

Study on the utilization of waters of ‘Deçani Bistrica’ river basin

¹Musa Islamaj, ²Sylejman Daka, ³Sali Fazliu

¹Department of Civil Engineering, EPOKA University, Albania
²Department of Civil Engineering, Pamukkale University, Denizli, Turkey

Abstract

The catchment in Republic of Kosova can be divided in basins of the rivers as following: Basin of Drini i Bardhë in village Radavc, Peja municipality, basin of river Ibër, Mitrovica municipality, basin of river Morava e Binçës, Gjilani municipality and basin of river Lepenci in Kaçanik municipality. The watershed of Bistrica e Deqanit, which is subject of this paper belongs to the basin of Drini i Bardhë which belongs to the Adriatic Sea catchment.

The river “Lumëbardhi” is one of the rivers of Kosovo, which has a fairly stable flow, our opinion is that the average flow of

$$Q_{av}=4.72 \text{ m}^3\text{/s} \quad (1)$$

is quite high and has a long time duration. Other characteristic values

$$Q_{min} = 0.960 \text{ m}^3\text{/s} \quad (2)$$

And

$$Q_{max} = 152.2 \text{ m}^3\text{/s}, \quad (3)$$

are in different time intervals and suitable for use.

River “Lumëbardhi” of Deçani has nearly 6.13 % from the surface of catchment of river “Drini i Bardhë” . The average of rainfall perennial is $H_{sh.v.mes.} = 1090 \text{ mm}$.

This river has other positive features which make it more interesting for the study. In “Drini i Bardhë” stream around 350.00 nmm, while the highest quota of basin is nearly 2 400.00 nmm, It will be a detailed analysis of the quantity of water which can be accumulated and used for:

- a. Water Supply
- b. Irrigation for agricultural
- c. Production of electric hydropower and
- d. Recreation

The analysis should be made on that way that all concerned parties for water to meet their demands.

Introduction

Utilization of waters of Deçani Bistrica river

Water demands continue to increase. Meeting the needs of all interested for pure water is becoming more and more difficult as our water resources are limited. Every conversation, may that be in politics, economy, culture, health or other, begins with the word **water**. Is there water? What is the amount of water? Will there be non-stop drinking water, water for industry, for agriculture, etc? This is the conversation in any political presentation when there are tendencies to govern a country.

In all partisan presentation or when a political conversation takes place, it is stated or promised that the drinking water system will be constructed or improved, or the system of removing sewage or constructing facilities to protection from floods, there will be water for drinking, irrigation, etc.

In any economy planning, among the key priority elements as the raw substance which needs to be secured in having sufficient amounts is in fact having a sufficient amount of pure water. Then one should secure sufficient amounts and high quality water supplies for the needs of the city, industry, and energy, with the exception of road infrastructure.

Securing sufficient and proper quality water supplies for the needs of the city impacts health and culture life, but it also is significant in terms of opportunities to develop a country's sustainable economy. A country's studies and plans of water resources are mandatory for sustainable economic plans. Without a carefully devised hydro-economic foundation, water resources of a country cannot be either preserved or utilized.

Water is not an everlasting asset and these resources undergo changes during global climate changes. Countries with fluctuation in the water natural balance will not have possibilities in the region as there would be an increase in the price of water, energy expenditures for using the water, there will also be additional expenditures for water quality improvements for normal economic development.

Worldwide, around 3% of the electric energy is used to bringing waters in quotas necessary for utilization.

Necessary measures for the improvement of the quality of water resources are:

Facilities intended for water quality improvements are of varying dimensions, depending on the processes which should be performed to improve water quality. The type and dimensions of the facilities depend on physical, chemical and bacteriological features of the water as well as on the water amounts obtained for usage. For a most rational usage, several measures should be undertaken:

- Constructing high-tech equipments
- Reducing losses in pressure
- Reducing losses in the flow, and of measures
- Other efficient for water usage.

Image: Classical map, Bistrica differentiated by colors, picture of Kosovo with the river basin



Figure 1 The river basin on the upper part of the flow

Water is the element of life in all activities to lead a normal life. The country without sufficient amounts of water cannot have state independency. Water resources are a strategic element for the existence of a state therefore the increase and purification of water resources are of great importance for a society. Development of any state in the world has been closely connected to water resources. Since the ancient times water has been the dominating element in developing settlements, economies, agricultures and other.

Many preliminary studies and analyses are required when intending to use a water resource. We need to have sufficient knowledge on hydrology, meteorology, topography, geology, hydrology, logical data, etc. Based on accurate analyses conducted on these elements, it is only by using them cautiously that these resources can be used and be protected by basin waters.

It is only when we have knowledge about the amounts of water of a basin in certain times that the water resources of a basin can be secured for a sustainable economic development, preservation of people's health, agricultural development and protection from damages from full Waters.



