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A Study on Watershed Management in Surampalem Village

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Abstract: ***Watershed management will helps in developing as tools of integrated ecological and economic study, it is involving the management of land, water, and other resources in a defined area for ecological, social, and economic purposes by incorporation of technological advancements, such as remote sensing, GIS,. in this paper watershed management information system had been developed based on geographic information system and remote sensing technology. We were consider the Surampalem Village for our study to calculate the storm water impact on soil erosion and the impact of storm water on agriculture land and the natural vegetation. This study will hepls in improving the irrigation facilities and helps in developing the seasonal crops in the village.***

Keywords: Watershed, storm water.

I. INTRODUCTION

A. General

The District of East Godavari, like most ultra-rural areas, experience increases storm water runoff that results from development. This runoff places a burden on sewer systems and degrades aquatic resources when it is not managed adequately. Unmanaged storm water runoff overloads the capacity of sewers and is responsible for increased combined sewer overflow events.

The storm water runoff occurs when the rainfalls over the infiltration land such as roadway, walk way, parking lots, rooftop and other surface that prevent the infiltration of storm water and. This runoff volume increase and flooding problem generate in city. This runoff existing in the drain in near lake and river. The sedimentation, nitrogen, bacteria, phosphorus, oil, grease, trash, pesticides, metal and other matter pollute the storm water in urban areas. The storm water drain in sewer line to meet the sewage water its more pollute, then after drain in lake or river the other industrial wastewater pollutes the storm water.

The watershed management practice to prevent the pollution of runoff and use in storing tank and water infiltration in ground. watershed management is the science of managing storm water runoff to prevent adverse impacts on the environment. The main goal is to manage water quantity in addition to protecting water quality. This study to analysis of storm water impact, and give solution based on BMPs (Best Management Practice).To analysis the runoff and planning to managing runoff flow.

B. Need To Study

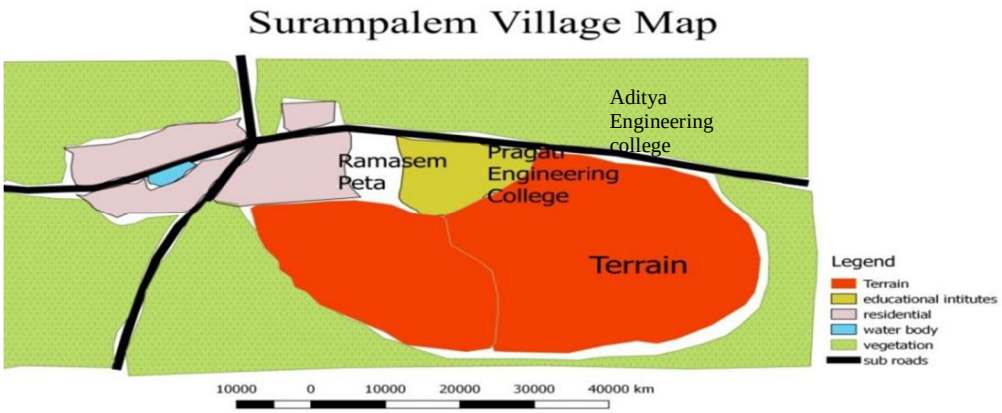
1) To manage Storm water runoff it occurs flooding in surampalem village.
2) The lack of the proper drainage system it occurs the overflow into sewer line.
3) Due to erosion of land it occurs sedimentation into sewer system.
4) The rain is main source of pure water, this rainwater discharging into river is already polluted by industrial waste and sewer system its west of Storm water.
5) Lack of infiltration of rainwater in ground due to urbanization, it is require to recharging of groundwater.

II. STUDY AREA

1) *Location:* The study area of Surampalem village is situated in Gandapalle Mandal of East Godavari district at a distance of 29 km from district head quarters. 82.057 E, 17.0814N.
2) *Area:* The catchment area of the surampalem village is 575881 square meters.
3) *Size and shape:* The size of the catchment area is moderate and it is in irregular shape.
4) *Physio-graphic and Drainage:* The Surampalem is characterized by Impervious layers, pervious layers, Educational institutions, roads,vegetation and residential buildings.
5) *Elevation:* Highest elevation of study area is 104 meters and lowest elevation of study area is 74 meters.
6) *Climate and Rainfall:* The normal rainfall of this area is 945mm. Rainfall collected from 2008 to 2017.When coming to the month of June 2018 to 2019 march reports,the normal rainfall of this area is 728.7 mm.The summer temperature touches around 36º to 38.3°C and winter temperatures with 20°C to 22°.C.

