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An Assessment of Land use Change as Influenced by an Industrial Property in Ewekoro between 1986 and 2015 using Remote Sensing Technique: Implications for Estate Surveyors and Valuers

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Abstract

Background/Objectives: This work assesses land use change as influenced by an industrial property in Ewekoro between 1986 and 2015 using Remote Sensing Technique and the implications for Estate Surveyors & Valuers. **Methods/Statistical Analysis:** To assess the rate of growth of built-up area in Ewekoro, LandSat images of the study area were obtained from National Remote Sensing Center, Jos and processed accordingly. The satellite image generated data on the condition of the landscape over specific periods (1986, 2001, 2006, 2009 and 2015) for the purpose of studying possible land use change on the immediate environment due to manufacturing activities of the cement industry. **Findings:** Findings revealed growth in property development as influenced by Lafarge cement factory. In 2015, built-up area increased by 28.32%. The increase in built-up area in 2015 may not be unconnected with the additional plant lunched in 2011. This new plant producing 2.5 million of metric tons of cement will no doubt attract property development and investment (both commercial and residential). **Applications/Improvements:** The findings agreed with other established research works. Relationship between industrial production and built up area was graphically demonstrated. The study concludes by highlighting specific implications for Estate Surveyors and Valuers vis a vis land use dynamics in Ewekoro.

Keywords: Ewekoro, Estate Surveyors and Valuers, Land Use, Remote Sensing

1. Introduction

Remote sensing technique has proved to be a strong tool in land use change detection with high resolution images[1]. It is equally an important tool for Estate Surveyor and Valuer who desire to investigate growth of particular property investment over time in a particular location. Remote sensing technique has the ability to detect increase or decrease in particular land use (property investment). For instance Remote sensing technique can be used to investigate how growth in commercial investment has led to decrease in other forms of property investment. In Nigeria where ground data gathering is usually met with challenges and errors, remote sensing technique provides accurate data in abundance. This work assesses land use change as influenced by an industrial property in Ewekoro between 1986 and 2015 using Remote Sensing Technique and the implications for Estate Surveyors & Valuers.

Remote sensing technique has proved to be a powerful tool in environmental impact assessments. Results ema-

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nated from such studies have always aided planning and other land use based decisions. Land use changes over a time control activities on land[2]. The complexity of urban development calls for effective planning of cities[3].

In his work titled 'assessment of the spatial relationship between poverty and environmental quality in Minna metropolis'[4]. used SPOT, 1995 and landsat TM, 2001 with the aid of ILWIS software to derive indices of urban decay. In assesing the existing landuse patter in Minna[5]. used SPOT images, 1993 and 1994 from where changes in landuse pattern were detected. The relevance and capability of remote sensing technology in studying spatial dynamics is therefore not in doubt.

[6]examined the use of Remote Sensing and GIS in mapping of urban sprawl (1930-2005) and land use/ land cover change detection of Bhubaneswar, (2000-2005). Satellite data were established to be useful and powerful in mapping of urban area.

[7]in their work examined the changing pattern in Land use in Lekki Peninsula area of Lagos, over the period of time spanning 39years using a topographical map of 1964 and a Quick Bird image of 2003. A Land use map of the study area was produced using ArcGIS 9.2, which was used for the digitization and analysis. Development in new classes of Land use was observed. Industrial, Commercial and recreational Land use class were among the new classes of Land use present in 2003 as compared to the predominantly educational Land use class obtainable in 1964. The study also revealed an unparalleled rise in the built up areas from 40.93 hectares in 1964 to 7271.19 hectares in 2003.

These applications readily established the versatility of remote sensing technique to urban phenomenon including analysis of spatial impact of industrial activities on real property.

2. The Study Area

Lafarge cement factory is located in Ewekoro. Ewekoro Local Government is divided into ten political wards as follows: Itori, Owowo, Mosan, Abalabi, Wasimi, Papalanto, Arigbajo, Obada, Asa, Yobo, and Elere, Onigbedu wards. It has a land area of 631.5 square kilometers with a population of 55,156 (2006 population census). The indigenous dwellers of Ewekoro Local Government areas are mainly the Egbas; particularly the EgbasOwus. The people engage primarily in farming and trading activities

Ewekoro Local Government is located in Ogun State which is in the South Western part of Nigeria (see Figure 1). Ewekoro Local Government which can be accessed via Lagos-Abeokuta road which lies on 6° 58 30 North and longitude of 3° 15 30 East and 6° 51 30 North and longitude of 3° 15 30 East. It has an area of 631.5 square kilometer.

The area enjoys abundant rainfall with monthly average of between 80mm to 100mm during rainy season which is usually between April to November with a break normally in August (Meteorological Department, Abeokuta).

