3. Deposition Trends

In this chapter we first compare depositions in the previous (1991 – 1995) and present (1996 – 2000) period and then we compare changes in the depositions and emissions for the years 1996 – 2000.

3.1 Comparison of depositions in the present and previous five year period

In order to compare depositions for two different 5-year periods, we denote the mean deposition over the period 1991 – 1995 as 100% and we express the depositions for the present period as the percentage of the previous period.

For total nitrogen (Figure 3.1), depositions in the Gulf of Bothnia, Baltic Proper and Gulf of Riga are respectively 25%, 24% and 4% higher in the present that in the previous 5-year period. In the remaining three sub-basins depositions in the present 5-year period are lower.

For heavy metals the computations of atmospheric depositions to the Baltic Sea in period 1991-1995 are available for lead and cadmium. These computations were carried out by MSC-E for the evaluation of trends in concentrations and depositions of lead and cadmium within the EMEP region for the period 1990-1998 (*Ilyin et al.*, 2001). However, it should be mentioned that evaluation of depositions for 1990-1998 period was made on slightly different set of emission data.

On average mean cadmium depositions in present 5-year period are 30% lower for all sub-basins of the Baltic Sea in comparison with the previous period (Figure 3.2). Most significant changes can be indicated for two sub-basins Gulf of Finland (62%) and Belt Sea (61%).

For lead the decrease in depositions is more significant. On average mean depositions of lead in present 5-year period are 60% lower for all sub-basins of the Baltic Sea in comparison with the previous period (Figure 3.3). As for cadmium, most significant changes can be indicated for Belt Sea (34%).

The comparison of mercury depositions for two 5-year periods is not presented in this report since modeling results for 1991-1995 period are not available at the moment. As soon as these computations are performed, this comparison will be added in this section.

Similar comparison was made also for lindane (γ-HCH) depositions (Figure 3.4). Mean depositions of lindane (γ-HCH) for period 1991-1995 were on average practically the same as in the period 1996-1998. However, on the level of individual sub-basins changes in depositions are different for different parts of the Baltic Sea. For Kattegat, Belt Sea, and Baltic Proper some increase in mean depositions take place, whereas for Gulf of Riga, Gulf of Finland, and Gulf of Bothnia decrease of depositions can be indicated.

3.2 Annual depositions versus annual emissions in the years 1996 - 2000

To compare emissions and depositions in these years, we assume that both, the sum of annual emissions from all to the Baltic Sea and the annual total depositions to the entire Baltic Sea are equal to 100% in 1996. Emissions and depositions in the following years are expressed in percent of their 1996 values.

Annual emissions of total nitrogen (Figure 3.5) decline monotonically in the entire period with annual emissions in 2000 11% lower than annual emissions in 1996. However, this decline of nitrogen emissions is placed well within the uncertainty range of emissions and therefore, can not be considered as significant. Annual depositions of total (oxidized and reduced, wet and dry) nitrogen in the 1996 - 2000 period do not follow the emission pattern closely, showing the influence of meteorological conditions. Annual deposition values for different years are scattered around 1996 value with maximum in 1998.

The comparison of heavy metal emissions and depositions is presented in Figures 3.6-3.8. As for the nitrogen compounds emissions for cadmium, lead, and mercury gradually decrease during the period 1996-2000. However, annual depositions do not follow closely variations of emissions. Maximum annual depositions for cadmium take place in 1997, for lead in 1998. For mercury annual depositions to the Baltic Sea increase during the period 1996-2000 with maximum in 2000. Modeling results for lindane (γ-HCH) do not cover entire period 1996-2000. Therefore, the comparison of lindane emissions and depositions is presented for three years 1996-1998 (Figure 3.9). Some increase in depositions of lindane to the Baltic Sea from 1996 to 1998 can be indicated.

