

Geospatial Assessment of Change in Land Use Land Cover of Temple Town Vontimitta after Bifurcation of Andhra Pradesh, India

¹E. Tejaswini, ¹Siva Prathap. T, ¹M. Prasad, ²T. Lakshmi Prasad & ²Israel.Ch

¹Department of Earth Sciences, Yogi Vemana University, Kadapa, Andhra Pradesh India-516005.

²Department of Geology, Acharya Nagarjuna University, Nagarjunanagar, Guntur -522510

Abstract

Development and Improvement cause land debasement issues, remembering expanded tension for normal assets and the board of water assets. Geospatial Technology is one of the widely accepted, detailed and useful ways to develop land use classification of maps. This review expects to research the effect of the spatio-temporal elements of land use land cover (LULC) patterns in Vontimitta Mandal, YSR Kadapa district, Andhra Pradesh using Geospatial technologies. LANDSAT-8 OLI data for the years 2014 & 2020 used as main input data for this study particularly after bifurcation of the state. A semi-regulated cross breed arrangement strategy was utilized for picture order and post-grouping procedures for LULC change discovery. The greatest probability characterization calculation is utilized to recognize LULC changes in the review region. The review region is arranged into five significant LULC classes' in particular Horticultural land, Timberland land, Developed region, Water bodies and Waste grounds. Exactness appraisal of LULC was assessed utilizing a disarray matrix in Arc GIS software and ground truth corroboration. Based on LULC maps, major changes identified in the study area from 2014 to 2020 are mentioned hereunder. Agricultural land is decreased by 11.41%, Forest land is decreased by 1.72%, Waste land is increased by 1.60% Built up land is increased by 15.49% and Water bodies decreased by 0.77%. The outcome of the study would help concerning authorities for sustainable management of Natural Resources.


Keywords: *Geospatial Technology, Temple Town Vontimitta, Bifurcation, Andhra Pradesh*


Article Publication

 Published Online: 15-Sep-2021

*Author's Correspondence

 T. Siva Prathap

 Associate Professor
Dept of Earth Sciences
Yogi Vemana University
Kadapa, Andhra Pradesh, India

 [10.31305/rrjim.2021.v06.i09.031](https://doi.org/10.31305/rrjim.2021.v06.i09.031)

© 2021 The Authors. Published by RESEARCH REVIEW International Journal of Multidisciplinary. This is an open access article under the CC BY-

NC-ND license 

(<https://creativecommons.org/licenses/by-nc-nd/4.0/>)

Introduction:

Land use essentially implies the alteration of the land surface by human communication. Land cover alludes to the physical and natural safeguard over the outer layer of the land, along with water, mixed timberland, uncovered soil, and artificial systems (Ellis, 2007). At present, landscape dynamic studies have become an essential apprehension, which in turn is an indicator for change in the environment and ecology of the whole world (Ruiz-Luna and Berlanga-Robles, 2003; Garai and Narayana, 2018; Prasad et al 2019). Because, the global need to balance ever growing energy needs have an adverse effect on the landscape, ecology and environment, particularly developing nations like India (Areendran, et al., 2013). The unending development of populace applies extreme tension ashore, which is connected with rural interest and use, urbanization and science and technology, economic development etc. (Yesmin, et al., 2014). Land use/land cover change location is viewed as the best remote detecting instrument to concentrate on the various peculiarities identified with the improvement of urbanization or the difference in a region in the past (Lambin, 1997). The LULC change reads give helpful data to a superior comprehension of past rehearses, current LULC examples, and future LULC direction (Almazroui et al., 2017; Bhagyanagar et al., 2012; Zhang et al., 2016). Change recognition is an essential advance in checking metropolitan

development. It works with quantitative investigation of the spatial appropriation of the space of revenue (Mohamed and Elmahdy 2018). Subsequently, accessible data on LULC modifications can provide fundamental contribution to decision-production of natural administration and arranging what is to return (Shiva Prathap et al., 2019.)

The proposed study area Vontimitta Mandal (Fig.1) is one of the important mandals in YSR Kadapa district after bifurcation of united Andhra Pradesh. The study area has got significance due to the famous and historical temple of Lord Sri Rama. Henceforth it declared as the oldest temple of Rama in newly formed Andhra Pradesh state. There after major changes took place in and around the Vontimitta village and its surrounding villages. Hence the present study is aimed to assess the landscape dynamics of Vontimitta Mandal. The results of this study not just work with metropolitan organizers and policymakers to all the more likely comprehend the effect of land use and land cover changes on regular assets yet in addition decidedly assist them with improving the moderation systems.

