# Hydrogeochemical investigation of seawater intrusion into confined aquifer in Liepaja city

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Large scale pumping of groundwater has caused seawater intrusion into Upper Devonian Famenian multi aquifer (D3fm), particularly Muri – Zagare aquifer (D3mr-zg) in the Liepaja city area, and intrusion is developing towards water supply wells which are located inland to the south-east from Liepaja City. In this study attempt has been made to determine seawater intrusion rate and current hydrogeochemical conditions in Muri – Zagare confined aquifer using data on chemical composition of groundwater samples, taken from exploration and monitoring wells.

Dataset of major ions and trace elements were used acquired from monitoring wells, project wells and water supply wells dated from 1960.-ies to year 2013. Various techniques are used for better understanding of seawater intrusion development, its current state and possible further development, including Principal Component Analysis (PCA) and Hierarchical Cluster Analysis (HCA) and probability graphs.

Probability graph revealed that it is possible to distinguish fresh, brackish and saline water by electrical conductivity (EC) threshold. Seawater influence can be detected up to 4 km inland from the Baltic Sea coast. Analysis of hydrogeochemical data reveal great influence of cation exchange processes on groundwater chemical composition. Besides seawater intrusion, signs of intrusion from subjacent aquifer (Devonian akmene-jonisku) were detected from analysis. Majority of samples showed manganese, sodium, potassium and calcium ion correlation with Cl- indicating that these components can be enriched during freshwater and seawater mixing. This study revealed that is possible to distinguish brackish water from freshwater by using Ca/Cl, Mg/Cl and K/Cl ionic ratios. PCA and HCA statistical analysis proved their usability in investigation of seawater intrusion process as they can distinguish different groups of water from chemical composition point of view.