Decision Document on Dioxins and Furans under the Process for Identifying Candidate Substances for Regional Action under the Sound Management of Chemicals Initiative

Prepared by the
Substance Selection Task Force of the
North American Working Group
for the Sound Management of Chemicals

Discussion Draft for Public Review and Comment
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Preface

This Decision Document is the main deliverable for the third stage in the *Process for Identifying Candidate Substances for Regional Action under the Sound Management of Chemicals Initiative* (Substance Selection Process). Its objectives are to:

1. provide a recommendation to the North American Working Group for the Sound Management of Chemicals (SMOC Working Group) regarding a possible North American Regional Action Plan (NARAP) for Dioxins and Furans;
2. review the results of the Substance Selection Process for Dioxins and Furans;
3. identify issues related to major NARAP implementation considerations; and
4. provide recommendations on the possible scope of a NARAP for Dioxins and Furans .

The Substance Selection Task Force (SSTF), a subsidiary body of the SMOC Working Group, administers the Substance Selection Process. Its mandate is to review substances as possible candidates for NARAPs to be developed by the three Governments of Canada, the United Mexican States, and the United States of America. The SSTF consists of two members from each of the Parties and one observer each from the ENGO, industry and academic sectors.

The SMOC Working Group is the principle body responsible for administering the Sound Management of Chemicals (SMOC) initiative. The SMOC initiative and the Working Group were established by Commission for Environmental Cooperation (CEC) Council Resolution 95-05, Sound Management of Chemicals.

Council Resolution 95-05 was developed under the authority of the North American Agreement on Environmental Cooperation (NAAEC) and advances many of the commitments and obligations set out in the NAAEC. The Council (of Ministers) is the governing body of the CEC, which was established as part of the NAAEC. The CEC Council approved Council Resolution 95-05 on 13 October 1995, at its second regular meeting, which was held in Oaxaca, Mexico.

A key focus of the SMOC initiative to-date has been the development of NARAPs for persistent and toxic substances that the Parties agree warrant collective regional action because they pose a significant risk to human health and the North American environment. The NARAPs reflect a shared commitment by the Parties to work cooperatively to build on domestic policies and laws, improve domestic capacities, and bring a regional perspective to the implementation of international environmental commitments that are in place or being negotiated to address persistent and toxic substances.

Each NARAP is necessarily unique resulting from the need to reflect differing circumstances for each Party, including production, use, and disposal practices for substances; natural endowments, climatic and geographical conditions; and economic, technological and infrastructure capabilities. The sharing and transfer of information and best practices to enhance national capacity for the sound management of chemicals has been one common theme for NARAPs. To-date, NARAPs have been established for DDT, chlordane, mercury and PCBs.

The SMOC Working Group established the Substance Selection Process to facilitate systematic, rigorous and transparent consideration of substances to possibly be addressed by additional NARAPs. The process has three stages:

