# COMPARATIVE ANALYSIS OF THE GROWTH OF KADUNA AND ZARIA URBAN CENTRES USING REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEMS.

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**ABSTRACT**

This study compared the extent of spatial growth of Kaduna and Zaria urban centres into their adjourning rural lands from 1973 - 2005. It assessed the factors responsible for their spatial growth and derived spatio- temporal growth maps of the urban centres. This was with a view of designing a geo-spatial database for future monitoring of the study areas.

The primary data set entailed the administration of structured questionnaire within the two cities and their adjourning rural land using random sampling technique. Seven hundred and fifty and two hundred and fifty copies of the questionnaire were administered in Kaduna and Zaria respectively. The questionnaire elicited the principal factors responsible for the growth of the urban centres. Geoinformation data were generated from LandSat ETM+ and NigeriaSat-1 multi-spectral imageries on Kaduna and Zaria urban centres for three different dates (1973, 1987 and 2005). The satellite imageries were subjected to digital image processing. Five land cover types were delineated based on supervised classification using the Gaussian Hypothesis. Spatio-temporal growth maps for the urban centres were generated using map overlay and query operations in Arcview and ILWIS 3.2 Academic environment. The areal extents of each land cover type for the various years were estimated. Analysis of Variance (ANOVA) was used to test for the statistical significance of land cover changes within the study areas.

The results showed that there were similarities in the trend of the land cover dynamics. However, the magnitude and rate of the changes differed. The mean annual increase for the Kaduna study area was 288.24 hectares (5.2% per annum) while that of Zaria City was 96.34 hectares (5.0 % per annum). This implied that 9,223.7 and 3,083.6 hectares of rural land had succumbed to urban colonization in Kaduna and Zaria metropolis respectively during the 32year period. The variations were significant in the coverage area of land cover in Kaduna ($F = 6.9$; $p < 0.01$) and between Kaduna and Zaria ($F = 8.6$; $p < 0.01$). However, there was no significant variation in the land cover in Zaria ($F = 2.7$; $p > 0.09$). Comparisons for each of the years showed that in 1973, the mean difference was significant in the comparison between agricultural land and bare surface ($F = 6.8$; $p < 0.03$); agricultural land and gully ($F = 6.9$; $p < 0.02$ ); vegetal cover and

bare surface ($F = 7.6$; $p < 0.01$) and vegetal cover and gully ($F = 7.6$; $p < 0.01$). In 1987, variation was significant only between the built - up and gully land covers ($F = 6.7$; $p < 0.04$) while in 2005, variations were significant between the built - up and bare surface ($F = 6.7$; $p < 0.04$) and between built - up and gully ($F = 6.8$; $p < 0.03$). The results also indicated that there were similarities in the factors responsible for the growth of the urban centres. The factors included population growth, agglomeration economies, and the provision of basic amenities. In addition, patterns of infrastructure initiatives like the development and expansion of transport arteries, service facilities, and establishment of higher institutions of learning also encouraged regional development that eventually led to urban sprawl.

It was concluded that the spatial expansion of Kaduna and Zaria urban centres resulted in the change in land cover classes of the two cities. The spatial expansion was induced by the dynamics of urbanization and industrialization.