

# THE EFFECT OF INFRASTRUCTURAL DEVELOPMENT ON URBAN GROWTH: A CASE STUDY OF POKUASE INTERCHANGE, GHANA

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## Abstract

Infrastructural development projects have been seen to erupt in recent times both in rural and urban areas. While development changes the peri-urban environments in the sub-region, little or sometimes no attention is given to the consequences of infrastructure development in these areas. Hence, the aim of the study is to analyze the effect of infrastructure development on peri-urban communities in Pokuase. The research put to use methods of qualitative and quantitative approaches of analyzing the case study and as well as spatial interpretation of the results of socio-economic developments. Findings made from the research show that land use land cover has seen some transformation over the studied years, as many farmlands have been converted to places of residence and factories thus increasing population. Road link between communities has increased as well as provided employment opportunities. However, the spatial modification of the peri-urban area has been limited by the displacement of people living along the construction route. As the result of the research may prove, it is evident that the impact of infrastructure development in the urban sector requires essential planning and collaboration with technical and traditional leaders which brings integration between all related parties involved in the success of the development.

## 1. INTRODUCTION

Recently experts from numerous nations have used the element of infrastructure development as a metric and indicator to measure each country's capacity to compete worldwide, hence, it has recently become a much-disputed topic (Schwab, 2018). This is mostly due to the perception that having access to appropriate, basic facilities is closely tied to the general welfare of the population in any given nation. Additionally, the most important factor used to assess a country's leadership success is infrastructure development. (Onolememen, 2015). Infrastructure services are essential to economic output and urban development. These services include power, transportation, and telecommunications, as well as the provision of water, sanitation, and proper waste disposal. The general consensus is that infrastructure is crucial for promoting urban land development and private economic activity. (Investment & Reviews, 2015)

Adequacy of infrastructure adds up to enlarging production, extensive trade, managing population growth, reducing poverty, or developing environmental conditions among others altogether helping determine a country's development by compromising economic and urban growth (Choudhury et al., 2019)

However the strive of improving the urban space and enhancing its standard sometimes cut out some benefits of the impacted people throughout the construction of developmental facilities(Aoun, 2016; Brussel et al., 2019). Developments, especially the interchange aimed at solving a problem of mass concern and not endanger the lives of the people it may serve.

Projects on infrastructure development in Ghana are often tasked with their actions on urban needs at the city level (Kennedy, 2015). Infrastructural impact on the Peri-urban areas has been classified into the following areas: land, ecology, water resources, energy, greenhouse gases, and other emissions to air, and human environment among Wethersfield (Puplampu & Boafo, 2021). Infrastructure development can reduce the ability of the natural environment, its habitats, and

species to adapt to climate change. And on the other side, infrastructure development can present opportunities to extend and improve or create new habitats for existing wildlife and plants (Choudhury et al., 2019).

Building network facilities, be it recent or improving the current asset is considered to have a variety of repercussions on the peri-urban area's population, urban shape, and economic condition. Communities around the project area are sometimes not properly engaged about the consequences of the construction and the risk it seems to pose to the livelihood of the community members. Projects on infrastructure development in this country are often tasked with their actions on urban needs at the city level (Kennedy, 2015).

Inspired from the above considerations, this paper is aimed at analyzing the effects of infrastructure development on peri-urban communities looking at year periods between 2015,2016,2018 and 2021 in the Pokuase urban area. The noteworthy contributions of this paper have been summarized as:

- To determine the extent of land use land cover change in Pokuase.
- To determine the impact of the development on the communities' livelihoods in the Pokuase interchange.

## **2. STUDY AREA AND DATA SOURCE**

The Ga-West municipality includes Pokuase. The Kumasi to Accra route's entry point is the Ga West Municipal Assembly, which was established by L.I. 1858 in November 2007. The Municipality is bounded by latitudes 5°48' North, 5°39' North, longitudes 0°12' West and 0°22' West, and latitudes 0°12' and 0°22' West. Akuapem South to the North, Ga South to the South and West, and Ga East and Accra Metropolitan Assembly to the East are its neighbors. There are roughly 193 localities, covering a land area of about 305.4 sq km. Ga West Municipal Area is a particularly significant riparian zone because it is situated inside the Densu River Basin. Pokuase is a neighborhood in Accra, the capital of Ghana. It may be reached from the Accra center by

turning right off the Accra-Kumasi Expressway (or the old Nsawam Road). Along the Accra-Kumasi highway, Pokuase Junction is one of the busiest bus hubs for shared cabs and buses.