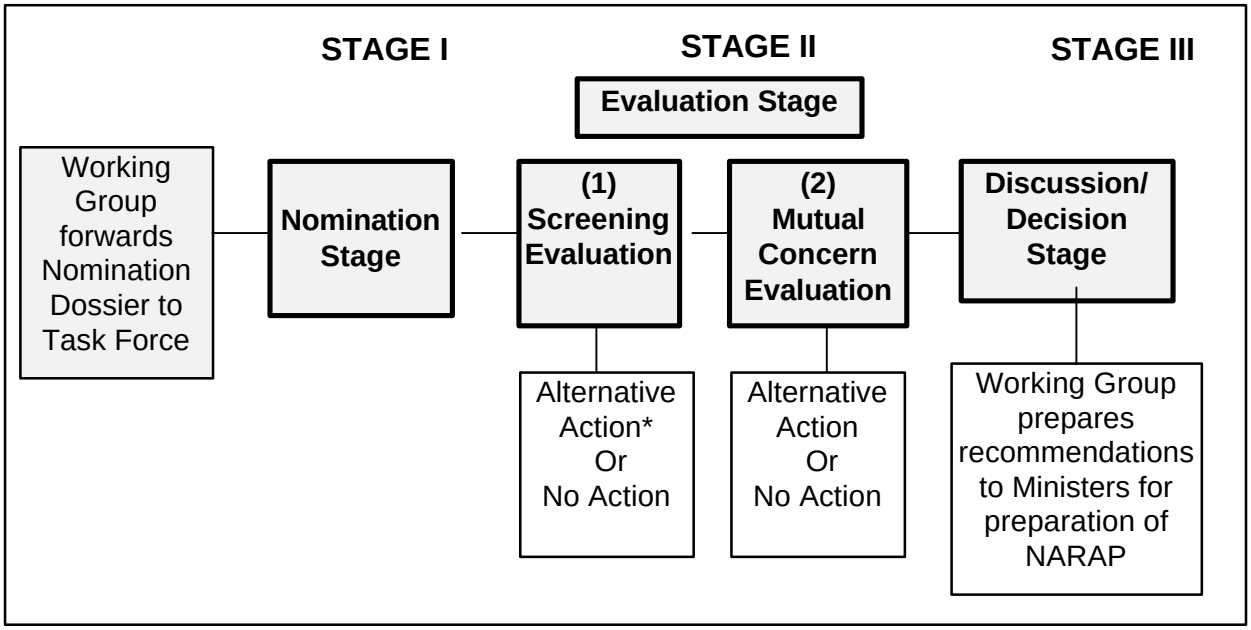
(i) A *Nomination Stage* (Stage I) involving review of a Nomination Dossier prepared by one or more of the three Parties and referred to the SSTF by the SMOC Working Group. The Nomination Dossier contains standardized information for each nominated substance. The purpose of the review is to assess whether there is justification for the nominated substance to proceed to the next stage of the Substance Selection Process;

(ii) An *Evaluation Stage* (Stage II) consisting of two parts. First, a *Screening Evaluation* to assess whether a substance deserves further attention on the basis of scientific considerations, including evidence of entrance to the environment, transboundary environmental movement, persistence, bioavailability and bioaccumulation, and that a credible risk assessment documents exists. Second, a *Mutual Concern Evaluation* to determine the degree to which all Parties agree there is a problem and that there would be real benefits from collective action;

(iii) A *Decision Stage* (Stage III) in which a Draft Decision Document is prepared recommending a course of action to the Working Group for the nominated substance. The recommendation could be: 1) for the development of a NARAP, 2) for alternative action, or 3) for no action. The NARAP will also identify issues related to key implementation considerations.

The SMOC Working Group referred four Nomination Dossiers to the SSTF on 21 May 1998: Dioxins and Furans, Hexachlorobenzene (HCB), Lindane, and Lead. This Decision Document on Dioxins and Furans is the first to be produced out of the Substance Selection Process.

Figure 1: Flow Diagram of the Substance Selection Process



*'Alternative action', although not limited to this, might entail recommendations for acquisition of more information, or taking action in another forum.

Substance Selection Task Force Members

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1.0 Principle Recommendation to the SMOC Working Group

We recommend the development of a North American Regional Action Plan for dioxins and furans based on the results of our review under the *Process for Identifying Candidate Substances for Regional Action under the Sound Management of Chemicals Initiative* (Substance Selection Process).

2.0 Review of the Results of the Substance Selection Process

2.1 Nomination

The SSTF reviewed the nomination dossier and concluded that there was ample justification for continuing with dioxins and furans in the Substance Selection Process.

2.2 Summary of the Screening Evaluation – Stage II(1)

SSTF members considered the evidence for dioxins and furans in meeting the criteria for Stage II(1) based on the following arguments.

Criterion (i) *'may enter', 'is entering' or 'has entered' North American ecosystem (emissions, media, biota).* There was consensus among the Parties that this criterion had been met and that it was well established in US and Canadian experiences. It was noted that there were very limited data currently available for Mexico.

Criterion (ii) *available and acceptable risk assessment(s)*. Various published documents tend to be based on relatively older (early 1990s) scientific evidence (Canadian assessment under the Canadian Environmental Protection Act, 1993, Draft USEPA Dioxin document 1994). However, other documents are currently being finalised which provide updated evidence, including the United States Environmental Protection Agency (USEPA) Dioxin document, an assessment by the WHO International Programme on Chemical Safety (IPCS) expected to be released in 1999, and an assessment on carcinogenicity by the International Agency for Research on Cancer (IARC, 1997). Since Parties have access to 'near final' draft versions of the documents, and it is not expected that revisions to existing risk assessments will be substantially different, there was consensus in the SSTF that the criterion can be considered to be met.

