GEOENVIRONMENTAL APPRAISAL OF UPPER BUDAMERU RIVER CATCHMENT USING REMOTE SENSING AND GIS

T. Rambabu[1], P. Sankara Pitchaiah[2] , P.Raghuram[3] and P.A.R.K. Raju[4]
1&3 Assistant Professor, Geospatial Information Centre, SRKR Engineering College, Bhimavaram-534204
2 Professor, Dept. of Geology, Acharya Nagarjuna University, Nagarjunanagar, Guntur-522510.
4. Professor, Dept.of Civil Engineering, SRKR Engineering College, Bhimavaram-534204
e-mail: rambabu.tenneti@gmail.com, popuri.raghuram@gmail.com, profpsanu@gmail.com & profparkraju@gmail.com

Abstract

Budameru is the second largest watershed that joins Kolleru Lake, which is having an area of about 1826 Sq. Km. The Upper Budameru river catchment is digitized with the aid of geospatial data. Drainage, water resources, land use and transport network carried out using IRS P6 LISS-III satellite data. The catchment area comprises of two districts and it is covered in 12 mandals and 120 villages. Nearly 143 habitations are located in them. Most of the habitations are villages developed mostly along the banks of river Budameru. Out of 143 habitations, 89 are situated close to the river Budameru. The drainage pattern of the upper Budameru area is evenly distributed and the predominant drainage pattern is dendritic. The transport network is good. Land use study indicates that the most of the area is under agriculture, and dense forest cover.

Key words: Watershed, Water resources land use, transport network, Remote Sensing and GIS.

1. Introduction

Kolleru Lake is the biggest shallow fresh water lake body in Asia, spread over three districts West Godavari, Krishna and Khammam districts of Andhra Pradesh[1]. The lake is fed directly by water from seasonal Budameru, Tammileru and Ramileru rivulets. Kolleru Lake maintains its connection with Bay of Bengal through a 60 km long complexly meandering tidal channel Upputeru.

Budameru is one of the rivers connected to Kolleru Lake. It is originated from Kondavagu and Palavagu are generated by small streams flowing from Chimalapadu south and north reserve forests and also from Krishnarao palem reserve forest. During the passage of river Korulavagu and Pulivagu joins Budameru, originate from Rangapuram reserve forest. Budameru River joins the Krishna River between Pata Ibrahimpatnam and Tummalapalem. Later the canals, Vanneru and Dosapadu join with Budameru and finally merged with Kolleru Lake. The average rain fall in the study area is about 940.72 mm.

2. Study Area

The entire Budameru watershed classified into two sub watersheds viz. upper Budameru and lower Budameru watersheds. The present study confined to upper Budameru watershed. It lies in the northern portion of Krishna River and having coordinates of 16° 30' N to 16° 57' N latitudes and 80° 28' E to 80° 48' E longitudes. The location map of the study area is shown in figure 1.
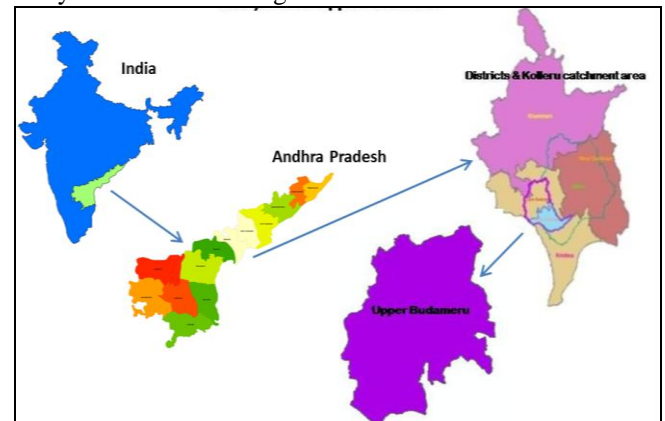

Figure 1. Location map of the study area

3. Methodology

Image characteristics of land use / land cover classes carried out using IRS P6 LISS-III satellite data. Survey of India toposheets (1:50,000) are taken as base map for primarily interpolation of spatial features. Forest boundaries, major and minor roads, railway networks etc are extracted from Survey of India toposheets. Preliminary interpretation observed on satellite data are delineated on screen using standard classification system[2,3]. Field work is carried out simultaneously in selected / areas within the watershed and necessary modifications are made.