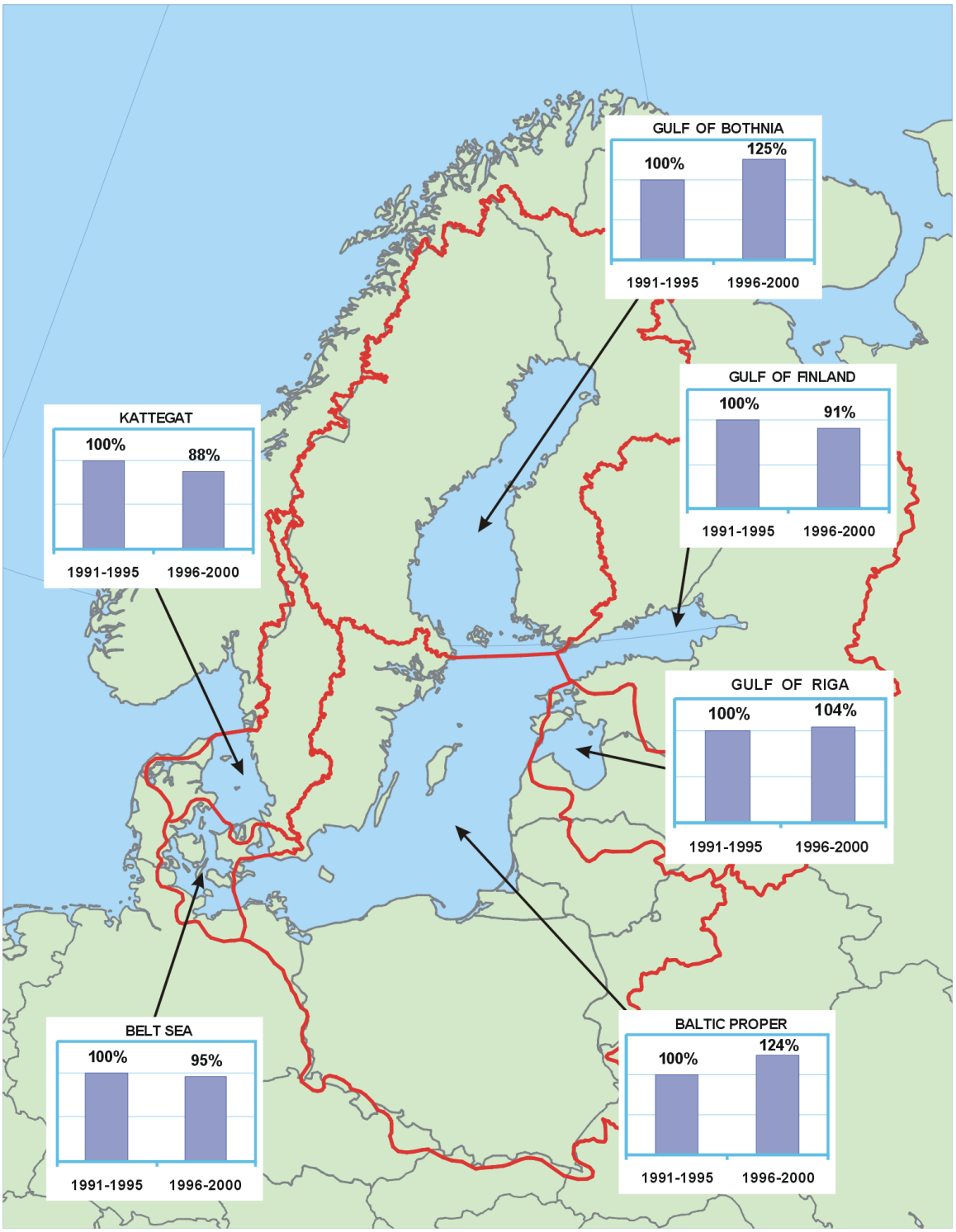

Figure 3.1. Changes in % between 5-year average total annual nitrogen depositions in the period 1991-1995 and in the period period 1996-

2000.

