

Estimating Releases and Prioritizing Sources in the Context of the Stockholm Convention

Dioxin Emission Factors for Forest Fires, Grassland and Moor Fires, Open Burning of Agricultural Residues, Open Burning of Domestic Waste, Landfill and Dump Fires

Table of contents

	page
Acknowledgments	2
1.0 Introduction	6
2.0 Inventories of Unintentionally Produced Persistent Organic Pollutants	7
2.1 UPOPs Inventories and Resource Allocations	7
2.2 Elements of UPOPs Inventories	8
2.2.1 Sources	8
2.2.2 Activity Levels	8
2.2.3 Emission Factors	8
2.3 Uncertainties of Inventories	9
3.0 OPEN BURNING – Forest Fires, Grassland and Moor Fires, Open Burning of Agricultural Residues, Open Burning of Domestic Waste, Landfill and Dump Fires	10
3.1 Forest Fires, Grassland and Moor Fires	10
3.1.1 UNEP Dioxin Toolkit	10
3.1.2 Australian Studies	10
3.1.3 Canadian Studies	10
3.1.4 Japanese Study	10
3.1.5 Korean Study	10
3.1.6 New Zealand Study	11
3.1.7 Spanish Study	11
3.1.8 U.S. Study	11
3.1.9 Summary – Forest Fires, Grassland and Moor Fires	11
3.2 Open Burning of Agricultural Residues	14
3.2.1 UNEP Dioxin Toolkit	14
3.2.2 Australian Studies	14
3.2.3 Danish Study	15
3.2.4 German Studies	15
3.2.5 Japanese Study	15
3.2.6 U.K. Studies	15
3.2.7 U.S. Studies	15
3.2.8 Summary – Open Burning of Agricultural Residues	15
3.3 Open Burning of Domestic Waste	17
3.3.1 UNEP Dioxin Toolkit	17

3.3.2 Belgian Study	18
3.3.3 Swedish Study	18
3.3.4 Japanese Studies	19
3.3.5 U.S. Studies	19
3.3.6 Summary – Open Burning of Domestic Waste	20
3.4 Landfill and Dump Fires	23
3.4.1 UNEP Dioxin Toolkit	23
3.4.2 Asian Studies	24
3.4.3 Japanese Study	24
3.4.4 Swiss Study	24
3.4.5 Related Studies	24
3.4.6 Summary – Landfill and Dump Fires	25
3.5 Findings and Recommendations	25
	25
Appendix A: Dioxin Inventories in Latin America	27
A.1 Argentina	27
A.2 Cuba	30
A.3 Mexico	32
References	36

List of Tables

Table 1: Open Burning of Domestic Waste -- Dioxin emission factors for releases to air according to combustion conditions, general waste composition, and PVC content of the waste	22
Table 2: Dioxin Emission Factors with Strongest Scientific Support to Date	26
Table A.1: General, Single-Value Emission Factors	27
Table A.2: Argentina – Top ten dioxin sources and estimated releases, based on Toolkit emission factors only and on most appropriate emission factors for selected sources -- forest fires, grassland and moor fires, open burning of agricultural residues and open burning of domestic waste	28
Table A.3: Cuba – Top ten dioxin sources and estimated releases, based on Toolkit emission factors only and on most appropriate emission factors for selected sources -- forest fires, grassland and moor fires, open burning of agricultural residues and open burning of domestic waste	30
Table A.4: Mexico -- Estimated dioxin releases from forest fires, as presented in various reports	32
Table A.5: México -- Top ten dioxin sources and estimated releases, based on Toolkit emission factors only and on most appropriate emission factors for selected sources -- forest fires, grassland and moor fires, open burning of agricultural residues and open burning of domestic waste	33

List of Figures

Figure 1: Forest fires –emission factors for releases to air (DM = direct measurements of forest fire; SB = surrogate burn in enclosed facility)	13
Figure 2: Forest fires – emission factors for releases to land (DM = direct measurement of forest fire ash)	14
Figure 3: Open burning of agricultural residues – emission factors for	16

releases to air (DM = direct measurement of agricultural residue burning; SB = surrogate burn in enclosed facility)	
Figure 4: Open burning of agricultural residues – emission factors for releases to land (DM = direct measurement of agricultural residue burning)	14
Figure 5: Burning Domestic Waste in Steel Barrels and Open Piles – Emission Factors for Releases to Air (GW = garden waste; HHW = household waste; RDF = refused derived fuel; OP = open pile; B = barrel)	21
Figure 6: Burning Domestic Waste in Steel Barrels and Open Piles – Emission Factors for Releases to Residues (GW = garden waste; HHW = household waste; RDF = refuse derived fuel; OP = open pile; B = barrel)	21
Figure A.1: Argentina -- Ten largest dioxin source categories, based on emission factors from UNEP Dioxin Toolkit (2001)	29
Figure A.2: Argentina -- Ten largest dioxin source categories, based on emission factors for selected sources (forest fires, grassland and moor fires, open burning of agricultural residues, uncontrolled burning of domestic waste) shown in Table A.1	29
Figure A.3: Cuba -- Ten largest dioxin source categories, based on emission factors from UNEP Dioxin Toolkit (2001)	31
Figure A.4: Cuba -- Ten largest dioxin source categories, based on revised emission factors for selected sources (forest fires, grassland and moor fires, open burning of agricultural residues, uncontrolled burning of domestic waste), as shown in Table A.1	31
Figure A.5: Mexico -- Ten largest dioxin source categories, based on emission factors from UNEP Dioxin Toolkit	35
Figure A.6: Mexico -- Ten largest dioxin source categories, based on revised emission factors for selected sources (forest fires, grassland and moor fires, open burning of agricultural residues, uncontrolled burning of domestic waste), as shown in Table A.1	35