Chapter 5: Air

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5.1 INTRODUCTION

This section considers the regulation of *outdoor* air contaminants,[1] an area that includes the involvement of both the federal and provincial governments. The provinces establish standards to regulate air contaminants at levels to prevent harm to human and ecosystem health, to prevent discomfort and loss of enjoyment of property, and to prevent damage to the physical environment. The federal government's role in the control of air pollution is to undertake research, enter into treaties, control transboundary air pollution and set standards to protect public health and safety.[2] This chapter provides a relatively detailed up date as to the status of Ontario provincial and federal air standard setting as of April, 2000. The legislative and regulatory framework is outlined, along with a brief description of the provincial approvals process for air approvals. The provincial standard setting plan is described in some detail; other aspects of provincial air regulation are briefly mentioned. On the federal side, the current Canada Wide Standards setting process is described in terms of current proposals; other aspects of federal and federal-provincial air standard setting are also mentioned more briefly. Attempts have been made to provide up to date references as of the date of this study so that those interested in further review regarding air standards can begin from the status as of April, 2000. However, it should also be mentioned that both federally and provincially, for particular air contaminants, there are many specific in depth consultation processes, with an array of participants or stakeholders, and so for a review of a particular contaminant, as opposed to an overall view which this chapter provides, the documentation available for the particular stakeholder process should be consulted.

5.2 PROVINCIAL REGULATION

Ontario's *Environmental Protection Act (EPA)*[3] is the principal statute governing air quality in the province. It establishes a general prohibition against discharging contaminants into the natural environment in excess of the amounts permitted by the regulations. "Contaminant" is defined to include a substance that causes an "adverse effect." "Adverse effect" is defined to include, among other things, "harm or material discomfort to any person;" "an adverse effect on the health of any person" and "impairment of the safety of any person." Because of the regulations, emissions may be permitted in accordance with a Certificate of Approval issued by the Ministry of the Environment (MOE). Specific provisions are provided for Certificates of Approval for all stationary sources that emit, or have the potential to emit outdoor air contamination.[4] Certificates of Approval are legally-binding licences that set out the conditions under which a facility can operate, including maximum permissible contaminant emission levels. The Ministry of the Environment has established standards and guidelines that inform the setting of these emission limits, as described below.

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[1] For information regarding indoor air pollutants and their effects on children, see Pollution Probe and The Canadian Institution of Child Health, *The Air Children Breathe: The Effects on Their Health*. Conference Proceedings, (January 19/20, 1998).

[2] Estrin, D. and Swaigan J. *Environment on Trial: A Guide to Ontario Environmental Law and Policy*. Third Edition, (1993).

[3] *Environmental Protection Act,* R.S.O. (1990), E. 19.

[4] *Ibid.*, EPA, s. 9. The Act and Regulations exempt a number of sources from this requirement. See also R.R.O. (1990), Reg. 346, s. 3.

5.2.1 Ambient Air Quality Criteria

Ambient Air Quality Criteria (AAQC)[5] are established under the *EPA* and limit total atmospheric contaminant levels. The Criteria are established for different time periods and set the maximum average contaminant concentration that is permissible during a particular time period. Hence, a one hour AAQ Criterion for a contaminant would limit the average atmospheric quantity of the contaminant that is present during a one-hour period at a particular point or receptor. AAQC are based on either human health or environmental effects, whichever is the most sensitive, and are normally set at a level that is not expected to cause adverse effects to a sensitive receptor, based on continuous exposure. Consequently, socio-economic factors including costs and technological feasibility are not considered in the setting of an AAQC. If odour or irritant effects are experienced at levels below health effects, then the AAQC are established based on that more sensitive impact. The Criteria are not themselves standards, but they may become indirectly enforceable by way of being included in a particular Certificate of Approval issued to a particular applicant for a specific facility or mobile source. Where relevant, they are used to guide the setting of individual Certificate of Approval limits.[6] Where National Ambient Air Quality Objectives (see below) exist, they inform the setting of AAQC.[7] The Canada Wide Standards process under CCME has largely usurped development of additional National Ambient Air Quality Objectives (NAAQO), in the sense that the federal government is devoting its resources to the CWS process although the authority to enact NAAQO is still in place. The Ontario Ministry of the Environment expects that in the future as new standards are developed (see description of this process later in this chapter), all of the criteria will be adopted as standards and there will no longer be air "guidelines" in use. This approach will be more consistent with current practice and more consistent with enforceability requirements.[8]

5.2.2 Point of Impingement Standards

Regulation 346[9] under the *EPA* sets out Point of Impingement (POI) standards for non-vehicular contaminant sources. These legally-binding standards limit the contaminant content of the emissions that are produced by individual facilities. A point of impingement is the location at which a contaminant first makes contact with a sensitive receptor following emission. The receptor may be human, animal or plant. For any given emission source, there exist multiple points of impingement, as the contaminant reaches different receptors (people, plants, wildlife) that are situated at different distances and in different directions from the emission source.[10] Schedule 1 to Regulation 346 establishes Point of Impingement limits for a number of contaminants. These standards are maximum average contaminant concentrations that are permitted over a half hour period at the Point of Impingement. They may not be exceeded unless

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[5] *Ambint Air Quality Criteria Regulation,* R.R.O. (1990), Reg. 337.

[6] Ontario Ministry of the Environment. *Backgrounder on the Development and Implementation of Air Quality Standards*, (not dated) [hereinafter *MOE Backgrounder*].

[7] Personal Communication, J. Smith, D. Harper, A. Socha, Standards Development Branch, Ontario Ministry of the Environment, (March 30, 1999).

[8] Personal Communication, S. Fleming, A. Socha, Standards Development Branch, Ontario Ministry of the Environment, (March 16, 2000).

[9] *General Air Pollution Regulation*, R.R.O. (1990), Reg. 346.

[10] Personal Communication, Doug Harper, Manager of Human Toxicology and Air Standards Section, Ontario Ministry of the Environment, (July 29, 1999).

an emission source is explicitly exempted by regulation.[11]

Regulation 346 sets out, in its Appendix, formulae to calculate the concentration of a contaminant at the different possible points of impingement, depending on variables including source concentration and a range of relevant environmental conditions, such as weather. In order to determine if it is in compliance with POI standards, an industry calculates its POI concentrations using these formulae, for the range of points of impingement that are relevant to its situation. The industry then compares the *highest* POI contaminant concentration calculated with the Regulation 346 standard.[12]

Once an Ambient Air Quality Criterion is developed for a particular contaminant, it is used by the MOE to set a Point of Impingement standard, via a series of established mathematical relationships. For example, a 24 hour AAQ Criterion is multiplied by 3 in order to derive a 24 hour POI limit. Similarly, an annual AAQ Criterion is multiplied by a factor of 15 to determine the annual POI limit. According to the MOE, these relationships between AAQC and POI standards are well developed. The limitation of this method, however, is that it fails to consider background contaminant levels. In other words, it works well for an individual facility, but does not take into account the emissions produced by other facilities. It does not guarantee, therefore, that if the POI limits derived in this manner were met by all contaminant sources, that the AAQ Criterion for total atmospheric contaminant levels would also be satisfied. According to the MOE, this is only a concern for a few contaminants such as nitrous oxides and particulate matter, where background levels are significant. For other contaminants, background levels are apparently minimal.[13] However, it should be noted that among the contaminants of greatest concern for respiratory impacts on children are nitrous oxide and particulates.

Because POI standards apply to existing sources, some socio-economic issues are sometimes considered by the MOE in their development. The MOE considers whether the POI standards are "technically feasible" and whether the "costs" of implementation are balanced by their "benefits."[14] However, new sources may be required to be built to the more recent POI standards where applicable.

5.2.3 Point of Impingement Guidelines

The provincial Ministry also makes use of Impingement Guidelines. Like POI standards, they are used to review Certificate of Approval applications and to approve new and modified emission sources. However, in contrast to POI standards, they do not automatically apply to emission sources and are only legally-binding when incorporated into a Certificate of Approval. While POI standards are developed for substances that are identified as being of relatively greater risk to human health and the environment, based on release quantities, the number of sources, and the potential for exposure at levels that may cause adverse effects, guidelines apply to substances that are released from relatively few sources and which the Ministry has determined are best managed on a case-by-case basis. POI guidelines are generally set to avoid adverse human health and environmental effects and accordingly, are not informed by socio-economic factors.[15] As indicated above, the MOE expects to move toward use of standards only as the

[11] *General Air Pollution Regulation*, R.R.O. (1990), Reg. 346, s. 5.

