Assessment of the Spaces between the Developed and Undeveloped Areas in Rongo Town

Timon Oluoch Auma[1], Professor Francis Ang'awa (Phd) [2],
Dr. Warkach Tonui (Phd) [3]

Department of Geography and Social Development, School of Humanities and Social Sciences, Jaramogi Oginga Odinga University of Science and Technology.

ABSTRACT: *The establishment of any urban centres is always characterised by either commercial, industrial or administrative activities. Rongo Town is one of the towns that has attracted a large population and this has led to inadequate houses for the residents and general stress in the provision of social amenities. The general objective of the study was to analyse the socio-economic impacts of Rongo urban sprawl. The specific objective of the study was to assess the spaces between the developed and undeveloped area of Rongo Town. This was important because it projected the causes of inadequate housing units in Rongo Town. Concentric Urban Theory was used to guide the study. Cross sectional design method was used in the study. Quantitative and qualitative design methods were used to give the study a structure. The target population was 27,759. From this 6,095 households were used as respondents. Primary and secondary data were collected. Primary data was collected by use of questionnaires, observation checklist, photographs and sketches. Secondary data involved written articles by experts in urban growth and information in government offices and non-governmental organisations. This data was analysed by Statistical Package for Social Sciences which yielded descriptive and inferential statistics. This data was also analysed by content analysis through description. The spaces between the developed and undeveloped areas were found to be so large. The study recommended the construction of high density houses by filling in the spaces between the developed and undeveloped areas in Rongo Town with houses and other necessary infrastructures.*

Keywords: compact, expansion, infilling, infrastructure, outlying, planning, urban design

I. INTRODUCTION

1.1 Background

The growth of a town is a natural phenomenon that occurs in terms of population increase and infrastructure. Population increase is attributed to migration from other regions and natural births, UNFPA (2007). The rise of urban population due to population migration is always the major factor that cause a high rate of population increase in urban areas. The rate of population increase in urban centres is expected to hold in developing countries because majority of employment opportunities are found in urban centres due to slow rate of rural development in terms of infrastructure and industrial development, Africa Development Bank (2012). Moreover, most of the social amenities are concentrated in urban centres in developing countries. These services include medication, water, electricity, education and recreation areas like cinema and video halls and sports grounds. Development of the infrastructures in urban centres in developing countries are scattered due to poor or lack of planning and policies and their implementation. The need to construct clustered houses with good plans that increase accommodation capacity is inevitable because of the ever-rising population, Smith (2013).

1.2 Statement of the Problem

The development of houses in urban centres should be carefully done in a way that promotes accommodation capacity while maintaining the fundamental requirements of the housing designs. This is imperative because the health and risk control measures must be observed. However, the present state of spaces between the developed and undeveloped areas of Rongo Town is wanting because the spaces between the houses and other infrastructures were so large. The condition has augmented to inadequate housing in Rongo Town which has further led to scattered development.

1.3 Research objective

The main objective of the study was to assess the socio-economic impact of Rongo Urban Sprawl. The specific objective of the study was to assess the spaces between the developed and the undeveloped areas of Rongo Town.

II.   LITERATURE REVIEW

2.1 Outlying Pattern of Urban Development

Scattered development of urban areas is associated with unplanned and inequitable pattern in growth processes, which in most cases lead to underutilization of resources and inadequate provision of social services. The resource which is seriously underutilized in this case is land due to scattered development, Ewing (1994). Urban development can be categorized into three aspects such as infill, expansion and outlying. The growth, which takes place through infill, involves the process of developing the inner spaces in the urban centre and constructing storey buildings. Expansion means outward enlargement of urban centres in terms of population and physical structures like houses and roads through a continuous built up. Outlying is the growth and development that involves isolated development, and linear branch of growth that takes place along linear features like road or railway, Roca et al. (2014).

2.1.1 Spatial Structure of Outlying Development

The density of population increases as one moves towards the core of the urban centre. This happens as urban residents want to reside closer to the core of the town where they can easily access the services that they require. People also want to reside next to the core of the town in order to reduce the transport cost from their residential areas to the core of the town where most of the services are offered. The population of urban residents also decreases as one moves from the core of the town towards the town fringe because of the commuter cost which increases towards the neighbourhood, Burcher et al. (2006).

