STANDARDIZED TOOLKIT FOR IDENTIFICATION AND QUANTIFICATION OF DIOXIN AND FURAN RELEASES, 2nd Edition, February 2005

The conceptual basis of the Toolkit and the effort expended on its preparation are laudable. Unfortunately, the 2005 edition of the Toolkit suffers from numerous serious deficiencies and errors, many of which were identified in its 2003 edition and earlier drafts. We believe that these flaws should be corrected between COP-1 and COP-2 with the aim of presenting a revised Toolkit for adoption at COP-2.

The Toolkit provides a template to follow as well as a list of dioxin sources and associated emission factors. In theory, when a country identifies its dioxin sources according to the Toolkit's list of sources, determines the activity levels for each source and inserts those values into the Toolkit's spreadsheet, the results should enable the country to prioritize its important dioxin sources for action. In practice, this is not the case because 1) the Toolkit's emission factors are, in many cases, markedly inappropriate; and 20 the Toolkit does not address all potentially important dioxin sources.[a]

These shortcomings are especially crucial for developing countries and countries with economies in transition which, due to capacity issues, may rely heavily if not completely on the Toolkit in preparing their inventories. As a consequence, these countries may end up with highly distorted priorities in their National Implementation Plans (NIPs). Priorities established in NIPs can strongly influence national policy priorities, and they can also influence how money is spent and how international assistance is provided.

Emission Factors

Emission factors presented in the Toolkit will be more meaningful if reported as a range (low, median or mean and high) accompanied by some indication of the certainty of such values, e.g., low, medium or high.[b] The Toolkit must also include more emission factors that are based on data from developing countries and countries with economies in transition.

The great majority of emission factors in the Toolkit are derived from studies of processes and practices in developed countries. In most cases, there is no factual basis for the assumption that these emission factors are relevant for activities outside of those countries. Indeed, using the Toolkit spreadsheets but substituting other emission factors from published studies and reports has resulted in release estimates and, consequently, ranking of sources that are dramatically different from those obtained by relying only on the Toolkit's emission factors. In fact, experts consulted by IPEN-participating NGOs have suggested that certain emission factors in the Toolkit may be overstated by one or more orders of magnitude, while certain others may be equally understated.

The Toolkit's emission factors of particular concern include but are not limited to the following:

- Forest fires, grassland and moor fires: The Toolkit's emission factor for release to air is about 40 times higher

[a] Several newly added dioxin sources are evident in the 2005 Toolkit. However, other sources that have been reported in the literature and suggested in formal comments are still absent, while new sources continue to emerge.

[b] Both countries and environmental NGOs have made requests to this effect in comments submitted on earlier versions of the Toolkit. However, there has been no response.

than that reported in a 2003 study;[1]

- Burning clean wood in household heating stoves: The Toolkit's emission factor for release to air is 200 times greater than values reported by the Canadian government;[2]
- Open burning of household waste: The Toolkit's emission factor for release to air is 10-60 times higher than the values published in the scientific literature; [3,c]
- EDC/VCM/PVC production: The Toolkit's emission factor for release to water is almost 27,000 times lower than the value reported by Germany,[4] and the emission factor for release to residues is 40 times lower than the value calculated from releases reported in the 2002 U.S. Toxics Release Inventory by U.S. producers.[5,6]
- Production of other chemicals, including pesticides: the Toolkit presents only emission factors for releases in products, i.e., no emission factors for releases to air, water or land and residues for 11 of the 13 other chemicals and pesticides addressed.[d] This is especially remarkable considering that the combined results of the European Union's most recent inventories show that pesticide manufacture accounts for 1/3 of total dioxin releases in the EU. [7, 8]
- Cement kilns firing hazardous waste: The Toolkit does not present emission factors for cement kilns firing hazardous waste, which are listed as a priority source in the Stockholm Convention. Instead it presents emission factors for cement kilns in general even though cement kilns are not considered a Stockholm Convention Part II or Part III source. A U.S. assessment found that emission factors to air and to residues (cement kiln dust) for cement kilns firing hazardous waste were, respectively, about 90 times greater and some 100 times greater than those for cement kilns firing not hazardous waste.[9, e] In contrast, the Toolkit asserts that burning hazardous wastes makes no difference in emission factors on the basis of one partially complete assessment of one cement kiln.

Further work is needed to include more identified sources, to identify industrial sources and develop emission factors for these sources. A cursory comparison of the Toolkit's emission factors suggests that the Toolkit tends substantially to underestimate emission factors for industrial sources, such as chemical production, and to overestimate emission factors from non-industrial sources, such as biomass com-bustion.

