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RETURN PERIOD FLOWS IN BUNA RIVER ON SHKODRA LAKE

Përmbledhje: Shqipëria në krahasim me vendet e tjera europiane konsiderohet si një ndër vendet më të pasura me resurse ujore, por mungesa e projektimit dhe llogaritjeve të sakta të argjinaturave mbrojtëse është e shoqëruar me përmbytje të shpeshta, të cilat përgjithësisht ndodhin në veri të vendit. Vitet e fundit është bërë rivlerësimi i disa projekteve të argjinaturave mbrojtëse ku disa prej tyre rezultojnë me flukse prurjesh më të mëdha në krahasim me projektet e tyre origjinale. Prania e këtyre llojeve të flukseve të prurjeve mund të rezultojë në përmbytjen e argjinaturave lumore. Qyteti i Shkodrës përmbytet shpesh dhe argjinaturat lumore të tij janë të dëmtuara, çka do të thotë se periudhat e kthimit janë më të mëdha se standardet kombëtare të projektuara 2% dhe 1%. Zona e marë në studim është segmenti i Lumit Buna, i cili shtrihet që në fillimin e derdhjes së tij nga Liqeni i Shkodrës dhe deri tek bashkimi i tij me Lumin e Drinit, i cili shërben në formën e një shkarkuesi për Liqenin e Shkodrës. Ky studim ka për qëllim të analizojë prurjet e lumit duke përdorur metodat analitike dhe empirike dhe duke testuar për periudha të ndryshme të kthimit të prurjeve me limitin e sipërm të tyre prej 0.1 %. Ky studim sjell të dhëna të reja në vlerërësimin e prurjeve të Lumit Buna në mënyrë që të eliminohet risku i tejkalimit dhe dëmtimit apo thyerjeve që mund t'i ndodhin argjinaturave të lumit si dhe projektimi i saktë i këtyre strukturave.

Fjalë kyçe: *periudhat e kthimit të prurjeve, përmbytjet, argjinaturat*

Abstract: Albania in comparison with other European countries is considered to be one of the richest in water resources but the lack of proper river embankments flows design is associated with floods which takes part especially in north of the country. In recent years, the design of many embankments flows were re-evaluated, often resulting in discharges larger than the original design, occurrence of these kinds of revised flows could result in river embankment overtopping. Shkoder city side is flooded frequently and embankment of river is damaged which means that return period flows are greater than national designed standards 2 % and 1 %. Considered area of this case study is Buna River out flowing which serves as a spillway for Shkoder Lake in the city segment extended till to Drin River junction. The present study aims to analyze the river flows by using analytical and empirical approaches

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using several tested return period of discharges admitted as upper limit 0,1 %. This paper provides new information and tools in better understanding Buna's river flows in order to avoid risk of overflows and embankment break happened recently and designing properly those structures.

Key words: *Return period flows, floods, embankment.*

INTRODUCTION

Despite being only 41 km long, river of Buna (Bojana) has quite a large watershed, covering 5,187 km², because of the whole drainage area of Shkoder Lake, the largest lake in southeastern Europe, which is also part of it. Also, thanks to the waters from the Great Drin, the Bojana/Buna ranks second place among all tributaries to the Adriatic Sea, measured in range of the annual discharge 320 m³/s (Stratobërdha *et al*., 2008).

Albania is relatively a small area of 28.748 km², the changes of climate over all the country are remarkable and influence of floods, especially in north of the country are inevitable. Region of Shkoder is located on northwest of Albania, its administrative centre of the Region is city of Shkoder. It is located on 41°50'50"N 19°22'18"E

Figure 1. View of Buna River on Bahçallëk Bridge

by geographical coordinates, climate is characterized by annual average temperature is 15°C; average annual rainfall is 1,500–2000 mm (Annonymus, 19841). This scheme is very unique and difficult to evaluate properly Buna flows by the classical method of engineering hydrology (Selenica, 2004).

MATERIAL AND METHODS

One of the most classical methods to determine the maximum flow on the surface accumulative basins, based on data of precipitation and basin characteristics, is given by Giandotti, 1940.