Criterion (iii) *judgement on measured/predictive data on the following: bioaccumulation, persistence, bioavailable*. For *bioaccumulation*, there was consensus that sufficient data were available to meet this criterion. It was noted that it was the more highly chlorinated congeners that met the numerical values. For *persistence*, there was also agreement that the criterion was met. For *bioavailability*, it was judged that current evidence demonstrated this was well established.

Criterion (iv) *monitoring evidence of transboundary environmental transport for POPs (e.g., appearance in biota, OR indirect evidence of transport potential (e.g., air persistence 2 days, and volatility 1000Pa for POPs).* There was consensus that long-range transport had occurred. The available evidence was adequate, although somewhat limited.

2.3 Summary of the Mutual Concern Evaluation – Stage II(2)

2.3.1 Nature and Extent of Risk to Human Health or the Environment in North America

Throughout North America there is a shared concern regarding the toxicity of dioxins and furans and the potential risks they pose to humans and wildlife. Because these chemicals are persistent and bioaccumulating, diet serves as the principle route of exposure in humans. In the United States and in Europe, environmental levels have been in decline since the early 1970s. However current levels of dietary exposure, found in the US and Canada, continue to be a health concern.

Dioxins and furans are well-established mammalian carcinogens and can reasonably be assumed to be human carcinogens. IARC has designated 2,3,7,8-TCDD as a known human carcinogen. Dioxins and furans have also demonstrated a variety of non-cancer effects including developmental, and reproductive effects, immunosuppression, and endocrine disruption. These chemicals have also been associated neuro-developmental alterations in human new-borns.

Evidence also indicates that more than 100 species of invertebrates, fish, reptiles, amphibians, birds and mammals contain detectable levels of dioxins and furans. Levels increase higher up in the food chain. Population declines have been observed for some higher order food chain species which coincided with egg concentrations of TCDD and related chemicals. This has raised concern regarding reproductive and developmental effects in the ecosystem. The potential for changing biodiversity and ecosystem structure and function is an important consideration presently being considered by scientists and policy makers.

2.3.2 Nature and Extent of the Evidence of Transboundary Environmental Transport in North America

The principle known source of dioxins and furans in North American is waste combustion. Atmospheric transport is thought to be the principle way dioxins are distributed in the environment, since dioxins can be transported long distances. Dioxins and furans, particularly 2,3,7,8-TCDD, have been found in the tissues of polar bears, ringed seals and beluga whales from areas in the Canadian Arctic that are far from sources of these compounds. The United States and Canada have both developed inventories of dioxin sources. Mexican data on sources of dioxins and furans is only indirect. The amount of dioxin transported across international boundaries is unknown.

Dioxins, particularly 2,3,7,8-TCDD, are very persistent in environmental media. Half-lives in soil, water, and sediment have been reported to be greater than 10 years, 1.5-1.6 years, and 4.4-6.2 years respectively.

The more highly chlorinated congeners of dioxins and furans accumulate in biota. BCFs greater than 26,000 for 2,3,7,8-TCDD in white sucker, have been reported. The presence of dioxins and furans in animals at the top of the food chain (e.g., polar bears) demonstrate that these substances biomagnify.

2.3.3 Degree to Which Human Health or Environmental Benefits in North America can be Demonstrated as a Result of Collective Action

2.3.3.1 Reduced Risks

Controlling releases into the environment could reduce risks. Known examples where this has occurred include:

(i) reduced releases to river systems from pulp and paper industries allowing (a) fish restocking and consequent population re-establishments due to elimination of reproductive effects previously hindering growth, and (b) availability of fish harvested and safe for human consumption;

(ii) recovery/restoration of wildlife, where previous declines have been associated with dioxin contaminants.

2.3.3.2 Reducing Human Exposure

Steps could be taken to reduce human exposure and thus risks of toxic effects, including:

(i) bringing about a reduction in dioxins in natural foods (high order food chain species) harvested and consumed by certain populations (for example, Inuit hunters and their families). This will increase the rather small margin of safety thought to exist between current estimated contaminant intake and intakes that may result in health effects; and

(ii) reductions in contaminant levels in fish species consumed by communities harvested from rivers previously subject to discharge from pulp and paper industries.

