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Criteria for the Selection of Substances for Virtual Elimination. Final Report of the Ad Hoc Science Group on Criteria

Canada. Department of the Environment. Ad Hoc Science Group on Criteria

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FINAL REPORT
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15 Septembre 1994

A companion document to
'Towards a Toxic Substances Management Policy for Canada',
a discussion document prepared by Environment Canada

Aussi disponible en français

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1.0 INTRODUCTION

In the document "Towards a Toxic Substances Management Policy for Canada", the federal government is proposing a framework for action on substances of concern in the environment to ensure the protection of the environment and human health. This central objective is supported by two key goals: to virtually eliminate from the environment, substances that are predominantly anthropogenic, persistent, bioaccumulative and toxic; and to implement full life-cycle (cradle-to-grave) management of all other substances of concern. In support of the proposed Policy, an *ad hoc* group of government scientists (Appendix I) was requested to recommend science-based criteria for the identification of substances that would be considered for virtual elimination from the environment. The criteria would identify toxic, predominantly anthropogenic substances that are persistent and bioaccumulative, *i.e.* those substances which have the greatest impact on the health of ecosystems, including humans.

This report forms the basis for further stakeholder discussions on the proposed criteria for the selection of substances for virtual elimination from the environment. The report outlines the chosen criteria and summarizes the recommendations on the proposed cut-off values for bioaccumulation and persistence.

Specific cut-off values for Toxicity are not addressed in this document since the Policy proposes that substances must be "CEPA-toxic" or "CEPA-toxic Equivalent". Similarly, the "predominantly anthropogenic" criteria will be addressed on a substance by substance basis, therefore, specific cut-off values for this criteria are not addressed in this document.

2.0 DEFINITIONS

Persistence

Persistence is a parameter that cannot be measured independently of the medium. It is commonly presented as the half-life, $T_{1/2}$, (i.e., the time that it takes 50% of the material to degrade through chemical, biochemical and photochemical processes) of the chemical in the reported medium. Transport and dilution through the medium should not be included. For the purposes of the policy, persistence refers to breakdown of the chemical rather than removal by these advective processes.

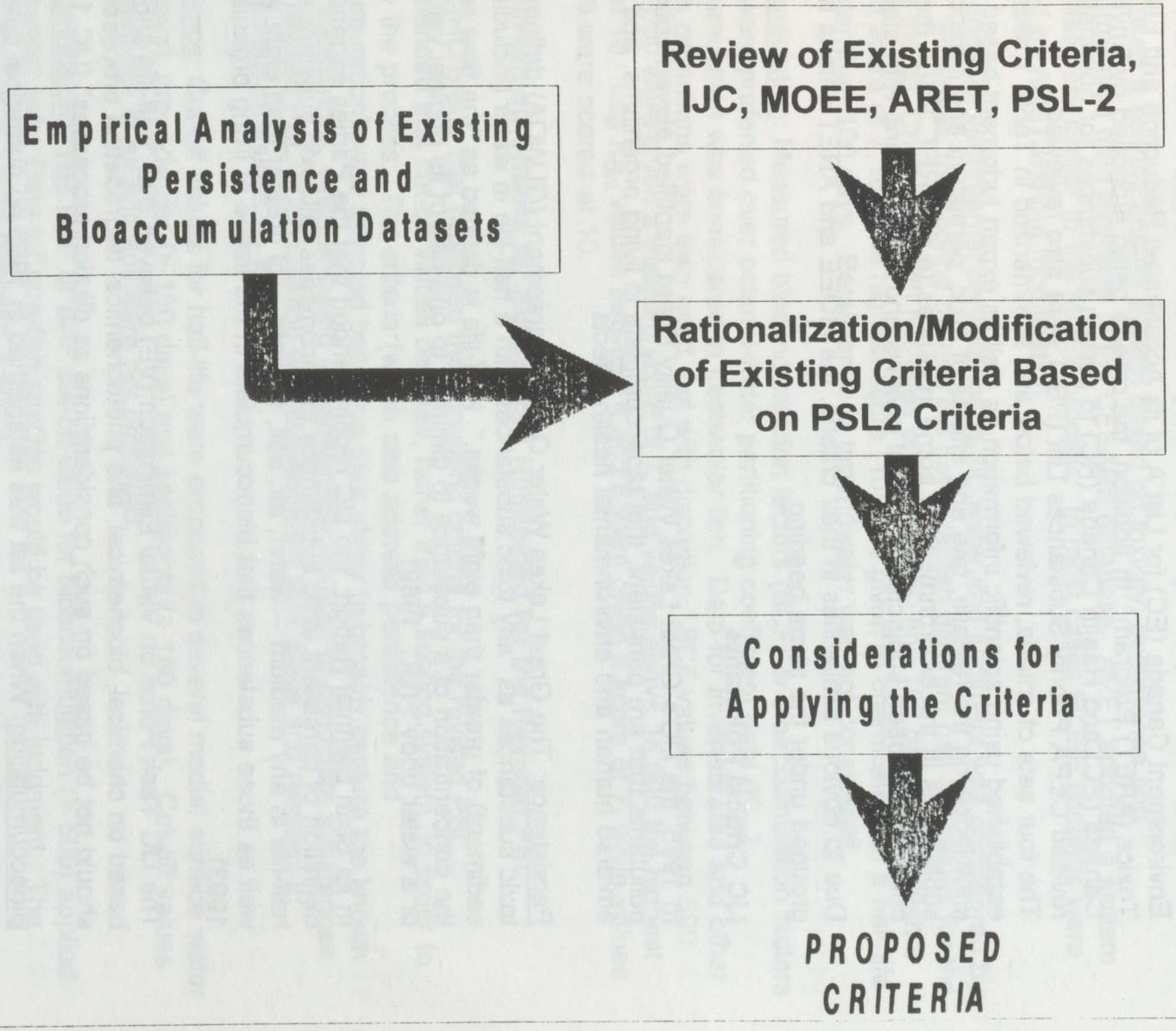
Persistence in groundwater represents a very special case. This medium is occasionally anaerobic and degradation under these situations is usually very much slower than in other media where, for the most part, aerobic conditions prevail. Because groundwater conditions vary significantly from the other environmental media and are so site-specific, a criterion for persistence in groundwater is not proposed here.

Bioaccumulation

Bioaccumulation is a general term describing accumulation of chemical substances by organisms directly from the surrounding media and indirectly through the ingestion of food. The potential for a substance to bioaccumulate can be expressed in terms of the bioaccumulation factor (BAF), the bioconcentration factor (BCF) or the octanol-water partition coefficient (K_{ow}) (applicable to organic substances). The BCF is a comparison (ratio) of the concentrations observed in biota with concentrations in the medium to which it is exposed in a steady-state relationship. BCFs are usually calculated in controlled laboratory tests where the intake in the biota (usually fish) is derived from dissolved chemicals in the medium. When the ratio is derived from accumulation through both the medium and the food chain, it is called the bioaccumulation factor (BAF). BAFs are often calculated from field data. Both the IJC's Virtual Elimination Task Force and the UN-ECE Task Force on Persistent Organic Pollutants acknowledge that BAFs are preferable to BCFs, although BCFs are frequently used due to availability of information. Both BAF and BCF are technically difficult to measure and calculated values are often highly variable even within the same organism.

Figure 1:Criteria for Persistence and Bioaccumulation

Overview of Activities



3.0 REVIEW OF EXISTING CRITERIA FOR PERSISTENCE AND BIOACCUMULATION

To establish criteria for persistence and bioaccumulation three sets of existing criteria and their accompanying lists of substances, referencing persistence and bioaccumulation, were critically reviewed. These were developed by the International Joint Commission (IJC) for its Critical Pollutants List; the Ministry of Environment and Energy for Ontario (MOEE) for its Primary List for Bans and Phase-outs; and Environment Canada (EC) for List A of its Accelerated Reduction and Elimination of Toxics (ARET) Program. In addition, the criteria being proposed by Environment Canada (EC) and Health Canada (HC) to screen substances for nomination to the revised CEPA Priority Substances List (PSL) were also reviewed.
The four sets of criteria, reviewed below and summarized in Table 1, were established using scientific information as well as expert judgment based on available knowledge on the release, fate and effects of toxic, persistent and bioaccumulative substances in the environment. In some instances (e.g., ARET, PSL), the sets of criteria have been subjected to critical reviews and consultations with stakeholders.

Due to obvious similarities in their criteria, the MOEE and ARET criteria have been grouped under the same heading.

IJC Critical Pollutants

In 1985, the IJC's Great Lakes Water Quality Board identified eleven critical pollutants that are persistent, that bioaccumulate in living organisms, and cause adverse human and environmental health effects.

Persistence: The Great Lakes Water Quality Agreement (GLWQA) defines persistent toxic substances as "any toxic substances with a half-life in water (including sediment) of greater than eight weeks." Half-life is defined as "the time required for the concentration of a substance to diminish to one-half of its original value in a lake or a water body". (IJC, 1989)

In its Sixth Biennial Report, the IJC recommended that the Parties expand the definition of persistent toxic substances to encompass "all toxic substances with a half-life in any medium -- water, air, soil, or biota -- of greater than eight weeks, as well as those substances that bioaccumulate in the tissue of living organisms" (IJC 1993).

The IJC Task Force on Virtual Elimination (VE) believed that "half-life should be based on chemical, biochemical, and photochemical degradation processes and should not be based on such considerations as dilution processes" (IJC 1993).

Bioaccumulation: When the list was established in 1985 no numerical criterion for bioaccumulation was used. There was also none to be found in the GLWQA. In 1993, the IJC VE Task Force recommended the use of the bioaccumulation factor

(BAF) rather than the bioconcentration factor (BCF) because the BAF takes into account the accumulation through the food chain. Although the Task Force recognized that BAF scoring is relatively arbitrary, it indicated that chemicals that pose a hazard to biota generally have a BAF above 1,000. A chemical with a BAF above 5,000 is considered to be of high concern (IJC 1993).

MOEE Primary List for Bans and Phase-Outs and ARET List A

MOEE used a scoring criteria system based on toxicity, persistence and bioaccumulation data available in the CESARS database. ARET adopted a system which was very similar to the MOEE process. In most cases MOEE scorings were adopted by ARET without modification.

Persistence: Environmental persistence in air, water and sediment was considered by MOEE. However, the scoring system did not establish different half-life values for the various media. Chemicals with half-lives of between 50 and 100 days were given a medium score of 7, and the highest score (10) was given to chemicals with a half-life of greater than 100 days. Persistence in groundwater was not considered.

Bioaccumulation: Measured bioconcentration factors (BCF) or bioaccumulation factors (BAF) were preferred over octanol-water partitioning coefficient data (K_{ow}). Bioaccumulation was considered in freshwater fish. Data for invertebrates and other non-fish organisms were also used, but with discretion. BCF values between 500 and 15,000 were given a medium score of 7, and values above 15,000 the highest score of 10. Log K_{ow} values between 4 and 6 were given a score of 7, while values above 6 were scored at 10.

