2003) Waste Reduction and Prevention Act (1990)	Dangerous Goods Handling and Transportation Regulation (55/2003) Waste Disposal Grounds Regulation (150/91)	The Dangerous Goods Handling and Transportation Regulation defines provisions for the generation, handling, disposal and generation of hazardous wastes.	The regulation also sets out the associated administrative requirements such as obtaining the appropriate approvals, permits, licenses and manifest for these wastes.
Ontario Ministry of the Environment	Environmental Protection Act (1990) Environmental Bill of Rights (1993)	General Waste Management (Reg. 347, 1990)	Reg. 347 covers the management of hazardous and liquid industrial waste and requires generators to register their facility and wastes generated with the MOE, to use registered carriers to ship their waste, to manifest their shipments, and to maintain records.	The Hazardous Waste Information Network (HWIN) is a new system introduced by the MOE for registering, tracking and monitoring hazardous waste. It is the first large-scale electronic manifest system in North America. HWIN allows hazardous waste generators, carriers, and receivers to register their activities with the Ministry of Environment and Energy online. It also enables users to create and process electronic manifests over the web.
Quebec Environment Quebec	Environment Quality Act (2002)	Hazardous Materials Regulation (1997)	The main regulatory provisions, applicable to all hazardous materials, prohibit the release of a hazardous material into the environment; require measures to be taken in case of an accidental spill; require measures to be taken in case of cessation of activities or dismantling of buildings; and prohibit the use of oil to settle dust.	The Regulation details provisions for the registering of hazardous materials, obtaining a permit for certain activities related to hazardous materials and the documentation required for transporting materials.
New Brunswick Ministry of Environment and Local Government	Occupational Health & Safety Act (1983) Clean Water Act (1989) Clean Environment Act (1996) Clean Air Act	Reg. 88-221 – Workplace Hazardous Materials Information System Regulation (1988) – under the	The handling of regulated waste falls under the Workplace Hazardous Materials Information System Regulation - Occupational Health and Safety Act.	Regulations under the Acts noted provide administrative procedures for various systems of approvals, permits, registrations, and other authorizations that the Department of Environment issues.

Nova Scotia Department of Environment and Labour	(1998) Environment Act (1995)	Occupational Health & Safety Act Dangerous Goods Management Regulations (1995) Activities Designation Regulations (1995)	The Dangerous Goods Management Regulations specify requirements for the handling, storage, and disposal of hazardous wastes. The Activities Designation Regulations outline activities that require approval from the Minister or an administrator designated by the Minister. These regulations apply to modifications or extensions to existing activities.	Anyone who wants to generate, receive or carry waste dangerous goods must complete a "Waste Dangerous Goods Generator, Receiver Or Carrier Registration" form which can be obtained from any regional or district office of the Department of Environment of Labour. All waste or dangerous goods shipments require accompanying documentation while in the transportation cycle. This form, known as a waste manifest, requires a Provincial ID Number for the Generator (Consignor), Carrier and Receiver (Consignee). Each manifest form (consisting of six copies) must be distributed/retained in accordance with the TDG Regulations.
Prince Edward Island Department of Fisheries, Aquaculture and Environment	Environmental Protection Act (1988)	Waste Resource Management Regulations	The Act outlines rules for respecting the procedures to be followed with regard to applications for license or permits required for handling, storing and disposing of hazardous wastes.	The Waste Resource Management Regulations require that approvals be obtained to construct and operate a waste management facility. The approval system allows the Department of Fisheries, Aquaculture and Environment to more accurately measure the types and amounts of waste material being generated in the province.
Newfoundland and Labrador Department of Environment	Environmental Protection Act (2002) Dangerous Goods Transportation Act (1990)	Dangerous Goods Transportation Regulation (96/206)	The Act gives extends authority to classifying and designating toxic substances as dangerous goods and curtailing or banning their manufacture, use and release. The Minister may stipulate concentration and manner of release of dangerous goods and waste dangerous goods, stipulate monitoring and reporting requirements, establish codes and require contingency plans and direct responsible persons on handling, storage, training, site de-contamination, and treatment and disposal.	Certain activities defined in the regulations and generally involving the release of substances, require an approval to avoid or minimize adverse environmental effects. Part XI defines requirements, procedures and Minister's authority for approvals under the EPA.
Yukon Department of	Environment Act (1991)	Special Waste Regulations	Under the regulations, anyone who generates, stores, handles, mixes, transports, disposes or releases special wastes is considered a waste	A key element of the Special Waste Regulations is the prohibition against the unauthorized release of special waste into the environment. The prohibition is supported

Environment				manager. A waste manager is legally responsible for knowing and complying with the regulations.	by a tracking and reporting system for monitoring special wastes.
Northwest Territories Department of Resources, Wildlife and Economic Development	Environmental Protection Act (1988)	General Management of Hazardous Waste (1998) (Guideline)		The Guideline outlines the roles and responsibilities for the generator, carrier and receiver of hazardous wastes. It also provides guidance on the storage and management of hazardous waste.	The Guideline provides direction on registering a hazardous waste management facility, as well as for the registering of generators, carriers and receivers of hazardous wastes.
Nunavut Department of Sustainable Development	Environmental Protection Act (1988) Transportation of Dangerous Goods Act (1990)	Spill Contingency Planning and Reporting Regulations (R-068-93) Transportation of Dangerous Goods Regulations (1991)		The Spill Contingency Planning and Reporting Regulations under this Act is most relevant to hazardous wastes and details provisions for spills, spill reporting and contingency plans. The Transportation of Dangerous Goods Regulation under the Act of the same name details requirements for the handling, storage and disposal of hazardous wastes.	Under the Act, permits and licences are required for generating, transporting and disposing of wastes and a manifest is required for tracking.

4.3 Municipal

While legal and administrative arrangements related to the management of hazardous waste in Canada fall under the jurisdictional responsibility of the federal and provincial governments, hazardous waste issues fall into the responsibility area of the municipalities. The municipalities manage water and wastewater treatment and delivery; the collection of solid waste, and may use By-laws to regulate the sources of air pollution that are within the municipal boundaries. Each of these may have a hazardous waste component. Municipalities are also responsible for the management of landfill sites including hazardous landfill sites that may pose risks if leaching occurs.

