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Land Use / Land Cover studies of some parts of Mogamureru River basin, Kadapa, by using Geospatial Techniques

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ABSTRACT

Land use/land cover (LULC) pattern of a region is an outcome of natural and socio-economic factors and their utilization by man in time and space. The increase in density of population is directly proportional to the land use/land cover. The present study shows the spatio-temporal dynamics of land use/cover an integrated survey based on satellite image interpretation corroborated with limited field checks was carried out with a view to assess the natural resources and environmental potential zones of some parts of Mogamureru river of Kadapa district, Andhra Pradesh falling in Survey of India Toposheet No.57 J/07. Land use/land cover map was prepared in Arc GIS 10.4, ERDAS Imagine 2014 through visual interpretation of IRS P6 LISS-III data and multi-temporal of the area. The area in terms of LULC can be divided into following classes: Barren land, fallow land, forest, built-up land, agriculture land and water bodies. Landsat 8 satellite imageries of two special time intervals, Landsat 8 thematic mapper (TM) of 2010-2011 have been obtained via global land cover facility site (GLCF) and earth explorer website and quantified the changes in the year 2010-11. Supervised and unsupervised type methods have been employed using most chance techniques in ERDAS Imagine 2014. The images of the area have been categorized into six exceptional classes, specifically forest, barren/wastelands, built-up, water bodies, agriculture and fallow land. The outcomes indicate that over the past year, barren/waste land, built-up land and fallow land have been changed the total geographical area.

Keywords: Landuse/Landcover, Remote sensing, GIS, Landsat 8, Agriculture Land

1. Introduction:

Ground water is a dynamic and replenishable natural resource but in hard rock terrain availability of ground water is limited extend and its occurrence is essentially confined to fractured and weathered zones. Ground water occurrence, being subsurface phenomenon, its identification and location is based on indirect analysis of some directly observable terrain features like lithology, geological structures, geomorphic features and their hydrologic characters.

Analysis of remotely sensed data for drainage, geological, geomorphological and lineament characteristics of terrain in an integrated way facilities effective evaluation of ground water potential zones. Similar attempts have been made in generation of different thematic maps for the delineation of ground potential zones in different part of the study area. Analysis of remotely sensed data along with survey of India topographical and collateral information with necessary ground checks help in generating the base line information for ground water targeting. With the available space born multispectral data, the geological, and geomorphological and geo hydrological maps on 1:50,000 scale have been generated at operational level (Bhattacharya and Reddy, 1991). The occurrence and movement of groundwater in an area is governed by several factors such as topography, lithology, geological structure, depth of weathering, slope, land use/land cover, and interrelationship between these factors. To understand groundwater prospects of an area, integration of different thematic layers is required. In the hard rock terrain, availability of groundwater is limited and its occurrence is essentially confined to fractures and/or weathered horizons (Krishnamurthy et al.2000; Chandra et al.2006; Vijith, 2007; Suja Rose and Krishnan, 2009). The remote sensing systems provide synoptic coverage and accurate spatial information, which enable economical utilization over conventional methods of hydrogeological surveys. Rapid advances in the development of the GIS, which, provides spatial data integration and tools for natural resource management has been proved to be an efficient and successful tool for groundwater studies (Shahid et al.2000; Jaiswal et al.2003; Sreedevi et al.2005; Nageswara Rao and Narendra, 2006; Mondal et al 2008; Adham et al.2010)

With the capabilities of remotely sensed data and GIS techniques, numerous thematic maps can be integrated to produce a conceptual mode for delineation of ground water potential zones (Chowdhury et al.2009; Murthy and Mamob,2009; Gupta and Srivastava,2010.)

2. Methodology:

The study used a satellite imagery resolution is 23.5 meters. The digital data was correct by ERDAS Imagine version 2014. The main methodology of the work is prepared by Arc GIS 10.4 Software. Different types of land use land covers are prepared by GIS software. Location map were prepared by SOI Toposheet (1:50,000) scale. For preparation of Land use Land cover map were prepared by using LISS-III Imagery, resolution is 23.5 meter. The drainage map is prepared by SOI Toposheet and Imagery. Geocoded Satellite imagery 57J/07 (IRS LISS-III) utilized to extract the information resource base comprising various litho units and soils, dynamic resource including vegetation cover, forest, surface and sub-surface water resource land use pattern, drainage and communication net work and habitation distribution.

