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Analysis of Some Morphometric Parameters: Case Study in the Blinaja River Basin, Kosovo

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Abstract: *Analysis and determination of morphometric parameters of a river basin is of great importance for planning and management. The paper examines the morphometric characteristics of the Blinaja River Basin, using materials, methods related to the use of the ArcMap program. In this case, different morphometric parameters were determined, including: the winding coefficient, the density of the river network, the asymmetry of the basin, the shape factor, etc. According to the size of the basin, they entered the small size < 250 km2, with an average meandering coefficient of 1.15, density of the river network which classifies it with moderate densities and with the shape of a basin elongated basin.*

Keywords: *Morphometry, Basin, Blinaja, Kosovo.*

1. Introduction

Morphometry is the measurement and mathematical evaluation of earth surface configuration, dimension, shape and landform processes [1]. According to [2] the quantitative assessment of the morphometric characteristics of the basin is quite important in determining hydrological processes, soil conservation, planning and management of natural resources. Also in their works authors such as: [3, 4], [5] and [6] in India and [7] in Greece, point out that morphometric parameters have been used to assess groundwater potential, construct flood maps, erosion areas, and manage of the watershed. According to [8, 9] it turns out that morphometric analysis of the drainage system is useful for assessing the potential of water resources, watershed management and flood risk management. A qualitative study of the river basin revealed accurate data regarding; geomorphology, geological construction, groundwater potential and basin management as the basic unit for integrated water resources management [10]. Therefore, morphometric assessment is an essential in examining hydrology of river basin for sustainable use of land and water resources and for effective management of water induced disasters. The Blinaja River Basin is the left tributary of the Sitnica River. This basin with an area of 31.43 km^2 contributes to the waters of the Sitnica River basin. It is of particular importance to the community which lives within the space of this basin. Almost 100% of the inhabitants who live in the area of the River Blinaja Basin provides their needs for water (drinking, irrigation, technological) by pumping the groundwater of the local Blinaja alluvial aquifer. Regarding the quality of groundwater data are found in studies conducted in 2016 and 2021 by [11, 12]. Also a study on the hydrographic aspects of the Golesh massif is found in the study of the author [13].

2. Research Methodology

The study area is located in the central part of the Republic of Kosovo (Figure.1.), between the geographical coordinates 20º 57'30", 21º 04'00" (E) and 42º 28'20", 42º 33'50" (N), covering a surface of 31.43 km^2 [11, 12]. In the River Blinaja Basin live 5169 inhabitants [14] with a density of 165 inhabitants per/km^2. Residents mainly deal with farming and some craft activities, but there is no any industry activity. Morphologically, two units can be distinguished, the mostly mountainous western part ranging in altitude from 670 m to 884 m (Neck of Goleshi) and the valley part ranging from 530 m to 670 m a.s.l. The fluvial processes, which were developed from west to east, shaped the relief of this area, creating erosion forms in the upper western part of the basin, and depositing the material downstream. The catchment area is covered by forests (64.86%), agriculture land (17.37%), mountain pastures (9.21%), inhabited area (5.02%), meadows (2.32%), road infrastructure (0.86%) and water area

(0.14%) [11, 15]. The climate of the Blinaja catchment is continental [16], with average annual air temperatures ranging from -0.24°C to 22.14°C, while the average annual rainfall is 656.4 mm [17]. The study area is characterized by three rock complexes. The western and southwestern part is composed of Paleozoic rocks, represented by quartzite, quartzite-conglomerate, sandstone, sericitic shale, quartz-sericite, limestone quartz, biotitic, gneiss and marble [18, 19, 20]. The north-western part consists of Jurassic ultrabasic rocks represented by serpentinites, peridotites, harcburigites, etc. Neogene formations are widespread mainly on the eastern side (Fushë Kosovë) of the basin and are represented by clays, partly by lignite, etc. Quaternary formations spread out along both sides of the river Blinaja and its eastern tributaries and are represented by prolluvium, alluvium and vegetable soils [20], ranging in thickness from 0.5 to 3.5 m.