As a result of specific needs of a municipality and/or the concentration of activity in the urban environment, it is usual for municipalities, especially in the large cities of Canada, to have By-laws that go beyond the Canada-Wide Standard. For example, municipalities are active in requiring reduction of the amount of toxics and hazardous wastes discharged to the municipal sewer systems. The following are selected examples of legal and administrative actions taking by municipalities:

Case 1

On April 9, 1997, the former Metro Council of the City of Toronto adopted Clause no. 21(n) of Report no. 4. The clause addresses pollution prevention initiatives around regulating waste being discharged into the sewer system. The clause included the means for educating households and the industrial sector about alternatives to toxic chemicals.

The New Sewer Use By-law requires that industries carry out pollution prevention planning. The reasons for requiring pollution prevention planning are to:

- Improve water quality
- Control toxic metals and organics
- Improve biosolids quality [38]

The City of Toronto is one of the first municipalities in Canada to incorporate Pollution Prevention (P2) planning requirements into the sewer use By-law. The objective of P2 planning is to help industries identify ways of reducing and/or eliminating the creation of pollutants and wastes at source. Thirty-eight subject pollutants are named in the By-law and companies discharging any of the named pollutants above the allowable thresholds are required to prepare a pollution prevention plan and submit a summary of the plan to the City [38].

Case 2

Environment Canada plans to establish, by 2005, a new Canada-Wide Standard for the removal of mercury from the effluent from the mercury amalgam released from dental operatories. A manufacturer of a mercury amalgam removal system may choose to conform to the CWS through either Compliance with ISO 11143

or Compliance with the Environment Canada Testing and Verification Protocol for Mercury Amalgam Removal Technologies [now under development]. Both methods of establishing compliance with the CWS are required to demonstrate removal of 95% of all particulate mercury of a size large than 1 µm. The Toronto and Vancouver Sewer Use By-laws also require compliance with a stringent standard for discharge of soluble mercury from these dental amalgam separators. Therefore, to sell equipment into these large markets (large in the Canadian scene), the vendors have to deliver performance that is beyond the CWS, and many are upgrading their equipment, or initiating new applied research for the purpose.

Case 3

To address air quality concerns, the City of Toronto has introduced a new Bylaw on discharge from dry cleaning operations that requires a much higher standard of removal of perchloroethylene (PERC) than the industry has achieved to date. Since PERC is a toxic VOC and a smog precursor, strong enforcement of the Bylaw will be the norm. However, commercial equipment to meet the higher standard for PERC discharge is not available, or economically beyond reach. Thus new technology is under development, but not yet commercialized.

In both Case 2 and Case 3, enforcement and availability of technology must go together. These are examples of the regulation driving the development of improved technology.

5.0 INTERNATIONAL APPROACHES

For the purpose of examining various international approaches related to the legal and administrative arrangements for waste management, five countries were selected that are also significant users of nuclear power: the United States, France, the United Kingdom, India and China.

Some countries who are not users of nuclear power were of interest from the point of view of their hazardous waste management approaches, and were therefore also selected for review and reporting. These include: Denmark, Australia, Malaysia, Hong Kong, and Thailand. Selected documents of relevance to the international approaches sited are included in Appendix D.

5.1 United States of America

In the United States, a comprehensive federal regulatory regime for domestic generation, handling and disposal was established in the 1970s and significantly strengthened between the mid-1980s and mid-1990s. Transboundary waste traffic was almost exclusively with Canada and Mexico, although very limited data on waste imports and exports is available for the period prior to the mid-1990s.

Hazardous waste management in the United States is primarily handled by private-sector companies. Firms generating, transporting, storing, treating and disposing of hazardous

waste are subject to strict regulations and strong enforcement. Laws making firms liable for the clean-up of contaminated sites provide a strong incentive for proper waste management.

Under the U.S. *Environmental Protection Agency (EPA)* regulations, hazardous waste is defined as waste that exhibits certain characteristics (ignitability, corrosivity, or reactivity) or has the potential to leach a certain amount of toxic chemicals. In addition, the *EPA* can designate specific wastes (referred to as “listed wastes”) as hazardous and, therefore, subject to regulation.

The U.S. Congress has specifically exempted certain wastes from regulation under the United States’ major Hazardous Waste Management (HWM) law, the *Resource Conservation and Recovery Act (RCRA)*. These exemptions include wastes from mining, petroleum production, electricity generation, and small sources. *Radioactive waste is regulated under the Atomic Energy Act* rather than by the laws that cover hazardous waste (unless the radioactive waste is mixed with hazardous waste, in which case it is regulated under both radioactive and hazardous waste laws).

According to *EPA* statistics, nearly 20,000 generators in the United States produced approximately 279 million tons of hazardous waste in 1995. These data include 267 million tons of wastewater (or 96% of the total), which is considered hazardous waste under U.S. definitions [8].

5.2 European Union

Each year in the European Union, 1.3 billion tonnes of waste – some 40 million tonnes of hazardous waste are thrown away. Sixty-seven percent of what is thrown away is either burned in incinerators, or dumped into landfill sites. However, the European Union is aiming for a significant reduction in the volume of waste generated through new waste prevention initiatives, better use of resources, and encouraging a shift to more sustainable consumption patterns. It wants to reduce the quantity of waste going to “final disposal” by 20% from 2000 to 2010, and by 50% by 2050, with special emphasis on cutting hazardous waste [39].

The Council of the European Communities passed a Council Directive in December 1991 on hazardous waste (91/689/EEC). The principal aim of the Council Directive is to formulate a common definition of hazardous waste and to introduce greater harmonization of the management of such waste. It lists hazardous wastes, constituents and properties that render waste hazardous. Establishments that carry out their own waste disposal require a license. This Directive contains stricter management and monitoring instruments for hazardous wastes. The main provisions to ensure environmentally sound management of hazardous waste are:

- Definition of hazardous waste (Article 1), further developed by the list of hazardous waste established by Council Decision 94/904/EC, replaced by Commission Decision 2000/532/EC as amended

- The prohibition of mixed hazardous waste with other hazardous or non-hazardous waste (Article 2)
- Specific permit requirements for establishments and undertakings dealing with hazardous waste (Article 3)
- Periodic inspections and requirement to keep records for the producer of hazardous waste (Article 4)
- Appropriate packaging and labeling of hazardous waste during collection, transport and temporary storage (Article 5)
- Waste management plans for hazardous waste (Article 6) [40].