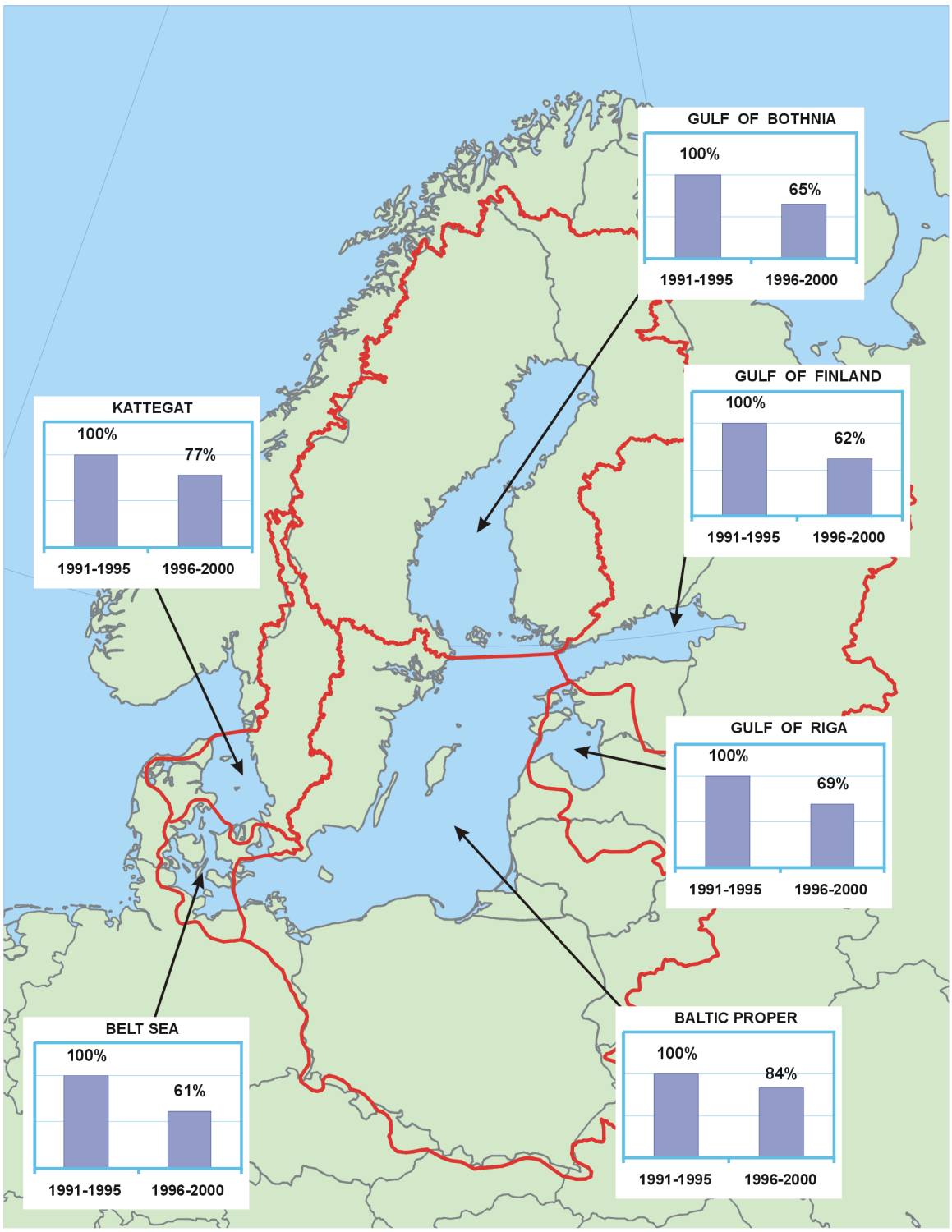

Figure 3.2. Changes in % between 5-year average annual cadmium depositions

in the period 1991-1995 and in the period period 1996-2000.