2.1 Study Area:

The study area lies between Longitude 78^0 15'- 78^0 25' E and Latitudes 14^0 20' – 14^0 30' N and forms of Kadapa district of Andhra Pradesh, falling in survey of India Toposheet No. 57 J/07. The area is approachable both by rail and road. Muttukuru, Nallacheruvupalle, Thimmapurampeta, Goturu, Alavalapadu, Peddajuturu, Gollalaguduru, Vemula, and Tallapalli are some of the important villages of the study area.

2.2 Preparation of base map:

The base map is the main requirement for any mapping using remote sensing techniques. In the study area we used SOI Toposheet No.57 J/3 (1:50,000scale) for base map preparation. The major features like roads, rivers, and drainage, forest area are traced on tracing sheet. The traced maps are converting with using GIS Software. The flow chart showing the methodology of land resources analysis is given in Fig.1.

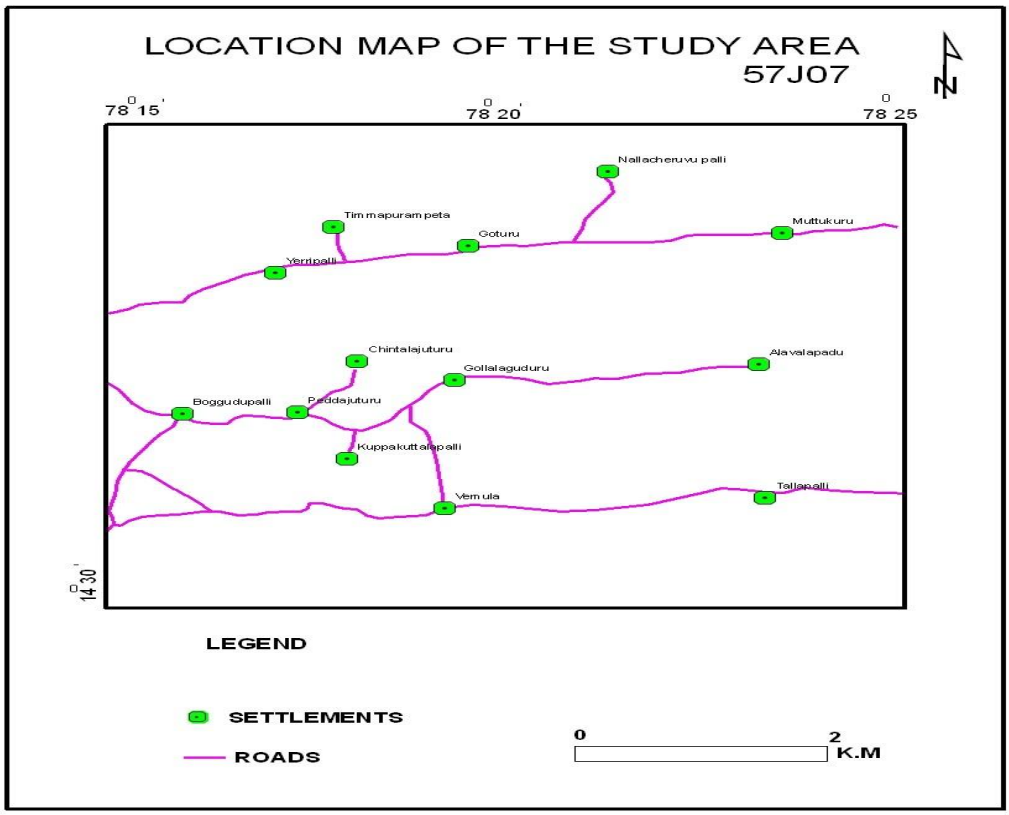

Fig:1 Location map of part of Mogamureru river Basin

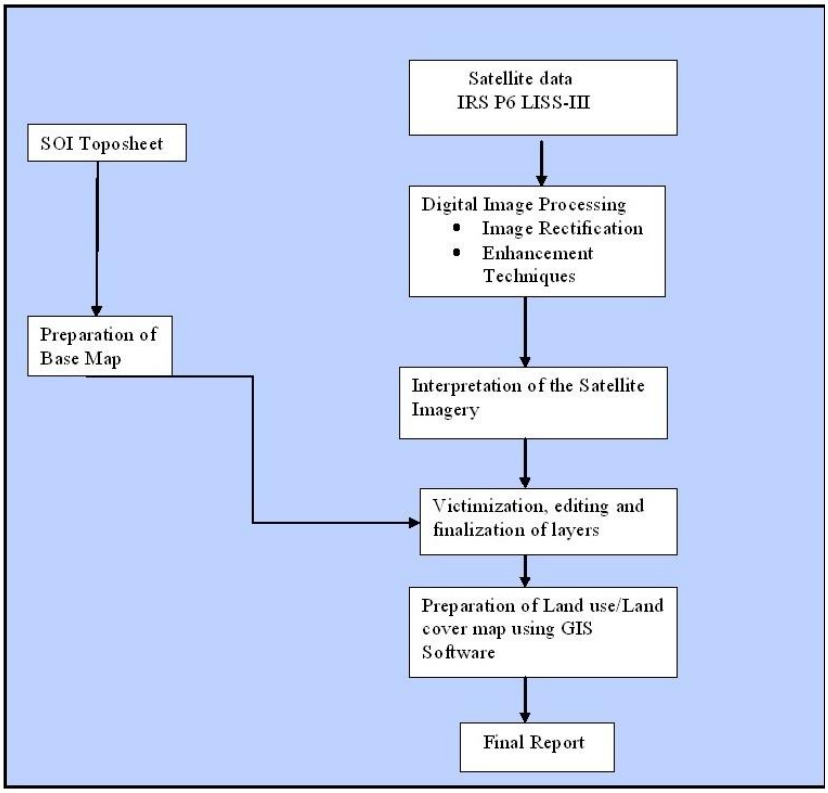

Fig: 2 Flow chart of study area

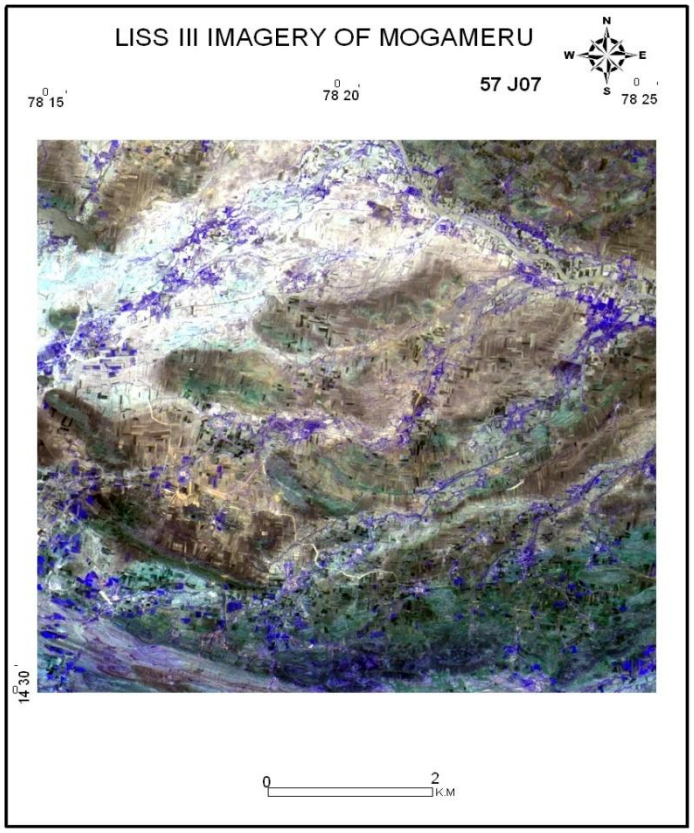

Fig: 3 Satellite imagery (LISS III) of Mogamureru river basin

3. Methodology:

Geocoded Satellite imagery 57J/07 (IRS LISS-III) utilized to extract the information resource base comprising various litho units and soils, dynamic resource including vegetation cover, forest, surface and subsurface water resource land use pattern, drainage and communication net work and habitation distribution. The thematic information pertaining to each resource is prepared by using geocoded satellite imagery and Survey of India Toposheet No: 57J/3. These pre-field thematic maps are modified substantiated and confirmed after limited field checks. The pre-field interpretation and preparation of various thematic maps viz, Geological, Geomorphological and Geohydrological maps for the studied area were carried out in the laboratory using geocoded satellite image and the corresponding Toposheet during January- April 2011, field checks were carried out along selected traverses for a period of three weeks in the month of January 2011. Then, post field interpretation by incorporating the field as well as the data interpreted in the laboratory and making of project report and finalization of the thematic maps over a period of three weeks in the month January-February 2011.

4. Results and Discussion

4.1 Geology:

The oldest rocks of the area belong to late Archean or Early Proterozoic Era which are successed by rocks of Dharwarian Age and both traversed by Dolorite dykes (Murthy al., 1979). The older rocks overlain by rocks of Cuddapah super group and Kurnool belonging to Middle and Upper Proterozoic Age. The main lithologic units consist chiefly of Quartzite, limestone, and shale. Alluviam consist of gravel .sand, silt and clay occurs along the river courses in the watershed.

