International Journal of Advance and Applied Research (IJAAR)
Peer Reviewed Bi-Monthly

ISSN – 2347-7075
Impact Factor – 0.899
Vol.6 No.1 Sept – Oct 2018

FLOOD FREQUENCY ANALYSIS OF PANCHAGANGA RIVER BASIN

Dr. D. H. Pawar
Asst. Professor, Department of Geography, Shivaji University, Kolhapur, (MS).

Prin. R. B. Bansode
Principal, Baba Naik, Mahavidyalaya, Kokrud

Dr. A. K. Raskar
Asst. Professor, Vishawasrao Naik Arts Commerce and Baba Naik Science Mahavidyalaya, Shirala

ABSTRACT

In short term immense rainfall is called flood. The basin Panchaganga having five tributary likes Kasari, Kumbhi, Dhamni, Bhogavati and Tulsi. In monsoon season orographic rainfall is effective and active all these tributaries its occur flood like situation in Panchaganga basin. In June to September month all small channels are active so its impact on flood situation show in lower Panchaganga basin so in the research topic the objective is to study of flood frequency analysis of Panchaganga Basin. The calculation of flood frequency of Panchaganga basin having methodology is used of Gumbels extreme value distribution (1958) of flood frequency analysis. It's need to hydrological planning in future of the river basin.

Keywords- *Flood Frequency, orographic rainfall*

INTRODUCTION

In short term immense rainfall is called flood. The basin Panchaganga having five tributary likes Kasari, Kumbhi, Dhamni, Bhogavati and Tulsi. In monsoon season orographic rainfall is effective and active all these tributaries its occur flood like situation in Panchaganga basin. In June to September month all small channels are active so its impact on flood situation show in lower Panchaganga basin so in the research topic the objective is to study of flood frequency analysis of Panchaganga Basin. The calculation of flood frequency of Panchaganga basin having methodology is used of Gumbels extreme

value distribution (1958) of flood frequency analysis. It's need to hydrological planning in future of the river basin.

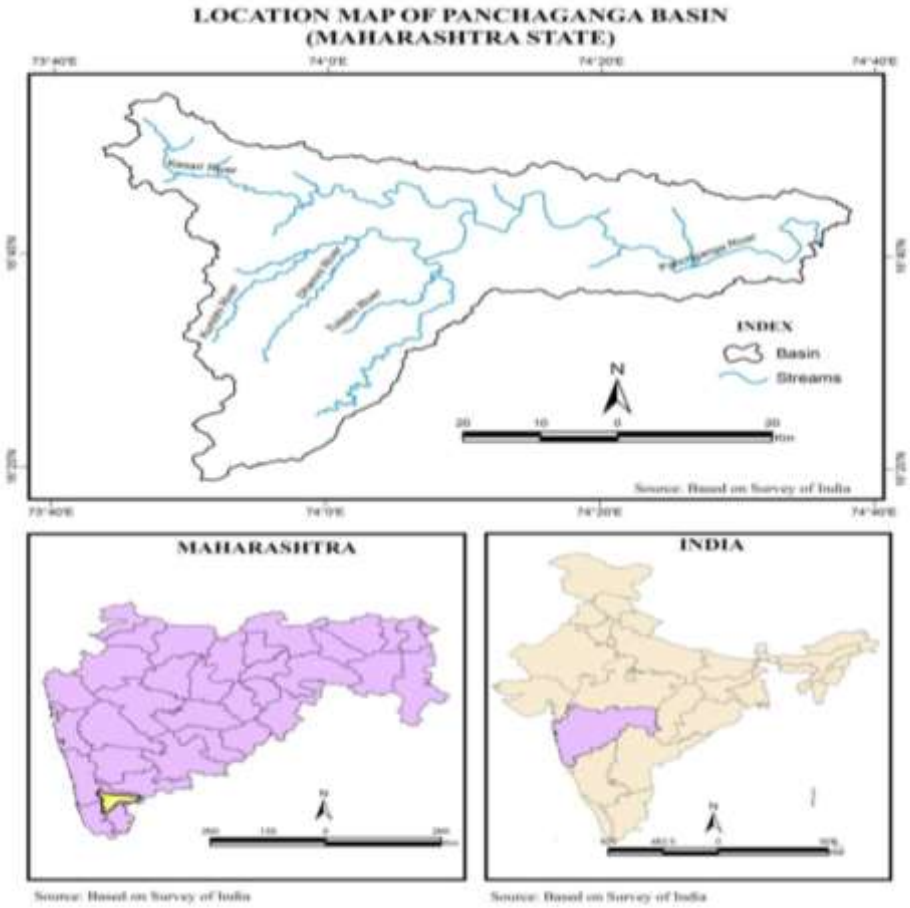
OBJECTIVES

While studying for the specific research paper on the following aim and objective have been considered:

