Appendix H: Indicator Fact Sheet on PCDD/F depositions

(copy from the HELCOM web pages:
http://www.helcom.fi/environment2/ifs/ifs2008/en_GB/pcddfdepositions/)

1. Atmospheric depositions of PCDD/Fs on the Baltic Sea

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1.1.1.1 Key message

Net annual depositions of PCDD/Fs to the Baltic Sea have decreased in period from 1990 to 2006 by 59%.

1.1.1.2 Results and Assessment

Relevance of the indicator for describing the developments in the environment

This indicator shows the levels and trends in PCDD/F atmospheric depositions to the Baltic Sea. The net depositions of PCDD/Fs represent the pressure of emission sources on the Baltic Sea aquatic environment.

Policy relevance and policy reference

HELCOM adopted a Recommendation in May 2001 for the cessation of hazardous substance discharges/emissions by 2020, with the ultimate aim of achieving concentrations in the environment near to background values for naturally occurring substances and close to zero for man-made synthetic substances.

Assessment

Net annual atmospheric depositions of PCDD/Fs over the surface of the Baltic Sea have decreased in period 1990-2006 by 59% (Figure 1). The most significant change in PCDD/F net depositions can be noted for the Belt Sea (73%) and the Kattegat (65%). For other sub-basins the decrease of depositions varies from 45% to 59% (Table 1).

The highest level of PCDD/F net deposition fluxes (0.27 ng TEQ/m^2/y) over the Baltic Sea can be seen in its southern-western part (the Belt Sea) while the lowest one over the Gulf of Bothnia (0.07 ng TEQ/m^2/y). In other sub-basins the level of net deposition fluxes varies from about 0.1 to 0.2 ng TEQ/m^2/y. Among the HELCOM countries the most significant contributions to depositions over the Baltic Sea belong to Poland, Russia, and Denmark (12%, 7%, and 7%).

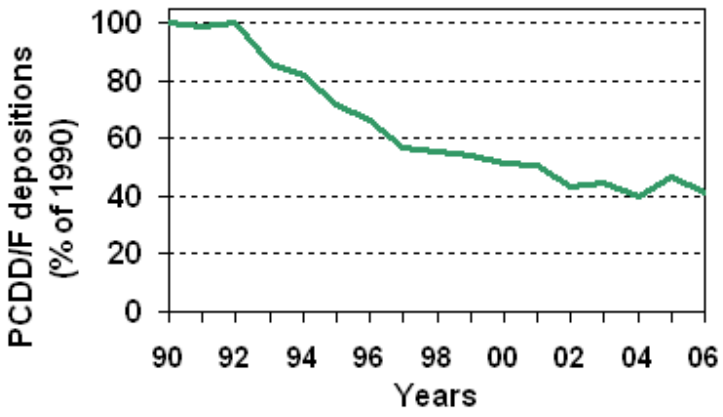

Figure 1: Computed net annual depositions of PCDD/Fs over the Baltic Sea for the period 1990-2006, (% of 1990).