Urban centres are characterized by movement which bring about face to face contact among the residents. These residents are always engaged in daily contact for consultation, work, trade activities, negotiation and other purposes which demand for the need to keep the distances between the housing units closer, Hartz (2013).

2.1.2 Quality of Urban Design

The sustenance of an urban centre is a basic necessity because it promotes an urban structural pattern that aims at providing the necessary infrastructure at the present without compromising the future, State of Environment of Tasmania (2006). There is always compatibility between housing density and transport in a town. scattered housing and other infrastructure propel other structures away from them and hence increase the travel distance which finally leads to increased transport cost from the core of the town to the scattered areas towards the neighbourhood, Sabelo (20012, 2013).

2.1.3 Expansion Structure of Urban Development

It is important for local authorities to play a leading role in shaping urban landscape because urban land must be patterned and structured to make the infrastructure more market oriented that promotes more residential and commercial accommodation that enhances the quantity and efficiency in revenue collection. This would make it easy to collect taxes as the houses are built closer to one another that ensures strict collection from one house to another, Chaoyi (2013).

2.2.1 Infilling Structure of Urban Housing Development

The spread of urban residential areas into the neighbourhood has caused a great concern to the American community as it has increased the cost of providing basic services to the residents. The overextended distance which increases the cost of providing the services can be controlled by building clustered housing units and storey houses in the town, Municipal Research and Service Centres, Washington DC USA (2016).

Adequate commercial and residential housing is a priority in all urban centres because the population change in urban centres is always having an upward trend which requires the establishment of more housing units. The major challenge in the understanding of the basic reality between the housing and the available land is inevitable. It has been observed that the spaces between the houses and other infrastructure should be filled in order to ensure that the land is economically used to increase the carrying capacity, Rowleys et al. (2012).

2.2.2 Stakeholders in Urban infilling Structural Processes

Land use in urban centres has necessitated the involvement of experts from major areas like planners, economists and ecologists. This has prompted the need for more urban housing units. The developers and planners in some parts of the world like USA have adapted Smart Growth Movement strategy which is aimed at transferring incompatible land use structure to the outside of the town boundary and put in place structures that are compatible to other structures where they are placed. This concept also proposes for the re-use of abandoned land. In this case, the process of shaping the future of urban housing and other infrastructure will be in the right direction, Rahimi (2016).

According to Mueller (2010), the infrastructure like houses in the town must have some emergency operation areas in place to help in saving life in case of any disaster like falling houses or fire outbreaks. The construction of clustered houses must be done in such a way that the emergency exits like doors and windows are properly identified and located because the high number of people in high density areas may put the lives of many people at risk. Vertical expansion of a town is very important in ensuring high density. However, the geophysical structure of the ground must be strong enough to support the buildings structures. This calls for proper groundwork survey before vertical expansion is done in any urban area because the safety of human beings is of paramount importance, Nissa et al. (2016).