Draft Screening Criteria for Substances Nominated for the Revised PSL

The EC/HC group that proposed the screening criteria for the revised PSL recommended that cut-off values be used, rather than a scoring system, in order to simplify the process. The criteria (which also address persistence and bioaccumulation) were selected based on their ability to broadly capture the known priority substances, while ensuring a manageable number of candidate substances for the revised PSL. Consultation with stakeholders took place and resulted in proposed cut-off values as follows.

Persistence: Cut-off values for half-life were proposed in several media: surface water (> 50 days), groundwater (> 100 days) and sediments (> 180 days). Cut-off values for persistence in air and soil were not proposed.

Bioaccumulation: The BCF or BAF cut-off value for bioaccumulation (> 500) applied to freshwater fish. Data for non-fish species would be used with judgment. The criterion for Log K_{ow} was between 3 and 7.

4.0 SELECTION OF CRITERIA AND CUT-OFF VALUES FOR PERSISTENCE AND BIOACCUMULATION

Over the past twenty years, there has been much debate on the meaning of persistence and bioaccumulation. Similarly, there has been a lack of universal agreement on the criteria that can be used to identify substances presenting unacceptable environmental risks. The scientific reality is that numerical cut-off values all contain a certain degree of judgement. Nevertheless, they reflect a learned judgment based on data, scientific evaluation and expertise.

As previously stated, the criteria for persistence and bioaccumulation were derived from four sets of criteria developed for freshwater ecosystems by the IJC, MOEE, and EC (ARET and PSL) and summarized in Table 1. Since these criteria were developed for purposes other than virtual elimination from the environment, the existing criteria were modified to reflect the objectives of the proposed Toxic Substances Management Policy. The modifications were made based on the best available scientific knowledge.

Persistence and bioaccumulation data were compiled for the 68 substances identified on the IJC Critical Pollutants List, MOEE Primary List for Bans and Phase-outs, ARET List A, and those PSL substances found to be "toxic" (see Appendix II). Most of the data were taken from MOE (1992) and are properly referenced in that document. From this data set, a variety of empirical analyses were performed in an attempt to identify appropriate "cut-off" values. Of the 68 substances or groups of substances, 37 were considered to be synthetic while 31 could be considered naturally-occurring, of which 8 are elements. The portion of this data set dealing with synthetic substances, or naturally occurring substances that have predominantly anthropogenic sources, was used to test a variety of criteria combinations to determine their selectivity with respect to known highly persistent and bioaccumulative toxic substances. The flow of activities is shown schematically in Figure 1.

Using the draft PSL screening criteria as a starting point, the data for the 37 synthetic substances were gauged against several sets of cut-off values. This process led to the selection of a set of criteria believed to be most supportive of the Policy, i.e., one that would capture the most persistent and bioaccumulative of the toxic substances considered, and would result in a realistic number of substances being addressed under the Policy.

Persistence

The IJC used a half-life of eight weeks (56 days) to define persistence in water which also included sediments while MOEE/ARET gave high scores (7+) to all media where the substances' half-lives exceeded 50 days. The proposed criteria for revising the PSL addressed various sub-compartments of the aquatic environment with cut-off values ranging from 50 to 180 days. Examination of the data available for the

compounds on these different lists indicated that further, more limiting, criteria were needed to select the substances that are generally recognized as being highly persistent.

The following observations were made for the data set pertaining to persistence (Appendix II):

1) persistence data, expressed as half-lives, were predominantly available for air and surface waters;
2) the reported half-lives focused on transformation, not movement between media nor dilution; and
3) for some substances, wide ranges of half-lives within the same media are apparent.

Histograms for each environmental medium were developed from the persistence data set, and data were tested against a variety of cut-off values. A clustering of substances at certain cut-offs generally recognized as being highly persistent was evident (Appendix IV). The manipulation of the data set revealed that persistence is media dependent and that criteria must therefore be developed for <u>each</u> medium.

Direct application of draft PSL screening criteria and IJC criteria screened in 25% and 35% respectively of the group of synthetic substances. The draft PSL criteria were modified for <u>each</u> medium. Values for soil and air[1] were added. Half-lives for defining persistence should be those based on studies done in relevant environments. The number of substances screened in by these changes was increased to 19. Longer half-life values were considered. It reduced the number of substances substantially, however, known persistent and bioaccumulative substances were left out. Ultimately, the recommended values were based on the group's consensus. Although air is often not a direct source of exposure for terrestrial organisms, persistence in air was retained as a criterion because it is a good indicator of the potential for long-range transport and for ecosystem contamination in remote areas.

Recommended values for defining persistence are:

<u>Any one</u> of the following:	**Air $T_{1/2} \geq 5$ days**
	Surface water $T_{1/2} \geq 6$ months
	Sediments $T_{1/2} \geq 2$ years
	Soil $T_{1/2} \geq 6$ months

[1] IJC and PSL2 criteria for persistence do not take into account the various environmental media (e.g., air, water, sediment, soil). IJC criteria consider only water, while PSL2 criteria consider water and sediments.

Bioaccumulation

There is no level of bioaccumulation that, *a priori*, is hazardous. The consensus opinion is, however, that in the case of freshwater fish, substances with BCFs greater than 500 are considered "accumulating", while those in excess of 5000 are considered highly accumulating. There is no consensus on BCF values that would be appropriate for organisms at lower trophic levels than fish.

When BAF or BCF values for a substance are not available, the logarithm of the substance's octanol-water partition coefficient (log K_{ow}) may be used to estimate the bioaccumulation potential. It is generally accepted that a log K_{ow} value of approximately 5 corresponds to a BCF for fish of 5000. Substances with estimated log K_{ow} values above 7 should be used with caution as these substances may not accumulate at levels predicted from K_{ow} relationships.

Bioaccumulation data were available for 51 of the 68 (77%) substances appearing in Appendix II. The following observations were made on the data set:

1) The data predominantly pertain to freshwater fish, although there are some data on aquatic freshwater invertebrates and microorganisms;
2) No terrestrial (vertebrate or invertebrate) BAF or BCF data were identified in the primary reference source (MOEE), as only freshwater ecosystems were targeted;
3) The data show wide ranges of BAFs or BCFs for some substances within the same species.

The use of the draft PSL cut-off (BAF or BCF $\geq$ 500) resulted in the selection of 65% of the synthetic substances as potential candidates for virtual elimination. A higher value (BAF or BCF $\geq$ 5,000) decreased the percentage screened in to 45%. With further increase in the value of the cut-off (i.e., BAF or BCF $\geq$ 50,000), the percentage of substances was reduced significantly, with well known highly persistent and bioaccumulative substances being left out. Further debate in the 5,000-15,000 range favoured setting the cut-off value at 5,000 in order to capture the most bioaccumulative substances.

Criteria recommended for bioaccumulation are based preferably on the BAF or BCF values, or in their absence, the log octanol-water partition coefficient (log K_{ow}), with the following numerical cut-offs:

BAF (or BCF) $\geq$ 5000	**Preferably in freshwater fish. Data for other non-fish biota can be used with discretion, especially in cases where other biota are more relevant (e.g., algae or macrophytes whenever the substance is a herbicide). BAFs or BCFs calculated on the basis of whole body weight or tissue representing a significant proportion of the whole body weight are preferable to those**

	calculated on the basis of metabolic or excretory organs.
Log K_{ow} ≥ 5	**note that log K_{ow} values above 7 should be used cautiously**

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APPENDIX I

ad hoc Science Group

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APPENDIX II

Data Summary for Substances Studied

CANDIDATE SUBSTANCE	PERSISTENCE				BIOACCUMULATION			log K_{ow}
	Media (days)				Trophic Level (BCF)			
	Air	Water	Sediments	Soil	Micro-org	Invert. (aqu)	Vert. (aqu)	
Cadmium and compounds	1-4	pers	pers	pers	329-23,000	6463-17,600	100-1760	n/a
Chlordane	<<1	7.6 yrs (GW)		>20 yrs			100-37,800	3.32-6.0
Chlorinated paraffins	1						1-139,000	5-12
Chlorinated wastewater effluents		<1-3					269-12,000	n/a
bis(Chloromethyl) ether	<2.9	<<1						
Chloromethyl methyl ether	<3.9	<<1						
Chromium and compounds	1-4	pers	pers	pers	1-120,000	>1	>1	n/a
Creosote impregnated waste materials								n/a
DDT (+DDD+DDE)	2.96	4380	1100 d-190 yrs	15-190 yrs	9350-12,000	14,125-47,863	933-363,000	6.19-7.0
Dichloromethane	30-730	704 yrs (GW)					0.8-2.3	1.25
Dieldrin	175-1095	>1460		175-1095		1585-5012	77,000	4.55-6.2

CANDIDATE SUBSTANCE	PERSISTENCE				BIOACCUMULATION			log K_{ow}
	Media (days)				Trophic Level (BCF)			
	Air	Water	Sediments	Soil	Micro-org	Invert. (aqu)	Vert. (aqu)	
Mirex			>600 yrs	>600 yrs			7300-28,000	5.83
Nickel and compounds	1-4	pers	pers	pers	1-100,000	2000-4500	200-300	n/a
Octachlorostyrene	17						33,000	
PAHs								
1,6-Dinitropyrene								
1,8-Dinitropyrene								
Acenaphtene								4.33
Anthracene	<<1	<1	115.5	50-455		1800-9096	480-910	4.45-4.54
Benzo[a]pyrene	<<1	<1	90d-58 yrs	57-550		10,109	479-2657	5.97-6.34
Benzo[e]pyrene			292			25,200		
Benzo[ghi]perylene	<<1		292	590-650			6816	6.58
Benz[a]anthracene	<<1	<1	292	102-700			347-10,000	5.66
Benzo[b]fluoranthene	<<1	<1-30	292	365-600		10,000		6.12

CANDIDATE SUBSTANCE	PERSISTENCE				BIOACCUMULATION			log K_{ow}
	Media (days)				Trophic Level (BCF)			
	Air	Water	Sediments	Soil	Micro-org	Invert. (aqu)	Vert. (aqu)	
Benzo[j]fluoranthene			292					6.2
Benzo[k]fluoranthene	<<1	2.49-20	292	910-2140		13,225		6.12
Chrysene	<<1	<1	292	365-900		6088		5.66
Dibenz[a,h]anthracene	<<1			361-420			45,000-115,000	6.5
Dibenzo[a,i]pyrene	<<1	950-1460	292	232-361				7.29
Dibenz[a,j]acridine			292					
7H-dibenzo[c,g]carbazole			292					
Fluoranthene	<1						6000	4.95
Fluorene								4.18
Indeno[1,2,3-c,d]pyrene	<<1	125-250	292	650-730				6.58-7.66
Naphthalene	<1	<<1	>3-129	2.1-2.2		131	300-425	3.30-3.37
Perylene			292				112	6.06
Phenanthrene	<1	69		16-200			1778-5225	4.46-4.57

