



Journal of Contemporary Urbanology

A Peer Review Journal
Editorial Office:
Department of Urban and Regional Planning,
Benue State University,
PMB 102119, Makurdi



Journal of Contemporary Urbanology

Volume 8, No.1, March, 2021

ISSN: 2315-8050

Advisory Board Members

Editor -in-Chief

Dr. Sylvester Tarungwa Iorliam
PhD, RTP, MNITP

Prof. T. T. Gyuse RTP, FNITP

*Department of Urban and Regional Planning
Nasarawa State University, Keffi.*

Managing Editor

Prof. Thompson Adeboyejo
RTP, MNITP,

Prof. J. Olujimi RTP, FNITP

*Department of Urban and Regional Planning,
Federal University of Technology, Akure.*

Editorial Members

DR. (Mrs) I. D. Mngutyo RTP, MNITP

Dr. P. Adzande RTP, MNITP

Prof. A. O. Afon RTP, MNITP

Dr. F. K. Kwaghsende RTP, MNITP

Dr. Edet E. Ikurekong RTP, MNITP

Dr. Jacob Atser RTP, MNITP

Prof. K. Oyesiku MNITP

*Department of Geography,
Ogun State University, Ago-Iwoye.*

Prof. A. Ahmed RTP, MNITP

*Department of Urban and Regional Planning,
Ahmadu Bello University, Samaru-Zaria.*

Prof. J. B. Falade RTP, MNITP

*Executive Director, Foundation for Development
and Environment Initiation (FDI),
Former Country Representative, UN Habitat.*

All Correspondence to the **Managing Editor, Journal of Contemporary Urbanology**,
Department of Urban and Regional Planning, Benue State University, P.M.B.102119, Makurdi.
email: editornurbanology@gmail.com, williamsdesilva@yahoo.com

08135829753



Journal of Contemporary Urbanology

Volume 8, No.1, March, 2021

ISSN: 2315-8050

Contents

ALL CORRESPONDENCE SHOULD BE ADDRESSED TO

Dr. Sylvester Tarungwa Iorlami, Editor in Chief, Journal of Contemporary Urbanology,
Department of Urban and Regional Planning, Benue State University,
PMB 102119, Makurdi, 970001, BNS, Nigeria or P.O.Box 735, Makurdi.

e-mail: editornjournalurbanology@gmail.com

williamsdesilva@yahoo.com

- The Dynamics of Land Use and Land Cover Change in Non-Coastal
Town of Giyani, Limpopo, South Africa 1
Jimoh M. Yusuf^{1,2*}, Ola A.B², Raheem W.M², A.R. Suleiman², and Raheem W.A²
- Effects of On-Street Parking on Traffic Flow in Makurdi Metropolis, Nigeria 16
**Daniel Peverga DAM¹, Godwin Mbatsavbee KWANGA², Emmanuel AYUA³,
Emmanuel Adah OSENI⁴ and Tersoo Michael JENMKE⁵**
- Social Construction and Inclusive Planning: Dilemma of A Shifting Gender Paradigm 31
Ajene Adam Ajene
- Students' Preferences of Housing in On-campus and Off-Campus Accommodation in
Federal University of Technology, Akure, Nigeria. 42
Ayoola, Hezekiah Adedayo
- Socio-Economic Impact of Road Traffic Accidents on Livelihoods in Minna, Nigeria 56
Ortserga Saakuma
- Public Space Management and Sustainable Development in Nigeria:
The Imperatives and Challenges for Urban Lafia, Nasarawa State. 68
M. K. Dahiru¹(dahirumkmail.Com), Nasir L. BALA², and Ibrahim .M. SAGIR²

THE DYNAMICS OF LAND USE AND LAND COVER CHANGE IN NON-COASTAL TOWN OF GIYANI, LIMPOPO, SOUTH AFRICA

Jimoh M. Yusuf^{1,2*}, Ola A.B², Raheem W.M², A.R. Suleiman², Raheem W.A²

¹ Department of Urban and Regional Planning, University of Venda, Thohoyandou, Limpopo, South Africa

² Department of Urban and Regional Planning, University of Ilorin, Nigeria,

* Correspondence Author: eemayusuf@gmail.com; Tel. +27639810888, +2348188719036

Abstract

Against the background that land is considered not only as an essential means of production but also as a basis of human existence, its availability and accessibility requires adequate research attention. It is on this conviction that this study seeks to model the patterns, rate as well as identify the consequences of land modification in Giyani town of South Africa over the last 30 years in order to provide informed sustainable land use management policies and programmes. The study used a supervised classification method for geospatial analysis of available Landsat imageries for 1987, 1997, 2007 and 2017 to analyze the changes in land cover in Giyani using available imageries in Bands. ArcGIS 10.3 software and raster calculator tool were employed to produce change detection maps. Land Consumption Rate and Absorption Coefficient were adapted to respectively measure land consumption by each member of the community and change of urban land consumption. The results were overlaid to obtain a visual representation of the area/extent of changes that occurred over time. The result shows that 781.9ha of vegetation was transformed between 1987 and 2017, this was largely informed by the increased demand for firewood and material for construction, construction of infrastructure, government offices etc. Built-up areas increased in its coverage to about 919.44ha within the three decades (1987-2017). Due to the expansion of the town to the hinterland, bare land was consumed by about 672.87ha within same period with 0.06 LCR in 2017 and 0.09 LAC between 2007 and 2017. The paper underscored need for vertical growth (smart-city growth concept), and advocated for promoting tree planting among Giyani residents to prevent wanton land modification.

Keywords: Land use, Land Cover, Non-Costal city
JCU Volume 8, No.1, March, 2021

Introduction

The human-land interactions have in history enjoyed the patronage of scholars in geography and allied disciplines (Barrows, 1923; Sauer, 1925), it also forms a focal point in land use and land cover transition literature. Although, in the recent times Fresher denotations are emerging discoveries on "land" and "land use" (Blaike and Brookfield, 1987; Peet and Watts, 1996). People-land interaction transcends the "use" and "management," of land but also entails several complex connections within and between actors and organizations. Evidence of these processes is abundant (Levin and Weiner 1997).