3. Materials and Methods

To assess the rate of growth of built-up area in Ewekoro, LandSat images of the study area for 1986, 2001 and 2006 and Nig Sat for the 2009 and 2015 images were obtained from National Remote Sensing Center, Jos and processed accordingly. The satellite image generated data on the condition of the landscape over specific periods (1986, 2001, 2006, 2009 and 2015), for the purpose of studying possible land use change on the immediate environment due to manufacturing activities of the cement industry.

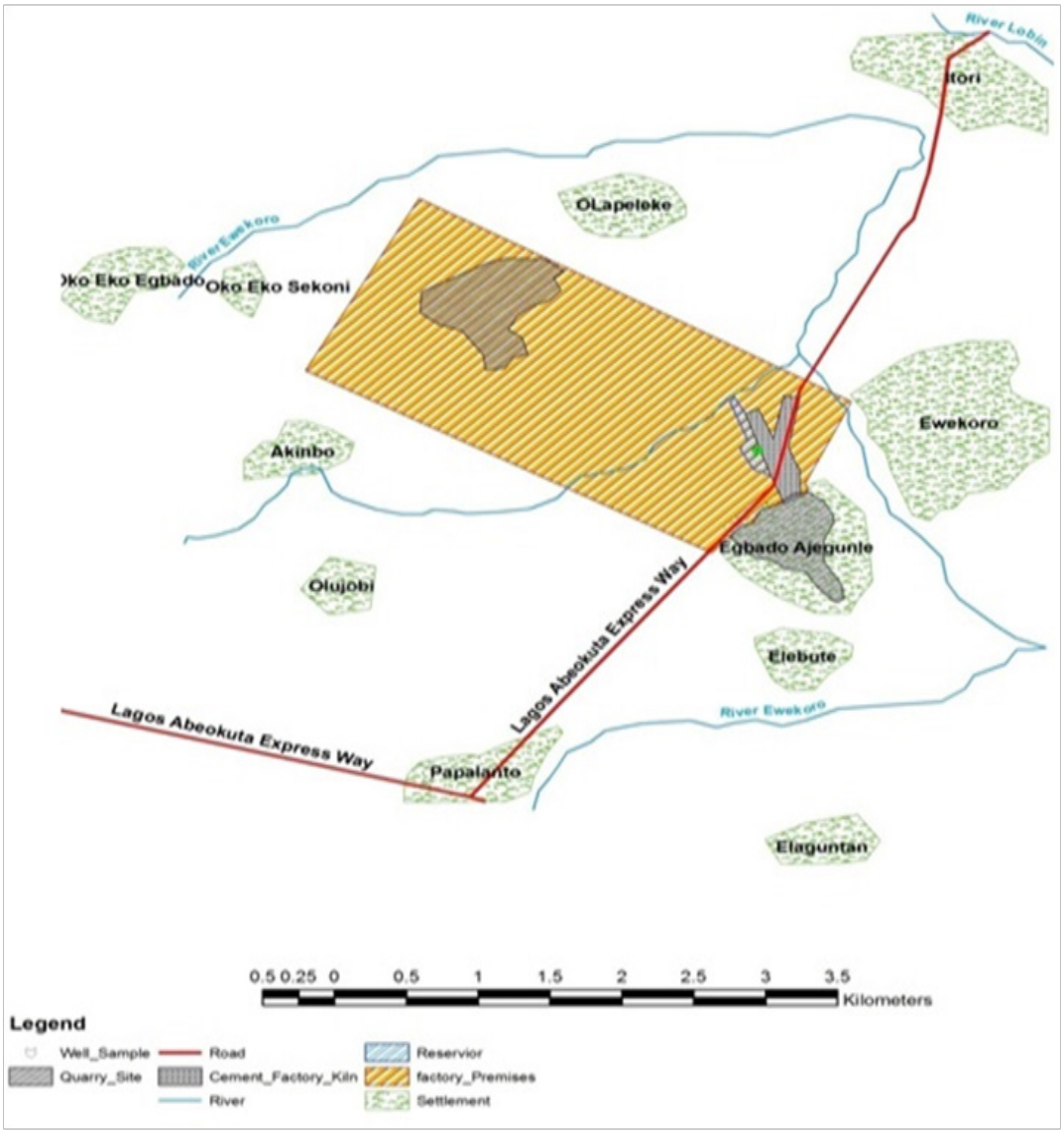
The resolutions of the images are 30m for 1986 and 28.5m for both 2001, 2006 and 2015. The resolution of the 2009 NigSat is 32m. False colour composite and classified images were produced for the purpose of analysis. The classification scheme adopted was the supervised classification in the Integrated Land and Water Information System (ILWIS) 3.1 environment. With this software, it was possible to determine the changes to vegetation and buildings as a result of pollution from the cement factory.