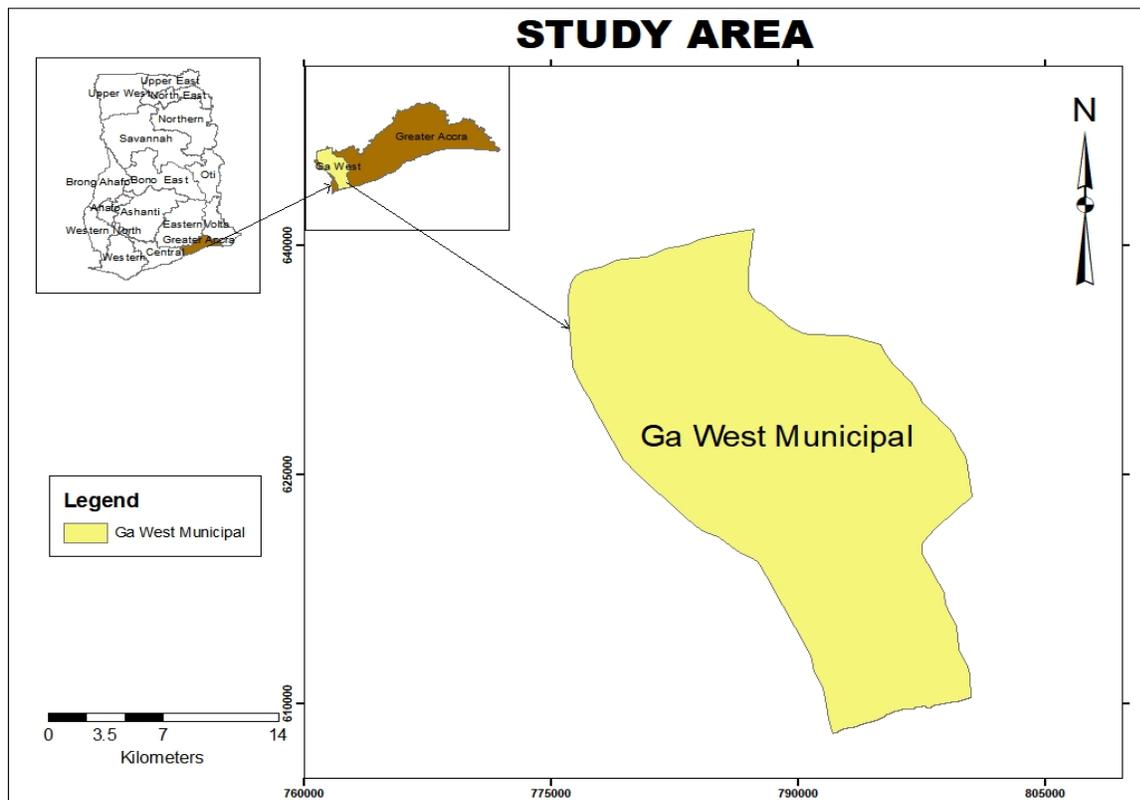


Figure 1. Study Map.