1) To Study Flood Frequency Analysis of Panchaganga Basin

LOCATION OF STUDY REGION

The Panchaganga river is one of the major rivers of the westerly regime of the Krishna drainage system spread within the 16° 20"22‟ to 16° 55" 4‟ to North Latitude and 73° 45" 33‟ to 74° 35" 3‟ East Longitude. The length of this easterly flowing river is 80.73 km occupying an area of 2571.02 km². The entire catchment area of Panchaganga basin falls under Kolhapur district of western Maharashtra with Warana and Dudhganga river basin lying in north and south are respectively.



Database and Methodology:-

The flood discharge data is collected from the HDUG, Nasik. For the flood frequency analysis of river basin having too much method, like Log Pearson and Gumbels extreme value distribution etc. the Panchaganga basin is situated on peninsular of India. So the following method is suitable for calculation of Flood frequency.

Gumbels Extreme Value Distribution

$$\text{Recurrence of interval } 1/T = 1 - e\text{-}e\text{-}y$$

$$y = - \ln \{\ln [T/(T-1)]\}$$

$$x = xave + Ks$$

$$y = yn,ave + Kon$$

where,

T – Recurrence of interval

P – Probability in %

y – Gumbel variate.

(Reference: Ponce, V. M., 1989. Engineering Hydrology, Principles and Practices, Prentice Hall, pages 223-226.)

FLOOD FREQUENCY ANALYSIS

The Panchaganga river basin is one of the highly developed economic zone in western Maharashtra. To augment feature development large structures along the river channel and bridges across the river are planned. such hydraulic structure most with stand extreme hydrological event like flood, heavy rainfall. The hydraulic structure must be built accordingly frequency analysis of floods and heavy rainfall provides information on probability of occurrence of extreme events.

A model has been developed by Gumbels to predict hydrological events like floods, rainfall etc. He introduced the concept of extreme value distribution (1958). Gumbels defines flood a large set flow of water in the year (365 days). He termed the annual series of flood flows i.e. flood flows which are largest of all the flows occurring every 365 days in a year. The Gumbels model gives the

probability of occurrence of an extreme hydrologic event equal to or large then of a particular value.

The flood discharge values for four stations namely Wadange, Mandukali, Ptraychiwadi, Nitawade shows a gradual increase. This increases may be attributed to the economic development of the region, new construction along and across the river channel make cause a drastic effect leading to modification of river channel leading to rise in extreme.

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Gumbels Extreme Value Distributions of Flood Frequency Analysis.

Return period T (yr)	Probability P (%)	Gumbel variate (y)	Flood discharge Q (m3/s)			
			Wadange	Mandukali	Ptraychiwadi	Nitawade
1.05	95.2	-1.113	1097.8	162.7	215.65	382.2
1.11	90.1	-0.838	1193.9	183.41	242.44	447.43
1.25	80	-0.476	1320.4	210.63	277.65	533.18
2	50	0.367	1614.5	273.97	277.65	732.69
5	20	1.5	2010.4	359.18	469.83	1001.1
10	10	2.25	2272.6	415.61	542.81	1178.9
15	6.66	2.673	2420.5	447.44	583.99	1279.1
25	4	3.199	2603.8	486.89	635.04	1403.4
30	3.33	3.384	2668.7	500.86	635.04	1447.4
50	2	3.902	2849.5	539.78	703.45	1570
100	1	4.6	3093.4	592.27	771.36	1735.4
150	0.66	5.007	3235.6	622.89	810.96	1831.8
200	0.5	5.296	3336.4	644.58	839.02	1900.1

CONCLUSION

Gumbels extreme value distribution (1958) of flood frequency analysis is suitable on peninsular of India. The Gumbel's model gives the probability of occurrence of an extreme hydrologic event equal to or large then of a particular value. In Panchaganga basin flood frequency analysis four stations. In which returns of period, probability of flood occurrence and actual water discharge during this period was calculated. The returns of period increase with probability of flood decrease (Table 5.13). at Wadange, Mandukali, Ptraychiwadi and Nitawade flood frequency probability (95.2%) recorded in 1.05 years 1097.8, 162.7, 215.65 and 382.2 are respectively.

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