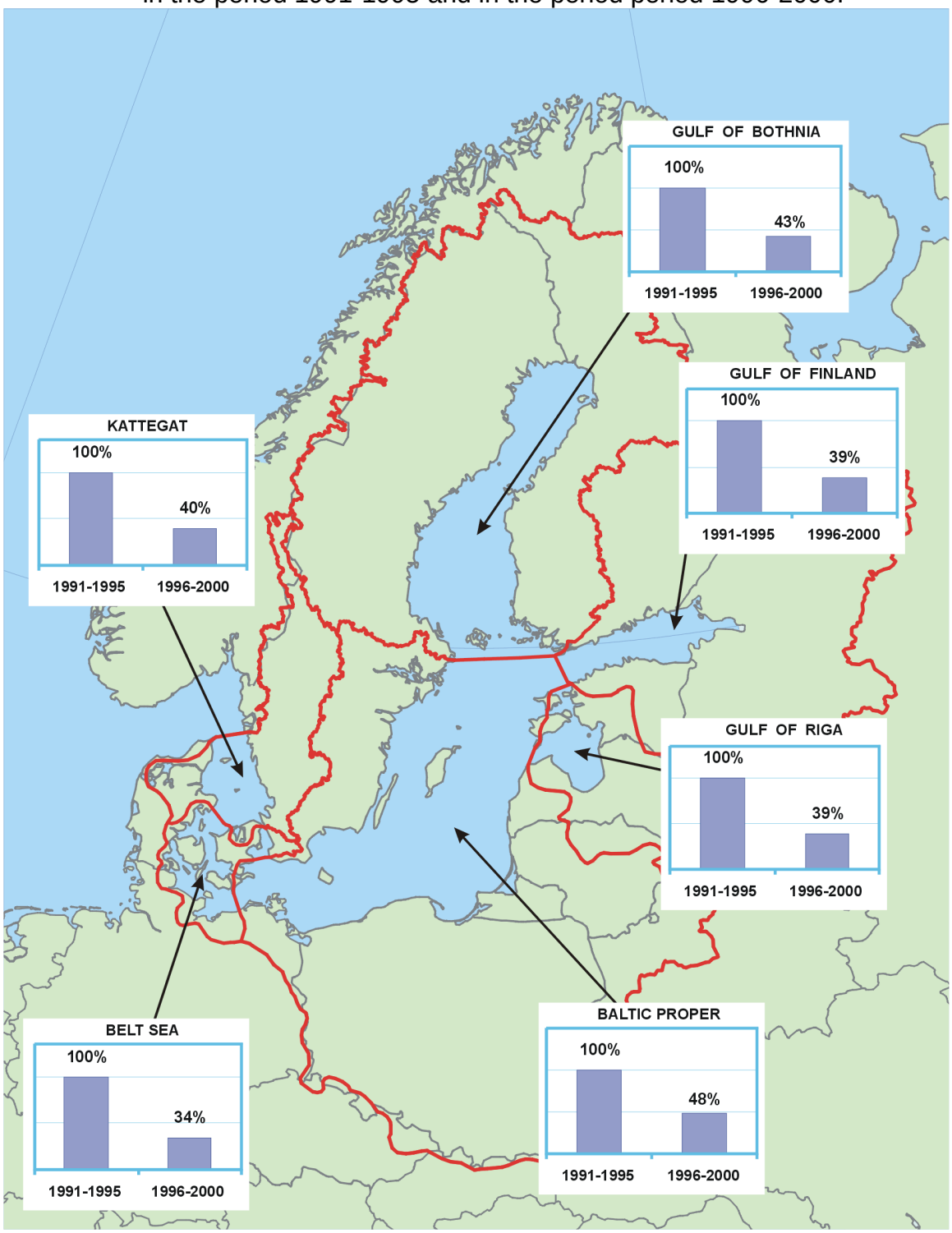

Figure 3.3. Changes in % between 5-year average annual lead depositions in

the period 1991-1995 and in the period period 1996-2000.

