Morphometric Analysis of the Tumkur-Gubbi Watershedof Shimsha River Basin, Karnataka, India,by using Remote Sensing and GIS Techniques

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Abstract: Morphometric analysis is very essential and significant in all hydrological investigation for development and management of watershed. Quantitative morphometry plays an important role in the hydrological processes. The Tumkur-Gubbi watershed is situated in Tumkur district of Karnataka between Latitude 13˚13′00″ to 13˚33′30″ and Longitude 76˚58′30″ to 77˚16′30″. It forms the parts of Shimsha river basin comprising parts of Tumkur andGubbitaluks of Tumkur district, Karnataka State. Tumkur-Gubbi watershed is sub divided into Bugadanahalli, Hanumanthapura, Maidala, Sankapura and Halinurusub-watersheds, Morphometric analysis of the above mentionedsub-watersheds arecarried out using LISS-III andASTER GDEM satellite imageries data and SOI maps are georeferencedand are computed using ArcMap-10.2.2 on 1:50,000 scale. Thesesub-watersheds show dendritic to sub dendritic drainage pattern with 5^{th} order stream and lower order streams are dominated. Low to moderate drainage density (1.07 to 2.17 km/km^2) of all sub-watershed indicates strong permeable material with exalent vegetative cover and moderate relief. The stream frequency of the sub-watershed ranges from 0.74/km^2 to 2.65/km^{2}lower value indicates good permeability, vegetation and infiltration capacity than the higher values. The Relief ratioisranging from 0.009 to 0.023suggesting the intensity of erosion which operates on the watershed slopes. The value of elongation and circulatory ratio shows that all the sub-watersheds having elongated shapes. Therefore, remote sensing is an efficient tool in computing the morphometric parameters.

Keywords:Remote sensing, GIS, Morphometry, Tumkur-Gubbi, Shimsha river,Sub-watershed.

I. INTRODUCTION

Morphometric analysis is an important aspect of the characterization of watershed which provides the quantitative narration of the drainage pattern of a basin (Strahler, 1964). The major surface runoff of the area is conveyed to the single outlet and which is the proper unit to study the several processes of the land surface is watershed (FarrukhAltaf, et al, 2013).Characteristic of stream network, narration of shape, drainage texture and pattern are the fundamental units of fluvial terrain, so lot of works are focused on watershed geometry(Abrahams, 1984).Morphometric studies at the watershed scale provide the information about the formation and development of land surface process occurs within the watershed (Singh, 1992, Dar, 2013). So many quantitative methods are emplaced to recognize the evolution and behavior of thedrainage patterns (Abrahams, 1984). For un-gaugedbasins morphometric analysis is a very good substitute to know about the underlying factors controlling the hydrological behavior apart from the information of soil, geology, geomorphology and so on(Romshoo, 2012).

Nowa daysRemote sensing and GIS are providing easier and accurate platforms for evaluating morphometric parameter and its analysis of watershed at different terrain. Satellite data and GIS tools arefruitfullyemployed to produce data on the spatial deviations in characterization of drainage thus providing hydrologic conditions necessary for developing basin management strategies (Das, et al., 2005, Vittala, et al., 2004, Nag, 1998).In the present investigation, morphometric analysis is performed using GIS environment and remote sensing to manipulate and analyze spatial information and characteristics of 5 sub-watersheds of the Shimsha River basin of Tumkur-Gubbi watershed which is Major source of irrigation and the development of ground water. Geomorphological effects on Hydrogeological behavior of the sub-watersheds can be understand using comparison of the quantitative morphometric parameters(FarrukhAltaf, et al, 2013).

II. MATERIALS AND METHODS

The Tumkur-Gubbi Watershed (study area) is located between Latitude 13˚13′00″ to 13˚33′30″ and Longitude 76˚58′30″ to 77˚16′30″ covers an area of about 624 Sq. km., and it forms the parts of Shimsha river basin comprising parts of Tumkur and Gubbitaluks of Tumkur district, Karnataka State and falls in Survey of India topographic maps Nos. 57C/15, 57G/2, 57G/3, 57G/4, and 57G/6 on 1:50,000 scale. Topographically the Tumkur-Gubbi watershed is an undulating terrain with elevations varying from 1270 m to 742 m. above MSL, with an elevation difference of about 528 m from North East to South West. The Tumkur-Gubbi watershed is drained mainly by the tributaries of river Shimsha initially this flows towards West direction and the terrain is sloping towards West and South west region all along the river flow. From review of previous studies the Tumkur-Gubbi Watershed falls in one of the Hard rock terrains of Karnataka and belongs to one of the drought prone area Fig.1.

Morphometric analysis of Tumkur-Gubbi Watershed of Shimsha Riverbasin was carried out on the Survey of India toposheets and LISS-III and ASTER GDEM satellite imageriesin the scale of 1:50,000.The toposheets were first georeferencedand UTM projection system was given to them. This was followed by digitization of existing drainage pattern of the toposheethas been carried out and new drainages have been updated using satellite imageries ASTER GDEM and the analysis of drainage network of this watershed is carried out according to Horton law (1945) and stream ordering wasdone followingStrahler (1964). Digitization of drainage network has been carried out using ArcMap-10.2.2. The aerial and linear parameters were considered for morphometric analysis entire watershed. The 5sub-watersheds were demarcated following the water divider(Fig. 2 to 6).

Using different mathematical relations proposed by different earlier workers linear morphometric parameters like Stream order is done by hierarchical ordering (Strahler, 1964), Stream length refers to the length of streams of each order, Mean stream length is by using Lsm=Lu/Nu, Stream length ratio is calculated Rl=Lu/Lu-1 (Horton, 1945), Bifurcation ratio is by adopting Rb=Nu/Nu+1 (Schumn, 1956), Mean Bifurcation ratio Rbm is by using Average of bifurcation ratios of all orders (Strahler, 1957), where, L is stream order, Lu is stream length of order ‘u’, Lu-1 is Stream length of next lower order, Nu is total number of stream segments of order ‘u’, Nu+1 is Number of segment of next higher order.