[12] Personal Communication, Doug Harper, Manager of Human Toxicology and Air Standards Section, Ontario Ministry of the Environment, (July 29, 1999).

[13] Personal Communication, Doug Harper, Manager of Human Toxicology and Air Standards Section, Ontario Ministry of the Environment, (July 29, 1999).

[14] *MOE Backgrounder,* undated, *op.cit.*

[15] *MOE Backgrounder*, undated, *op.cit.*

newer standards are developed.[16]

5.2.4 Ministry of the Environment Three Year Plan for Standard Setting

During the 1980s, air standard setting was undertaken by a committee comprised of representatives from the Ministries of Labour and Environment. When this group disbanded in the late 1980s, standard setting and revision was left without a formalized process or overseeing committee. Consequently, these activities were undertaken as they were perceived to be needed. In 1994, for example, a revised lead standard was developed.[17] In the mid-1990s, the Provincial Auditor criticized the MOE for its lack of a formal standard setting process and in response, the Ministry developed its Three Year Plan for Standard Setting.[18] The 1996 Plan[19] recognized that many of Ontario's air standards, some of which were established two decades previously, may not be adequately protective. The Ministry also acknowledged that the science of risk and exposure assessment had changed significantly. Accordingly, the Ministry undertook an assessment of its air standards in order to establish priorities for review. Following comparison to the standards in other jurisdictions, Ontario standards for 75 substances were deemed to be sufficiently stringent for the time being. These substances were set aside while higher priority substances are reviewed.[20] A decision by the MOE to accept these 75 standards was posted to the EBR on February 21, 2000.[21]

In its identification of priorities for review, the MOE's Standards Development Branch considered toxicity, whether the substance is present in the environment and to what extent, quantities of release, the number of sources and the potential for exposure to a contaminant.[22] Branch documentation states that it also considers new information related to environmental/human health effects, the need to meet MOE commitments to federal/provincial standard-setting working groups, information from tools such as the National Pollutant Release Inventory, and needs that have been identified in support of Ministry programs.[23]

Based on these criteria, over 70 substances were identified as priorities for evaluation and were included

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[16] Personal Communication March 16, 2000, *supra* note 8.

[17] See Section 8.4.3 of Case Study #1.

[18] Personal Communication, Doug Harper, Manager of Human Toxicology and Air Standards Section, Ontario Ministry of the Environment, (April 16, 1999).

[19] Previously available at http://www.ene.gov.on.ca/envision/standards/index.html

[20] Ministry of the Environment, Standards Development Branch, October, 1999, *Reviewing Ontario's Air Standards*. The jurisdictions to which each of the 75 standards was found comparable and a brief rationale statement for retaining the standard can be found in this document at Table 1 and Appendix A. (hereinafter, Reviewing, 1999).

[21] EBR posting EBR Registry Number PA9E0004, titled *Setting Environmental Quality Standards in Ontario: the Ministry of Environment's Standards Plan;* pdf file located at: http://www.ene.gov.on.ca/envision/env_reg/er/documents/2000/pa9e0004.htm. Written submissions permitted between November 5, 1999 and January 4, 2000; Decision posted Feb. 21, 2000. Based on the document, *Reviewing Ontario's Air Standards*, October 1999, Standards Development Branch, Ministry of the Environment (hereinafter, Standards Plan, 2000).

[22] Standards Plan, 2000, *supra* note 21, section 3.2

[23] Fax received from D. Harper, Manager of Human Toxicology and Air Standards Section, Ontario Ministry of the Environment, (June 1, 1999).

in the Ministry's Plan. In January, 1997, stakeholder consultation began on proposed air quality standards for an initial set of 14 of these substances.[24] These consultations were undertaken to solicit science and technology related information regarding the proposed standards and to seek feedback regarding timely and equitable implementation. In March, 1998, standards for 9 of these substances were posted to the *Environmental Bill of Rights*[25] Registry and the decisions for those 9 were posted in December 1998. The remaining 5 substances[26] were to undergo more comprehensive assessment. Initial standards were proposed for these substances in 1998; as of April , 2000, they are still undergoing revision and preparation of information drafts, and establishment of a risk management process.[27]

In January, 1999, information regarding an additional 18 substances[28] for review was posted on the Registry.[29] This group of 18 has been posted on the Registry with proposed Ambient Air Quality Criteria (AAQC) and Point of Impingement (POI) Standards, along with detailed rationale documents for each of the eighteen chemicals.[30] For fifteen of these eighteen standards, the AAQC is proposed to be more stringent; for two of these standards, (methyl isobutyl ketone and toluene), the AAQC is proposed to remain the same; while for one of these eighteen standards, (isopropyl benzene), the proposed AAQC is to be made less stringent. For those proposed to be more stringent, the factors range from 1.5 times more stringent to 500 times more stringent, with the upper end of this range being for the air carcinogens (acrylonitrile, chloroform and propylene oxide). However, this type of comparison is crude at best and the proposals should be reviewed specifically for further information.[31] For these eighteen proposed air standards, the POI half-hour standard is proposed to be more stringent for 13 of them and to remain the same for five of them. However, all of them are proposed to be standards rather than guidelines. An interim standard is proposed as a range, from the proposed standard, up to a specified amount, for nine of them; for the other nine, the ultimate proposed standard does not require an interim range.[32]

There will be a further group of 15 substances for which the review process will begin shortly, but as of April, 2000, these have not yet been posted to the Registry.[33] They are expected to be posted to the EBR later in the year 2000.[34]

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[24] 1,4 dichlorobenzene, acetaldehyde, arsenic, cadmium, carbon tetrachloride, chromium VI, cyclohexane, dichloroethane, formaldehyde, methylene chloride, nickel, styrene, tetrachloroethylene, trichloroethylene. Supra, footnote 21, Table 1(a).

[25] *Environmental Bill of Rights*, R.S.O. (1993), c. 28.

[26] cyclohexane, cadmium, chromium VI, nickel and arsenic.

[27] Standards Plan, 2000, *supra* note 21, table 1(a).

[28] acetonitrile, acrylonitrile, ammonia, chlorine, chloroform, ethyl ether, ethylbenzene, hydrogen chloride, isopropylbenzene, vinylidene chloride, methanol, methyl ethyl ketone, methyl isobutyl ketone, mineral spirits, n-hexane, propylene oxide, toluene, xylenes.

[29] *MOE Backgrounder*, undated, *op.cit.*

[30] Ministry of Environment, Consultation on 18 Ontario Air Standards: Information Summary, http://www.ene.gov.on.ca/envision/env_reg/er/registry.html (hereinafter, Consultation on 18)

[31] Consultation on 18, *supra* note 30, Table I.

[32] Consultation on 18, *supra* note 30, Table I.

[33] Personal Communication, J. Smith, D. Harper, A. Socha, Standards Development Branch, Ontario Ministry of the Environment, (March 30, 1999); See also Standards Plan, 2000 *supra*, note 21.

[34] This next group of fifteen (actually to be sixteen with the addition of uranium), include: acetone, acetonitrile, acrolein, acrylamide, cyclohexane, Di(2-ethylhexyl)phthalate, Di-n-octylphthlalate, Hexamethylene diisocyanate monomer and buiret, Hydrogen cyanide, Hydrogen fluoride, Methane di-phenyl diisocyanate,

In addition to the 70 substances identified as priorities for standards revision, there also remains the possibility of additional standards development or revision in response to new information. For example, the uranium standard is to be released shortly because of concerns arising in Port Hope, Ontario. Other reasons for additional standards to be developed or revised include new information from other sources such as IARC (International Agency for Research on Cancer) carcinogens, EPA IRIS (Environmental Protection Agency (U.S.) Integrated Risk Information System), World Health Organization, and the National Toxics Program.

Following the above groups of proposals, thirty-three of the 70 air priorities identified in the Standards Setting Plan will remain for air standards development. Of these, eight are being developed under either the Canada Wide Standards process or under a Federal-Provincial Working Group under CEPA (benzene, mercury, NOX, ozone, particulate matter, total reduced sulphur, sulphur dioxide, chlorinated di-benzo-p-dioxins (CDD's and furans). Further comment as to some of these latter is found below in the review of the federal role.[35]

Those POI standards that are revised through this process automatically apply to all emission sources, regardless of whether a facility holds a Certificate of Approval authorizing the application of the former emission standard. In contrast, POI guidelines do not automatically apply to emission sources, but rather, are applied when a source seeks to renew its Certificate of Approval.[36] Accordingly, as POI guidelines are replaced by standards, they will apply to all emission sources.

