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Variations in the Physico-Chemical Parameters of under groundwater of Blinaja catchment, Kosovo

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Abstract: Water quality, quantity and safety have become major issues in Kosovo. The sustainability development of social, economical and political development of the region is very dependent on the health and quantity of the natural water resources. The monitoring of physico-chemical parameters of underground water of Blinaja catchment has a vital role in the conservation and management of water resources. Aiming to provide an integrating approach in terms of monitoring and mapping the water resources in the region, as well as ensuring the sustainability, several parameters have been evaluated. Thus, in order to assess the spatial variation of water quality in the Blinaja catchment river basin, 6 sampling stations were identified and 18 sampling was carried out. The results revealed variations in the temperature, conductivity, pH, total residue, DO, alkalinity, turbidity, calcium, potassium, sodium, magnesium, Cl^-, SO_4^{2-}, HCO_3^- and NO_3^- values. The variations are mainly due to the stagnant or flowing nature of the water body. The increased amount values are recorded mainly in the locations close to the anthropogenic activities.

Keywords: physico-chemical parameters, Blinaja catchment, water quality, Kosovo.

1. INTRODUCTION

Water is very important for health and socio-economic development of a country. Demographic changes, the development of the standard of livingand other human activities are increasing the demand for qualitative water. Therefore, today the preservation and protection of water quality become a global problem. Many parts of the world are facing with the lack of good quality water *(Ray D et al., 2000)*. Groundwater are historically considered reliable sources regarding their quality, protected from surface contamination enable the layers that play a role of filters when the contaminated water goes through them in the depth of the ground. (*Sabhapandit P., et.al., 2010)*. The seasonal study and the variation of parameters of water quality provide information about the condition of their quality in a period of time *(Haloi N. and Sarma H.P., 2011)*. Their consumption in a large scaleand because of climate change it is noted the lack of water which also causesdegradation in their quality. In the whole country, recent decades the surface and ground waters are at a big pressure from pollution. Years ago, due to water pollution, in this area population had health concerns by using poor-quality water. It is therefore necessary to monitor the quality of water in order to understand the chemical characteristics and provide a reliable assessment of water quality *(Zhang X et al, 2010)*.This study which covers a period from April 2015 until January 2016 in the area of the river basin Blinaja has been undertaken in order: first to have more accurate picture of the quality of groundwater, secondly to get the data and information of the country and thirdly to provide a safer information to the population about the quality of drinking water from this catchment. The study area is constructed of geological formations, mainly of Paleozoic, Neogene and Quaternary period. By the hydrogeological point of view groundwater lie in three types of aquifers: the aquifer type with intergranular porosity, the aquifer type with the cracks and fissures porosity and the aquifer type built in the Palaeozoic rocks.

2. STUDY AREA

The study area is located in the central part of the Republic of Kosovo *(Fig.1.)*, between the geographical coordinates (20º 57'30", 21º 04'00" and 42º 28'20", 42º 33'50"). The catchment area is 31.19 km^2. By the morphological aspect they are divided into two morphological units. The western part of the mountain character with an altitude of 670 m up to 1100 m, and the valley part at an altitude of 530m, up to 670 m. The Geomorphologic process which influences the shape of the relief is the that fluvial, which was developed from west to east, creating erosion forms in the upper part of the basin, while in the down part depositing the material by fluvial processes. The catchment area is covered: 64.86% forests, 17.37%

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agriculture land, 9.21, mountain pastures 5.02% inhabited area, 2.32% meadows, 0.86% road infrastructure and 0.14 water area. The climate of the catchment of Blinaja is continental *(Pllana, 2015)* which affects the relief conditions of the terrain. The data referring to the meteorological station of Pristina are recorded as followed: air temperature range from -1.1 ° C (January) up to 19.9 ° C (July, August), the period from 1948 to 1978, in 2013the average annual temperatures ranged from 0 °C (December) up to 23.4ºC (August), in 2014 the average annual temperatures ranged from 2 °C up to 21,9ºC. The Average annual rainfall are 660 mm (2001-2011), the largest amount of rainfall, 66.7 mm in November, while the lowest in February (36.1 mm) *(KHI quoted by Bublaku S. 2015)*. Residents mainly deal with farming, currently there is no industry development, in addition to some craft activities. The river of Blinaja represents the main resource of surface water, it is seasonal river, and the water from this river is mainly used for irrigation. His flow fluctuation is related to the intensity of rainfalls. For drinking water residents of that area use groundwater from sources or open wells. The water flow ranges from 0.1 to 7 l/s. The average depth of the wells is 12.5 m, while the static water level ranges from 0.50 to 25.6 m. The Water quality upstream is evaluated as good, while the middle and down is under the pressure of wastewater discharges. Surface waters in this basin are subject to pollution from urban discharges and agricultural pollution. Wastewater discharge predominate the possibility of natural self cleaning, especially in the period June-September. In this period shall be increased the tendency of groundwater contamination in the middle and downstream which is mainly built from deposits that favour the infiltration in a large-scale.