CANDIDATE SUBSTANCE	PERSISTENCE				BIOACCUMULATION			log K_{ow}
	Media (days)				Trophic Level (BCF)			
	Air	Water	Sediments	Soil	Micro-org	Invert. (aqu)	Vert. (aqu)	
Pyrene	<<1	200-2000	292	210-2000		2702	4000-6000	4.88-5.18
Pentachlorophenol	1	<1	42-1500	7-30	1250		251-5370	5.12
Polychlorinated biphenyls							1076-200,000	4.11-6.03
Polychlorinated dibenzo-p-dioxins	<1	380-500	>365	10 yrs			240-26,000	6.15-7.28 (2,3,7,8-)
Polychlorinated dibenzofurans	<1	380-500	>365	10 yrs			240-26,000	5.82 (2,3,7,8-)
Tetrachloroethylene	27-58						49-61.5	2.6-3.4
Toxaphene	4-5	20 yrs		20 yrs			100,000	4.68-4.82
Tributyltin		730	>200	105-140			257-5020	3.7
Trichloroethylene	1-60	<12-28					<3-100	2.29-2.42
Trifluralin	<<1			42-190		20-1250	240-3261	5.28-5.38

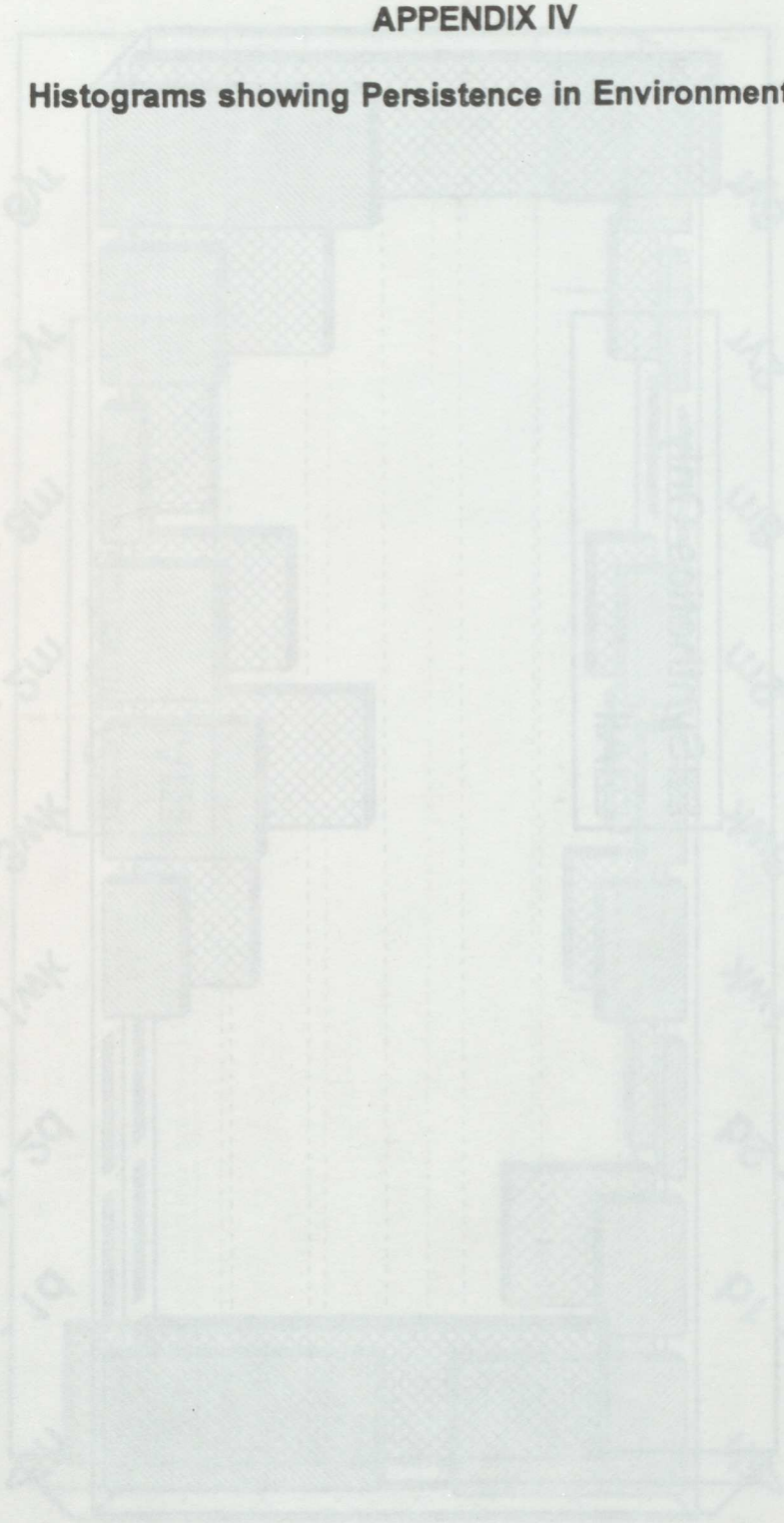
APPENDIX III

Abbreviations

ARET	Accelerated Reduction/Elimination of Toxics
BAF	Bioaccumulation Factor
BCF	Bioconcentration factor
CEPA	Canadian Environmental Protection Act
CESARS	Chemical Evaluation Search and Retrieval System
GLWQA	Great Lakes Water Quality Agreement
IJC	International Joint Commission
$\log K_{ow}$	Octanol-Water Partition Coefficient
MOEE	Ontario Ministry of Environment and Energy
PSL	Priority Substances List
$T_{1/2}$	Half-life
UN-ECE	United Nations Economic Commission for Europe
VE	Virtual Elimination