4. Results and Discussion

As a result of the presence and activities of Lafarge Cement industry, spatial land use changes in Ewekoro are likely to take place. To establish this, LandSat images of the study area for 1986, 2001 and 2006 and Nig Sat for the 2009 and 2015 images were obtained and processed.

Table 1 reveals the coverage and variation of changes in the use of land within a stipulation period of 1986,

Figure 1. Map of Ewekoro Town and Environs, Ogun State, Nigeria.



Source: Adapted from[8].

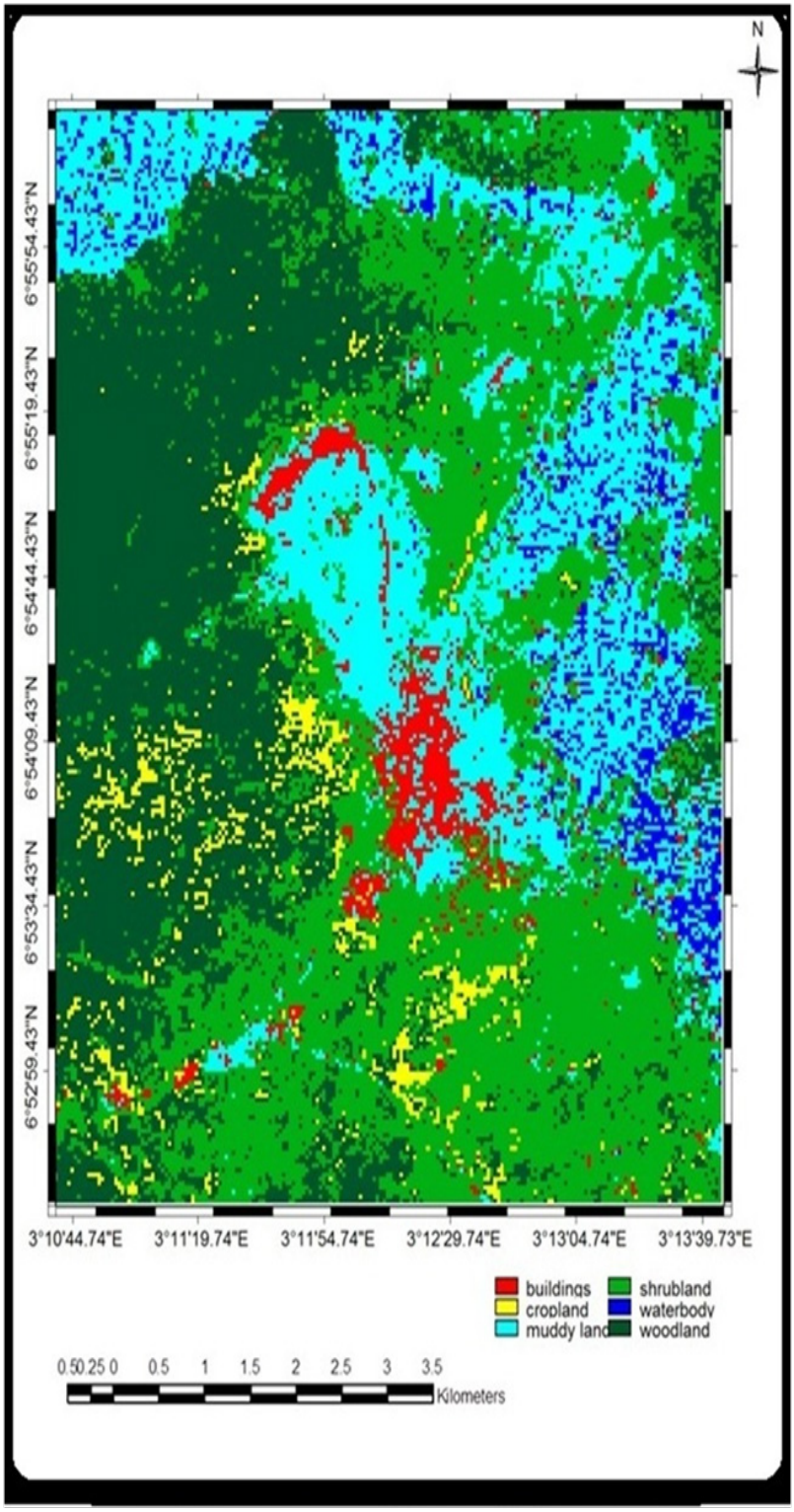
2001, 2006, 2009 and 2015. (See figures 2-6). For building and built up area, between 1986 and 2001 is 7.69% while in 2006 is 0.60%, in 2009 is 73.37%. For crop land and other places for farming, between 1986 and 2001 is 24.44%, by 2006 -67.86% and by 2009 is - 88.89%. For muddy land the analysis shows that between 1986 and 2001 is -35.66%, in 2006 it is -58.67% while in 2009 is -142.05%. For shrub land, between 1986 and 2001 is -62.47% in 2006 is 138.34% while in 2009 is -7.86%. For the water body, between 1986 and 2001 is -98.81%, in 2006, -7.22% and in 2009 is -93.48%. The area for woodland between 1986 and 2001 is 97.22%, in 2006 -13.98% while in 2009 is 11.61%. In 2015, built-up area increased by 28.32%. The increase in built-up area in 2015 may not be unconnected with the additional plant lunched in 2011. This new plant producing 2.5 million of metric tons of cement will no doubt attract further property development (both commercial and residential).