The Relief morphometric parameters like Basin relief refers to Vertical distance between the lowest and highest points of watershed, Relief ratio is done by Rh=Bh/Lb and Ruggedness number is calculatedRn= Bh×Dd (Schumn, 1956), where, Bh is Basin relief, Lb is Basin length and Dd is Drainage density.

The aerial morphometric parameters like Stream frequency is by adopting Fs=N/A, Drainage density by usingDd=L/A (Horton, 1945), Drainage intensity is done by Di=Fs/Dd(Faniran, 1968), Drainage texture is calculated by Rt=N/P, Constant channel maintenance refers to C=1/Dd, Length of overland flow is done byLof=1/2Dd, Shape index is determined by Sw=Lb^2/A, Texture ratio refers to T=N1/P (Horton, 1945), Form factor is done by Rf=A/$(Lb)^2$(Horton,1932), Circulatory ratio refers to Rc=4πA/P^2 (Miller,1953), Elongation ratio is calculated Re=2√(A/π)/Lb (Schumn, 1956) in which N is Total number of streams, A is Area of watershed, L is Total length of streams, Fs is Stream frequency, Dd is Drainage density, N is Total number of streams, P is Perimeter of watershed, Lb is Basin length, N1 is Total number of first order streams, π=3.14. All the values required for calculating morphometric parameters of different sub-watersheds are tabulated in Table 1.

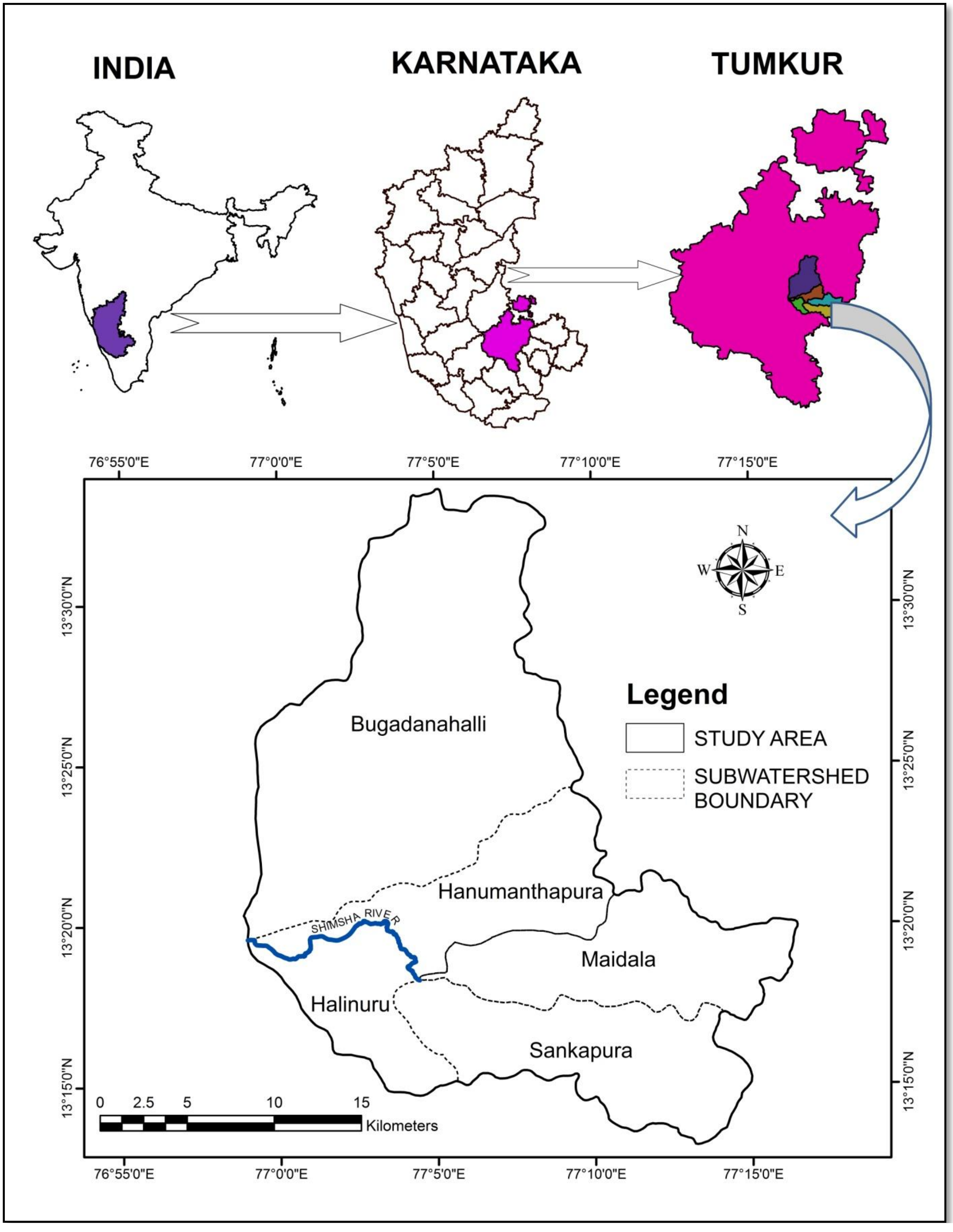

Figure 1: Location Map of Tumkur-Gubbi watershed of Shimsha river Basin.