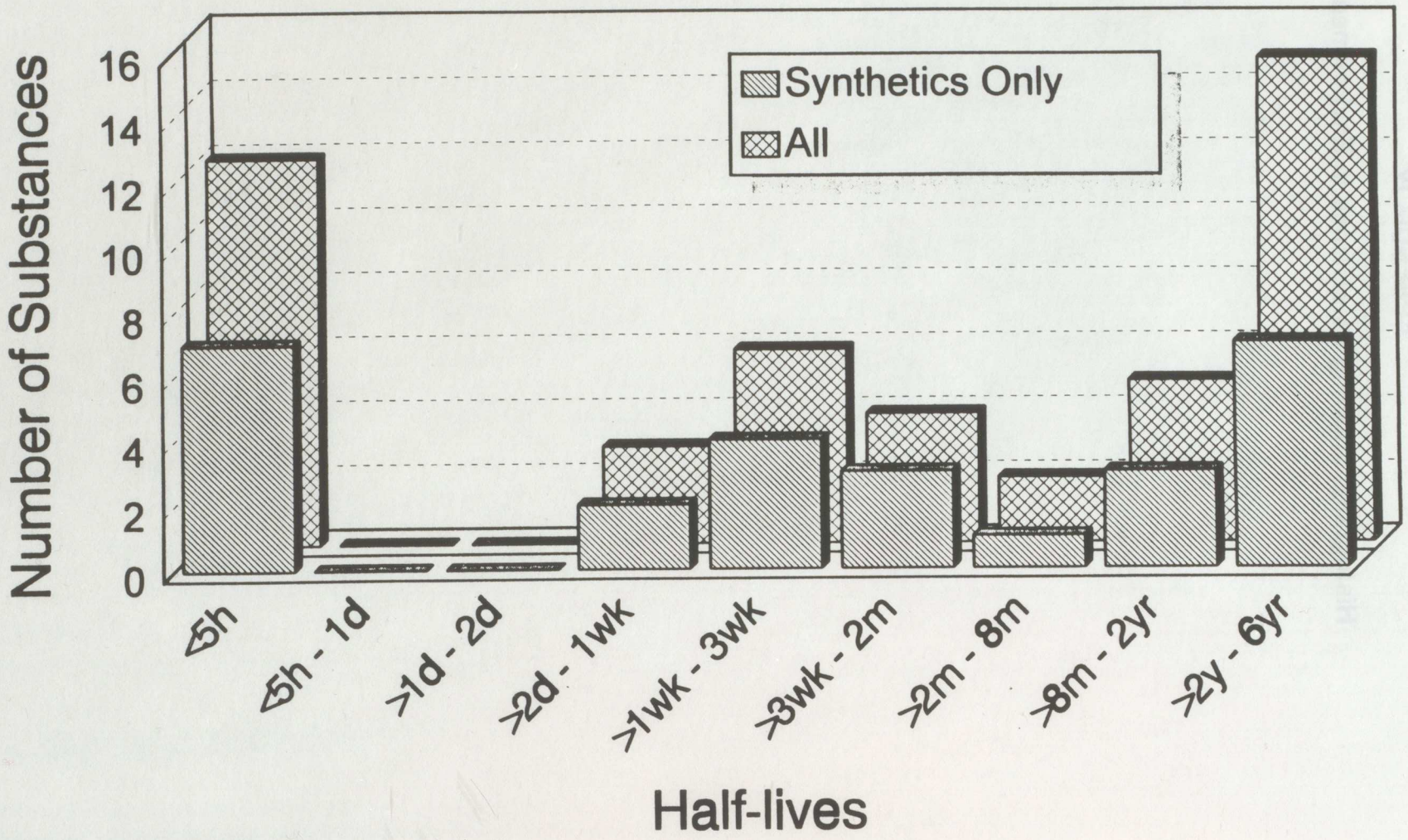
APPENDIX IV

Histograms showing Persistence in Environmental Media



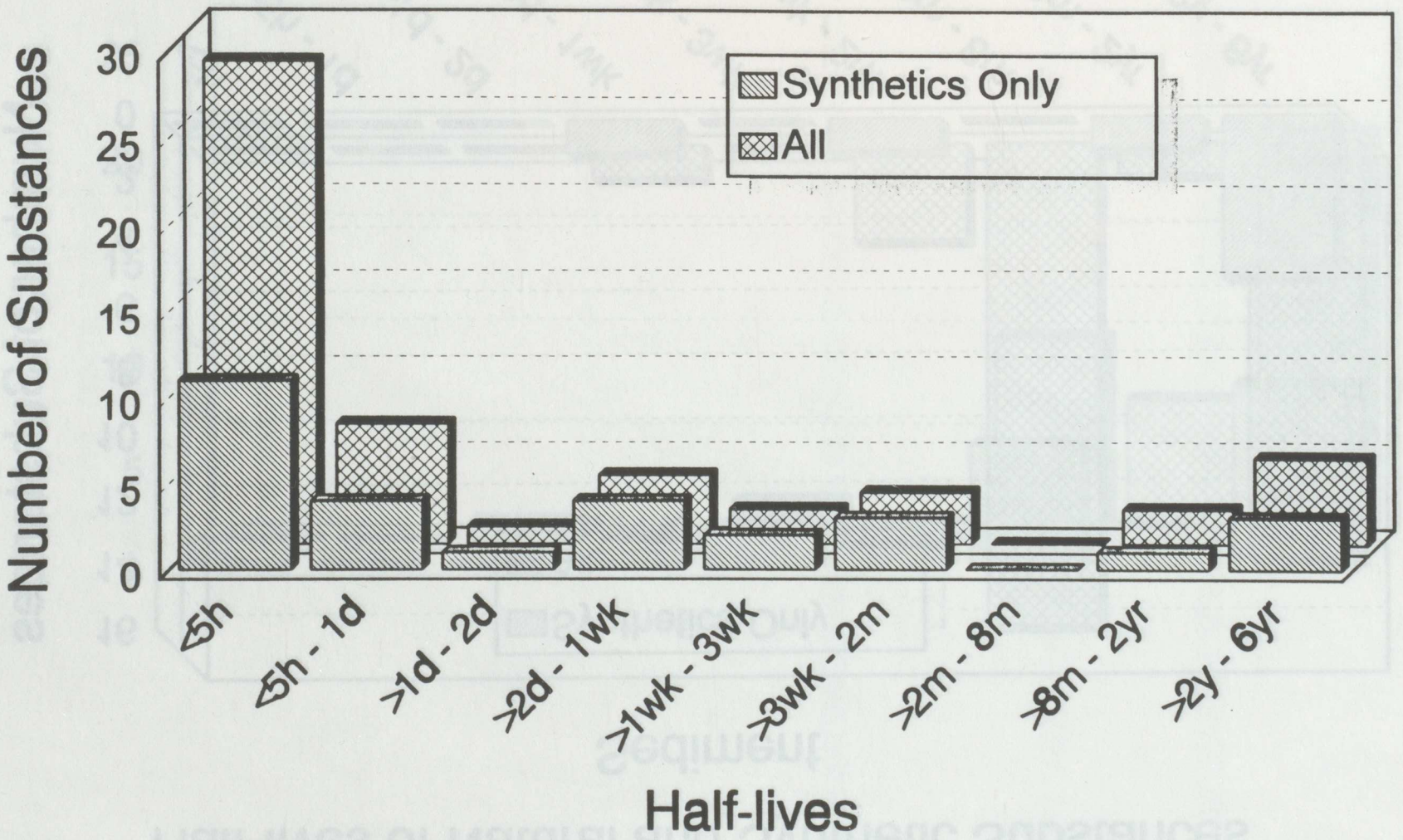
Half-lives of Natural and Synthetic Substances

Water



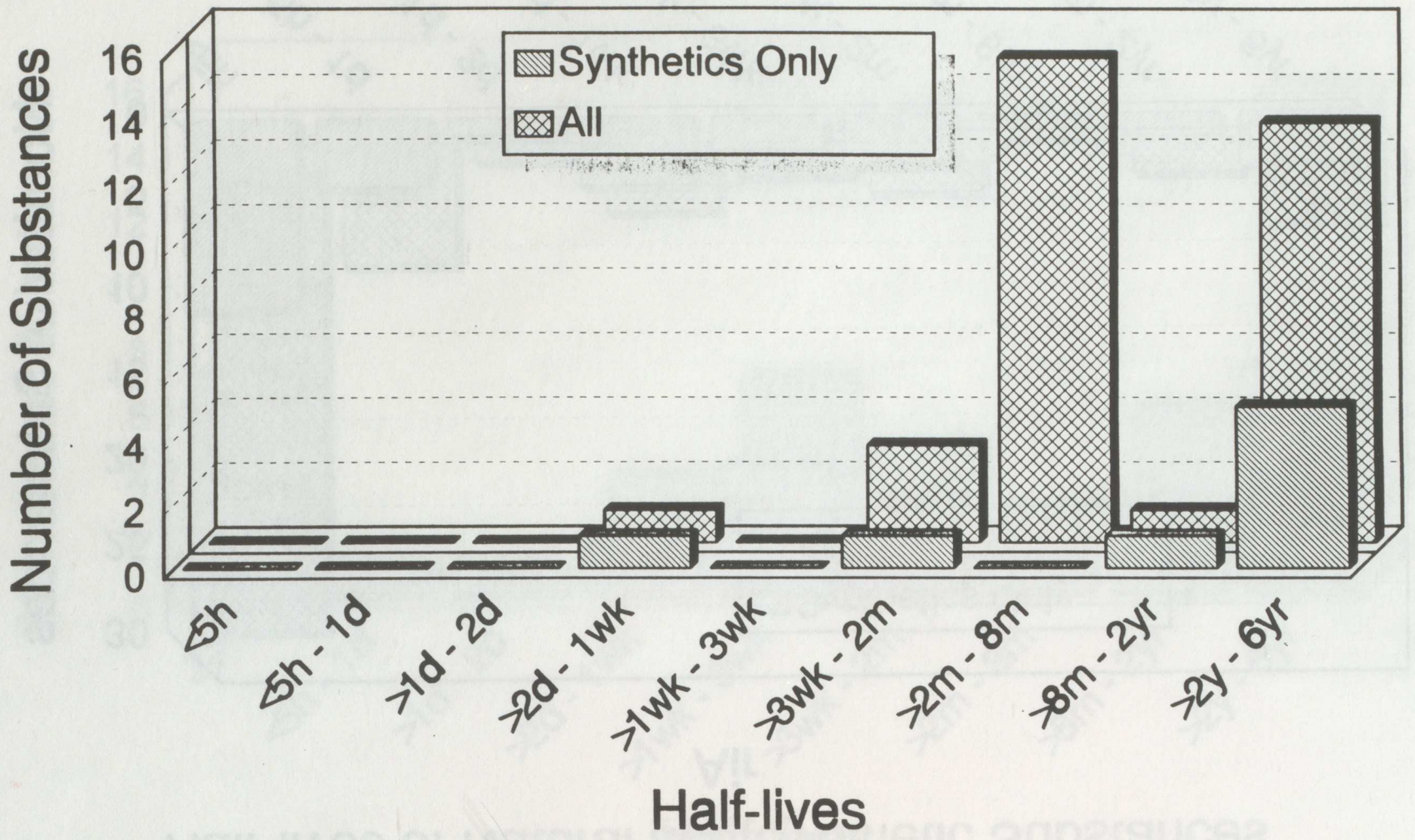
Half-lives of Natural and Synthetic Substances

