Aayushi International Interdisciplinary Research Journal (AIIRJ)
UGC Approved Sr.No.64259
Vol - V Issue-I JANUARY 2018 ISSN 2349-638x Impact Factor 4.574

Estimation of Surface Runoff in the Man River Basin (MS)

Mr. B.M. Mali
Research Student,
Department of Geography,
Shivaji University, Kolhapur.

Dr. K. A. Mali
Head - Dept. of Geography,
Vasantrao Naik Govt. Institute of Arts And Social Sciences,
Nagpur.

Abstract:

The Man river basin runoff is important for water conservation and it was already an important means of securing sufficient water for agricultural crops. In other parts of the arid and semi-arid world those systems have been given up, the structures are destroyed and the skills forgotten (Prinz 1994). The runoff can either be diverted directly and spread on the fields or collected in some way to be used at a later time (Rosegrant et al., 2001). Runoff requires relatively large surface flow. Development of runoff is increasing specially in semi-arid and arid areas after 1980 in India. In arid zones for food and fuel production could help to restore self sufficiency in food production for local populations in many dry regions. Countries where this method has been used include Egypt, Tunisia, Libya, and southern Algeria. Some other countries outside Africa include Isreal, Jordan, North Yemen, India, Pakistan and the Soviet Union. The water harvesting techniques are also beneficial for the agricultural development and it is useful for different discipline to do so.

Keywords: Runoff, water harvesting, water conservation.

Introduction:

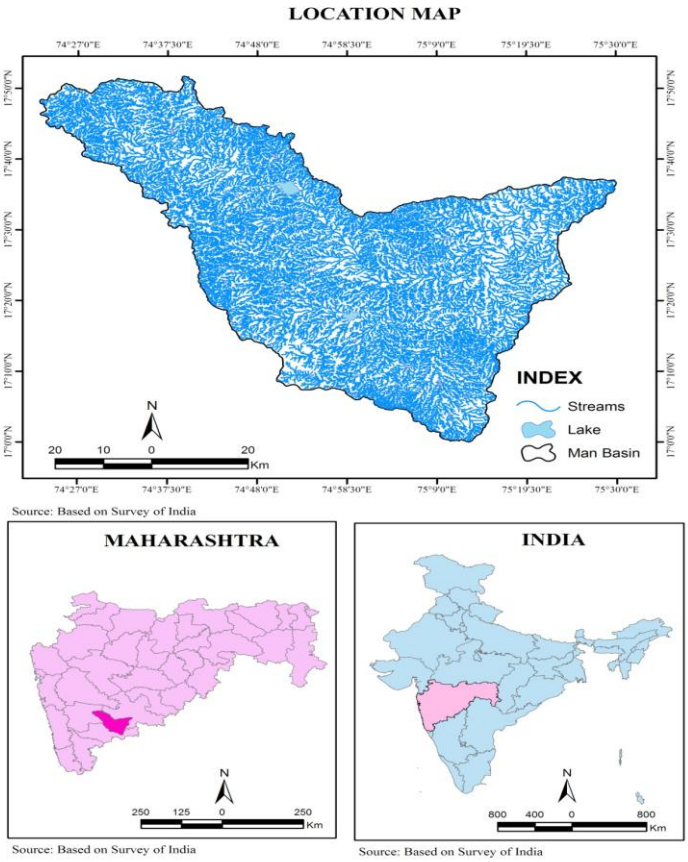
Water is essential for human life and to sustain a diverse and thriving water environment. It is important to our Indian economy as an essential requirement for Industry, Power generation, Commerce and Agricultural development. We need it to support our growing population and to improve our standard of living. There are significant pressures on water resources which effects both the water environment and water supplies.

The factors affecting runoff are quantities and rates of runoff (probable quantity of water), time of concentration, intensity and duration of rainfall, land slope, hydrologic conditions, drainage density and pattern, vegetative cover, conservation practices, topography, land management practices etc. (Rajora, R., 1998)Runoff is one of the indicators of availability of water drainage basin.

The study of runoff on the basis of rainfall is very important and useful for the agricultural development with the help of sources of water recharge.

Study Region:

The study area is marked as a drought prone area. Man basin stretches from 16°50’30” North to 17°31’42’North latitudes and 74°22’30’’ East to 75°30’30’’ East longitudes. It is a part of Southern Maharashtra, lies in the district of Satara, Sangli and Solapur tahsils of Maharashtra State. The height of study area is 917m. From mean sea level. The Study region covers the total area of 4753 sq km.



Objectives:

1. To study area average rainfall in the Man River basin.
2. To analyze estimation of runoff of Man River basin.

Database:

The following data has been used for the calculating runoff and this rainfall data collected from the IMD, Pune.

Tabal -1

Average Rainfall In Man River Basin.