Table 1: Characteristics of sub-watersheds of the study area

Sub-watersheds Name	Maximum elevation (km)	Minimum elevation (km)	Basin relief	Basin Length (km)	Perimeter (km)	Basin area (km^2)	Longest flow path (km)
Bugadanahalli sub-watershed	1.26	0.74	0.53	29.71	82.13	289.46	39.76
Hanumanthapura sub-watershed	1.22	0.75	0.48	21.12	60.25	84.78	27.80
Maidala sub-watershed	1.16	0.76	0.41	21.91	57.64	94.37	25.65
Sankapura sub-watershed	1.08	0.77	0.31	21.01	56.54	102.87	23.08
Halinuru sub-watershed	0.84	0.74	0.10	11.78	40.39	52.60	16.63

Table 2:Important linear parameters of sub-watersheds of the Study area

Sub-watersheds Name	Stream order	Stream length (km)					Stream number				
		I	II	III	IV	V	I	II	III	IV	V
Bugadanahalli sub-watershed	5	214.21	110.28	57.74	35.71	19.71	291	79	19	3	1
Hanumanthapur sub-watershed	5	80.80	29.22	21.58	13.29	4.86	113	22	7	3	1
Maidala sub-watershed	5	114.49	43.59	21.82	5.57	18.90	190	44	11	4	1
Sankapura sub-watershed	5	119.65	42.56	25.74	15.37	11.92	172	45	12	3	1
Halinuru sub-watershed	3	34.53	9.24	12.53	-	-	30	7	2	-	-

Table 3:Comparisons of mean stream length and steam length ratios of sub-watersheds of the Study area

Sub-watersheds Name	Mean stream length (km)					Stream length ratio			
	I	II	III	IV	V	II/I	III/II	IV/III	V/IV
Bugadanahallisub-watershed	0.74	1.40	3.04	11.90	19.71	0.51	0.52	0.62	0.55
Hanumanthapurasub-watershed	0.72	1.33	3.08	4.43	4.86	0.36	0.74	0.62	0.37
Maidalasub-watershed	0.60	0.99	1.98	1.39	18.90	0.38	0.50	0.26	3.39
Sankapurasub-watershed	0.70	0.95	2.14	5.12	11.92	0.36	0.60	0.60	0.78
Halinurusub-watershed	1.15	1.32	6.26	-	-	0.27	1.36	-	-

Table 4:Linear and Aerial aspects of sub-watersheds of the study area

Sub-watersheds Name	Bifurcation ratio				Mean bifurcation ratio	Stream frequency	Drainage density	Drainage intensity
	I/II	II/III	III/IV	IV/V				
Bugadanahalli sub-watershed	3.68	4.16	6.33	3.00	4.29	1.36	1.51	0.90
Hanumanthapura sub-watershed	5.14	3.14	2.33	3.00	3.40	1.72	1.77	0.97
Maidala sub-watershed	4.32	4.00	2.75	4.00	3.77	2.65	2.17	1.22
Sankapura sub-watershed	3.82	3.75	4.00	3.00	3.64	2.26	2.09	1.08
Halinuru sub-watershed	4.29	3.50	-	-	3.89	0.74	1.07	0.69

Table 5: Aerial and Linear aspects of sub-watersheds of the study area

Sub-watersheds Name	Constant channel maintenance	Length of overland flow	Drainage texture	Ruggedness number	Relief ratio
Bugadanahalli sub-watershed	0.66	0.33	4.79	0.75	0.018
Hanumanthapura sub-watershed	0.57	0.28	2.42	0.84	0.023
Maidala sub-watershed	0.46	0.23	4.34	0.84	0.018
Sankapura sub-watershed	0.48	0.24	4.12	0.63	0.014
Halinuru sub-watershed	0.93	0.47	0.97	0.08	0.009

Table 6: Important Aerial aspects of sub-watersheds of the study area

Sub-watersheds Name	Shape index	Texture ratio	Form factor	Circularity ratio	Elongation ratio
Bugadanahalli sub-watershed	3.05	3.54	0.33	0.54	0.65
Hanumanthapura sub-watershed	5.26	1.88	0.19	0.29	0.49
Maidala sub-watershed	5.09	3.30	0.20	0.36	0.50
Sankapura sub-watershed	4.29	3.04	0.23	0.40	0.54
Halinuru sub-watershed	2.64	0.74	0.38	0.41	0.69