Air

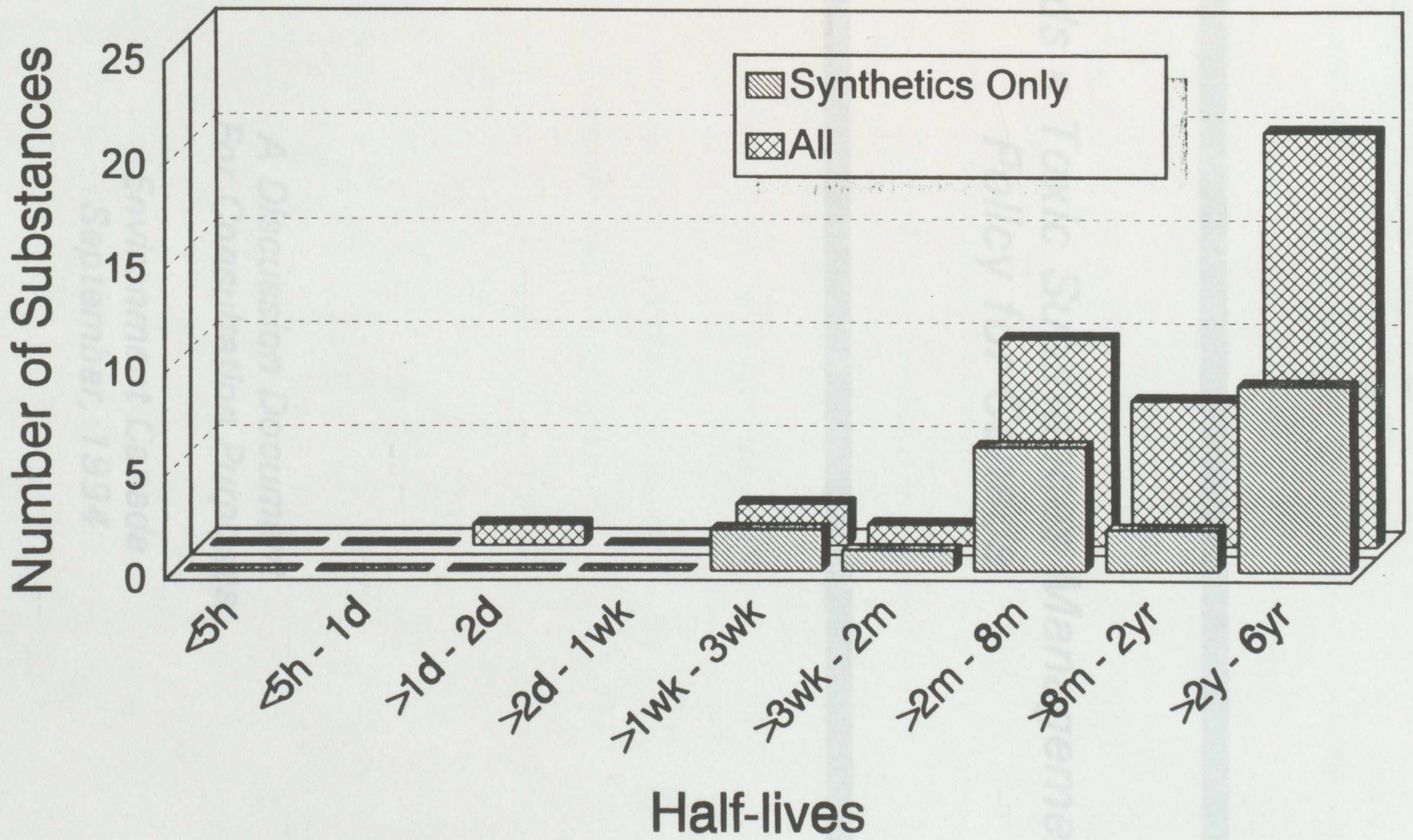


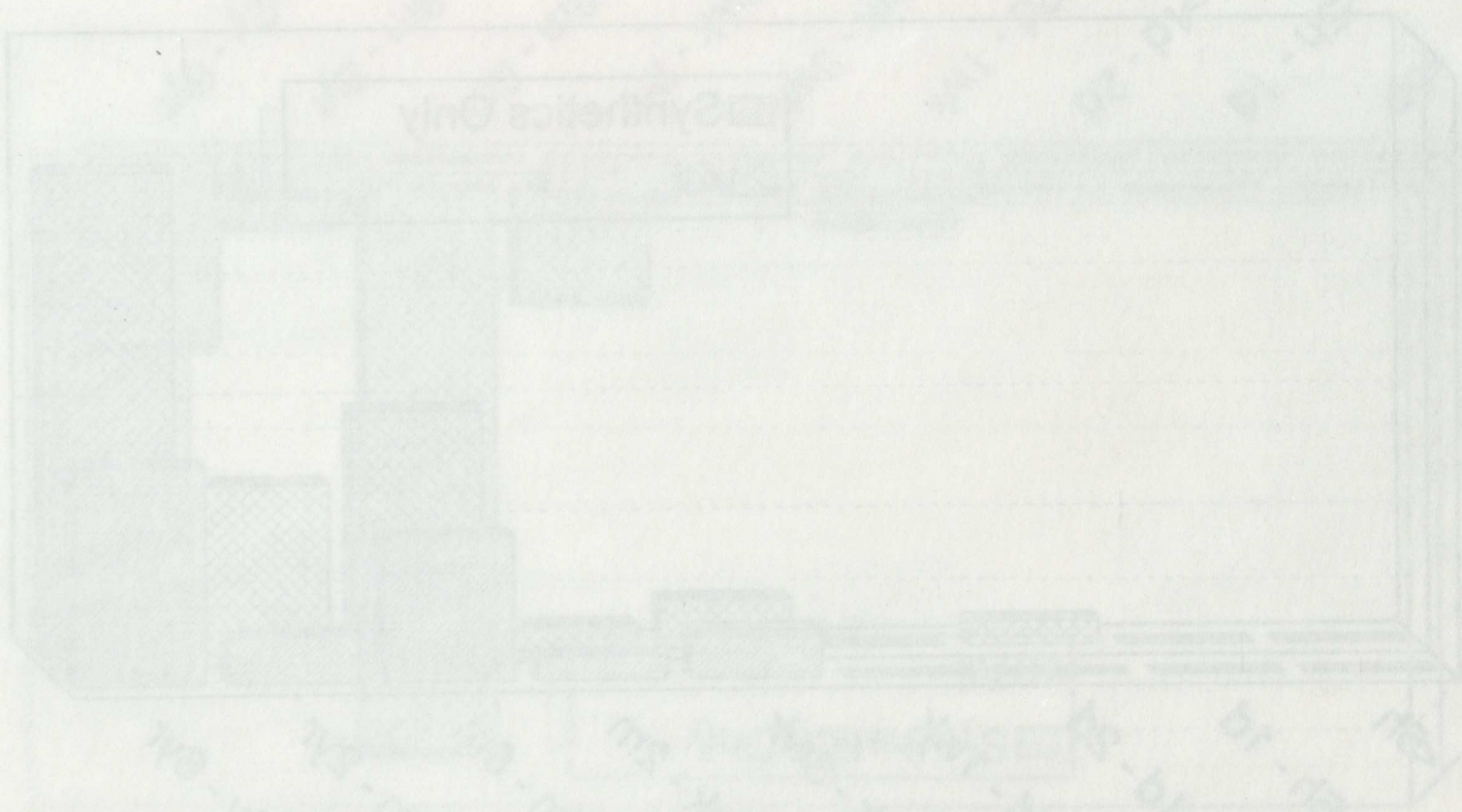
Half-lives of Natural and Synthetic Substances

Sediment



Half-lives of Natural and Synthetic Substances
Soil





Towards a Toxic Substances Management Policy for Canada

A Discussion Document
For Consultation Purposes

Environment Canada
September, 1994

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THE NEED FOR A POLICY

Many of the goods and services we have come to rely upon either use or produce toxic substances that may be harmful to human health and the health of our environment. Scientific studies have shown this is particularly true of toxic substances that are persistent--that take a long time to break down--and bioaccumulative--that accumulate in living organisms. The last decade has provided numerous examples of how poor management of such substances can result in long-term problems that are either extremely costly or nearly impossible to correct.

Science is not always able to predict what kind of long-term effects a substance might have upon the environment or human health. Managing toxic substances more effectively requires a proactive approach--one that focuses on preventing pollution rather than reacting to it after it has already occurred. In keeping with the Speech from the Throne, the federal government is emphasizing pollution prevention as a key strategy to sustainable development. It is proposing a policy that underscores the need for preventive and precautionary approaches in managing toxic substances.

The federal government already administers a number of programs aimed at reducing or eliminating the threat of toxic substances. Some of these programs are outlined in Annex 1. The proposed policy recognizes that environmental management is a rapidly evolving field. It underscores the need to apply the principle of pollution prevention to all of the government's current programs. And it reflects the growing public demand for government action to protect human health and the environment while sustaining jobs and a healthy economy.

Towards a Toxic Substance Management Policy for Canada puts forward the federal government's proactive approach to dealing with substances that could prove harmful to human health or the environment. The proposed policy provides direction to decision makers and sets out a framework to ensure that federal programs are consistent.

The federal government is seeking comment on the proposed policy-- Why is it needed? Has it set the appropriate goals? Are the criteria adequate? How will the policy be implemented? The federal government will review public and stakeholder reaction to the proposed policy with the provinces and territories before it is finalized.

THE PROPOSED POLICY

The proposed policy will provide a framework that will allow for the effective management of substances that are of concern because they are or may be used and released into the environment or because Canadians are exposed to them through the environment. The proposed policy has two key objectives:

- to virtually eliminate from the environment substances that are predominantly anthropogenic (resulting from human activity), persistent, bioaccumulative and toxic;

- to implement full life-cycle (cradle-to-grave) management of all other substances of concern.

The proposed policy will be see action at two levels. First, it will help to direct a number of domestic programs by defining their ultimate environmental objectives. Second, it will be a centrepiece of Canada's position on toxic substances in discussions with the world community.

The conceptual framework of the proposed policy is shown in Figure 1. It illustrates that substances of concern will be managed under one of two tracks.

Under Track 1, substances that are mainly the result of human activity and that are persistent, bioaccumulative and toxic will be targeted for virtual elimination from the environment. Industry will be given a fixed period of time to demonstrate why a substance selected for Track 1 should not be targeted for virtual elimination. The federal government will render a final decision after reviewing all of the evidence. The process will be open and transparent.

Track 1 substances will be virtually eliminated from the environment through management strategies that ensure no measurable release of the substance (Annex 2). If a Track 1 substance cannot be controlled throughout its life cycle to prevent its release into the environment, measures will be taken to prevent its generation and use.

The proposed policy is in keeping with the principle that the polluter pays. It also recognizes the complexity of production and control systems. The onus, therefore, will be on the user to demonstrate that its proposed management strategy will ensure there is no measurable release of the substance into the environment. Elements and naturally occurring substances are not candidates for Track 1 treatment. However, when warranted, certain natural substances that have been used or released as a result of human activity may be targeted for reduction to naturally occurring levels under Track 2.

Track 2 aims at managing substances of environmental concern that do not meet all four criteria. In most cases, these substances will be toxic and may exhibit one or two of the

remaining criteria. The federal government will advocate that these substances be managed throughout their entire life cycle--from cradle to grave.

Track 2 is based on widely used risk assessment and risk management approaches for toxic substances. Risk assessment is the process of deciding how dangerous a substance is by describing the hazard, and estimating both the level of exposure and how organisms respond to the substance. Risk management is the process of deciding what to do about an assessed risk, taking into account a wide range of legal, economic, and sociological factors.

When warranted, Track 2 includes the goal of virtual elimination from the environment of predominantly anthropogenic substances that pose an unacceptable risk to human health or the environment.

Management strategies developed under Track 2 aim at pollution prevention. Industry will be encouraged to use processes, practices, materials and energy that avoid or minimize the creation of pollutants and wastes. This is in keeping with the National Commitment to Pollution Prevention supported by the Canadian Council of Ministers of the Environment.

Criteria will be applied to substances such as single chemicals, complex combinations of chemicals and mixtures such as effluents and emissions. The proposed criteria are presented in Table 1 and are discussed in detail in Annex 2.

The source of a substance is a fundamental consideration. Some substances that are persistent, bioaccumulative and toxic occur naturally and can never be eliminated from the environment. For the purposes of the proposed policy, "predominantly anthropogenic" (Annex 2) refers to substances whose levels in the environment are largely due to human activity as opposed to natural sources.

Since it is difficult to apply bioaccumulation and persistence criteria to complex substances and mixtures, components of such substances will be analyzed against these criteria individually, either for Track 1 or Track 2. When a specific component of a mixture meets all of the criteria, that component will be targeted for virtual elimination. Examples of how this proposed policy could be applied to substances that are currently managed in Canada are outlined in Annex 3.

In putting forward this proposed policy, the federal government is sending a clear signal that toxic substances must be managed safely throughout their life cycles. In fact, the goals and objectives set out in the proposed policy put Canada at the forefront of the member countries of the Organization for Economic Cooperation and Development (OECD) with respect to the management of toxic substances.

In implementing the proposed policy, the federal government will be mindful of international standards and Canada's commitment to facilitate free trade. Working in cooperation with the United States and Mexico through the Commission for Environmental Cooperation, Canada has an opportunity to promote the objectives and

strategies of the proposed policy within a North American context.

The proposed policy provides Canadian business with clear, predictable expectations. Rather than waiting for government to propose management strategies for specific substances, business is provided with an incentive to research and invest in new products and processes that do not harm the environment. This could strengthen the Canadian economy by encouraging business and industry to innovate, capture new markets and create jobs.

APPLICATION OF THE PROPOSED POLICY

The proposed policy will apply to all substances in Canada that are or may be used and released into the environment or that Canadians are exposed to through the environment.

In applying the proposed policy, the federal government will take into account the division of legislative powers between the federal and provincial/territorial governments.

Where a specific site is already contaminated by substances that meet all four criteria, the goal of eliminating such substances from the environment will be incorporated into the management strategies developed to deal with the situation. Environmental risk as well as technical and socio-economic factors will guide the nature and scope of interventions.

In situations where a substance is also naturally occurring, no measurable release means no release above natural background levels.

The proposed policy will be promoted and used to control or eliminate the entry of toxic substances into Canada from sources outside the country through commerce or long-range transport (Annex 4). In discussions with the international community, the federal government will place a priority on substances that have been targeted for virtual elimination from the Canadian environment.

IMPLEMENTATION OF TRACK 1 AND TRACK 2

Once a substance is targeted for virtual elimination (Track 1) or full life-cycle management (Track 2), the best risk management strategy for the substance will be identified and implemented.

In many cases, Track 1 and Track 2 substances may already be subject to federal or provincial or territorial management strategies consistent with the proposed policy. These include measures under the Canadian Environmental Protection Act (CEPA), the Pest Control Products Act, the Food and Drugs Act, etc., as well as various provincial and territorial legislation dealing with the environment and health. Where substances are adequately managed under existing programs, no new action will be initiated. For those substances requiring further management strategies to meet the goal and objectives of the policy, existing legislation will be used to initiate those strategies. Finally, substances not covered by a regulatory regime will be subject to the Strategic Options Process (Annex 1).

