

ECONOMIC COMMISSION FOR EUROPE
Geneva

HEMISPHERIC TRANSPORT OF AIR POLLUTION 2010

PART C: PERSISTENT ORGANIC POLLUTANTS

AIR POLLUTION STUDIES No. 19

Edited by Sergey Dutchak and Andre Zuber

Prepared by the Task Force on Hemispheric Transport of Air Pollution
acting within the framework of the
Convention on Long-range Transboundary Air Pollution



UNITED NATIONS
New York and Geneva, 2010

NOTE

Symbols of United Nations documents are composed of capital letters combined with figures. Mention of such symbols indicates a reference to a United Nations document.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

In United Nations texts, the term “ton” refers to metric tons (1,000 kg or 2,204.6 lbs).

Acknowledgements

The task force co-chairs and the secretariat would like to acknowledge the assistance of EC/R, Inc., in preparing this publication. We would also like to acknowledge the invaluable contribution of the individual experts and the Convention's Programme Centres and Task Forces.

ECE/EB.AIR/102

UNITED NATIONS PUBLICATION
<i>Sales No. 11.II.E.9</i>
<i>ISSN 1014-4625</i>
<i>ISBN 978-92-1-117045-0</i>

Copyright ® United Nations, 2010
All rights reserved

UNECE Information Service
Palais des Nations
CH-1211 Geneva 10
Switzerland

Phone: +41 (0) 22 917 44 44
Fax: +41 (0) 22 917 05 05
E-mail: info.ece@unece.org
Website: <http://www.unece.org>

Contents

Tables.....	vii
Figures	ix
Chemical Symbols, Acronyms and Abbreviations	xiii
Preface	xix

Chapter 1 Conceptual Overview	1
1.1. Purpose of the HTAP 2010 Assessment on Persistent Organic Pollutants	1
1.2. International Policy on POPs	2
1.2.1. <i>The POPs Protocol under the UN ECE LRTAP Convention</i>	2
1.2.2. <i>SC on POPs and the GMP</i>	3
1.2.3. <i>International Programmes and Assessment</i>	4
1.3. Properties of POPs	7
1.3.1. <i>Types and sources of POPs</i>	8
1.3.2. <i>Legacy POPs and new POPs</i>	11
1.3.3. <i>Metrics of Long Range Transport (LRT)</i>	15
1.4. Integrated Approach for Understanding POPs Transport: Observations, Emissions and Models.....	16
1.4.1. <i>Observations and Process Studies</i>	16
1.4.2. <i>Emission inventories</i>	16
1.4.3. <i>Modelling approaches</i>	16
1.4.4. <i>Impacts</i>	17
1.4.5. <i>Monitoring-modelling assessment</i>	18
1.5. Interactions between climate and POPs	19
1.6. Findings and Recommendations	26
References.....	27

Chapter 2 Observations and Capabilities.....	33
2.1. Introduction.....	33
2.2. Atmospheric Observations	33
2.2.1. <i>Atmospheric Monitoring Activities</i>	33
2.2.2. <i>Atmospheric Monitoring Techniques</i>	34
2.2.3. <i>Long-range Transport Observations</i>	34
2.3. Oceanic Observations	43
2.3.1. <i>Oceanic Measurements</i>	44
2.3.2. <i>Water Monitoring Techniques</i>	45
2.4. Air-Surface Interaction, Degradation and Transformation	45
2.4.1. <i>Atmospheric Processes</i>	45
2.4.2. <i>Air-Soil Exchange</i>	46
2.4.3. <i>Air-Vegetation Exchange</i>	50
2.4.4. <i>Air-Water Gas Exchange</i>	51
2.4.5. <i>Air-Snow/Ice Exchange</i>	56
2.5. Chemical Tracers	57
2.5.1. <i>Chiral chemicals as tracers of sources and air surface exchange</i>	57
2.5.2. <i>Isomer and parent/metabolite tracers of sources and pathways</i>	60
2.6. Effects of Climate Variations on LRT and Trends	63
2.7. Assessing the Effectiveness of Control Measures — Observational Data and Quality Assurance.....	66
2.7.1. <i>International QA/QC Efforts on POPs</i>	67
2.8. Findings and Recommendations	67
References.....	71

Chapter 3 Emission Inventories and Projections for Assessing Hemispheric or Intercontinental Transport of Persistent Organic Pollutants.....	89
3.1. Introduction.....	89
3.2. Emission inventories.....	89
3.2.1. <i>Global inventories and databases</i>	90
3.2.2. <i>Regional and national inventories and data bases</i>	97
3.2.3. <i>Inventories and data bases of new POPs</i>	104
3.3. Uncertainties and verification of emission inventories.....	106
3.3.1. <i>Assessment of uncertainties/Consistency of POP inventories</i>	106
3.3.2. <i>Improvement of inventories by observations and modelling data sets</i>	107
3.4. Emission Projections.....	115
3.4.1. <i>Methodologies</i>	115
3.4.2. <i>Future emission scenarios for specific pollutants</i>	115
3.5. Summary and Recommendations	119
References.....	121