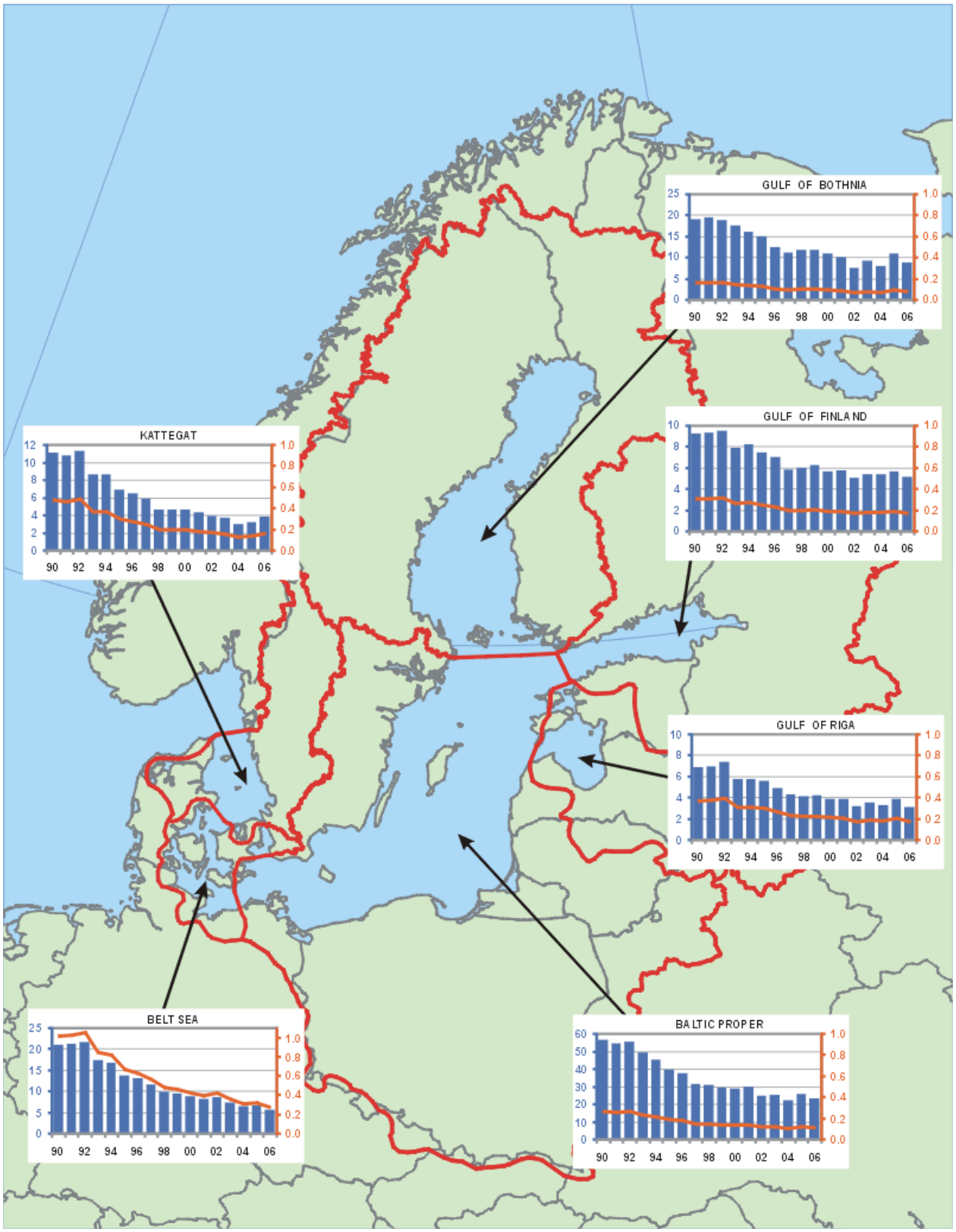
GULF OF BOTHNIA
GULF OF FINLAND
KATTEGAT
GULF OF RIGA
BELT SEA
BALTIC PROPER
90 92 94 96 98 00 02 04 06

Figure 2: Time-series of computed net annual deposition of PCDD/Fs over the six sub-basins of the Baltic Sea for the period 1990-2006 in g TEQ/year as bars (left axis) and total deposition fluxes in ng TEQ/m^2/year as lines (right axis). Note that different scales are used for net depositions in g TEQ/year and the same scales for net deposition fluxes.

Data

Table 1. Computed net annual depositions of PCDD/Fs over the six Baltic Sea sub-basins for period 1990-2006. Units: g TEQ/year

Sub-basin	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
	19	19	19	17	16	15	12	11	12	12	11	10	8	9	8	11	9
GUF	56	54	56	49	45	39	37	31	31	29	29	30	24	25	22	26	23
GUR	9	9	10	8	8	7	7	6	6	6	6	6	5	5	5	6	5
BAP	7	7	7	6	6	6	5	4	4	4	4	4	3	4	3	4	3
BES	21	21	22	17	17	14	13	12	10	9	9	8	9	7	6	7	6
KAT	11	11	11	9	9	7	6	6	5	5	5	4	4	4	3	3	4
Baltic Sea	**121**	**119**	**121**	**104**	**99**	**87**	**80**	**69**	**67**	**65**	**62**	**61**	**52**	**54**	**48**	**56**	**50**

Metadata

Technical information:

1. Source:

EMEP/MSC-E

2. Description of data:

Net annual depositions of PCDD/Fs were obtained using the latest version of MSCE-POP model developed at EMEP/MSC-E (Gusev et al., 2005). The latest available official emission data for the HELCOM countries have been used in the model computations. Emissions of PCDD/Fs for each year of this

period were officially reported to the UN ECE Secretariat by most of the HELCOM countries. These data are available from the EMEP Centre on Emission Inventories and Projections (CEIP) (http://www.emep-emissions.at/ceip/). Lithuania and the Russian Federation submitted part of the data for this period. In particular, Lithuania submitted data for 1997-2006. For previous years emission values were obtained using extrapolation. Russia did not report the information on emission for 2001, and 2003-2006. Value of emission for 2001 was obtained using interpolation between emissions for 2000 and 2002. Emissions of Russia for 2003-2006 were estimated using interpolation between emission for 2002 and the forecast of emission for 2010.

3. Geographical coverage:

Net annual depositions of PCDD/Fs were obtained for the European region.

4. Temporal coverage:

Timeseries of net annual depositions are available for the period 1990 – 2006.

5. Methodology and frequency of data collection:

Atmospheric input and source allocation budgets of PCDD/Fs to the Baltic Sea and its catchment area were computed using the latest version of MSCE-POP model. MSCE-POP is the regional-scale model operating within the EMEP region. This is a three-dimensional Eulerian model which includes processes of emission, advection, turbulent diffusion, wet and dry depositions, degradation, gaseous exchange with underlying surface, and inflow of pollutant into the model domain. Horizontal grid of the model is defined using stereographic projection with spatial resolution 50 km at 60º latitude. The description of EMEP horizontal grid system can be found in the internet (http://www.emep.int/grid/index.html). Vertical structure of the model consists of 15 non-uniform layers defined in the terrain-following s-coordinates and covers almost the whole troposphere. Detailed description of the model can be found in EMEP reports (Gusev et al., 2005) and in the Internet on EMEP web page http://www.emep.int under the link to information on Persistent Organic Pollutants. Meteorological data used in the calculations for 1990-2006 were obtained using MM5 meteorological data preprocessor on the basis of the Re-analysis project data prepared by National Center for Environmental Predictions together with National Center of the Atmospheric Research (NCEP/NCAR) in the USA (http://wesley.ncep.noaa.gov/reanalysis.html) and meteorological analysis of European Centre for Medium-Range Weather Forecasts (ECMWF).

Results of model simulation of atmospheric transport and net annual depositions of PCDD/Fs are provided on the regular basis annually two years in arrears on

the basis of emission data officially submitted by Parties to CLRTAP Convention.

Quality information:

6. Strength and weakness:

Strength: annually updated information on atmospheric input of PCDD/Fs to the Baltic Sea and its sub-basins.
Weakness: uncertainties in officially submitted data on emissions of PCDD/Fs.

7. Uncertainty:

The MSCE-POP model results were compared with measurements of EMEP monitoring network [Gusev et al., 2006, Shatalov et al., 2005]. The model was evaluated through the comparison with available measurements during EMEP TFMM meetings held in 2005. It was concluded that the MSCE-POP model is suitable for the evaluation of the long range transboundary transport and deposition of POPs in Europe.

8. Further work required:

Further work is required on reducing uncertainties in emission data and modeling approaches used in MSCE-POP model.

1.1.1.3 References

Gusev A., I. Ilyin, L.Mantseva, O.Rozovskaya, V. Shatalov, O. Travnikov [2006] Progress in further development of MSCE-HM and MSCE-POP models (implementation of the model review recommendations. EMEP/MSC-E Technical Report 4/2006. (http://www.msceast.org/reps/4_2006.zip)

Gusev A., E. Mantseva, V. Shatalov, B.Strukov [2005] Regional multicompartment model MSCE-POP EMEP/MSC-E Technical Report 5/2005. (http://www.msceast.org/events/review/pop_description.html)

Shatalov V., Gusev A., Dutchak S., Holoubek I., Mantseva E., Rozovskaya O., Sweetman A., Strukov B. and N.Vulykh [2005] Modelling of POP Contamination in European Region: Evaluation of the Model Performance. Technical Report 7/2005. (http://www.msceast.org/reps/7_2005.zip)