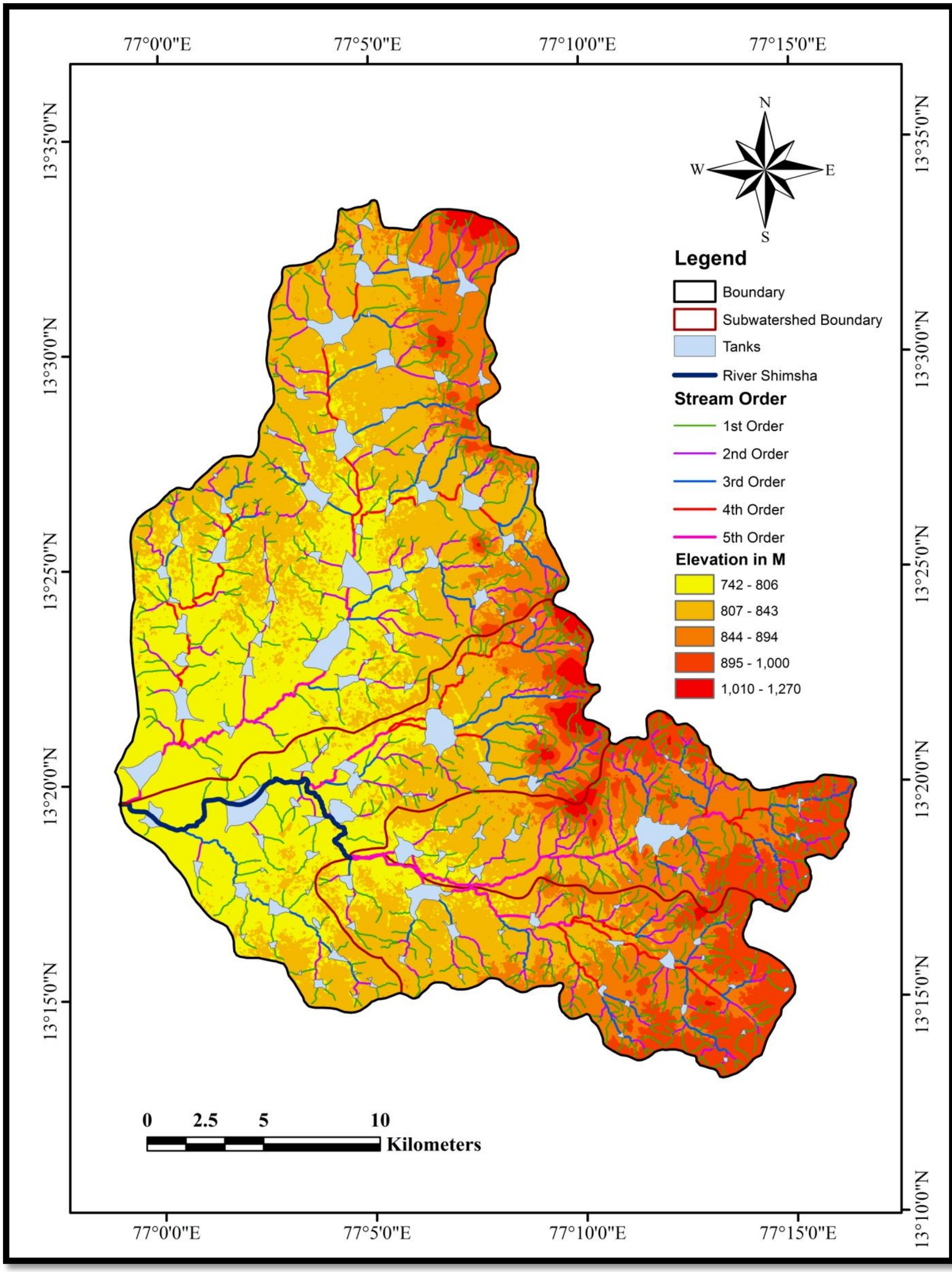

Figure 2: Stream order with Elevation map of Tumkur-Gubbi watershed of Shimsha River Basin.

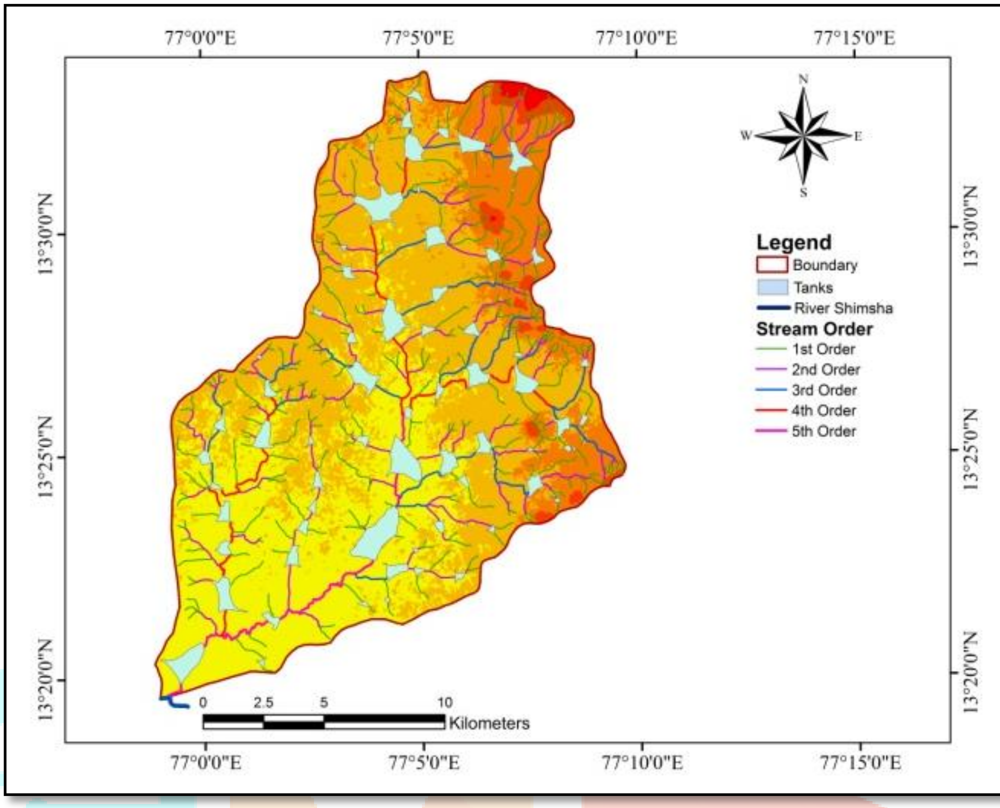

Figure 3: Stream order with Elevation map of Bugadanahallisub-watershed.