Table 1. Summary of Land use variation in Ewekoro covering 1986, 2001, 2006 and 2009

land use	1986	2001	% Change	2006	% Change	2009	% Change	2015	% Change
Buildings	1.56	1.68	7.69	1.69	0.6	2.93	73.37	3.76	28.32
Cropland	1.35	1.68	24.44	0.54	-67.86	0.06	-88.89	0.05	-16.67
Muddy land	8.16	5.25	-35.66	2.17	-58.67	0.78	-142.05	0.62	-16
Shrub land	15.08	5.66	-62.47	13.49	138.34	12.43	-7.86	11.55	-7.08
Water body	1.68	0.97	-98.81	0.92	-7.22	0.06	-93.48	0.06	0
Woodland	12.95	25.54	97.22	21.97	-13.98	24.52	11.61	24.74	0.90
	40.78	40.78		40.78		40.78			

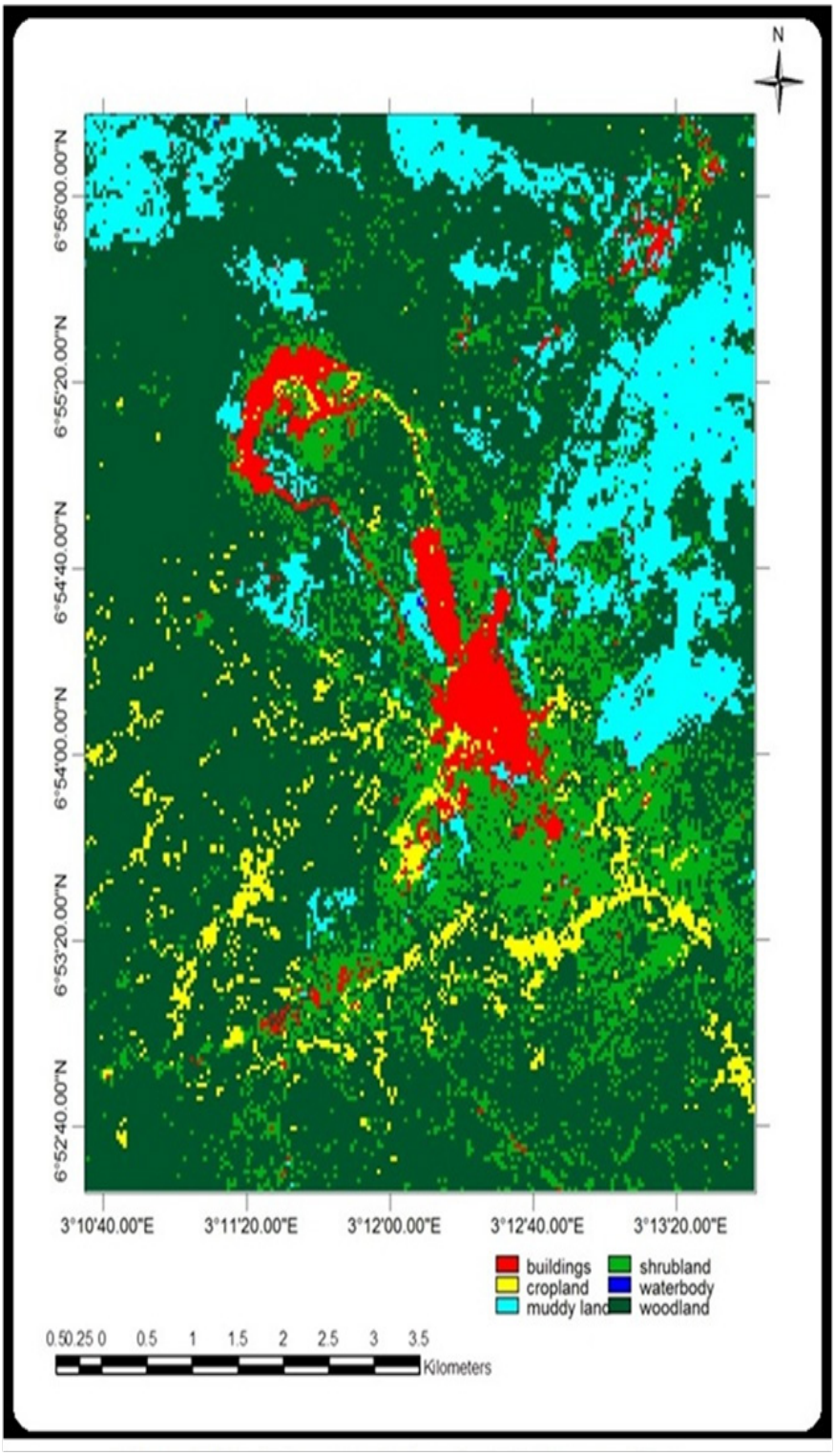
Source: National Center for Remote Sensing, Jos.

