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CHANGE DETECTION IN LAND USE LAND COVER OF CHINCHOLI TALUK USING REMOTE SENSING AND GIS

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Abstract : Land Use Land Cover (LULC) Change Detection is a vital tool for monitoring and managing natural resources and land use planning. This study aimed to create a LULC Change Detection map of Chincholi Taluk, located in the state of Karnataka in India, using Remote Sensing and GIS techniques. The study involved the acquisition and processing of satellite imagery for two different time periods, classifying the images into different land cover classes, and performing a change detection analysis to detect any changes that had occurred. The accuracy of the results was validated through fieldwork and accuracy assessment. The results showed significant changes in land use, including deforestation, urbanization, and agricultural expansion. These changes highlight the need for sustainable land use management in Chincholi Taluk. The study provides valuable information for decision-making processes related to natural resource management and land use planning.

Keywords: Change Detection , Image Classification, Remote sensing ,GIS

INTRODUCTION

Land Use Land Cover (LULC) Change Detection is an important process for analyzing and monitoring the changes in land use and land cover over a period of time. The process involves the use of Remote Sensing and GIS techniques to acquire, process, and analyze satellite imagery to create LULC maps for different periods. These maps are then compared to detect any changes that have occurred. LULC Change Detection is a valuable tool for studying the impact of human activities on the environment and for managing natural resources. It is widely used in various fields, including agriculture, forestry, urban planning, and environmental management. Remote Sensing and GIS are the key technologies used in LULC Change Detection. Remote Sensing involves the use of satellite imagery to collect data about the Earth's surface, while GIS is used to manage and analyze this data. These technologies have revolutionized the way we study and manage our environment, providing accurate and timely information for decision-making processes. In this process, the accuracy of the results is crucial, and it is important to use appropriate techniques and methods for data acquisition, image processing, and analysis. The accuracy of the results can be validated through fieldwork, ground truth data collection, and accuracy assessment. Overall, LULC Change Detection using Remote Sensing and GIS is an important tool for studying and monitoring land use changes, managing natural resources, and supporting decision-making processes in various field.

Study area :