2.3 Theoritical framework

Concentric Urban Theory which was proposed by Burges (1920) was used to guide the study. He proposed a circular model of urban expansion where urban activities and settlements are controlled by social and economic status. His proposal had five circular zones whereby the first zone was the central business district followed by transition zone, low class residential, middle class residential and high income class or commuter zone, (Figure 1).
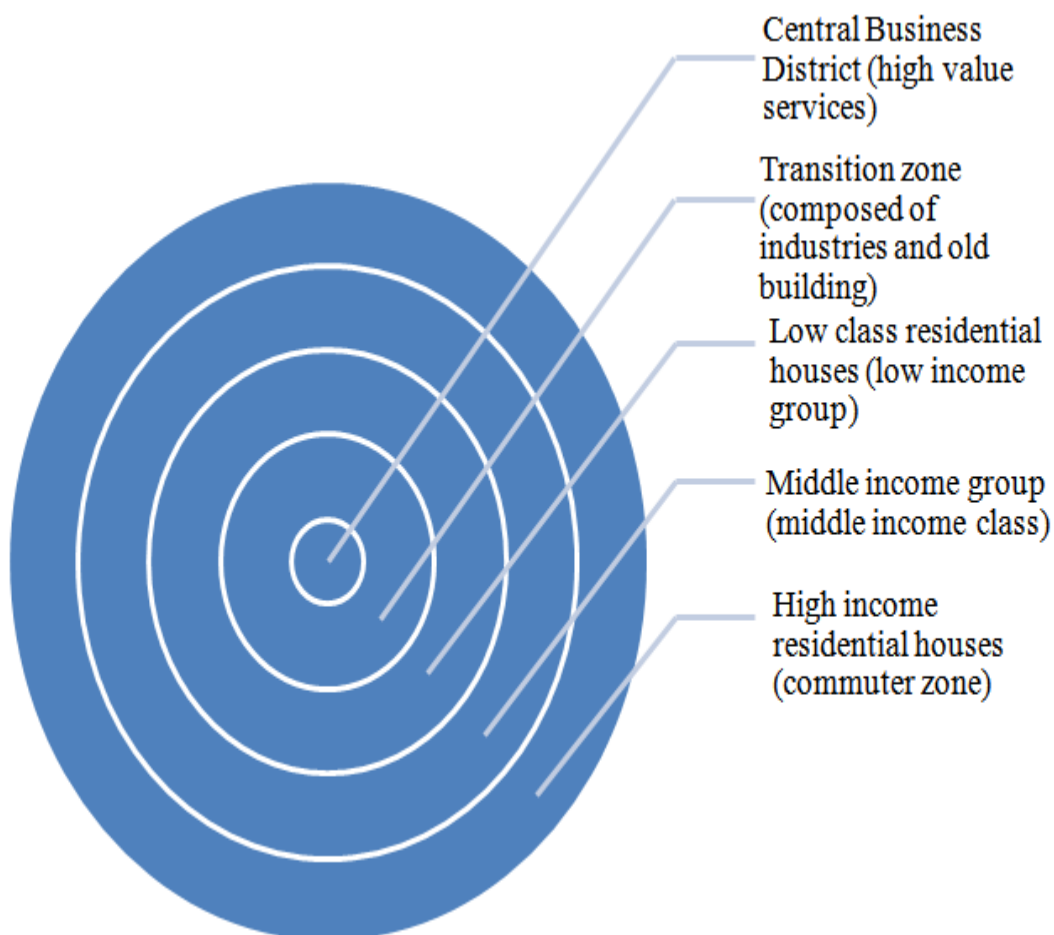

Figure 1; Concentric Urban Theory
Source; Burges, (1920)

III.   METHODOLOGY

3.1 Study Area

Rongo Town is located in Western Kenya, (Figure 2). It is found at Latitude 0^0 $42^'$ $13^"$ S and Longitude 34^0 $52.2^'$ $30''$ E, MOS (2008). It is located at 1700m above sea level. The town covers an area of 22 square kilometres. The three administrative sub locations that make up Rongo Town are Kabuoro, Koderobara and Kanying'ombe. The core of the town has been subdivided to form Rongo Town Sub Location under the local administrative leadership of an assistant chief. It is found in Migori County which is one of the counties of Kenya. Rongo Town is currently the administrative headquarters of Rongo Sub-County.