Considering land as an essential production means and equally the basis of human existence, harnessing it can generate wealth for individuals, groups and communities as well as provide for food, fibre, fuel and other biotic materials for the consumption of man (Anafo, 2013). Since its availability and accessibility can be linked to prosperity and survival, it is an essential socio-economic asset (Theron, 2009). Land in South African context is an indispensable part of development and socio-political reconstruction in a post-apartheid era (Department of Land Affairs, 2006:5). Despite its fixed supply nature and inelasticity, there is ever increasing pressure upon it as population grow (Dawson, 1984). Rosch et al. (2010).

Land modification has over the years significantly been influenced by human engagement and activities in a manner that could be referred to as non-linear, commonly referred to change in land use (Tayyebi and Pijanowski, 2014). The global look, as presented by several scholars portray human as a major transformer of land use through the capturing of the land and its resource for habitation, transportation, recreation, comfort and other forms of livelihood. This development was unprecedentedly accelerated particularly when human quest to maximize production scale, through industrialization and technological innovations (Fabiyyi, 2006). These have reportedly exacerbated urban growth, population explosion, increased social inclusion and economic opportunity as well as the colonization of geographical space (Okwori & Fabiyyi, 2016; Ndabula et al., 2013). Among several scholars, Chaudhary et al. (2008); Fabiyyi, (2006) and Balogun et al. (2011) have identified urban evolution and growing population as well as industrialization and modernization as regular global phenomena having the highest and the most substantial effects on the interconnectedness and the workings of environment.

Information about the dynamics and the associated factors of land modification is thus essential for effective resource allocation, policy making, planning and implementation

of land use management while balancing increasing human demands for basic needs (Singh and Khanduri, 2011, cited in Okwori & Fabiyi, 2016) against sustainability.

Most studies in Southern Africa (Mpho and Jabulani, 2019; Brent, 2004, 2007) have either isolated biodiversity and ecosystem or assessed land as an indicator of transformation in the farm redistribution, or examined from the point of apartheid spatial engineering focusing rural environment. Little attempt succeeded in analyzing the Land cover transformation from urban point of analysis. This study thus seeks to model the patterns, rate as well as identify the causative factors of land

South Africa over the last 30 years in order to provide information for sustainable land use management of the study area, as well as other small and medium sized towns in the province.

Materials and Methods

The Study Area

Giyani town serves as the administrative hub of Greater Giyani Municipality as well as the Mopani District Municipality. Greater Giyani is largely rural, with Giyani the only semi-urban concentration. Giyani is located +/- 185 km from Polokwane, +/- 100 km from Thohoyandou and +/- 550 km from Tshwane.

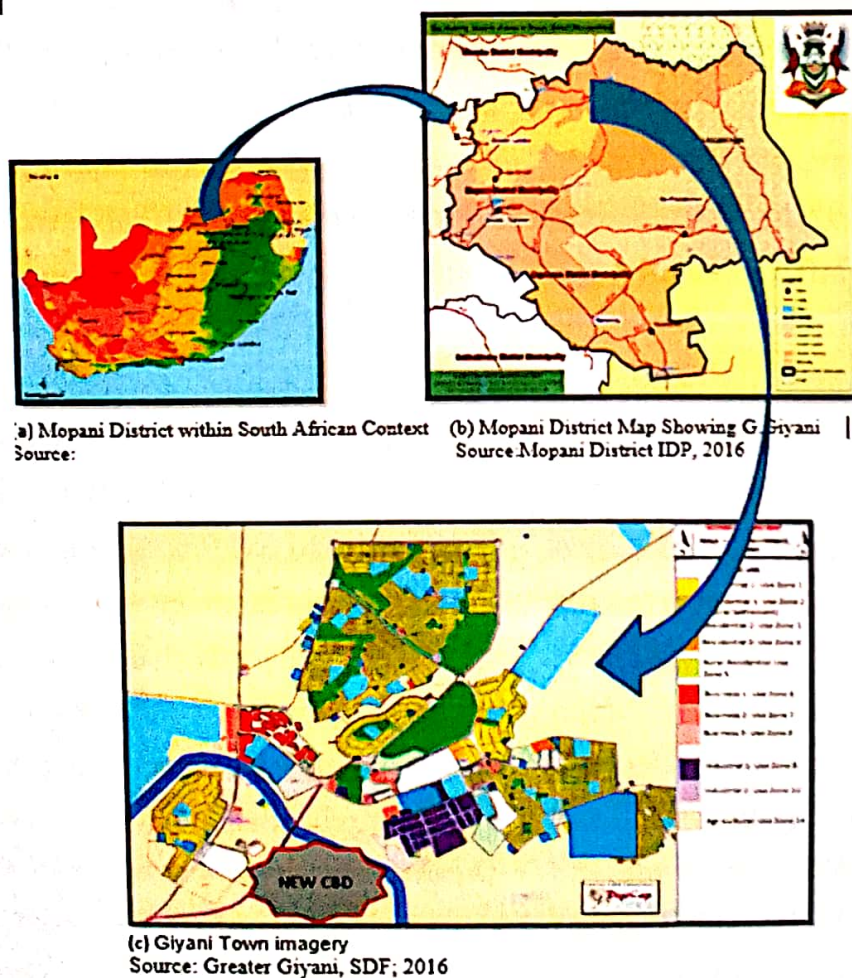


Fig. 1(a-c): The study area in Maps
JCU Volume 8, No.1, March, 2021

According to the South African Census data of 2011, Giyani population as estimated in 2016 (Stats SA CS 2017) at an average annual rate of 1.08% (Stats SA Census 2011) stands at 25,082. Giyani household analysis reveals average household size to be 3.1, and a total of 8,098 households, 34.3% of this population are below the age of 15 year, 60.4% are between 15 and 64 years of age while less than 5% are above 65 years old. Meanwhile the ratio of male per 100 females is estimated at 79.9%. It has 83.6 % female headed households in the district which is more than 4 in every 5 households.