5.2.1 Great Britain

While domestic production of hazardous wastes in the EC is controlled by the European Council Directive 91/689/EEC, the Special Waste Regulations (SWR) 1996 (as amended) implement the Hazardous Waste Directive (HWD) into domestic legislation for England and Wales.

The Environment Agency administers the requirements of these regulations to provide an effective control system for wastes that are difficult to handle. They ensure that dangerous wastes are soundly managed from their production to their final destination for disposal or recovery.

A consignment note system (set up by the SWR) is the mechanism for ensuring that special wastes are tracked from their point of arising to their point of disposal. A consignment note must accompany every movement of special waste. Everyone involved with the transfer of special waste must retain a copy of the consignment note. In addition, copies must be passed to the Agency [41].

5.2.2 France

The French Ministry of the Environment was established in 1971. Its mission is to monitor the quality of the environment, protect nature, prevent, reduce or totally eliminate pollution and other nuisances, and enhance the quality of life. There are four main departments within the Ministry but the most relevant to the topic of hazardous waste management is the Department for the Prevention of Pollution and Risk (DPPR). The DPPR monitors the activities of industry from an environmental perspective. Firms from various industrial sectors are listed as “classified installations,” and are subject to regular compliance inspections under the Regional Departments for Industry, Research and the Environment (DRIRE) Law of July 19, 1976. The DPPR is also concerned with environmental protection for small and medium-sized businesses and industries and encourages them to reduce discharges into water and atmospheric releases through disseminating information and raising awareness and knowledge about environmental risks [42].

Working closely with the Ministry of Environment is the Agency for Environment and for Energy Management (ADEME). It is involved in implementing the government’s environment and energy policies and helps France meet its international commitments.

ADEME was established in 1991, replacing three separate organizations: AQA (Agency for Air Quality), ANRED (National Agency for Waste Recovery and Elimination) and AFME (the French Agency for Energy Management). After ADEME was established, its first priority was to implement the spirit of the 1975 and 1992 laws on waste. After 2002, the priority was to ensure that waste could be recovered or treated in economically viable conditions and that it should not be sent to landfill. It was recommended that collection and conversion systems had to be developed and at the same time, modernization of the sector should make it possible to reduce or even eliminate the threats to the environment and to health, stemming from landfilling or waste treatment. The agency is working on a transforming the waste sector, promoting treatments and technologies that are economically viable and ecologically acceptable.

The national policy in France on radioactive waste states that reliable, transparent and stringent management of this waste must ensure the protection of individuals, preservation of the environment and limitation of undue burdens imposed on future generations. A public agency, ANDRA (National Radioactive Waste Management Agency), has the responsibility for the long-term management of radioactive waste. This agency operates waste repositories, defines the acceptance criteria for waste in these repositories and controls the quality of their production. It also keeps a national inventory of radioactive waste in France [43].

5.2.3 Germany

Germany is a federal republic in which sixteen federal states have considerable control over environmental policy, including policies to manage hazardous waste. In the early years of hazardous waste program development, individual states were largely responsible for designing and implementing regulatory programs and determining how hazardous waste management capacity would be developed. In 1972, Germany passed a national hazardous waste law. Hazardous waste is referred to as “special waste” in Germany and its hazardous waste regulations currently name 332 types of waste belonging to the category of special waste. Nuclear waste, wastewater, military wastes, and mining wastes are regulated separately. Waste oil has additional regulations that supplement those covering special waste. According to 1993 data, Germany generates approximately nine million tons of hazardous waste annually. As of 1992, sixteen landfills and thirty-one large incinerators comprised Germany’s large-scale, commercial, off-site hazardous waste disposal capacity [8].

5.3 Asian Countries

5.3.1 India

The spirit of environmental protection expressed by the Indian Constitution is embodied in the *Water Act of 1974* and the *Air Act of 1981*. The Central Pollution Control Board (CPCB) developed the national level industry-specific standards called Minimal National Standards (MINAS) that establish a minimum level of treatment for specific industrial wastewater. This minimum level of treatment is stipulated on the basis of the annual

turnover of the industry as well as the techno-economic feasibility of the control objective.

In 1986, the *Environment Protection Act* was enacted by the Ministry of Environment and Forests (MOEF). Under this Act, the relevant sets of rules regulating hazardous wastes/chemicals include: the "Manufacture, Storage, and Import of Hazardous Chemicals Rules" (1989) that focus on requirements for preventing industrial accidents and potential hazards; and, the "Hazardous Waste Management and Handling Rules" (1989) aimed at solid and semisolid hazardous wastes generated by a variety of industries potentially producing the toxic, flammable, reactive, and corrosive wastes, in solid, sludge as well as fluid phases. The rules provide so called "cradle to grave" guidelines for generators, transporters, operators of disposal facilities, and the state governments regarding monitoring [44].

5.3.2 *China*

In October 1995, the National People's Congress adopted the Law on the Prevention and Control of Environmental Pollution by Solid Wastes. The guiding ideology and principles in making this Law reflect the tenet of the Basel Convention to minimize hazardous wastes to the greatest extent possible. The Law set down fundamental management systems, such as a system of waste registration, a permit system for dealing in hazardous waste, and a system of reporting sheets on movements of hazardous waste.

In the 1990s, China advocated cleaner production measures in several industries to reduce wastes. The policy of encouraging the comprehensive reuse of wastes helped to raise the utilization rate for solid wastes to 43 per cent. Cities are now building their own centralized disposal facilities for hazardous wastes and municipal solid wastes.

China still lags behind industrialized countries in hazardous waste management and overall environmental protection targets because of the constraints imposed by its levels of economic development, technology and management. In addition, it is clear that further human resources training is required.