GROUP	FORMATION	LITHOLOGY
Kurnool Group	Nandyal shales	Shale
	Koilakuntla limestone	Limestone
	Panyam quartzite	Quartzite
----------Unconformity----------		
Papagni Group	Vempalli formation	Cherty dolomite mud
		Stone/Shale
	Gulcheru quartzite/Conglomerate	
----------Unconformity----------		
Peninsular Gneissic Complex Gneisses, Schist, Granitoids with acidic and basic intrusive.		

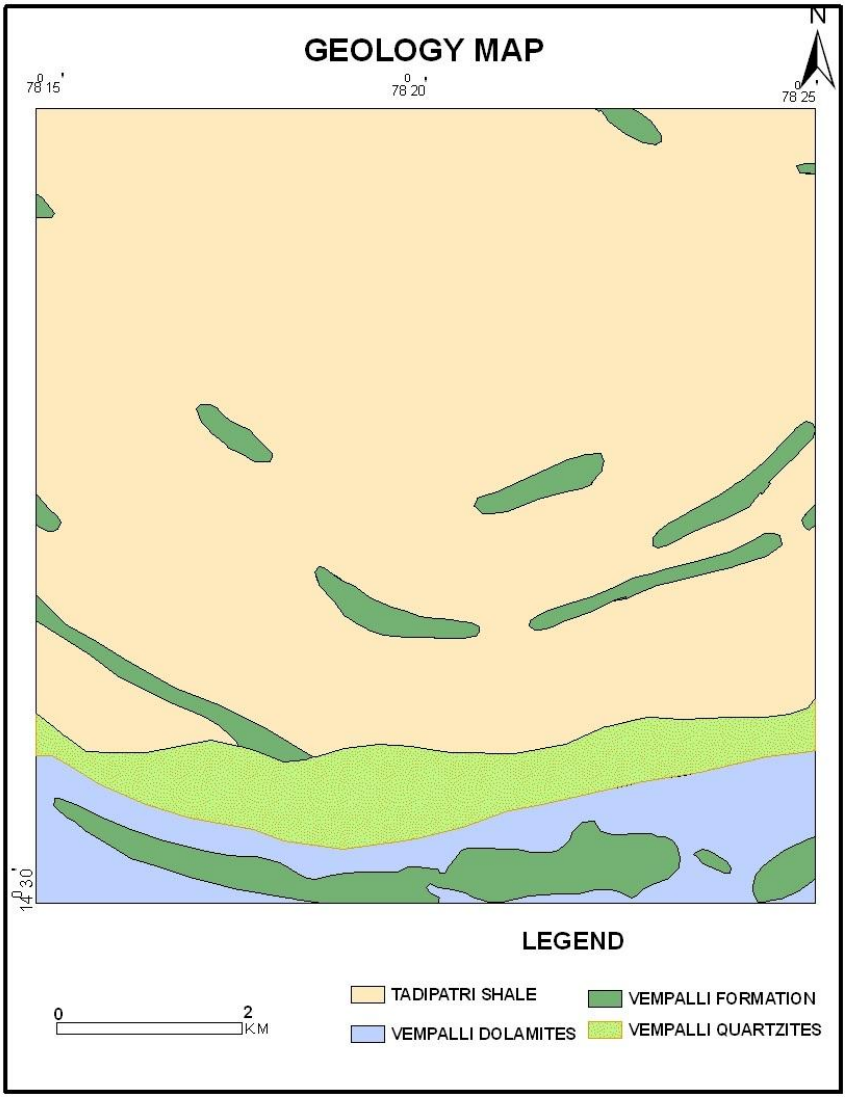

Fig: 4 Geology map of the Mogamureru river basin

4.2 Physiography and Drainage:

The North-east and Southern part of the study area is covered by high hills/ridges and valleys. The Mogamureru river is flowing through Nallacheruvupalle, Thimmapurampeta,

Goturu, Alavalapadu and Peddajuturu, Muttukuru villages and confluence with Papaghni river near Animola village.