Map of Kenya

Figure 2: Map of Kenya showing position of Rongo Town
Source : Google Maps

Some of her major neighbouring towns are Homa Bay, Awendo, Suneka and Kisii, (Figure 3 and Figure 4). The town is located at a road junction of Migori-Kisii Road and Migori-Homa Bay Road.
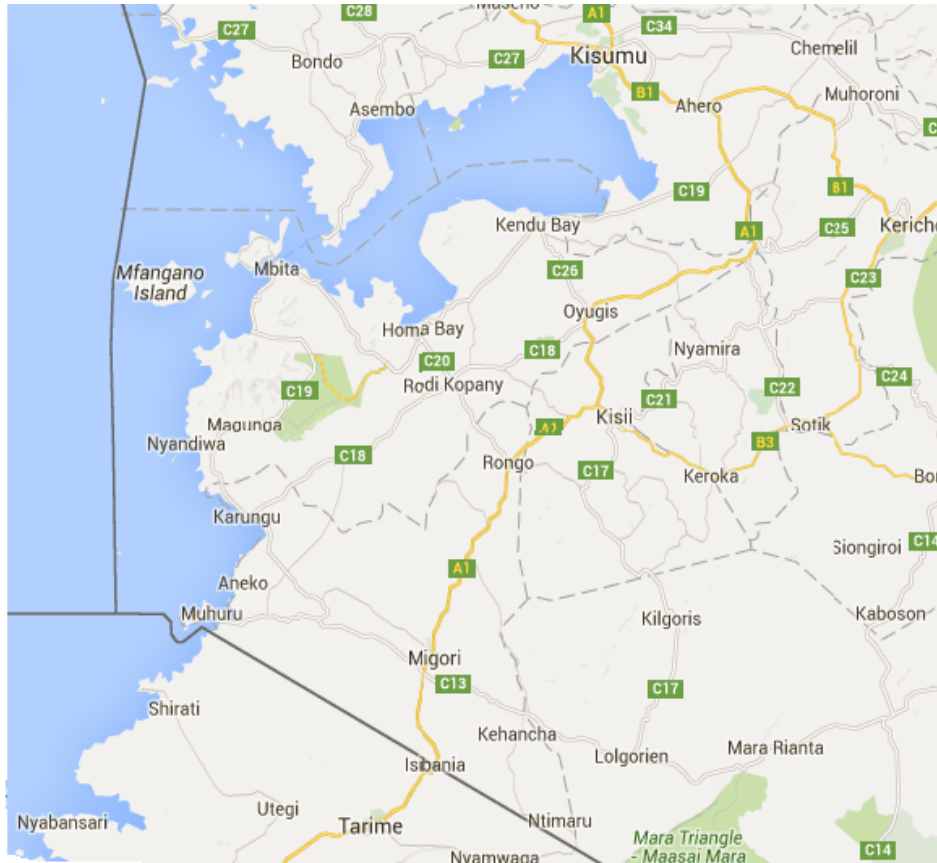Position of Rongo Town and neighbouring towns

Figure 3: Map of Rongo Town and her neighbours
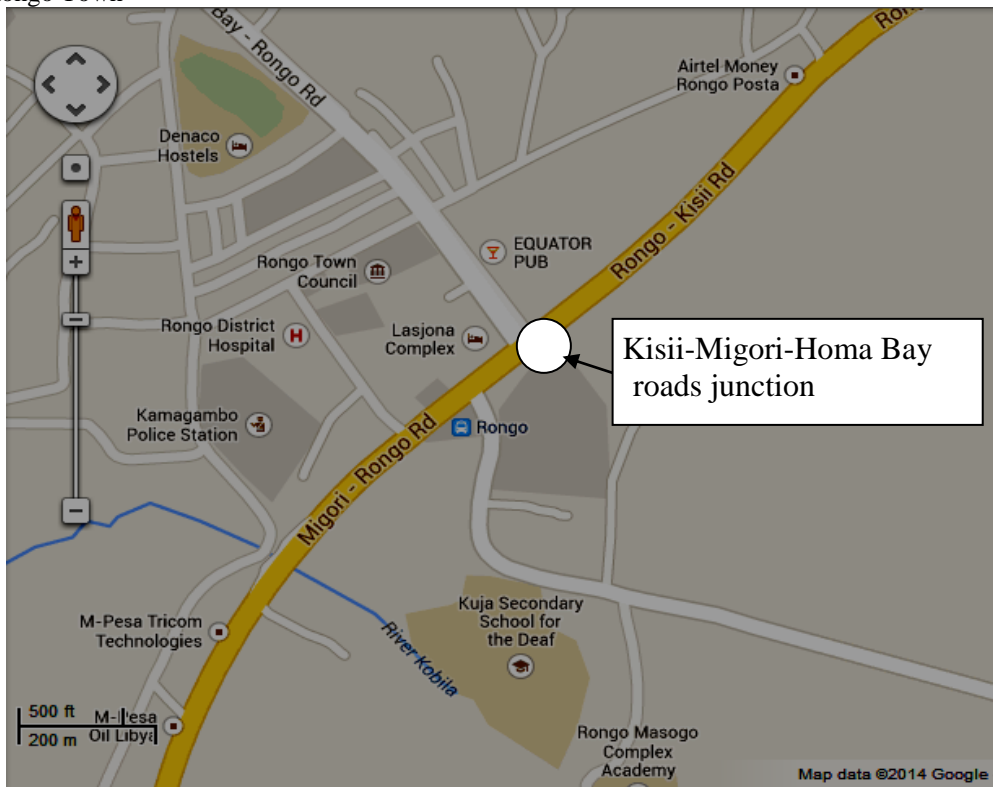**Source:** Google Maps