The Strategic Option Process, like other existing programs, is intended to develop strategies to manage toxic substances. It is based on the principles of public participation; transparent decision-making; cost-effectiveness, flexibility, equity and inter-governmental cooperation. Stakeholders will be invited to participate in each phase of the process and to make recommendations to federal, provincial and territorial ministers.

While socio-economic factors will have no bearing on the environmental objective for Track 1 substances-- that is, their virtual elimination from the environment --such factors will help determine their management strategies and implementation time lines. For Track 2 substances socio-economic factors will help to determine both environmental objectives and appropriate management strategies. Examples of socio-economic factors include: the benefits of a specific substance to human health and the health of the ecosystem; the cost and feasibility of developing and using alternatives; the impact on employment, Canadian competitiveness, trade and regional development; and fairness and equity. Such factors will help to indentify the shortest possible time in which environmental objectives may be achieved as well as what impacts those objectives may have on industry and the Canadian public.

The policy proposes that one way virtual elimination can be achieved is by preventing the release into the environment of a substance in measurable quantities. In practice, measurable release limits will be defined for each substance based on the ability of laboratories to complete the analysis with a certain degree of confidence. Sensitive but routine analytical methods will be used as references. It is not the intent of the policy to 'chase the last molecule' of a substance. Common sense will apply and progress towards virtual elimination will be monitored.

Figure 1. Cadre conceptuel de la politique proposee

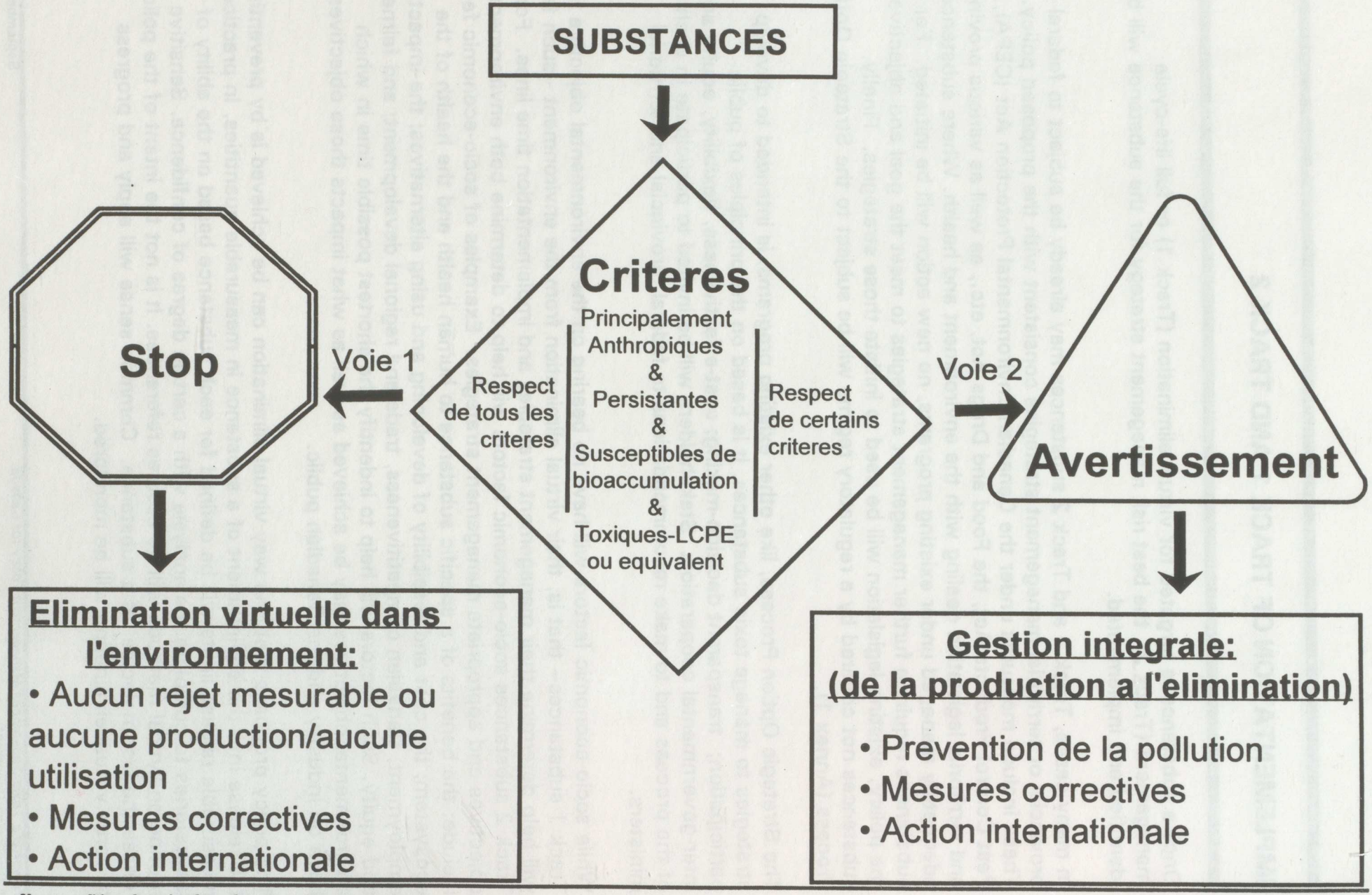


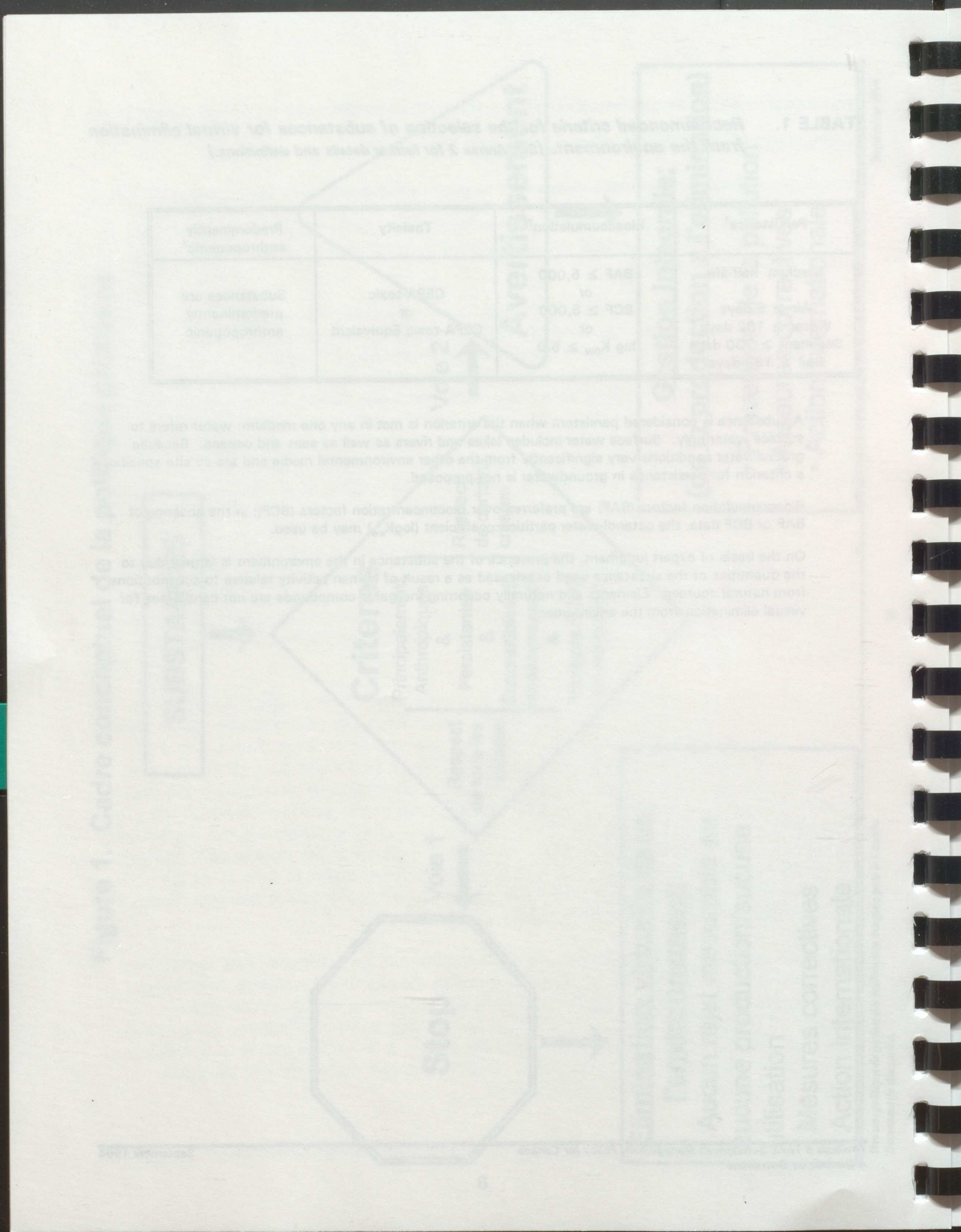
TABLE 1. ***Recommended criteria for the selection of substances for virtual elimination from the environment.*** ***(See Annex 2 for further details and definitions.)***

Persistence[1]	Bioaccumulation[2]	Toxicity	Predominantly anthropogenic[3]
Medium half-life Air ≥ 5 days Water ≥ 182 days Sediment ≥ 730 days Soil ≥ 182 days	BAF ≥ 5,000 or BCF ≥ 5,000 or log K_{ow} ≥ 5.0	CEPA-toxic or CEPA-toxic Equivalent	Substances are predominantly anthropogenic

1 A substance is considered persistent when the criterion is met in any one medium: water refers to surface water only. Surface water includes lakes and rivers as well as seas and oceans. Because groundwater conditions vary significantly from the other environmental media and are so site specific, a criterion for persistence in groundwater is not proposed.

2 Bioaccumulation factors (BAF) are preferred over Bioconcentration factors (BCF); in the absence of BAF or BCF data, the octanol-water partition coefficient ($\log K_{ow}$) may be used.

3 On the basis of expert judgment, the presence of the substance in the environment is largely due to the quantities of the substance used or released as a result of human activity relative to contributions from natural sources. Elements and naturally occurring inorganic compounds are not candidates for virtual elimination from the environment.



ANNEX 1: Current programs and activities

The federal government has a number of programs already in place to deal with substances that are in use (existing substances) and proposed for use (new substances) in Canada. For new substances the application of pollution prevention principles is straight forward, since these substances have yet to be introduced into the environment. For existing substances, the proposed policy promotes a proactive approach by setting clear objectives and priorities. Various regional ecosystems have been targeted for special treatment to ensure that potentially harmful substances are identified and that management strategies are in place to ensure the protection of human health and the environment.