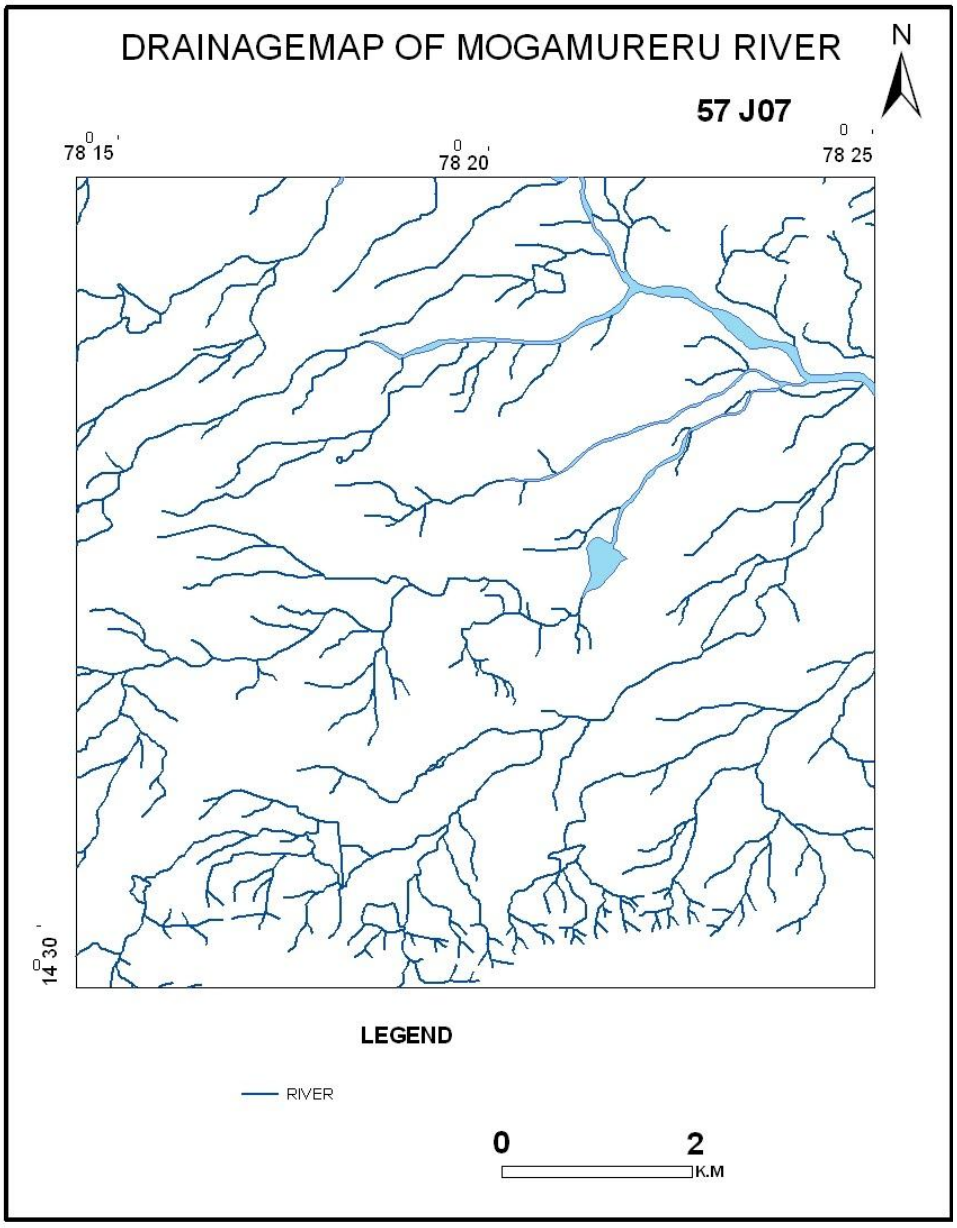

Fig: 5 Drainage map of the study area.

4.3 Geomorphology:

Geomorphology involves study of landforms, reconstruction of process responsible for their origin and study of influence to tectonics in time space frame. The Geomorphological mapping includes inventory and classification of landforms. Each landform depend by its composition depth of weathering structural frame and the environment which includes soil cover, hydrology and hydrogeology. The landforms are classified on the basis of mode of origin, relief slope factor and surface cover. The landforms occurring in the area as grouped as denudational hill,residualhill, pediment, pediplain, cuesta, structural hill, structural velley, and linear ridge. The Geomorphological mapping is important for understanding resource potential, resource utilization, resource depletion and depletion and degradation associated with landforms.

