International Journal for Research in Engineering Application & Management (IJREAM)
ISSN : 2454-9150 Vol-08, Issue-01, APR 2022

Modelling of Latur Sub-region by Using QGIS 3.16

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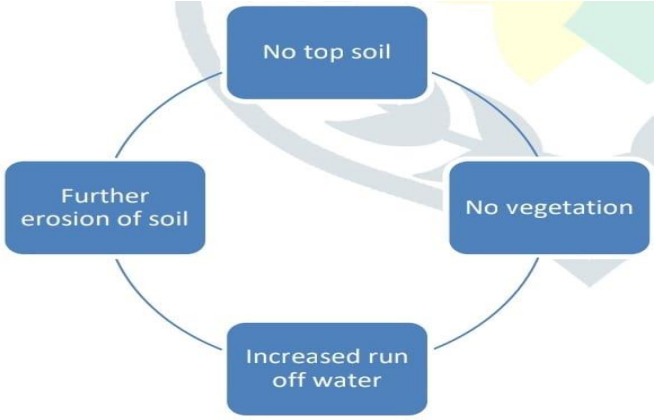
ABSTRACT **- In this project we made an attempt to be familiar with the topic of " WATERSHED MANAGEMENT BY USING QGIS 3.16.As India is facing scarcity of water, so watershed management is the only option for development of rural Area. Advances in data utilization through geographic information systems (GIS), and data sharing through the internet have provided watershed managers access to more information for management decisions. In the future, applications incorporating hydrologic simulation models, GIS and decision support systems will be deployed through the internet.**

KEYWORDS: Watershed Management, information Technology, internet, geography, geographical information systems, spatial analysis

I. INTRODUCTION

Watershed management decision making is inherently complex . watershed management means the rational utilization of land and water resources of watershed or optimal production with minimum hazards to natural resources, protect critical terrestrial and aquatic habit, prevent soil erosion and based economic activity while concurrently managing the pressure of an urbanized landscape. Water is life, in all forms and shapes. This basic yet profound truth eluded many of us in the second half of the 20th century. Water professionals and scientists around the world are ringing the alarming bells of an impending water crisis. Yet attempt to address sum of issues or to offer partial solutions met with limited success. The ever-growing population and comimitment expansion of agriculture and industry have placed increasing demand on the limited water resources. Watershed is the drainage area on the land surface from which runoff or excess water from rainfall reach at a special point known as common outlet. It is the common point from the which the excess amounts of water collected and distribute through a outlet to the connecting sources.



Watershed development aims to balance the conservation, regeneration and use by humans of land and water resources within a watershed. Common benefit from successful watershed development project include improved agricultural yield and increased access to drinking water. GIS is a very powerful tool for development of the watershed area with all natural and socio- economic facts for better planning ,excavation and monitoring of the project. It give a clear perspective for analysis at various levels to different partners of the watersheds.

II. THE STUDY AREA

Latur is one of the draught-prone district of Marathwada region of Maharashtra state. The most of the area of Latur Taluka is categorised as semicritical. The normal annual rainfall of Latur Taluka varies from 650 to 800 mm only . In addition ,rainwater is not efficiently percolated in to the ground because of deforestation and silt deposition in the stream network of Manjara river catchment .This has lead to decline of ground water level over a period of time. Thus an urgent need to adopt an integrated approach develop ground water resources by harvesting rainwater through.

1]Artifical ground water recharge structure, say recharge well, injection well, check band etc.

2] Removal of Silt deposited in the nallas tree plantation activities.

The total area watershed covered by 2613.45

Hydrology / type of soil.

1 st Layer- Black cotton soil approximate depth= 1 to 5m.

2 nd Layer- Hard murum with Boulder approximate depth =4 m

3 rd layer – jointed rock approximate depth= 3.50m

4 th Layer – Red soil /Red Murum approximate depth =2.5m

5 th layer – Manjara basin particular approximate depth =4m

6 th layer- structured rock vertical approximate depth =4m.