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7) *Soils:* A major portion of the area is covered by red soils. Red loamy soils constitute 57%, red sandy 34%, while the remaining is covered by black clay, black loamy, black sandy and red clay. Percolation capacities are more the water holding capacity is very less as it contains high organic matter.
8) *Educational Institutions*
a) Pragati engineering college
b) Aditya engineering college



A. Crops of Surampalem Village

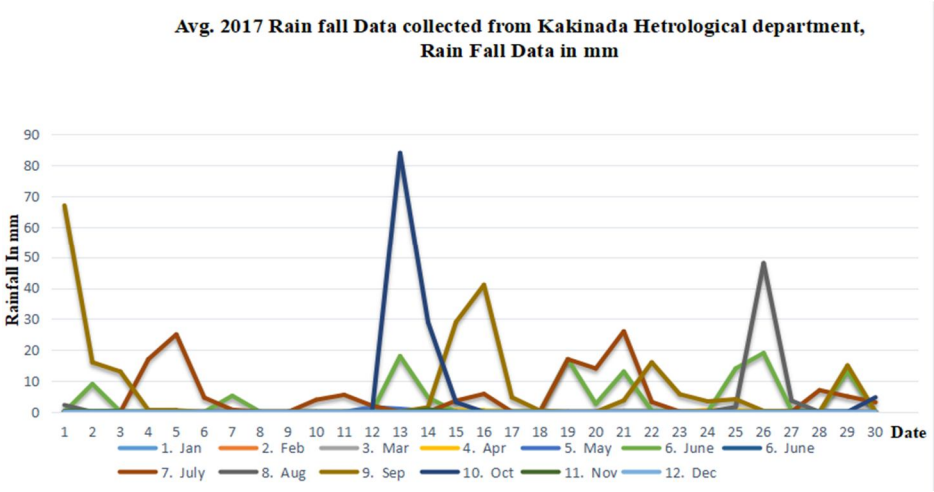
This area is most suitable for growing, Horticulture crops especially temperate fruits like mangoes, papayas , watermelon and sugarcane etc. In view of this, the farmers are switching over to the cultivation of watermelons. The only problems in growing the fruit crops is lack of irrigation facilities and lack of technical issues ..etc

III.METHODOLOGY

1) Geographical study of study area (surampalem village) .
2) Digitizing of various land use characteristics by using GIS(Geographical information system).
3) Creating of contour maps by using SURFER 15 helps in determining the elevation at different points .
4) Collection of rainfall data for ten years period (2008-2018) ,from Hydro meteorological department Kakinada ,East Godavari district .
5) Forecast of rainfall by using from the previous data .
6) Sustainable methods for collection and storing of runoff storm water.

Table : Rainfall data is collected from hetero-logical department, Kakinada.

S.No	Month	Avg Rainfall
1.	Jan	0.1
2.	Feb	0.2
3.	Mar	0.7
4.	Apr	2.4
5.	May	3
6.	June	116.8
7.	July	142.8
8.	Aug	183.3
9.	Sep	252.9
10.	Oct	187.2
11.	Nov	26.4
12.	Dec	0



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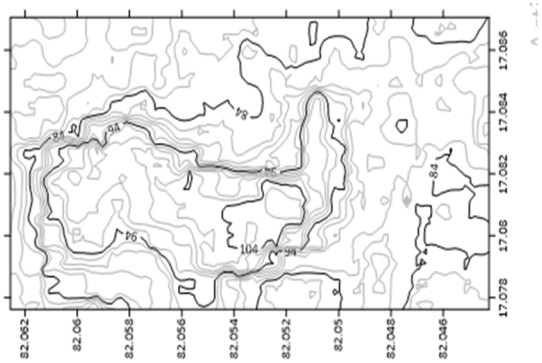


Figure 4: Contour Map of the Surampalem Villege

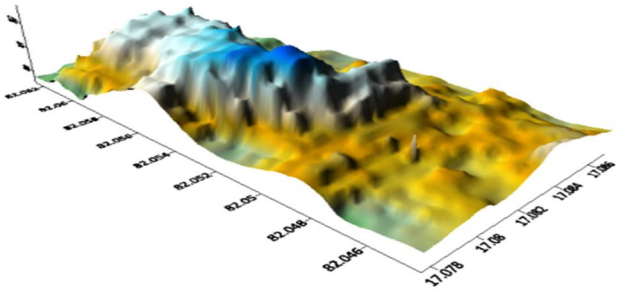


Figure3: Degital Elevation Modal of Terrain near Surampalem Villege

A. Creation of Contour Map

Contour map can be created by make use of modern tools like Google earth pro and golden surfer software, by integrating these software will helps in creating of digital elevation model of the geographical area and assists in laying of collecting channels from the terrain based on the levels in the village. This will also helps in calculation of catchment area and storm water quantity.