5.2.5 The Standard Setting Process

The MOE's stated policy is to set its standards to be protective of the most sensitive receptor. When available information indicates that children are the most sensitive receptor, as was the case with lead and is the case with a forthcoming uranium standard, the Ministry reports that it will base its standard on the protection of children.[37]

To assess the risk posed by a particular contaminant, the Ministry relies on risk assessments developed by other regulatory agencies such as Environment Canada, Health Canada, the U.S. Environmental Protection Agency (EPA), individual state EPAs and the World Health Organization (WHO).[38] The MOE acknowledges that "there is considerable variability among regulatory agencies on the types and number of ambient air quality standards, guidelines and exposure limits." Reasons can include different endpoints or types of effects, different averaging times and different methodologies. Differences also include considerable differences in the way standards are developed; some jurisdictions basing results almost exclusively on results of detailed risk assessments; others extrapolating from workplace exposure limits.[39] Ministry staff advise that their review of these other jurisdictions' risk assessments is thoroughly

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Methyl isocyanate, phenol, toluene diisocyanate, uranium and vinyl chloride. *supra* note 30, page 6.

[35] Consultation on 18, *supra* note 30, Table II.

[36] Personal Communication, Doug Harper, Manager of Human Toxicology and Air Standards Section, Ontario Ministry of the Environment, (July 29, 1999).

[37] Personal Communication, J. Smith, D. Harper, A. Socha, Standards Development Branch, Ontario Ministry of the Environment, (March 30, 1999).

[38] *MOE Backgrounder,* undated, *op.cit.*

[39] Reviewing, (1999), s*upra* note 20.

documented, including their assessments as to whether the judgments made by that jurisdiction at various steps in the hazard assessment process are consistent with the judgments that would be made in Ontario's risk assessment process.[40] Ministry staff also advise that their preference, where possible, is the work of U.S. EPA or California, at least as to the risk assessment aspect of the process (i.e. not necessarily the risk management approach).[41]

The Ministry inventories contaminant sources and ambient contaminant levels in order to estimate exposure levels in the province.[42] The MOE states that it considers multi-media exposure.[43] While exposure is generally assessed based on adult body weight and breathing rate, the MOE asserts that its standards are protective of children based on the use of very large uncertainty factors.[44]

To set a standard, the MOE turns once again to the standards developed in the jurisdictions listed above. It may also develop a standard independently, which is usually based on existing scientific information. The Ministry develops a proposed *Rationale Document for the Development of Ontario Air Standards* which sets out the range of standards that the Ministry is considering for adoption.[45] The Ministry solicits information and commentary from stakeholders on this draft by organizing information sessions and posting the draft to the *Environmental Bill of Rights* Registry.[46]

According to the MOE, it then considers information received from the public and undertakes a preliminary risk analysis for the proposed standards. Where no substantive implementation issues have been identified by stakeholders, or where implementation can be achieved via ongoing or planned initiatives, the Ministry proposes an Ambient Air Quality Criterion, a Point of Impingement Guideline or Standard that is based on the Ambient Air Quality Criterion, and sets out an effective implementation date. The new standards are posted on the *Environmental Bill of Rights* Registry.

When Ministry assessments and stakeholder input indicate that a number of sources will be out of compliance with the range of standards being considered and will incur undue financial hardship or other economic consequences to be in compliance, or where more scientific information needs to be considered in the risk assessment, the Ministry states that it undertakes a more detailed assessment in the form of a *Detailed Risk Management Analysis*. For example, for the 18 standards currently under review, this Analysis has not yet been prepared; it will be undertaken after receipt of the comments from affected parties and the public as solicited on the *Environmental Bill of Rights* registry. The basis upon which risk management decisions will be made has not yet been determined, and a stakeholders advisory

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[40] Personal Communication, (March 16, 2000), *supra* note 8.

[41] For the MOE's description of the risk assessment process followed in some of the leading jurisdictions (U.S. EPA, California, Massachusetts, Michigan, and New York, see Reviewing, (1999), *supra* note 20.

[42] Personal Communication, *supra* note 8.

[43] Ontario Ministry of the Environment. *Workshop on Incorporating Risk Management Considerations in the Development of Ontario Air Standards: Report of the Standards Development Branch, Ontario MOE.* (September 25, 1998) [hereinafter, *MOE Workshop*]. In the October, 1999 Report , *supra* note 20, the description is that the Ontario MoE takes a multi-media protection approach; that is the multi-media aspect of the approach is that the most sensitive receptors may be non-human, i.e. vegetation, wildlife, accumulation in soil, or entering food-chain (at page 2).

[44] Personal Communication, J. Smith, D. Harper, A. Socha, Standards Development Branch, Ontario Ministry of the Environment, (March 30, 1999).

[45] *MOE Backgrounder,*undated, *op.cit.*

[46] *Ibid.*.

consultation to consider the parameters for the risk management stage of the standard setting for this group will be established. Ministry staff advise that they are concerned as to whether affected industry has demonstrated a "compelling" rationale to show that there are "major implementation issues" with the proposed protective standards. However, pending that process, interim standards will be set, which for carcinogens will be within a range corresponding to risk levels of one excess cancer in a population of 1,000,000 (10^{-6}) over a lifetime, up to, but no higher than 1 excess cancer in a population of 10,000 (10^{-4}) over a lifetime.[47] Ten to the minus six life time risk is the target standard; the risk management consultation is primarily to put the onus on the affected industry to show why they cannot meet that standard immediately; and if it is satisfactorily proven that there are some barriers to doing so, then to establish the time frame and conditions to move from the interim standard to the long term standard.[48] This includes an examination of the technical options available to reduce emissions and their socio-economic effects.[49]

In order to assess whether there are such "compelling implementation issues," the consultation document asked industry to provide the following information:

- the operations or processes which give rise to emissions of the substances under review;
- the reduction in emissions that would be required to bring the facility into compliance with the proposed standard;
- changes in equipment, potential additional systems or operations (including pollution prevention measures) necessary to achieve and maintain compliance with the proposed standard, including projected capital and annual operating costs of such changes, timing and any gains in productivity, recovered materials or reduced energy or raw material usage;
- if it is claimed that a standard is not technically achievable, to provide documentation of the conditions or circumstances that confirms this position;
- provide documentation as to the degree of reduction in emission and ground-level concentration that could be achieved in the operation, facility and/or firm;
- the earliest possible time frame for compliance with the standard; and
- whether the firm is involved in developing emission reduction strategies under the federal Strategic Options Process for this substance.[50]

The document also refers industry to other documents for assistance in preparing their submissions, including the *Framework for the Application of Socio-economic Analyses in Setting Environmental Standards*.[51]

The standards plan advises that "In the absence of specific, significant implementation issues the Ministry will proceed to finalize the proposed standards" and that "If stakeholders make no comments about the proposed standards, it will be presumed that they have no concerns or will have no difficulty, technically or financially, in complying with the proposed standard."

The Ministry states that one of the purposes of this analysis is to ensure that the costs and benefits associated with the standard are "balanced," and to verify industry claims such as cost burdens. The

[47] Consultation on 18, *supra* note 30 at page 3.

[48] Personal Communication, (March 16, 2000), *supra* note 8.

[49] *Ibid.*

[50] For example, see the Toluene rationale document, one of the group of 18, note 57 below (detailed rationale).

[51] Economic Integration Task Group, CCME, (1998). http://www.mbnet.mb.ca/ccme/pfds/SEFrameENG.pdf

analysis is conducted by way of a multi stakeholder working group that includes representation from the major sources of a particular substance. The outcome of this process is to be a proposed Ambient Air Quality Criterion, a Point of Impingement Standard or Guideline and an effective implementation date. The standards are posted to the *Environmental Bill of Rights* Registry for final comment.

The MOE states that when a large number of sources are affected by a revised standard, other options include implementing "technology-based solutions," adopting a philosophy of continuous improvement with short-, medium-, and long-term plans for reducing emissions, setting interim Point of Impingement limits based on considerations of cost and technical feasibility (which are incorporated into Regulation 346 and are therefore binding), or setting a Point of Impingement limit at a level that is deemed "reasonable" in light of the costs imposed and benefits realized.[52] However, the MOE does not have a policy in place to guide the development of alternatives when proposed standards are deemed to be too onerous to industry.[53]

When considering cost-benefit arguments for air standards, the U.S. Environmental Protection Agency report, *The Benefits and Costs of the Clean Air Act Amendments of 1990* should be borne in mind.[54] That study reported that "The economic value of the public health and environmental benefits that Americans obtain from the Clean Air Act Amendments of 1990 exceed their costs by a margin or four to one. Included in the benefits is the prevention of thousands of premature deaths and millions of asthma attacks related to air pollution each year. By the year 2010, the benefits will total about $110 billion (U.S.) compared to the costs of achieving those health and ecological benefits at only about $27 billion.[55] The study was extensively peer reviewed at all stages of its design, research, analysis and report. These figures did not even include many additional benefits not yet quantified, such as the control of cancer-causing air toxics and benefits to crops and ecosystems. Some of the recommendations from this study are endorsed and repeated at the end of this chapter.