7 th layer- solid machine rock /deccan trap basal

 DOI : 10.35291/2454-9150.2022.0147

III. METHODLOGY

1. Site selection:
   The selected watershed is comprised of four villages, named Akharwai, Bhoisamudrga, Jewali and Taklibardpur, which have been situated in Latur district of Maharashtra. The study area watershed lies between geographical latitudes 85.14139 N and 20.86742 E. The location is 15 km from Latur city. The rainfall ranges between 650 to 800mm. The temperature ranges between 20 to 35 degree Celsius.
2. Pre field work:
   In pre field work, we collected topographical sheet of Latur district ,open series map number E43K7 having scale 1: 50000 from survey of India and studied previous year data about watershed management and development in that area.

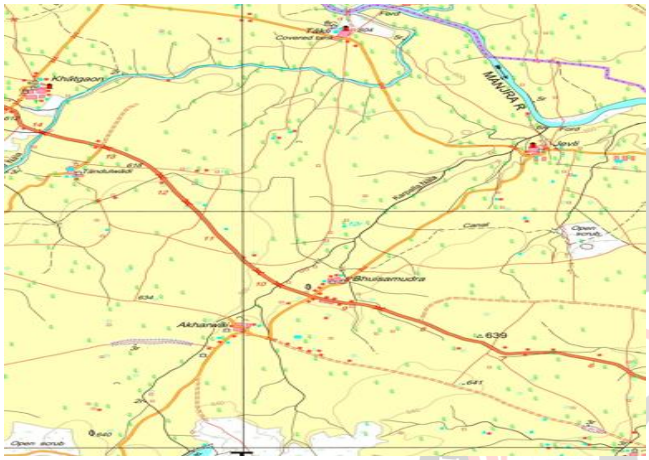


Fig.2 Toposheet Of The Area

3. Field Investigation:

A] survey of watershed area: in preliminary survey we studied about the selected region considering various parameters.

B] data collection from site

4. Watershed Modelling:

The software used for watershed delineation is QGIS 3.16

A] **Digital Elevation Mode**l: selection of DEM image N18E076 from SRTM
downloader using OSMstandard from QuickMapServices

Fig.3 DEM Image Of Study rearea

B] Stream Parameters Analysis:

1) Stream Length: Stream length indicate the behaviour of surface runoff on the basin which has a significant role in the drainage basin system.
   Stream length = 16934.775 m
2) Bifurcation Ratio: It is defined as the ratio between the total number of the stream segment of one order to that of the next higher order in the drainage basin.
3) Stream Frequency: The stream frequency of a basin may be defined as the total number of stream segment within the basin per unit area.
4) Form Factor: Form factor is defined as the dimensionless ratio of the basin area to the square of the basin length.

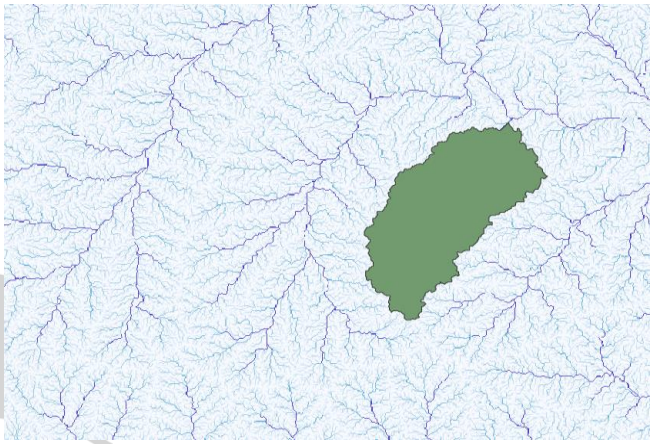


Fig.4 Drainage Line Of Study Area

C] Basin Geometry parameters

1) Drainage Density: It is defined as the ratio of the total length of the stream over the contributing area
   Drainage density= 16934.775/26440670.910= 0.64 x 10>-3
2) Texture Ratio: It is the ratio of the total number of stream segment per perimeter of watershed.