China is now focusing its efforts on:

- Strengthening law enforcement
- Controlling pollution by hazardous wastes and improving their comprehensive use and disposal
- Drafting and issuing the National Program for Centralized Hazardous Wastes Disposal Sites in the Tenth Five Year Period
- Selecting priority projects for controlling solid wastes
- Using economic incentives to promote waste minimization
- Further promoting cleaner production, and
- Intensifying international cooperation and exchange of waste management information [45].

Most industrial solid wastes in China are composed of smelting slag, coal ash, coal refuses, chemical residues, tailings, and radioactive wastes. These industrial wastes cause a severe pollution problems. The annual volume of industrial solid waste is approximately 650 million tons excluding those from township enterprises that account for an additional 100 million tons. Among this waste, 115 million tons (or 17.5%) are treated. Around 20 million tons (or 3-4%) of this waste is discharged into the natural environment. Nearly 2 million tons of coal ash are discharged into rivers. Finally, around 250 millions tons are stored for further treatment. Industrial solid wastes, coal refuse, slag, and coal ash account for 50% of all industrial solid waste in China. Tailings, coal refuses and coal ash are the most substantial part of industrial waste outputs. Their average treatment rate is lower than 7%. The greatest volume of industrial waste is from Liaoning, Hebei, Shandong, Sichuan and Shanxi. These five regions account for over 40% of the nation's industrial solid waste [46].

5.4 Non-Nuclear Countries

The following are selected countries that are not nuclear power users, however their approach to hazardous waste management has been reviewed.

5.4.1 Denmark

Denmark's hazardous waste management system consists of two main features: a highly decentralized process of inspection and oversight of facilities; and a highly centralized system for collecting, transferring, treating and disposing of waste. Denmark delegates most implementation responsibilities to the country's 275 municipalities and, to some extent, its fourteen counties.

Denmark's main environmental law for controlling industrial pollution was the 1973 *Environmental Protection Act*. It was a framework law that left to the Ministry for Environment and Energy the task of developing specific rules and regulations through statutory orders. The law established a system, which is still in use, of listing individual firms, designated as "particularly polluting enterprises," that fall within certain industrial sectors. Listed companies are then subject to regulatory supervision by municipalities or counties and must comply with a standard set of requirements for their sector. Currently, the list covers sixty *industrial sectors and includes 10,000 individual enterprises*. The *Environmental Protection Act* was amended numerous times over the years until a complete revision was enacted in 1991 [8].

5.4.2 Australia

Australia's approach to hazardous waste management is outlined in the *Hazardous Waste (Regulation of Imports and Exports) Act*. The main purpose of the *Hazardous Waste Act* is to regulate the export and import of hazardous waste to ensure that it is disposed of safely, so that human beings and the environment, both within and outside Australia, are protected from the harmful effects [47].

Australia ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal on 5 February 1992 and the Convention came into force on 5 May 1992. The Hazardous Waste (Regulations of Exports and Imports) Act of 1989 was amended in 1996 to ensure that it complied fully with the provisions of the Basel Convention. The original Act of 1989 only controlled movements of wastes that lacked financial value, usually destined for final disposal operations (for example, by incineration or landfill). In 1996, the Act was amended to include wastes that possess financial value, usually destined for recycling and recovery operations.

Under the amended *Hazardous Waste Act*, exporting hazardous waste without a permit is an offence subject to a fine of up to \$1 million or imprisonment for up to five years. The Minister for the Environment can only grant a permit to export hazardous waste where it can be shown that the wastes will be managed in an environmentally sound manner in the country of import. It should be noted that no export permits have been granted for the export of hazardous waste to any developing country since the amendments to the *Hazardous Waste Act* came into force in December 1996 [48].

Australia as a non-nuclear power does not produce nuclear waste, except for a small amount of fuel from research reactors, and as such, they do not wish to become an international nuclear waste repository. Successive Australian Governments have agreed that Australia should not accept the radioactive wastes of other countries [49].

5.4.3 Malaysia

Over the last few decades, Malaysia's economy has expanded rapidly and has undergone a transition from agriculture to manufacturing. From the mid-1980s to the mid-1990s, the growth rate of Malaysia's gross domestic product (GDP) exceeded 8%. The size of the manufacturing sector has increased by 60% in ten years. These trends have made hazardous waste management one of Malaysia's most pressing environmental problems. The country began its process of developing a hazardous waste regulatory program in the early 1980s, coming out with regulations in 1989.

Hazardous waste is known in Malaysia as "scheduled waste". Regulations specify 107 categories from nonspecific and specific sources. The Department of Environment estimates that total production for 1996 was around 630,000 tons. According to 1994 statistics, over half of the waste is produced by three sectors: metal finishing (28%), textiles (15%), and industrial gas production (14%). Malaysia's basic environmental legislation is the *Environmental Quality Act* of 1974. It provides the legal basis for hazardous waste regulation in the country. In 1989, the HWM regulations were promulgated. Delays in developing the regulations were attributed to a lack of trained personnel, a lack of facilities and the difficulty in preparing schedules for toxic and hazardous wastes [8].

5.4.4 *Hong Kong*

Hong Kong uses the term “chemical waste” for hazardous waste. Substances qualifying as chemical waste are specifically noted in lists called “schedules”. Hong Kong generates approximately 100,000 tons of chemical waste per year.

The 1980 Waste Disposal Ordinance (WDO) provides the foundation for managing all of Hong Kong’s solid and chemical waste. Although studies of toxic and chemical wastes were undertaken as early as 1977, a concerted government effort to address this issue was not outlined until the publication of the 1989 white paper, “Pollution in Hong Kong: A Time to Act,” which catalyzed public attention regarding the problem. Laws defining chemical wastes and their management were passed in 1991 as amendments to the WDO. Until that time, little effort was made to prevent discharges directly to sewers and surface water. The regulations implementing the 1991 WDO Amendments were promulgated as the Waste Disposal (Chemical Waste) (General) Regulations in 1992 and have been in force since 1993. The regulatory program includes provisions for:

- Registering hazardous waste generators
- Notifying regulators about the disposal of certain chemical wastes
- Outlining adequate packaging, labeling and storage procedures for waste
- Licensing waste collection and disposal facilities
- Establishing a “trip ticket” system to track waste from production to disposal
- Making improper dumping subject to prosecution [8].

