Appendix E: Indicator Fact Sheet on HM emissions

(copy from the HELCOM web pages:
http://www.helcom.fi/environment2/ifs/ifs2006/en_GB/hmemissions/)

Atmospheric emissions of heavy metals in the Baltic Sea region

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1.1.1 Key message

Annual emissions of heavy metals from HELCOM countries have decreased during the period from 1990 to 2004 by 44% for cadmium, 42% for mercury, and 86% for lead.

1.1.2 Results and Assessment

1.1.2.1 Relevance of the indicator for describing the developments in the environment

This indicator shows the levels and trends in cadmium, mercury, and lead emissions from anthropogenic sources of HELCOM countries to the atmosphere. The emissions of heavy metals represent the pressure of emission sources on the atmosphere of the Baltic Sea region and subsequently on the Baltic Sea aquatic environment.

1.1.2.2 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.

On the European level the relevant policy to the control of emissions of heavy metals to the atmosphere is being taken in the framework of UN ECE Convention on Long-Range Transboundary Air Pollution (CLRTAP). The Executive Body of CLRTAP adopted the Protocol on Heavy Metals on 24 June 1998 in Aarhus (Denmark). It targets three particularly harmful metals: cadmium, lead and mercury. According to one of the basic obligations, Parties will have to reduce their emissions for these three metals below their levels in 1990. The Protocols has been signed by 36 and ratified by 22 countries and has been entered into force in 2003.

1.1.2.3 Assessment

Annual emissions of heavy metals from HELCOM countries have decreased during the period 1990-2004 by 44% for cadmium, 42% for mercury, and 86% for lead (Figure 1). For individual countries, the most significant drop of cadmium emissions can be noted for Estonia (87%) and Lithuania (86%). In case of lead emission, the most significant decrease can be seen for Germany where the emission in 2004 was almost 80 times lower than in 1990. Mercury emission most significantly decreased in Sweden (by 83%).

Essential reduction of annual lead emission of HELCOM countries from 2003 to 2004 is mostly caused by the change of emission in Russia.

The reduction in heavy metal emission to the atmosphere is a consequence of increased use of lead-free fuels, use of cleaner production technologies as well as of economic contraction and industrial restructuring in Poland, Estonia, Latvia, Lithuania, and Russia in early 1990s.

In 2004 total annual emissions of HELCOM countries amounted to 107 tonnes of cadmium, 38 tonnes of mercury, and 1124 tonnes of lead. Among the HELCOM countries the largest contributions to cadmium total emissions of HELCOM countries belong to Russia (52%) and Poland (42%), for lead – to Poland (49%) and Russia (30%), and for mercury – to Poland (53%) and Russia (30%). Maps of the Baltic Sea Region and time-series of annual total Cd, Hg, Pb emissions of HELCOM countries are shown on Figures 2-4. The diagrams on the maps also show the fractions of emissions deposited to the Baltic Sea. The highest fractions belong to Denmark and Sweden (about 20% for lead and cadmium and 10% for mercury), and the lowest one to Russia (about 0.5%).