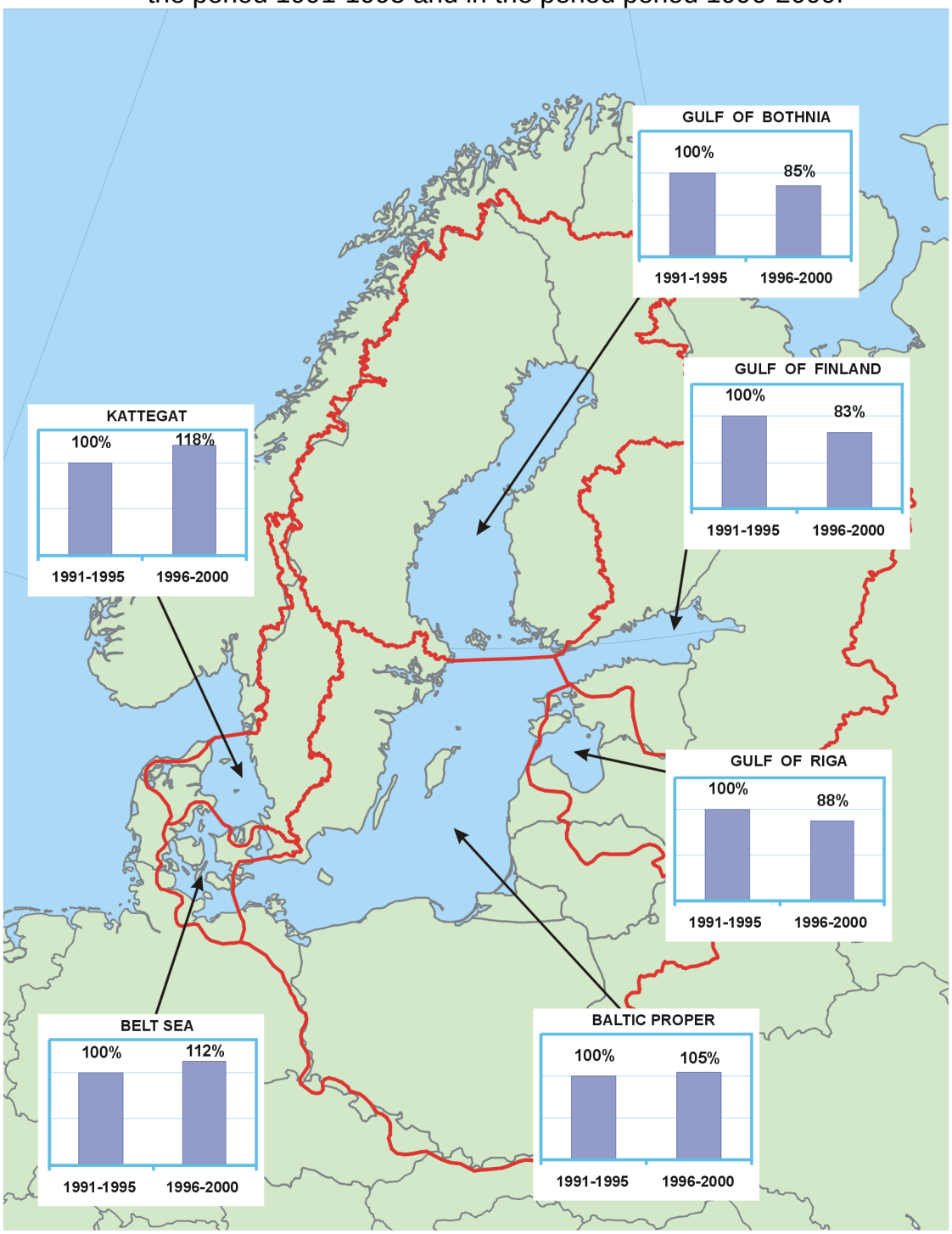

Figure 3.4. Changes in % between 5-year average annual lindane (γ-HCH) depositions in the period 1991-1995 and in the period period 1996-

2000.