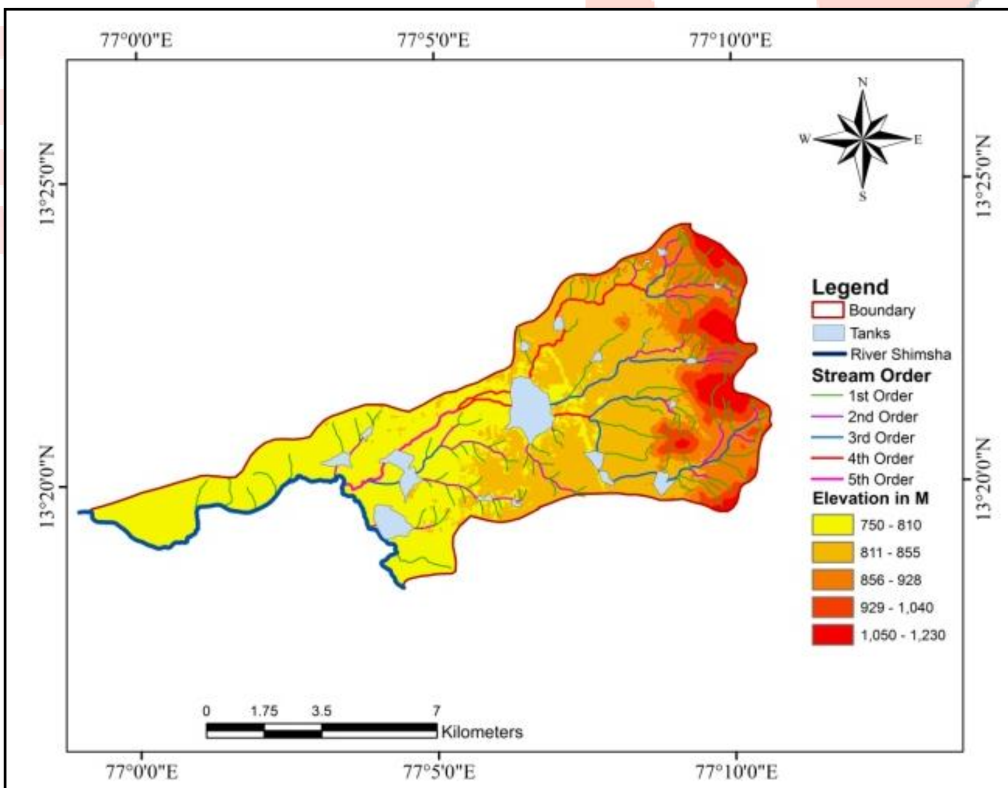

Figure 4: Stream order with Elevation map of Hanumanthapurasub-watershed

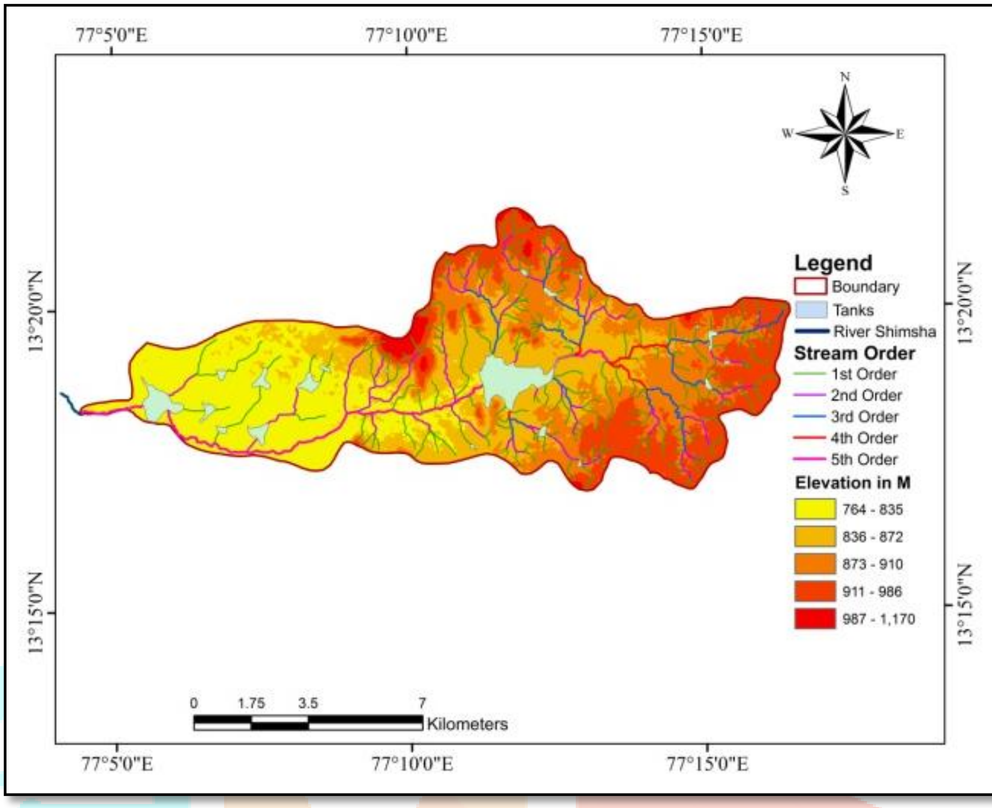

Figure 5: Stream order with Elevation map of Maidalasub-watershed

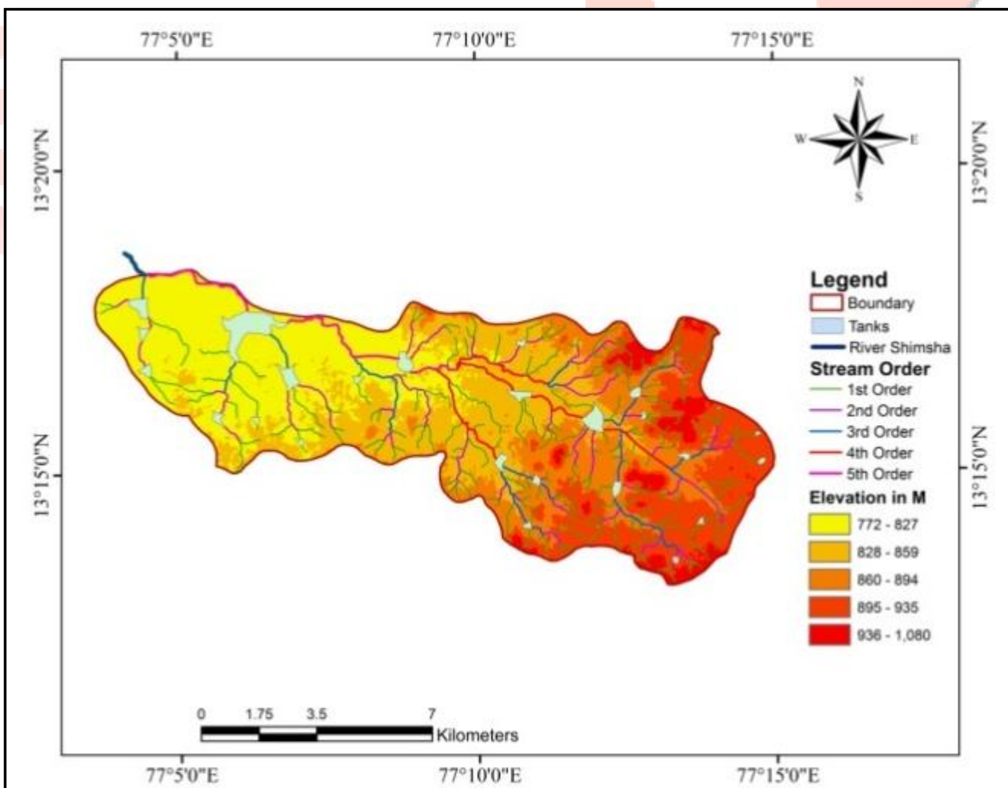

Figure 6: Stream order with Elevation map of Sankapurasub-watershed.

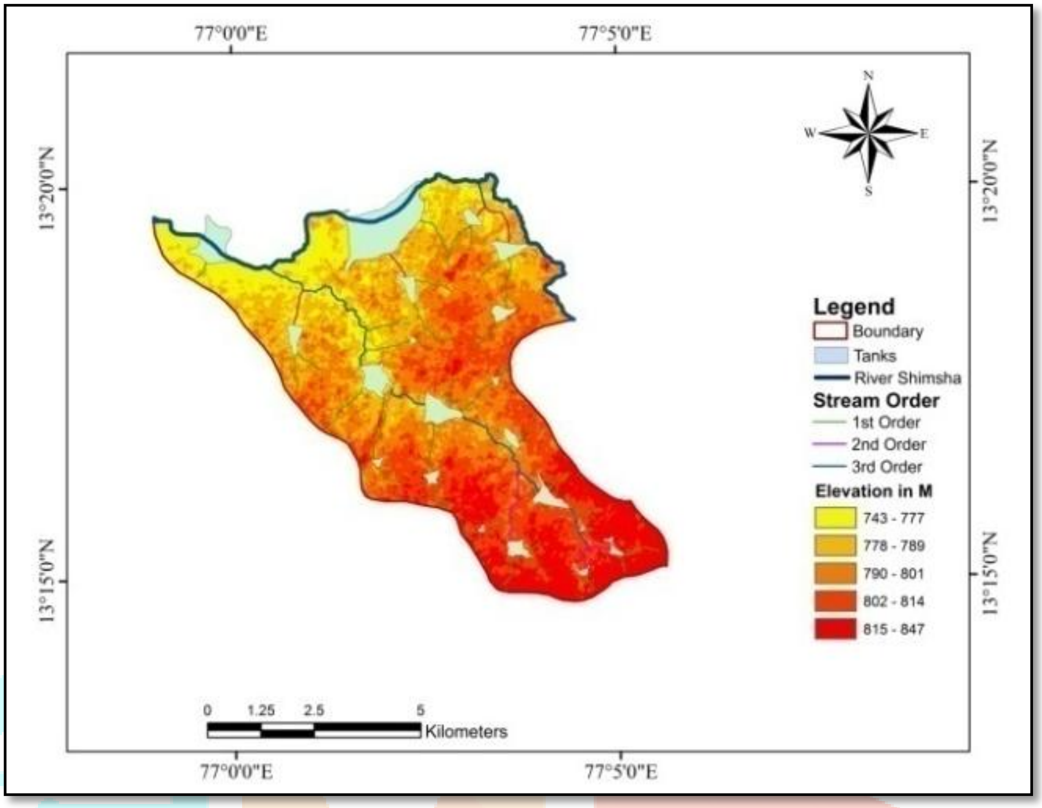

Figure 7: Stream order with Elevation map of Halinurusub-watershed

III. RESULTS AND DISCUSSION:

3.1. Stream Order (U):

The major stream order of all 5sub-watersheds is 5th order (Table 1) and finally joining to river Shimsha as shown in Fig.1. Among 5 sub-watersheds, 4 sub-watersheds having highest stream order up to 5th order those are Bugadanahalli, Hanumanthapura, Maidala,Sankapurasub-watersheds and 1sub-watershed is having lowest stream order up to 3rdorderisHalinurusub-watershed.Fig.2shows that the 5sub-watersheds draining into RiverShimsha.Bugadanahallisub-watershed is draining into river Simsha at Northern side and the remaining 4 sub-watersheds are draining at the Southern side and all together draining towards Western direction.Stream order and elevation maps of all the 5 sub-watersheds are shown in Figs 2 to 6. The higher order streams are associated with greater discharge, and higher velocity. Southernsub-watershed of the river clearly contributes more surface runoff and since higher velocity enhances the erosion rates, into the river Shimsha. Further, as the stream order increases number of stream segments decrease, higher order streams