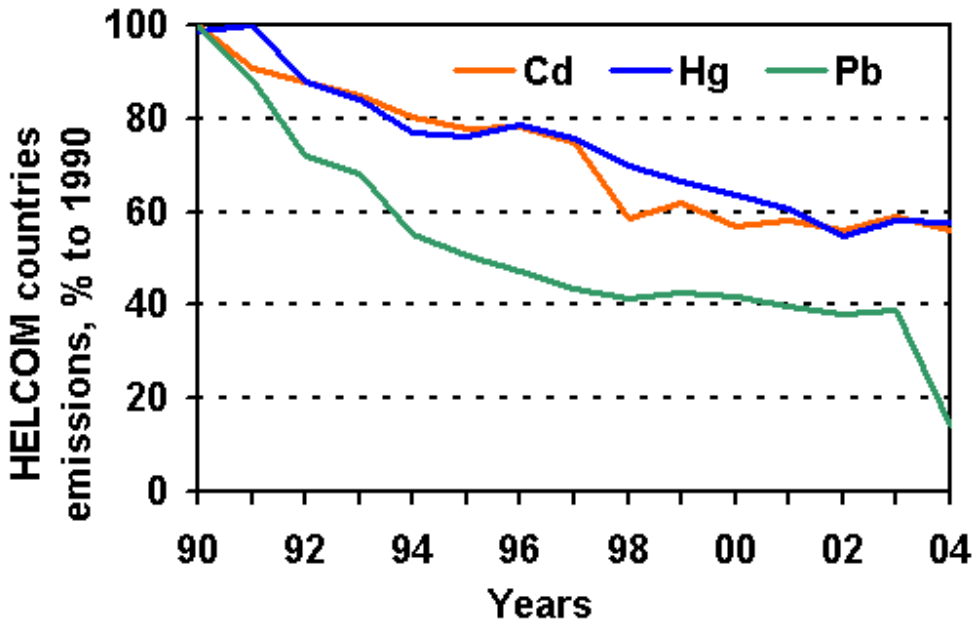

Figure 1. Total annual emissions of cadmium, mercury, and lead to air from HELCOM countries in period 1990-2004 (% of 1990).