5.4.5 *Thailand*

As in Malaysia, attention to hazardous waste management in Thailand has been spurred by rapid economic and industrial growth. Between 1990 and 1995, the country’s GDP exceeded 10% growth per year. Between 1969 and 1990, the number of registered facilities generating hazardous waste increased from around 600 to 50,000 (over 50% of them in Bangkok).

It was not until 1992 that the Ministry of Industry promulgated a number of hazardous waste management announcements and regulations. The *Hazardous Substances Act (1992)* amended the *1967 Poisonous Substances Act* and is the primary law governing the manufacture, storage, transport, use and disposal of hazardous substances. According to the *Hazardous Substances Act (1992)*, “hazardous waste” includes: explosive substances, flammable substances, oxidizing agents and peroxides, toxic substances, substances causing diseases, radioactive substances, mutant-causing substances, corrosive substances, irritating substances and other substances, chemicals or otherwise, which may cause injury to persons, animals, plants, properties or environments.” The law raised penalties for violating hazardous materials rules and established strict liability for accidents involving hazardous substances [8].

6.0 CANADA'S INTERNATIONAL COMMITMENTS

Through domestic regulations, under authority of the *Canadian Environmental Protection Act 1999 (CEPA)*, Canada implements the terms of international agreements to which it is a signatory. Once Canada has ratified an agreement, through its parliamentary process, the agreement is legally binding and, for this reason, Canada would be subject to any penalties imposed by non-compliance.

Canada is a signatory to many international agreements regarding environmental protection. Only those related to hazardous waste are discussed and selected documents of relevance are included in Appendix E. The agreements in force (ratified by the Canadian government) include the following:

1. Canada-U.S.A. Agreement on the Transboundary Movement of Hazardous Wastes, 1986 (as amended in 1992)
2. United Nations Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989 (ratified by Canada in 1992)
3. Organization for Economic Cooperation and Development (OECD) Decision of Council on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations, C(92)39/Final, March 1992, Revised C (2001) 107 Version harmonized with the Basel Convention
4. Initiatives of the Radiation Protection and Radioactive Waste Management Division of the OECD Nuclear Energy Agency (NEA), 1958 and 1972
5. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention)
6. Stockholm Convention on Persistent Organic Pollutants (1998)
7. North American Agreement on Environmental Cooperation (NAFTA) (1994)

6.1 **Canada-U.S.A. Agreement on the Transboundary Movement of Hazardous Wastes, 1986**

Canada and the United States entered into a comprehensive agreement to decrease the risk to the environment and public safety during waste transportation, and to manage transboundary shipments effectively. This agreement sets out specific administrative conditions for the export, import, and transportation of hazardous waste between the two countries.

The Agreement Between the Government of Canada and the Government of the United States of America Concerning the Transboundary Movement of Hazardous Waste was signed by the Canadian Environment Minister and the U.S. Environmental Protection

Agency (EPA) Administrator on October 28, 1986, and came into effect on November 8, 1986. The Agreement ensures both that the transboundary movement of hazardous waste is handled safely and that such waste is shipped to facilities that are authorized by the importing jurisdiction.

Within the context of the Agreement, wastes are considered hazardous if defined as such by the legislation of the exporting country. In Canada, hazardous wastes are covered by the Export and Import of Hazardous Wastes Regulations (made pursuant to the *Canadian Environmental Protection Act* and the federal *Transportation of Dangerous Goods Act* and Regulations).

To achieve environmentally sound management of hazardous wastes, a number of legal, institutional and technical conditions need to be met, including:

- A regulatory and enforcement infrastructure ensures compliance with applicable regulations
- Sites or facilities must be authorized and be of an adequate standard of technology and pollution control to deal with hazardous wastes in the way proposed, and in particular, they must take into account the level of technology and pollution control in the exporting country
- Operators of sites or facilities at which hazardous wastes are managed are required, as appropriate, to monitor the effects of those activities
- Appropriate action is taken in cases where monitoring gives indications that the management of hazardous wastes has resulted in unacceptable emissions
- People involved in the management of hazardous wastes are capable and adequately trained in their capacity.

In addition, a number of activities are specified that should be carried out in this context, including:

- The identification and quantifying of the types of waste being produced nationally
- A best practice approach to avoid or minimize the generation of hazardous wastes and reduce their toxicity, such as the use of cleaner production methods or approaches
- The provision of sites or facilities authorized as environmentally sound to manage wastes, and in particular hazardous wastes.

Canada and the United States both recognize the environmental and economic advantages of minimizing (a) the distances that hazardous wastes must travel and (b) the amount of hazardous waste moved. Thus, in conformance with environmentally sound management practices, approximately 900,000 tonnes of hazardous wastes cross the Canada-U.S. border annually, on their way to *the nearest* environmentally sound recycling, treatment or disposal site. Canada and the United States amended their agreement in 1992 in support of the 1992 Organization for Economic Cooperation and Development (OECD) Decision of Council on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations [50].

The Canada – U. S. A. Agreement is also compatible with the Basel Convention, the United Nations Environment Programme and the resolutions of the London Dumping Convention.

Relevance to Nuclear Waste

Certain wastes, as a result of being radioactive, are subject to other international control systems. Nevertheless, there are parallels in these agreements and some types of waste, i.e. hazardous mixed with nuclear waste, fall under the terms of several agreements.

6.2 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989

The United Nations Basel Convention on the control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted in 1989, and entered into force in 1992. By May of 1991, Canada had ratified the Basel Convention, and at this date there are at least 150 parties to the Convention. The Convention requires environmentally sound management of hazardous waste and hazardous recyclable material, and a reduction in exports for final disposal. Wastes characterized as hazardous under Article 1, para 1(a), and those not covered by Article 1, para 1(a), are given in Annex VIII and Annex IV, respectively, of the convention.

The following are prior declarations, guidelines, recommendations, instruments and regulations adopted within the United Nations system, that represent the lead-up to the formulation of the Basel Convention:

- Declaration of the United Nations Conference on the Human Environment (Stockholm, 1972)
- Cairo Guidelines and Principles for the Environmentally Sound Management of Hazardous Wastes adopted by the Governing Council of the United Nations Environment Programme (UNEP) by decision 14/30 of 17 June 1987
- Recommendations of the United Nations Committee of Experts on the Transport of Dangerous Goods (formulated in 1957 and updated biennially).