Map of Rongo Town

Figure 4: Map of Rongo Town showing Kisii-Migori-Homa Bay roads junction.
Source: Google Maps

The temperature of Rongo Town is 22^0 C with humidity ranges between 52% and 71%, Migori County Development Report, (2013-2017). The average rainfall of the town is 1833mm per year. The town is located in the area that has loam, sandy and clay soils in different parts. Most of the parts that surround the town support subsistence agriculture. The crops grown include maize, beans, cassava, groundnuts and some horticultural crops such as mangoes, bananas, avocadoes, paw paws, indigenous vegetables, tomatoes, onions and kale. Sugarcane is also grown as a major cash crop.

The topography of the land in this area is a gentle sloping ground. Population of Rongo Town and the villages around is 27756 with 6095 households, KNBS Population Census (2009). This population compared with the area of the town, gives a density of 1261 persons per square kilometre.

3.2 Research Design

The study employed cross sectional study design method. This is the design in which individuals are carefully selected to represent the views of others from stratified areas of study. This is specially done when the target population and the area of study are so big while the time is limited, Mugenda and Mugenda (2003). It involved dividing the area of study into smaller areas known as strata and using sampled population. It helps to save time and resources as the sampled population represents the rest in the study and their contribution is therefore used across the entire region for analysis. The study used quantitative and qualitative designs. Quantitative design involved the use of numerical figures from the area of study. Qualitative design involved the use of non numerical figures in the research process. Quantitative and qualitative designs were used to give the study a logical structure.

3.3 Target Population

The total population of Rongo Town was 27,756. This was the entire population of the three sub locations of Rongo Town which were Kabuoro, Koderobara and Kanying'ombe. The total number of households in these sub locations was 6,095. Each of these sub locations had the following number of households; Kabuoro 3,195, Koderobara 2,142 and Kanying'ombe 759, KNBS- population Census (2009). 6,095 households were used as target population.

3.4 Sampling Procedure

Purpossive sampling method was used in selecting the respondents of the study. This involved the selection of those who were born in the area, stayed in the area for a long time and adults with the information about the study area. In this case, household heads were sampled as respondents because of their age and therefore had more information about the area. Only household heads who had attained literacy level were selected because the study required more accurate information which needed respondents with some basic level of literacy. In this case, out of 6,095 households, 360 household heads were selected as respondents and this was pegged on the suggestion of Krejcie and Morgan (1970) table of sample determination. The total number of household heads were shared proportionately by the three strata which were Kabuoro, Koderobara and Kanying'ombe and this was according to the number of household heads in each stratum. Sampling was done in order to save time and resources because the area of study and the population were too large but the time and resources were limited. Krejcie and Morgan table of determining sample population is shown in Table 1.

Table 1: Determining Sample Size for a Given Population.

N	S	N	S	N	S
10	10	220	140	1,200	291
15	14	230	144	1,300	297
20	19	240	148	1,400	302
25	24	250	152	1,500	306
30	28	260	155	1,600	310
35	32	270	159	1,700	313
40	36	280	162	1,800	317
45	40	290	165	1,900	320
50	44	300	169	2,000	322
55	48	320	175	2,200	327
60	52	340	181	2,400	331
65	56	360	186	2,600	335
70	59	380	191	2,800	338
75	63	400	196	3,000	341

80	66	420	201	3,500	346
85	70	440	205	4,000	351
90	73	460	210	4,500	354
95	76	480	214	5,000	357
100	80	500	217	6,000	361
110	86	550	226	7,000	364
120	92	600	234	8,000	367
130	97	650	242	9,000	368
140	103	700	248	10,000	370
150	108	750	254	15,000	375
160	113	800	260	20,000	377
170	118	850	265	30,000	379
180	123	900	269	40,000	380
190	127	950	274	50,000	381
200	132	1,000	278	75,000	382
210	136	1,100	285	1,000,000	384

Note.—N is population size,   S is sample size.

From the Krejcie and Morgan table of sample size determination, 360 household heads out of 6,095 households were sampled as the population of the study. This number was proportioned in the stratified areas as shown in Table 2.