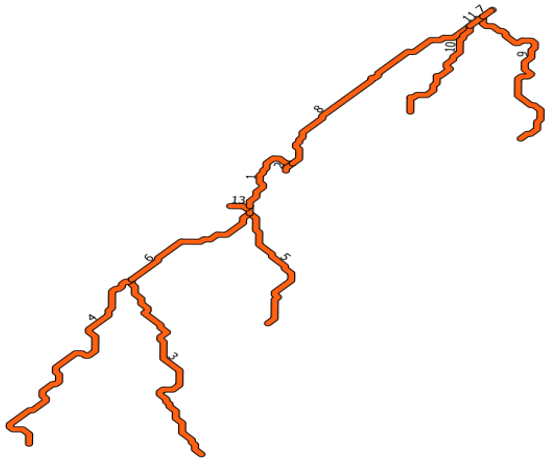


Fig.5 Drainage Length

D] Relief Parameter Analysis

Relief is the elevation difference between reference points located in the drainage basin.

Maximum relief: Elevation difference between highest and lowest point.

Relief ratio: Ratio of relief to horizontal distance on which relief was measured.

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Ruggedness number: It is the product of relief and drainage density.

E] Watershed Delineation

Accurate delineation of a watershed plays an extremely important role in the management of the watershed. The delineated boundaries form the nucleus around which the management efforts such as land use, land change, soil types, geology and river flows are analyzed and appropriate conclusions drawn.

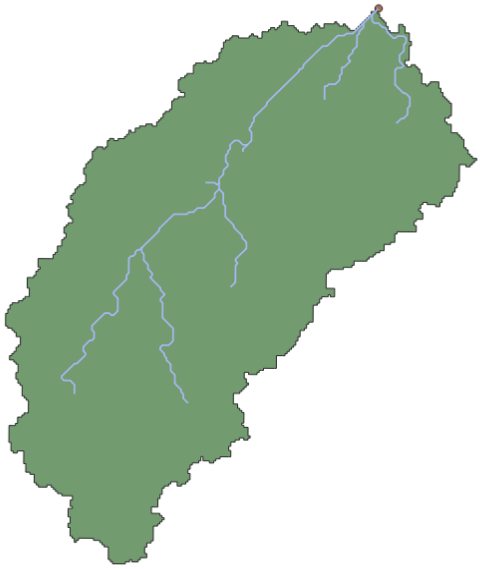

Fig.6 Watershed Delineation

STEPS:-

OSM Standard from Quick Map services
Selection of NI8E076 DEM From SRTM Download
Reprojected DEM by wrap project
Filled DEM fill sinks (wang & lev)
Strahler order use Raster calculate isolated lines
Channel network & drainage basing
Outlet point by new shape file-toggle edit save features
Upslope area
Convert Raster – vector
Project clipping

F] Runoff Analysis

The process of runoff generation continues as long as the rainfall intensity exceeds the actual infiltration capacity of the soil but at stop as soon as the rate of rainfall drops below the actual rate of infiltrate.

Runoff volume estimation

Volume= runoff area of catchment x runoff quantity

By using SCS curve number method

Q = (P-0.2S) >2/P+0.8S

Runoff volume =21.76x 10>6 cu.m

Results in loss of water from watershed which could have been used by the community for drinking, domestic use, irrigation, industry, mining etc. - results in sheet, rill, gully or ravenous erosion of soil from watershed.

Leads to decline in groundwater table and affects recharge adversely and results in damage to property and life.

Vegetation is a very crucial factor which affects erosion, runoff and climatic factors of the area. It provides food, fodder, fruit, fuel, forage, small timber to the community. The type, quantity and quality of vegetative cover in watershed influences runoff, erosion and sediment production, infiltration etc.

IV. CONCLUSION

Remote sensing, GPS and software are very useful to plan watershed structures like contour trench, gully plug, gabion structure, check dams, K.T. weir etc are quickly planed with the help of QGIS.QGIS is found very easy to use and provides more satisfactory result in short time as compare to conventional planning. The planning cost reduction is also significant. Gully plug are planned on first and second order small streams with gentle slope. suitable site checks are necessary before actual implementation of project. Water shed development program is very vital for the development of the village as well as country. Method applied can be also used to another watershed. Virtual model of area is done by using topographical data of area is designed by using GIS tools.

Fundamental of watershed and amalgamation with GIS technique can be successfully implemented in new watershed. Future scope includes applying same methodology to new area.

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