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of Nitrogen, Lead,  
Cadmium, Mercury and  
Dioxines/Furans  
to the Baltic Sea in 2007

Jerzy Bartnicki  
Alexey Gusev  
Wenche Aas  
Semeena Valiyaveetil



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# **Atmospheric Supply of Nitrogen, Lead, Cadmium, Mercury and Dioxines/Furanes to the Baltic Sea in 2007**

Jerzy Bartnicki<sup>1</sup>, Alexey Gusev<sup>2</sup>, Wenche Aas<sup>3</sup>, Semeena Valiyaveetil<sup>1</sup>

<sup>1</sup>Meteorological Synthesizing Centre-West (MSC-W)

<sup>2</sup>Meteorological Synthesizing Centre-East (MSC-E)

<sup>3</sup>Chemical Coordinating Centre (CCC)

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## Summary

The results presented in this EMEP Centres Joint Report for HELCOM are based on the modelling and monitoring data presented to the 33th Session of the Steering Body of EMEP in Geneva in September 2009. It includes measurements, as well as emissions and depositions calculated by the EMEP models of nitrogen compounds, heavy metals and PCDD/F for the year 2007.

The measured monthly and annual 2007 concentrations in air and precipitation for nitrogen species and heavy metals are presented in the report. For all the components a significant south-east gradient can be noticed in the measured concentrations in 2007. The temporal patterns of monthly Cd and Pb concentrations in air show a strong winter maximum, and temporal pattern of Hg monthly concentrations weaker winter maximum. Reduced nitrogen in air has maximum both in spring and autumn, while oxidised nitrogen show a clear increase in spring. The different components show no seasonal variation in precipitation.

Annual emissions from the HELCOM Contracting Parties in 2007 are shown below for all pollutants considered in the report. The annual nitrogen oxides emission from the international ship traffic on the Baltic Sea in 2007 is 107 kt N.

Country/ship	POLLUTANT					
	NO <sub>2</sub> kt N	NH <sub>3</sub> kt N	Cd tonnes	Pb tonnes	Hg tonnes	PCDD/F g TEQ
Denmark	51	62	0.7	6	1.1	28
Estonia	11	8	0.7	40	0.7	5
Finland	56	29	1.1	21	0.8	12
Germany	391	514	2.5	106	4.0	83
Latvia	13	13	0.6	18	0.0	13
Lithuania	21	30	0.4	7	0.4	11
Poland	269	240	39.6	573	15.9	442
Russia	1327	750	59.4	355	14.0	808
Sweden	50	41	0.6	16	0.6	36
<b>HELCOM</b>	<b>2188</b>	<b>1687</b>	<b>106</b>	<b>1142</b>	<b>38</b>	<b>1438</b>
<b>Ship-Baltic</b>	<b>107</b>					

Annual depositions of all considered pollutants in 2007 are shown in the Table below for 6 sub-basins of the Baltic Sea and for the entire Baltic Sea.

Basin	POLLUTANT					
	Ox-N kt N	Red-N kt N	Cd tonnes	Pb tonnes	Hg tonnes	PCDD/F g TEQ
GUB	16,6	10,4	0.9	29	0.7	7
BAP	7,2	4,4	4.3	128	1.9	24
GUF	5,5	3,8	0.5	16	0.3	6
GUR	61,0	50,1	0.4	11	0.2	4
BES	8,8	14,2	0.5	16	0.2	10
KAT	8,1	9,5	0.5	17	0.2	4
<b>BAS</b>	<b>107,1</b>	<b>92,4</b>	<b>7</b>	<b>217</b>	<b>3.4</b>	<b>55</b>

Oxidised nitrogen depositions in 2007 into the Baltic Sea were 3% lower in 2007 than in 2006, whereas reduced nitrogen depositions were 3% higher. Total nitrogen deposition remained on the same level in 2007 as in 2006.

Levels of cadmium and lead deposition to the entire Baltic Sea slightly decreased in 2007 comparing to 2006 by 6% and 9%, respectively. At the same time mercury deposition to the entire Baltic Sea for 2007 were 6% higher than that for 2006. In case of PCDD/Fs there is a decrease of deposition from 2006 to 2007 by 9%.

Anthropogenic emission sources of HELCOM countries contributed to the annual deposition over the Baltic Sea in 2007 about 20% for lead and mercury and about 40% for cadmium and PCDD/Fs. Essential contribution to total annual deposition belongs to other sources, in particular, natural emissions, re-suspension with dust, distant emissions, and re-emission.

The following sectors contributed most significantly to the annual anthropogenic emissions of HELCOM countries in 2007: Combustion in Power Plants and Industry (62 □ 88 %), Commercial, Residential and other Stationary Combustion (5 □ 22 %), and Industrial processes for Pb, Cd, And Hg (3 □ 11 %), and Waste for PCDD/Fs (13%).

Most significant contribution to deposition of HMs and PCDD/Fs to the Baltic Sea was made by Poland followed by Estonia for Pb, Russia for Cd, and Denmark for Hg and PCDD/Fs.

Model results in comparison with available measurements for 2007 made around the Baltic Sea are within an accuracy of 60% for Pb and Cd, and 30% for Hg. Computed concentrations of PCDD/Fs are lower than measurements by a factor 2-3.

## **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 includes 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 thirtieth session of the Steering Body of EMEP. Following decision of the HELCOM /MONAS-11 Meeting, it presents the results for the year 2007.

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