Being a town with dual functions (as administrative hub for both Mopani District and Greater Giyani Municipalities) it has served as a centrifugal force that has attracted to the region remarkable growth and development in various forms and sizes, this includes buildings, roads, infrastructure, and services. It has equally attracted population influx from within and outside the region. These come with numbers of attendant consequences on land and its resources particularly the modification of land uses and coverage. Meanwhile in most of the previous studies, as earlier acknowledged, e.g. Mpho and Jabulani (2019); Hanna et al, (2010) and others either emphasis biodiversity and ecosystem or pay premium to rural farm land redistribution, paying little attention to analyzing land cover transformation from

urbanisation point of view. This study thus seeks to fill this gap with the view to identify the patterns, rate as well as the implications associated with land modification in Giyani town of South Africa over the last three decades in order to offer information for sustainable land use management.

Method

This study involved the use of geospatial analysis of available LandSat imageries for 1987, 1997, 2007 and 2017 to analyze the changes in land cover in Giyani. Using data (LandSat imageries) from various public sources in bands. We used Band 2, Band 3 and Band 4 for the years 1987, 1997 and 2007, and band 5, Band 4, and Band 3 for the year 2017 using ArcGIS 10.3 software, to creating. Composite imagery (i.e. combining the bands to form one imagery) was created using the composite band tool in the raster processing toolbox for each year. Raster calculator tool (the spatial analyst toolbox) was used to produce change detection maps by subtracting the earlier year from the current year. Statistical analysis for each map was produced showing the area covered by each land use in m² and finally converted to hectares and the percentage covered by each land use is shown in tables.

The areas measured are expressed as follows:

- a) $\text{Area (m}^2\text{)} = \text{Cell size (pixels)} \times \text{Count (Number of pixels in each land use)}$

classification;

b) $\text{Hectares} = \text{Area (m}^2\text{)} / 10,000$

On the other hand, Land Consumption Rate (LCR) is a measure of progressive spatial urbanization of a study area and Land Absorption Coefficient (LAC) is a measure of change of urban land by each unit increase in urban population. The two were adopted to measure the rate at which the land in the town changed to equally measure land cover change per unit of change in population for this period, thus:

$$\text{L.C.R} = A/P \dots \dots \dots (1)$$

Where A = total Area of land occupied by the town; and P = total Population of the town under consideration

Land Absorption Coefficient (LAC) was further used to measure change in urban land by each unit increase in urban population, it expresses land consumption by each member of the community. This was calculated as:

$$\text{L.A.C} = A_2 - A_1 / P_2 - P_1 \dots \dots \dots (2)$$

Where: A = areal extent of the city in hectares; and P = population

Images were generated for different years from this analysis, these were overlaid to obtain a visual representation of the area/extent of changes that occurred during the period for each of the land cover strata. In this (overlay) operation, the exact location and the amount of change in the towns were determined through

georeferencing. The study emphasizes more on built up land in terms of location of change.

The magnitude change for each LULC class was calculated using a supervised classification method based on each year's Landsat by subtracting the area coverage of the second year from that of the initial year as shown in the equation below

$$\text{Magnitude} = \text{Magnitude of the new year} - \text{Magnitude of the previous year} \dots \dots \dots (3)$$

Percentage change (trend) for each LULC type was then calculated by dividing magnitude change by base year area coverage and multiplied by 100 as shown in the equation below:

$$\text{Trend (percentage change)} = \frac{\text{magnitude of change}}{\text{Base year}} * 100 \dots \dots \dots (4)$$

Base year

In obtaining the annual rate of change for each LULC type, the trend (percentage change) was divided by 100 and multiplied by the number of study year 1987 – 1997 (10 years), 1997 – 2007, 2007 – 2017 (10 years) and 1987 – 2017 (40 years) as the case may be is as shown in the equation below:

$$\text{Annual rate of change} = \frac{\text{Trend (percentage change)}}{100} * n \dots \dots \dots (5)$$

Presentation of findings and Discussion

Spatial and temporal analysis of land use change in Giyani 1987-2017

From the analysis of the classification of land use/cover transformation in the study area, calculated using a supervised classification method based on each year's Landsat, significant variations was found to exist both spatially and temporally. These are shown in the generated maps depicting the rates and magnitude of transformations experienced at different years and decades, (see figure 2 to 7). Land area are estimated and illustrated on

individual basis as well as percentage coverage for the three decades (1987 through to 2017).

Land cover transformation in Giyani (1987-2017) is presented in Table 1 and Figure 1. In 1987, the built-up areas (357.5ha) accounted for about 20.31% of the total land area, bare lands, on the other hand covered 41.21% implying about 725.4ha while in the same year, the part covered by vegetation was estimated to be about 677.4ha equivalent to 38.48% of the entire land area in the town.

Table 1: Land use and land cover change in Giyani town (1987-2017)

Classes	1987		1997		2007		2017	
	Area (Ha)	%	Area (Ha)	%	Area (Ha)	%	Area (Ha)	%
built up	357.57	20.3	636.57	36.16	1028.8	58.44	1277.01	72.54
Vegetation	677.43	38.5	714.33	40.58	174.42	9.91	379.53	21.56
Bare lands	725.4	41.2	409.5	23.26	557.19	31.65	103.86	5.90
Total	1760.4	100	1760.4	100	1760.4	100	1760.4	100

Source: Authors' computation, 2019

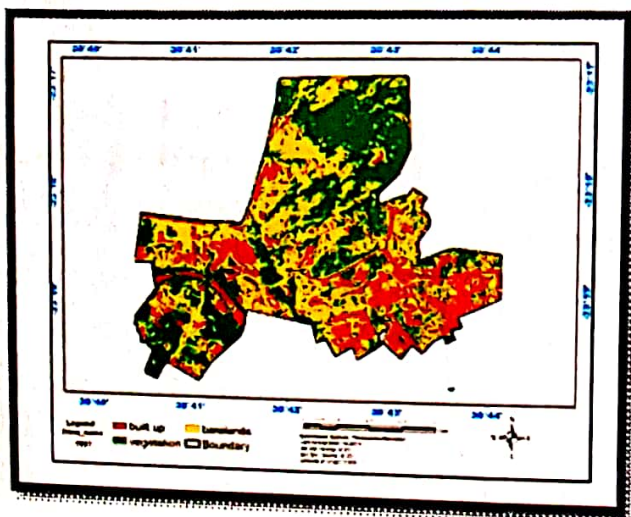


Figure 2: Land use and land cover change in Giyani town (1987) Giyani town(1997)