## 2.1 DATA SOURCE

The source of data used in the study was derived by employing a combination of qualitative and quantitative methodologies, a mixed method research strategy is used for data collecting and analysis. A list of questions was issued to collect data for the quantitative analysis. Furthermore, data was sourced from some professionals, households, pedestrians among others. Data collected was analyzed by the use of descriptive statistics by using Statistical Product for Service Solution (SPSS) and Microsoft Excel to generate frequency tables, cross tabulations, bar graphs and bar charts to analyze quantitative data. The summary was presented in tables and graphs. Qualitative

data was recorded, transcribed and used as integral parts of written texts to better understand patterns and relationships between variables. Direct quotations from respondents were also used to analyze qualitative data. In exploring the spatial trend of the research area, satellite images were employed to comprehend any spatial changes graphically before and after the developments which came up as a result of the infrastructure growth. Landsat satellite images were obtained from the USGS dataset, which has spatial characteristics for the years 2015, 2016, 2018 and 2021. Good quality images with less than 10% cloud cover were obtained. The images were geometrically and radiometrically corrected. Moreover, the images were normalized for the purposes of change detection. The satellite images were already geo-referenced in the War Office Spheroid and Transverse Mercator Projection System. There was image pre-processing, classification and accuracy assessment. These processes paved way for the production of change detection maps and further trend analysis.

### **3. METHODOLOGY**

A list of questions was issued to collect data for the quantitative analysis. where, data was sourced from some professionals, residents, Technical/traditional leaders among others through questionnaires, interviews and open discussion on how local policies and planning, and infrastructural development has impacted and controlled residential evolution in the urban space. These data were classified and analyzed using statistical software suite. The images were pre-processed for outlier removal and further corrected for radiometric errors before moving to sensor calibration in the spatial domain, image was clipped to extracts features that reside entirely within a boundary defined by the study area. Image classification was carried out for thematic LULC change analysis and the classifier performance is assessed based on well-known measures.