Figure 2 The river bed during the minimal flow of the river

‘Topography of the river

Deçani’s Bistrice is located in the South-Western part of the Republic of Kosova. It is a part of the Drini i Bardhe river basin.

The source of this river originated from the ‘Accursed Mountains’ and starts at the 2600 quota (Kozhnieri Mountain) and flows into Drini i Badhe at the quota of 427. The basin of this river is $P=269.90 \text{ km}^2$ where nearly 30.02 km^2 are agricultural fields and pastures 69.93 km^2 , forests nearly 98.70 km^2 , bushes 71.60 km^2 .

In a longitudinal aspect this river has a highly strong current, particularly on its upper flow. The basin has the shape of the “leaf”. Rainfalls differ greatly on its upper part of the flow compared with its lower flow. Around 60% the surface of the basin is covered with various trees. The other part of the river is pasture and agricultural land. The basin has a significant descent from and rainfalls have created the numerous streams. As the climate stretching over the river basin has significant variations during the seasons, consequently there is a plenty of granulated rock and when full waters appear there is also a large carriage and thus the middle and lower part of the flow there are damages of agricultural areas.



Figure 3 The river Bistrice e Decanit on its minimal influx Q_{\min}

The Deçani Bistrice river has a highly rapid flow. On its upper flow it has a descent of $J_1 > 8.0\%$, on its middle flow it has a descent of $1.0\% < J_2 < 8.0\%$ and the descent in the lower part of the flow nears at

$$J_3 < 1.0\% \quad (4)$$

The average steepness of Deçani Bistrice river is

$$S = \frac{\Delta H}{L} = \frac{(2600-427)}{52} = 41.78 \text{ m/km} \quad J_{\text{aver.}} = 4.178\% \quad (5)$$

The average steepness of the river is 4.178%, but at its upper flow the river has a greater steepness than in the lower or middle flow. Consequently, during rainfalls one can observe a carriage of solid materials and their deposit along the banks but also on the surface of agricultural lands.