Categories of Releases

The Toolkit establishes five categories of releases -- air, water, land, products, and residues – and defines releases to land as *" PCDD/PCDF contaminated product "applied" to land directly, residues from a process left on or applied to land or PCDD/PCDF deposited onto land via environmental processes."* According to this definition, dioxin-containing materials that are sent to landfills are not considered as releases to land. This contrasts with the approach taken by the European Union (EU) and some non-EU countries where dioxins in residues sent to landfill are classified as releases to land. [10, 11]

With releases to land defined so that landfills are excluded, the Toolkit's fifth category, releases to residues, becomes problematic, especially under circumstances that prevail in most developing countries and countries with economies in transition. In these countries, landfills, if they exist, are frequently poorly-designed, poorly-contained and poorly-regulated. Under such conditions, it is dangerously misleading to suggest that sending dioxin-contaminated residues to a landfill is not a dioxin release to land. It is also important to note that dioxins have been detected in

---

[c] The composition of household waste has been shown to vary greatly within a country, for example, whether the waste comes from rural or urban households, and even more extreme variations have been noted for household wastes from different countries and regions. This suggests that dioxin releases will also cover a very broad range.

[d] In comments on earlier versions of the Toolkit, environmental NGOs have submitted lists of hundreds of chemicals and pesticides that are known or suspected to be accompanied by dioxin formation during their production.

[e] The Toolkit asserts that a later investigation "*suggested that, provided combustion is good, the main controlling factor is the temperature of the dust collection device in the gas cleaning system*." Since the Toolkit cites no source for this statement, it could not be verified. However, in their study of U.S. dioxin sources, Cleverly et al. (1997) note, *"There is evidence of marked differences in the distribution of CDD/CDF congeners between cement kilns burning and not burning hazardous waste,"* and identify the dominant congeners as follows: *"2,3,4,7,8-PeCDF in cement kilns burning hazardous waste; 2,3,7,8-TCDF in cement kilns not burning hazardous waste."* (Cleverly, D.; Schaum, J.; Schweer, G.; Becker, J.; Winters, D. 1997. The congener profiles of anthropogenic sources of chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans in the United States. Organohalogen Cpds 32:430-435).

both landfill gas[12, 13] and landfill leachates, [14, 15,16,17,18] which indicates that dioxins sent to landfills can escape into the air and water.

The Toolkit's limited definition of releases to land in conjunction with inclusion of the category of releases to residues tends to create an illusion that the burial of dioxin-containing residues in landfills is not a release to the environment and it tends to undermine the aim of the Stockholm Convention to reduce total releases of dioxins and other U-POPs from anthropogenic sources with the goal of their continuous minimization and, where feasible, ultimate elimination. Such an approach could be considered inappropriate, even in a country where landfills are typically well-designed, well-contained and well-regulated. The UNEP Dioxin Toolkit, however, will be used as a planning tool primarily by governments of developing countries and countries with economies in transition.

Dioxin Source Identification Strategy

During the INC7 plenary, it was agreed that the next edition of the Toolkit, this 2005 edition, would include a source identification strategy. Contrary to that agreement, the 2005 Dioxin Toolkit does not include such a strategy. This strategy is essential since the Toolkit's list of sources does not include all sources that have already been identified in the scientific literature and other reports, and new sources continue to be discovered. Given this circumstance, countries need a source identification strategy if they are to identify and properly prioritize all of their important dioxin sources.

A source identification strategy is particularly important for developing countries and countries with economies in transition. These countries may have sources that have not been identified because they involve processes and practices that are no longer used or have never been used in developed countries. For example, the Toolkit's list of sources in Category 7 -- the industrial sectors that produce chemicals, pesticides and consumer goods -- is remarkably limited considering the numerous chemical processes that use chlorine in some form[19] and the World Chlorine Council's statement, "*Dioxins can be formed in chemical processes, where the element chlorine is involved.*"[20]

Revising and Updating the Toolkit

The process for revising and updating the Toolkit is a matter of considerable concern. Comments have been submitted by countries, pubic health and environmental NGOs, and industry NGOs experts at every stage of the Toolkit's development. Needless to say, these comments have generally been professionally prepared and well-documented. However, responses to many of these comments have been cursory at best. In addition, at least for the comments from environmental NGOs and from some countries, there is little evidence that they influenced subsequent Toolkit revisions. For example, we are aware of multiple requests, both from countries and environmental NGOs, for source citations for the Toolkit's emission factors and other matters of fact, for ranking emission factors according to uncertainty, and the use of ranges of values rather than single values. Few if any of these requests are reflected in the final product. As mentioned earlier, the agreement in the INC7 plenary to include a source identification strategy in the Toolkit was not honored, apparently because the International Council of Chemical Associations *"does not see a need to include such a strategy."*[21]

Unlike similar processes managed by the Secretariats of the Stockholm Convention and the Basel Convention, the development and revision of the Toolkit has been notable for its lack of transparency and responsiveness. Parties and other stakeholders need better opportunities for review and for input. Finally, the process should not only be more responsive and transparent, but the Toolkit should also be subject to independent review and verification by experts in the field who have no personal stake in the present product.