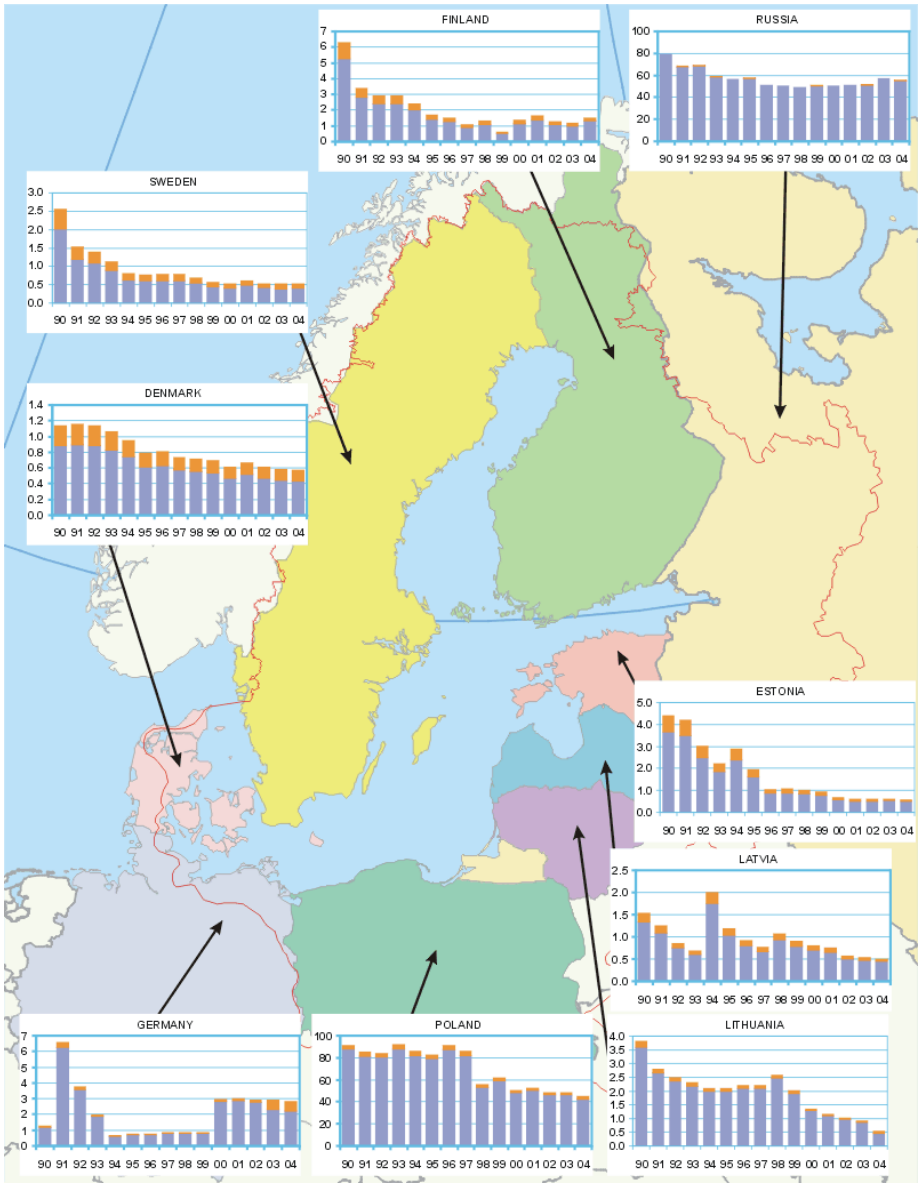

Figure 2: Map of cadmium emissions of HELCOM Contracting Parties (CP) to air as totals in tonnes/year for the period 1990-2004. Red sections of the bars identify the fraction of emission deposited to the Baltic Sea. (The emission data of the CP refer to the total area of the CP except for Russian Federation, for which emissions from the territory of Russian Federation within the EMEP domain is used). Note: different scales have been used for different countries! **Click image to enlarge!**