To calculate the concentration time are analyzed several empirical formulas as Giandotti, 1934; Tournon – Merlot, 1973; Puglisi – Zanframundo, 1978; Pezzoli, 1970; Kirpich, 1976. From this analysis is selected formula Puglisi – Zanfromundo, valid for country conditions.

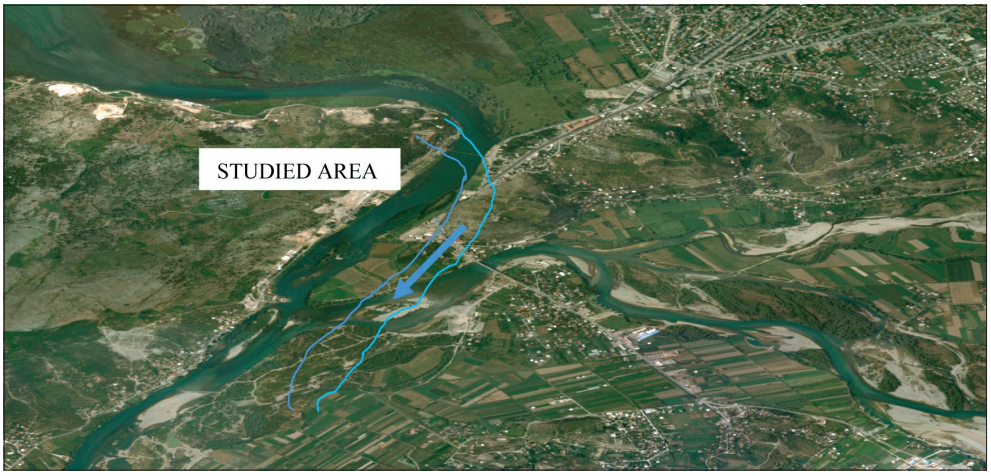


Figure 2. Satellite images of Buna River flowing out from Shkoder Lake

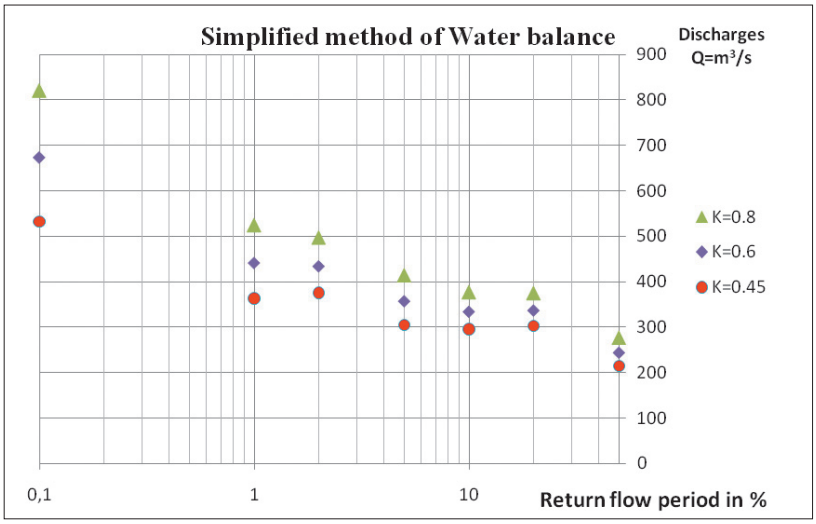
One of the most common methods of quantifying run-off from watersheds is an empirical formula widely known as the rational formula, which is based in concept, on the criterion that for storms of uniform intensity, distributed evenly equal to a certain percentage of the rainfall intensity occurs when the entire basin area is contributing at the outlet.