Toluene

One of the current proposals in the group of 18 substances on which stakeholder comment is being solicited is toluene. The EBR posting for toluene[56] provides a brief description of the rational for the development of the Ontario Air Quality Standards for Toluene and the detailed supporting document is also available.[57] Similarly, each of the other of the eighteen substances in the current review has a separate posting and rationale document.

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[52] *MOE Workshop, supra* note 43.

[53] Personal Communication, J. Smith, D. Harper, A. Socha, Standards Development Branch, Ontario Ministry of the Environment. (March 30, 1999).

[54] U.S. Environmental Protection Agency, "*The Benefits and Costs of the Clean Air Act Amendments of 1990*," www.epa.gov.oar/sect812

[55] Among the benefits counted by the study, to be achieved by 2010, are the prevention of 23,000 annual premature deaths, aversion of over 1,700,000 annual asthma attacks, prevention of 67,000 incidences of chronic and acute bronchitis, 91,000 occurrences of shortness of breath, 4,100,000 lost work days and 31,000,000 days of restricted activity, 22,0000 respiratory related hospital admissions, 42,000 cardiovascular hospital admissions and 4,800 emergency room visits for asthma -- in the U.S. alone.

[56] EBR Registry Number PA00#0018, Proposal for Policy, comment period from February 21, 2000 to May 21, 2000, *Rationale for the Development of Ontario Air Quality Standards for Toluene*. www.ene.gov.on.ca/envregistry/013213ep.html

[57] www.ene.gov.on.ca/envision/env_reg/er/documents/2000/pa9e0004.html

For the toluene standard, the current proposal is to leave the existing 24 hour Ambient Air Quality Criterion at 2,000 ug/m^3 and the existing half hour Point of Impingement standard at 2,000 ug/m^3. In other words, no change to the existing standard which was originally published in 1970 is proposed. The rationale includes that the health-based risk assessment from Health Canada was considered the most appropriate for developing the standard. The Health Canada Tolerable Concentration is 3,750 ug/m^3, but deriving a 24 hour AAQC from this concentration would result in an increase to the standard. As a result, the MOE is recommending no change to the existing standard.

Propylene Oxide[58]

Another of the current proposal by the MOE for 18 air standards is Propylene Oxide. The AAQC (24 hour) for this contaminant is proposed to be reduced from 4500 micrograms per cubic metre of air (ug/m^3) to 1.5 ug/m^3; the annual average AAQC to be .3 ug/m^3. The current half hour Point of Impingement guideline is 13,500 ug/m^3. The proposal is to change that to a standard, and to reduce the standard to 4.5 ug/m^3. An interim standard is proposed in the range of 4.5 to 450 ug/m^3. It is identified in the consultation document as a carcinogen. Propylene oxide is described as used mostly as an intermediate in the chemical production of urethane foams, other manufactures, sterilization and fumigation. The Rationale document identifies that the United States EPA identifies propylene oxide as a probable human carcinogen. The proposed standard is based on a risk level of one excess cancer risk per 1,000,000 people. The interim standard is proposed to allow for a phase-in period to achieve the new standard, and the range identified is that between a lifetime one in a million excess risk level and one in 10,000 excess cancer risk level. As was described in the toluene example, industry is asked to provide detailed information as to "the technical and economic considerations associated with achieving an interim POI standard" in the proposed range. They are also asked for information regarding the feasibility of achieving the final proposed POI standard.

Ethyl Ether[59]

The proposal for ethyl ether is to reduce the AAQC (24 hour) from 30,000 to 8,000 micrograms per cubic metre of air, and to reduce the POI guideline from 30,000 ug/m^3 to 700 mg/m^3, and as a standard, not a guideline. An interim range from 700 to 7,000 mg/m^3 is proposed. Ethyl ether is described as a solvent for waxes, fats, oils, perfumes, alkaloids and gums, as a reagent in certain chemical reactions, and as used in manufacture of gun powder and as a primer for gasoline engines. It is also used in medical therapeutic use. For this proposed standard, MOE based their AAQC proposal on the health-based Threshold Limit Value from the American Conference of Governmental Industrial Hygienists. The half-hour POI standard is based on odour effect. Again, industry and stakeholder comment as to implementation issues is being sought with respect to finalizing the interim standard. For this posting, the MOE included an appendix as to the agency-specific reviews of air quality guidelines for ethyl ether, including the standard in that jurisdiction, the documentation available, key references, a discussion of the peer review process, a brief discussion of the key risk assessment considerations, in this case, a discussion of threshold effects and non-threshold effects, a discussion of the key risk management considerations for the jurisdiction and a statement as to the utilization of a multimedia approach in the jurisdiction. This type of information is extremely useful and the MOE should be encouraged to continue making its reviews of other

[58] EBR Registry Number PA00E0017; Policy Posting, Written submissions due between February 21, 2000 and May 21, 2000. The detailed rationale document, *Rationale for the Development of Ontario Air Standards for Propylene Oxide*, February 2000, is available at: www.ene.gov.on.ca/envision/env_reg/er/documents/2000/pa9e0004.htm .

[59] EBR Registry Number PA00E0008, Policy Posting, Written Submissions permitted between February 21, 2000 and May 21, 2000. Detailed rationale document, *Rationale for the Development of Ontario Air Standards for Ethyl Ether*, February 2000 is available at: www.ene.gov.on.ca/envision/env_reg/er/documents/2000/pa9e0004.htm

jurisdictions' standards available in this manner.

5.2.5.1 Styrene: An Example

Styrene is one of the original 14 air contaminants identified for evaluation in 1996 under the MOE's Three Year Plan. The existing standard for styrene dates back to 1975 and is odour-based. In its evaluation, the Ministry reviewed the risk assessments and standards of other regulatory agencies, styrene's toxicity and styrene levels in Ontario. Two possible regulatory approaches existed, based on different health end-points. The first concerned neurological effects including fetal neurotoxicity (widely viewed to be among the most sensitive end-points), and injury to the central nervous system and the liver. The second was based on carcinogenicity. The latter was rejected on the basis that, in the opinion of the MOE, there was inadequate evidence in epidemiological and animal studies of a link between styrene exposure and cancer. In contrast, the State of Massachusetts characterizes styrene as a probable human carcinogen and estimates the additional risk of cancer from styrene at one in one hundred thousand with a lifetime exposure of 20 micrograms/cubic metre of air.

The MOE focused its neurotoxicity-based analysis on two sources: Health Canada and the World Health Organization. In 1993, Health Canada developed a Tolerable Daily Intake (TDI) for styrene under the *Canadian Environmental Protection Act*.[60] It recognized fetal neurotoxicity as being among the most sensitive of end-points for styrene. With this in mind, it developed a TDI value of 125 micrograms per cubic metre, based on the LOEL for neurotoxic effects observed in animal studies. The standard was specifically intended to be protective against fetal neurotoxicity. Health Canada then derived a Tolerable Concentration based on this TDI, and the breathing rates and body weights of 5 to 11 year olds. The result was a Tolerable Concentration of 92 micrograms per cubic metre.

The WHO also explicitly recognized, in the development of its 1997 standard for styrene, that neurotoxicity in the form of developmental impairment is among the most sensitive end-points for styrene. However, the WHO based its standard on data regarding the subtle neuro-psychological effects (such as reductions in visuomotor accuracy) observed in human occupational exposure studies. These data were adjusted by a factor of 4.2 to facilitate a conversion from occupational to continuous exposure. An additional safety factor of 10 was employed for inter-individual variation and finally, a further factor of 10 was applied because a LOAEL was adopted in place of a NOAEL. The WHO notes that the resultant level of 450 micrograms per cubic metre *should* be protective of neurological effects as observed in animal species (emphasis added).