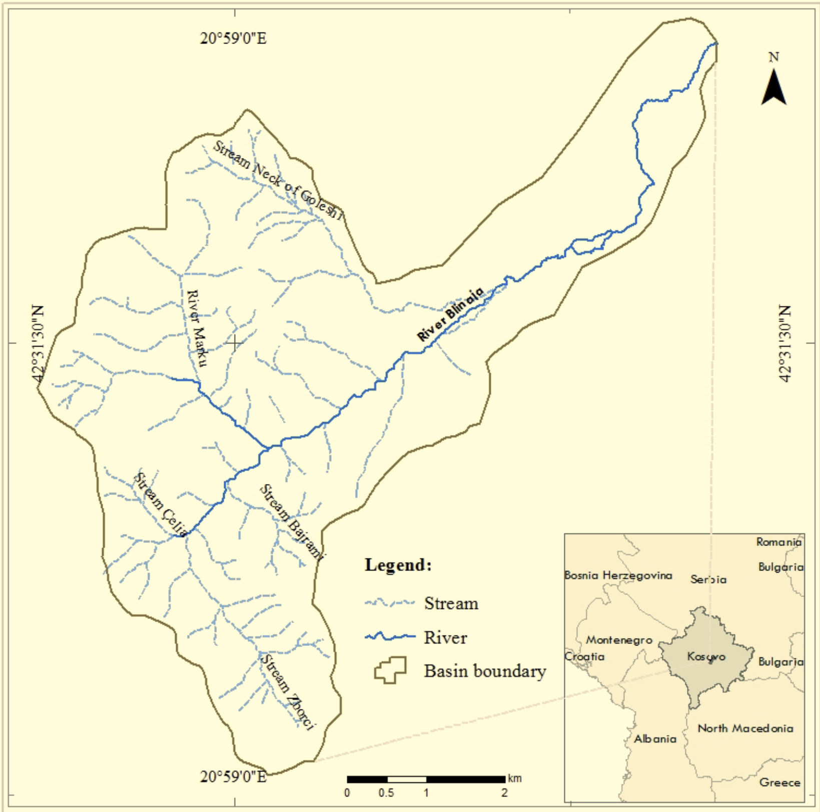

Figure1. *The position of the study area*

This study was preceded by several field observations on geological and tectonic aspects, hydrographic, hydrogeological, pedological, etc. A 1: 25000 scale topographic map was provided, which was georeferenced and digitized through the ArcMap (GIS) program for the purpose of the study. This map served us to determine the morphometric parameters for all river and streams of the Blinaja River basin. Line geometry was used for rivers and streams, while polygon geometry was used to define the basin boundary. Excel program has also been developed for creating spreadsheets and some calculation aspects. The above data were processed in tabular, analytical and graphical way, resulting in the writing of this paper.

3. Results and Discussions

The morphometric analysis of watersheds provides a detailed explanation of interconnection between processes act over the earth's surface and several earth's system components such as geology, geomorphology and hydrology [21]. For understanding basin characteristics and erosion susceptibility, analysis of different parameters of drainage morphometry of sub-watersheds is very significant [3].

Area of the basin - it is an area of land where all precipitation converges into a common outlet through secondary streams or ravines that flow into a main stream. It reflects the volume of water that can be generated from a rainfall. The area of the drainage system is always considered as the foremost hydrological features of a watershed. This area may reflect the total volume of surface water which basically originates from precipitation. Regarding the size of the basin [22] made the classification into three groups: 1) Small Watersheds < 250 km^2, 2) Medium Watersheds between 250 to 2500 km^2, 3)

Large Watersheds > 2500 km^2. Based on this classification, it turns out that the size of the Blinaja river basin (A = 31.43 km^2) belongs to the first group, with a small size.

Perimeter of the basin - this is the length of the divortium aquarum that shapes the outline of the basin area. This parameter is useful to differentiate the shape of the basin when comparing basins of the same area; that is, if it is elongated or rounded.

Shape of the basin - in order to characterize the shape of a basin, we used several parameters related to the ratio of area, perimeter or length of the longest water stream, which is defined as the distance from the basin outlet to the further upstream.

Meandering coefficient (kgj) - rivers in different territories have numerous meanders which are the result of geological construction, tectonic activity, geographical features (relief, soil, vegetation, hydrography, etc.), climatic conditions, topography, etc., which lead to the formation of with different meanders. A meander is one of a series of regular sinuous curves in the channel of a river or other watercourse. River meanders are amongst the most common terrestrial landforms [23]. Blinajë River and its streams have numerous meanders which derive from geological features (lithological, tectonic, etc.), geographical (relief, hydrography, soil, vegetation, etc.), climatic (precipitation, temperature, etc.), topographic (height, width, etc.) which have led to the present state and to the development of perspective towards the extension of the length of the rivers. The meandering coefficient (kgj) indicates the measurement of the river management, which is determined by the formula [24] (equation 1.):

$$k_{gj} = \frac{L\ (km)}{D\ (km)} \qquad (1)$$

Where:

L - length of the river (km).

