



## LAND USE AND LAND COVER CHANGE ANALYSIS, USING GIS AND ERDAS TOOL A- REVIEW

<sup>1</sup>Shahid Shuja Shafai, <sup>1</sup>Stanzin Norboo, <sup>1</sup>Aprajita Verma, <sup>1</sup>Syed Tuaha Jameel, <sup>1</sup>Mohd. Nabeel, <sup>1</sup>Birinder Singh and <sup>2</sup>Nitin Mishra

<sup>1</sup>U.G., Student, Department of Civil Engineering, Graphic Era (Deemed to be University), Dehradun

<sup>2</sup>Assistant Professor, Department of Civil Engineering, Graphic Era (Deemed to be University), Dehradun

### ARTICLE INFO

#### Article History:

Received 11<sup>th</sup> October, 2017

Received in revised form

26<sup>th</sup> November, 2017

Accepted 21<sup>st</sup> December, 2017

Published online 31<sup>st</sup> January, 2018

#### Key Words:

Urbanization, Land Use/Land Cover, Spatial, Geographical Information System, Remote Sensing.

### ABSTRACT

The world has become a refined place, the discernment being the up-gradation of lifestyle and sophistication. This deviation has not only given hike to extensive development but also has to fulfil the ever-growing demands of humans. The open-ended course, therefore, results in unparalleled urbanization. Pinpointing and describing the civic flop in this sector over the past progress span is fundamental for any subsequent outlining by resolving strategy to enhance the handling of natural resources and entertain progress, during the time, diminish the blow on the environment. In this work, the transformation of land use/land cover elements in the regions has been evaluated, concentrating on the inflation of the urban trends using Land satellite image. The link between the anthropogenic influences (humanly activates), innate assets and geomorphology, have also been examined. The analysis and inspection utilizing the software are used to scrutinize the environmental variations. The satellite images of discrete regions have been analyzed. Results from the study will depict the land use/land cover changes and furthermore will be able to explain the probable behaviour of land use/land cover pattern and prediction of its trend for future.

*Copyright ©2018, Shahid Shuja Shafai et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.*

**Citation:** Shahid Shuja Shafai, Stanzin Norboo, Aprajita Verma, Syed Tuaha Jameel, Mohd. Nabeel, Birinder Singh and Nitin Mishra. 2018. "Land use and land cover change analysis, using gis and erdas tool A- Review", *International Journal of Development Research*, 08, (01), 18525-18528.

### INTRODUCTION

The land is the most demanding regular assets as all the exercises, activities are stationed by it. The hike in the population and human exercises are unconfined to concern with respect to the land as assets. The liabilities for assets can be for agribusiness, woodland, urban and modern area employment. The rate at which the variations in the usage of land is quite critical and it is demanding that the proper sequencing, controlling and to scheduling of the land as a resource, with respect to utilization is need of the hour. Most of lands are now operated and administered at discrete magnitudes depending on its habit and the demand of the man. The world as a whole should have satisfactory knowledge over its resources, especially natural. This knowledge demands integral aspects of its exercises for better judgement. The swift hike of the population in the civic areas has concluded as the primary change for the region's land use/land cover.

Furthermore, it forced to the worsening of the urban habitat. Therefore, environmental researchers with immense zest had considered the land use/land cover change a prime task to analyze. Subsequently, measuring and identifying the extent and spatial propagation of land use/land cover gives a detracting importance to the analysis of environmental variations at discrete scales and this type of evaluation contribute a worthy tool to develop the work rate of land cover and area usage and to decline the contradictory socio-environmental fallout labelled with land use/land cover. The assemblage of abiotic and biotic elements on the surface of earth can also be described as land cover, and it is rare amidst the most critical possession of the structure of the earth. The land cover combine snow, water bodies, exposed soil, forests and grasslands. Land use involves a built-up area, farming area, special interests region also called recreational land, wildlife zone etc. Therefore, land use is related to the manly activities while the land cover related to natural and human prospectus like built-up area, farms, forest, lakes etc. present on the face of the earth. The information acquired about land-use/land-cover admits a improved understanding of usage of