4. Results and Discussions

The catchment area of upper Budameru watershed covers an area of 1069.73 sq.km. In this, about 1031.73 sq.km is located in Krishna district while the rest 38 sq.km is in Khammam district. The study area comprises of 12 mandals, in which 11 mandals are located in Krishna district are Konduru, Agiripalli, G. Konduru, Gannavaram, Ibrahimpatnam, Mylavaram, Nuzividu, Reddigudem, Veerulapadu, Vijayawada Rural and Vissannapeta and only one mandal Yerrupalem in Khammam district. Number of mandals and their aerial extent are shown in table 1.

4. a. Transport Network

The upper Budameru catchment area is well connected by road and rail networks. Majority of the population in the watershed are greatly depending on the network of well distributed roads. Most of the roads in the study area are minor and all these roads are connected with major roads. The ma-

jor roads are divided from National Highway which has a length of 9.274 km and again connected with minor and other roads. Besides these roads, a South Central Railway line is passing through this area with a length of 26.67 km. All the classes regarding transportation network are shown in figure 2.
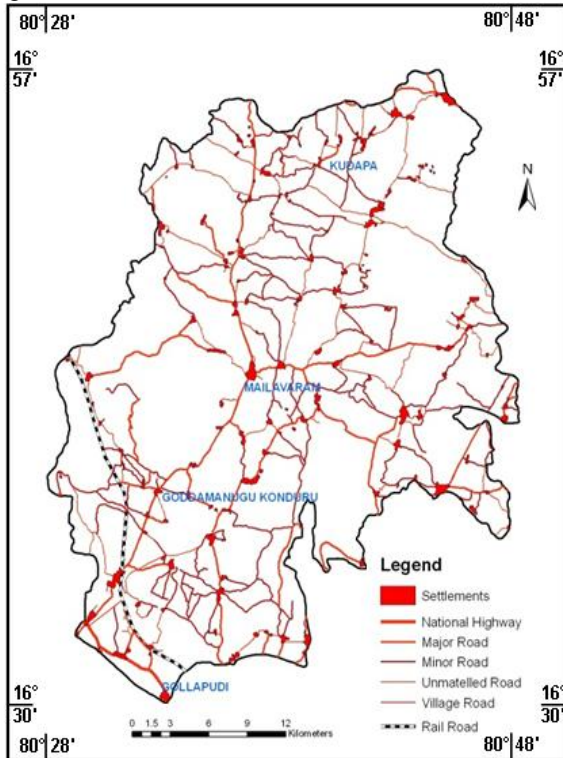

Figure 2. Transport network map

Table 1. Mandal-wise aerial extent of study area

S.No	Mandal name	Area in Sq.km
1	Yerrupalem	38.556
2	Konduru	60.789
3	Agiripalli	113.482
4	G.Konduru	232.258
5	Gannavaram	2.724
6	Ibrahimpatnam	67.836
7	Mylavaram	207.425
8	Nuzividu	58.799
9	Reddigudem	153.407
10	Veerulapadu	0.006
11	Vijayawada rural	109.733
12	Vissannapeta	24.723

4. b. Drainage and Surface Water Resources

The drainage pattern of the upper Budameru area is evenly distributed and the predominant drainage pattern is dendritic.It is observed that the principal streams present in the study area are Palavagu, Pulivagu, Korulavagu, Kondavagu and Kumpanivagu. The total extent of water bodies and the natural drainage are shown in figure 3.
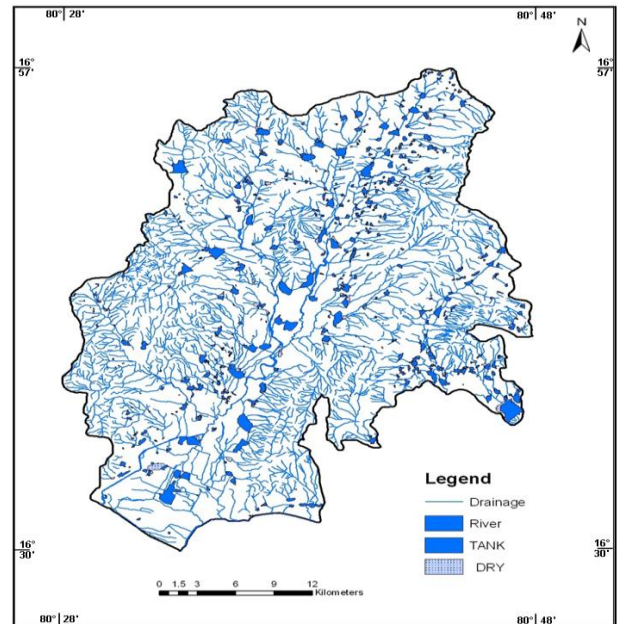

Figure 3. Drainage and Surface Water Resources

The water bodies comprise surface water either impounded in the form of ponds, tanks and reservoirs or flowing as streams, rivers, canals etc. the dry tanks which are having no water but they have some wetness in their nature. The tanks with varying dimensions are delineated from satellite image. Upper Budameru area covered with 514 tanks having 41.41 sq.km in area. Most of these tanks are seasonal. Many of the tanks (82.4%) are dry while the remaining is categorized as wet.