Figure 2. Satellite Image of Study Area in 1986.



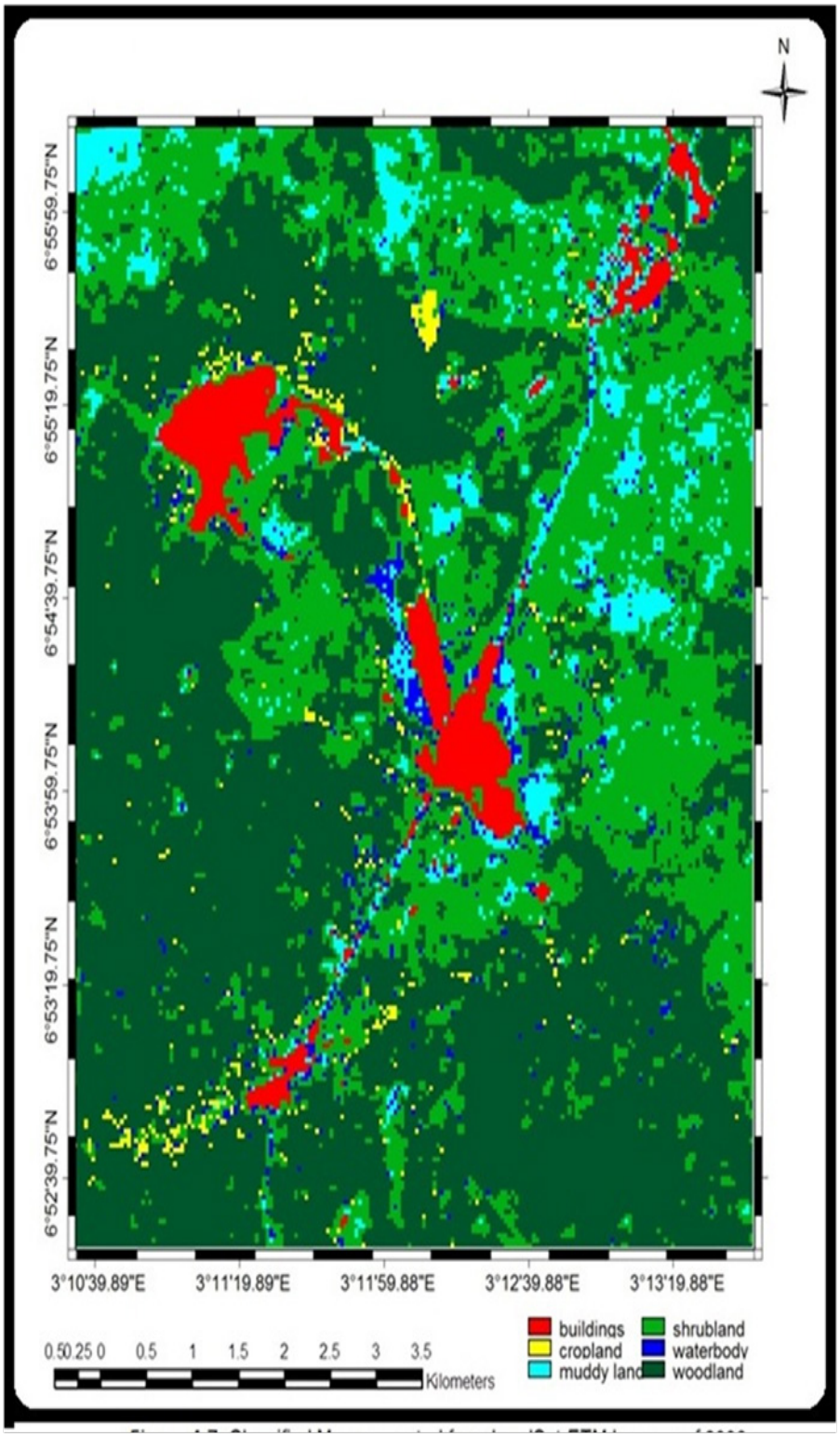
Source: National Centre for Remote Sensing, Jos.