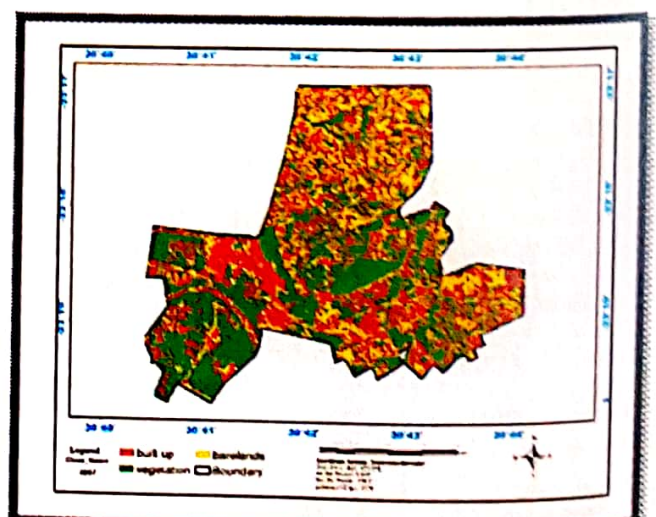


Figure3: Land use and land cover change in

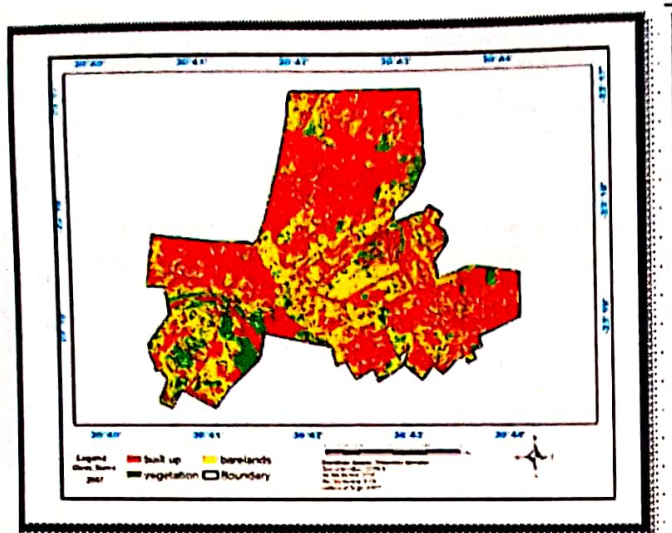


Figure 4: Land use and land cover change in Giyani Town (2007)

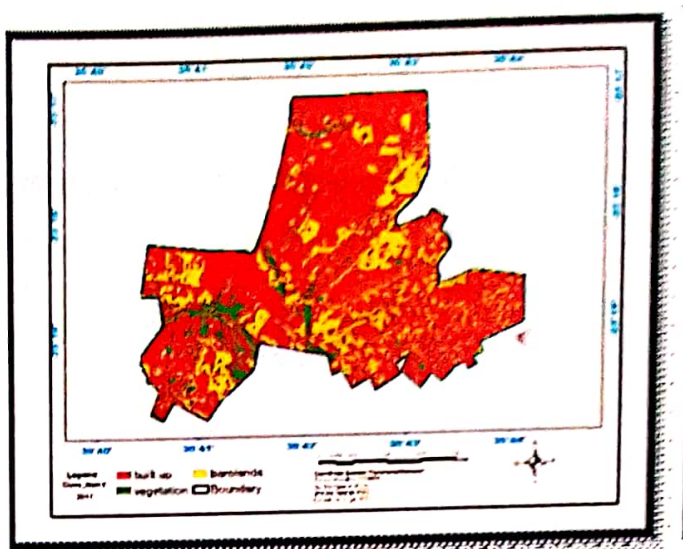


Figure 5: Land use and land cover change in Giyani Town (2017)

Subsequently, the table further indicates that in just a decade interval, between 1987 and 1997, the built-up areas had increased to cover 36.16% of total area of Giyani, while in the next two decades, built-up land use increased to cover 58.44% (1028.8ha) and 72.54%

(1277.10ha) of the entire area of Giyani land respectively by the years 2007 and 2017. Vegetation cover was approximately 714.33ha (40.58%,) in 1997 while 174.42ha was consumed in 2007 for same land use category.

Table 2: Decadal interval of Land use and land cover change in Giyani town (1987-2017)

LAND USE	1987 – 1997		1997 – 2007		2007-2017	
	Area (Ha)	%	Area (Ha)	%	Area (Ha)	%
Bare lands - Built up	114.75	6.52	467.64	26.56	372.87	21.18
Bare lands – Vegetation	59.67	3.39	3.42	0.20	193.14	10.97
Vegetation – Bare lands	20.61	1.17	78.3	4.45	23.94	1.36
No Change	1565.37	88.92	1211.04	68.79	1170.45	66.49
Total	1760.4	100	1760.4	100	1760.4	100

Source: Authors' computation, 2019

Table 2 depicts a loss of about 114.75ha of virgin land to built-up area and more than 20ha of land was converted from vegetation cover to bared land between 1987 and 1997. Significantly, close to nine in every ten hectares of land in the town, implying 88.92% retained their previous uses within the same decade. Succeeding decade (1997-2007)

recorded more than ¼ of the entire town's land cover compromised from bare land to built-up and impervious cover, this implies about 467.6ha of land. While part of the land that retained their uses in the previous decade was equally compromised for various land uses, the table above depicts a 20.13% (352.33ha) reduction in this category from the previous

decade. On the other hand, 193.14ha about 10.97% was previously bare land in the previous decade but taken over by vegetation,

and about 21% was invaded by impervious land use (built-up) between 2007 and 2017.