are associated with greater discharge and velocity.According to Singh, et al, (1997) any deviation suggests that the watershed is typified with high relief and moderately steep slopes, underlain by uniformrocks and uplift across the watershed.

3.2. Stream Length (Lu) and Mean Stream Length (Lsm):

Stream length and mean stream length values are presented respectively in Tables 3 and 4 whichshows that first order streams is having maximum length of stream segments and it decreases as order increases in all the sub-watersheds are shown in Figs. 2 to 6. The results are indicating uniform lithology at subsurface. From the observation it is clear thatthe drainage characteristic of sub-watersheds depends only on movement of water. 4 sub-watersheds are at the southernside of the river and 1 sub-watershed at northern side of the River. The sum of all order stream length is greater at southern side than northern side, therefore southern side ishydrologically more active. Based on observation, the author conclude that during same intensity storm event over whole watershed, the Northern side of river shows short basin lag times compared to Southern side under similar vegetation cover and soil moisture (FarrukhAltaf, et al, 2013). Table 3 indicates that Lsmof all sub-watersheds are ranging from minimum 0.60 km for stream order 1 of Maidalasub-watershedto a maximum of 19.71 km for the 5th order of Bugadanahallisub-watershed. Horton's lawof stream lengths states that the Lsm of any order is greater than that of its lower order.