Figure 3. Satellite Image of Study Area in 2001.



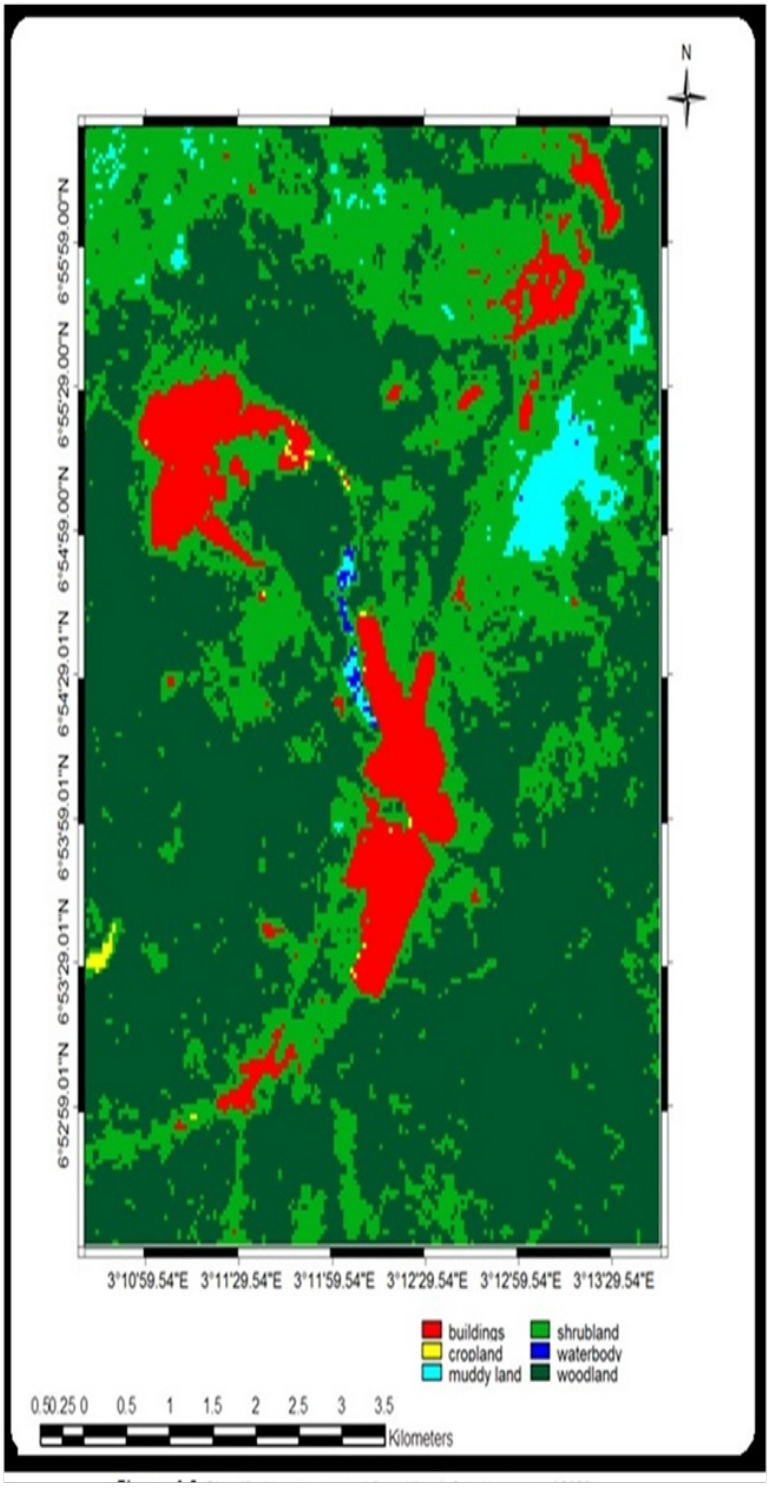
Source: National Centre for Remote Sensing, Jos.

Figure 4. Satellite Image of Study Area in 2006.