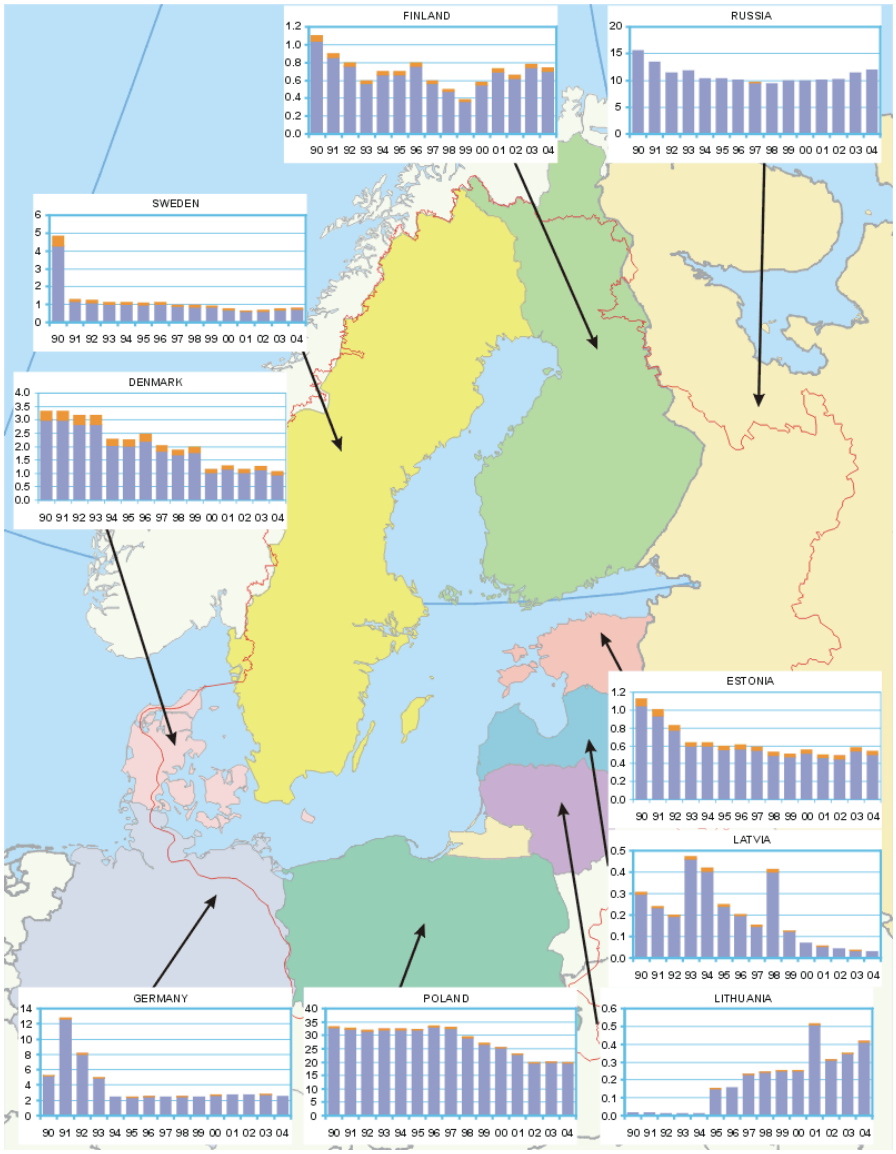

Figure 3: Map of mercury emissions of HELCOM Contracting Parties (CP) to air as totals in tonnes/year for the period 1990-2004. Red sections of the bars identify the fraction of emission deposited to the Baltic Sea. (The emission data of the CP refer to the total area of the CP except for Russian Federation, for which emissions from the territory of Russian Federation within the EMEP domain is used). Note: different scales have been used for different countries! **Click image to enlarge!**