New substances

To prevent the introduction of new toxic chemicals into the environment, the screening procedures for new chemicals under the Canadian Environmental Protection Act (CEPA) New Substances Notification Regulations will be consistent with the proposed policy. Substances that are persistent, bioaccumulative, toxic and predominantly the result of human activity will be prevented from release into the environment. If it can be demonstrated that such a substance can be controlled throughout its life cycle, the proposed policy will allow its manufacture or importation provided there is no measurable release into the environment. Substances that cannot be adequately controlled will be prohibited from being imported, manufactured or used.

Priority Substances Assessment Program

Under the toxic substances provisions of CEPA, the federal government assesses existing substances to determine whether they are "toxic" under the Act. Referred to as Priority Substances List (PSL) assessments, this activity involves the selection of substances based on their potential to cause harm to the environment or human health, followed by the detailed characterization of the risk they may pose. Those substances found to be "toxic" on the basis of these assessments are subject to a Strategic Options Process (described below) to determine how best to reduce or eliminate the risk they pose to the environment or human health. These activities fall within Track 2 of the proposed policy.

All 44 substances on the original list (PSL1)--including individual chemicals, groups of compounds, effluents and wastes--were assessed by Environment Canada and Health Canada. Twenty-five were found to be "toxic" and appropriate management strategies have been or are being developed.

The proposed policy will introduce changes in the way predominantly anthropogenic substances meeting the criteria for persistence and bioaccumulation will be handled. The federal government will document the reasons why it believes that the criteria referred to in Table 1 of the policy have been met.

Strategic Options Process (SOP)

As previously noted, the SOP is intended to develop strategies to manage toxic substances. Various tools will be considered to achieve environmental and health objectives. These include market-based tools such as trading programs, taxes, financial incentives, environmental liability, and deposit and refund systems. Others include voluntary actions, information sharing, codes of practice, environmental quality guidelines, regulations, and technology development and transfer.

Over the next two years, the SOP will be used to develop strategies for managing substances declared toxic under the CEPA Priority Substances Assessments Program. Similarly, the process will be applied to substances identified for Track 1 and Track 2 that are not adequately managed under an existing program.

The process is limited to an 18-month time frame. Quicker action can be expected for Track 1 substances since environmental objectives have already been set at virtual elimination from the environment. If stakeholders are unable to reach consensus on management strategies and implementation timetables, the federal government, in consultation with the provinces and territories, will act in order to achieve the targeted objectives.

Pesticides

Pesticides are registered for use in Canada through the Pest Control Products Act (PCPA). The Act is managed by the Interdepartmental Executive Committee on Pest Management which includes Agriculture and Agri Food Canada, Environment Canada, Health Canada and Natural Resources Canada.

The proposed policy's long-term goal--virtually eliminating from the environment substances that mainly result from human activity and that are persistent, bioaccumulative and toxic--will be applied to pesticides. Management strategies will seek to prohibit the registration and use of pesticides that meet these four criteria.

Under the PCPA, new pesticides that meet Track 1 criteria will only be registered under exceptional circumstances, that is, when there is no acceptable alternative to deal with a critical situation. A priority scheme is currently in place to re-evaluate pesticides that are already registered. It includes the characteristics of persistence, bioaccumulation and toxicity as well as other factors such as the extent of use, exposure potential, the age of the data base, gaps in the data base and so on. The availability of acceptable alternatives will be considered before any regulatory action is taken. Pesticide producers

have to satisfy government of the safety, merit and efficacy of their products.

The Accelerated Reduction/Elimination of Toxics (ARET)

ARET complements the thrust of the proposed policy and builds on the consensus among industry, government, academic and health groups to reduce or eliminate emissions of selected substances on a voluntary basis.

Two prioritized lists were developed in 1993 which grouped substances according to their persistence, bioaccumulation and toxicity (Table 2, Annex 2). Substances on the first list met all three criteria. All substances on the second list met the ARET toxicity criterion; in addition, some met the criteria for persistence or bioaccumulation.

The long term goal for substances on the first list is to virtually eliminate emissions from human sources, with a 90 per cent reduction in emissions targeted for the year 2000. Substances on the second list have been targeted for a 50 per cent reduction in emissions by the year 2000.

In early 1994, Canadian companies and government facilities were challenged to meet these targets. Industry and government action plans and reduction commitments will be submitted this fall. A public report summarizing these commitments will be available in early 1995. The ARET initiative will recognize best efforts in achieving targets.

Emissions from substances that have been classified as persistent, bioaccumulative and toxic under this program will be significantly reduced or even eliminated. Significant reductions are also expected in emissions of other ARET substances. ARET substances that meet all four criteria in the proposed policy will be targeted for Track 1 with the environmental objective of virtual elimination from the environment. ARET strategies will be recognized by the Strategic Options Process to achieve the specific environmental objectives.

Ecosystem Initiatives

Beginning in the late 1980s, the federal government launched a series of regionally-based initiatives, often referred to as flagship programs or ecosystem management plans. The goals, objectives and strategies of the various plans vary according to federal-provincial/territorial partnerships and the specific needs and priorities of the communities they serve. The general objectives of the proposed policy recognizes the need to tailor management strategies to meet specific regional requirements.

The **Atlantic Coastal Action Plan** sets out to restore, enhance and conserve the coastal ecosystem in 13 sites in Atlantic Canada; involve stakeholders in the development of Comprehensive Management Plans; promote environmental stewardship, education and

awareness; and implement pilot projects that demonstrate low-cost, innovative solutions to environmental issues involving watersheds.

The **Fraser River Action Plan** seeks to clean-up the Fraser River; restore the productivity of the natural environment; develop a management program to ensure the continued health and productivity of the Fraser River basin; and return salmon populations to historic levels.

The **Northern River Basins Study** is examining the cumulative effects of development on the Peace, Athabasca and Slave river basins. The study will contract research projects relating to contaminants, drinking water, nutrients, the food chain, traditional knowledge, hydrology and hydraulics, other river uses, and synthesis modelling. Information from the projects will form a data base that will be used to assess and predict the cumulative effects of development on the aquatic environment and assist in the management and protection of the basins.

The **St. Lawrence Vision 2000** program addresses several areas for action including bio-diversity, agriculture, community involvement, decision making and health. The initiative also focuses on reducing liquid toxic effluent discharges and establishing corrective measures to reduce the impact of effluents on the environment. It also provides funding and other support for technology development projects designed to virtually eliminate toxic substances.

The **Great Lakes 2000** initiative has several components including restoration, pollution prevention and conservation. The Canadian Ontario Agreement (COA), signed in July 1994, is part of the initiative. Its three main objectives are restoration of degraded areas; prevention and control of pollution; and conservation and protection of human health and the health of the ecosystem.

COA puts in place a six-year, federal-provincial strategy with targets and schedules for the reduction or virtual elimination of 13 Tier 1 substances that are a problem in the Great Lakes. These include 11 substances identified by the International Joint Commission as being of immediate concern in the Great Lakes and two other substances identified for priority action through bi-national activities in Lakes Superior and Ontario.

These Tier 1 substances are:

Aldrin/dieldrin,
Benzo(a)pyrene,
Chlordane,
DDT,
Hexachlorobenzene,
Alkyl-lead,
Mercury,
Mirex,
Octachlorostyrene,
PCBs,
PCDD (dioxins),
PCDF (furans), and
Toxaphene.

In addition, COA targets significant reductions for 26 other substances (Tier 2) identified by science-based screening methods or management plans. These Tier 2 substances have the potential for causing widespread damage, or have already caused local damage, within the Great Lakes environment. A variety of tools including regulations, pollution prevention strategies and voluntary measures will be undertaken in order to achieve the goals of the agreement.

The **Arctic Environmental Strategy's Northern Contaminant Program**, is a partnership of federal and territorial agencies and the five northern aboriginal organizations (Council for Yukon Indians, Dene Nation, Metis Nation, Inuit Tapirisat Canada, Inuit Circumpolar Conference Canada). Its primary objective is to reduce or eliminate contaminants in local sources of food. The program identifies sources of contamination. It assesses contamination levels found in living organisms and their effects on the health of the ecosystem. It provides timely health advice to northern peoples. It also supports the establishment of international controls over the long-range transportation of pollutants, since most pollutants--similar to those found in the Great Lakes--originate outside the region.

ANNEX 2: Criteria for selecting substances for virtual elimination from the environment

This annex describes the four criteria (persistence, bioaccumulation, toxic and predominantly anthropogenic) that will be used to consider substances for virtual elimination from the environment. These criteria have been developed on the basis of experience, data analysis and expert judgment.

Persistence and Bioaccumulation

A substance's environmental persistence is usually defined in terms of its half-life--the time required for the concentration of a substance to diminish to half of its original value. The proposed policy only considers chemical and biological processes that alter or degrade a substance. Dilution or transportation to other locations are excluded from consideration. Among other things, the persistence of a substance will vary depending upon the medium in which it is found--air, soil, surface water, or sediment. It is therefore appropriate to determine criteria for each. For a substance to be considered persistent, it must meet the criteria in at least one medium.

Bioaccumulation describes the accumulation of chemical substances by living organisms, either directly from the surrounding medium or via food. The potential for a substance to bioaccumulate can be expressed in terms of the bioaccumulation factor (BAF), the bioconcentration factor (BCF), or the octanol-water partition coefficient (Kow). BAF and BCF measure the concentration of a substance in an organism relative to concentrations found in the surrounding environment. BAF, unlike BCF, includes intake from food and is the preferable measurement, although either can be used depending upon the availability and quality of data. In the absence of BAF or BCF data, the log Kow will be used as a surrogate for bioaccumulation.

The proposed policy criteria for persistence and bioaccumulation were derived from four sets of criteria developed by the International Joint Commission (IJC), the Ministry of Environment and Energy of Ontario (MOEE), Environment Canada (Priority Substances List), and ARET. These criteria are summarized in Table 2 of this Annex.

Starting with the PSL screening criteria, three sets of increasingly stringent values were tested using data for 68 toxic substances previously identified as priorities by the authorities identified above. Then, the best value for each specific criterion was selected to ensure that substances among the 68 generally recognized as most persistent and bioaccumulative in the Canadian environment were included.

Toxic

Under the proposed policy, a substance will meet the criterion for toxic if it is "CEPA-toxic" or "CEPA-toxic equivalent". Under section 11 of CEPA, a substance is defined as toxic if it enters or may enter the environment in a quantity or concentration or under conditions that:

- have or may have an immediate or long term harmful effect on the environment;
- constitute or may constitute a danger to the environment on which human life depends; or
- constitute or may constitute a danger in Canada to human life or health.

"CEPA-toxic equivalent" refers to a determination of toxicity equivalent in rigour to the determination of "toxicity" under CEPA.

A substance does not have to enter the Canadian environment in order to be targeted for Track 1 since the proposed policy is designed to be precautionary. Once adopted, the proposed policy will direct action towards substances that may enter the Canadian environment in quantities or concentrations sufficient for the substance to be considered toxic.