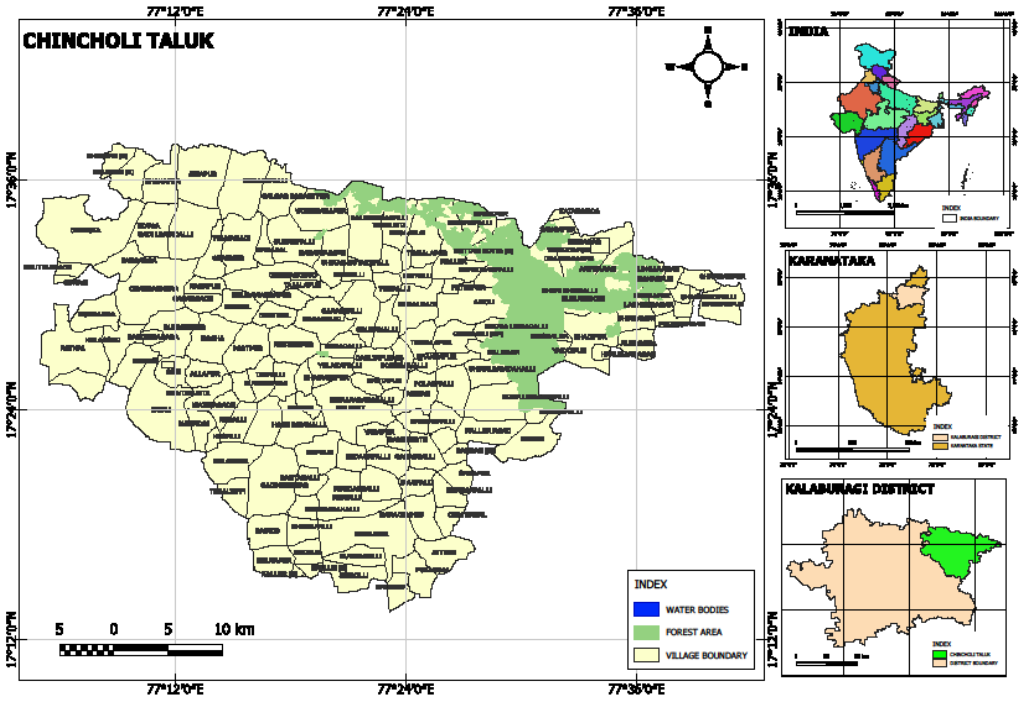

Fig.1 Study Area Map of CHincholi Taluka

Chincholi taluk is located in the northern part of the kalaburagi district, bordering the state of telangana and bidar district. It is situated at an elevation of 465 meters (1,526 feet) above sea level. The taluk covers an area of approximately 1500 square kilometers and is surrounded by other taluks of the Kalaburagi district, such as Sedam ,chittapur and kalaburgi taluks.

Chincholi taluk has some forested areas, but the majority of the taluk is covered by scrub forests and grasslands. The forests in the taluk are mainly found in the hilly areas towards the north and northeast

According to the 2011 Census of India, Chincholi taluk has a population of approximately 250,000 people, with a roughly equal gender ratio. The literacy rate in the taluk is around 57%, which is lower than the national average. The majority of the populations are involved in agriculture, with other significant occupations being construction work, manufacturing, and transportation.

Agriculture is the primary source of livelihood for the people of Chincholi taluk. The area is known for its red soil, which is ideal for growing crops such as jowar (sorghum), bajra (pearl millet), cotton, and pulses. The taluk is also home to several fruit orchards, where fruits such as mangoes, guavas, and pomegranates are grown.

OBJECTIVE:

To generate and compare the satellite image of Chincholi Taluk for a decade from 2009-2019

METHODOLOGY

The materials and methodology used in a study on LULC change detection using Remote Sensing and GIS techniques typically include the following steps:

Data Acquisition: The study requires obtaining satellite imagery LISS 3 for the study area and time period of interest.

Data Pre-processing: The raw satellite data is processed to remove errors, noise, and cloud cover. This involves atmospheric correction, radiometric calibration, and image enhancement.

Image Registration: The processed images are registered or aligned spatially to ensure that they are aligned to the same geographic location.

Image Classification: The study uses supervised or unsupervised classification algorithms to classify the satellite images into different LULC classes. These classes can include forest, agriculture, water bodies, bare soil, urban areas, and mining areas.

Accuracy Assessment: The accuracy of the LULC classification is assessed using ground truth data, such as field surveys, aerial photography, or other reliable sources. Change Detection Analysis: The LULC maps for different time periods are compared to

identify and quantify changes that have occurred in the study area. This includes identifying areas where there has been a change in land use or land cover, and the magnitude of these changes. Data Analysis: The study analyzes the data to identify the drivers of change, such as human activities, natural factors, or a combination of both. Results and Discussion: The study presents the results and discusses the implications of the findings for land use planning and management.

RESULT:

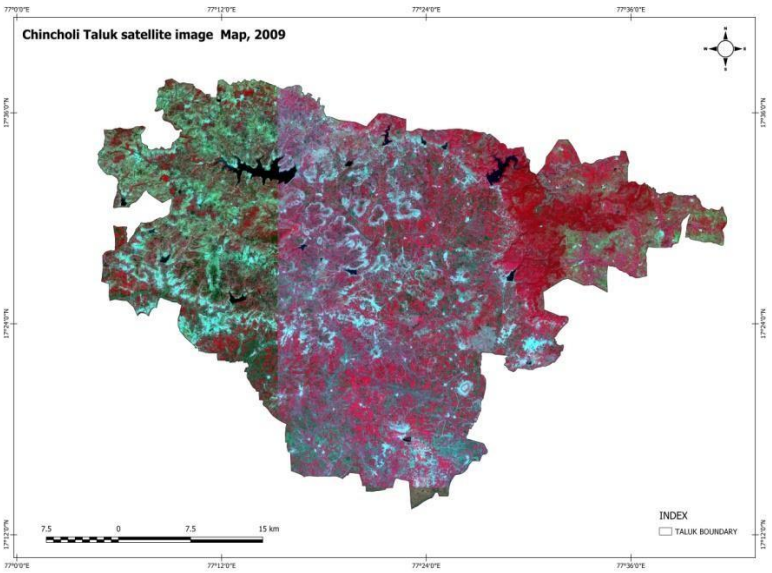

Figure 2: LISS 3 satellite imagery 2009

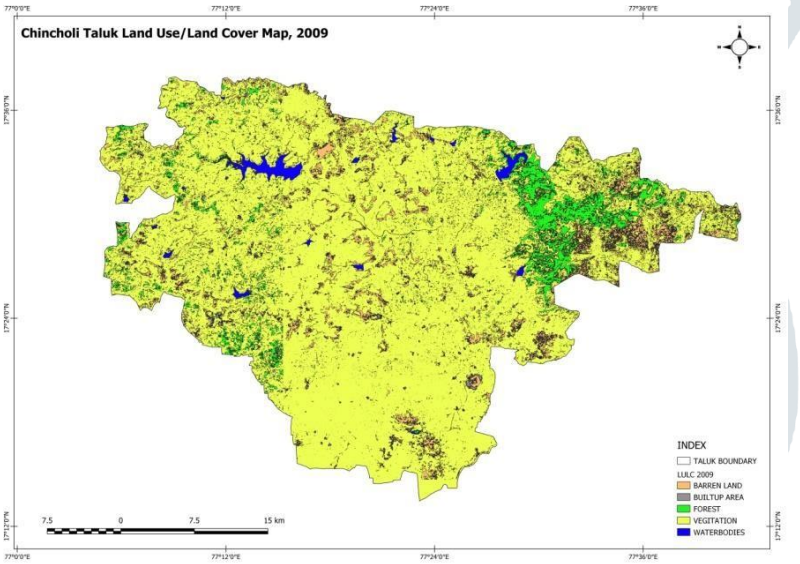

Figure 3: Land use /land cover map 2009

Table 1: Land use Land cover classification and its changes 2009

2009 CHINCHOLI LULC			
S.NO	**LULC**	**AREA (Square KMS)**	**% COVERED**
1	Barren land	155.06	10.04%
2	Builtup land	22.26	1.44%
3	Forest	158	10.23%
4	Agriculture land	1192	77.15%
5	Waterbodies	17.7	1.15%
TOTAL		1545.02	100.00%

According to the analysis of the 2009 Liss3 image, Chincholi taluk had a total land area of approximately 1525.02 square kilometers, with various land use categories.The largest land use category in Chincholi taluk was agriculture land, covering 1192 square kilometers (77.15 %). This suggests that agriculture was a major activity in the taluk at that time, and was likely a significant source of livelihood for its residents