Study Area

The study region Temple town Vontimitta Mandal (Fig.1) is one of the significant income mandals of YSR Kadapa locale that falls in Survey of India (SOI) topographic sheets of 57J/05 and 57N/03, between 14°38'33"N - 79°03'33"E Scope and Longitudes covering a degree of 408.89 km². Vontimitta village is the Mandal headquarter which is 26 km from the district headquarter Kadapa city. The study area well connected with Roads (Kadapa-Chennai highway) and Rail (Kadapa- Chennai) network nearest railway station is located in Vontimitta Village. The Vontimitta Mandal of YSR Kadapa district Andhra Pradesh falls in tropical climate category. The proposed study area falls in Nallamalai group in Cuddapah super group form Stratigraphy point of view. The major rock types in the study area are quartzite, dolomites and shales belong to Nallamalai group. Geo-morphologically the study area comprises the structural hills, residual hills, pediment and Pediplain configuration with shales and dolomites as main litho units.

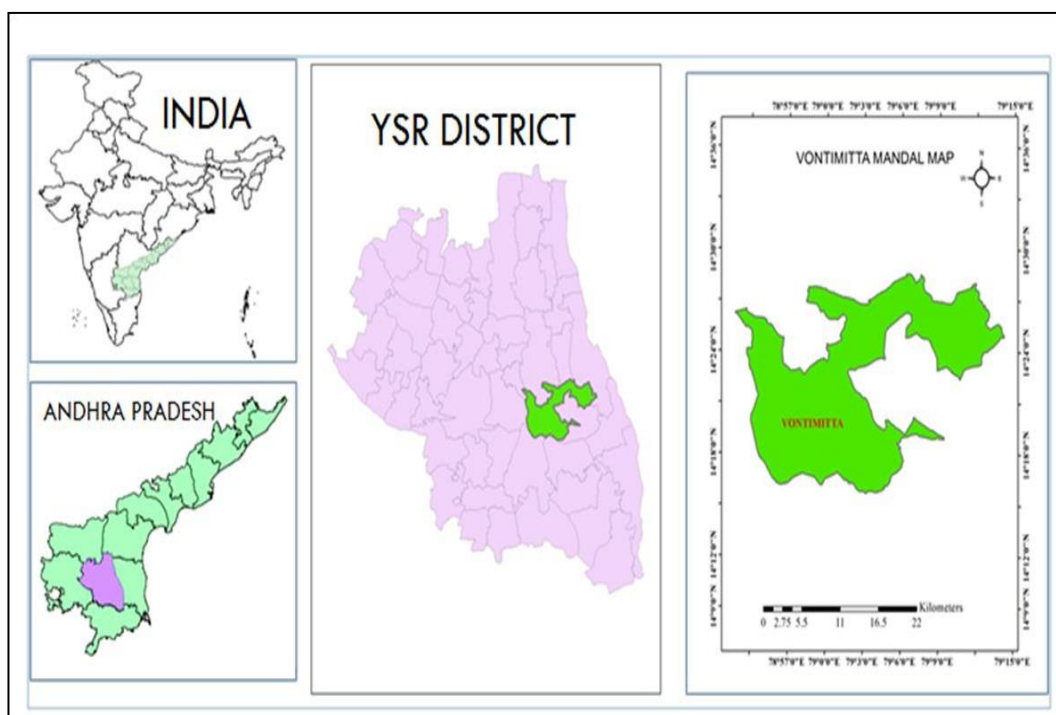


Fig 1 : Location map of the Study area.

Materials and Methods

Data collection: Landsat 8 Operational Land Imager (OLI) at a spatial resolution of 30 m cloud free data procured from the USGS Earth Explorer (<https://earthexplorer.usgs.gov/>) for the years 2014 and 2020. The

bands used are 5,4 and 3 for both the imageries at level one processing. The collected images were layer stacked to convert three bands (5, 4 and 3) into a single multi spectral layer (Fig.2) and sub-setting has been done by using mandal boundary shape file.