D - linear source river discharge length (km).

Table 1., in summary form, shows the total lengths of rivers and streams (L), their length in a straight line (D) from the source to the outflow, as well as the meandering coefficient (kgj).

Table1. *Total lengths of rivers and streams, their length in a straight line, meandering coefficient*.

Name of the river / stream	Unit (km)		Meandering coefficient (k_{gj})	Difference (L-D)
	The length of the river (L)	Straight line length (D)		
Blinaja River	12.08	7.70	1.57	4.38
Mark River	1.66	1.52	1.09	0.13
Stream Ligata	2.70	2.34	1.16	0.36
Deep stream	1.72	1.51	1.14	0.21
Zborc stream	3.96	3.25	1.22	0.71
Gjora stream	0.98	0.88	1.12	0.10
The neck of Golesh stream	4.94	4.12	1.20	0.81
Leletiq stream	1.34	1.22	1.10	0.12
Pirat Stream	0.61	0.53	1.15	0.08
Stan stream	2.02	1.94	1.04	0.08
The stream of Lendina	1.37	1.13	1.22	0.24
Berat stream	1.56	1.45	1.08	0.11
Çelia stream	1.45	1.33	1.09	0.12
Bajrami stream	1.62	1.47	1.10	0.15
Karamanda stream	0.96	0.91	1.05	0.05

This coefficient indicates the extent of river meandering for a given territory. From the results obtained for this territory, it is shown that (kgj-s) are not very large. So, the value of the management (winding) coefficient in these watercourses varies from kgj_{min} = 1.04 (Stani Stream) to kgj_{max} = 1.57 (Blinaja River) and average value of $kgj_{average}$ = 1.15. Since the values of the meandering coefficient have been shown to be relatively small, it is noticed that in these rivers and streams the erosions in depth and the regressive ones are very pronounced, since the geological formations are favorable for such erosion, while the lateral erosion is small.

Surface measurement – surfaces are important elements that argue qualitatively and quantitatively many geographical phenomena [24]. The measurement of areas was carried out using the topographic map at a scale of 1: 25000, for this study area. On this map, applying the ArcMap (GIS) program, the measurement was performed by automatic method for the whole study area in general and for all sub-basins in particular.

Table2. *Surfaces according to the sub-basin*

No.	The name of the sub-basin	S (km^2)
1	Bajrami	1.38
2	Çelia	1.09
3	Karamanda	0.73
4	Neck of Goleshi	4.64
5	Marku	6.87
6	Zborci	4.28
7	Sub-basin (other territories)	12.44
8	The total amount	31.43

Sub-basin areas showed values from 0.73 km^2 to 6.87 km^2. The largest area was shown in the Marku sub-basin, while the smallest area was shown in the Karamanda sub-basin.

Now applying formulas [24] (equation 2 and 3):

$$S_{p1} = \sum_{1}^{6} S_{1,6} \tag{2}$$

$$S_p = S_{p1} + S_{p2} \tag{3}$$

Where:

S_{p1} - sum of sub-basin areas, we find the sum S_{p1} = 18.99 km^2.

Sp_2 - sum of areas of other territories = 12.44 km^2.

Now the total area is calculated as the sum of the areas of the sub-basins and the areas of other territories. Total area = Sum of sub-basin areas (S_{p1}) + Sum of areas of other territories (S_{p2}). $S_p = S_{p1} + S_{p2}$ = 18.99 km^2 + 12.44 km^2 = 31.43 km^2. Surface measurement gives us information about the development trend of shrinking and enlarging surfaces through river erosions.

Density of the river network - represents the intensity and dynamics of the development of the hydrographic network. A topographic map at a scale of 1: 25000 was used to determine the density of the river network in this study. On this map are measured the lengths of the river network with permanent and temporary flow for the whole area as well as for the main basins. The obtained data are presented in Table 3. The density determined by the formula [25] (equation 4.):

$$D_d = \frac{L_u}{A} \tag{4}$$

Where:

Dd – Drainage density.