4. c. Land Use / Land Cover

Land use / land cover[4] is also done through the aid of satellite image. Through the visual interpretation analysis; land used for manual needs such as built up land, agriculture, canal system, road network, rail network and etc is measured. Besides, land covered by natural features such as forests, hills, rivers, natural streams, lakes, oceans, ponds and etc are delineated and shown in figure 4..
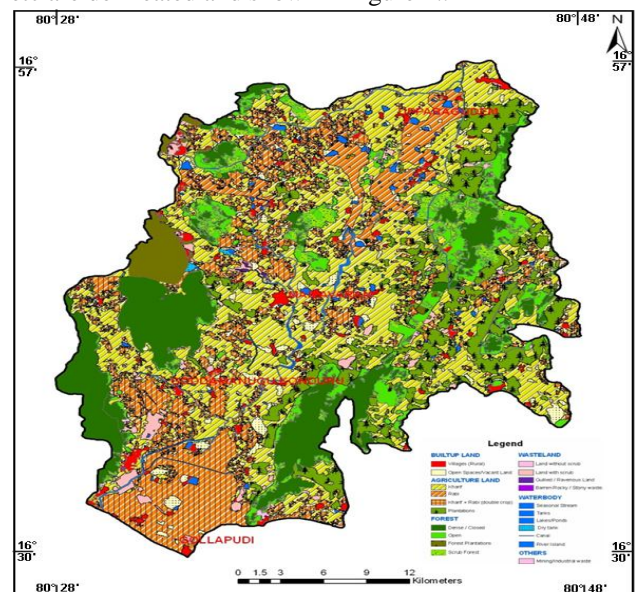

Figure 4. Land use / Land cover map

The information about all the land use / land cover classes, its area and percentages are shown in table 2.

Table 2. Aerial extent of various Land Use / Land Cover classes

Land Use /Land Cover Class	Area in sq.km	% of Area
Built-upland	22.057	2.061
Open Spaces/Vacant Land	0.687	0.006
Industrial area	6.329	0.591
Kharif	352.781	32.978
Rabi	46.671	4.362
Double Crop	182.385	17.049
Plantations	117.873	11.019
Dense / Closed Forest	167.539	15.661
Open Forest	3.852	0.360
Forest Plantations	1.039	0.097
Scrub Forest	21.49	2.009
Seasonal Stream	3.681	0.344
Water channel area	3.626	0.338
Canal	6.521	0.609
Tanks	11.982	1.124
Dry tank	30.003	2.804
Land with scrub	13.891	1.298
Land without scrub	1.687	0.157
Gullied / Ravenous Land	0.433	0.040
Mining/Industrial waste	0.235	0.022
Barren Rocky / Stony waste	0.4896	0.045
Total	**1069.725**	**100**

From the table, it is observed that the most of the area is under agriculture (32.978%) and dense forest cover (15.661%). Paddy is the major crop. Good vegetation cover is spread over the area. With the afforestation measures, the vegetation cover is expanded in SW direction. Very dense forest is noticed in three mandals i.e., Veerulapadu, G.Konduru and Ibrahimpatnam.

5. Conclusions

Remote sensing is a powerful tool for spatial data as input for GIS through which a detailed map can be generated. Upper Budameru catchment area comprises of two districts and it is covered in 12 mandals and 120 villages. Nearly 143 habitations are located in them. A good drainage pattern is present in the catchment and it is dendritic in nature. The transport network in the Upper Budameru area is good. Most of the habitations are villages developed mostly along the banks of river Budameru. Out of 143 habitations, 89 are situated close to the river Budameru. From land use analysis of the Upper Budameru it is observed that the most of the area is under agriculture and dense forest cover.

Acknowledgments

References

[1] http://www.lakekolleru.com/800x600/Index_Page/Index_page.html.

[2] Lillisand, T.M. and Kiefer, R.W., 2000, "Remote Sensing & Image Interpretation", John Wiley, New York.

[3] Sabins, Floyd F. 1997, "Remote Sensing Principles and Interpretation", 3rd Edition, Published by W.H Freeman & Co., New York.

[4] NRSA, 2006, Manual of National Land Use / Land Cover Mapping, Hyderabad.