B. Factors Affecting the Quantity of Stormwater

The surface run-off resulting after precipitation contributes to the stormwater. The factors affecting the quantity of stormwater flow are as below:

1) Area of the catchment
2) Slope and shape of the catchment area
3) Porosity of the soil
4) Obstruction in the flow of water as trees, fields, gardens, etc.
5) Initial state of catchment area with respect to wetness.
6) Intensity and duration of rainfall vii. Atmospheric temperature and humidity
7) Number and size of ditches present in the area

C. Methods for Estimation of Quantity of Storm Water

1) Rational Method
2) Empirical formula method

In both the above methods, the quantity of storm water is considered as function of intensity of rainfall and coefficient of runoff and area of catchment

The typical runoff coefficient for the different ground cover is provided in the Table:

Type of Cover	Coefficient of runoff (k)
Business areas	0.70 – 0.90
Apartment areas	0.50 – 0.70
Single family area	0.30 – 0.50
Parks, Playgrounds, Lawns	0.10 – 0.25
Paved Streets	0.80 –0.90
Water tight roofs	0.70 – 0.95

D. Calculation of Storm Water Quantity by using Rational Method

Storm water quantity can be estimated by rational method as below:

Storm water quantity, Q = C.I.A / 360

Where,

Q = Quantity of storm water, m3 /sec

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C = Coefficient of runoff
I = intensity of rainfall (mm/hour) for the duration equal to time concentration,
A = Drainage area in hectares
Where, Q is m3 /sec; I is mm/hour, and A is area in square kilometer

E. Empirical Formula Method

Volume of water runoff=Catchment area *Runoff (k=0.15) * Annual Average rainfall
In this paper we had calculated the volume of water Runoff by using Empirical formula method because it is one of the most Effective methods which will give accurate values.
NOTE: *k values ranges from 0.1 to 1*

F. Sample Design Calculations

Volume of water runoff =catchment area * run off coefficient (K) * annual area rainfall
= 575881 * 0.15* 949.5
=82019.9 m^3
According to 2018 reports
Volume of water runoff =catchment area *runoff coefficient (K)*annual area rainfall
= 575881*0.15*728.7
=62946.6m^3

IV. RESULTS AND DISCUSSIONS

A. General

Experimental studies have been undertaken to evaluate the Catchment area, volume of annual rainfall Runoff and Design of collecting Chamber. The collection of rainfall data and designing of collecting chamber is done by considering the above values obtained from the previous rainfall data.

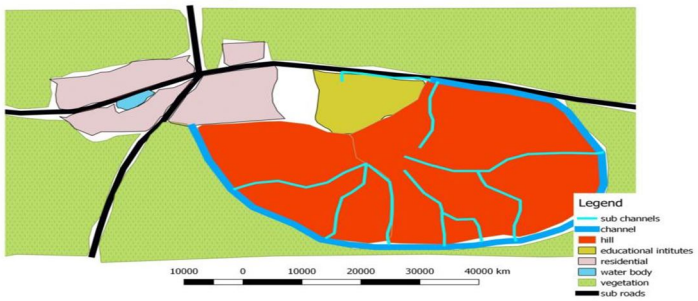


Figure 5: Collecting channels of Storm water

Collecting channels will helps in collect the storm water from the terrain area and these are connected to the main channel so that all the runoff water after the presentation and percolation will get collected by the collecting channels as shown in figure. The collected water further stored and used for the future use.

B. Summary And Conclusion Summary

The main aim of the present investigation was to Design a suitable watershed management system to Surampalem village, so that the rainfall runoff which is collected from the Catchment area can be collected in a suitable collecting chamber after Excluding all the losses.

V. CONCLUSION

To summarize the paper, the catchment area of Surampalem village are selected for design watershed management system. In order to select the best option for the watershed management, Three alternatives were considered, namely: Subsurface System, Rooftop System, Combination System the alternatives were compared economically and it was found that alternative , i.e. subsurface system of was found to be most economical. However, before finalizing it is important to consider other aspects of a watershed management system, like annual rainfall runoff, space availability, long term usability, aesthetics and environmental issues.