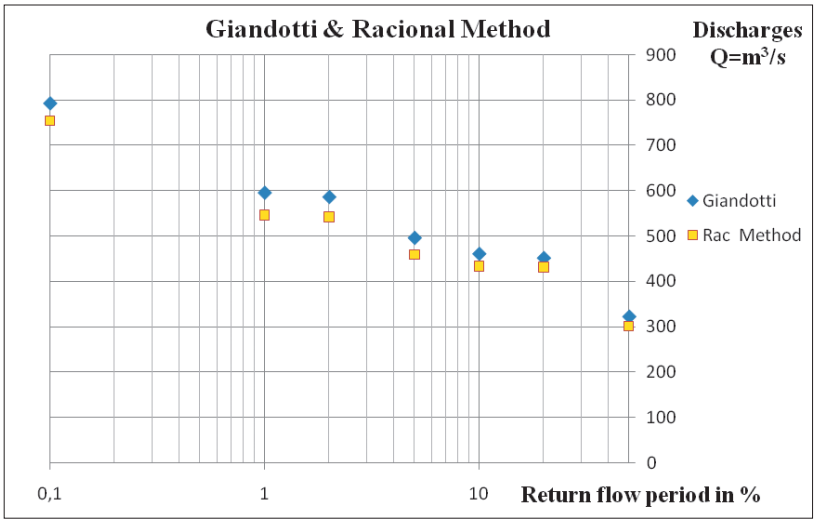
Rational method differs from other methods because takes into account the flow coefficient K, which is expressed depending on the type of soil, vegetal cover and the slope of terrain simplified method.

Simplified Water Balance method is based on the settlement of the balance of water volumes, the rain that falls in the catchment basin and dynamic volumes to flow to the axis by calculating the maximum flow.

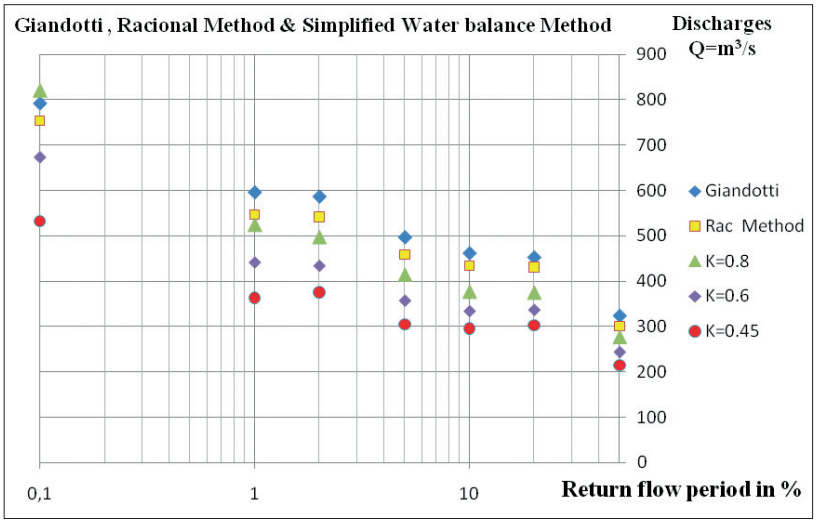
RESULTS AND DISCUSSION

Giandotti and rational method estimates very close values between them as matter of fact second method is more near to reality, because takes also in consideration K soil parameters on watershed for different parts of the basin. Simplified method of Water Balance is more flexible for engineering calculations because gives the solution for different coefficients of flowing K basing on measured data on river bed (Pustina, 2008). On the following graphs are shown estimated discharges for variable return flow periods, by using three mentioned methods.





Graphics 1, 2 Relationship of Q max = f (p) for Buna river near Shkoder lake with empirical methods for different flow return periods



Graphic 3 Relationship of Q max = f (p) for Buna river near Shkoder lake with methods for different return flow periods

CONCLUSIONS

The main study purpose was to give accurate estimations of hydrologic data by using empirical methods in order to avoid floods and design properly the dikes on the region with reliable return flows period. By using historical hydrologic data elaborating with three methods was given a full view how discharges oscillate for every single method. An important issue is regarding the small differences between p=1% and p=2% which in terms of design means not a quite difference between a flow which occurs once in 100 years and once in 50 years. Elaborated data will help in better understanding and designing of river embankments along the Buna River.

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