Article 11 of the United Nations Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal allows countries to enter into bilateral/multilateral agreements or arrangements, as long as these agreements or arrangements do not derogate from environmentally sound management of wastes.

The Agreement affirms the four basic principles that both shipping and receiving countries recognize as necessary to control transboundary shipments of hazardous waste:

- Each country must adequately manage waste within its own jurisdiction
- The exporting country must give the importing country prior notice of the proposed shipment; the importing country then indicates whether it objects to the proposed shipment

- The two countries must co-operate to ensure that transboundary shipments of hazardous waste are accompanied by proper manifests, in order to verify compliance with the Agreement and with domestic regulations
- The exporting country must permit re-entry of any hazardous waste that may be returned by the importing country.

Each country must adequately manage waste within its own jurisdiction, adopting the following goals:

- Transboundary movements of hazardous wastes should be reduced to a minimum, consistent with their environmentally sound management
- Hazardous wastes should be treated and disposed of as close as possible to their source of generation
- Hazardous waste generation should be reduced and minimized at source.

Recent Developments

In December 1999, Parties to the Basel Convention adopted a Liability and Compensation Protocol to ensure compensation for victims of accidents resulting from transboundary movements of hazardous waste and their disposal [6]. The Convention now offers a partnership for corporations, non-government organizations (NGOs), foundations or government agencies, to create a tailored program for each partner and to access the expert capacity of the Secretariat, and other Parties. A priority, as agreed by the parties, is to meet the challenge of disposal of “e-waste“, including computer scrap in particular. Growing at about three times faster than the general waste stream², computer scrap contains substances³ hazardous to human health and the environment. In addition, the dismantling and handling of the end-of-life computers and containing them is hazardous work affecting the health of workers in some of the poorest countries.

The Basel Convention has a Strategic Plan, covering the period to 2010, approved by the parties at their 6th Conference in December 2002. During the next decade (2000-2010), the Convention will build on this framework by emphasizing full implementation and enforcement of treaty commitments. The other area of focus will be the minimization of hazardous waste generation.

Recognizing that the long-term solution to the stockpiling of hazardous wastes is a reduction in the generation of those wastes - both in terms of quantity and level of hazard, Ministers meeting in December of 1999 set out guidelines for the Convention’s activities during the next decade, including:

- Active promotion and use of cleaner technologies and production methods
- Further reduction of the movement of hazardous and other wastes
- The prevention and monitoring of illegal traffic

² Basel Convention Newsletter, April 2003-06-09

³ Lead, chromium, mercury, PVCs, flame retardants, barium, phosphorus, beryllium

- Improvement of institutional and technical capabilities -through technology when appropriate - especially for developing countries and countries with economies in transition
- Further development of regional and sub-regional centres for training and technology transfer.

Relevance to Nuclear Waste

International movements of nuclear waste could adopt the goals of the Basel Convention. Adapted for nuclear waste, they would be as follows:

- Transboundary movements of nuclear wastes should be reduced to a minimum consistent with their environmentally sound management
- Nuclear wastes should be treated and disposed of as close as possible to their source of generation
- Nuclear waste generation should be reduced and minimized at source

6.3 Organization for Economic Co-operation and Development (OECD)

6.3.1 OECD Decision of Council on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations, 1992

In addition to regulating hazardous waste transported domestically and between Canada and the United States and other countries, both Canada and the United States supported the 1992 Organization for Economic Co-operation and Development (OECD) Decision of Council on the Control of Transfrontier Movements of Wastes Destined for Recovery Operations. As already required under the Canada-U.S.A. Agreement, this decision requires that the country in which wastes originate provides the country to which they are being shipped with adequate and timely information on the shipment. The appropriate authorities in the country of destination then have the option of consenting or objecting to the proposed shipment. The Canada-U.S.A. Agreement takes into account this OECD decision.

Between 1984 and 1992, eight Council Acts were adopted in the OECD system, all of which formed the basis of the Basel Convention (see 4.3). However, the OECD control scheme has the purpose of preserving the ability among OECD countries of pursuing transboundary movements of recyclables. The Basel Convention aims to reduce or eliminate all transboundary movements of hazardous waste, including hazardous recyclables.

The OECD control scheme is supportive of life cycle-based product policies, whereas the Basel Convention does not address this point. Since there is a present activity with respect to the harmonization of the two agreements, including the identified substances in the lists, it is argued by the BIAC (Business and Industry Advisory Committee to the OECD) that harmonization must include critical elements such as “preserving the ability to continue transboundary movements of recyclables among OECD countries.” In order

to facilitate this, the risk-based approach of the OECD agreement must be preserved, and expedited procedures for intra-OECD trade must be retained [51].

The decision-making process in the Basel Convention is dominated by countries with little or no economic, social or environmental stake in recyclables. The OECD system classifies wastes based on risk factors (whereas the Basel system classifies wastes on consideration of intrinsic hazard). Risk assessment is carried out on the basis of complete information about a given waste, the conditions under which it is handled and transported and the value of the material to be recycled. The OECD view is that the more valuable the material, the less chance of its being lost or dumped during transit. Decisions about the degree of risk that a given shipment poses are based on a thorough consideration of all the various factors involved. For instance, a certain waste might be intrinsically very dangerous, but the arrangements for handling could require stringent safety measures, thus making the risk very low because the probability of an environmental accident would be very small. A less dangerous waste might be shipped in large quantities or under less stringent conditions, thus actually increasing the environmental risk, when compared with the intrinsically dangerous material. This type of risk assessment is a key tool used for the OECD control system. This is a good approach and could be applied generally to hazardous and radioactive wastes.

Relevance to Nuclear Waste

Wherever a nuclear waste is potentially recyclable, and thus has a potentially high value, the OECD control system for transfrontier movement of wastes is a more appropriate model to use as a starting point. For example, if and when recycling of nuclear fuel rods is established, it is likely to involve significant capital expense and thus several countries would utilize the facility. Thus, the OECD view on stringent safety protection for an intrinsically hazardous (valuable) material would be applicable.

