



Geological conditions for prevention of nitrate pollution of potable waters in the agricultural areas of Southeast Bulgaria

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This work presents results of eighteen months monitoring study of the hydro-chemical parameters of ground waters from the Tundja basin in Southeast Bulgaria. During the study a variety of hydro-chemical parameters were measured and between them the amount of nitrates in potable water sources was recorded. It was found that the concentration of nitrates is elevated for the entire region and at some springs it is far above the acceptable values, posing significant health risk for the local population. The main source of nitrates appears to be the agricultural practice which is dependent upon fertilization. With far less significance but still noticeable is the pollution from cattle and pig farms, which although equipped with wastewater treatment facilities still release pollutants. Thirteen sample sites were studied, which are located in various geological and geomorphological environments. In these sites the measured nitrate amount varies according to the season but usually it is in the range 50 – 550 ppm. It was found that in some geological environments the pollution is less than in other. The main factors that affect the amount of nitrates in the water were found to be as follows: 1. The distance (separation) between the recharge zone where nitrates accumulate and the point of discharge; 2. The status of the recharge zone e.g. fertilized farmland, uncultivated grassland, forest, etc. 3. The elevation difference (the gradient) between the area of water pollution and the discharge point; 4. The type of aquifer, which collects and conducts the waters, e.g. porous aquifer, fracture aquifer, karst aquifer; 5. The geometry of the aquifer, e.g. factors that determine the internal path of waters like clay or caliche screens, etc. With about 540 mm rainwater per year, the region is relatively dry, so the selection of water sources is very limited. Another factor that cannot be controlled is the type of aquifer. About 90% of the wells are located in the Quaternary river terraces and the rest are situated in karst aquifers in Triassic dolomitic marbles. Isolated springs are fed by fractures in Paleozoic granites. The only factor that appears in human control is the status of the land in the water accumulation zone. In this aspect significant conclusions were made during the study. In case of porous aquifer located in Quaternary or Pliocene sediments it appears, that distance of at least 300 m between the well and the fertilized land is obligatory in order to ensure natural purification and decrease of the nitrate content to the acceptable level of around 50 ppm. In case of karst aquifers, the clearance zone should be more than 500 m. At present requirements exist with respect to clearance zones around potable water wells in Bulgaria, but they are very modest regarding the proximity to the fertilized lands. Many wells are located at a distance varying between 50 and 150 m from intensely fertilized lands. At least from the point of view of nitrate pollution these clearance zones are insufficient.