Prepared by Pat Costner,
Senior Science Advisor, IPEN
Eureka Springs, Arkansas, USA
pcostner@ipa.net
April 2005 Edition

IPEN Dioxin, PCBs and Waste Working Group

The IPEN Dioxin, PCBs and Waste Working Group was established in May 2001 in Sweden, after the text of the Stockholm Convention was agreed. The Working Group, within its capacity and resources, works to assure that measures addressing dioxins, PCBs and wastes are appropriately interpreted and fully incorporated into each country's Stockholm Convention Enabling Activities and National Implementation Plans. Furthermore, it works to promote policies and practices in every region and country aimed at the elimination of dioxins and PCBs; and aimed at reduction and elimination of wastes, and appropriate waste management for the residues.

Contact to Secretariat:
c/o Arnika Association
Chlumova 17, Prague 3
130 00, Czech Republic
phone/fax: +420 222 781 471
e-mail: ipen-dioxin@arnika.org
website: http://www.ipen.org

References

[1] Prange, J., Gaus, C., Weber, R., Papke, O., Muller, J., 2003. Assessing forest fire as a potential PCDD/F source in Queensland, Australia. Environ. Sci. Technol. 37: 4325-4329.

[2] Environment Canada and the Hearth Products Association of Canada, 2000. Characterization of Organic Compounds from Selected Residential Wood Stoves and Fuels. Report ERMD 2000-01. Ottawa, Canada.

[3] Wevers, M., De Fre, R., Desmedt, M., 2004. Effect of backyard burning on dioxin deposition and air concentrations. Chemosphere 54: 1351-1356.

[4] Quass, U., Fermann, M., 1997. Identification of Relevant Industrial Sources of Dioxins and Furans in Europe (The European Dioxin Inventory). Final Report No. 43, Essen, Germany: Landesumweltamt Nordrhein-Westfalen.

[5] Chlorine Chemistry Council, 2004. Putting TRI Dioxin Data in perspective: Dioxin Data – 2002 Dioxin Data. http://www.trifacts.org/dioxin_data/index.html

[6] The Innovation Group, 2002. Chemical Profiles: Ethylene Dichloride. http://www.the-innovation-group.com/welcome.htm

[7] Quass and Fermann, 1997.

[8] Wenborn, M., King, K., Buckley-Golder, D., Gascon, J., 1999. Releases of Dioxins and Furans to Land and Water in Europe. Final Report. Report produced for Landesumwaltamt Nordrhein-Westfalen, Germany on behalf of European Commission DG Environment. September 1999.

[9] U.S. Environmental Protection Agency, 2003. Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds. Part I: Estimating Exposure to Dioxin-Like Compounds. Vol. 1: Sources of Dioxin-Like Compounds in the United States. Chapter 5. Combustion Sources of CDD/CDF: Other High Temperature Sources. Review Draft. EPA/600/P-00/001Cb. Washington, D.C

[10] Quass and Fermann, 1997

[11] Wenborn et al., 1999.

[12] Parker, T., Dottridge, J., Kelly, S., 2002. Investigation of the Composition and Emissions of Trace Components in Landfill Gas. R&D Technical Report P1-438/TR. Bristol, UK: Environment Agency).

[13] Mitchell, D., Loader, A., Briscombe, C., Richardson, S., Scott, D., 1993. A study of organic compounds in landfill gas and an investigation of pollutant emissions from a landfill gas engine. Warren Spring Laboratory. ISBN 0 85624 756 1.

[14] Osako, M., Kim, Y.- J., Lee, D.-H., 2002. A pilot and field investigation on mobility of PCDDs/ PCDFs in landfill site with municipal solid waste incineration residue. Chemosphere 48: 849 856

[15] Behnisch, P., Fujii, K., Shiozaki, K., Kawakami, I., Sakai, S., 2001. Estrogenic and dioxin- like potency in each step of a controlled landfill leachate treatment plant in Japan. Chemosphere 43: 977- 984.

[16] Kim, Y- J., Lee, D.- H., Osako, M. 2002. Effect of dissolved humic matters on the leachability of PCDD/ F from fly ash Laboratory experiment using Aldrich humic acid. Chemosphere 47: 599-605

[17] Schramm, K., Wu, W., Henkelmann, B., Merk, M., Xu, Y., Zhang, Y., Kettrup, A., 1995. Influence of linear alkylbenzene sulfonate LAS as organic cosolvent on leaching behavior of PCDD/ Fs from fly ash and soil. Chemosphere 31: 3445- 3453.

[18] Yoshikawa K, Urabe S, Matsufuji Y, Sato T. Field survey on the concentration of dioxins in landfill leachate in Japan. Proceedings 7th International waste management and landfill symposium, Sardinia 99, October 1999. pp. 384- 390

[19] Euro Chlor, The Chlorine Tree. www.eurochlor.org/chlorine/generalinfo/tree.htm

[20] World Chlorine Council, 1998. Dioxins and Furans in the Chemical Industry. http://www.eurochlor.org/chlorine/issues/dioxins.htm)

[21] UNEP, 2005. Consideration of comments on the standardized toolkit for identification and quantification of dioxin and furan releases** UNEP POPS/COP.1/INF/10, 14 January 2005.