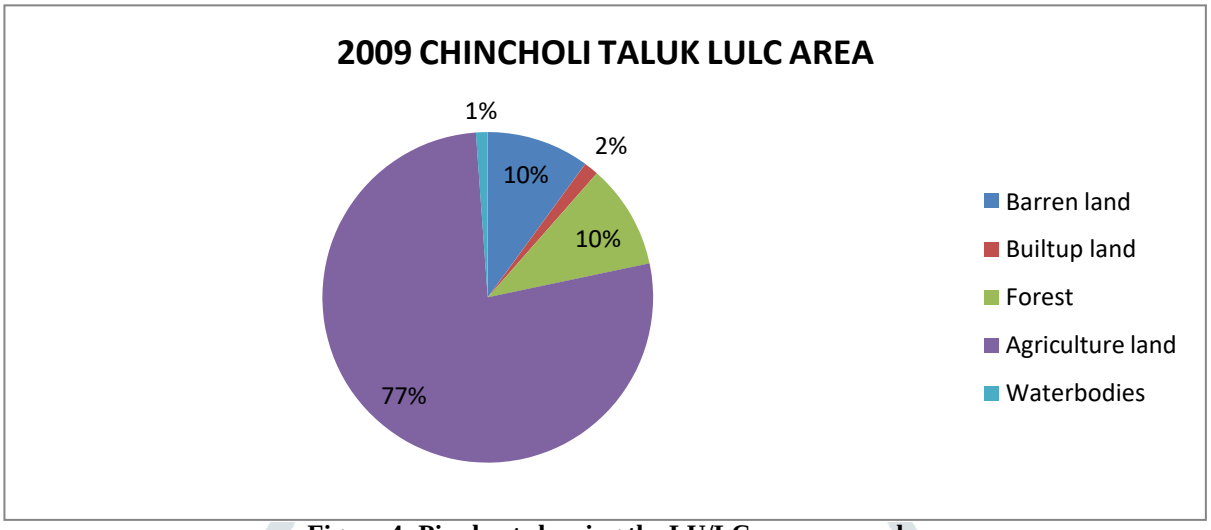

Figure 4: Pie chart showing the LU/LC area covered

Forests covered 158 square kilometers (10.23 %) of the taluk, indicating the presence of a significant amount of natural vegetation in the area. This is important for biodiversity conservation and as a source of resources for the local community.Water bodies, which included rivers, lakes, and other bodies of water, covered 17.7 square kilometers (1.15%) of the taluk.

These were important for irrigation, drinking water, and other uses. Barren land covered 155.06 square kilometers (10.04%)), indicating a significant amount of unproductive land in the taluk. This land may have been unsuitable for agriculture or other uses due to factors such as poor soil quality, topography, or other environmental conditions. Built-up land covered only 2.26 square kilometers (1.44%),

suggesting that urbanization and industrialization had not had a major impact on the landscape of Chincholi taluk at that time.