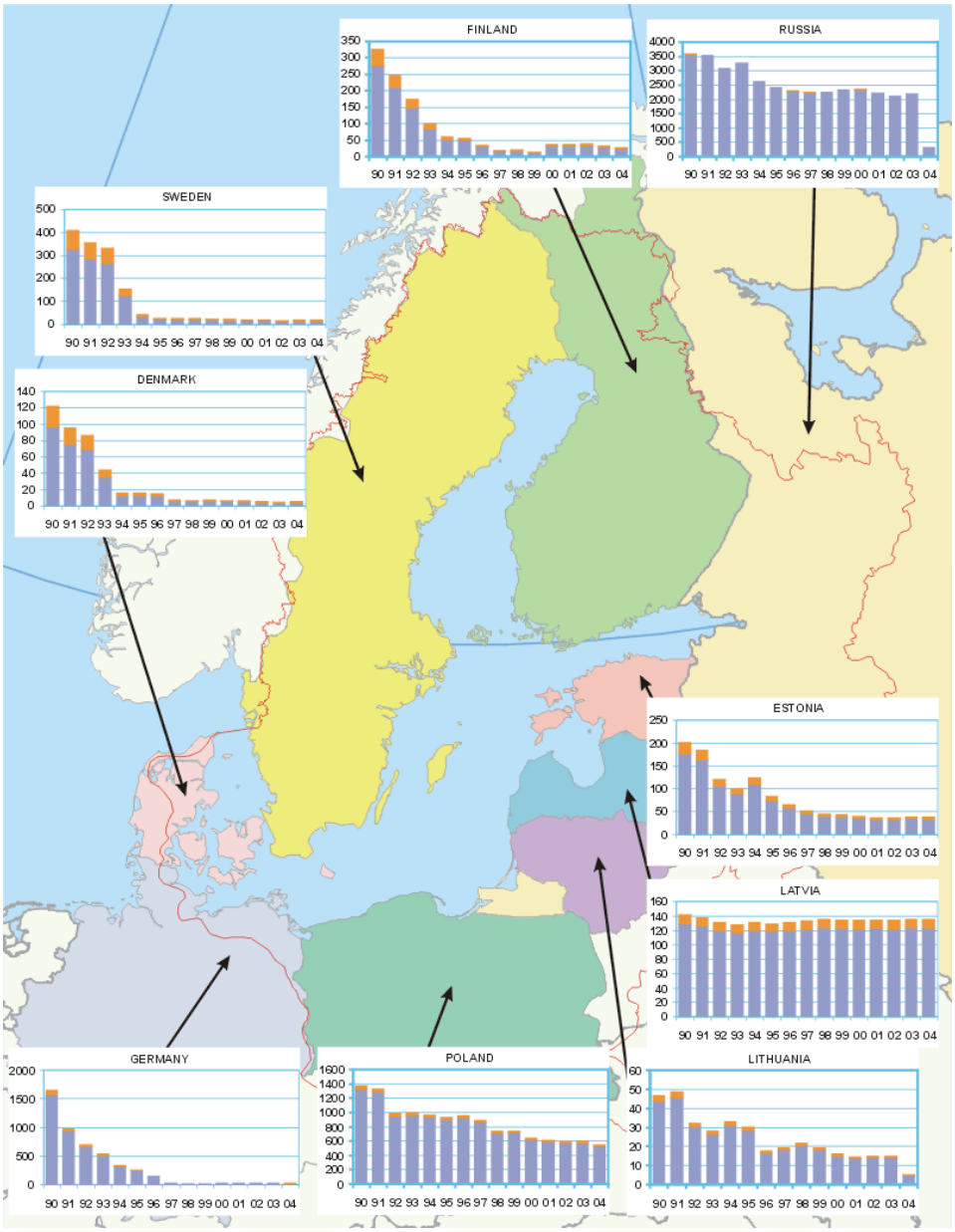

Figure 4: Map of lead emissions of HELCOM Contracting Parties (CP) to air as totals in tonnes/year for the period 1990-2004. Red sections of the bars identify the fraction of emission deposited to the Baltic Sea. (The emission data of the CP refer to the total area of the CP except for Russian Federation, for which emissions from the territory of Russian Federation within the EMEP domain is used). Note: different scales have been used for different countries! **Click image to enlarge!**

1.1.2.4 Supporting information

http://www.msceast.org/HELCOM/HM_emissions_of_HELCOM_countries.pdf

1.1.3 Data

Table 1. Cadmium emissions from anthropogenic sources of HELCOM countries from 1990 to 2004. Values of emissions estimated using interpolation are shaded. Units: tonnes/year

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Denmark	1.1	1.2	1.1	1.1	1.0	0.8	0.8	0.7	0.7	0.7	0.6	0.7	0.6	0.6	0.6
Estonia	4.4	4.2	3.0	2.2	2.9	2.0	1.0	1.1	1.0	0.9	0.7	0.6	0.6	0.6	0.6
Finland	6.3	3.4	2.9	2.9	2.4	1.7	1.5	1.1	1.3	0.6	1.4	1.6	1.3	1.2	1.5
Germany	1.3	6.6	3.7	2.0	0.6	0.8	0.8	0.8	0.8	0.8	3.0	3.0	2.9	2.9	2.8
Latvia	1.5	1.2	0.9	0.7	2.0	1.2	0.9	0.8	1.1	0.9	0.8	0.8	0.6	0.5	0.5
Lithuania	3.8	2.8	2.5	2.3	2.1	2.1	2.2	2.2	2.6	2.0	1.4	1.2	1.0	0.9	0.5
Poland	91.6	85.0	84.1	91.9	85.8	82.6	91.2	85.8	55.4	61.7	50.4	52.5	48.7	48.5	44.9
Russia	79.4	68.2	68.8	59.0	56.6	57.4	51.0	50.4	49.0	50.9	50.5	51.0	51.5	57.3	55.4
Sweden	2.6	1.5	1.4	1.1	0.8	0.8	0.8	0.8	0.7	0.6	0.5	0.6	0.5	0.5	0.5

Table 2. Lead emissions from anthropogenic sources of HELCOM countries from 1990 to 2004. Values of emissions estimated using interpolation are shaded. Units: tonnes/year

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Denmark	122	95	86	44	16	16	15	8	7	7	7	6	5	5	5
Estonia	201	185	121	101	124	84	65	52	46	44	41	37	37	39	38
Finland	326	247	175	100	60	57	35	19	20	14	38	38	40	34	27
Germany	1653	986	691	534	333	259	149	22	18	18	25	25	23	23	21
Latvia	142	138	131	128	131	130	131	133	135	134	134	134	134	136	135
Lithuania	47	49	32	28	33	30	18	20	22	19	16	15	15	15	5
Poland	1372	1336	986	997	966	937	960	896	736	745	647	610	588	596	544
Russia	3591	3553	3095	3276	2643	2426	2304	2247	2262	2339	2352	2235	2118	2207	330
Sweden	409	357	331	155	44	28	26	25	24	23	20	19	17	19	19