Image Enhancement

The aim is to further improve Image Contrast for better interpretation of satellite data through Edge enhancement in ERDAS IMAGINE software (version 2014).

Image Processing

This progression depends on the directed characterization - Maximum Likelihood (ML) technique to deliver the guides of land use/land cover change location in the review region. The maximum likelihood classifier is one of the most well-known techniques for grouping in far off detecting, in which a pixel with the maximum chance is arranged into the evaluating magnificence For this cycle, the unearthly signature of each pixel receives coordinated with the education marks and the photograph is characterized as desires be became accomplished (Japan Association of Remote Sensing, 1996).

Methodology for land use and land cover change (LULCC) detection:

Picture characterization is an extremely viable device in clarifying the course of pixel allotment in a somewhat detected picture to an exceptional land-use type. There are a few kinds of characterizations, for example, administered, unaided (somewhat directed), object-based arrangement, machine learning classification, fuzzy grouping, relapse tree investigation, and fuzzy-spectral combination examination. In any case, numerous scientists have applied regulated grouping since it is more exact than the unaided one. Further, to show LU/LC changes with various timescales, the greatest probability strategy has been utilized as it is the absolute best and best kind of managed characterization procedures (Kamel, 2020). Nevertheless, this technique requires a long calculation, in light of the ordinary dissemination of information in each info bar and will, in general, surpass the marks. As per the marks grouping, five land use/land cover types have been recognized in the review district: (i) Forest Area (ii) Agricultural land (iii) Wastelands (iv) Built uplands, and (v) Waterbodies. Grouped pictures of two distinct years (2014 and 2020) were contrasted utilizing cross-organization all together with deciding subjective and quantitative parts of the progressions of Each LULC Class.

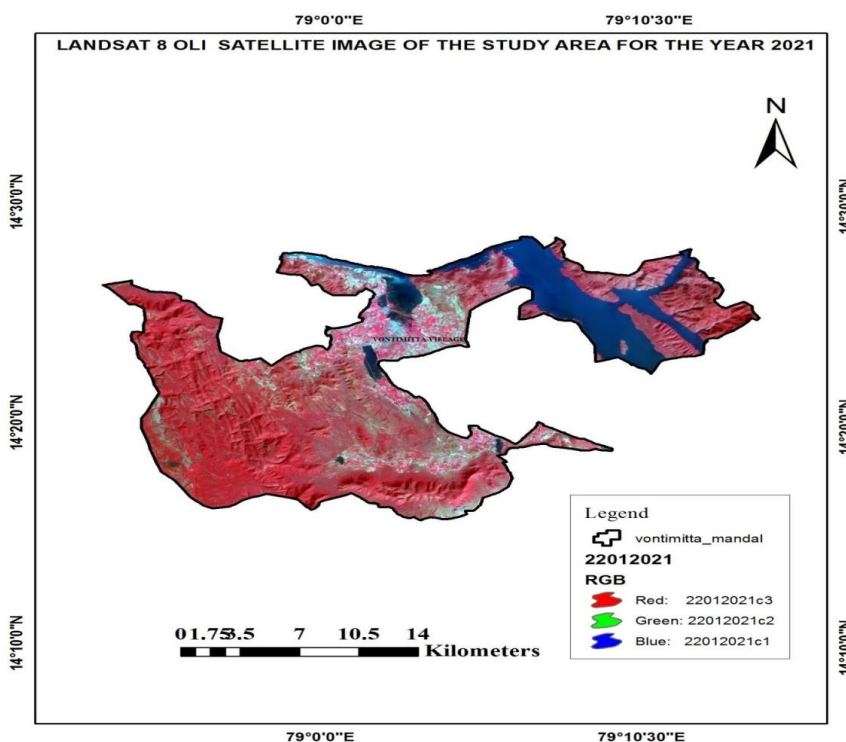


Fig 2. Landsat 8 OLI Layer stacked image colour composite of the study area for the year 2020.

Results and Discussion

The comparative analysis of the classified imagery of the two years 2014 and 2020 reveal the following facts among the five classes with the statistical interpretations is as follows

Forest Area

This is a region inside the advised limit bearing an affiliation primarily of trees and other vegetation types equipped for creating lumber and other timberland produce. The review region covers for the most part the thick and scours timberland. On satellite pictures, this vegetation/clean is recognized by a green shade, smooth surface. The woodlands are found in the North West and North East pieces of the review region. The woodland land diminished from 177.87 sq.km (43.50%) to 170.85 sq.km (41.78%) during 2014 - 2020. The net reduction is 7.02 Km² (1.72%) of the absolute region.