Lu – Total stream lenght of all orders (km).

A – Area of the basin (km^2).

Table3. *Density of the river network.*

No.	The name of the sub-basin	A (km^2)	Lu (km')	Dd (km'/km^2)
1	Bajrami	1.38	5.02	3.64
2	Çelia	1.09	2.69	2.47
3	Karamanda	0.73	2.62	3.59
4	Neck of Goleshi	4.64	12.91	2.78

5	Marku	6.87	17.32	2.52
6	Zborci	4.28	12.68	2.96
7	Other territories	12.44	25.18	2.02
8	Total amount (whole basin)	31.43	78.42	2.50

The maximum value of density is shown in the Bajrami basin (3.64 km'/km^2), while the minimum value in other territories of the river basin Blinajë (2.02 km'/km^2). This parameter helps us to see the trend of development of neotectonic uplift forces and trends of dynamics and development of relief as a whole. Regarding density IBAL (2009) [25] gives the classification as in table 4.

Table4. *Drainage density and class*

Drainage Density (approximate values)	Class
0.1 to 1.8	Low
1.9 to 3.6	Moderate
3.7 to 5.6	High

Referring to IBAL (2009), the density of the hydrographic network in the Blinaja River catchment belongs to the moderate class, ie it is within the limits of 1.9 to 3.6, with a slight tendency towards the upper class (Bajrami and Karamanda sub-basins).

Asymmetry of the basin - is a morphometric coefficient, because through it the size of erosion on both sides of a river is generally determined for a catchment, the qualities, types and stability of rock formations on both sides of the basin, the magnitudes of the nectonic movements etc. To determine the asymmetry coefficient, the areas to the left and right of the main river in the catchment area were measured. This coefficient is determined by the formula (equation 5) [24]:

$$a = \frac{S_m - S_d}{S_m + S_d} \tag{5}$$

Where:

Sm-area left (km^2)

Sd-area right (km^2)

a-coefficient of asymmetry

Table5. *The data for determining the asymmetry for river basin Blinaja*

The name of the basin	The sizes of the surfaces in (km²)			Asymmetry (a)
	Left area (Sm)	Surface right (Sd)	Total area (Sp)	
Blinaja River	19.54	11.89	31.43	0.24

Table6. *The data for determining the asymmetry for sub-basin in river basin Blinaja*

The name of the sub-basin	The sizes of the surfaces in (km²)			a
	Sm	Sd	Sp	
Bajrami	0.57	0.73	1.30	-0.12
Çelia	0.71	0.38	1.09	0.30
Karamanda	0.4	0.33	0.73	0.10
Marku	2.05	4.82	6.87	-0.40
Neck of Goleshi	1.55	3.09	4.64	-0.33
Zborci	2.25	2.00	4.25	0.06
Sub-basin (other territories)	6.77	5.78	12.55	0.08

From the results shown in the table 6. the coefficients of symmetry have different values and signs for different sub-basins. The smaller in absolute value the asymmetry coefficient is the more symmetrical is the surface of that sub-basin.

Asymmetry factor (AF) - another geomorphic index is the asymmetry factor. The asymmetry factor (AF) is a way to evaluate the existence of tectonic tilting and transverse to the flow at the scale of a drainage basin. The AF examines whether the areas to the left and right of a drainage basins trunk stream are placed symmetrically [26]. Asymmetry factor was used as one of the numerical determinations of the relation between the drainage basins and the tectonic effect. It is mathematically expressed as (equation 6) [27]:

$$AF = \left(\frac{A_r}{A_t}\right) * 100 \quad (6)$$

Where:

AF = Asymmetry factor.

Ar = The area of the basin to the right.

At = the total area of drainage basin.

Fault and drainage basin is natural system, and has its self-similarity between individual to the gross system [27,28]. has divided the AF into three classes is in Table 7.

Table7. *Classes by AF value [27]*

The values of AF are classified into Class		
Class 1	AF ≥ 65 or AF < 35	
Class 2	35 ≤ AF < 43 or 57 ≤ AF < 65	
Class 3	43 ≤ AF < 57	

AF values in the stusing area range from 34.86 to 70.16. These values were compared with the classification values according to the classes given by [27], as in Table 7. Table 8. presents the AF values and classes for this study. The Blinajë river basin, as the main basin, belongs to the second class, while the sub-basins: Çelia, Marku and Neck of Golesh belong to the first class. In the third grade are the sub-basins: Bajrami, Karamanda and Zborci (Table 8.).