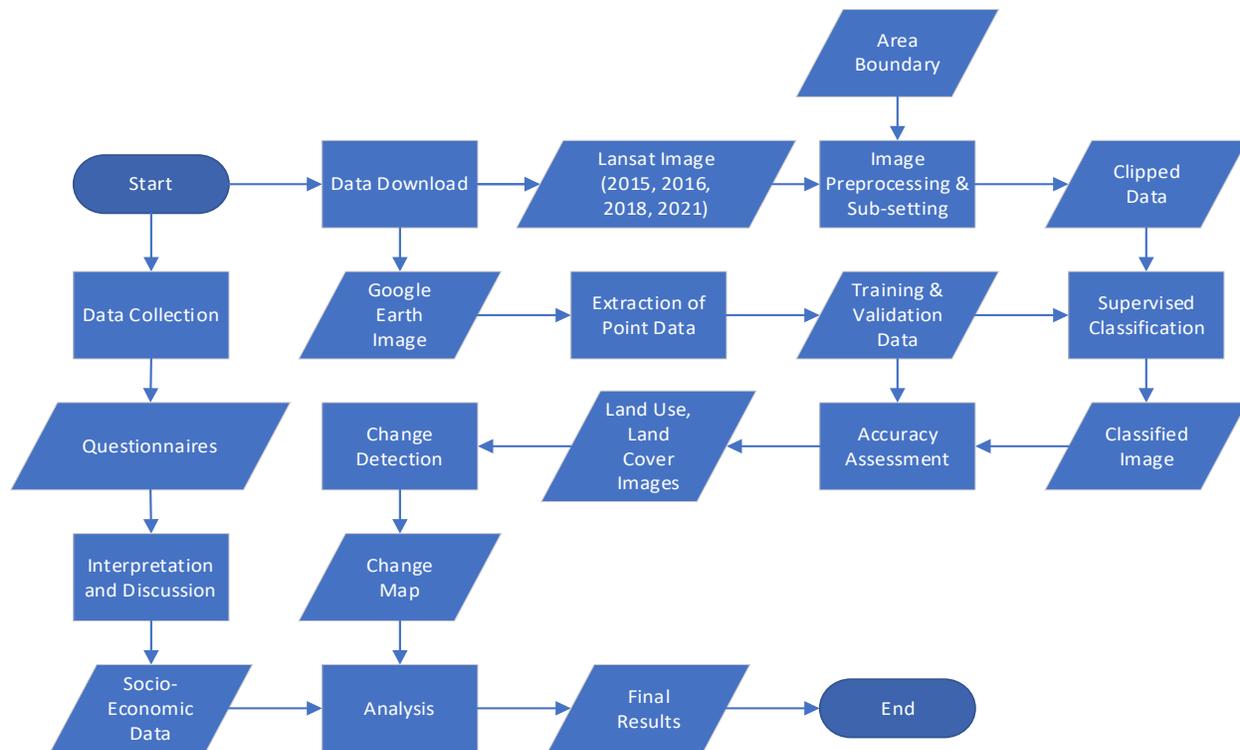


Fig 2 Summary of methodology

## 4 RESULTS

### 4.1 Land Use/Land Cover Change

In the present study accuracy of all the raster layers was assessed through the development of an error-matrix. A stratified random sampling design was adopted in the accuracy assessment. The generated maps of the time periods—2015, 2016, 2018 and 2021 revealed an overall accuracy of 88.37%, 83.33%, 87.8%, 78.05% and kappa coefficient of 0.83, 0.76, 0.82 and 0.704 respectively. In general, accuracy of all the raster layers is acceptable (Alam, 2020) therefore, the results obtained can be considered as reliable to a larger extent. The classified maps in the images shows that settlement grew as vegetation and bare land decreased in size, and water bodies in the area maintained their average square area. In the years 2015 and 2016 there was no significant change in the area covered by bare land because of the time difference the noticeable change that occurred

was small vegetation but in 2018; bare land increased which hints at the fact that people were clearing lands to build and 2021 the settlements in the area increased. From the questionnaires majority of the respondents said easy access to good roads increased urban development in the area. Due to the population increase there has been a surge in buildings for residential areas, this improves the livelihood of the residents in the area but has also decreased the amount of vegetation in the peri-urban area.

Urban development has its pros and cons, and for this reason, a visual look at the Pokuase area reveals there has been an increasing spurt in the use of land. This is so, because of the expansion of the roads in the Pokuase area. Urban development has given the peri-urban a facelift and also assisted in the facilitation of the movement of goods and people, create employment, support economic growth, enhance access to education and health care services, as well as connect people to families and entertainment (Naazie. et al., 2018). Land use change maps for the specified periods are below;