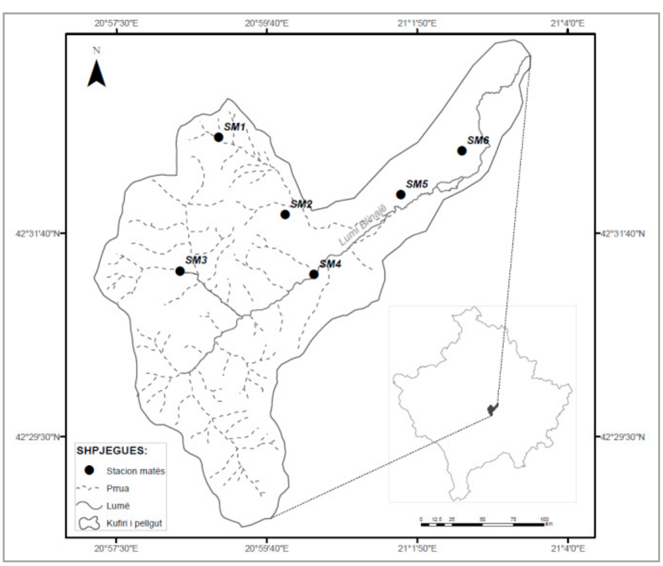

Fig .1. Physical-geographical position of the study area.

3. MATERIALS AND METHOD

The methods used in the research process followed these phases: analysis and synthesis of previous materials and field activity-identification and determination of sampling location, the measurement of the coordinates and altitude, the measurement of some physic-chemical parameters in the field, laboratory analysis as well as interpretation and control of results. Selection of the sampling location is made according to hydro-geological and geological criteria in order that samples to be more representative. However, the main difficulty in sampling process is representation and integrity *(Madrid and Zayas, 2007)*. The "GPS" instrument of the type Garmin 79C is used for the measurement of coordinates and altitude. Before each measurement it is done the calibration of GPS in a polygonal point with coordinates and altitude known in advance. Samples for hydro-chemical analysis were taken from various hydrological components of basin such as the sources and wells *(Fig.1.)*. Totally 18 water samples were taken for chemical analysis (6 from the source/spring/and 12 from the wells). Samples were taken in the period April, August 2015 and January 2016 during good weather conditions, in order to avoid possible water pollution from precipitations, as this would affect the quality of the samples.

Water samples were taken in polyethylene bottles, with a volume of 1 litter, closed with pressured cork and fillet cap. The bottles were filled, leaving a space under the compressed cap, about 1 mm, to eliminate the possibility of the pollution of the water of the sample. Samples taken in the field are stored in the field refrigerator in order to preserve natural conditions until the same sample is sent to the laboratory. Water parameters were analyzed in the laboratory for main anions and cations, while physico-chemical parameters such as temperature, pH, electrical conductivity and dissolved oxygen in water, were measured directly in the location where the samples are taken *(Hounslow, 1995)*.The laboratory analyses are conducted at the Faculty of Natural Sciences-Department of Chemistry. The determination of the electrical conductivity, pH value and temperature of the water is made with the device ISOLAB-Cond-Temp, by applying as described in the relevant manual. Before each measurement it is made its calibration by certified standard solution for PE with 1413µS/cm. For the pH value the calibration of the device is made with buffer solution, the acidic buffer (pH=4:01), neutral buffer (pH=7.0) and basic buffer (pH=10.0). The total alkalinity is determined by standard solution HCl 0.155 mol/dm^3, using the methodology of the US Geological Service. For the determination of total hardness it is applied the method with complexometric titration with EDTA (K III) 0.05 mol/dm^3 with water are taken 100 cm^3 for analysis in Erlenmeyer flasks are added 5 cm^3 buffer ammonia in the presence of the indicator Eriochrome Black, where the colour from pink passes to blue. Ion Ca^{2+} is determined also by titration of 100 cm^3 of the sample with the same standard solution of EDTA between strongly basic 5 cm^3 2 mol/dm^3 solvent of NaOH, in the presence of indicator HSN where the colour light pink passes to the open blue. Ion Mg^{2+} is determined by counting the difference of the overall strengths and Calcium, Cl is determined with the photometric method which is analogous method with the standard method as EPA 325.1 and US-Standard Methods 45000-Cl-E. The determination of SO_4^{2-} is made with the photometric method ISO 8502-11. Joni nitrate (NO_3^-) is defined in H_2SO_4 and H_2PO_4 with 2.6-Dimetilfenol (DMF) and 4.6-Dimetilfenol-photometric method which is analogous to the standard method ISO7890/1. Water samples are analyzed and interpreted by using graphs, charts, maps and statistical analysis *(Hounslow, 1995)*.

4. DISCUSSION OF RESULTS