Table8. *Asymmetry factor values in the study area*

The name of basin and sub-basin	Area (km²)		AF	Class
	Ar	At		
Blinaja	11.89	31.43	37.83	2
Bajrami	0.73	1.3	56.15	3
Çelia	0.38	1.09	34.86	1
Karamanda	0.33	0.73	45.21	3
Marku	4.82	6.87	70.16	1
Neck of Goleshi	3.09	4.64	66.59	1
Zborci	2.00	4.25	47.06	3
Sub-basin (other territories)	5.78	12.55	46.06	3

Gravelius compactness coefficient - this index represents the shape of the surface of the basin, according to its delimitation, and its influence on runoff and the hydrograph resulting from a precipitation [29]. It is expressed by the following (equation 7) [29]:

$$K_c = \frac{P}{2\sqrt{\pi * A}} = 0.28\frac{P}{\sqrt{A}} \quad (7)$$

Where:

Kc – Compactness coefficient.

P – Perimeter of the basin in (km).

A – Area of the basin in (km2).

The results for this coefficients are given in Table 9.

Table9. *Gravelius compactness coefficient in study area*

The name of the basin and sub-basin	A (km²)	P (km)	Kc
Blinaja	31.43	32.66	1.63
Bajramit	1.38	4.92	1.17
Çelia	1.09	4.93	1.32
Karamanda	0.73	3.4	0.91
Marku	6.87	11	1.18
Neck of Goleshi	4.64	11.55	1.5
Zborci	4.28	9.5	1.29
Sub-basin (other territories)	12.44	27.5	2.2

The Gravelius compactness coefficient values calculated for the River basin Blinaja and sub-basins were compared with the values given by [30], as shown in Figure 2.

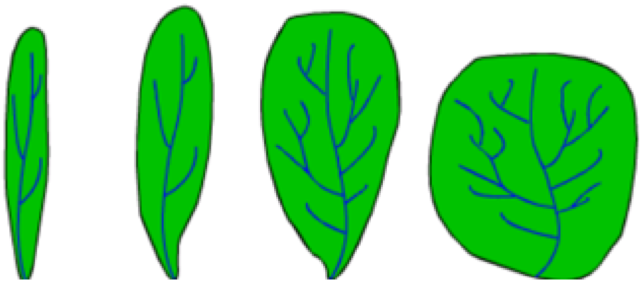

Figure2. *Some (Kc) values for different watershed shapes [30].*

The shape of the basin according to the coefficient of compactness according to Gravelius, the shape of the basin of the river Blinaja and its sub-basins is mainly elongated.

Form factor **-** this is one of the parameters that explains the elongation of a basin. It is defined as the ratio of a basin area to its length. The ration of the basin area with a square of the basin lenght is difined as form factor (Rf) [32]. Basically, Rf varies from 0 to 1 as the highly elongated shape to perfect circular shape. And it has been used to predict the basin intensity of a particular area. The parameter is defined by the following expression (equation 8) [32] :

$$R_f = \frac{A}{L^2} \tag{8}$$

Where:

R_f – Form factor.

A – Area of the basin in (km^2).

L – Lenghth of the basin in (km).

Regarding the basin shape factor, [33] have given approximate values which are shown in Table 10.

Table10. *Approximate basin shape factor values*

Form factor (approximate values)	Shape of the basin
< 0.22	Very long
0.22 to 0.30	Elongated
0.30 to 0.37	Slightly elongated
0.37 to 0.45	Neither elongated nor widened
0.45 to 0.60	Slightly widened

0.60 to 0.80	Widened
0.80 to 1.20	Very widened
> 1.20	Surrounding the drain

Form factor values for the study area are shown in Table 11. The Rf values of 6 sub-basin range from 0.24 to 0.52 (Table 11.). These values were compared with the given values, according to [33] and are also shown in the table with the respective basin shapes.