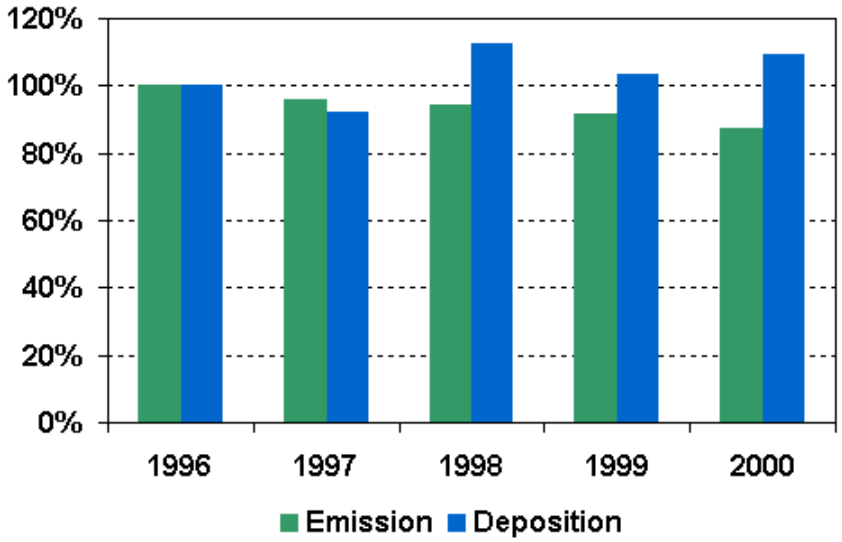

Figure 3.5. Relative annual nitrogen emissions from all HELCOM countries and annual depositions to the Baltic Sea for the period 1996-2000. Emissions and depositions in 1996 are assumed to be 100%.

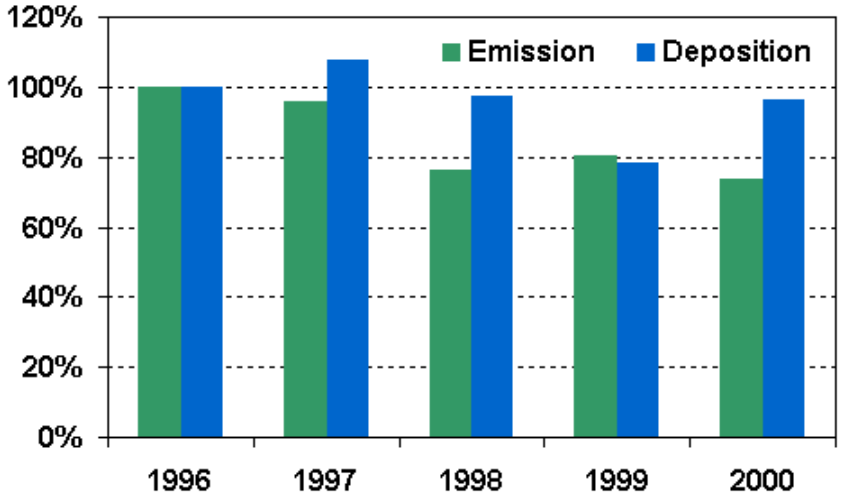

Figure 3.6. Relative annual cadmium emissions from all HELCOM countries and annual depositions to the Baltic Sea for the period 1996-2000. Emissions and depositions in 1996 are assumed to be 100%.

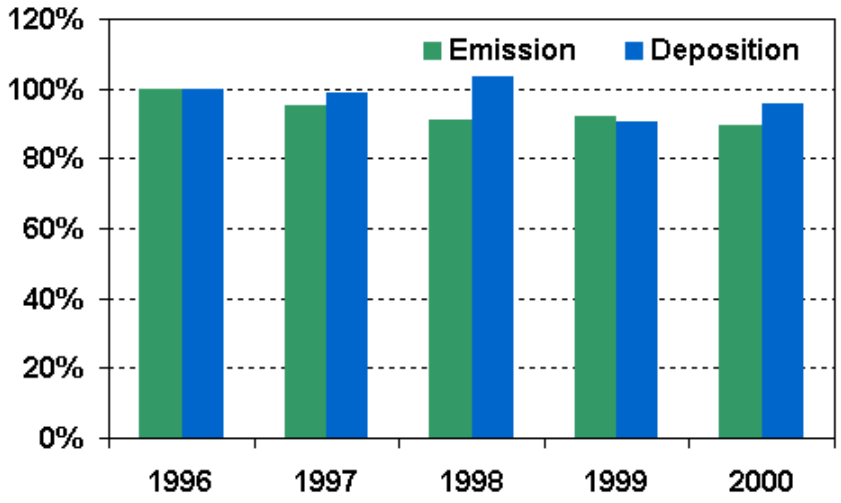

Figure 3.7. Relative annual lead emissions from all HELCOM countries and annual depositions to the Baltic Sea for the period 1996-2000. Emissions and depositions in 1996 are assumed to be 100%.