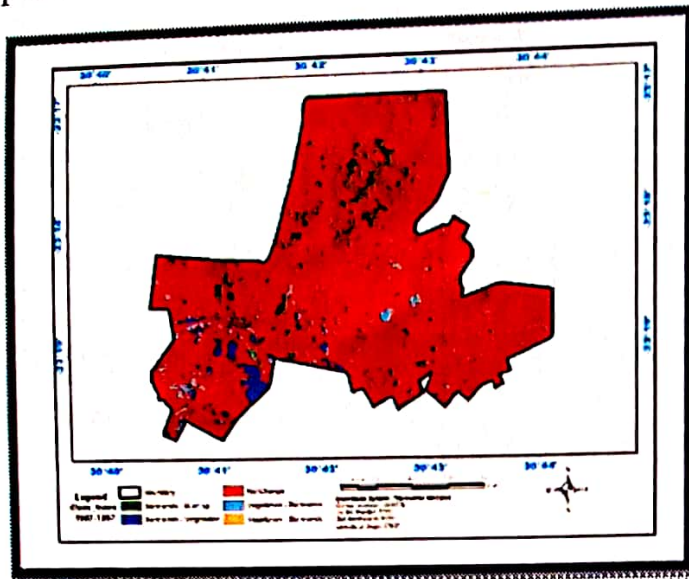


Figure 6: Land use and land cover change in Giyani town(1987-1997) in Giyani town(1997-2007)

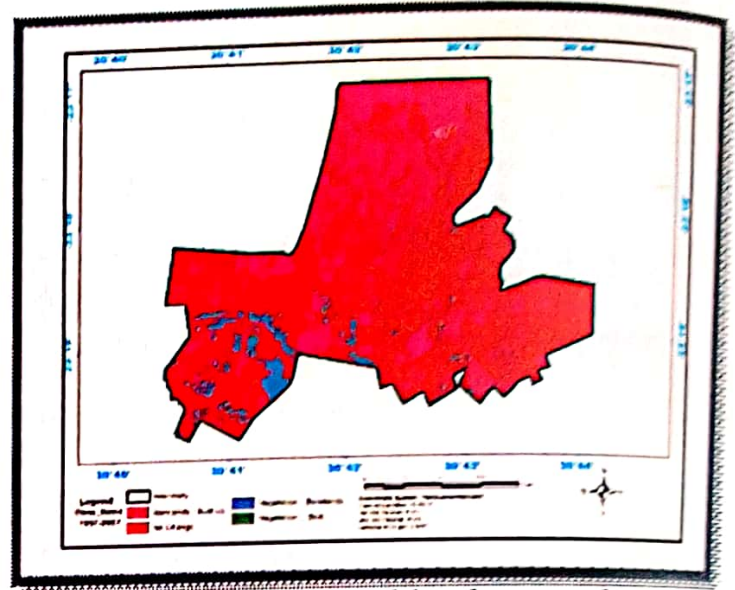


Figure 7: Land use and land cover change in Giyani town (1997-2007)

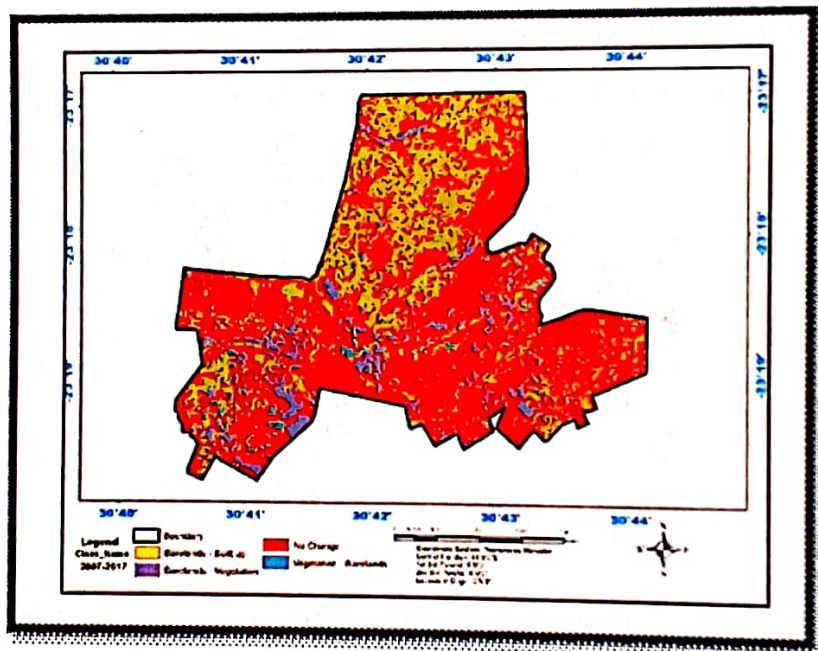


Figure 8: Land use and land cover change in Giyani town (2007-2017)

Land Consumption Rate (LCR) as a measure of progressive spatial urbanization and Land Absorption Coefficient (LAC) as a measure of change of urban land by each unit increase in urban population were examined between 1987 and 2017 and presented in Table 3. It

should be noted here that the projected population figures were used in the estimation of both the Land Consumption Rates and the Land Absorption Coefficients as given in Table 3.

Table 3: Land Consumption Rate and Land Absorption Coefficient of Giyani town (1987, 1997, 2007 and 2017)

Year	Land Area Cover (Ha)	Population	Land Consumption Rate	Land Absorption Coefficient	
				Year	LAC
1987	1760.4	-	-	-	-
1997	1760.4	22,211	0.08	1987/1997	-
2007	1760.4	25,025	0.07	1997/2007	0.1
2017	1760.4	27,660	0.06	2007/2017	0.09

Source: Authors' computation, 2019

Table 3 indicates that in 1997 in Giyani, land consumption rate which explains the rate of land per individual inhabitants of the town was estimated to be 0.08 with a population 22,211. The town experienced a decreased rate in land consumption to 0.07 in about 10 years after with increased population to about 25,025. Same trend was observed between 2007 and 2017 when the town witnessed growth in its population and decrease in the corresponding LCR respectively to 27,660 and 0.06. Meanwhile, the coefficient values as estimated

and shown in Table 3 depicts 0.1 between 1997 and 2007 and 0.09 between 2007 and 2017.