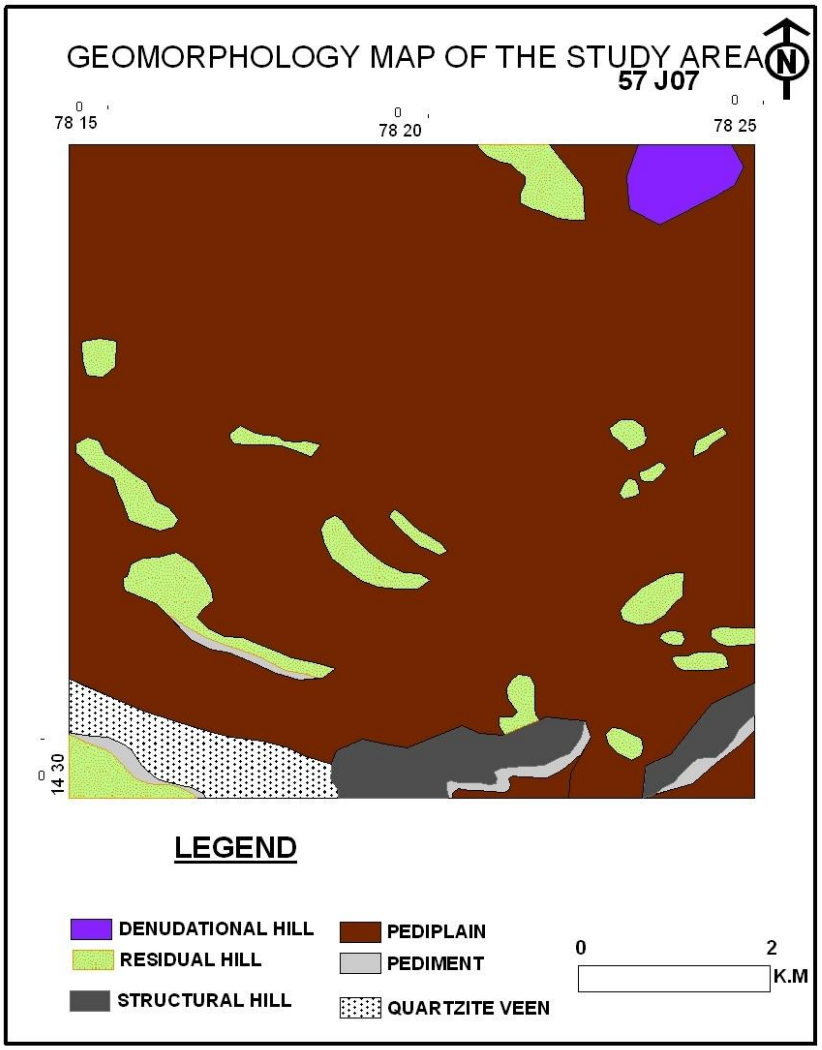

Fig: 6 Geomorphology map of the Mogamureru river.

4.4 Landuse & landcover classification system:

The land resources are studied by preparing the land use/land cover map. The land use/ land cover pattern fall under the board under categories of buildup land, agriculture land, forest land, and un-cultivated land and water bodies.

The land use/land cover system adopted in mapping of earth surface features is a system derived from the united states Geological Survey (USGS) landuse /landcover classification system, Showed in the system.

1. Urban or buildup land
2. Agriculture land.
3. Forest land
4. Water bodies.
5. Uncultivated land.

4.4.1 Spatial distribution of Land use/Land covers Built-up land:

Residential:

Urban or buildup land is composed of areas of intensive with much of the land cover by structures. Included in this category are cities, towns, villages, industrial and commercial complexes and institutions. In the study area major towns or villages are Other villages in Muttukur, Goturu, Thimmapurampeta, Yerripalle, Alavalapadu, Gollalaguduru, are Classified land use/land cover map of the study area is shown.

4.4.2 Agricultural Land

All the cultivated land with or without crops orchards and plantations are considered in this class.

Crop Land:

Crop lands are the agricultural lands under crop. In the study area the crop lands have wet cultivation and dry cultivation. Wet cultivation includes food crops such as paddy, and chilli plantations etc. Dry cultivation includes trees orchards, ground nut, etc

4.4.3 Barren Land:

The barren lands are surrounded by villages Vemula, Kuppakuttalapalli, Peddajuturu, and Muttukuru, Thimmapurampeta etc., in Central part and in South Eastern part major land is used for urbanization.

4.4.4 Forest Land

Forest land represents areas that have a tree crown aerial density of 10 percent or more, are stocked with trees capable of producing timber or other wood products and exert an influence on the climate or water regime. Sparse forest land located on undulating terrain, up lands, and slopes of the hills in the NW – SE trending. In the study area we are prepared Different type of lands using remote sensing and GIS techniques.