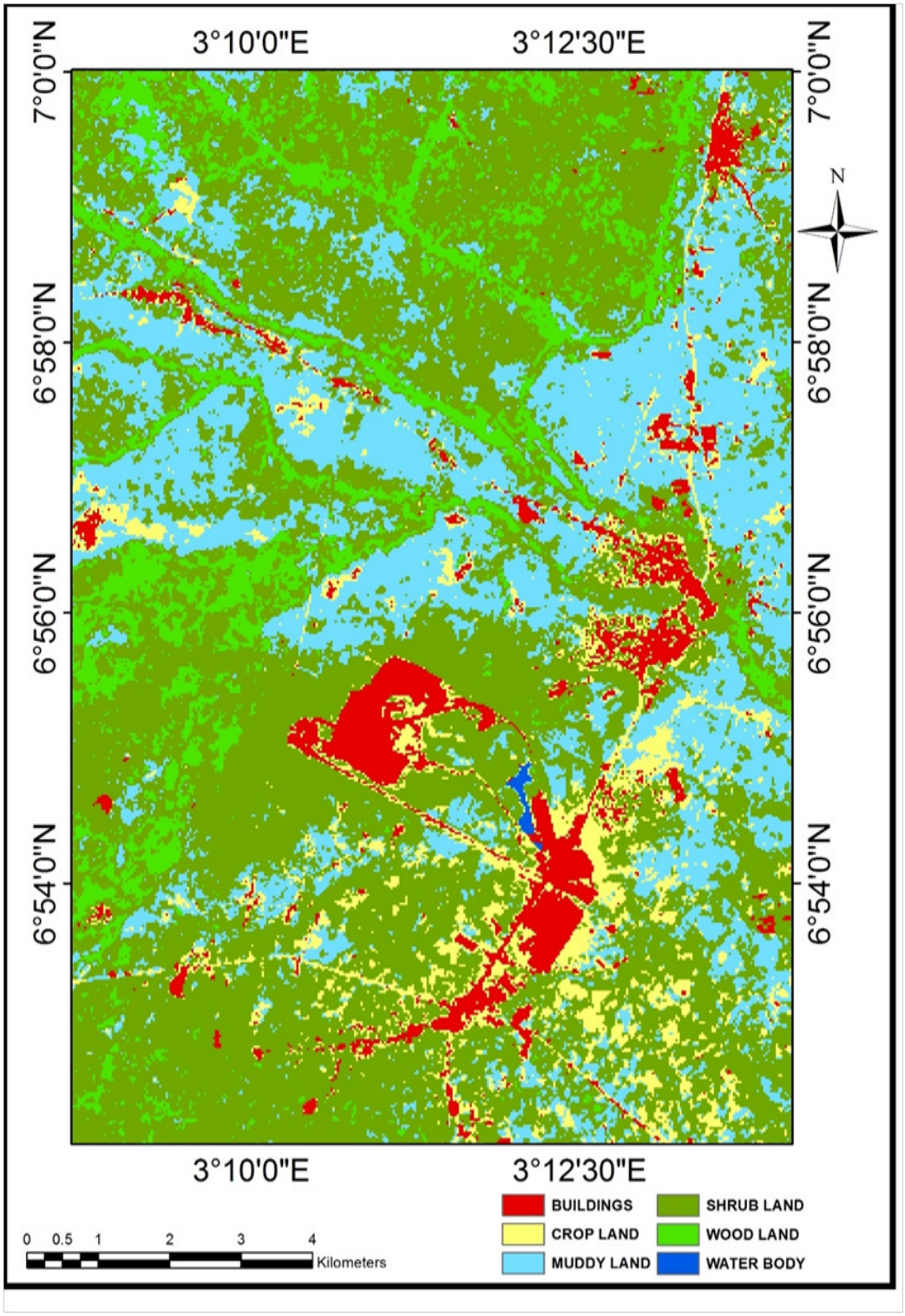
Source: National Centre for Remote Sensing, Jos.

Figure 5. Satellite Image of Study Area in 2009..



Source: National Centre for Remote Sensing, Jos.

Figure 6. Satellite Image of Study Area in 2015.



The analysis implies that, there is consistence changes in the built –up and in number of building within the period of study, most especially in 1986 & 2001, while compare with 2006, it shows a considerable reduction in the area of space compare with the tremendous blown up of the area by 2009 and 2015.

For cropland, cropping and farming activities was recorded to be high between 1986 and 2001, but beginning to reduce in area coverage thereafter as, 2006 recorded a loss of space and more of it in 2009. For muddy land, there is a consistence loss of land between 1986 to 2001, in 2006 and 2009. For shrub land, there is a huge loss between 1986 and 2001 (62.47%) while it was regain in 2006, (13.49%) and loss again by (7.86%). Water body consistently lost out during the period of study. The wood land between 1986 and 2001 seems increase (97.22%), but was at loss in 2006 (13.98%) while the area covers begins to increase in 2009 (11.61%).

