

Kielce, dn. 29.09.23 r.

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Evaluation of the variability of tap water composition in the agglomeration X

Abstract

Water is one of the most important products needed for human life. In the era of the 21st century and the increased popularity of various fertilizers on farms, a great deal of undesirable substances get into the ground, which can seep into aquifers and then into drinking water. It is very important that the best quality water reaches the potential consumer. The chemical stability of water is the state of water in which the minerals in it remain in a state of chemical equilibrium, including carbonate and calcium. Chemically stable water is particularly important for the technological systems that supply it to the consumer, because its operation is then safe for them. Minerals that precipitate can form a precipitate that is harmful to the water supply network, while minerals that dissolve in the water can lead to the water exhibiting corrosive properties. The research problem is to evaluate the variability of the composition of tap water over the 10 years from 2012 to 2022 for 3 selected water supply intakes in Kielce County. These include Wola Kopcowa, Bolechowice and Koloman. These are rural agglomerations located in the vicinity of Kielce. Each of the aforementioned localities was examined in terms of the quality of water flowing through water supply systems using data obtained from "Waterworks Kielce" Sp. z o.o., as well as in-house tests conducted in a chemical laboratory. Then, using the above-mentioned test results and the advanced computer program PHREEQC, it was verified whether the water from a given water supply network is chemically stable. An additional and very important factor was the testing of water for the activity of the radioactive element radon using specialized AquaKIT equipment (manufactured by Genitron GmbH). Analysis of the water quality results from 2022 (water was taken from 3 starting, middle and ending points for each of the groundwater intakes in question) made it possible to create a multi-criteria ranking, while the individual places in it allowed to determine whether the condition of the water changes with the flow through the water supply system. The main scientific objective of the study was to determine the variability of water quality and chemical stability over time, and to create a model of the influence of water quality indicators on the radon content of water. The research hypothesis was that the chemical stability of intake water deteriorates as a function of the duration of intake operation against the alternative hypothesis of no significant deterioration in water chemical stability. Research hypothesis two: radon concentrations in the water supply network are significantly lower than in water directly flowing from the aquifer and do not exceed EPA limits.

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