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A. Based on the experimental investigations carried out, the following conclusions are drawn

1) In this project we have explained about the watershed management system in Surampalem village.
2) Watershed management policies can protect one of our most important natural resources. The reduction of impervious surfaces can increase groundwater recharge and water quality.
3) By watershed management system, we can improve the ground water level, It is used for various domestic purposes.
4) There is a great need for the Implementation of watershed management system in rapidly developing areas like metro cities where there is a large impervious area which will helpful to meet the future needs of the human community.
5) Regular maintenance, cleaning and repair is required for the operation of a successful watershed management system.
6) The quality of storm water can be affected by air pollution, insects, and dirt or organic matter.
7) The supply of water from a watershed management system is not only limited by the amount of rainfall but also by the size of the collection area and the storage facilities.
8) The collected storm water is to be drained by using pipes through a particular area.
9) The collected water should be stored in a collecting chamber .
10) The aim of the project should design a suitable collecting chamber for collected storm water.
11) Study the collected storm water for future uses like domestic uses, irrigation purposes, horticulture purposes etc.

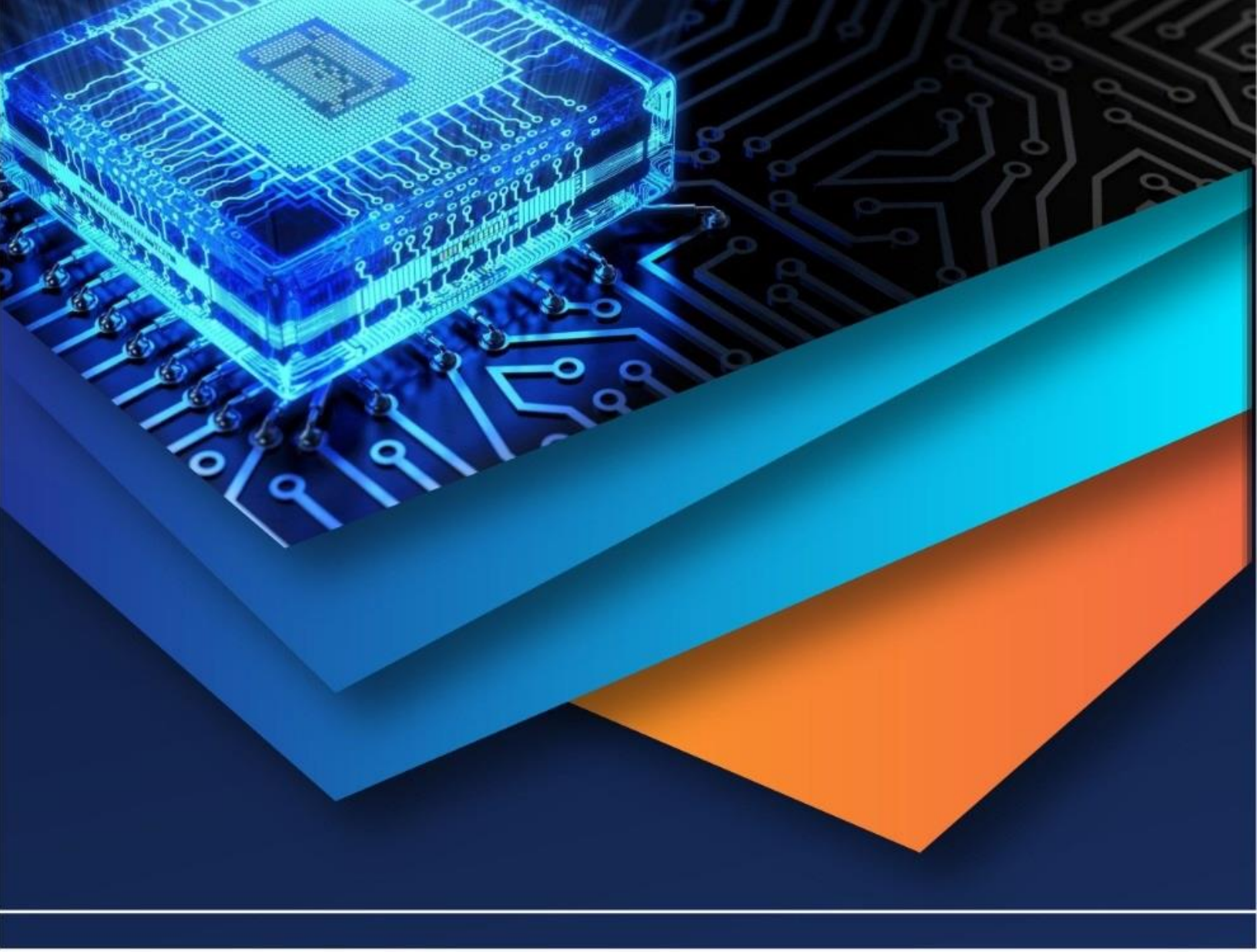
B. Scope for Future work

1) Improved ground water levels.
2) Assured and water supply for various domestic purposes.
3) Quality improvement owing to dilution of ground water.
4) Failure of bore wells will be reduced.
5) Better storm water management practices leads to a healthy Environment.

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