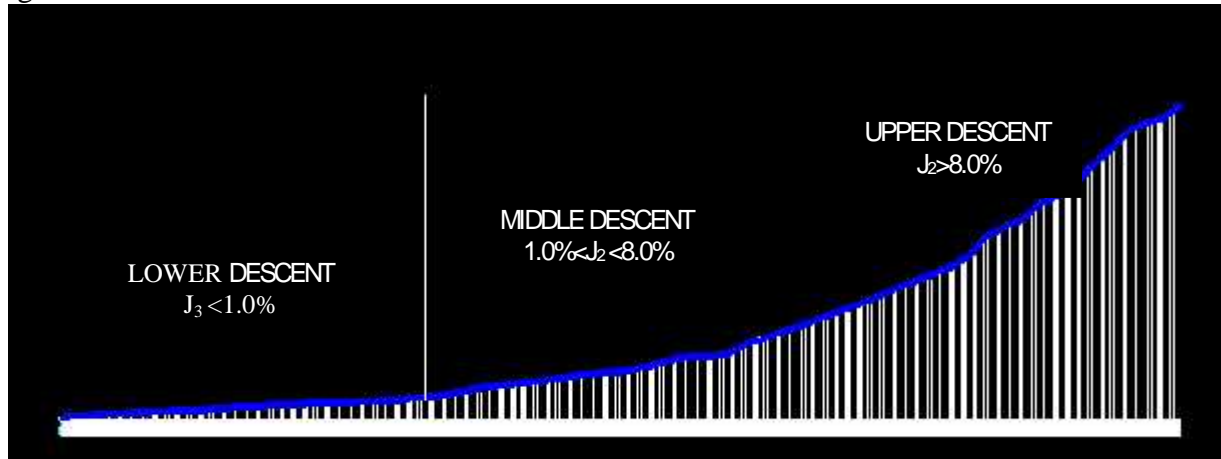


Figure 4 The longitudinal profile of Deçani's Bistrice river

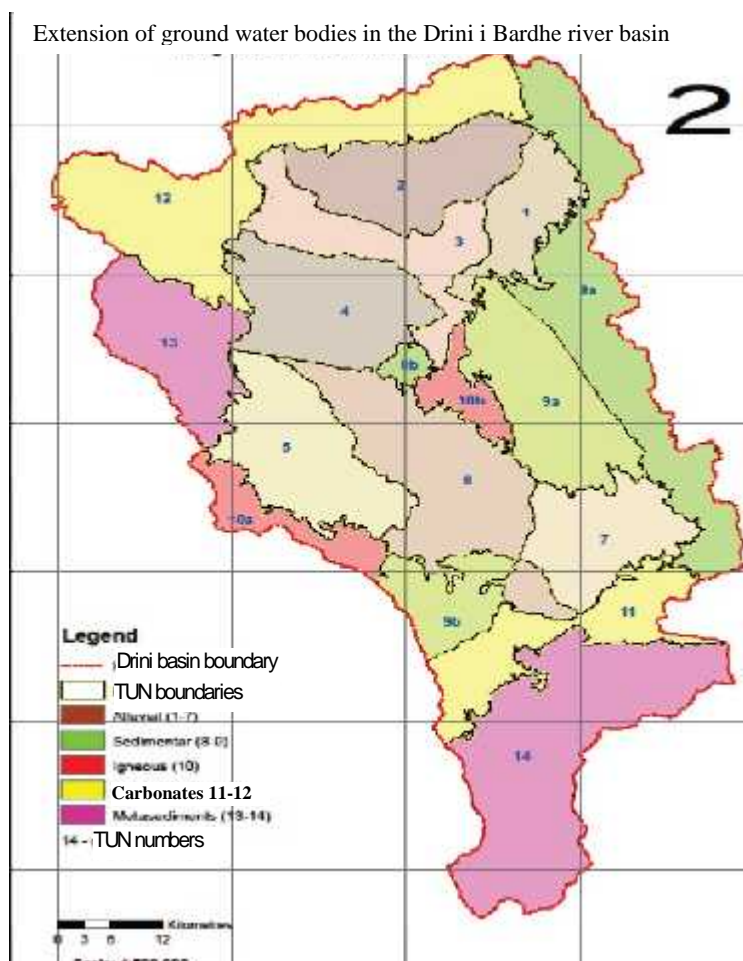


Figure 5 Ground water bodies in the Drini i Bardhe basin

Hydrology

- A station for measuring the river influx is located in the river. It includes approximately 114 km² or 42% of the total surface area.
- The measuring station is installed at 675.19 quota which was first installed in year 1953 (Lata, then Linography).

It is mentioned above that the river has only one point of recording the influx. This spot is located at the 30th km, which has approximately 42% of the water-collecting surface, there is no other profile even though we consider the surface area of 42% to be very small in comparison to that of total surface area of the basin and other points ought to be installed in order to perform accurate influx measurements.

The water-collector of the Deçani river is “leaf”-shaped which runs from the mountains of Kozhneri at the 2253 quota and flows into Drini i Bardhe at the 427 quota.

Measurements have been recorded since 1953 but there have been intermittent interruptions.

The average flow

$$Q_{\text{aver.}} = 4.72 \text{ m}^3/\text{sec} \quad (6)$$

– the average monthly and annual flow.

Meanwhile, based on mathematical calculation, according to Gumbel’s distribution, we come up with

$$Q_{\max,50\text{years}}=90\text{m}^3/\text{sec} \quad (7)$$

whereas

$$Q_{90,100\text{years}}=123 \text{ m}^3/\text{sec}. \quad (8)$$

$$Q_{50\%100\text{years}}=163 \text{ m}^3/\text{sec}, \quad (9)$$

$$Q_{90\%100\text{years}}=227 \text{ m}^3/\text{sec}, \quad (10)$$

at certain moments, the river records very high influx volume.

Meteorology

Meteorology stations to record rainfalls and temperatures are also installed in the region of Deçani Bistrica.

This river has $F=114.6 \text{ km}^2$ with a longitude $L=52\text{km}$. The distance from the center of the water collector is 9 km, the concentration factor is $K=2F/04=0.49$

and the average descent is

$$S = \frac{\Delta H}{L} = \frac{(2600-427)}{52} = 41.78 \text{ m/km}. \quad (11)$$

At the inflow of Deçani Bistrica, based on measurements, the rainfall values are:

Average annual amount of rainfalls for a dry year is 870mm/y.

Average annual amount of rainfalls for year with average humidity is 1090mm/v

Average annual amount of rainfalls for a humid year is 1090mm/v

Average annual amount of rainfall for a humid year is 1295 mm/v

Meanwhile, for rainfalls in the upper part of the basin are $H=1200\text{mm/v}$ in Gjakova, the nearest station. So, in year 1960 rainfall amounting at $H=1600-900\text{mm/year}$ have been recorded – very rich in rainfalls – a humid year, whereas for a dry year we have $H=1100\text{mm} - 700 \text{ mm}$.

Average snow days in the upper part vary from 19-12 to 25-03.:

Table 1 Average temperature in Peja by season

Winter	Spring	Summer	Autumn
1+1°C	10.9°C	20.4°C	12.1°C

In the upper parts these values are significantly lower.