However, these show that building & built-up area is increasing which is as a result of urbanization and improvement on the standard of living from year 2001 to 2015. These upward changes in built up area can be linked to increase in annual production by Lafarge which record similar increase during same period (Table 2) As at 2009 annual cement production and built up area record a percentage increase of 51.52 and 73.37% respectively. In 2015, cement production recorded 125% increase with a corresponding 28.32% increase in built-up area (see figure 7). Building developments were attracted by the presence of Lafarge as staff sought accommodation and complementary uses were springing up within the area.

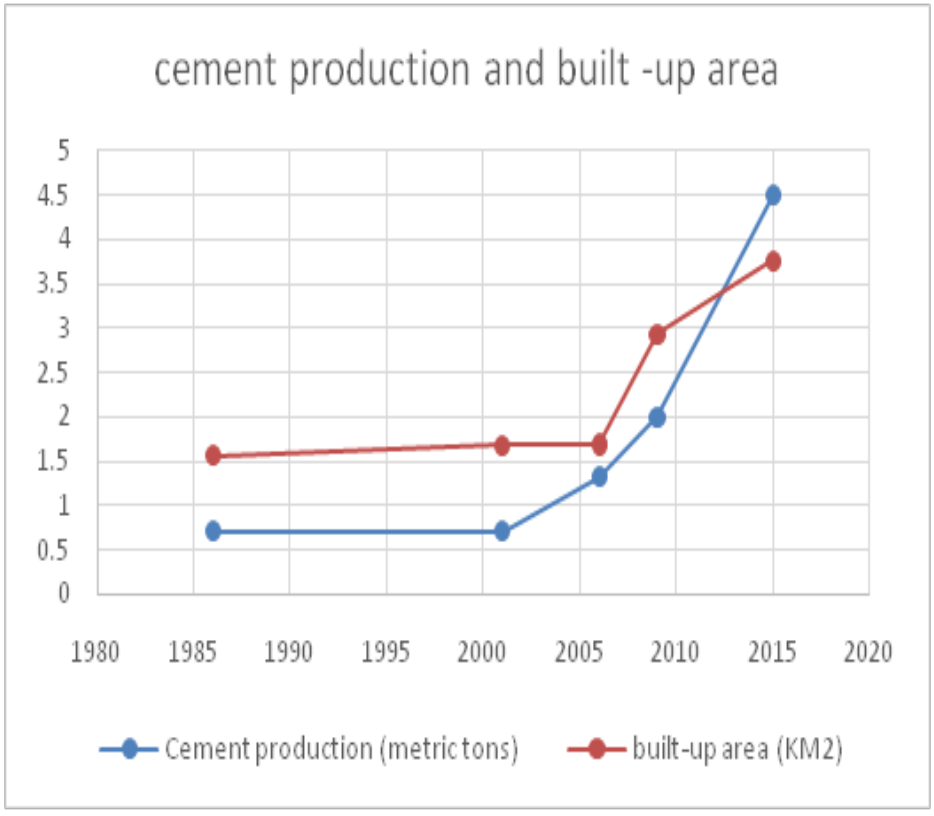


Figure 7. Cement production and built-up area between 1986 and 2015.

Table 2. Annual cement production (1986-2009)

Year	1986	2001	% Change	2006	% Change	2009	% Change 2015 % change
Annual production (MT)	706,500	706,500	0%	1,320,000	86.84%	2,000,000	51.52% 4,500,000 125%

Source: Lafarge cement Ewekoro, 2011)

This improvement which has given birth to increase in number of buildings and other construction works as negatively affected other uses of the land like the crop land, muddy land, shrub land and water body.

The implication of this is the alteration of the balanced eco-system and increase in urban heat and global warming. This analysis reveals that as more number of buildings was recorded in the area, there is increase in number of people; this also has implication on the number of lives affected by the pollution from the cement factory located in the area

5. Conclusion and Implications for Estate Surveyors and Valuers

I. In assessing the land use change as influenced by Lafarge cement factory in Ewekoro, there are certain implications for Estate Surveyors and Valuers as revealed during the analysis.
II. There is a growing property market for potential Real Estate investors in Ewekoro.
III. There is need for Estate Surveyors and Valuers to study the dynamics and characteristics of the growing population in order to accurately forecast their housing need.
IV. Though there is growing population, other studies have proved that property located not too close to the cement plant attracts higher rent due to less pollution effect. As such, property investors need to be guided on the best location.
V. Building finishes and maintenance plan for buildings in Ewekoro should be guided by the pollution prevalent in the area.

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