3.3. Stream Frequency (Fs):

According to Horton, (1945) the stream frequency is the total number of streams of all orders per unit area. TheanalyzedFs of all sub-watersheds are shown in Table 4,the Fs is maximum in Maidala(2.65/km^2), followed by Sankapura(2.26/km^2), Hanumanthapura(1.72/km^2), Bugadanahalli(1.36/km^2), Halinuru (0.74/km^2). According to Montgomery, et al, (1992) the relief, infiltration capacity and permeability of watershed are related toFs.The values observed in study area indicate that Maidalasub-watershed has rocky subsurface and lowinfiltration capacity in all the 5sub-watersheds. From Table 4it is noticed that increase in stream number leads to decrease in stream frequency.Fs of HalinuruSub-watershedindicate good vegetation and infiltration capacity. The data of Fs indicate early peak discharge for sub-watersheds in order of their decreasing Fs resulting in flash floods, where as the discharge from Halinurusub-watershed takes longer time to peak because of less runoff rates (Diakakis, 2011).

3.4. Bifurcation Ratio (Rb) and Mean Bifurcation Ratio (Rbm):

Both Bifurcation Ratio and Mean Bifurcation Ratio are tabulated in table 4, in whichRbm of Bugadanahallisub-watershed is 4.29, Hanumanthapurasub-watershed is 3.40, MaidalaSub-watershed is 3.77, Sankapurasub-watershed is 3.64 and Halinurusub-watershed is 3.89. Rbmis not constant from one order to the next, due to variations in lithology and geometry of watershed, but it is constant over the series as proposed byFarrukhAltaf, et al, (2013). According to Rakesh, et al, (2000) HigherRbmvalues suggest early hydrograph peak during the storm events.Moreover, wherever in a basin, powerful geological control dominates. Strahler, (1957) suggest that the powerful geological control dominates in a basin whenRbm shows only a very small variation for different areas indifferent environment. According to Nag, (1998) Higher Rbm values suggest structurally more disturbed watershed with strong distortion in drainage pattern and vice versa.From the values of Rbm it is clear thatBugadanahallisub-watershed (Rbm=4.29), is having maximum Rbm which indicates smaller basin lag time in which drainage development is controlled by structural features andHanumanthapurasub-watershed (Rbm = 3.40) is having minimum Rbm which indicates longer basin lag time.

3.5. Relief Ratio (Rh):

Basin slope of the study areaindicates the erosion intensity operating on the basin. According to FarrukhAltaf, et al, (2013) Rh depends mainly on the area and size of watershed will increases with decrease in drainage area. In the present investigation Rh valuesranging from a minimum of 0.009 in Halinuru sub-watershed to a maximum of 0.023 in Hanumanthapura sub-watershed which is tabulated in Table 5. If Rh value is high this shows that the area is susceptible for intense erosion of the basin. This indicates that Hanumanthapura sub-watershed is more susceptible and Halinurusub-watershed is least susceptible for erosion among all the 5 sub-watersheds of the study area.

3.6. Drainage Density (D):

The Resistance of surface materials to weathering, permeability ofsubsurface rock formation, vegetation and climate etc are the factors affecting D. Dodov, et al, (2006) states that the drainage density controls the movement of water with respect to time within the basin. Generally, if the D value is low then the region is underlined with good resistant permeablesubsurface, low relief and good vegetation cover. Also D value is high then the region is underlined with impermeable subsurface high relief and less vegetation cover. The values ofD from Table 4 indicates that Halinuru, Bugadanahalli and Hanumanthapurasub-watershedsare having low values (less than 2.0 km/km^2), while Sankapura and Maidalasub-watersheds are having moderate D values (2.0–2.5 km/km^2) indicatingthat they are made up of less relief, good vegetation cover and permeable subsurface materialwhich imparts betterinfiltration capacity and suitable sites for ground water recharge as compared to high values watersheds. Based on D valueHalinurusub-watershed has the highest basin lag time, whereasMaidalasub-watershed has the lowest lag time.

3.7. Drainage Texture (Rt):

Infiltration capacity has got influence on drainage texture (Horton, 1945). Five different texture classes are represented by very coarse (<2), coarse (2–4), moderate(4–6), fine (6–8), and very fine (>8) (Smith, 1950). As per this classification, Halinurusub-watershed has very coarse drainage texture, Hanumanthapurasub-watershedhave coarse Rt, andBugadanahalli, Maidala and Sankapurasub-watersheds have moderate Rt as the values shows in Table 5.Hydrologically based on the drainage texture characteristics basin lag time is more in case of very course texture watershed fallowed byother texture classes. In present study Bugadanahallisub-watershed (Rt = 4.79) exhibits the shortest duration for peak flow, whileHalinurusub-watershed (Rt = 0.97) exhibitslonger duration to peak flow.

3.8. Form Factor (Rf):

According to FarrukhAltaf, et al, (2013)the basins having high form factorsare having high peak flows of shorter duration, while elongated sub-watersheds with low form factors are having lower peak flowof longer duration.The values obtained from Table 6 indicating that theBugadanahalli, Hanumanthapura, Maidala, Sankapura and Halinurusub-watersheds showing lower values of formfactor, which indicates elongated shape and longer hydrograph peak. Flood flows in case ofcircular basins are faster than the elongated basins. The present study indicates that all the sub-watersheds are having longer hydrograph peak and are less susceptible for floodflows. Therefore it is indicating that Watershed hydrology is having larger impact fromwatershedmorphology.