Table11. *Form factor values in the study area*

The name of the basin and sub-basin	A (km²)	L^2 (km)	Rf = S/L²	Shape of the basin
Bajrami	1.30	1.79	0.41	Neither elongated nor widened
Çelia	1.09	1.64	0.41	Neither elongated nor widened
Karamanda	0.73	1.12	0.58	Slightly widened
Marku	6.87	3.64	0.52	Slightly widened
Neck of Goleshi	4.64	4.42	0.24	Elongated
Zborci	4.25	3.42	0.36	Slightly elongated
Sub-basin (other territories)	12.55	9.32	0.14	Very long

4. CONCLUSION

The analyzed basin resulted in an area of 31.43 km^2 and a perimeter of 32.66 km'. Based on this classification, it turns out that the size of the Blinajë river basin belongs to the first group, with a small size. Within the main basin of the river Blinaja were identified six sub-basins presented in tabular form in this paper. Blinaja river basin and its sub-basins showed meandering coefficient from 1.04 (min) to 1.57 (max) and average value 1.15. The values of this coefficient were shown to be relatively small and this shows that in these rivers and streams, deep erosion and regressive erosion are very pronounced. Sub-basin areas showed values from 0.73 km^2 to 6.87 km^2. The largest area was shown in the Marku sub-basin, while the smallest area showed the Karamanda sub-basin. The maximum value of density is shown in the Bajrami basin (3.64 km'/km^2), while the minimum value in other territories of the river basin Blinaja (2.02 km'/km^2). The study showed that the hydrographic network of the river basin Blinaja belongs to the moderate class, ie it is within the limits of 1.9 km'/km² to 3.6 km'/km², with a slight tendency towards the upper class (Bajram and Karamanda sub-basins.). The river basin Blinaja, as the main basin, belongs to the second class, while the sub-basins: Çelia, Marku and Neck of Golesh belong to the first class. In the third grade are the sub-basins: Bajrami, Karamanda and Zborci. Sub-basins in this study area showed form factor mainly of all types (table11).

REFERENCES

[1] Obi Reddy GE., Maji AK., Gajbhiye KS., 2002. GIS for Morphometric Analysis of drainage basins, GIS India, 4, 9-14.

[2] Yasmin, Polisgowdar, BS., Satish Kumar, U, Ayyangoudar MS, Narayan Rao K , 2013. Morphometric analysis of Milli watershed of Raichur district using GIS. Karnataka Journal of Agricultural Science, 26 (1), 92-96.

[3] Javed, A., Khanday, M.Y. and Rais, S. 2011. Watershed Prioritization Using Morphometric and Land Use/Land Cov-er Parameters: A Remote Sensing and GIS Based Approach. Journal of the Geological Society of India, 78, 63-75. http://dx.doi.org/10.1007/s12594-011-0068-6.

[4] Javed A, Khanday MY, Ahmaed R, 2009. Prioritization of Subwatersheds based on morphomeric and land-use analysis using remote sensing and GIS techniques. J Indian Soc Remote Sensing, 37,261–274.

[5] Lama TD, Singh RK., Saikia US & Satapathy KK., 2015. Geomorphometric analysis of a hilly watershed in north east India: International Journal of Agricultural, Environment and Biotechnology, 8(1), 29-36.

[6] Eahya Al Huda, 2017.. Morphometric Characteristics of Dikrong River Catchment in the Foot-Hills of Arunachal Himalayas . IOSR Journal of Humanities And Social Science (IOSR-JHSS) 22, (7), 13.

[7] Diakakis M, 2011. A method for flood hazard mapping based on basin morphometry: Application in two catchments in Greece, Natural Hazards, 56 (3), 2011, 803–814.

[8] Ali, U., Ali, S. A., Ikbal, J., Bashir, M., Fadhl, M., Ahmad, M., Ali, S,. 2018. Soil erosion risk and flood behavior assessment of Sukhnag catchment Kashmir Basin: Using GIS and remote sensing. Journal of Remote Sensing and GIS, 7, 1. https://doi.org/10.4172/2469-4134.1000230.

[9] Ali K., Bajracharya RM, Sitaula BK., Raut, N and Koirala, HL, 2017. Morphometric analysis of Gilgit River Basin in Mountainous Region of Gilgit-Baltistan Province, Northern Pakistan. Journal of Geosciences and Environment Protection, 5, 70-88. doi.org/10.4236/gep.2017.57008.

[10] EU. 2000. Directive (WFD) 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy, 22/12/2000. Official Journal L 327:1-73/.