Chapter 4 Global and Regional Modelling of POPs.....	127
4.1. Introduction.....	127
4.2. Modelling approaches for the evaluation of POP transport	129
4.2.1. <i>Theory and Background of models of POP transport in the atmosphere</i>	129
4.2.2. <i>Overview of existing models and approaches</i>	130
4.3. Model applications to study POP long-range transport on global and regional scales	135
4.3.1. <i>Applications of POP transport models at global scale</i>	135
4.3.2. <i>Applications of POP transport models at regional scale</i>	140
4.3.3. <i>New POPs: Modelling studies of long-range transport</i>	142
4.3.4. <i>Influence of climate variability and climate change on transport pathways and levels of persistent pollutants</i>	145
4.4. Intercomparison of POP intercontinental transport models	146
4.4.1. <i>POP model intercomparison studies</i>	146
4.4.2. <i>HTAP intercomparison of POP models</i>	147
4.5. Status of the integrated approach and future outlook	156
4.6. Findings and Recommendations	158
References.....	161

Chapter 5 Impacts of long-range transport of persistent organic pollutants on human health and ecosystems.....	167
5.1. Overview of impacts of POPs	167
5.1.1. <i>Toxicity</i>	167
5.1.2. <i>Developmental and reproductive effects</i>	167
5.1.3. <i>Carcinogenicity</i>	168
5.1.4. <i>Effects unique to wildlife</i>	168
5.1.5. <i>Relation to other assessments of POPs transport</i>	168
5.2. Impact of POPs on ecosystems	168
5.2.1 <i>Bioconcentration, bioaccumulation, and biomagnification</i>	169
5.2.2. <i>Measurement of POPs in ecosystems</i>	169
5.3. Impact of POPs on human health.....	171
5.3.1. <i>Exposure pathways</i>	171
5.3.2. <i>Human health impacts</i>	173
5.3.3. <i>Health impacts of POPs due specifically to long-range transport</i>	178
5.4. Monitoring in human media.....	179
5.5. Implications of HTAP analysis	180
References.....	181

Chapter 6 Summary	185
6.1 Importance of Persistent Organic Pollutant long-range transport as an exposure pathway...	185
6.1.1 <i>Findings</i>	185
6.1.2 <i>Recommendation</i>	185
6.2 Importance of monitoring	186
6.2.1 <i>Findings</i>	186
6.2.2 <i>Recommendations</i>	186
6.3 Modelling POP transport and fate. Importance of processes understanding.	187
6.3.1 <i>Findings</i>	187
6.3.2 <i>Recommendations</i>	188
6.4 Primary and secondary emissions of POPs. Importance of air-surface exchange.	188
6.4.1 <i>Findings</i>	189
6.4.2 <i>Recommendations</i>	189
6.5 Emerging substances, screening	190
6.5.1 <i>Findings</i>	190
6.5.2 <i>Recommendations</i>	191
6.6 Integrated approach.....	191
6.6.1 <i>Findings</i>	191
6.6.2 <i>Recommendations</i>	191
6.7 Effects of climate change	192
6.7.1 <i>Findings</i>	192
6.7.2 <i>Recommendations</i>	192
6.8 Concluding Remarks.....	193

Appendices

Appendix A of Chapter 2	Observations and Capabilities — Summary Tables	195
Appendix B of Chapter 2	Observations and Capabilities — Modelling Studies related to Observations	217
Appendix C of Chapter 2	Observations and Capabilities — Air Monitoring Programs	221
Appendix D	Editors, Authors, & Reviewers.....	233

Tables

Chapter 1	Conceptual Overview
Table 1.1.	Criteria for identifying chemicals as POPs 9
Table 1.2.	Legacy and new POPs considered under CLRTAP and SC 12
Chapter 2	Observations and Capabilities
Table 2.1.	Observations in Alpine Regions (segregated according to regions) 40
Chapter 3	Emission Inventories and Projections for Assessing Hemispheric or Intercontinental Transport of Persistent Organic Pollutants
Table 3.1.	Contributions of various emission activities to global emission of PAH16 in 2004 94
Table 3.2.	Global data about DDT consumption and emissions for the years 2000 and 2010 distinguished by different world regions. 98
Table 3.3.	Substances addressed in Denier van der Gon et al. [2005]. 100
Table 3.4.	Source categories defined in the POP inventory 101
Table 3.5.	Relative contribution of source sectors to remaining POP emissions upon full implementation of the POP Protocol by all UNECE-Europe countries 116
Table 3.6.	POP emissions by country group in 2000, projected POP emissions for 2020 following a baseline, current legislation policy scenario and assuming full implementation of the POP Protocol in 2020 116
Table 3.7.	Total emissions of dioxins to air in Europe (baseline scenario). 118
Table 3.8.	Total emissions of PCB to air in Europe (baseline scenario). 118
Chapter 4	Global and Regional Modelling of POPs
Table 4.1.	Summary of modelling approaches for POPs with examples and references 131
Chapter 5	Impacts of long-range transport of persistent organic pollutants on human health and ecosystems
Table 5.1.	Overview of toxic properties of POPs. 173
Table 5.2.	IARC carcinogenicity ratings for several POPs 176
Table 5.3.	Selected long-term monitoring programs for POPs in human media 180

预览已结束，完整报告链接和二维码如下：

https://www.yunbaogao.cn/report/index/report?reportId=5_2051