It should be noted that in June 1998 the World health organisation lowered the tolerable daily intake level for dioxins to 1-4 pico grams per kilogram of body weight per day.

2.3.3.3 Other Benefits of Action

There will be capacity building benefits received from:

(i) Information gathering, including source characterisation, fate and transport identification, environmental levels monitoring, and human exposure measurement; and

(ii) Technology research, innovation, cooperation and transfer.

3.0 Analysis of Major Implementation Considerations

The purpose of this section is to identify issues related to key considerations that influence the priority and timing for developing and implementing a NARAP for dioxins and furans in North America.

3.1 Public Health and Environmental Measures Available to Reduce Risk

The focus of implementation in the near term will be on improving and sharing information and reducing data uncertainty among the three parties. This effort will require improved technology

development and demonstration; as well as additional and improved monitoring and surveillance of dioxin and furan concentrations in sources, ambient media, and exposure pathways. Exchanges of data, information, monitoring and analytical technologies, will be required to reduce scientific uncertainties about the risks to the environment and human health posed by dioxins and furans.

Experience in Canada and the United States has shown that improvements in technology can lead to dramatic reductions in releases of dioxins and furans from various industrial sectors. For example, use of chlorine dioxide instead of sodium hypochlorite as the bleaching agent in pulp and paper mills has led to significantly reduced levels of dioxins and furans in mill effluents in Canada and the United States. Similar successes have been achieved improvements in technology for incinerators and other combustion sources. Unilateral regulations, bilateral agreements, and various voluntary initiatives have all contributed to the development of measures to reduce releases of dioxins and furans in the northern countries.

3.2 Benefits to Human Health and the Environment

There is ongoing discussion among the parties about the human health and environmental benefits that would be realized in North America from collective actions to control releases of dioxins and furans. At the outset, Mexico may be the principal beneficiary of shared scientific knowledge, and, as a result, may avoid the problems encountered in recent decades by the other parties.

A benefit of reducing exposure to dioxins and furans for all three parties would be a reduction of human cancer risks, as well as reduced risks to immune, neural, endocrine, and reproductive systems associated with dioxin exposures. Given Mexico's demographic structure, with its higher percentage of persons of childbearing age, this would provide an important protective benefit. In addition, all three parties have sub-populations at higher risk due to nutritional deficiencies, multiple exposures, and sensitivities, so that any reduction in dioxin exposure would be beneficial. Economic benefits could also be realised as a result of reduced numbers of fish and shellfish advisories thus permitting the re-opening of many fisheries in North America. Ecological risk assessments in North America have found that dioxins and furans, because they are bioaccumulative and persistent, pose the greatest risks to piscivorous mammals and birds because of their position at the top of the food web. Reductions in releases to the environment should benefit this biota.

3.3 Sustainability of Food Production

Food production in Canada, the United States and Mexico is unlikely to be affected by initiatives undertaken to reduce exposure to dioxins and furans, with the possible exception noted above of improved production associated with re-opened fisheries. Dioxins and furans are not used as pesticides and thus their reduction or elimination will not lead to substantially changed agricultural practices.

3.4 Feasibility and Availability of Alternatives

In Canada and the United States, controls are or will soon be in place for commercial waste combustion sources. Pulp and paper manufacturers have successfully modified chemical processes that significantly reduce dioxins in the waste stream from these operations. The opportunity exists to replicate these successes in other dioxins and furans producing operations, including, for

example, medical waste in Mexico. These proven technologies illustrate how Mexican industries could grow, while reducing or completely avoiding the production of dioxins and furans. It is expected that most reductions successes will be achieved via technological process changes, rather than with changes to alternative products.