Table 2. Sample size determination

Strata- sub-location	NO of households	Proportion	NO of houses to be chosen
Kabuoro	3,195	3,195/6,095=5/10	5/10×360=180
Koderobara	2,142	2,145/6,095=4/10	4/10×360=144
Kanying'ombe	759	759/6,095 = 1/10	1/10×360=36
Total	6,095		360

3.5 Data Collection

Both primary and secondary data were collected and used in the study. Primary data included information which was collected directly from the area of study. This primary data was collected using questionnaires, observation checklists, sketches and photograghs. This data consisted of urban activities and scenes as they were in existence at the time of study. Primary data was important because it gave the original information from the scene of study and also made the investigator to interact with the scene of study which gave him more insight about the activities in the area of study. Secondary data which was collected included written information about urban activities from government offices, non governmental offices and written works of experts on urban activities from the library and the internet. Secondary data was important because it provided written records which acted as a basis upon which the primary data which was collected was anchored to.

The questionnaires which were used contained open and close-ended questions. Open- ended questions gave the respondents chance to add their own views while answering the questions on matters pertaining to factors that led to rapid urbanisation of Rongo Town, nature of spaces between the developed and undeveloped areas, the boundary of Rongo Town and the villages around, perception of town residents about urban growth as positive or negative and strategies that should be put in place to regulate urban growth in Rongo Town. Close-ended questions restricted the respondents to answer the questions on issues asked only so as to avoid being redudant. Open-ended questions were based on the issues concerning perception of the residents of Rongo town, the growth and development of Rongo town. The respondents were required to give their views on urbanisation of the town, whether it had impacted on them positively or negatively and in which areas. These areas were effects of increase of population in Rongo town on the provision of social amenities and other social issues like employment, security, garbage collection and disposal. The questions were also asked on the strategies that should be put in place to regulate urban growth and sprawl and finally the changes in the number of houses and estates which were increasing from time to time towards the neighbourhood. Close-ended questions were dealing with issues on population in estates, traders, number of households and number of people in each household. They were also asked on spaces between developed and undeveloped areas on issues concerning compact or scattered development. This was done because matters concerning distance and population required

exact figures which should not involve estimation or other issues outside that. The questions were made simple for the respondents to understand. This was important because the investigator wanted to get the right opinion of the respondents, Mugenda and Mugenda (2003).

3.6 Data Analysis

Data collected for the study was cleaned to remove issues that were not related to the study, organised in terms of weight and grouped according to the issues under study and finally coded for consistency. Quantitative data was analysed using Statistical Package for Social Sciences (SPSS) version 20 as analytical tool which yielded descriptive and inferential statistics. The descriptive statistics included percentages, mean, mode and median which helped in analysing urban activities. Inferential statistics helped to present the analysis of urban activities which were under investigation from a quantitative data. Data was further analysed by use of content analysis method. This involved organising the whole data into concepts pertaining to urban activities and then writing descriptions about them as they appear.

3.7 Presentation of Data

The information on analysed data was discussed and presented using graphs, tables, mean, percentages and written description for easy understanding. The percentages were used to show the level of an occurrence or presence of an activity. The mean was used to show the average occurrence of urban activities and scenes. The tables contained analysed data based on figures on urban scenes and activities. Some photographs were also used to show the scenes of urban activities on the ground to make the study more practical. Analysed data was also presented by written description on urban activities to give elaborative information on urban scenes and activities, Lyons (2010). This information is presented in the next chapter.

IV.   RESULTS AND DISCUSSION
4.1   Spaces between Developed and Undeveloped Areas

The mean distance between the developed and the undeveloped areas was found to be as large as 12.09 metres. This proved that the spaces between the developed and the undeveloped areas were so large, (Plate 1 and Figure 5).