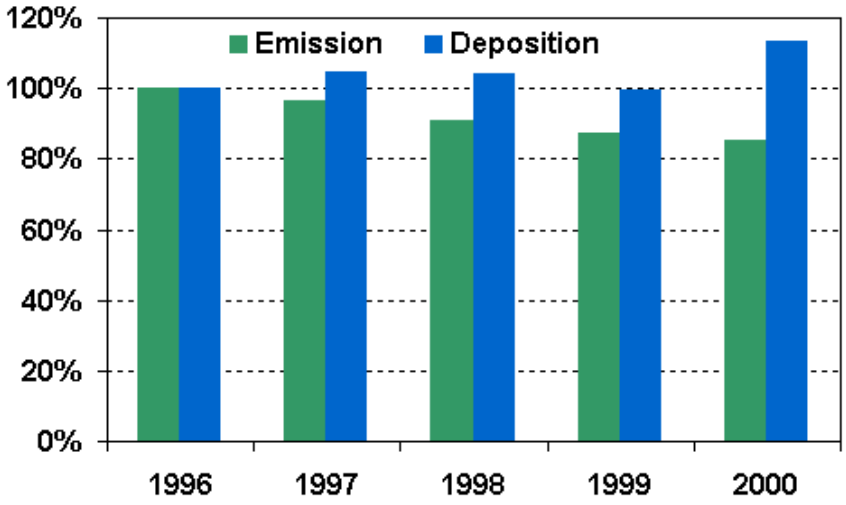

Figure 3.8. Relative annual mercury emissions from all HELCOM countries and annual depositions to the Baltic Sea for the period 1996-2000. Emissions and depositions in 1996 are assumed to be 100%.

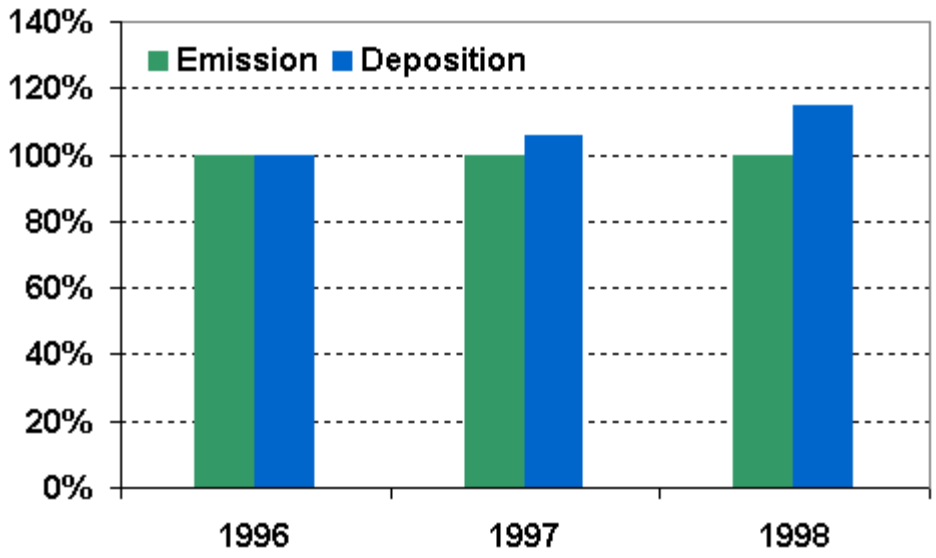

Figure 3.9. Relative annual lindane emissions from all HELCOM countries and annual depositions to the Baltic Sea for the period 1996-1998. Emissions and depositions in 1996 are assumed to be 100%.