Agricultural Land

It is characterized as the land fundamentally used for cultivating and for the creation of food, fiber, and other business and plant crops. It includes land under crops (flooded and neglected land) ranches and so on Horticulture land with crops plantations and manors are considered in this class. In the review region, the croplands have wet development and dry development. Wet development includes food harvests like Rice, paddy, Banana and vegetables, and so on Dry development includes Bengal gram, red gram, and groundnut, and so on Absolute horticultural land in the review region diminished essentially from 52.64 sq. km (12.87%) during 2014 to 6.00 sq. km (1.47%) in the year 2020. This class showed a significant decrease of its group 46.64 Km² (11.41%) somewhere in the range of 2014 and 2020. The main reason for this conversion of agricultural land in and around the Vontimitta village is due to temple development and associated activities.

Built up Land / Settlement land

Developed land is made out of spaces of escalated with a significant part of the land covered by structures. Included in this classification are urban communities, towns, villages, modern and business edifices, and foundations. The review region goes under the semi-metropolitan provincial arrangement classification. In the study area major villages are Chitarajupalli Gollapalli, Kondamachupalli, Mantapampalli, Narvakatipalli, Rachagudipalli, Gangaperuru, Konarajupalli, Kotha Madavaram, Nadimipalli, Pennaperuru, Salabad etc. The complete developed land area expanded from 6.68 sq. km to 70.03 sq. km. The Built up land is increased from 1.63% - 17.13% during 2014 to 2020 respectively. The significant gain in this class because of the kodanda Ramalayam temple developments in large scale and also some villages are Re-habited from the Somasila reservoir backwater area.

Water bodies

Water bodies include natural and artificial lakes, in particular waterways, lakes, trenches, tanks, and repositories. The capacity of the water looks dark tone on the satellite picture. The profound waters and profound bodies are dull blues in shading. Tanks are described with grape plantations in square/ rectangular and blue shading tones. The little channel is apparent in the vegetation region. The majority of the tanks are unified in the focal point of the space investigated and scattered in the eastern parts with more dry tanks. The area's water bodies diminished from 52.53 km² to 49.39 km².

Waste lands

Land, which would not uphold any vegetation, is known as infertile lands or wastelands. Barren rocky, salt-impacted land, land with and without smooth, sandy location, sheet rocks, and stony locales are protected on this classification. Such lands are fashioned because of the real properties of soil, temperature, precipitation, and close by natural conditions. The review space of wasteland diminished from 119.17 sq. km to 112.61 sq. km in the review region and is available in the southwest piece of the space.