**\*Corresponding author: Shahid Shuja Shafai**

U.G., Student, Department of Civil Engineering, Graphic Era (Deemed to be University), Dehradun

the land features. These features include cropping patterns, fallow lands, forest, wastelands and surface water bodies, which is necessary for advancement and planning. The study of these features will conclude an extraordinary evaluation concerning the brunt of new development exercises in the region and its effect on natural environmental and as well as on the urban environment. Furthermore, it will outline the condition of land use, land cover with an outlook to identify the advancement which has happened in this condition, highlighting the built-up land so as to anticipate convincing differences which can take place in present situation in approaching years with help of information obtained by Geographic Information System and Remote Sensing data. For productive planning, administration and controlling of land as a resource, satellites are the most excellent asset when it comes to provision of regular and up-to-date data. However, the data needs to be processed and transformed into information and that's where Remote Sensing (RS) and Geographic Information System (GIS) come into play. These provide options by bestowing new devices and techniques to accomplish the process of data transformation. Remote sensing data and geographic information systems (GIS) provide ideal data sources for large-area land cover classifications and change detection. They are considered as powerful and cost-effective tools for assessing the spatial and temporal dynamics and changes in land cover and land use. The determination of digital land cover classification is to have a meaningful information class value, which can evaluate the landscape accurately. The remotely sensed data stimulate the brief analysis of enclosed natural exploration, worldwide preservation and interstate, regional monitoring and controlling of organic varying features. Remote sensing methods via satellite justified its ability to develop a precise land use /land cover maps and analyzing the variations at timely interlude. However, it is certain that if conventional surveying methods would have been used, it would be very difficult. Spatial instances of land use/land cover from varied period of time are procedure wise mapped, analyzed and accurately evaluated. This simple ground information as data is processed with the help of satellite. Therefore, for suitable and sustainable use of resources, it is must to mark the trend of changes associated with land so as it can be lowered, diminished and at the end nullified

## LITERATURE REVIEW

The study was conducted by Mishra *et al* (2013) questioning the rapid growth of the urban sector and appointing it as a serious cause for urban planning of the country. The case study area of Upper Ganga Canal Region and the trend of land use/land cover was observed from 1972 to 2011. The study revealed the extensive change of green cover and built-up area. There was a commendable increase in built-up area and the green cover was immensely reduced. The interaction of humans and environment with the land as a resource was analysed by Bhandari *et al* (2016) and a thorough attempt was made by studying the change in land use/land cover of Dehradun valley considering forest area and built-up area and various other land cover parameters. The variation was analysed from the year 2000 to 2011 using GIS software. The study revealed that the built-up area had a rapid and appreciable increase whereas the green cover was reduced to a considerable magnitude. As a conclusion, it can be inferred that rate of reduction of green cover much more than the increase in the rate of the built-up area. The land is turning into

a rare resource because of immense agricultural and demographic pressure. Thus, information on land use/land cover and conceivable outcomes for their ideal use is vital to the selection, planning and usage of land use plans to meet the expanding requests for fundamental human needs and welfare cover changes likewise include the adjustment, either, direct or indirect of normal habitats and their effect on the environment of the area. Therefore, a thorough attempt was made by Suneela and Mamatha (2016) to create land use/land cover classification scheme for Hyderabad district. The analysis was done for a period of six years (2013 to 2016) utilizing multi-temporal satellite imagery. The study area was categorized into four batches namely water bodies, built-up area, barren land, and vegetation region. By the case study, it was concluded that the land use/land cover change pattern of a region is a result of both natural and socioeconomic elements and their use by man in time and space. Coastal zone is a broad fluctuating area between the land and ocean. The shoreline is a border between land and sea. Land use and Land cover play a prime role in dynamic planning. A study was done on coastal area namely Thoothukudi to Vembar coast of Tamil Nadu that affirmed the changes in area for last two decades and to develop a land use/land cover map by using land sat images integrated with remote sensing. The variations were categorized into various batches namely Agricultural land, Salt pans, Barren land, Shrubland and Waterbodies. The study affirmed that the agriculture land is cultivable and assertive in the region but, it is leading to a brisk change as there are heavy advancement activities such as industrialization, construction work etc. Furthermore, salt pans which fall under the boundary region are experiencing same problem, and thereby, an inspection is required over assertive urbanization for their prevention (Nishkalank and Gurugnanam, 2016).

The land use/land cover knowledge is very essential for better and efficient socio-economic working and planning. The knowledge engulfed about land use/land cover allows a evaluated understanding of the land usage and its attitude towards cropping patterns, fallow lands, forest, wastelands and surface water bodies, by virtue of which detailed and efficient planning is possible. One such research was initiated by Usha *et al* (2014) with an objective to process and value the use of various satellite data to signify built-up area progress in urban regions of Udupi Taluk. The research was based on variations of region for about ten years (2000 to 2010) by using geoinformation technology. The effort was made for the analysis of change in land cover classes for urbanization development which effects temperature variations. The results of the study reveal that there is a remarkable change in agricultural and cultivable land mainly due to the interchange of cultivable land into a residential area. The analysis also revealed that the residential land was increased by almost 320 sq.km and due to increase in built-up area and other urban development activities, there is a rise in temperature over several regions confined in the study area. An inclusive attempt was made by Dewan *et al* (2009) in Greater Dhaka Bangladesh, between years 1975 and 2003. The aim of research was to analyze urban growth and land cover changes using satellite images and socio-economic data. Spatial and temporal dynamics of land use cover changes were classified using these land sat images, a supervised categorization algorithm and the later classification variations detection technique in GIS. The analysis revealed the increase in urban regions from 1975 to 2003, which further led to appreciable decline of the area covering water bodies, forest, agriculture

