

Salt Water Intrusion on the Polish Baltic Coast

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ABSTRACT

Seawater - freshwater interactions on the Polish part of the Baltic coast occur in various hydrogeological settings, including sandy spits (Hel Peninsula, Vistula Spit), islands (Wolin and part of Uznam/Usedom near Szczecin, Stogi and Wyspa Sobieszewska near Gdańsk Region), cliff coasts, coastal lowlands and Vistula Delta area. Groundwater salinity in some of these environments has various origins. Besides contemporary seawater encroachment it can be also attributed to relic sea waters trapped below younger deposits or to ascension of brines from underlying older geological formations as Jurassic and Triassic strata (e.g. in Vistula Delta or Żarnowiec trough).

Investigation of the brackish and saline water and their origin on the present Polish coast started about one hundred years ago, when the coastal region belonged to Germany, with pioneering works of e.g. Jentsch (1911), Ostendorf (1930); Schroedter (1931). The Vistula delta plain was the first area of detailed studies. At that time two sources of the salt waters were distinguished – salt water ascension from the Mesozoic strata in the central part of the delta and the remnants of sea water from the early stages of the delta evolution (young relic sea water from the Littorina time). More detailed investigations started at the turn of 1950's and 60's. (Pazdro, 1958). New investigation methods have been gradually implemented over the last 40 years, especially geoelectrical logging, remote sensing, isotopic and chemical composition analyses, including noble gases and numerical simulation models.

The Tri-city agglomeration consisting of Gdańsk, Sopot and Gdynia is supplied with water mainly from groundwater intakes. Total amount of groundwater exploitation along the Polish coast exceed 70 % of water supply. A direct threat of seawater intrusion was apparent in this region in 1980's due to large groundwater abstraction from wells close to the seaside. Since that time due to reduction of water use for industrial and domestic purposes, gradual freshening of the aquifers is observed. However, studies on the risk of seawater are continued in view of the expected sea level rise. The role of submarine groundwater discharge in contaminant transport becomes increasingly studied. The large scale contribution of SGD in Poland to the pollution of Baltic sea seems limited, because it is less than 1% of the total outflow of rivers from the Polish area and the quality of coastal aquifers is generally good. However, it can be important locally, in areas with intense agriculture adjacent to semi-isolated parts of the sea, such as the Puck Bay.

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