3.9. Elongation Ratio (Re):

According to Schumn (1956) Elongation ratio is defined as the ratio between the diameter of the circle of the same area as the drainage basin and the maximum length of the basin.Thevalues of elongation ratio (Re) generally exhibit from 0.6 to 1.0 associated withsubsurface geology and different climate conditions. Values nearer to 1.0 are typical of areas of very low relief, while valuesfrom 0.6 to 0.8 are typical of areas with high relief and steep ground slope (Strahlar, 1964). Re values are classified into three categories, viz, circular (>0.9), oval (0.9–0.7), andless elongated (<0.7)(FarrukhAltaf, et al, 2013).Aelongation basin is less efficient in the discharge of run-off than the circular basin (Singh, and Singh, 1977).From the study it is showing that Re valuesforBugadanahalli, Hanumanthapura, Maidala, Sankapura and Halinuru sub-watersheds is less than 0.70 which indicates that all sub-watersheds of the study area belong to elongated basin with steep slope and high relief.

3.10. Circulatory Ratio (Rc):
According to Miller, (1953) Rc is that ratio of the area of the basin to the area of circle having the same circumference as the perimeter of the basin.In the present case, Rcfor Bugadanahallisub-watershed is 0.54 suggestingthat the area is exemplified by high relief, elongated and permeable surfaceresulting in greater basin lag time,whereasHanumanthapura, Maidala, Sankapura and Halinurusub-watersheds have lower circularity ratios is in range from 0.29 to 0.41 suggestingimpermeable surface and low reliefresulting in lower basin lag times(Table 6). This suggests that Hanumanthapura sub-watershedwill show shorter time to peak flow, while Bugadanahallisub-watershed will show longer time to peak.

3.11. Length of Overland Flow (Lg):
According to Horton, (1945) the length of overland flow approximately equals half of reciprocal of drainage density. Hydrologic and hydrographic development of watershed depends mainly on thelength of overland flow (Horton, 1932). Table 5 shows thatLg for the Hanumanthapura, Maidala, Sankapura and Halinurusub-watersheds in chronological order is 0.33, 0.28, 0.23, 0.24 and 0.47 respectively.TheLg for Hanumanthapura, Maidala and Sankapurasub-watersheds exhibitsshort flow paths and steep slopes, whereasLgfor Bugadanahalliand Halinurusub-watersheds suggestlongest flow paths and gentle slopes.

3.12. Constant of Channel Maintenance (C):
According to Schumn, (1956) constant of channel maintenance isthe reciprocal of the drainage density (D) and signifies how much drainage area is required to maintain a unit length of channel. From the values obtained in Table 5 showing that C value ranges from 0.46 for Maidalasub-watershed to 0.93 for Halinurusub-watershed. Low values in case of Maidalasub-watershedsuggests that it is associated with sparse vegetation, very low-resistance soils, and rocky terrain, while the watershed Halinurusub-watershed is associated with good vegetation, resistance soils, and comparably plane terrain as proposed by FarrukhAltaf, et al, (2013) elsewhere.

3.13. Shape Index (Sw):
According to Horton, (1945) shape index of the watershed suggests the rate of flow of water and yield sediment along the length and relief of the subwatershed.In the present study shape index values ranging from 2.64 in Halinurusub-watershed to 5.26 in Hanumanthapurasub-watershed as shown in Table 6. In terms ofSw only, Hanumanthapurasub-watershed will havethe shorter basin lag time, while Halinurusub-watershed will have the longer basin lag time.

3.14. Texture Ratio (T):
Texture ratios of sub-watersheds in drainage morphometric analysis are mainly influenced byrelief, infiltration capacity of surface and underlying lithology(FarrukhAltaf, et al, 2013). T value varies between 0.74 in case of Halinurusub-watershedand3.54 in case of Bugadanahallsub-watershed (Table 6). Hydrologically, it can be said that Halinurusub-watershedhas the longer basin lag time followed by Hanumanthapura, Sankapura, Maidalaand Bugadanahallsub-watersheds has the shorter.

3.15. Ruggedness Number (Rn):
The structural complexity of the area and its relationshipwith the relief and drainage density is indicated by ruggedness number, which also suggests the area is susceptible to soil erosion (Zaz, et al, 2012). Rn is minimum in case of Halinurusub-watershed (Rn= 0.08) and maximum in Hanumanthapura and Maidalasub-watersheds (Rn = 0.84)(Table 5),Suggesting that Halinurusub-watershed is less susceptible for erosion,whereasHanumanthapura and Maidalasub-watersheds are more susceptible for erosion.

IV.CONCLUSION
Remote sensing and GIS techniques are considered to be powerful tools in the determination of morphometric parameters. The morphometric analysis indicates that all the 5 sub-watersheds are exhibiting dendritic to sub dendritic drainage pattern. The stream length ratios of all sub-watersheds are varying due to changes in slope and topography of the terrain. The topography, underlying subsurface lithology, geomorphology and existing vegetation are directly influencing on the hydrological response of the sub-watersheds. The entiresub-watersheds are exhibiting differential hydrological behavior due to the spatial variation in the morphometric parameters.It is concluded that comparatively Sankapura and Maidalasub-watersheds are contributingmore to the stream runoff in the Tumkur-Gubbi watershed of Shimsha riverbasin, and on the contrary, Halinuru, Bugadanahalli and Hanumanthapurasub-watersheds are contributing lessdue to significant influences on the hydrological behavior from the morphometric parameters. Based on the morphometric parameters affiliationHalinuru, Bugadanahalli and Hanumanthapurasub-watersheds are associated with plane terrain, resistance soils,good vegetationcover, permeable subsurface materials and longer basin lag time resulting in higher infiltration capacity and comparably are better sites for ground water recharge compared to Sankapura and Maidalasub-watersheds.Present investigation provides information for selecting suitable site for ground water recharge atTumkur-Gubbi watershed of Shimsha river basin. Finally it is concluded that the morphometric analysis is very essential and significant in all hydrological investigation for development and management of watershed.

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