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## GEOCHEMICAL MAPPING IN POLAND – CURRENT STATUS AND PERSPECTIVES

Geochemical mapping is a part of geological mapping, which deals with contents of the chemical elements in some Earth's environment (rocks, soils, water sediments, surface water and groundwater) in the form of geochemical maps. Geochemical maps are elaborated at different scales (small scale maps – below 1:500,000; medium scale – regional maps from 1: 500,000 to 1:50,000 and large scale – detailed maps below 1: 50,000) according to the observation density (number of sampling points per unit of surface measure).

Geochemical maps present geochemical background and geochemical anomalies. The most common definition of geochemical background is the natural content of an element or compound in a material (e.g. soil, sediment, rock) with reference to a particular area. Geochemical anomaly means uncommon content of the element or compound, which is above or below the limits typical of geochemical background. Two types of anomalies may be distinguished: positive ones (under geochemical background) and negative ones (below geochemical background). Geochemical anomalies may be caused by natural, geological factors such as metal deposits or by factors of anthropogenic origin (human activity). When both types of factors affect the same anomaly, it is called the mixed type anomaly. Many of the **Zn-Pb-Cd** anomalies which occur in the Upper Silesia and Lower Silesia are anomalies of that kind.

Awareness of chemical elements distribution in particular environment is an extremely important information not only for deposit geology, but also for institutions and individuals dealing with the issues connected with town and country planning, agriculture, forestry and health condition of people and animals in the area. Positive geochemical anomalies may result in pathological changes of living creature caused by toxic substance influences, while negative geochemical anomalies may cause changes related to the shortage of particular element.

Due to high cost of geochemical mapping, the first stage of the survey employs small scale sampling to estimate quickly and at relatively low cost the geochemical background differentiation of large areas (e.g. entire country). This technique allows also to distinguish regional and local anomalies. At this stage of the survey the origin of the anomalies (natural, anthropogenic or mixed) may be defined as far as the source of contamination may be identified. The next stages of the survey comprise geochemical mapping at regional scales covering the areas

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outlined in the first stage and finally detailed mapping of selected areas. Detailed geochemical maps are used for environmental protection needs of provinces (voivodeships) and smaller administrative units. Such a course of action saves both time required for the survey as well as its cost. As a rule the area of the selected places for detailed mapping makes only a small fraction of the area investigated at the first stage.

Taking into consideration the above mentioned problems, Polish Geological Institute started in 1991 the geochemical mapping program aimed at determining the actual chemical condition of soils, water sediments as well as surficial water and groundwater. Between 1991 and 1993 geochemical mapping of Poland at the scale of 1: 500 000 was conducted (Lis and Pasieczna 1995a). On the basis of that study between 1991 and 1999 geochemical mapping at regional scales (1:100,000 or 1: 50,000) were conducted in the most important urban-industrial areas of the country. Geochemical atlases of Warsaw (Lis 1992), Kielce (Lenartowicz 1994), Upper Silesia (Lis, Pasieczna 1995c), Wałbrzych (Pasieczna et al. 1996), Łódź (Koniecznyńska 1998b; Lis, Pasieczna 1998a), Wrocław (Tomassi-Morawiec et al. 1998) Szczecin (Lis, Pasieczna 1998b; Nałęcz 1998), Legnica-Głogów Copper District (Lis et. al. 1999), Gdańsk (Lis, Pasieczna 1999a; Nałęcz 1999) and Częstochowa (Lenartowicz 2001) areas have been completed so far.

The study which has been conducted so far indicates that the most urgent task of geochemical mapping at the moment is realization of geochemical maps at the scale 1: 25,000 in the areas of Pb-Cd-Zn anomalies in Upper Silesia-Krakow region ( approx. 2400 sq. km), around Głogów and Legnica cooper smelters (approx. 1200 sq. km) and some areas of former mining and metallurgy in Lower Silesia (aprox. 500 sq. km). The total area of the selected targets makes less than 1.5 % of the entire country area.

Between 1996 and 1998 the first pilot sheet (Sławków) at the scale of 1:25,000 was prepared. A number of factors was taken into consideration while conducting the project. One of the maximum Pb-Cd-Zn anomalies occurs in the area of Bolesław, Bukowno and Sławków. The reason for the anomaly are: ore-bearing dolomites outcropping as well as exploitation, processing and Pb-Zn ore metallurgy, both contemporary and past. The land use in the area covered by the pilot sheet is differentiated. Its northern and southern part is covered by forest (approx. 40% of the area) while arable land makes its central part (approx. 18 % of the area). The results obtained at the pilot study indicate that geochemical mapping at the scale 1: 25,000 is extremely useful for estimation of soil, surface water and water sediment contamination as well as for country and town planning, agriculture, water management and health care. Preparation of next four sheets at the scale 1:25,000 is in progress.

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