[11] Çadraku, H., Gashi F., Shala A., and Fetoshi O., 2016. Variations in the Physico-Chemical Parameters of under groundwater of Blinaja catchment, Kosovo, IFAC-PapersOnLine 49-29(2016) 200-205.

[12] Çadraku, H., 2021. Groundwater Quality Assessment for Irrigation: Case Study in the Blinaja River Basin, Kosovo. Civil Engineering Journal Vol.7, No.09: 1515-1528.

[13] Labus D., 1973. Hidroloske osobine planine Goles - Prilog poznavanju vode u serpentinama Kosova, Buletin i punimeve shkencore 1, Prishtinë.

[14] Kosovo Agency of Statistics, 2021. Kosovo census atlas, https://ask.rks-gov.net/.

[15] Çadraku, H., 2018. Application of GIS in ntegrated river basin management, case study of the Blinaja river basin, Kosovo. Geo Information, UDC: 004.6:528.47:556.53(497.115).

[16] Pllana, R., 2015. Climate of Kosovo, ASHAK, Prishtinë (in Albanian).

[17] Hydrometeorological Institute of Kosovo, 2019. "Vjetar hidrologjik" station Prishtina, (period 2001-2019).

[18] Pavić, A.; Menković, Lj.: Koséal, M., 1980. Osnovna Geoloska Karta SFRJ, Urosevac (1: 100 000), Podujeva K 34-43.

[19] Lončarević, Č., 1971. Osnovna Geoloska Karta SFRJ, Orahovac (1: 100 000), Kosovska Mitrovica K 34-42.

[20] Meshi, A.; et.al., 2012. Geological Map (scale 1: 25 000), Region Blinaja (in Albanian).

[21] Paul II., Bayode EN., 2012. Watershed characteristics and their implication for hydrologic response in the Upper Sokoto Basin, Nigeria. J Geogr Geol 4 (2):147. https:// doi.org/10.5539/jgg.v4n2p147.

[22] Rees, D., 1986. Watershed. Knights Press.

[23] Leopold L. B., Wolman M. G., Wolman M. G., and Wolman M. G. 1957. River channel patterns: braided, meandering, and straight. US Government Printing Office Washington, DC.

[24] Talani R., 2000. Morfologjia dhe Morfometria e Luginave në Alpet e Shqipërisë (Monografi- in Albanian language), ISBN 99927-41-44-9, faqe (39-53), Tiranë.

[25] IBAL S.A., 2009. Plan de Ordenación y Manejo Ambiental de la Microcuenca de las Quebradas Las Panelas y La Balsa (Environmental Management Plan of the Microbasin of Las Panelas and La Balsa ravines).

[26] Cox, R.T.; Van Arsdale, R.B.; Harris, J.B. Identification of possible Quaternary deformation in the north-eastern Mississippi Embayment using quantitative geomorphic analysis of drainage-basin asymmetry. Geol. Soc. Am. Bull. 2001, 113, 615–624.

[27] Dehbozorgi, M., Pourkermani, M., Arian, M., Matkan, A.A., Motamedi, H. and Hosseiniasl, A., 2010. Quantitative analysis of relative tectonic activity in the Sarvestan area, central Zagros, Iran, Geomorphology. doi: 10.1016/j.geomorph.2010.05.002.

[28] Alam, S. and Saputra, Z., 2017. Gravity Model and Fractal Dimension of Ungaran Geothermal Area, in ITB International Geothermal Workshop. Bandung.

[29] López Cadenas de Llano & Mintegui Aguirre., 1987. Hidrología de Superficie (Surface Hydrology). Escuela de Técnica Superior de Ingenieros de Montes. Madrid, Spain. Edit. Salazar. PP 222.

[30] Musy, A. 1998. Hydrologie appliquée, Cours polycopié d'hydrologie générale, Lausanne, Suisse.

[31] Musy, A. 2001. e-drologie. Ecole Polytechnique Fédérale, Lausanne, Suisse.

[32] Strahler A.1957. Quantitativ analisis of watershed geomorphology. Am Geophys Union Trans 38:912-920.

[33] Perez, J. 1979. Fundamentos del ciclo hidrológico (Fundamentals of the Hydrological Cycle). Universidad Central de Venezuela. Facultad de Ingeniería Departamento de Meteorología e Hidrología. Caracas, Venezuela. PP 38.

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