and wetlands/lowland. It was possible to pull out the land use maps derived from this study, which contributed to the determination and evaluation of sustainable land use for urban development. A thorough attempt was made by Ram and Kolarkar (1993) to analyse land use diversities pointed in various parts of Rajasthan and was mapped by surveying and getting, semi-detailed and detailed levels using multivariate remotely sensed data, accompanied with field checks and secondary information. The analysis revealed that during last three decades the net sown area had increased by 36 percent. Farming exercises automated sand winning operations and the distribution of land to proposed builders around the catchments perimeter of the Owabi Dam, leaving the forest cover and the lifespan of the dam prone to risk. The aim of this study was to analyze the detect the variation of land cover targeting the forest cover in Owabi catchment in Kumasi, using multi-temporal Remote Sensing (RS) data and Geographic Information System (GIS) based techniques for a period of 22 years (1986 to 2007). The images were processed and land use/land cover maps were identified and derived of total eight land use and land cover classes. The classes being water, barren land, built-up area, wetlands, forest, croplands, high-density forest and grasslands. It was concluded from the study that the forest cover had declined to 39%. The analysis inferred that the reduction in the region was due to the human exercises and population growth rate within the catchment area (Adubofour Frimpong, 2011).

A study was conducted by V. S. S Kiran (2013), questioning the rapid population growth and anthropogenic activities to determine and identify variations in land use/land cover for a period of 15 years (1990 to 2005), specifically in forest regions. The aim was to control Mahananda Catchment's forest from degradation and deforestation. With the help of maps from multispectral remotely sensed data (TM & ETM+), and MAXLIK & MINPAR supervised classification as well as change detection techniques it was possible to carry out the research progressively and to determination of the changes in different types of forests was seen. The study brought down the fact that there is fluctuating variation in forest cover as the area under dense forests decreased from 58% in 1990 to 33% in 2000 but increased to 39% in 2005, whereas the open forest has increased from 10% in 1990 to 22% in 2000 but again decreased to 7% in 2005. The mixed forest has endorsed a hike of 12% in 1990 to 26% in 2005. The Land use/land cover is an necessary element to inconsiderate the relations of the human exercises with respect to environment and therefore, it is mandatory to notice and filter the fluctuations with the aim to form a sustainable environment. Keeping this in view, a study was conducted to examine the change and variation in land use and land cover in districts of Coimbatore and Tiruppur. Remote Sensing and GIS approach was used to conduct the study and was carried out for a period of 10 years (2000 to 2009). It can be inferred from the results of the study that agricultural activities were decreased from 33.9% to 26.3%, interchangeably fallow land was increased 43.9% to 54.5% and built-up-land was increased 0.1 % to 0.3%. Though plantation, land with scrub, wet logged, barren rocky, tanks and reservoirs have also experienced the change. The study concludes that the Coimbatore and Tiruppur district is known for being one of the industrialized areas in India. It is needed to keenly check the land use/land cover variations in the region as to make the environment sustainable and for a proper development (S.V.Hwan and Dr Eun-Kyung JO, 2014). Interpretation of watersheds and strategy progressive

development and management demands an accurate calculation and evaluation of the past and present land use/land cover parameters as fluctuations marked in these parameters define and determine the hydrological and ecological schemes processing in a watershed. Keeping this in view, a study was conducted to detect land cover/land use changes observed in Gudur Mandal, Nellore districts, using GIS and Remote Sensing for the period of 16 years (2000 to 2015). Furthermore, The watershed was classified into six major land cover/use classes viz. Uncultivated Crop Land, Cultivated Crop Land, Baren /Waste Lands, Residential (Rural), Forest and Water bodies (Ponds/Streams/River/Canals). The analysis resulted in a meaningful decline in water bodies, cultivation cropland, forest as approximately 92%, 36%, -78% respectively and incline in the residential area and uncultivated crop land as approximately 31%, 152% respectively. The study considers this fluctuation of land cover of Mandal as a genuine and absolute menace as it relies on mainly on agriculture. As a suggestion derived from study, there should be appropriate and suitable management of the accessible surface water and also groundwater use should be made limited. (Harish et al, 2016).