6.3.2 Initiatives of the Radiation Protection and Radioactive Waste Management Division of the OECD Nuclear Energy Agency (NEA), 1958 and 1972

The NEA membership consists of 28 OECD member countries, including Canada. For its members, the NEA maintains information on the scientific, technological and legal basis for the peaceful use of nuclear energy. It develops authoritative understandings on key issues, consensus statements, and state-of-the-art reports, as input to government decisions on nuclear energy policy. NEA works closely with the International Atomic Energy Agency (IAEA), with which it has a cooperation agreement.

6.4 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (London Convention)

The International Maritime Organization (IMO) is the repository for conventions relating to marine safety, prevention of marine pollution and liability and compensation, especially in relation to damage caused by pollution. The IMO was established by United Nations in 1958.

The purposes of the Organization, as summarized by Article 1(a) of the Convention, are "to provide machinery for cooperation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade; to encourage and facilitate the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships". The Organization is also empowered to deal with administrative and legal matters related to these purposes.

The IMO itself, although responsible for secretariat duties, has no power to enforce conventions, but the 162 Contracting States have carefully defined powers of enforcement, e.g. in case of accidents on the high seas if there is a grave risk of oil pollution occurring. Generally, the flag State is primarily responsible for enforcing conventions as far as its own ships and their personnel are concerned. The IMO works internally and convenes conferences with member states for the purpose of drafting and adopting new conventions that then becoming binding on individual Governments that have ratified it. The "foundation" convention developed by IMO is the International Convention for the Safety of Life at Sea (SOLAS). This Convention incorporates a procedure involving "tacit acceptance" of amendments by States. The time-frame for drawing up, adopting, ratifying, and subsequently amending the IMO Conventions has typically been long, e.g. five years. The inclusion of an amendment procedure in SOLAS 1974 has streamlined the process.

The London Convention (adopted 1972, came into force 1975) on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the London Convention) is a key example of IMO conventions on marine pollution. The IMO conventions for marine pollution and the list for liability and compensation are as follows:

Marine pollution

- International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto
- International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972
- International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990
- Protocol on Preparedness, Response and Co-operation to pollution Incidents by Hazardous and Noxious Substances, 2000
- International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001

Liability and compensation

- International Convention on Civil Liability for Oil Pollution Damage, 1969

- International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971
- Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material, 1971
- Athens Convention relating to the Carriage of Passengers and their Luggage by Sea, 1974
- Convention on Limitation of Liability for Maritime Claims, 1976
- International Convention on Liability and Compensation for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea, 1996
- International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001

The London Convention

The London Convention addresses the international control and prevention of marine pollution. It prohibits the dumping of certain hazardous materials, requires (1) a prior special permit for the dumping of a number of other identified materials and (2) a prior general permit for other wastes or matter. These two types of materials and waste are described in Appendix E, reproducing excerpts from Annexes I, II and III of the London Convention.

"Dumping" has been defined as the deliberate disposal at sea of wastes or other matter from vessels, aircraft, platforms or other man-made structures, as well as the deliberate disposal of these vessels or platforms themselves.

Wastes derived from the exploration and exploitation of sea-bed mineral resources are excluded from the definition.

A much more restrictive convention has now replaced the London Convention, 1972. It is known as the 1996 Protocol. Article 3 of the 1996 Protocol introduces the "precautionary approach", which is an important innovation. This requires that "appropriate preventative measures are taken when there is reason to believe that wastes or other matter introduced into the marine environment are likely to cause harm even when there is no conclusive evidence to prove a causal relation between inputs and their effects." The 1996 Protocol specifically prohibits incineration at sea. Article 3 also states the principle that the polluter should bear the cost of the pollution.

Relevance to Nuclear Waste

The London Convention, 1972 and the 1996 Protocol are the only international agreements examined here that specifically address material that may be nuclear waste. The parties to the convention pledge to protect the marine environment against pollution caused by radioactive waste, and such waste is included on the "black list" of materials that are forbidden to be dumped. The type of materials that have, historically, been dumped at sea have an overlap with the nuclear materials that are contaminated by way of their radioactivity but could otherwise be classified as waste of the type described in as

“industrial waste” meaning “ waste materials generated by manufacturing or processing operations.” Such wastes are often in the form of solids or sludges.

Another expressed intention of the IMO conventions is that the polluter should bear the cost, as is required for nuclear waste under the auspices of the NWMO. An administrative procedure of the IMO conventions that would be worth examining for nuclear waste issues is the process of incorporating amendments to agreements, which was cumbersome but is now manageable, so that the time between proposed amendment and ratification is greatly decreased.

One of the IMO Conventions on liability directly addresses nuclear material, namely the Convention Relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material, 1971. This convention came into force in a record 180 days because the requirements were not complex and therefore agreement could be obtained relatively quickly from the Contracting States.

6.5 Stockholm Convention on Persistent Organic Pollutants

The Stockholm Convention on Persistent Organic Pollutants (POPs) – referred to as the Stockholm Convention, was negotiated under the United Nations Environment Programme (UNEP) by nations around the world. The Convention targets an initial list of twelve POPs, known as the “dirty dozen”. The initial list of POPs is separated into three broad categories:

- Industrial Chemicals – PCBs, hexachlorobenzene
- By-Products and Contaminants – dioxins and furans
- Pesticides – DDT, chlordane, toxaphene, mirex, aldrin, deildrin, endrin, heptachlor.

International negotiations to reduce and/or eliminate the release of the twelve POPs on a global scale began in 1998. The fifth and final negotiating session took place in Johannesburg, South Africa in December 2000. The Convention will “Enter into Force” once fifty countries have ratified it, a process that is expected to take three to four years.

The Stockholm Convention sets out obligations for countries covering the production, use, import, export, release and disposal of POPs. It requires countries to promote, and in some instances, to implement the best available technologies and practices for emissions of POPs from industrial processes. The Convention provides a process for adding other POPs to the agreement in the future. It also includes provisions aimed at preventing the development of new POPs [52].

6.6 North American Agreement on Environmental Cooperation (NAAEC)

The North American Agreement on Environmental Cooperation (NAAEC) is the environmental side agreement to the North American Free Trade Agreement (NAFTA).

