

Factors of pesticide influence on ground waters, using example of Lijeve polje (North Bosnia and Herzegovina, Europe)

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ABSTRACT

Lijeve polje is situated in north Bosnia and Herzegovina (B&H), and represents one of the most significant areas in B&H in which the agriculture is most represented. At the same time, the area of Lijeve polje represents a very populated area, in which the ground waters are used as the sole resource of water.

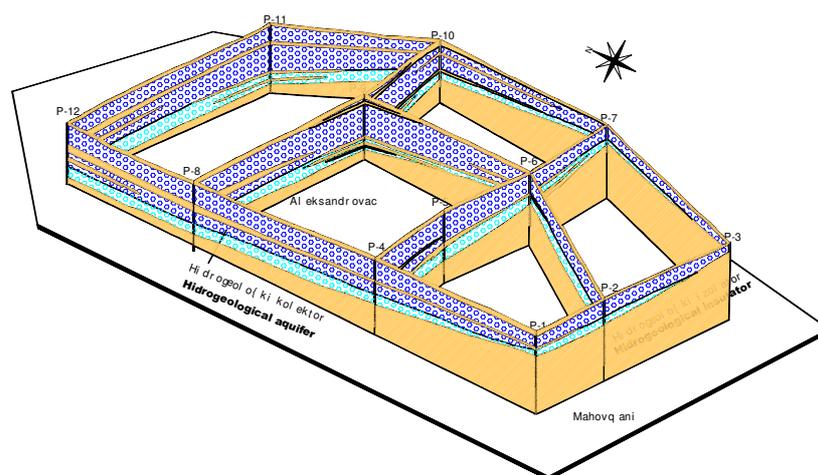


Figure 1. Block diagram of terrain South Lijeve polje

The given area is a tectonic trench filled with alluvial sediments of the rivers Vrbas and Sava. The thickness of the alluvial sediments varies from 8 to 35 m. In these sediments are formed intergranular types of unconfined aquifer.

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The source of recharging the ground waters are surface water flows, as well as infiltration of atmospheric waters. The filtration coefficient of the alluvial sediments is of $1 \times 10^{-2} \text{m/s}$, which puts this area in the area with the most perspective for a global water resource in B&H. Based on orthophoto shots the areas of fields for agriculture have been identified, where the agrochemicals are mostly used. The aim of the paper was to establish the state of ground waters, as well as the areas in which there is a contamination, as well as the factors to be analyzed in a general case, when it comes to the use of pesticides in an ecologically sensitive area. Using available hydrogeological data the vulnerability of the ground waters was defined, using the GIS methodology.

The vulnerability of the ground waters with the isohypses, the direction of the underground flow, as well as the land usage chart was basis for space stratification and defining locations of groundwater sampling. On the most sensitive locations the samples were taken and 20 active substances (pesticides) regularly used on the given area were examined.

At the site Lijevece polje examined 35 samples of ground water. In addition to 20 active substances (pesticides) analyzed the following parameters: pH, temperature, dissolved oxygen, water turbidity and conductivity.

Groundwater sampling was conducted expert team of Project, and the analysis of pesticides in water samples was made by the Agricultural Institute of Banja Luka.

The results of the analysis established five locations with high MDK content of pesticides, in comparison with the EU Directive 98/83/EC.