In January, 1997, the MOE proposed a new styrene Ambient Air Quality Criterion of 125 micrograms per cubic metre, the value developed by Health Canada. Following stakeholder consultation, it switched to the considerably less stringent WHO standard, stating that this standard provides "a more balanced treatment of both the observations of fetal neurotoxicity in animal species and human exposure data."[61] Among industry stakeholder complaints was the claim that users of styrene in the manufacture of plastic resins and in the fibreglass industry would not be able to meet the Health Canada standard, based on existing knowledge and technology. Consequently, the existing MOE standard of 400 micrograms per cubic metre, which is 50 micrograms more stringent than the WHO standard, was deemed protective of health and remains unchanged.[62]

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[60] *Canadian Environmental Protection Act*, R.S.C., (1985), c. 16 [hereinafter *CEPA*].

[61] Ontario Ministry of the Environment. *Rationale for the Development of Ontario Air Standards for Styrene: Consultation Draft*, (1998) [hereinafter Styrene Rationale].

[62] Styrene Rationale, *supra* note 59.

Since this standard was proposed, the Ministry has issued a revised Standards Plan, as described above, and has revised their process to ask industry specific questions in justification of any claims that they cannot meet the proposed standard. For example, the EBR posting for comment on the current group of 18 standards asks Industry questions as to whether there are "compelling implementation issues" as described above. As well, the risk management approach intended to follow this round of consultation is yet to be developed.

5.2.6 Ozone-Depleting Substances General Regulation

The *EPA Ozone-Depleting Substances General Regulation*[63] was developed to reduce or eliminate the use of ozone-depleting substances in the manufacture of pressurized containers, flexible plastic foams and rigid insulation foams.

5.2.7 Acid Rain Regulations

The acid rain regulations were adopted under a 1985 program called Countdown Acid Rain, in order to impose total annual sulphur dioxide emission limits on the major sources of these contaminants in Ontario.[64] These include Algoma Steel,[65] Inco,[66] Falconbridge[67] and Ontario Hydro.[68]

5.2.8 The Environmental Protection Act Part III: Motors and Motor Vehicles

The provincial government is also involved in the regulation of mobile emission sources. Part III of the *EPA* prohibits the removal from vehicles of systems and devices designed to reduce contaminant discharges.[69] The *Motor Vehicles Regulation*[70] sets out maximum permissible emission levels for operating vehicles, including maximum levels of hydrocarbons, carbon monoxide and visible emissions.

5.2.9 Smog Plan

The Ontario Ministry of the Environment's 1998 Smog Plan is aimed at reducing, by 75%, the number of exceedances of its ozone Ambient Air Quality Criterion. It seeks to accomplish this by reducing total nitrous oxides (NOX) and volatile organic compound (VOC) levels by 45% (1990 background standard).

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[63] *Ozone-Depleting Substances General Regulation,* R.R.O. (1990), Reg. 356.

[64] Estrin and Swaigen. (1993), *op.cit.*

[65] Reg. 663/85.

[66] Reg. 660/85.

[67] Reg. 661/85.

[68] Reg. 662/85. Note that the regulation controlling sulphur dioxide and nitric oxide emissions from the fossil-fueled electric generating stations of Ontario Hydro is now *Ontario Hydro* R.R.O. (1990), Reg. 355.

[69] *Environmental Protection Act*, R.S.O. (1990), E. 19, s. 22.

[70] *Motor Vehicles Regulation,* O.Reg. 361/98.

This reduction is to be accomplished, by the year 2015, through a variety of voluntary initiatives.[71] Additional information regarding ozone standards development is described below, in review of the proposed Canada-Wide Standard for ground level ozone. In addition, Canada is currently involved in negotiation with the United States of an Ozone Annex to the 1991 Canada-U.S. Air Quality Agreement. One round of negotiations was held in February, 2000; the next round is scheduled for June 14-15, 2000 in Washington. The purpose of the negotiation is to address trans-boundary ground level ozone air pollution between Canada and the United States. This is a major issue for Ontario since much of the ozone pollution in Ontario is from U.S. sources. At the same time, Ontario's actions with respect to its own contribution to ozone pollution (which impacts U.S. receptors to the east as well as Ontario, Quebec and eastern Canada) are critical to the negotiations and have been highly contentious. Furthermore, in development of the Canada-Wide Standard for ozone, the current levels in Ontario are standing in the way of development of a standard that is based on the most health protective levels.

5.3 ADEQUACY OF PROVINCIAL AIR QUALITY STANDARDS: INITIAL INFORMATION

In 1998, the Ontario Medical Association (OMA) released *The Health Effects of Ground-Level Ozone, Acid Aerosols and Particulate Matter*,[72] a report examining the health effects and regulation of air pollution in Ontario. The OMA reported that air pollution is a significant contributor to health conditions in Ontario and that as many as 1800 Ontarians die prematurely every year as a result of exposure to air contaminants.[73] The study emphasized that children are at particular risk.

A particular concern identified by the OMA was the restructuring of the electricity generation sector. The OMA fears that following privatization, increased reliance on cheap coal-generated electricity will result in high levels of air contaminants including volatile organic compounds, particulate matter, sulphur dioxide, mercury and carbon dioxide. This concern was echoed in a report[74] produced for the Toronto Board of Health which recommended stricter emission limits for a number of contaminants[75] originating from the electricity sector.

The OMA concluded that Ontario air standards are insufficiently stringent and called for a number of reforms including:

- stiffer sulphur dioxide and nitrous oxides emission limits for the electricity sector;
- a province-wide sulphur dioxide emission reduction of 75%;
- legislatively-mandated nitrous oxides emission reductions at Ontario Hydro; and
- stricter vehicular emission standards.

The OMA also highlighted the fact that current standards are not respected, noting that annual average

[71] Ontario Ministry of the Environment. *Ontario's Smog Plan: A Partnership for Collective Action*. Steering Committee Report. (January 1998). www.ene.gov.on.ca/envision/programs/3573e.pdf

[72] Available at: http://www.oma.org/phealth/ground.html

[73] http://www.oma.org/pcomm/pressrel/1998/may12.html

[74] Perrotta, K. and de Leon, F. *Ontario's Changing Electrical Sector: Implications for Air Quality and Human Health*. (March 1999). Prepared for Toronto Department of Public Health.

[75] sulphur dioxide, nitrous oxides, carbon dioxide, mercury, arsenic, beryllium, cadmium, chromium, lead and nickel.

ground-level ozone levels in the Great Lakes Basin have consistently surpassed the National Ambient Air Quality Objective of 15 ppb for the past several years. The OMA drew attention to the associated issue of severe cuts to Ontario's Ministry of the Environment, noting for example, that there were 40% fewer staff in 1997 than in 1990.

Since this report, the Minister of Environment has announced that emissions trading in the electricity sector would be permitted. It will allow for trading with companies from other (non-electricity) sectors which have no emission caps; it will allow trading with non-Ontario firms and sectors which have no emission caps; and accordingly will allow increased use of coal fired power plants to supply Ontario electricity users.[76]

Accordingly, the concerns expressed by the OMA in its 1998 report remain outstanding and furthermore, the impacts on childrens' health are expected to get worse rather than better from the electricity sector.

5.4 FEDERAL REGULATION

5.4.1 National Ambient Air Quality Objectives

National Ambient Air Quality Objectives (NAAQO) serve as a benchmark for air pollution regulatory regimes across Canada. They are non-binding and are designed to guide regulators in the issuance of operating permits to pollution-generating facilities. As discussed above, the Ontario MOE reports that it utilizes NAAQOs when setting its own air standards.[77] To date, objectives have been established for five pollutants: sulphur dioxide, nitrogen oxide, carbon monoxide, ozone and particulates.

The objectives specify the maximum permissible concentration of an air contaminant resulting from the combined emissions of all sources in an area. They are set for different time periods including, for example, one hour, eight hour and twenty-four hour objectives. The objectives include three regulatory levels:

> i) tolerable: intended to protect against adverse effects to human health. Concentrations above this level require prompt action in order to protect public health;
>
> ii) acceptable: provide adequate protection against deleterious effects to the environment, personal comfort and well-being; and
>
> iii) desirable: long-term goal for the improvement of existing air quality.

[76] For a good review of these and other important criticisms of the Ontario proposals with respect to emissions trading as well as implications from Ontario Energy Board decision making, see Kim Perotta, Toronto Public Health, Speaking Notes, *Stationary Sources - Implementation Approaches and Issues Municipal Perspective*, reproduced in Appendix C to the Final Report, *Ground-level Ozone Management: Approaches, Mechanisms, and Implementation*, Stakeholder Consultation, Negotiation of an Ozone Annex to the Canada-U.S. Air Quality Agreement, (February 10, 2000) [compiled by Environmental Canada, International Smog Programs].