Predominantly anthropogenic

The proposed policy considers a substance predominantly anthropogenic if, based on expert judgment, its presence in the environment is largely due to discharge or release through human activity as opposed to natural sources. When warranted, certain natural substances that have been used or released as a result of human activity may be targeted for virtual elimination to naturally occurring levels.

A companion document to this annex, prepared by an ad hoc science group, provides more information about the scientific rationale supporting the criteria for persistence and bioaccumulation. The document is available upon request from the Director of the Commercial Chemicals Evaluation Branch, Environmental Protection Service, Place Vincent Massey, 14th Floor, 351 St. Joseph Blvd., Hull, Quebec, K1A 0H3. Tel. (819) 997-1499 Fax (819) 953-4936

TABLE 2. ***Comparison of persistence and bioaccumulation criteria used by IJC, MOEE, ARET, and those recommended for the second PSL.***

	IJC	MOEE-ARET[1]	PSL
Persistence half-life (days)	56 days in water	air, water or sediment half-life Score ≤ 10 0 > 10 4 > 50 7 > 100 10	Medium Half-life Water > 50 Sediment > 180
Bioaccumulation BAF or BCF or log K_{ow}	no criteria	BCF Score ≤ 20 0 > 20 4 > 500 7 > 15000 10 log K_{ow} Score ≤ 2.0 0 > 2.0 4 > 4.0 7 > 6.0 10	BCF or BAF > 500 3< log K_{ow}< 7

[1] Due to obvious similarities, the MOEE and ARET criteria have been grouped under one heading.

ANNEX 3: Some examples of the application of the proposed policy

This annex demonstrates how the proposed policy can be applied to substances that may harm the environment or human health and outlines the type of information required to determine whether a substance is a candidate for virtual elimination from the environment or some other environmental goal. These substances were selected as examples to demonstrate the flexibility and the application of the proposed policy.

✓ = criteria is met
x = criteria is not met

EXAMPLE: DDT and Metabolites

PERSISTENCE (half lives)		**PROPOSED CRITERIA**	**MEETS PROPOSED CRITERIA**
Water:	DDD 22 yr, DDE 6 d, DDT 74 hr	>182 days	✓ x x
Air:	DDD 5.5 d, DDE 7.4 d, DDT 7 d	> 5 days	✓✓✓
Soil:	DDD 15.6 yr, DDE 15.6 yr,.DDT 100 d	>182 days	✓✓ x ✓
Sdmnt:	DDD 294 d, DDE 3 yr, DDT 31 yr	> 730 days	x ✓✓
BIOACCUMULATION			
BCF:	DDT 78,500	> 5000	✓
	DDE 51,000	> 5000	✓
	DDD 6,500	> 5000	✓ ✓
Log K_{ow}:	-	> 5.0	-

TOXIC: ✓

Pesticides are regulated in Canada under the *Pest Control Products Act* (PCPA) and *Pest Control Products Regulations*. Many unpredicted environmental effects have been associated with DDT, including egg shell thinning, and on that basis, it is considered "CEPA-toxic equivalent". In addition, because of environmental and safety concerns, including its persistence and its bioaccumulation and biomagnification, DDT is unacceptable for registration and use in Canada.

PREDOMINANTLY ANTHROPOGENIC: ✓

Exclusively synthetic; no natural sources

MANAGEMENT STRATEGY: **TRACK 1**

Pesticides are regulated in Canada under the *Pest Control Products Act* (PCPA) and *Pest Control Products Regulations*. Based on environmental and safety concerns, most uses of DDT were phased out 15 to 20 years ago. Registration of the two remaining DDT products was discontinued in 1985; the terms of discontinuation allowed for sale and use of existing stocks until December 31, 1990. Since then, the sale or use of any pest control product containing DDT would be a violation of sub-section 5(1) of the Act and section 6 of the Regulations. DDT is a candidate for control under the UN - Economic Commission on Europe (UN-ECE) Long Range Transportation of Atmospheric Pollutants (LRTAP) convention.

EXAMPLE: **CFCs**
(CFC-11, 12, 113 and 113A as examples)

PERSISTENCE (half-lives)		**PROPOSED CRITERIA**		**MEETS PROPOSED CRITERIA**
Water:	hours	> 182 days	x	
Air:	20-200 yrs	> 5 days	✓	
Soil:	n/a	> 182 days	-	✓
Sediment:	n/a	> 730 days	-	
BIOACCUMULATION:				
BCF:	< 4	> 5000	x	
Log K_{ow}:	< 100	> 5.0	x	X
TOXIC:				✓

On Schedule 1 of CEPA, because of their ability to deplete the stratospheric ozone layer and thereby contribute to increased UV-B radiation (CEPA-toxic equivalent) (cf. CEPA, section 11(b))

PREDOMINANTLY ANTHROPOGENIC: ✓

No known natural source

MANAGEMENT STRATEGY: **TRACK 2**

This is an example of toxic chemicals that do not meet all criteria (CFCs are not bioaccumulative) but for which virtual elimination from the environment is the objective. The current management strategy is:

- Phase out consumption (production and import) of new CFCs by January 1, 1996, as per Montreal Protocol
- Mandatory recovery and release prohibitions, training through provincial regulations as per National Action Plan on Recovery and Recycling and Reclamation of CFCs.

ANNEX 4: Canadian Competitiveness and Leadership

Management of toxic substances in OECD countries

Toxic substances are not confined by national borders. We have seen this in the Great Lakes. And we have seen it in the Canadian Arctic where there has been evidence of pollution by PCBs, dioxins, pesticides and heavy metals. These chemicals are the products of industrial activity in southern Canada and in other parts of the world. Some of these substances accumulate in the food chain, putting wildlife and people--even in seemingly pristine environments like the Arctic--at risk. So, it is clear that reducing or virtually eliminating the release of toxic substances in Canada is not enough to ensure the complete protection of the Canadian environment and public health. There is a need for international action on toxic substances.

OECD countries generally manage chemicals on a substance by substance basis. Chemicals meeting certain criteria, which indicate the need to reduce human and environmental exposure, are controlled through such measures as labelling, permit systems, limitation or substitution, emission control, phase-out and banning. This is similar to the life-cycle management approach for Track 2 substances under the proposed policy.

In this discussion document, Canada is proposing to adopt a more proactive policy for substances that are predominantly the result of human activity and that are persistent, bioaccumulative and toxic (Track 1). The proposed objective for these substances will be their virtual elimination from the environment. This aspect of the proposed policy will put Canada at the forefront of OECD countries.

Socio-economic impact of the proposed toxic substances management policy

Benefits and costs

The federal government is sending a clear signal that toxic substances must be managed safely throughout their life cycles. It will work with provincial and territorial governments and with industry and other stakeholders to determine the most effective strategies for dealing with substances falling under either Track 1 or Track 2 of the proposed policy. This will ensure that Canadian society and the economy are not subjected to undue hardships. At the same time, it will allow Canadians to benefit from technological developments that could be marketed worldwide.

We are learning that the cost of environmental cleanup can place an enormous financial burden on Canadian society. Increasingly, liability is being assigned to those responsible for pollution.

These considerations have prompted many businesses to anticipate and prevent environmental problems. In fact, many businesses are already reducing or eliminating the use of toxic substances for reasons of corporate stewardship and economics.

The proposed policy provides Canadian business with clear, predictable expectations. Rather than waiting for government to propose management strategies for specific substances, business is provided with an incentive to research and invest in new products and processes that do not harm the environment. This could strengthen the Canadian economy by encouraging business and industry to innovate, capture new markets and create jobs.

Reducing the risks that toxic substances pose to human health and the environment will provide Canadians with benefits in the form of lower costs for health care and environmental cleanup. Benefits will also accrue to governments. A clear federal policy will facilitate a harmonized, national approach to dealing with toxic substances and enhance the compatibility of government programs.

But the proposed policy will also result in costs. Industry and government will incur costs in developing management protocols, in searching for alternative products and processes, and in monitoring the release of toxic substances into the environment. Consumers may have to pay more for goods and services if alternative products and processes prove to be more expensive.

The socio-economic impact of the proposed policy will depend upon how effective toxic substances are managed. The costs and benefits of a specific management strategy might include: reduced risks to human health and the environment; costs to industry, consumers and government; impacts on employment, competitiveness and trade; regional impacts; and fairness and equity.

Impacts on competitiveness

The proposed policy could have a direct impact on production costs and the rate of technological innovation by Canadian industry. The policy's impact on Canadian competitiveness will depend on when and how the policy is applied, whether our major trading partners adopt similar environmental standards and the degree to which consumers are willing to pay for environmentally-friendly goods and services. These and other factors affecting competitiveness will be analyzed when developing management strategies through the Strategic Options Process.

Management strategies should be designed to maximize the potential for marketable innovations. In some cases, the cost of preventing the release of toxic substances into the environment will be at least partially offset by introducing new, more efficient technologies. Properly crafted environmental standards can encourage Canadian industry to innovate sooner and more effectively. This will allow industry in this country to capture new markets

and maintain established ones, thereby strengthening the economy, increasing income, and creating new and better jobs.

Management strategies could also result in increased costs for certain Canadian products, reducing their competitiveness in world markets. This effect could be mitigated by marketing strategies aimed at persuading consumers to pay more for products and services that protect the environment.

Implications of the North American Free Trade Agreement (NAFTA) and the North American Agreement on Environmental Cooperation (NAAEC)

The proposed policy could affect two key provisions of NAFTA--technical barriers to trade and measures relating to standards. These provisions of NAFTA do not inhibit Canada's ability to define legitimate objectives to protect human health and the environment and to establish levels of protection. However, in implementing the proposed policy, the federal government will need to be cognizant of Canada's commitment to facilitate free trade and recognize the international compatibility of standards.

The NAAEC came into force in Canada, the United States and Mexico on January 1, 1994. The agreement has created obligations and opportunities to protect and improve the North American environment. The agreement may influence the proposed policy in several ways.

With NAAEC, as with NAFTA, member countries must respect specific provisions for notification; publication; and provision of information about environmental laws, regulations, procedures or administrative rulings. More importantly, the agreement provides an opportunity to reduce the entry of toxic substances into the environment through long-range transport. Each member is committed to considering a prohibition to the export of pesticides or toxic substances that are prohibited from use within its own territory. When a member prohibits or severely restricts the use of a pesticide or toxic substance within its territory, it must notify the other members of this measure.

The Council of the Commission for Environmental Cooperation is committed to promote, and where appropriate, develop recommendations regarding limits for specific pollutants. Working with the United States and Mexico through the commission, Canada has an opportunity to promote the objectives and implementation strategies of the proposed policy within a North American context.

Comments on the proposed Toxic Substances Management Policy for Canada must be submitted by November 30, 1994.

Please direct your comments or suggestions in writing to the office of the Director of the Commercial Chemicals Evaluation Branch at the following address:

Commercial Chemicals Evaluation Branch
Environmental Protection Service
Environment Canada
351 St. Joseph Blvd., 14th Floor
Ottawa, Ontario
K1A 0H3

or by fax at (819) 953-4936