The comparison of the land use land cover statistics assisted in identifying the percentage change, trend and rate of change between 1987 and 2017. Table 4 below depicts the magnitude of change (area) and the percentage change for each static year at decadal interval (1987, 1997, 2007 and 2017) against each land use and land cover.

Table4: Magnitude of Change in Land Cover in Giyani 1987-2017 at 10-year interval

LAND USE		1997 – 2007	2007 – 2017	1987 -2017
-	279ha	392.23ha	248.21ha	919.44ha
---	-315.9ha	147.19ha	-453.33ha	-672.87ha
Vegetation	-36.90ha	-539.91ha	-205.1ha	-781.87ha

Source: Authors' computation, 2019

From the spatial transition analysis of land use types conducted between 1987 and 2017 in Giyani, the trends of land use transformation across different years and decades, as well as across various land uses are unpacked. Table 4 presents magnitude of changes that occurred in land use/cover in hectares at the three intervals

of examination. From the table, the magnitude of change in the vegetation cover between 1987 and 1997 was 236.90ha implying an increase, but a decrease by (-539.91ha) between 1997 and 2007 was recorded. Similarly, between 2007 and 2017 over 70.35ha of vegetation was lost. Meanwhile,

over 73ha of vegetated land was compromised and loss to other land uses between 1987 and 2017. The magnitude of change recorded in the built-up coverage between 1987 and 1997 was an increase in size by 279ha; another increment was further recorded by about 392.33ha and 248,22ha between 1997/2007 and 2007/2017

respectively. Overall, total transformation in the built-up segment was over 919ha of land in three decades (1987 and 2017). Bare lands were also consistently invaded by other land use types between 1987-1997 and 2007-2017, though it recuperated by 147.69ha between 1997 and 2007.

Table5: Decadal and Annual Percentage Change (Trend)

LAND USE	1987 – 1997	1997 – 2007	2007 – 2017	1987 -2017
Built – Up	44.83% (4.4)	38.14% (3.8)	19.44% (1.9)	72% (3.7)
Bare Lands	77.14% (7.7)	26.51% (2.6)	44.70% (4.4)	93.80% (4.9)
Vegetation	34.90% (7.7)	59.05% (5.9)	67.74% (6.7)	84.67% (5.4)

Source: Authors' computation, 2019

From Table 5, there was 44.83% change in built up between 1987 – 1997 implying about 4.5% annually, about 3.8%, 1.9% respectively between 1997/2007 and 2007/2017. Meanwhile, an average of 3.7% annual increase over the thirty years under investigation (1987-2017) was recorded.

Decadal Variation in Land Use and Land cover change

A further critical analysis of the transformation in land use across Giyani town when correlated with time indicated that the built up area with $r = 0.997$ is in upward trend relationship with

time. This implies that over time (1987-2017) the built up area increased, Figure 9. By implication, during 1997-2017, built up area on annual bases consume 30.63ha of other land uses cover to complement its expansion. On the contrary, within same period, vegetation cover shows a downward trend over the period with $y = -143,1x + 844$ and $r = -0.72085$ indicates reducing trend in land use change overtime. The result signifies that as year increased the vegetation cover reduced during the period under investigation, Figure 10. The figure further shows that despite the recovery

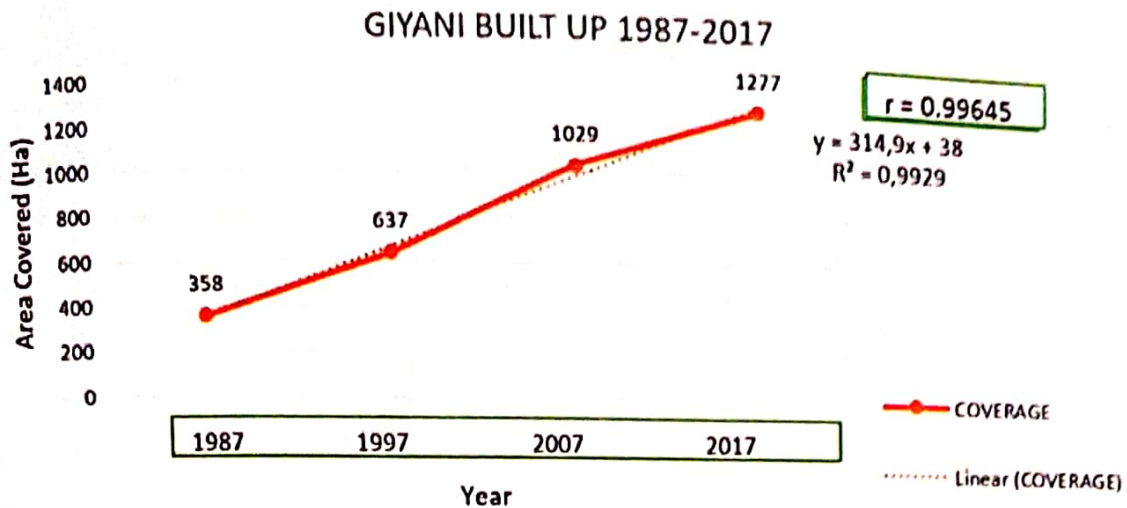


Figure 9: Trend of Percentage Change in built up area in Giyani town
 Source: Author's Field Survey, 2019