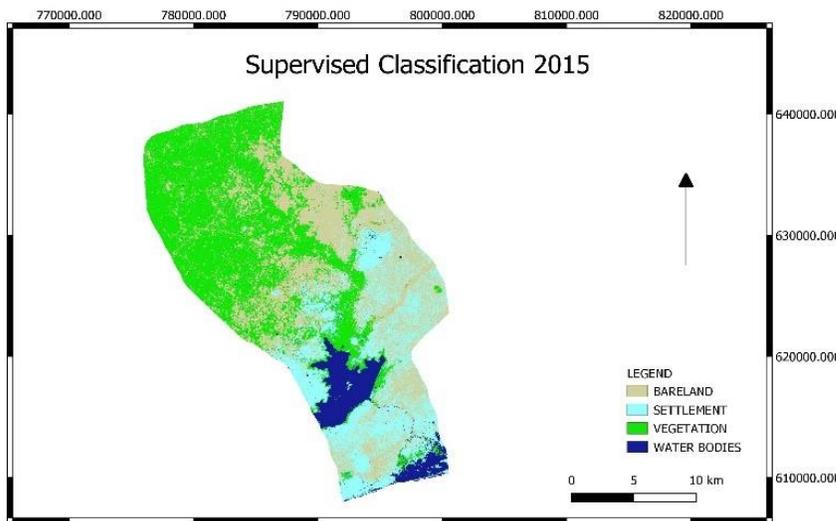


Figure 2 Supervised classification for the year 2015

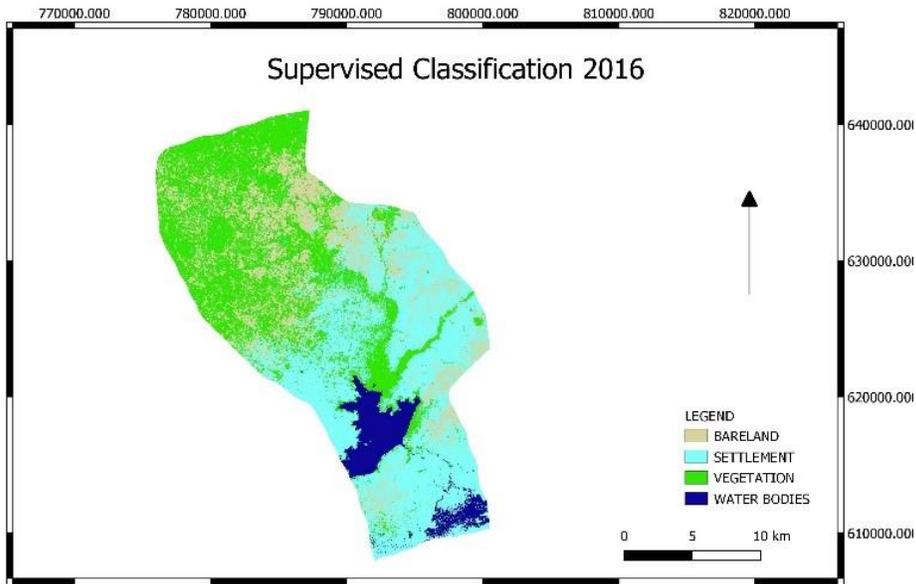


Figure2 Supervised classification for the year 2016

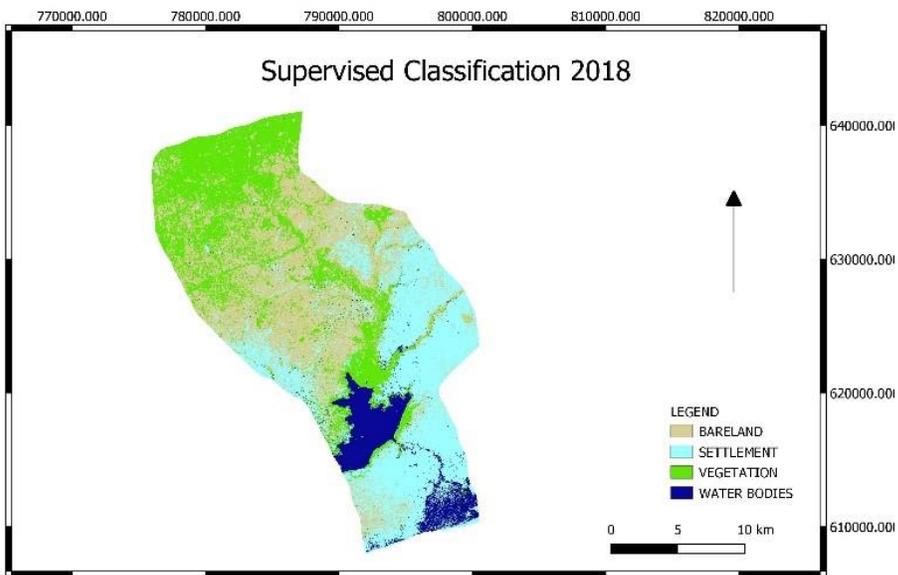


Figure 3 Supervised classification for the year 2018

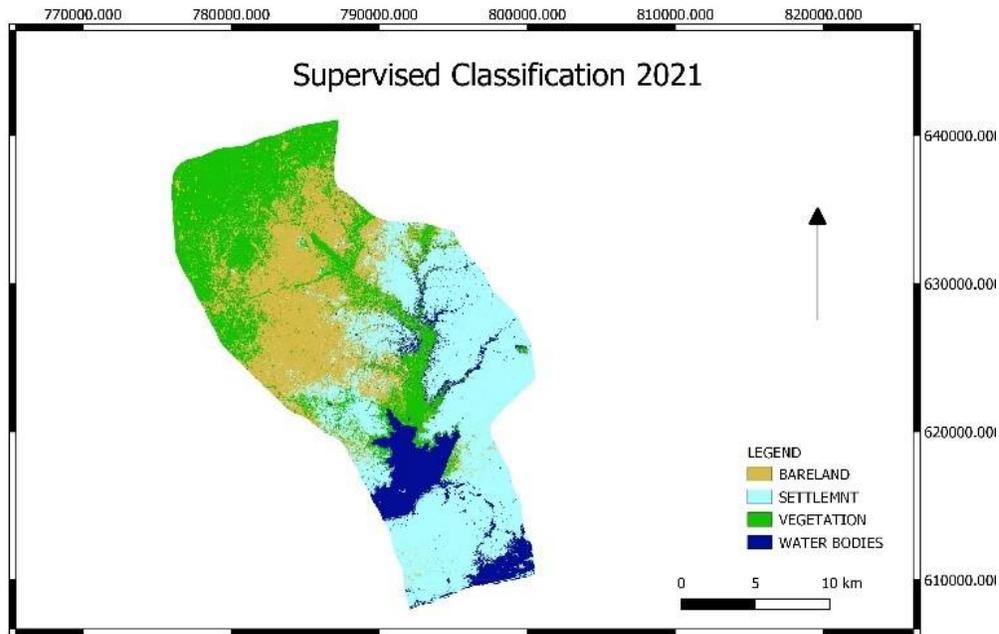


Figure 4 Supervised classification for the year 2021

## 5 CONCLUSIONS AND RECOMMENDATION.

### 5.1 Conclusion

In conclusion the research shows the various transformation in land use in the Ga West municipality over some years. The findings on the spatial interpretation of the analysis show the realities of peri-urban communities in the sub-region have turned out to be the hub for settlement developments. the projects encouraged the emergence of estates, which is by way of improving security in the environment. This has been noticed as a result of the interchange infrastructure, which comes as a drive-in land purchase growth mainly for settlements purposes. Due to the population increase, there is a surge in buildings for residential purposes has multiplied and real estate development has increased, this improves the livelihood of the residents in the area but has

also decreased the amount of vegetation in the peri-urban area. Study analysis reveals the change in green-cover vegetation land for residential and industrial purposes. The entire study was performed by exploiting all the Landsat sensors' images for long-term LULC monitoring and periodical change detection. Social Impact of the infrastructural development shows, there has been an improved source of livelihood, Improved quality of life and social services, and easy access to social amenities with shorter travel distances. The survey showed that urban integration has been on the increase in recent times since people travel from other places to do business in the developed area. Also, for the purpose of gaining employment in the construction area, the gaps between the communities have been bridged. Road expansion has given a facelift to the peri-urban area by opening more investment opportunities.