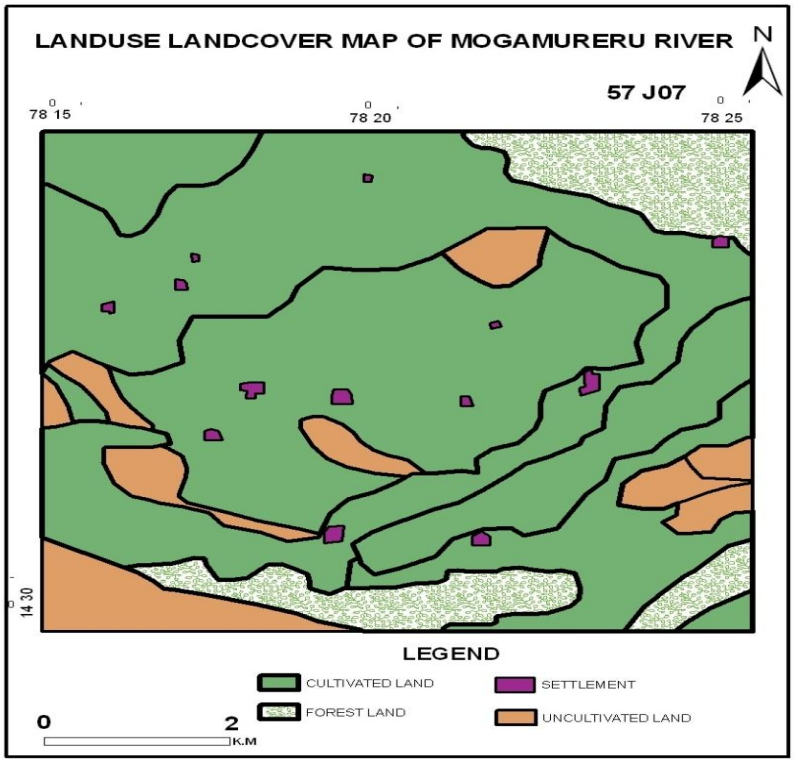

Fig:7 Landuse Landcover map of the study area

5. Conclusion

The Mapping of Geology, Geomorphology, Drainage and Landuse and Landcover were prepared using GIS Powerful tools. Under this study three thematic maps such as geological map, Geomorphological map, Land Use / Land cover map were prepared based on the image interpretation studies. Entire study area covered by high hill ridges and valleys. The rock types observed in the study area are Dolomites/Limestones, Shale, and Quartzites. Granitoids with volcanic intrusive belonging to peninsular Gneissic complex which is over lined by Gulcheru quartzite of lower Cuddapah followed by Kurnool group consisting of Panyam quartzite, Koilakuntla limestone, and Nandyala formations. Joints, lineaments, fractures, folds, faults are some of the structure elements interpreted in the study area. Fracture plains are observed in quartzite terrain which are dissected by dykes. Two sets of fracture plains have been identified in Gulcheru quartzite. Limestone's are developed in Nandyala Shale. Denudational hill, residual hill, pediment, pediplain, structure hill, structure valley are important landforms delineated in the area. In the study area Urban Land, Cultivated Land, Uncultivated Land and Forest Land were prepared.

References:

Adham, M.I., Jahan, C.S., Mazumder, Q.H., Hossain, M.M.A. and Haque, A.M. (2010) Study on groundwater recharge potentiality of Baring tract, Rajshahi distric, Bangladesh using GIS and remote sensing technique. Jour. Geol. Soc. India, v.75, pp.432-438.

Behera SC (1989). Hydro geomorphological studies in parts of Baitarn basin. Keonjhar District, Orissa using remote sensing techniques. A report on training project at IIRS Dehradun.

Bhattachrya A and Reddy PR(1991). Hydro geomorphological mapping for ground water prospects in India using IRS imagery. How to meet the demand of drinking water. In Remote sensing in Asia and Oceanic- Environmental change and monitoring. Asian association of remote sensing Tokyo, Japan.

Chandra, S., Rao, V.A., Krishnamurthy, N.S., Dutta, S. and Ahmed, S.(2006) Integrated studies for characterization of lineaments used to locate groundwater potential zones in a hard rock region of Karnataka, India. Hydrogeol. Jour., v.14,pp.1042-1051.

Chowdhury, A., Jha, M.K., Chowdary, V.M. and Mal, B.C.(2009) Integrated remote sensing and GIS-based approach for assessing groundwater potential in West Midnapur district, West Bengal, India. Int. Jour. Remote Sensing, V.30, pp.231-250.