Sr.No	Tahshil	Average rainfall (mm) in 2001-2015
1	Atapadi	385.7
2	Mangalwedha	667.5
3	Rajewadi(Man)	564.5
4	Sangola	534.3
5	Umadi(Jat)	476.1
6	K.Mahakal	489.1
7	Pandharpur	546.1
Total Man river basin average rainfall		**571.4 mm**

Source: Indian Metrological Department, Pane

Methodology:

The Inglis method is very useful and effecting for the runoff calculation. C.C. Inglis formula is also used for estimating the Runoff and Yield of a Basin. This formula is basically useful for southern part of India. Two separate formulas are suggested by the types of terrain.

Inglis Method:

For hilly catchment

$$Qy = 0.85 * Py - 30.4$$

For plain Areas

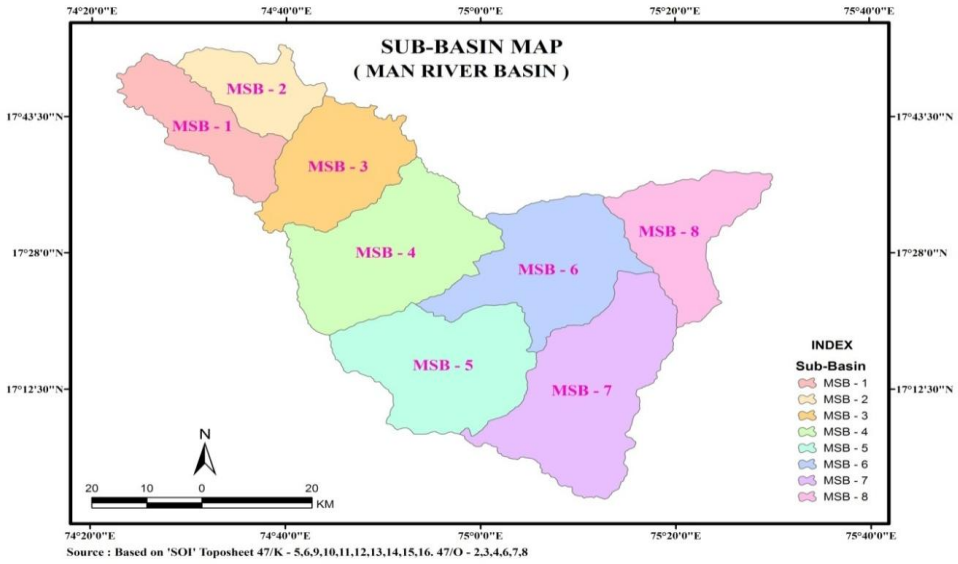
$$Qy = Py * \frac{Py - 17.8}{254}$$

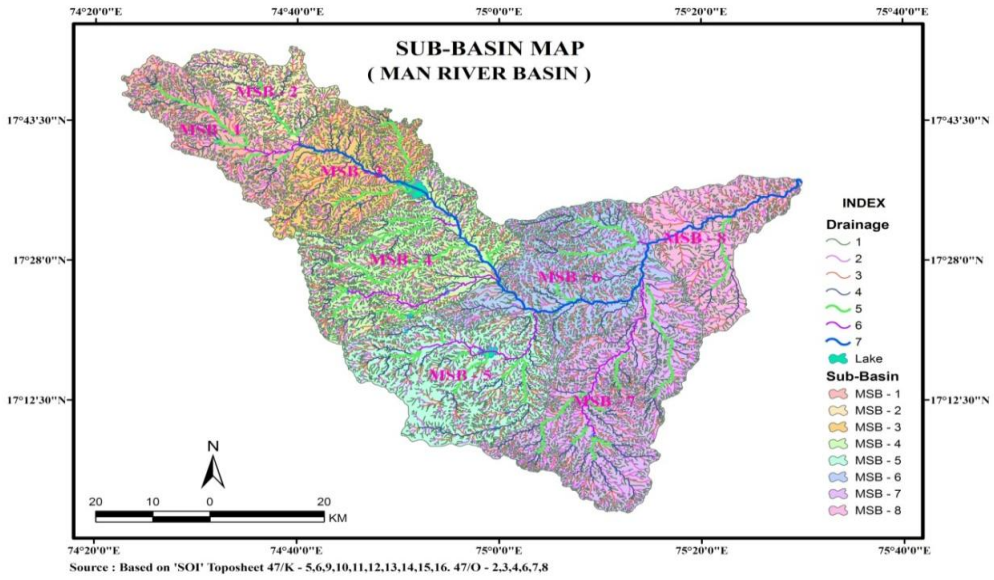
Where,

Py = yearly precipitation or annual rainfall in cm.

Qy = yearly run-off in cm depth over the basin.

By arithmetic mean method, the calculated average rainfall of Man basin is 571.4 mm. Runoff is calculated through sub basin. It is very much important in assessing the storage potentials of different catchments and deciding the location of a dam for the construction of storage reservoirs.





Area, Runoff and Yield of Drainage Basin.