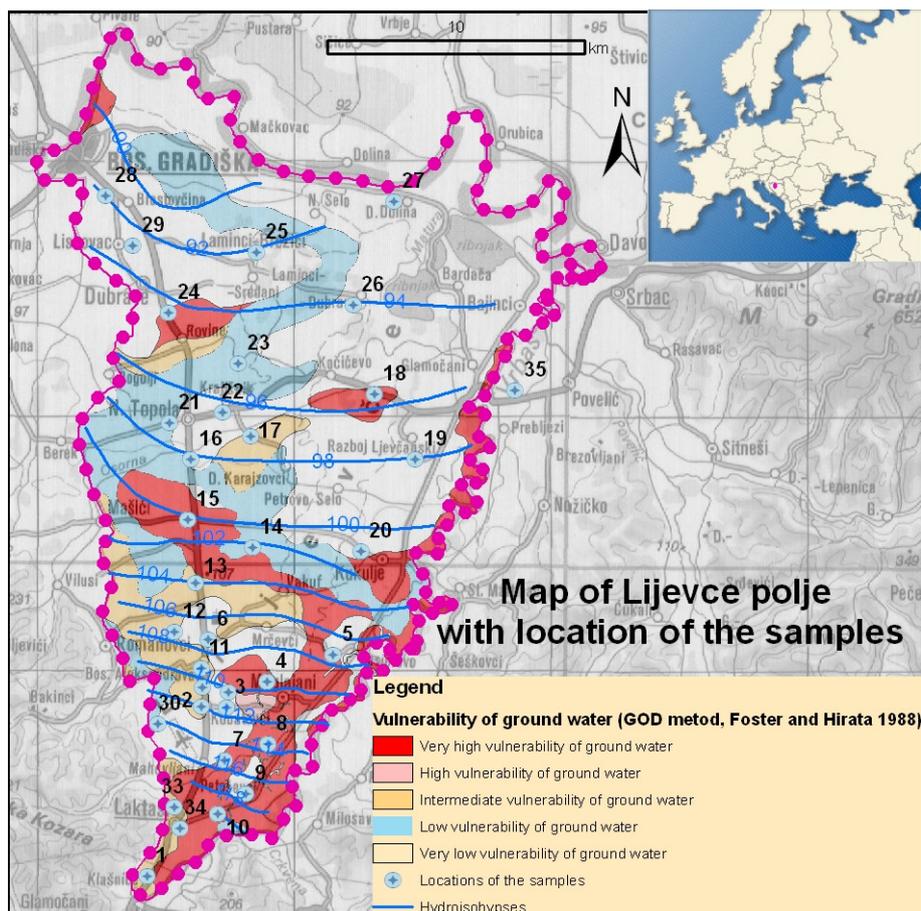


Figure 2. Map of Lijeve polje with location of the samples

Based on the obtained results we can conclude the following:

- compound gamma-BHC with concentration of 0.08 mg / l was found in sample No. 2. Place of sampling Kobatovci.
- compound atrazine was found at the following sampling locations:
 - Location of sampling Aleksandrovac (sample No. 6) concentration of 0.22 mg / l
 - Location of sampling Borac (sample No.12) concentration of 0.10 mg / l
 - Location of sampling Laminci (sample br.23) concentration of 0.10 mg / l
- alahlor compound with concentration of 0.10 mg / l was found in the sample No.4 position sampling Srijem
- metolahlor compound was found in the following sampling locations:
 - Location of sampling (sample no. 2) Kobatovci with concentration of 0.10 mg / l

- Location of sampling (sample no. 6) Aleksandrovac with concentration of 0.10 mg / l

Such results point to the conclusion that the impact of pesticides in ground water directly depends on the use of pesticides and the concentration used. Namely, in Aleksandrovac (sample 6) and Srijem (Paragon 4) downstream of the vulnerable areas, pesticide residues were found in ground water, which was expected if we know that the upstream section is an intensive agricultural production. On the other hand, at the site of Al (sample 12), Laminici (sample 23) and Kobatovci (sample 2) hydrogeological environment is defined as less vulnerable due to the hydrogeological characteristics. The presence of residues of pesticides in these locations are directly linked to the dose of pesticide and way of using. Potential causes of unlogical presence of pesticide residues may be improperly packaging waste pesticides which often ends up in abandoned gravel pits or channels in the area Lijeve polje.

For the purpose of monitoring groundwater quality is necessary to establish a monitoring network of piezometar. Network of piezometar should develop in accordance with the defined groundwater vulnerability.

Out of the natural factors the vulnerability of ground waters was defined as characteristics of a hydrogeological environment and pelological characteristics of the surface protection layer. Not least less important, human factor is present through present use of the land, and certainly the mode of use (dosage) of the agrochemicals. As a result of the research, education of population using pesticides in the production process was defined, in accordance with the space category of vulnerability and the culture being cultivated.

Key words: use and protection of ground waters, pesticides, GIS analysis, EU Directive