The NAAEC came into effect at the same time as the NAFTA in 1994, and was signed by Canada, Mexico and the United States. The Agreement imposes obligations on parties to effectively enforce laws; to pursue avenues of cooperation to this end; to effect specified private enforcement rights and opportunities; and to provide an annual public report on the enforcement of environment laws. It has created the framework to better conserve, protect and enhance the North American environment through cooperation and effective enforcement of environmental laws [53].

The Agreement also provided for the creation of the North American Commission for Environmental Cooperation (CEC). CEC is an international organization created by Canada, Mexico and the United States under the NAFTA. It was established to address regional environmental concerns, help prevent potential trade and environmental conflicts, and to promote the effective enforcement of environmental law [54].

In 1995, the law and policy program of the CEC initiated an ongoing project for enhancing regional cooperation for improved tracking and enforcement of North American Laws regulating the transboundary movement of hazardous wastes and chlorofluorocarbons (CFCs) [55].

The Land Transportation Standards Subcommittee (LTSS) is a subcommittee of the Committee on Standards-Related Measures and was expressly authorized by NAFTA to make compatible the Parties' relevant standards-related measures on bus, truck and rail operations, including the transportation of dangerous goods. The three countries have substantially "harmonized" regulations regarding hazardous materials transport although significant challenges remain, notably Mexico's continued implementation of standards related to "1993 Regulations for Domestic Transport of Hazardous Wastes and Materials." [55]

7.0 CONCLUSIONS

This background paper is a collection of information from diverse sources for the purpose of presenting a review of legal and administrative arrangements for hazardous waste management for Canada and internationally.

Our findings are that provincial regulations across Canada are essentially the same. The administrative arrangements differ slightly, but provide essentially similar protection across the country. The role of the Canadian Council of Ministers of the Environment (CCME) has been vital in obtaining this harmonization. Although there is an attempt to harmonize regulatory requirements, it still remains difficult to obtain accurate and consistent information across the country in terms of the total amount of hazardous waste generated. While some legislation requires firms to record and report certain hazardous waste volumes to provincial and federal governments, a complete summary of this information is not available in the public domain. There are some exceptions to this, such as the release of chemicals to air, land, and water, which are reported annually in the National Pollutant Release Inventory (NPRI), the inventory of PCBs in federal and non-

federal storage sites, the amount of common air pollutants in the atmosphere each year, and greenhouse gas emissions [24].

For developed countries, legal and administrative arrangements essentially parallel those in effect in Canada, although the terminology may differ considerably. For example the hazardous waste manifest is given different names in different jurisdictions. Developing countries such as Thailand are making serious efforts at achieving environmental protection to the same standards as western countries. Countries in transition such as India and China are doing the same. The capability of these countries with respect to enforcement is not entirely known, although, it has been reported by the United Nations Institute for New Technologies (INTECH) that there are some common problems with environmental law enforcement in developing countries. These include: lack of technical knowledge and funds; corruption; and low deterrent effect of sanctions [56].

It takes time - ten to fifteen years, historically - for a country to develop a mature set of legal and administrative arrangements for hazardous waste. The handling of nuclear waste would be anticipated to be more of a challenge given the social and environment implications that it may entail. Therefore developing a satisfactory system for short and long term storage, transporting, recycle of valuable materials in all countries will take a period of years, even when full attention is given to the work.

The list of substances to be controlled - namely CEPA toxics, and NPRI pollutants are essentially a “moving target”, as the lists are increased every year. A parallel activity for nuclear waste would be that some nuclear-related material may be expected to be re-classified into more stringent control. Materials not presently under control may become controlled.

There are a number of international agreements regarding hazardous waste that Canada is signatory to. Generally the agreements are complementary in their content, but there is also some overlap. Therefore, some efforts are ongoing regarding harmonization, e.g. the OECD and the Basel Convention. There is also a patchwork of member countries because some countries that have signed the agreements have not yet ratified them. The member lists of the agreements discussed have grown considerably since the first promulgation with the first set of members. For hazardous waste, there is no equivalent organization such as the International Atomic Energy Agency (IAEA) that is a focus for scientific and technical support.

The need for involvement of all stakeholders, i.e. civil society, groups such as the aboriginal community, has existed during the entire period of development of the hazardous waste management system. The present is an era of increasing public awareness (and protest). As nuclear waste is a sensitive issue with the public, involving both actual environmental problems and perceptions that may be derived from unreliable sources, consideration should be given to public accessibility to all information available to NWMO and deliberate plans for early public involvement.

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APPENDICES (Bound Separately)

Appendix A - Hazardous Waste Classes from Transportation of Dangerous Goods Regulations

Appendix B - A Guide to the Canadian Environmental Protection Act, 1999

Appendix C - Excerpts from Selected Provincial and Territorial Acts and Regulations

- BC – Special Waste Regulation Review – Discussion Paper
- AB – Waste Control Regulation (AR 129/93)
- SK – Environmental Management and Protection Act, 2002 – Fact Sheet
- SK – The Hazardous Substances and Waste Dangerous Goods Regulations
- MB – Dangerous Goods Handling and Transportation Regulation (55/2003)
- ON – Regulation 347 – General – Waste Management
- PQ – Hazardous Materials – Regulation Highlights
- NB – Regulation 88-221 under the Occupational Health and Safety Act
- NS – Dangerous Goods Management Regulations
- PEI – Environmental Protection Act
- NFLD – Guide to the Environmental Protection Act
- YK – Special Waste Regulations
- NWT – Guideline for the General Management of Hazardous Waste in the NWT
- NU – Consolidation of Environmental Protection Act

Appendix D - Excerpts from Selected International Acts and Regulations

- United States – Resource Conservation and Recovery Act (Summary)
- European Union – Council Directive 91/689/EEC of December 1991 on Hazardous Waste
- Britain – A Guide to the Special Waste Regulations 1996 (as amended)
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- Conversation with Xie Zhenhua, Minister of the State Environmental Protection Administration, China

Appendix E – Excerpts from Selected International Agreements

- Basel Convention – Annex VIII and IX
- Annexes I, II and III of the London Convention