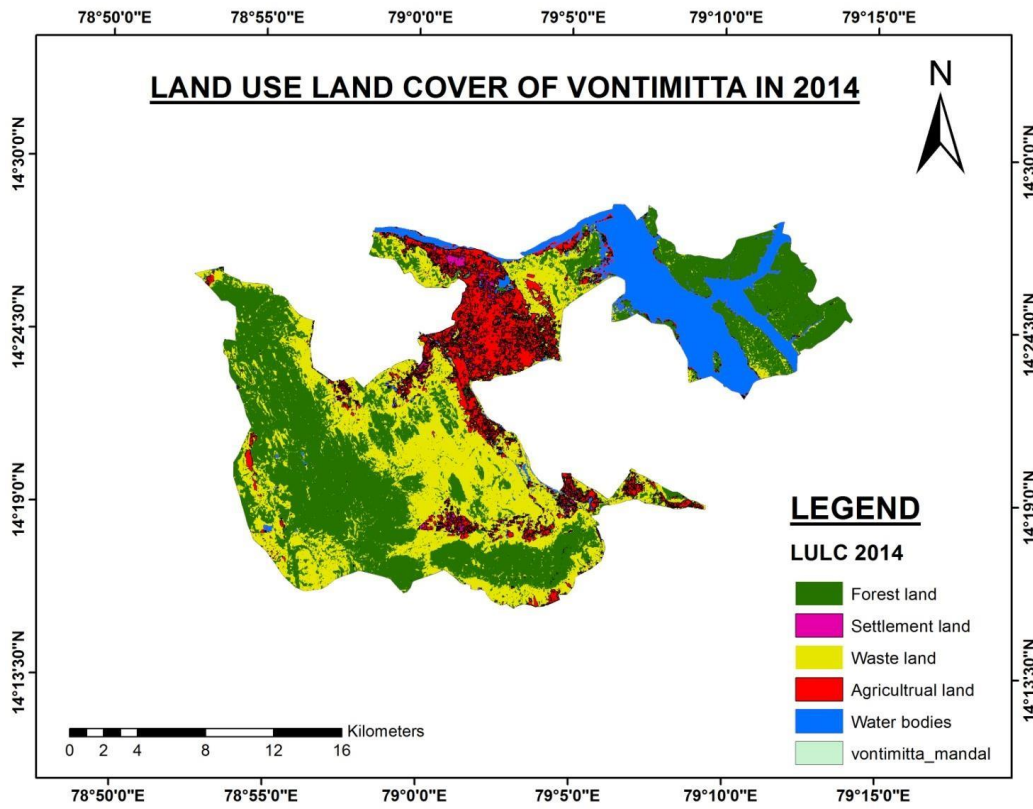


Fig: 3. Land Use Land Cover Of the Study Area in 2014

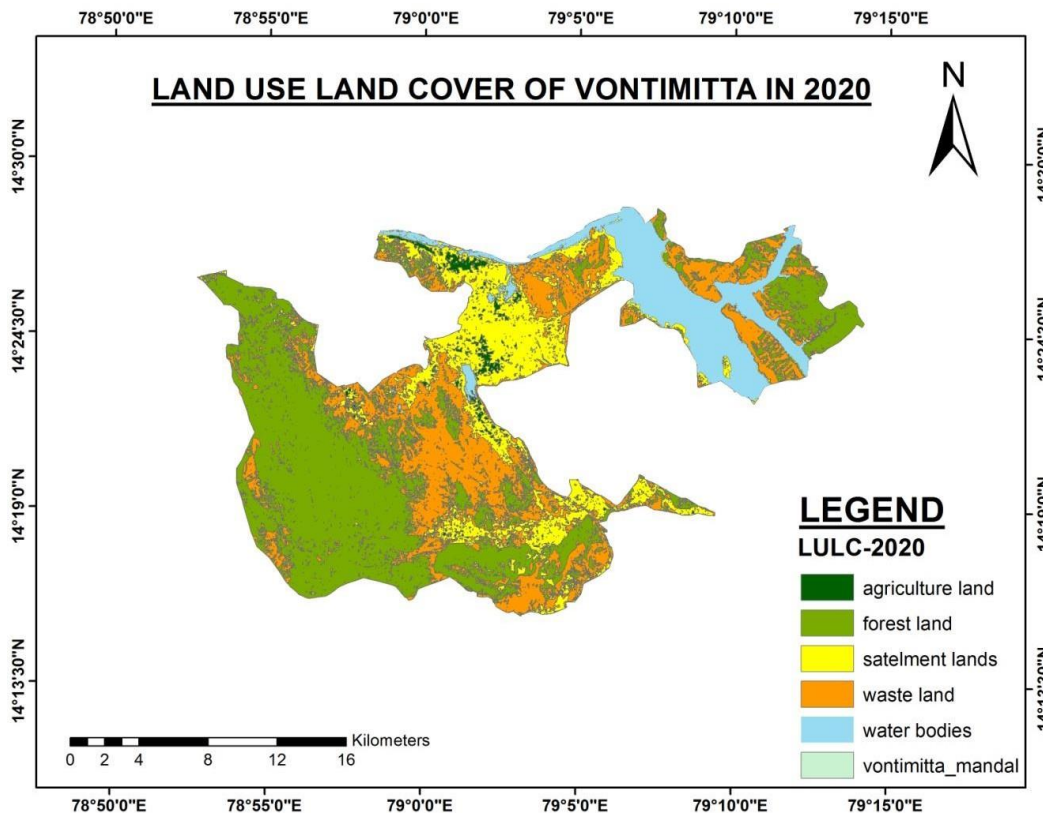


Fig: 4. Land Use Land Cover of the Study Area in 2020

Conclusion

The study covers that significant land use of the review area is farming land and developed land involved.