Table 3. Mercury emissions from anthropogenic sources of HELCOM countries from 1990 to 2004. Values of emissions estimated using interpolation are shaded. Units: tonnes/year

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Denmark	3.3	3.3	3.2	3.2	2.3	2.2	2.5	2.0	1.9	2.0	1.1	1.3	1.1	1.3	1.1
Estonia	1.1	1.0	0.8	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.6	0.5	0.5	0.6	0.5
Finland	1.1	0.9	0.8	0.6	0.7	0.7	0.8	0.6	0.5	0.4	0.6	0.7	0.7	0.8	0.7
Germany	5.3	12.8	8.1	5.0	2.5	2.4	2.5	2.4	2.5	2.5	2.7	2.8	2.7	2.8	2.6
Latvia	0.3	0.2	0.2	0.5	0.4	0.2	0.2	0.2	0.4	0.1	0.1	0.1	0.0	0.0	0.0
Lithuania	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.3	0.3	0.5	0.3	0.4	0.4
Poland	33.3	32.7	31.9	32.5	32.4	32.3	33.6	33.0	29.5	27.1	25.6	23.2	19.8	20.2	19.8
Russia	15.6	13.4	11.4	11.8	10.4	10.4	10.1	9.6	9.4	9.9	10.0	10.1	10.2	11.4	11.9
Sweden	4.8	1.3	1.2	1.1	1.1	1.1	1.1	1.0	1.0	0.9	0.8	0.7	0.7	0.8	0.8

1.1.4 Meta data

1.1.4.1 Technical information:

1. Source:

EMEP/MSC-E UN ECE Secretariat

2. Description of data:

Annual total emissions of all three metals were officially reported to the UN ECE Secretariat by HELCOM countries in 2006. These data are available from EMEP emission database WEBDAB: http://webdab.emep.int.

3. Geographical coverage:

European region

4. Temporal coverage:

Data on lead, cadmium, and mercury emissions are available for the period 1990 - 2004. Some of the HELCOM countries, in particular, Russia submitted part of the data for this period. Russia did not provide information for 2001. Values of emissions from Russia for 2001 were obtained using interpolation.

5. Methodology and frequency of data collection:

National data on emissions are annually submitted by countries Parties to CLRTAP Convention to the UN ECE Secretariat; the methodology is based on combination of emission measurements and emission estimates based on activity data and emission factors. Submitted data are passing through QA/QC procedure and stored in the UN ECE/EMEP emission database at EMEP/MSC-W.

1.1.4.2 Quality information:

6. Strength and weakness:

Strength: data on emissions are annually submitted, checked and stored in the database

Weakness: gaps in time series of national emissions, uncertainties in national emissions

7. Uncertainty:

Official data on heavy metal emissions can be underestimated to some extent (Ilyin et al., 2004). According to the data of UBA/TNO project (Berdowski et al., 1997), which provided expert estimates of heavy metal emissions for European region, their uncertainty can vary within a factor of 1.5 - 3.5. For countries of northwestern and central Europe (for instance, Norway, Sweden, Belgium, Poland) actual emission values can differ from estimates by 20-50% and for countries of central and eastern part of Europe the uncertainty can be essentially higher.

8. Further work required:

Further work is required on filling gaps in time series of emissions and reducing their uncertainties.

For reference purposes, please cite this indicator fact sheet as follows:

[Author's name(s)], [Year]. [Indicator Fact Sheet title]. HELCOM Indicator Fact Sheets 2006. Online. [Date Viewed], http://www.helcom.fi/environment2/ifs/en_GB/cover/.

Last updated 6.9.2006