[77] Personal Communication, J. Smith, D. Harper, A. Socha, Standards Development Branch, Ontario Ministry of the Environment. (March 30, 1999).

5.4.1.1 Derivation of NAAQOs

The Working Group on Air Quality Objectives and Guidelines (WGAQOG), composed of federal, provincial and territorial representatives of environment and health, is responsible for the development of National Ambient Air Quality Objectives. The Working Group reports to the *CEPA* Federal-Provincial Advisory Committee.

There are several steps in the process of developing a NAAQO. First, substances must be proposed and accepted for NAAQO development. A scientific review of the substance is then undertaken, using available information, in order to identify dose-response relationships for a variety of receptor end-points. Based on the scientific data, a Reference Level is determined. This is the level above which there are demonstrated health and/or environmental effects. A risk assessment is undertaken and a Rationale Document is prepared. The latter summarizes the scientific information, risk assessment and exposure estimate. It is used to derive a recommended NAAQO, which is presented to the *CEPA* Federal-Provincial Advisory Committee, the National Air Issues Coordinating Committee, Environment Canada and Health Canada, for adoption.[78] These steps are described in detail below.

The Working Group, the *CEPA* Federal-Provincial Advisory Committee and the National Air Issues Coordinating Committee may all nominate substances as candidates for the development of a NAAQO. The Working Group determines whether it is appropriate to proceed with the development of an air quality objective for a nominated substance by considering a number of factors including the abundance of the substance in the Canadian environment, environmental persistence of the substance, the capability and likelihood of the substance to cause adverse effects to human health or the environment, the existence of sub-populations that are sensitive to the substance, environmental transformation of the substance, and the appropriateness of managing the substance via an air quality objective.

When a substance is accepted for the development of a NAAQO, the Working Group undertakes a scientific assessment. The review includes an evaluation of the substance's physical and chemical properties, sources, and environmental fate, behaviour and levels. Also considered are monitoring technologies for detecting the substance. The substance's toxicity is assessed and exposure estimates are undertaken. Finally, a risk characterization for the substance is prepared. Toxicity assessment, exposure estimates and risk characterization are described, in turn, below.

Toxicity assessment first involves a qualitative assessment. This step critically assesses the scientific data concerning the substance. It provides conclusions regarding the likelihood that a substance poses a hazard to human health or the environment, the nature and severity of its potential effects, and the conditions of exposure under which the effects occur. Quantitative assessment describes the dose-response curves for various end-points and receptors.

According to the Working Group, exposure assessment considers all routes and media. The Working Group reviews existing data and undertakes exposure studies. It assesses the spectrum of potential

[78] Federal-Provincial Working Group on Air Quality Objectives and Guidelines. *A Protocol for the Development of National Ambient Air Quality Objectives. Part 1: Science Assessment Document and Derivation of the Reference Level(s)*. (1996) [hereinafter, *WGAQOG Protocol*].

receptors and identifies any subsets that are likely to exhibit heightened sensitivity. Finally, it provides estimates of human and environmental exposure to the substance. The purpose of risk characterization is to compare data on probable exposure levels with those levels that cause adverse effects. Sensitive or susceptible populations are identified.

The science assessment stage concludes with the determination of one or more Reference Levels for the pollutant. The Reference Level is the level above which there are demonstrated effects on human health or the environment. Reference Levels are intended to serve as benchmarks against which proposed National Ambient Air Quality Objective levels can be compared. Science assessment documents are subject to both internal and external review.[79]

In the risk management stage, control technologies, economic factors and other management issues are considered. A Rationale Document is prepared and includes the recommended objective as well as the rationale, based on the above-described analysis, for this choice.

5.4.1.2 The Relationship Between National Ambient Air Quality Objectives and Canada-Wide Standards

Recently, the processes for the development of National Ambient Air Quality Objectives and Canada-Wide Standards[80] were integrated. Air pollutants identified by government as management priorities will be targeted for the development of *either* a Canada-Wide Standard or a National Ambient Air Quality Objective.

The Working Group on Air Quality Objectives and Guidelines first prepares a risk assessment report, as described above. This is followed by the development of either a Canada-Wide Standard or a National Ambient Air Quality Objective. The former is undertaken by a committee of federal, provincial and territorial environment and health representatives when a commitment has been made by the Environment Ministers. In the absence of such a commitment, a NAAQO is developed by the WGAQOG. Both processes take place in consultation with stakeholders.[81]

5.4.2 Canada-Wide Standards

Particulate matter (PM) and ground level ozone are of particular concern to children. In January, 1998, the Environment Ministers identified PM and ozone as priorities for the development of Canada-Wide Standards. A Canada-Wide Standards Development Committee of federal, provincial and territorial environment and health officials was established. The group's mandate is to make recommendations on the form, target date and level of Canada-Wide Standards for ozone and PM, to organize and participate in national stakeholder consultations for the proposed standards and to prepare an overview of the jurisdictional implementation plans. Canada-Wide Standards for PM, ground-level ozone, Benzene and Mercury were proposed [82] with notice in the Canada Gazette on February 5, 2000. [83] These Standards

[79] *WGAQOG Protocol, op.cit.*

[80] See discussion in Chapter 6: Toxic Substances.

[81] Letter from Vic Shantora, Federal Co-chair, CEPA Federal/Provincial Advisory Committee to P. Muldoon, (Aug 25, 1998).

[82] http://www.mbnet.mb.ca/ccme/3e_priorities/3ea_harmonization/3ea2_cws/3ea2i_overviews/3ea2i4.html

are being developed under the framework of the Canada-wide Accord on Environmental Harmonization and the Canada-wide Environmental Standards Sub-Agreement (discussed further in Chapter 6). The Strategic Priorities Directorate of the Canadian Council of Ministers of the Environment (CCME) advised that the federal and provincial Ministers are also to consider other options for PM and ozone, including setting a standard for PM_{10} (coarse particulate matter), shortening the time frame for meeting the ozone target which is now set at 2015 and undertaking to review the standard in three years.[84] Since the federal-provincial agreements as to the proposed standards may be signed after the coming into force of the *Canadian Environmental Protection Act, 1999*, the Minister of the Environment published the proposed agreements in the Gazette as that legislation requires. Therefore the legislative framework for the federal agreement would be *CEPA 1999*. The federal and provincial Ministers intend to sign agreements as to the proposed standards in spring of 2000.

Benzene

Benzene was selected as a Canada-wide environmental priority in recognition that it is carcinogenic with no threshold and with the aim of reducing Canadians' exposure to "this known human carcinogen."

The agreement with respect to benzene (proposed under the Canada-wide Environmental Standards Sub-Agreement) proposes that the CWS is a national target of 30% reduction in total benzene emissions from 1995 emission inventory levels to be achieved by the end of the year 2000 in phase 1 and phase 2 to be developed for discussion in the spring of 2001.

The rationale states that the CWS "represents a balance between the desire to achieve the best health and environmental protection possible and the feasibility and costs of reducing the emissions that contribute to elevated levels of benzene in ambient air. The primary long-term air quality management goal for non-threshold toxicants like benzene is to reduce exposure to the extent possible and practicable, thereby reducing the risk of the adverse effects of this pollutant on human health." The rationale argues that lack of scientific certainty is not to be used as a reason to postpone "cost-effective measures to prevent environmental degradation." However, the rationale also acknowledges that most of the measures needed to reach the CWS are already underway.

It is apparent that the risk management approach has been relied upon in developing the Benzene CWS such that the proposal will not reach the level that would be necessary to best protect against health and environmental impacts. It is also apparent that the driver for the standard selected is not the CWS process; it is merely a repetition of measures already underway.

Particulate Matter and Ozone

Again, the Canada-Wide Standards for particulate matter and ozone proposed in the February 5th *Gazette* notice have been developed under the Harmonization Agreement and Sub-Agreement. The rationale states that "Significant adverse effects have been demonstrated for the air pollutants PM and ozone on human health and the environment." The context statement states that the long-term air quality management goal for these two pollutants is to "minimize the risks of these pollutants to human health

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[83] Canada Gazette Part I, Vol. 134, No. 6, (February 5, 2000), p.320, Government Notices: Department of the Environment, Canadian Environmental Protection Act, 1999: *Agreements Respecting Canada-Wide Standards for Benzene - Phase 1, for Particulate Matter (PM) and Ozone, and for Mercury*. See also http://canada.gc.ca/gazett/hompar1_e.html for the Gazette website and http://www.ccme.ca for the CCME website with additional information on the Particulate Matter and Ozone options.