The region under wasteland has diminished - 1.60% because of sanctuary improvement works from 2014 to 2020. The second significant classification of land in the review region is agribusiness which was diminished by 11.41% because of change in vegetation, desolate land, and developed land. The water bodies are decreased by 0.77%. The forest area has been decreased by 1.72%. The one major category of the study area is settlement land/ built-up land has been increased by 15.49% due to conversion of agriculture and waste lands in to settlement. Geospatial innovations assumed a critical part to gauge and investigate the considerable causes liable for the progressions in land use and land cover changes of Vontimitta income Mandal of YSR Kadapa area Andhra Pradesh. The outcomes not just work with metropolitan organizers and policymakers to all the more likely comprehend the effect of land use and land cover changes on normal assets yet additionally emphatically help them towards the feasible improvement of the space.

References

- Almazroui, M., Mashat, A., Assiri, M.E. *et al.* Application of Landsat Data for Urban Growth Monitoring in Jeddah. *Earth Syst Environ* 1, 25 (2017). <https://doi.org/10.1007/s41748-017-0028-4>.
- Areendran, G., Prakash Rao., Raj, K., Mazumdar, S., Kanchan, Puri., 2013. Land use/land cover change dynamics analysis in mining areas of Singrauli district in Madhya Pradesh, India, *Tropical Ecology*, 54(2), 239-250
- Bhagyanagar, R., Kawal, B. M., Dwarakish, G. S., & Surathkal, S. (2012). Land use/land cover change and urban expansion during 1983–2008 in the coastal area of Dakshina Kannada district, South India. *Journal of Applied Remote Sensing*, 6(1), 063576. <https://doi.org/10.1117/1.JRS.6.063576>.
- Chen, X., 2002. Using remote sensing and GIS to analyse land cover change and its impact on regional sustainable development. *International Journal of Remote Sensing*, 23(1), 107-124. Copyright © 1996 Japan Association of Remote Sensing.
- Ellis, E., 2007. "Land use and land cover change." In: *Encyclopedia of Earth*. Eds. Cutler J. Cleveland Washington, D.C.: Environmental Information Coalition, National Council for Science and the Environment.
- Garai, D., Narayana, A.C., 2018. *Egyptian Journal of Remote Sensing Space Science*. <https://doi.org/10.1016/j.ejrs.2018.01.002>
- Kamel, M. 2020. Monitoring of Land Use and Land Cover Change Detection Using Multi-temporal Remote Sensing and Time Series Analysis of Qena-Luxor Governorates (QLGs), Egypt. *J Indian Soc Remote Sens* 48, 1767–1785 <https://doi.org/10.1007/s12524-020-01202-8>.
- Lambin, E.F. (1997) Modeling and Monitoring Land-Cover Change Processes in Tropical Regions. *Progress in Physical Geography*, 21, 375-393. <http://dx.doi.org/10.1177/030913339702100303>.
- Mohamed, M.M., Elmahdy, S., 2018. Land use/land cover changes monitoring and analysis of dubai emirate. UAE Using Multi-Temporal Remote Sensing Data EPiC Series in Engineering 3, 1435–1443.
- Prasad ,M., Sunitha, V., Ramakrishna Reddy.M., 2019. Application of Geospatial Technology for Landscape Monitoring in and around Mangampeta barytes Mine, Andra Pradesh, India. *Environ. We Int. J. Sci. Tech.* 14 (2019) 123-142.
- Ruiz-Luna, A., Berlanga-Robles, C.A., 2003. Land use, land cover changes and coastal lagoon surface reduction associated with urban growth in northwest Mexico, *Landscape Ecol.* 18, 159–171.
- Siva Prathap, T., Yamini ,Y., Mohd Akhter A., Kamraju, M., 2019. Change detection in land use land cover using geospatial technology and open source data in Lankamalla forest and the neighbourhood – A case study in Andhra Pradesh, India, *Journal of Emerging Technologies and Innovative Research*, 6 (4) 557-573.
- Siva Prathap Thummalakunta, Sunandana Reddy Machireddy and T. Lakshmi Prasad (2019) “Model Builder and Arc Hydro tools of Geospatial Technology to extract Drainage Network and Watershed Delineation using Digital Elevation Model” *International Journal of Creative Research Thoughts (IJCRT)* ISSN 2320-2882, Vol 7 Issue 4, Page No. 537-544
- Siva Prathap T, Shaik Asiya, Mohd Akhter Ali, M. Kamraj “Enumeration of Springs in Buggavanka Watershed, Kadapa, Andhra Pradesh, India.” *International Journal of Innovative Knowledge Concepts*, 7(5) May, 2019, 189-195
- Siva Prathap, T., Karun Tej, Mohd Akhter Ali, M. Kamraju “A Geotechnical study of salt affected areas in Yogi Vemana University Watershed area”. *International Journal of Research and Analytical Reviews*. 2019, 6(2): 912-916. E-ISSN 2348-1269, PRINT ISSN 2349-5138