3.5 Societal Capacity for Change

Sources in the North are generally large point sources. It appears from preliminary information that dioxins and furans releases in Mexico are comprised predominantly of smaller sources spread throughout the country, such as brick making and open burning (e.g., clearing of forests). As brick making is a craft generally practised by individuals or small companies, it is expected that these sources in Mexico will pose different control challenges. However, some positive legislative steps have already been taken in the State of Guanajuato, and are being considered in six other central Mexican states. The recent and planned reductions in releases of dioxins and furans in Canada and the United States demonstrates that the societies in these countries have had the capacity to change their behaviours in order to reduce the risks posed by dioxins and furans.

Widespread public concern about dioxin and furan discharges from British Columbia pulp mills in the late 1980s prompted a broad-based community effort to invoke necessary measures. West Coast Environmental Law Association acted on behalf of more than 55 environmental, community, labour, tourism industry and aboriginal organizations (representing over 250,000 persons) to advocate improved regulatory and voluntary industry responses to the dioxin and furan problem. The campaign used several initiatives. It convinced the provincial government to adopt strict discharge standards, including the most stringent AOX standard in Canada.

The campaign advocated stricter enforcement of pulp mill standards, which led to an increase in the number of prosecutions and several important convictions. The British Columbia pulp and paper industry, as a consequence, has invested heavily in the past decade to reduce dioxin and furan discharges. One goal of the campaign was to urge the pulp and paper industry to produce products free of organochlorine contamination. The campaign also achieved success in significantly improving public access to information about the environmental impact and regulatory compliance of the British Columbia pulp and paper industry.

3.6 Implications/Opportunities for Economy and Trade

The implications for the Mexican economy could be highly negative if brick making was to be eliminated. Experience to date with point sources in Canada and the United States (e.g., incinerators, pulp and paper mills) indicates that serious effects on the economies of either country are unlike, although significant costs may be incurred by the industries involved. Other than perhaps with brick exports from Mexico, significant impacts on international trade as a result of controls on dioxins and furans releases are not expected.

3.7 National Capacity to Take Action, Available Expertise and Technology

Capacity building measures are required to develop expertise and technology in Mexico and improve prospects for action in all three countries. This would include systematic monitoring of levels in all three countries. Concentrations and exposure data must be collected in a reliable and scientifically sound manner, and shared among the parties. Laboratory expertise could also be

improved. Because analytical procedures are expensive, alternative approaches (e.g., use of biomarkers) are also required and are presently under development (e.g., immunochemistry kits). The objective is to have reliable and cost-efficient methods.

Sources and releases of dioxins and furans in Mexico are not well understood. Significant data gaps and uncertainties also remain with the Canadian and United States inventories (see Appendix A). Completion of a North American Inventory will give a better idea of what capacity is required to take action and will provide the basis for development of rational control strategies in the regional action plan.

Improved tools and information that quantitatively link dioxin emissions to general population exposure are also required. These will include source testing and methods development, long-range transport modeling, chemodynamic fate studies, screening and testing improvements (e.g., immunoassays and gene probes), ambient measurements, and the identification and modelling of human and non-human exposure pathways. Such technological improvements could be shared among the parties. This could be an integral part of programs already underway that address persistent, bioaccumulative, and toxic substances.

3.8 Jurisdictional and Regulatory Opportunities for Change

Alternatives to intended use products, like pesticides, usually consist of safer products. For non-use substances, like dioxins and furans, alternatives consist of improved or different processes that reduce or eliminate their generation. Some alternatives have been successfully implemented for combustion sources and paper and pulp manufacturing. Other sources are site-specific (e.g., contaminated sites, landfills). This presents a challenge to sort through these alternative processes to identify those that may apply in various situations and industries. In Canada, dioxins and furans have been identified as Track 1 substances under the Toxic Substances Management Policy and are thus slated for virtual elimination.

Although regulatory programs at the national and state or provincial levels are well established in the United States and Canada for remediation activities (e.g., Superfund in the United States), it is unclear whether these programs provide a comprehensive means of ensuring that the risks of dioxins and furans are acceptable. The parties could survey these programs and the basis for their establishment to determine if similar approaches are applicable in Mexico.

Once a comprehensive survey of control strategies is completed, the Action Plan should assess which control strategies appear to be the most effective regulatory tools (and conversely, which ones appear to lack effectiveness). As part of this assessment, the NARAP could identify any uncertainties that arise when assessing the effectiveness of the various control strategies. The assessment of the control strategies will not only allow the Parties to share regulatory experiences, but would also enable them to consider whether a NARAP should recommend the tripartite adoption of identified effective control strategies.