[84] Cynthia Wright, Director General, Strategic Priorities Directorate, (February 15, 2000), Letter to Stakeholders re Canada-wide Standards for PM and Ozone, Benzene and Mercury.

and the environment. However, recent scientific evidence indicates that there is no apparent lower threshold for the effects of these two pollutants on human health."

Again, the document states that the CWS's proposed at this time "represent a balance between the desire to achieve the best health and environmental protection possible in the relative near-term and the feasibility and costs of reducing the pollutant emissions that contribute to elevated levels of PM and ozone in ambient air." It continues, "As such, while they will significantly reduce the effect of PM and ozone on human health and the environment, they may not be fully protective and may need to be re-visited at some future date."

The CWS proposed at this time for PM is to deal with the "fine fraction", $PM_{2.5}$ for the interim period until 2005 when a planned review of the standard will be completed. There is to be consideration in the meantime as to whether the Ministers can agree on a PM_{10} standard. Similarly, there is to be consideration given to shortening the time frame from meeting the ozone target; namely reducing it from being reached by the year 2015 to 2012 or 2010. The need for reduction of transboundary flows of PM and ozone in certain regions in order to reach the targets is also acknowledged. Because most areas of Canada have ambient levels of PM and ozone better than the standards, but still above the levels associated with observable health effects, there is also included in the agreements, an Annex consisting of a guidance document for "Continuous Improvement and Keeping-Clean Areas-Clean".

This guidance document explicitly states that "There is a need to ensure that the public recognizes that CWS levels are only a first step to subsequent reduction towards the lowest observable effects levels. It would be wrong to convey the impression that no action is required in these areas or that it would be acceptable to allow pollutant levels to rise to the CWS levels." However, the measures called for in the Annex are very indeterminate: under the topic of Continuous Improvement areas, it states that "Jurisdictions should take remedial and preventative actions to reduce emissions from anthropogenic sources in these areas to the extent practicable." In Keeping Cleans Areas Clean, the document states that "Jurisdictions should work with their stakeholders and the public to establish programs that apply pollution prevention and best management practices." Examples cited include "strategies consistent with the CCME commitment to pollution prevention"; ensuring that new facilities and activities incorporate "the best available economically feasible technologies to reduce PM and ozone levels;" requiring capital upgrades to do the same, and "reviewing new activities that could contribute to an increase in PM and ozone levels with stakeholders and the public in terms of their social, economic and environmental merits." No process requirement or methodology for the latter is specified.

In the reporting methodologies section of the document is contained a statement that, "For the province of Ontario, a 45% reduction in NOX and VOC emissions from 1990 levels by 2015 will be considered the province's appropriate level of effort towards achieving the ozone CWS. Any remaining ambient ozone levels above the CWS in Ontario will be considered attributable to the transboundary flow from the U.S. of ozone and its precursor pollutants."

It is apparent from the document, that the proposed CWS's for ozone and particulate matter are not the optimum health based standards that one would hope for in protection of human health. Since these two substances are of particular concern to children and their respiratory health, we would conclude that the CWS process has not resulted in standards that are intentionally protective of children's health. Rather, the CWS's are heavily influenced by "risk management" considerations, including inter-jurisdictional and political considerations, not the least of which is the high ambient levels for these substances in Ontario from existing local and cross-border sources.

Mercury

The preamble to the Canada-wide Environmental Standards Sub-Agreement with respect to a Mercury CWS recites the high levels of mercury in fish and wildlife warranting "additional efforts to reduce atmospheric emissions derived from both deliberate use of mercury and from incidental releases of mercury." In addition to the health impacts, including those on sensitive populations, which the document describes as infants, children, and women of childbearing age, and those following traditional lifestyles, the document also describes that there is "additional, largely unquantified risk to fish-eating wildlife." The document, in describing how difficult it is to ascribe proportions of impact attributable to anthropogenic releases and how much to natural sources, states that "Because it is a natural and persistent bioaccumulative element which can be transported many miles in the atmosphere, mercury can have impacts many years and many miles removed from its original source.

A common thread through all mercury impacts is that deposition to water bodies from anthropogenic emissions poses a threat to human and ecosystem health, and that reduced deposition will contribute, in time, to reduced impacts." After reciting a list of jurisdictions in which mercury has been "consistently targeted for emission reductions", the agreement states that "Ministers of the Environment have thus agreed to undertake and promote the cost-effective actions to achieve further precautionary reductions in anthropogenic emissions (releases to the air) of mercury."

The document identified three major sectors as responsible for the bulk of mercury emissions: base metal smelting (the largest), waste incineration and coal-fired electricity. Standards to improve base metal smelting and waste incineration that are cost-effective have been identified. However, it states that "Efforts to develop a standard for the electricity generation sector have been complicated and progress has been delayed such that a work plan to develop standards for this sector will not be completed until early in 2000." For base metal smelting, existing facilities are expected to apply "best available pollution prevention and control techniques economically achievable" to achieve 2 g/Hg tonne of mercury per tonne of finished metals. For new and expanding facilities, the requirement is to apply "best available pollution prevention and control techniques to minimize mercury production throughout the life-cycle to achieve 0.2 g Hg/tonne for zinc, nickel and lead and 1 g Hg/tonne for copper. Existing facilities are expected to "make a determined effort" to meet the existing facilities standard by 2008; new and expanding facilities will be required to design for and achieve compliance immediately upon full scale operation. New or expanding incineration facilities, of any size, are to apply "best available pollution prevention and control techniques" to achieve the emissions limits which are specified according to whether they are municipal waste incinerators, medical waste incinerators, hazardous waste incinerators or sewage sludge incinerators. The highest emission levels are specified for the latter; the next highest for hazardous waste. Existing facilities are expected to apply "best available pollution prevention and control techniques" to achieve concentrations at the same levels as for new facilities for the specified waste stream, except that large medical waste incineration has a higher limit. New and expanding facilities must meet the targets immediately; existing facilities must meet the targets between 2003 and 2006 depending upon which waste stream they are incinerating.

For mercury from electricity generation, no CWS has yet been proposed. Clearly the jurisdictions are unable to arrive at a standard that is intentionally protective of children's health from this sector when no standard is even agreed. For the other two major sectors responsible for mercury emissions, that is, waste incineration and base metal smelting, it is apparent that a risk management approach has been taken in which the standards proposed are contingent upon availability of control equipment technologies and techniques. For existing facilities, there is the added consideration as to whether they are "cost effective" and "reasonably available".

The premise in setting standards for mercury is that the sectors must be allowed to continue in full

operation unimpacted by concerns for impacts on human health. Since children are identified as one of the key sensitive groups impacted by mercury pollution, this approach to the standard will mean that the impacts from existing mining and incineration facilities will continue, with reductions and improvements only subject to all of the caveats built into the CWS. In addition, these impacts are even more problematic for communities in Northern Ontario and elsewhere who live traditional lifestyles and who live off of the land. Members of First Nations communities who lead a traditional harvesting lifestyle are precluded from taking their wives and children with them on the land during the summer season, as they traditionally would do, because of the restrictions on fish consumption caused by the high mercury levels in some of the local lakes, resulting from mining operations. Mammals are also affected and alternative non-traditional food sources are not practical in these areas. Alternatively, if families feel compelled or desire to continue the practice of taking the whole family on the land, women of child-bearing age and children are exposed to troublesome levels of mercury in their foods.

5.4.3 The Canadian Environmental Protection Act [85]

5.4.3.1 National Emission Standards and Guidelines

National Emission Guidelines are suggested maximum pollutant emission levels for individual facilities and are based on the best practically-achievable technology. They are non-binding but are intended to be adopted as binding regulations by the provinces. National Emission Guidelines exist for emissions generated in arctic mining, coke ovens, asphalt paving and cement plants, among other sectors.

National Emission Standards are binding under the *Canadian Environmental Protection Act*[86] and set maximum emission levels for particular facilities. Standards have been established for lead from secondary lead smelters,[87] mercury from mercury-cell chlor-alkali plants,[88] vinyl chloride released in the manufacture of vinyl- and polyvinyl chloride,[89] and asbestos mines and mills.[90] Both National Emission Standards and Guidelines are developed by ad-hoc federal-provincial government and industry task forces that are established when there is a perceived problem with emissions from a particular industry.[91] This process has been overtaken by CCME processes pursuant to the Harmonization Agreement & the Standards Sub-Agreement thereunder.

5.4.3.2 Gasoline

The *CEPA Gasoline Regulations*,[92] which were implemented in response to health and environmental concerns, limit lead and phosphorous levels in gasoline.