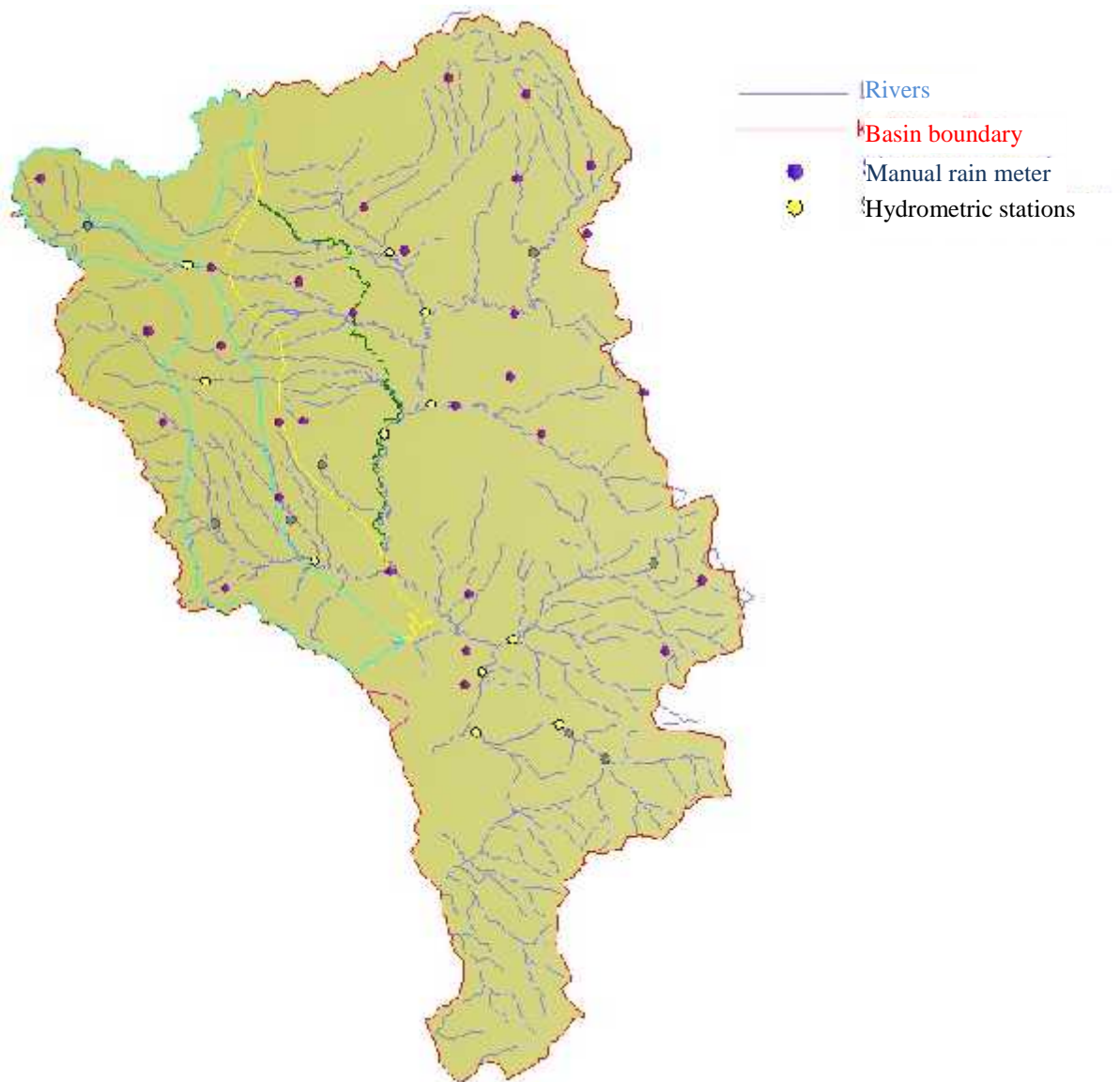


Figure 6 Drini i Bardhe basin with hydrometric stations and manual rain meters.

Geology

The river basin extends at a surface areas of $F=$ which is covered with layers of lime rocks which destruct under the temperature's influence and then, in a form of sand, it is carried over when full waters come in. Carbon rocks, lime and sedimentary rock dominate from organic remains. In the middle basin and in the lower part of the basin there are layers of rocks and sand forms from the breakaway of lime rocks and waters carried them over when full waters came in. The carriage contained rocks of varying diameters over 1.0 m. and sand of varying fractions.



Photo 4 Snowfalls in the upper part of the river

Depending on the amount of water during influxes, carriage of solid materials with a diameter $D > T_m$ occurs

Carriage of solid materials and their deposit on the surface areas nearby the riverbed of Decani Bistrica.

Conclusion

Based on this study, can be concluded:

This study shall present an analysis of possibilities in utilizing waters of the 'Deçani Bistrica' river basin in an optimal manner. We will use the most recent methods for the analysis of most optimal solutions in the utilizations of water resources by meeting the demands of all interested for water.

Living in the century of global crisis in the world (lack of energy and water), especially in the Republic of Kosovo, the idea is to use renewable energy sources. Among of these resources is the hydro-energy of Kosovo. Therefore it is very important to study and use it as soon as possible.

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