Dept. of space (1988). Preparation of hydro-geomorphological maps of India on 1:50,000 scale using satellite Imagery, project document National Technology on Drinking water, Dept. of Space 83p.

Gupta, M. and Srivastava, P.K. (2010) Integrating GIS and remote sensing for identification of groundwater potential zones in the hilly terrain of Pavagarh, Gujarat, India. Water Int., v.35, pp.233-245.

Jaiswal, R.K., Mukherjee, S., Krishnamurthy, J. and Saxena, R.(2003) Role of remote sensing and GIS techniques for generation of groundwater prospect zones towards rural developmental approach. Int. Jour. Remote Sensing, v.24,pp.993-1008.

K. Narendra, K. Ngeswara Rao and P. Swarnalatha(2013) Integrating Remote Sensing and GIS for Identification of Ground Water Prospective zones in the Narava Basin, Visakhapatnam region, Andhra Pradesh, Jour. Geol. Soc. Ind.. Vol 81.PP.248-260.

Krishanamurthy, J., Mani, A.N., Jayaram, V. and Manivel, M.(2000) Groundwater resources development in hard rock terrain: an approach using remote sensing and GIS techniques. Int. Jour. Appld Earth Obser. Geoinformatics, v.2, pp.204-215.

Krishna Murthy J and Srinivas G (1995). Role of geological and geomorphological int. J,. Remote Sensing, 16,2595-2618

Land Use / Land Cover Analysis in an Industrial area Using Remote Sensing Techniques: A Case Study from Yerraguntla Mandal, Kadapa District, Andhra Pradesh. J.Abdullah Khan, B. Murlaidhar Reddy, Anil Kumar, V. Sunitha.

Mondal, S.MD., Pandey, A.C. and Garg, R.D.(2008) Groundwater prospects evaluation based on hydrogeomorphological mapping using high resolution satellite images: a case study in Uttarakhand. Jour. Indian Soc. Remote Sens., v36, pp.69-76.

Murthy, K.S.R. and Mamob, A.G. (2009) Multi-criteria decision evalutation in groundwater zones identification in Moyal Teltele subbasin, South Ethiopia. Int. Jour. Remote Sensing, v.30, pp.2729-2740.

Nageswara Rao, K. and Narendra, K. (2006) Mapping and evaluation of urban sprawling in the Mehadrogedda watershed in Visakhaptnam metropolitan region using sensing and GIS. Curr. Sci., v.91, pp.1552-1557.

Obi Reddy GP, Suresh Babu R and Sambasiva Rao M (1994).Hydro-geology and hydro-geomorphological conditions of Anantapur district, using Remote sensing data,. Indian Geog. J.,69(2): 128-135.

Rao DP Bhattacharya A and Reddy PR (1996). Use of IRS.IC data for Geological and Geographical studies. Curr. Sci. special Session:IRS.IC,70 (7).619-623.

Ravindran KV and Jeyaram A (1997). Ground water prospects of shahbad Tehsil, I Baran district, Eastren Rajasthan and Remote Sensing Approach. J. Indian Soc.Remote Sensing, 25(4):239-246.

Saraf A.K. AND Choudhary PR (1998).Integrated remote sensing and GIS for ground water exploration and identification of artificial recharge sites, Int .J Remote

Srinivasa Gowd, S, Sudheer, A.S., Srinivasulu, S ,and Sreedevi, P.D. (1998) Remote sensing analysis to delineate groundwater potential zones of Peddavanka Watershed, Anantapur District, A.P, Geographical Review of India 60,145-154

Suja Rose, R.S. and Krishnan, N. (2009) Spatial analysis of groundwater potential using remote sensing and GIS in the Kanyakumari and Nambiya basins, India. Jour. Indian Soc. Remote Sensins, v.37,pp.681-692.
Shahid, S., Nath, S.K. and Ray, J.(200) Groundwater potential modeling in soft rock using a GIS. Int. Jour. Reomte Sensing, v.21, pp1919-1924.

Sreedevi, P.D., Subrahmanyam, K. and Ahmed, S.(2005) Integrated approach for delineating potential zones to explore for groundwater in the Pageru River basin, Cuddapah District, Andhara Pradesh, India. Hydrogeol. Jour., v.13, pp.534-545.

Vijith, H. (2007) Groundwater potential in the hard rock terrain of Western Ghats: a case study from Kottayam district, Kerala using Resourcesat (IRS-P6) data and GIS techniques. Jour. Indian Soc. Remote Sensing, v.35, pp.163-171.