Economic Impact: the project has not only increased employment but has given the community a facelift in economic development. In as much as infrastructural development has done good to the peri-urban area, some shortfalls were recorded over the period, where Some settlers were displaced, trade men and women were relocated, and change in land use, and an increase in the standard of living among others. Furthermore, it is popularly seen that the housing trend in the community has been elevated by the high-income group, and this led to the high purchase of land in certain neighborhoods and possible relocation of natives who could not bear the social class competition. All these actions gave some benefits to the municipal assembly in tax generation and property monitoring. Road users on the other hand turn to have a reduced travel time after the construction.

## **5.2 Recommendation.**

The research discusses how the expansion of infrastructure effects and its outcome in the peri-urban area has been seen not just in the physical development but also in the initiatives to raise both urban and rural residents' standards of living. The construction of the urban infrastructural sector requires essential planning and collaboration with technical and traditional leaders which brings integration between all related parties involved in the success of the infrastructural development. The collaboration of the related bodies and the peri-urban area is essential in achieving success in the community's development and the nation at large.

However, evaluating the impact of infrastructure development is dependent on how well stakeholders perceive the context of increasing community development and livelihood and how it responds to the outcome community has expressed in both spatial and socio-economic ways. The study recommends that local rules and regulations are to be put in place to mitigate the ripple effects of infrastructure development projects.

Most importantly, regulations to defend ownership of land as well as its use and strengthen the benefits of urban planning which deals with the startup effects of highway developments in the peri-urban area. It is therefore significant to carry out further research on more communities adjacent to the road infrastructure projects and assess if the results found in this study are unique or can be generalized, looking at various environmental dimensions.

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