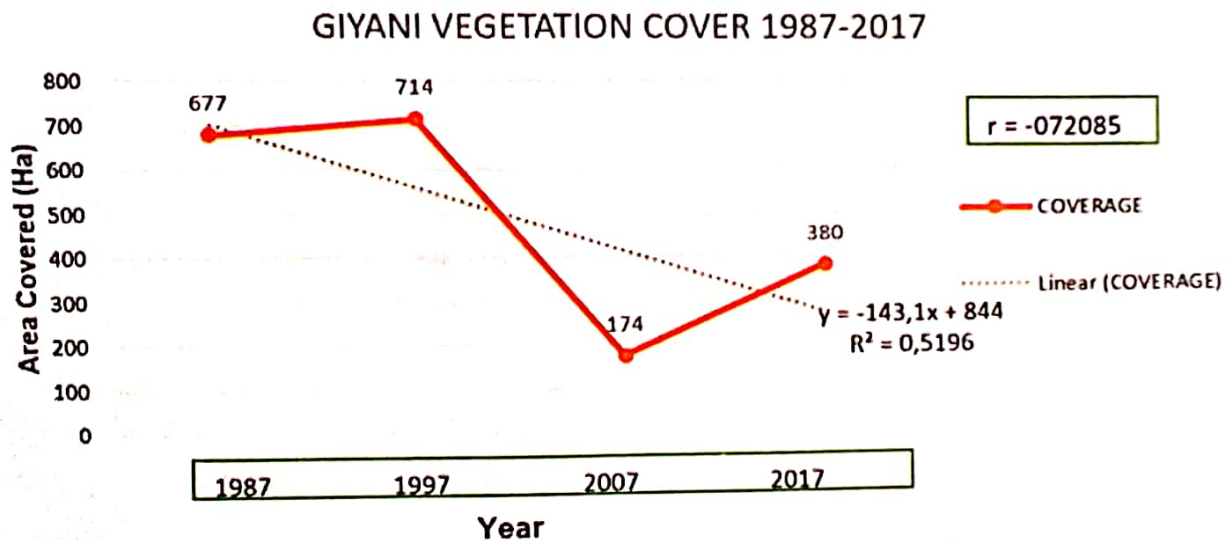


Figure 10: Trend of Percentage Change in vegetation cover in Giyani town
 Source: Author's Field Survey, 2019

of vegetation from a sharp drop between 1997 and 2007, with about 10ha loss on annual bases. Vegetation cover suffered an annual loss of 54ha per year during the period 1997-2007. About 73% of the loss in vegetation may be

connected to the transformation in the built-up within the same period, with built up annexing about 39.2ha annually within the same decade (1997-2007), Figure 9 resulting from increased urbanization.

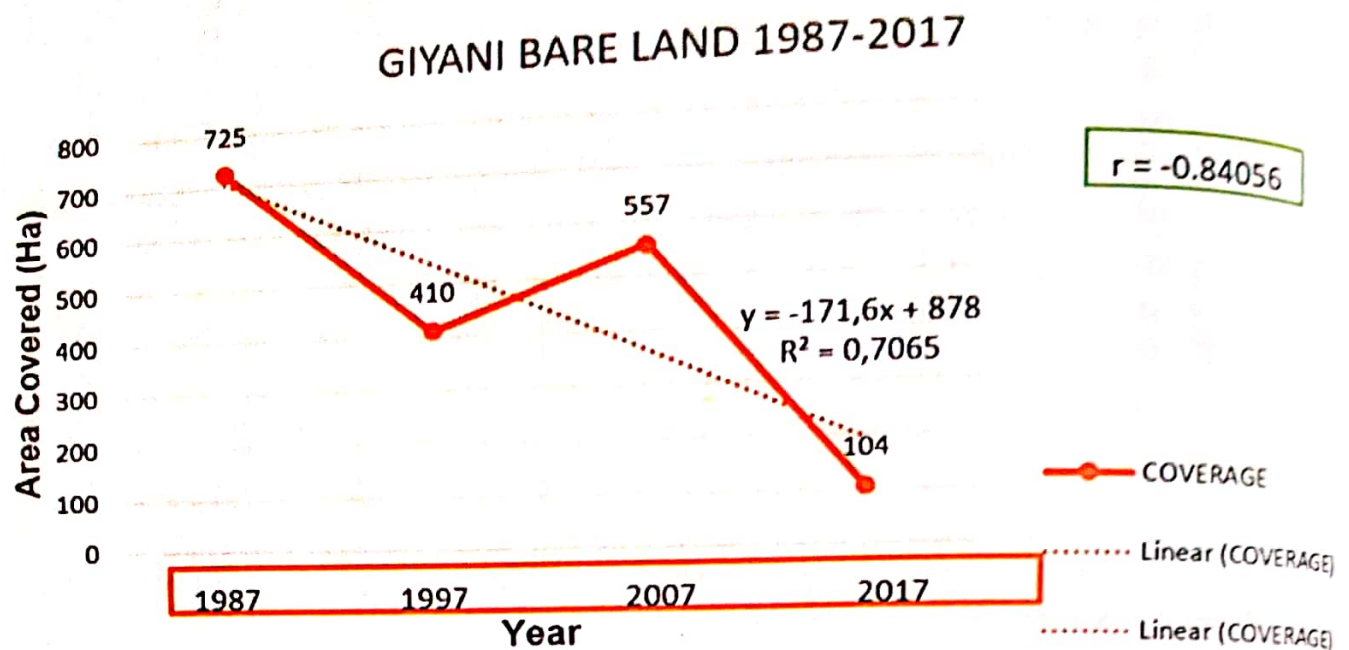


Figure 11: Trend of Percentage Change in Bare land in Giyani town (1987-2017)
Source: Author's Field Survey, 2019

A further probe into the trend of change into bare land in the study area revealed a negative movement in the trend, implying a reduction in the coverage of bare land. The linear interaction between the trend with time shows $y = -171,6x + 878$ and correlation coefficient $r = -0.84056$ implying that as year increased the bare land portion of the town recorded a decline. The reduction in the trend in bareness in the town between 1987-1997 and 2007-2017 may partly be accounted for by built up invasion, Figure 9 or the recovery by vegetation during this two decades, Figure 10. On the other hand, the increase recorded in the bareness may not be far from being the consequences of deforestation, farming, and bush burning as well as wood-gathering for energy sourcing and other human factors.

