

Estimation of emission of nitrogen and phosphorus compounds from polish agriculture to the Baltic Sea

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Poland is a typical lowland country with the prevailing share of agricultural territory (61%) and agricultural land (51%), including arable area and smaller share of forests and grassland in comparison to other countries in Baltic Sea. Almost the whole area of Poland lies in Baltic Sea basin and is drained by two big rivers Vistula and Oder, from which one is flowing exclusively along the country territory and by 10 small rivers discharging directly to the sea. The area of the country cover of 18% in the whole Baltic Sea basin and population density determine about 45% of total population located in Baltic Sea basin. Polish agriculture is very dispersed and not satisfactorily provided with the sanitary infrastructure.

Among 7 the biggest rivers discharging water to Baltic Sea (Newa, Wisła, Niemen, Dźwina, Oder, Gota and Kemi) two of them – Vistula and Oder flow along the Polish territory. Taking into consideration the outflow of water, in the last 18 years two dry periods - 1990-1993 and 2003-2007, one period of moderate outflow, 1994-1997 and one wet period characterized by the highest water outflow, 1998-2002 can be distinguished. The total amount of water flowing into Baltic Sea from Polish territory was in the range 38 – 70 km³ · year⁻¹.

The amounts of biogenic substances discharged yearly with river's water is extremely variable and correlate closely with the outflow of water. Correlation coefficient is much higher for nitrogen compounds (total N), $R=0,81$, than for phosphorus compounds (total P), $R=0,56$. There is also a significant correlation between amounts of both elements (N total and P total), $R=0,67$. Higher regression coefficient for nitrogen compounds and lower for phosphorus compounds justify the hypothesis that most of nitrogen compounds originate from dispersed sources and most of the phosphorus compounds from point sources.

The model of valuation of the share of biogenic substances losses, originating from different sources to Baltic Sea were used to the estimation of nutrient emission from agriculture (Fotyma and Igras 2009). The retention from natural and point sources both of nitrogen and phosphorus compounds is 40%, and from disperse sources 60% of nitrogen and 80% of phosphorus compounds. Using this figures the most probable contribution of different sources of biogenic substances in the total amount discharged to Baltic Sea is as follows: 20% of nitrogen and phosphorus compounds from natural sources, 65% of nitrogen and 56% of phosphorus compounds from disperse sources (practically from agriculture) and 15% of nitrogen and 23% of phosphorus compounds from point sources. Therefore the share of agriculture in pollution of Baltic Sea with biogenic substances is quite considerable.

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