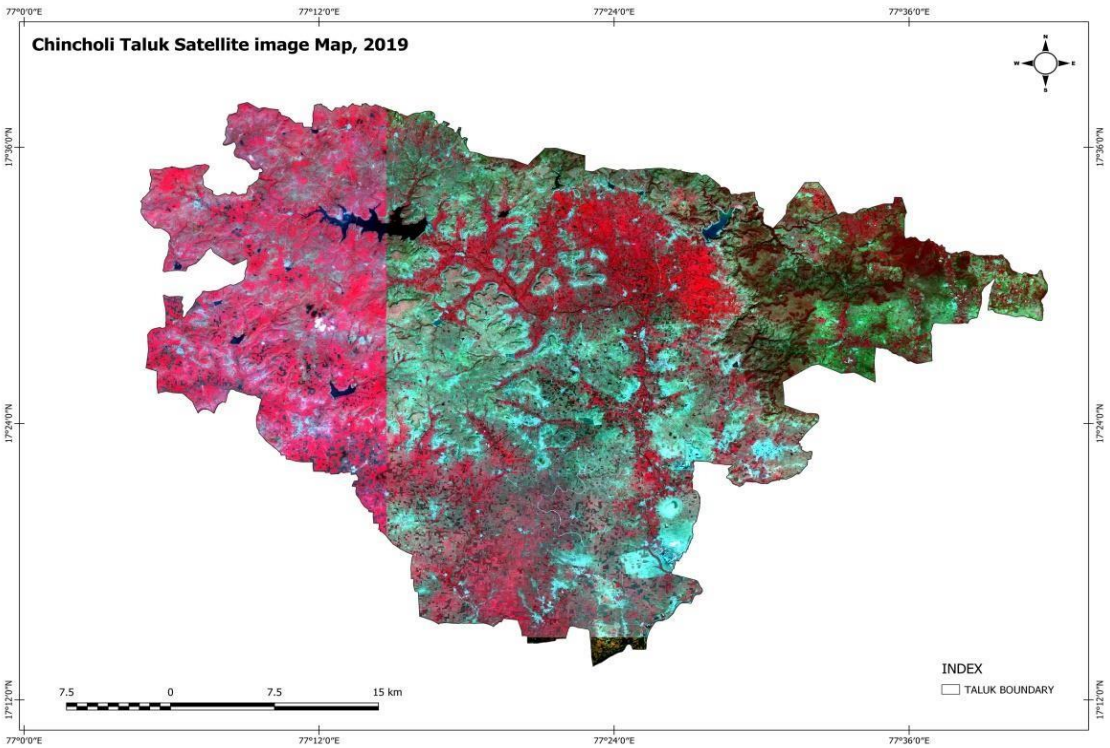

Figure 5: LISS 3 satellite imagery 2019

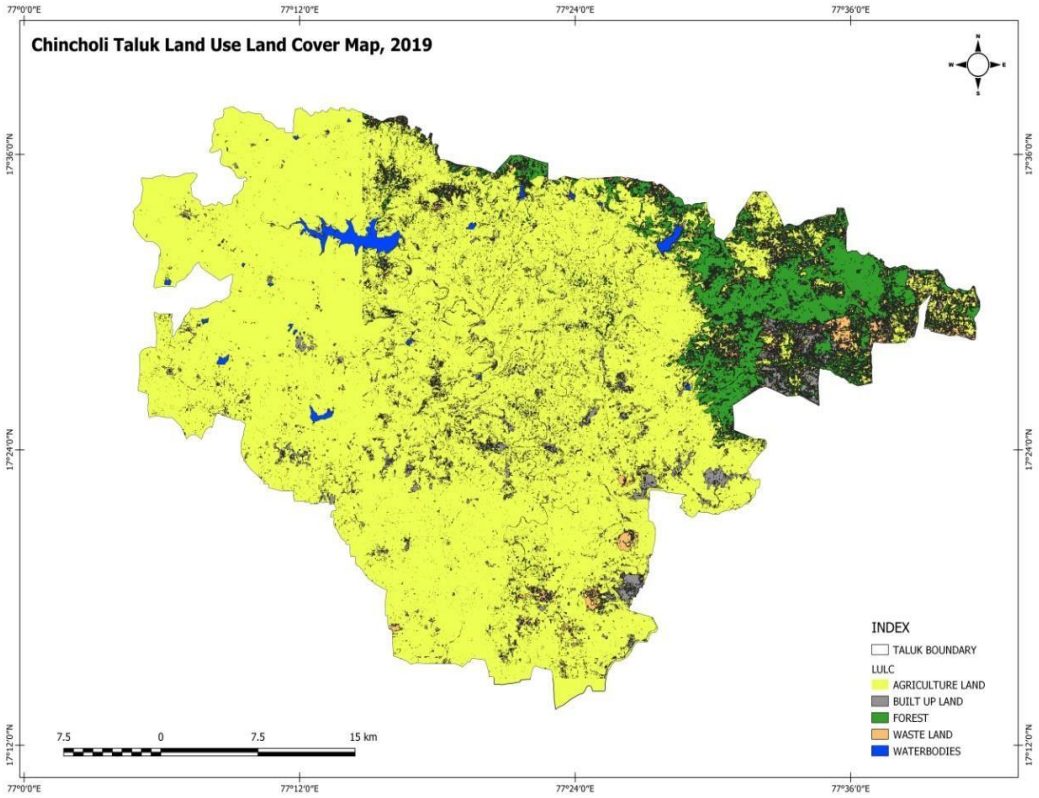

Figure 6: Land use /Land cover map 2019

Table 2: Land use Land cover classification and its changes 2019

2019 CHINCHOLI LULC			
S.NO	**LULC**	**AREA (Square KMS)**	**% COVERED**
1	Barren land	75	4.85%
2	Builtup land	89	5.76%
3	Forest	174.49	11.29%
4	Agriculture land	1192	77.13%
5	Waterbodies	15	0.97%
TOTAL		1545.49	100.00%

