

EMEP Centres Joint Report for HELCOM
EMEP/MSC-W Note 3/2003

**Atmospheric Supply of
Nitrogen, Lead, Cadmium, Mercury and Lindane
to the Baltic Sea in 2001**

Jerzy Bartnicki¹, Alexey Gusev², Kevin Barrett³, Hilde Fagerli¹

¹Meteorological Synthesizing Centre-West (MSC-W)

²Meteorological Synthesizing Centre-East (MSC-E)

³Chemical Coordinating Centre (CCC)

OSLO
October 2003

ISSN 0332-9879

Preface

The Co-operative Program for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe (EMEP) and the Baltic Marine Environment Protection Commission (HELCOM) are both conducting work on air monitoring, modelling and compilation of emission inventories. In 1995, HELCOM decided to rationalize its current programs by avoiding duplication of efforts with specialised international organizations. At the request of HELCOM, the steering Body of EMEP at its nineteenth session agreed to assume the management of atmospheric monitoring data, the preparation of air emission inventories and the modelling of air pollution in the Baltic region.

Following the coordination meeting held in Potsdam in Germany and the Pollution Load Input meeting held in Klajpeda-Joudkrante in Lithuania, both 1996, it was agreed that EMEP Centres should be responsible for regular evaluation of the state of the atmosphere in the Baltic Sea region and should produce an annual joint summary report which include updated emissions of selected air pollution, modelled deposition fields, allocation budgets and measurement data.

This report was prepared for the HELCOM, based on model estimates and monitoring results presented to the twenty-seventh session of the Steering Body of EMEP. Following decision of the HELCOM /MONAS-4 Meeting, it presents the results for the year 2001.

Acknowledgements

The authors are indebted to the scientific teams at MSC-E, MSC-W and CCC for providing the results included in this report and appreciate the opportunity afforded by the Steering Body of EMEP's coordination with HELCOM for close collaboration between the EMEP Centres.

We are most grateful to Marina Varygina, Ilia Ilyin and Victor Shatalov from MSC-E, and to Heiko Klein, Vigdis Vestreng and Per Helmer Skaali from MSC-W for their help in preparation of this report.

Contents

Preface	2
Acknowledgements	3
Contents	4
1. Executive Summary	6
2. Introduction.....	9
3. Observed Pollutant Concentrations at HELCOM stations in 2001	11
3.1 HELCOM measurement stations	12
3.2 Nitrogen concentrations in air.....	13
3.3 Nitrogen in precipitation.....	15
3.4 Heavy metals in the air	16
3.5 Heavy metals in precipitation	17
4. Atmospheric Supply of Nitrogen to the Baltic Sea in 2001.....	18
4.1 Nitrogen emissions	18
4.2 Annual deposition of nitrogen	27
4.3 Monthly depositions of nitrogen.....	33
4.4 Source allocation of nitrogen deposition	33
4.5 Comparison of model results with measurements.....	38
4.5.1 Air concentrations	39
4.5.2 Concentrations in precipitation.....	41
4.5.3 Concluding remarks	42
5. Atmospheric Supply of Lead to the Baltic Sea in 2001	45
5.1 Lead emissions	45
5.2 Annual deposition of lead.....	47
5.3 Monthly depositions of lead	49
5.4 Source allocation of lead deposition	49
5.5 Comparison of model results with measurements.....	52
6. Atmospheric Supply of Cadmium to the Baltic Sea in 2001	60
6.1 Cadmium emissions.....	60
6.2 Annual deposition of Cadmium.....	62
6.3 Monthly depositions of lead	64
6.4 Source allocation of lead deposition	64

6.5 Comparison of model results with measurements.....	67
7. Atmospheric Supply of Mercury to the Baltic Sea in 2001.....	75
7.1 Mercury emissions.....	75
7.2 Annual deposition of mercury	77
7.3 Monthly depositions of mercury	78
7.4 Source allocation of mercury deposition	79
7.5 Comparison of model results with measurements.....	82
8. Atmospheric Supply of Lindane to the Baltic Sea in 2001.....	85
8.1 Lindane emissions	85
8.2 Annual deposition of lindane	87
8.3 Monthly depositions of lindane	89
8.4 Comparison of model results with measurements.....	90
9. Conclusions	92
References	95
Annexes:	
A: Tables with measurements available at HELCOM stations	98
B: Monitoring methods, accuracy, detection limits and precision	109
C. Source allocation budgets for heavy metals	115
D. Source allocation budgets for heavy metals.....	122