Tabal - 2

Sub Basin and Types of Terrain.	Area (In Hectare)	Slope Length of The Basin	Form Factor	Runoff in Cum/Sec	Yield of Drainage Basin (In Cm Depth Over The Basin)	Dependable Yield (75%)
MSB-1 hilly	38913	0.01	0.36	18.16	706660.00	529995.06
MSB -2 hilly	29739	0.02	0.44	18.16	540060.24	405045.18
MSB 3plain	51019	0.02	1.03	8.64	440804.16	330603.12
MSB-4 plain	80591	0.02	1.67	8.64	696306.24	522229.68
MSB-5 plain	72496	0.01	0.59	8.64	626365.44	469774.08
MSB-6 plain	67091	0.01	0.44	8.64	579666.24	434749.68
MSB-7 plain	88516	0.01	0.4	8.64	764778.24	573583.68
MSB -8 plain	46961	000	0.53	8.64	405743.04	304307.28

Source: Compiled and computed by researcher

Discussion and Results:

Rainfall and runoff are significant constitute the sources of water for recharge of ground water in the sub-basin. Rainfall is a major the primary source of recharge into the ground water. Other, substantial sources of recharge include seepage from tanks, canals, streams and functional irrigation. This estimation is prerequisite as it tells the peak rate of runoff and total yield of the basin. Specifically, basin yield refers to the quantity of available water from a stream at a given point over a specified duration of time. In yield calculation the emphasis is more on water volumes rather than instantaneous discharge.

The 75 per cent dependable yield for basin is calculated as it is the expected annual runoff volume from the basin. So far the area is concerned, MSB -7 is the largest and MSB -2 is the smallest sub-basin. The area of MSB -7 sub basin is 88516 hectares. With respect to the slope length, MSB -2 & MSB -3 sub basin of hilly terrain is having highest slope length as it accounts for 0.2 km and MSB -8 ranks lowest with 0.0 km slope length. Hence the quantity of runoff from MSB -1 and MSB -2 sub basins will be decreased with respect to slope length of these basins.

The peak rate of runoff (in cum/sec) is highest for hilly sub basins as compare to plain. The sub basins belong to hilly terrain are having 18.16 cum/ sec runoff and those are of plain areas are having 8.64 cum/sec runoff. MSB -7, MSB -1, MSB -4 and MSB -5 sub-basins are having much higher yields as compare to other sub-basin of the Man basin. The dependable yield of MSB-1 and MSB -7 basins is highest as compare to others runoff; it is revealed that there is high possibility for sustainable water resource development in basin.

References:

1. Agarwal, A. and Narain, S., (1997): "Dying Wisdom: The Rise, Fall and Potential of India's Traditional Water Harvesting System", Centre for Science and Environment, Delhi.
2. Anyabandu, R. D. S., (2001): "Varieties of Water Harvesting in Making Water everybody's Business: Policy and Practice of Water Harvesting", Centre for Science and Environment, Delhi 2001 .
3. Approach", Journal of India Society of Remote Sensing Vol.27 Issue.3, pp.155-166
4. Biswar S.B., Sudhakar, S. Desai, V. R. (1999) Prioritization Sub-watershed based on morphometric Analysis of Drainage basin: A Remote Sensing and GIS
5. Central Ground Water Board, (2007): Guide on Artificial Recharge to Ground Water, Ministry of Water Resources, Government of India, New Delhi.
6. Dwivedi, A.K. and Bhadauria, S. S. (2009): "Domestic Rooftop Water Harvesting- A Case Study", ARPN Journal of Engineering and Applied Sciences, Vol. 4, No. 6 .

7. F.A.O. (1985) Watershed Development with Special Reference to Soil and Water Conservation, Soil Bulletin 44, F.A.O., Rome.
8. Garg, S. K., (1987): "Irrigation Engineering and Hydrolic Structures", Seventh Revised Edition, Khanna Publishers, Delhi, 1184 P.
9. Gould, J. and Nissen-Petersen, E., (1999): "Rainwater Catchment Systems for Domestic Supply", International Technology Publications, London, United Kingdom.
10. Government of India, (2003): Water Resources of India and World, Ministry of Water Resources, Newsletter on Fresh Water Year.
11. Horton, R.E., (1932), Drainage basin characteristics. Trans. Am. Geophys. Union 13, pp 350-360.
12. Jain, M.K. (1996): "GIS Based Rainfall, Runoff Modelling for Hemavathi Catchment", NIH Report CS/AR-22/96 -97, National Institute of Hydrology, Roorkee.
13. Panhalkar S. (2010): "Rain water harvesting and watershed management in Dudhganga basin (Maharashtra). Pp 133-136.
14. Panhalkar, S., Sapkale, J. and Pawar, C.T., (2009): Potential of Roof Rain Water Harvesting in R . K. Nager Sub Urban Area of Kolhapur City, International Journal of Environment And Development . Vol.6, Pp 1 -5.
15. Rajora, R., (1997): "Samvardhan- Jhabua Model of Integrated Watershed Development", DRDA, Jhabua (MP)
16. Ranade. R., (2000): "A Water Harvesting Manual for Urban Areas: Case Studies from Delhi", Publication Center for Science and Environment, New Delhi.