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[85] *CEPA*, *op.cit.*

[86] *Ibid.*

[87] *Secondary Lead Smelter Release Regulations*, SOR/91-155.

[88] *Chlor-Alkali Mercury Release Regulations*, SOR/90-130.

[89] *Vinyl Chloride Release Regulations*, SOR/92-631.

[90] *Asbestos Mines and Mills Release Regulations*, SOR/90-341.

[91] Mellon *et al.*, *The Regulation of Toxic and Oxidant Air Pollution in North America*. (CCH, Toronto, 1986).

[92] SOR/90-247.

The *CEPA Sulphur in Gasoline Regulations*[93] limit sulphur content in gasoline that is produced or imported for use or sale in Canada and for gasoline that is sold or offered for sale in Canada. Sulphur oxides are a precursor to smog and acidic precipitation, and these regulations were adopted to address environmental and health concerns related to these pollutants.[94]

5.4.4 Automobile Emissions: The Motor Vehicle Safety Act

The federal government is authorized under the *Motor Vehicle Safety Act*[95] to set emission limits for vehicles that are imported into or manufactured in Canada. Regulations[96] under the act set out permissible exhaust emission levels for hydrocarbons, carbon monoxide, nitrous oxides, among other contaminants. Generally, these emission limits are based on the capacity of available emissions reduction technologies.[97] The act also permits the government to require the installation of specific pollution control equipment. The sale of cars in Canada that fail to meet these standards is prohibited.

5.4.5 The Canadian Council of Ministers of the Environment

5.4.5.1 Comprehensive Air Quality Management Framework Agreement

The National Air Issues Coordinating Committee (NAICC), formed of staff from the federal and provincial environment and energy departments, is mandated under this agreement to develop coordinated air issue management plans and strategies, and to track progress in achieving targets to reduce air pollution. The NAICC is organized into two groups, one dealing with climate change and the other addressing remaining air quality issues. The Committee is developing action plans to reduce smog and acidic emissions and is also working on international programs such as the Canada-U.S. Accord on Acid Rain.[98]

5.4.5.2 National Action Plan for the Environmental Control of Ozone-Depleting Substances (ODS) and their Halocarbon Alternatives

This plan updates the 1992 National Action Plan for the Recovery, Recycling and Reclamation of Chlorofluorocarbons (CFCs). Objectives of the new, 1998 Plan include the improved environmental management of all ozone-depleting substances and their alternatives and to decrease their emissions from all industrial sectors. This is to be accomplished through a number or initiatives including:

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[93] SOR/99-236.

[94] The regulations specify that: beginning July 1, 2002, gasoline sulphur concentrations will be limited to an average of 150 ppm; beginning January 1, 2005, average levels should not exceed 30 ppm. A never-to-be-exceeded limit of 300 ppm is mandated for 2004, which will drop to 80 ppm thereafter.

[95] *Motor Vehicle Safety Act*, R.S.C. (1985), c. M-10.

[96] *Motor Vehicle Safety Regulations*, C.R.C., c. 1038.

[97] Estrin, D. and Swaigen, J., 1993, *op.cit.*

[98] http://www.mbnet.mb.ca/ccme/3e_priorities/3eb1.html

- minimizing emissions during the installation, operation, maintenance, repair, disposal and decommissioning of systems and equipment;
- requiring recovery and recycling of these compounds in all industrial use sectors;
- identifying appropriate dates for the phase-out of specific uses of CFCs and halons or mandating total containment;
- developing a strategy for the disposal of surplus CFCs and halons;
- implementing environmental awareness training; and
- supporting use of non-ODS alternatives.[99]

5.5 CONCLUSION

The original question for the study was whether air standard setting is intentionally protective of children. The answer differs between jurisdictions and is mixed.

In Ontario, for those standards that remain unchanged and not yet reviewed, there is no evidence that the standards were intended to protect children in particular when originally set, and no evidence that they are in fact protective of children. However, the Ministry of the Environment's Standard Setting Plan, announced in 1996 and revised in 1999 holds out promise that matters will improve. For example, the MoE chooses the most sensitive receptor for its hazard analysis, and that may be children. The MoE takes into account a multi-media, pathways approach in considering who or what is the most sensitive receptor. Where there is a receptor more sensitive than children (for example, an ecosystem effect), then children should also be protected. What remains to be seen is whether after the risk assessment stage, when hazard is identified, whether the risk management stage results in standards that are in fact protective of children. For example, for the current group of 18 standards presently under review, the risk management stage has yet to be undertaken and the criteria for evaluation and application of any alleged obstacles to implementation of the new standards has yet to be developed. The methodology and results of this stage will be critical.

Federally, the various standard setting processes have moved primarily to the Canada-Wide Standards process under the federal-provincial Environmental Accord. As some of the contaminants selected as priorities have now had proposed standards published in the Canada Gazette, along with the applicable rationale, it appears that the resulting standards are heavily influenced by the "risk management" part of the process; in particular by the approach that requires a unanimous consensus based approach to the adoption of new standards. The jurisdictions with the biggest problems for the particular contaminant seem to be driving the standard to a lower level than that which would be most protective of health and the environment. Accordingly, this approach is not intentionally protective of children, nor actually protective of children. This is an unfortunate result given that previously, the National Ambient Air Quality Objectives were one of the main federal contributions to air standard setting and were health based objectives. Although not binding, they have been, and remain, an important consideration in provincial air standard setting, at least in Ontario. The Canada-Wide Standard approach is not a health-based approach; it is a stakeholders' approach. Progress for the contaminants under this approach will be slow, if at all, according to the rationale documents for the proposed standards.

For both Ontario and Canada, federally, of course, as discussed in chapter 4, there also remains the issue of exposure to multiple chemicals and additive or synergistic effects. There also remains the issue of

[99] http://www.ec.gc.ca/ozone/nap-pan/nap_e.html

whether the underlying studies that the MoE and other standard setters are relying upon have assessed any health endpoints other than cancer. Additional work is needed in Ontario, as well as elsewhere, to begin to address these inherent deficiencies in the science underlying the standard setting process. The weight of evidence approach described in chapter 4 needs to be applied at every stage in the process, from the original design and analysis of the underlying studies, through to the risk management or final standard setting decisions.

5.6 RECOMMENDATIONS

5.6.1 Recommendations for Ontario

1. The Ontario standard setting plan is proceeding and should be encouraged to reach timely results with respect to the priority substances identified for review. However, the ultimate standards adopted in the group of eighteen contaminants currently under review and the fifteen yet to be proposed are highly dependant upon the approaches taken by Ontario in the next "risk management" stage of the process. The Ministry of the Environment should follow through with the development of a transparent, detailed and specific plan for finalization of these standards, as soon as possible. For carcinogens, the standards should in all cases be established at the risk level of no greater than ten to the minus six; with specific time frames for compliance being specified in the standard, if not immediately. No time frames should exceed five years for any substance, regardless of "implementation issues."

2. Research with respect to the evidence and data gaps for non-carcinogenic risks (for example endocrine disruptors and other health end-points) is a high priority for incorporation into standard-setting exercises and should be supported by the Ontario government.

3. Ontario should proceed with its own review of all of the priority air contaminants, originally identified, regardless of whether any of these are also in a Canada-Wide Standard or other federal provincial process. Ontario should ensure that all of the air contaminants in the province are regulated in the same manner and to the same risk levels.

4. Ontario should place special emphasis on standards for nitrous oxides and particulate matter in its own standard setting process because of the impact of these contaminants on children's health and because of the levels in which they are found in the Ontario environment.

5. Ontario should drastically improve its ozone commitment and should actively work to support a stringent ozone Annex between Canada and the United States.

6. Ontario should immediately repeal its plan with respect to emissions trading in the electricity sector and replace it with a plan that will ensure improved air quality from this sector within five years.

5.6.2 Recommendations for Canada

7. The Canada-Wide Standards process under the Environmental Harmonization Accord Standard Setting Sub-Agreement is ineffective for protecting children’s health and should be repealed with respect to air contaminants.

8. The Federal Minister of the Environment should establish standards on a health protective basis rather than pursuant to a Canada-wide consensus approach, and without risk management considerations.

9. Health protective standards should be published regardless of implementation issues.

10. Where implementation barriers are identified that require industry sector adjustments, sectoral time frames for compliance should be immediately established and subject to third party review.

11. All opportunities to improve current commitments (for example, shorter time frames, or more stringent standards) should be vigorously pursued.

12. A stringent ozone Annex should be reached with the United States as soon as possible.

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