3.9 International Commitments and Obligations

In 1998, Canada signed the UN-ECE Protocol on Persistent Organic Pollutants that calls for Parties to apply ‘best available technology’ (BAT) to emissions of a number of substances including dioxins and furans. Dioxins and furans (at least, 2,3,7,8 chlorinated congeners) have also

been proposed for inclusion in the base agreement currently being negotiated at the United Nations by the International Negotiating Committee (INC) and which are intended to result in global control of persistent organic pollutants.

Under the Great Lakes Binational Toxics Strategy (USA-Canada) signed by the Parties, virtual elimination of toxics was seen as a long term objective, but Canada (represented by Environment Canada) agreed to work with their partners to seek, by the year 2000, a 90 percent reduction in releases of dioxins and furans (this figure was 75 percent for the US EPA) from sources relating to anthropogenic activity in the Great Lakes Basin. In this Strategy, the substances are characterized as "Level 1 substances" on the basis of a number of selection criteria. Congeners specified for actions were to be consistent with the manner described in the Canadian government's Toxic Substances Management Policy.

Canada, along with 14 other countries, participated in a recent WHO/IPCS expert group meeting (1998) to establish a new 'tolerable daily intake' (TDI) for dioxin (WHO, 1998). The range proposed was for a daily intake of between 1 to 4 picograms per kilogram of body weight. Canada is currently considering the evidence on which this recommendation was made before deciding whether to adopt this value for risk management purposes.

4.0 Recommendations to the Working Group on the Scope of the North American Regional Action Plan for Dioxins and Furans

Three overarching points are particularly relevant when reviewing these recommendations. First, dioxins and furans are capable of long-range transport and current unilateral and bilateral initiatives do not provide for adequate control of transboundary sources (particularly those in Mexico). Second, Mexico does not currently possess the capacity to identify and reduce releases of dioxins and furans. As such, Mexico would greatly benefit from the capacity building and technology transfer efforts that would be a part of a North American Regional Action Plan for dioxins and furans. Third, NARAPs on dioxins and furans and HCB could be coordinated closely since a strong relationship exists between HCB formation and dioxin formation as combustion by-products.

The following elements could be contained in a NARAP on dioxins and furans:

1. Actions to improve national capacities to adopt measures to reduce risks to human health and the environment.
2. Short, medium and long-term risk reduction actions consistent with regional needs and objectives.
3. A strategy to address the financial commitments required by actions proposed in the NARAP.
4. Actions designed to improve the assessment of risk in the three countries by:
    - Updating and completing the sources and releases inventories for Canada and the United States (see Appendix A for overview of the current state of knowledge);
    - Initiating the development of a sources and releases inventory for Mexico;

- Developing a strategy to estimate human and environmental exposures and risks in Mexico; and
- Sharing expertise and knowledge on analytical capacities among the three countries.

5. Actions designed to analyse and implement risk reduction measures by:
   - Identifying technological changes (best practices) that have been made in various industrial sectors to reduce releases of dioxins and furans, including reviewing the costs and benefits of the technological changes to facilitate priority setting;
   - Completing the review of national and international control strategies for dioxins and furans (see Appendix A for an overview) so that poorly controlled sources and releases, particularly those that could lead to transboundary transport, can be identified;
   - Ensuring that information on analysis and implementation of risk reduction measures is shared among the three parties; and
   - Based on this review and analysis, developing and implementing measures to reduce risks to human health and the environment, including exploring the effectiveness of voluntary approaches relative to other policy instruments.
6. Actions designed to determine the success of the NARAP, including performance indicators measuring:
   - tissue levels in piscivorous mammals and birds;
   - shellfish and fish advisories (related to dioxins and furans); and
   - transboundary flux.

Appendix 1: Nomination Dossier

Appendix 2: Letters from the SSTF Chairperson to the Working Group Reporting on Stages in the Substance Selection Process

Appendix 3: Summary of Matrices used during the evaluation process

Appendix 4: Review of sources, releases and control programs

Appendix 5: Comments on the Dossier received by the SSTF

Appendix 6: List of other supporting documents not cited in the dossier