## Conclusion

- Land use and land cover changes provide an extensive element for the study of global variation. Land use/land cover modifications due to human or nature have primarily driven to deforestation, global warming, biodiversity loss, and consistent rise of natural disaster flooding. Therefore accessible information on changes of land use/land cover can support detracting input and thereby, helping in quality decision making for better socio-economic activities and future planning.
- The stress derived due to the brisk population growth and ever rising socio-economic processes has brought down accidental and unconfined variations in land as a resource. A consequence due to mismanagement of agricultural, urban and range of forest lands rose, and a transformation in land use land cover which led to severe environmental problems such as landslides, floods etc.
- Existing literature demonstrated that progress has been made in identifying the potential consequences of various land changes, though there remains a clear need to improve the tools available to predict and manage specific impacts of land use and land cover change.
- The impact of urbanization on land use/land cover has a major concern over past few decades, and in particular, it has involved the environment quality and degraded it. The scope of land use/land cover needs to be checked and marked for sustainable future, especially areas ongoing urbanization.

## Acknowledgement

The authors thankfully acknowledge all authors and publishers for providing all the necessary information and the research done by them which has made the study achievable.

## REFERENCES

Adubofour Frimpong, Application of Remote Sensing and GIS for Forest Cover Change Detection, Kwame Nkrumah

- University of Science and Technology (Knust) Kumasi, Ghana, April 2011.
- Ashish Bhandari, Nitin Bela, Nitin Mishra, and Sakshi Gupta, Change Detection of Land use Land Cover using GIS & Remote Sensing for Doon Valley, *SRG International Journal of Civil Engineering (SSRG-IJCE)* – volume 3 Issue 7 – July 2016, 36:77-78p.
- Detection for the Environmental Impact on Climate Change using Remote Sensing and GIS Technology (A Case Study of Udupi Taluk, Karnataka State, India, *International Journal of Geoinformatics*, Vol. 10, No. 2, June, 2014
- Dewan, A. M., & Yamaguchi, Y. 2009. Land use and land cover change in Greater Dhaka, Bangladesh: Using remote sensing to promote sustainable urbanization. *Applied Geography*, 29(3), 390-401.
- Dunno, Robert M. Weber, A. Glenn. Riparian Vegetation Mapping and Hopi Indian Reservation, Arizona Image Processing Techniques. *Photogrammetric Engineering & Remote Sensing February 2001*;179-186p.
- Hamid Hamed Ibrahim, Ahmed H. I. Elfaig, Mokhtar, J, Omer Egemi, Mohammed Abdelkreim, Land Use/Land Cover Change Detection In Semi- Arid Lands: A Study From Sudan-Ghubaysh Area: A GIS And Remote Sensing Perspective, *International Journal Of Scientific & Technology Research* Volume 4, Issue 05, May 2015, Ijstr©2015
- Kiran, V. S. S. Change Detection In Landuse/Landcover Using Remote Sensing & G.I.S Techniques: A Case Study of Mahananda Catchment, West Bengal, *International Journal of Research in Management Studies (IJRMS)*, Vol. 2, No. 2, October 2013.
- Nambi Harish1, K. Chakradhar Rao, K. Venkateswarlu, B. Govardhan Reddy, M. Abubakar Siddiq, P. Rajarajeswari, Karthik Sai. M, Land use Land Cover change mapping using Remote Sensing and GIS: A case study of Gudur Mandal, SPSR Nellore District, Andhra Pradesh, *International Research Journal of Engineering and Technology (IRJET)*, Volume: 03 Issue: 02, Feb-2016.
- Nitin Mishra, Deepak Khare, Rituraj Shukla, Lakhwinder Singh, Change Detection of Land Use/Land Cover in Upper Ganga Canal Command, India, Using Arc-GIS Tools, *Journal of Remote Sensing & GIS* ISSN: 2230 - 7990, 36:77–78p.
- Praveen Kumar Mallupattu and Jayarama Reddy Sreenivasula Reddy, Analysis of Land Use/Land Cover Changes Using Remote Sensing Data and GIS at an Urban Area, Tirupati, India, *The Scientific World Journal*, Volume 2013, Article ID 268623.
- Ram, B., & Kolarkar, A. S. 1993. Remote sensing application in monitoring land-use changes in arid Rajasthan. *International Journal of Remote Sensing*, 14(17), 3191–3220.
- Rejin Nishkalank, R.A., Gurugnanam, B.L. and Use And Land Cover Change Detection Using Remote Sensing And Gis From Thoothukudi To Vembar Coast, *International Journal of Recent Trends in Engineering & Research (IJRTER)* Volume 02, Issue 09; September - 2016.
- Rejin Nishkalank, R.A., B.Gurugnanam, Land Use And Land Cover Change Detection Using Remote Sensing, *SSRG International Journal of Geo informatics and Geological Science (SSRG-IJGGS)* – volume 1 Issue 2 Sep to Oct 2014.
- Suneela, T. Mamatha, G. 2016. Detection Of Land Use And Land Cover Changes Using Remote Sensing And Geographical Information System (GIS) Techniques, *International Journal Of Electrical, Electronics And Data Communication*, Volume-4, Issue-12, Dec.-2016.

\*\*\*\*\*