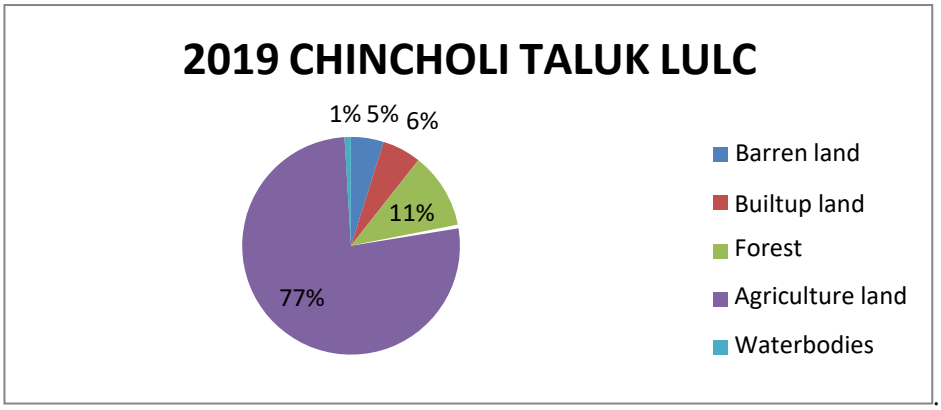

Figure 7: Pie chart showing the LU/LC area covered

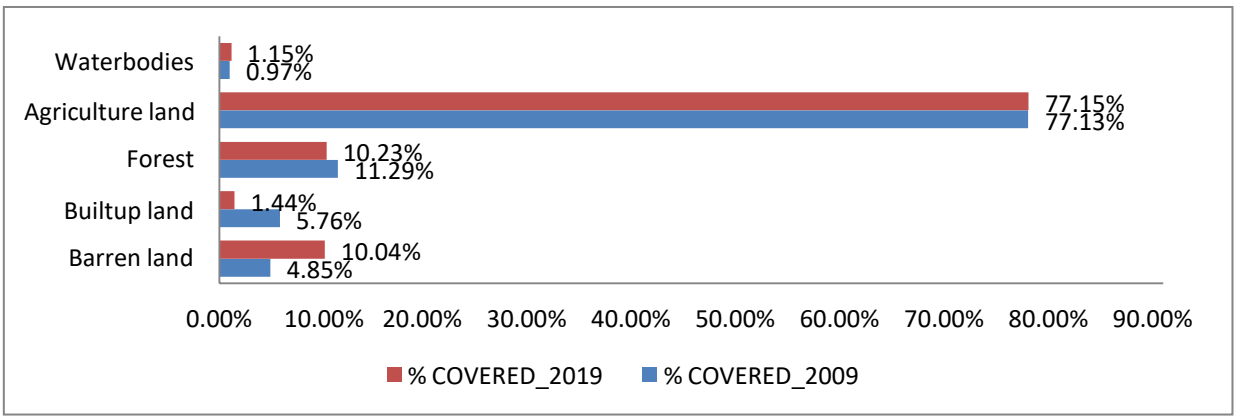

Figure 8: Land use Land cover classification and its changes 2009 and 2019

CONCLUSION

A change detection analysis was conducted by comparing the LULC maps generated from the 2009 and 2019 Liss3 satellite images of Chincholi taluk. The aim of the analysis was to identify and quantify changes in the land use patterns in the taluk over the past decade.

The comparison revealed significant changes in the distribution of land use categories in Chincholi taluk. Barren land decreased from 155.06 square kilometers in 2009 to 75 squarekilometers in 2019, indicating a significant conversion of barren land to other land use categories such as agriculture or built-up land. Built-up land increased from 22.26 square kilometers to 89 square kilometers, indicating rapid urbanization and industrialization in the area.

Forest cover remained relatively stable, with a slight decrease from 158 square kilometers to 175 square kilometers. Agriculture land continued to be the largest land use category, covering 1192 square kilometers in both maps. Water bodies decreased from 17.7 square kilometers to 15 square kilometers, indicating a possible impact of climate change or human activities on water resources in the taluk.

The change detection map generated as a result of the analysis provides a visual representation of the changes that have occurred in the land use patterns of Chincholi taluk over the past decade. The map shows the areas where land use changes have occurred, and can be used to identify the drivers of these changes.

This change in LULC can be attributed to various factors such as urbanization, population growth, agricultural practices, and climate change. The increase in built-up land may be due to urbanization and population growth, while the decrease in barren land may be due to afforestation efforts or land reclamation projects. The decrease in water bodies may be due to natural factors such as drought or human factors such as overuse or pollution.

This information can be useful for decision-makers and stakeholders involved in land use planning and management in Chincholi taluk. By understanding the changes that have occurred and the factors driving these changes, they can make informed decisions about future land use policies and strategies aimed at promoting sustainable development and conservation of natural resources.