Conclusion

Landsat data analysis as an instrument for spatial and temporal understanding of the dynamics of land use/cover attributes and variation in Giyani, Mopani District is evidently clear from this study. The study equally offered the descriptive representations of some causative features accounted for land modification in the town. The analysis in this study evidently depicts that the attributes of land use across the town momentarily evolved over time and reflected spatially. This development has transited Giyani from a small sized town to a settlement that could be referred to as medium sized town. Factors such as increased urbanization, construction, farming, deforestation, and other human activities are significantly responsible for the emergence of the different types of land use transformation in Giyani. This has led to

contributing to the transformation of the natural environment, though the effects of occasional drought in Giyani as a factor of change in the landscape of Giyani is acknowledged. Population growth was identified as a significant player bringing these scenarios with substantial impacts on the trend and dimension of land use in Giyani. The study further reiterated the effectiveness of the application of GIS, remote sensing and statistical instruments for land use monitoring for effective environmental management, particularly for data collection, database development and data analysis as well as identification of factors of land modification.

To stem further loss in land and its associated resources through transition in land use with the view to minimize the attendant environmental adversities in Giyani town, the study thus, recommend an aggressive afforestation program (tree planting policy). This should as a matter of necessity be adopted involving every Giyani inhabitants at all levels, all facets and sectors, by introduction of incentives. This will go a long way in restoring the vegetation, protecting the land and reducing the impact of global warming.

On the other hand, land use planning policies and other relevant spatial planning Laws should be overhauled to regulate population pattern and distribution while enforcing appropriate planning and ecological protection

laws.

The paper finally underscores vertical development pattern rather than horizontal (sprawling) urban growth, to conserve land and land resources.

References

- Anafo, D., (2013). Systems approach to pro-poor land reforms: A concept paper. *Land use policy*, 35: 421-426.
- Balogun, A. I., Adeyewa, Z. D, Balogun, A. A. & Morakinyo, E. T. (2011). Analysis of urban expansion and land use in Akure, Nigeria, using remote sensing and GIS techniques. Available at <http://www.academicjournals.org/jgrp/pdf/pdf2011/4th%20sep/Balogun%20et%20al.pdf>. Retrieved April 2nd, 2017.
- Barrows, H. (1923). Geography as Human Ecology. *Annals of the Association of American Geographers* 13(1): 1-13.
- Blaikie, P., and Brookfield, H. (1987). *Land Degradation and Society*, Metheun, London.
- Chaudhary, B. S., Saroha, G. P. & Yadav, M. (2008). Human Induced Land Use/ Land Cover Changes in Northern Part of Gurgaon District, Haryana, India: Natural Resources Census Concept. *J. Hum. Ecol.* 23, 3: 243-252.
- Chegg, I. (2013). Definition of urbanisation. Available at Retrieved July 22nd, 2013.
- Dawson, A.H., (1985). Land use policy and

- control in Japan. *Land Use Policy*, 2(1), pp.54-60.
- Fabiya, O. O. (2006). Urban Land Use Change Analysis of a Traditional City from Remote Sensing Data: The Case of Ibadan Metropolitan Area, Nigeria. *Humanity Social Sciences Journal*, 1, 1: 42-64
- Levin, R., and Weiner, D. (1997). *No More Tears: Struggles for Land in Mpumalanga, South Africa*, Africa World Press, Trenton.
- McCusker, B., (2004). Land use and cover change as an indicator of transformation on recently redistributed farms in Limpopo Province, South Africa. *Human Ecology*, 32, 1: 49-75.
- McCUSKER, B.R.E.N.T. and Ramudzuli, M., 2007. Apartheid spatial engineering and land use change in Mankweng, South Africa: 1963–2001. *Geographical journal*, 173, 1: 56-74.
- Ndabula, C., Averik, P.D., Jidauna, G.G., Abaje, I., Oyatayo, T.K. and Iguisi, E.O., (2013). Analysis of the spatio-temporal dynamics of landuse/landcover structures in the Kaduna innercore city region, Nigeria. *American Journal of Environmental Protection*, 1, 4: 112-119.
- Okwori Adija A. and Fabiyi Oluseyi. O. (2016) Factors Influencing Land Modification in Central Nigeria: a Case Study of Central Area of Kaduna State, *International Journal of Advanced Studies in Ecology, Development and Sustainability* Hard Print: 2354-4252 Online: 2354-4260 Vol. 4, 2.
- Peet, R., and Watts, M. (1996). *Liberation Ecologies: Environment, Development, Social Movements*, Routledge, London.
- Phethi, M.D. and Gumbo, J.R., (2019). Assessment of impact of land use change on the wetland in Makhitha village Limpopo province, South Africa *Jàmbá: Journal of Disaster Risk Studies*, 11(2).
- Rösch, M., (2013). Land use and food production in Central Europe from the Neolithic to the Medieval period: Change of landscape, soils and agricultural systems according to archaeobotanical data. *Economic Archaeology: From Structure to Performance in European Archaeology*, 237, pp.109-128.
- Sauer, C. (1925). The Morphology of landscape. In *University of California Publications in Geography*, University of California Press, Berkeley.
- Singh, P. and Khanduri, K. (2011). Land use and land cover change detection through remote sensing & GIS technology: case study of Pathankot and Dhar Kalan Tehsils, Punjab. *International Journal of Geomatics and Geosciences*, 1(4): 839-846.
- Tayyebi, A. and Pijanowski, B.C. (2014). Modeling multiple land use changes

using ANN, CART and MARS: Comparing *Earth Observation and Geoinformation*, 28: tradeoffs in goodness of fit and 102-116.
explanatory power of data mining tools
Lheron, J. (2009). Resolving land conflicts in
International Journal of Applied Burundi. *Conflict Trends*, 1: 3-10.



Journal of **Contemporary** Urbanology

Eagle Prints Nig.

Eagle Dove Mega Business
KM 2 Gboko Road, Makurdi, Benue State
07037976537, 08053398894