- Siva Prathap, T., Mohd Akhter Ali, Anupreet Singh Tiwana, M. Kamraju, Sagar M Waghmare “Site Selection for Sub Surface Dams across Papagni river in Chakrayapeta Mandal using Geospatial Technologies”. *J. Emerging Technoloies and Innovative Research*. 2019, 6(3): 82-94. ISSN-2349-5162, www.jetir.org
- Siva Prathap, T., M Sasi Kumar Naik, Mohd Akhter Ali, M. Kamraju. “Digital estimation of Dumps of Mining over burden quantities in open cast Baryte Mine of Mangampeta, Andhra Pradesh, India”. *Journal of Emerging Technologies and Innovative Research*. 2019, 6(4): 498-506. ISSN-2349-5162, www.jetir.org
- Siva Prathap, T., Y Yamini, Mohd Akhter Ali, M. Kamraju. “Change detection in land use land cover using geospatial technology and open source data in Lankamalla forest and the neighbourhood – A case study in Andhra Pradesh”. *J. Emerging Technoloies and Innovative Research*. 2019, 6(4): 557-573. ISSN-2349-5162, www.jetir.org
- Siva Prathap, T., Rajput NS, Joshi D., Vishwakarma J. (2016) “Framework for GIS Enabled Campus: Design & Deployment Methodology” *International Journal of Research in Engineering and Applied Sciences* (ISSN 2249-3905) Volume 6, Issue 5, May-2016 138-146.
- Siva Prathap T, Ch Latha, M Prasad, Mohd Akhter Ali “A Study on Oppidan Course of Buggavanka Environs, Kadapa, Andhra Pradesh, India using Geospatial Technologies” *International Journal of Humanities, Arts, Medicine and Sciences* (BEST: IJHAMS) ISSN (P): 2348-0521, ISSN (E): 2454-4728 Vol. 4, Issue 6, Jun 2016, 63-70
- Siva Prathap T, Ganesh Reddy .G & Vijaya Bhole “Morphometry of Buggavanka watershed in Kadapa, Andhra Pradesh, India using spatial information technology” *International Journal of Humanities, Arts, Medicine and Sciences* (BEST: IJHAMS) ISSN 2348-0521 Vol. 3, Issue 2, Feb 2015, 1-8
- Siva Prathap, T. & Srikanth Reddy, D.(2015) “Spatio-Temporal Analysis of Pulivendula Mandal, Andhra Pradesh using Remote Sensing and GIS” *International Journal of Research in Engineering and Applied Sciences* (ISSN 2249-3905) Vol. 5, Issue 11, November, 2015, 133-143.
- Siva Prathap, T., V. Sunitha, M. Sunandana Reddy., M. Ramakrishna Reddy., (2011) Geoinformatic Applications in Resource Management – A Watershed Approach, *Journal of Spatial Science*, Vol. IV No.2. pp 44-54 ISSN No 0974-7125.
- Yesmin, R & Mohiuddin.Swe, Asm & Uddin, Md & Shahid, M. (2014). Land use and land cover change detection at Mirzapur Union of Gazipur District of Bangladesh using remote sensing and GIS technology. *IOP Conference Series: Earth and Environmental Science*. 20. 012055. 10.1088/1755-1315/20/1/012055.
- Zhang, Z., Liu, S., Wei, J., Xu, J., Guo, W., Bao, W., Jiang, Z., & Zhu, L. (2016). Mass change of glaciers in Muztag Ata–Kongur Tagh, Eastern Pamir, China from 1971/76 to 2013/14 as derived from remote sensing data. *PloS One*, 11(1), e0147327. <http://dx.doi.org/10.1371/journal.pone.0147327>.