REFERENCES

1. M. K. Jat, P. K. Garg, and D. Khare, "Monitoring and modelling of urban sprawl using remote sensing and GIS techniques," International Journal of Applied Earth Observation and Geoinformation, vol. 10, no. 1, pp. 26–43, 2008. View at Publisher · View at Google Scholar · View at Scopus

2. N. E. M. Asselman and H. Middelkoop, "Floodplain sedimentation: quantities, patterns and processes," Earth Surface Processes & Landforms, vol. 20, no. 6, pp. 481–499, 1995. View at Google Scholar · View at Scopus

3. D. Maktav, F. S. Erbek, and C. Jürgens, "Remote sensing of urban areas," International Journal of Remote Sensing, vol. 26, no. 4, pp. 655–659, 2005. View at Publisher · View at Google Scholar · View at Scopus

4. C. A. Berlanga-Robles and A. Ruiz-Luna, "Land use mapping and change detection in the coastal zone of northwest Mexico using remote sensing techniques," Journal of Coastal Research, vol. 18, no. 3, pp. 514– 522, 2002. View at Google Scholar · View at Scopus

5. A. T. Hudak and C. A. Wessman, "Textural analysis of historical aerial photography to characterize woody plant encroachment in South African Savanna," Remote Sensing of Environment, vol. 66, no. 3, pp. 317–330, 1998. View at Publisher · View at Google Scholar · View at Scopus

6. J. G. M. Tziztiki, F. M. Jean, and A. H. Everett, "Land cover mapping applications with MODIS: a literature review," International Journal of Digital Earth, vol. 5, no. 1, pp. 63–87, 2012. View at Google Scholar

7. O. Aboyade, "Geographic information systems: application in planning and decision- making processes in Nigera," Unpublished paper presented at the Environmental and Technological unit in the Development Policy Centre, Ibadan, 2001.

8. A. G. O. Yeh and X. Li, "Principal component analysis of stacked multi-temporal images for the monitoring of rapid urban expansion in the Pearl River," International Journal of Remote Sensing, vol. 19, no. 8, pp. 1501–1518, 1998. View at Google Scholar · View at Scopus

9. T. Fung and E. Ledrew, "Application of principal components analysis to change detection," Photogrammetric Engineering & Remote Sensing, vol. 53, no. 12, pp. 1649–1658, 1987. View at Google Scholar · View at Scopus

10. H. Long, X. Wu, W. Wang, and G. Dong, "Analysis of urban-rural land-use change during 1995-2006 and its policy dimensional driving forces in Chongqing, China," Sensors, vol. 8, no. 2, pp. 681–699, 2008.View at Google Scholar · View at Scopus

11. M. El-Raey, Y. Fouda, and P. Gal, "GIS for environmental assessment of the impacts of urban encroachment on Rosetta region, Egypt," Environmental Monitoring and Assessment, vol. 60, no. 2, pp. 217–233, 2000. View at Publisher · View at Google Scholar · View at Scopus

12. S. Martinuzzi, W. A. Gould, and O. M. R. González, "Land development, land use, and urban sprawl in Puerto Rico integrating remote sensing and population census data," Landscape and Urban Planning, vol. 79, no. 3-4, pp. 288–297, 2007. View at Publisher · View at Google Scholar · View at Scopus

13. H. S. Sudhira, T. V. Ramachandra, and K. S. Jagadish, "Urban sprawl: metrics, dynamics and modelling using GIS," International Journal of Applied Earth Observation and Geoinformation, vol. 5, no. 1, pp. 29– 39, 2004. View at Publisher · View at Google Scholar · View at Scopus

14. S. Hathout, "The use of GIS for monitoring and predicting urban growth in East and West St Paul, Winnipeg, Manitoba, Canada," Journal of Environmental Management, vol. 66, no. 3, pp. 229–238, 2002.View at Publisher · View at Google Scholar · View at Scopus

15. J. R. Jensen, Introductory Digital Image Processing: A Remote Sensing Perspective, Prentice Hall, Upper Saddle river, NJ, USA, 1996.

16. J. F. Mas, "Monitoring land-cover changes: a comparison of change detection techniques," International Journal of Remote Sensing, vol. 20, no. 1, pp. 139–152, 1999. View at Google Scholar · View at ScopusT. M. Lillesand and R. W. Kiefer, Remote Sensing and Image Interpretation, John Wiley & Sons, New York, NY, USA, 4th edition, 2000.

17. P. Coppin, I. Jonckheere, K. Nackaerts, B. Muys, and E. Lambin, "Digital change detection methods in ecosystem monitoring: a review," International Journal of Remote Sensing, vol. 25, no. 9, pp. 1565–1596, 2004. View at Publisher · View at Google Scholar · View at Scopus