Plate 1: Dago swampy area
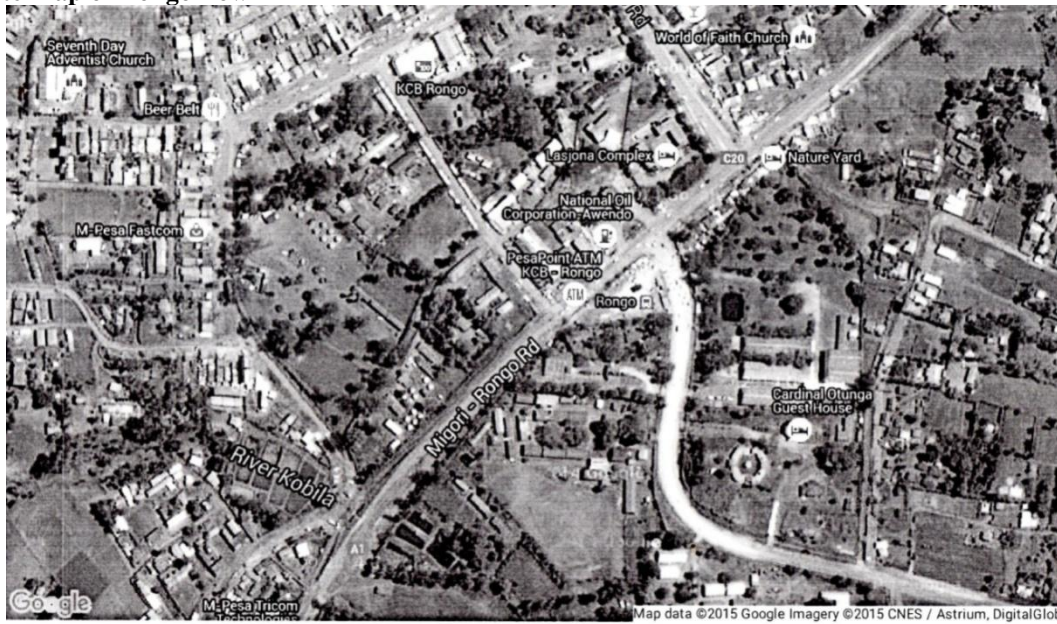
Satellite Map of Rongo Town

Figure 5: Satellite map of Rongo Town showing spaces between developed and undeveloped areas.
Source: Google hybrid maps

This trend propelled other buildings and structures away from each other. New York City had the same trend since there were very large spaces between the developed areas which were causing sprawl, however, it had started the process of filling in these spaces with high density buildings, Burcher, et al (2006). This trend in Rongo Town was contrary to Hartz (2013) that proposed compact buildings that could be used to save the land in the neighbourhood for other activities. It was further observed that the areas of Matagaro, Winter, Nyarach, Misadhe and Dago had the largest spaces of 14 metres apart compared with those of other areas of Ogeng'o, Kibo, Kuja School for the Deaf, Rongo SDA Church and Emmaus Catholic Church areas which had 10 and 12 metres as their mean distances between the buildings, (Table 3).

Table 3 : Mean distances between the buildings in areas of Rongo Town.

Area	Mean distance in metres
Ogeng'o	10
Winter	14
Kuja School for the Deaf area	12
Misadhe Church area	14
Matagaro Church area	14
Kibo area	10
Makutano area	10
Dago area	14
Rongo SDA Church area	10
Rongo Catholic Church area	11
Nyarach	14
Mean distance for all the areas	1 12.09

According to Smith (2013), large spaces between buildings in urban centres promoted scattered development which often moves towards the town fringe. Although there were undeveloped spaces which were left between the buildings and they were being used for other activities like airing clothes, they were so large to be used for that purpose in urban centres where more houses were needed to cater for the needs of a high population. In addition to this, there were still indigenous landowners who were still owning land in the core of Rongo Town with large parcels of land with scattered buildings and some farms around them. This was another scene which was propelling other infrastructures away from the core of Rongo Town thereby causing sprawl, (Plate 1). The mean distances between the buildings in different areas of Rongo Town were measured. The mean distances between the buildings were found to be so large as in Table 3.

The mean size of the buildings in the estates of Rongo Town were observed and found to be 15 metres by 5 metres. This was the size of most buildings for rental purposes which were built with many doors with some having two to three external doors. This size compared to the average plot size of 30 metres by 15 metres. It means that a half of the plots were used for building the houses in the individual plots of Rongo Town. Besides this, there were still some plots which were fenced in the core of Rongo Town but not developed and hence they were pushing other buildings away from them towards the neighbourhood of the town, (Plate 2). This again was an indication that the spaces within different plots were underutilized as was the case of Sao Paulo City which had scattered developments which were propelling other infrastructures very far from the centre of the town causing problems such as dependance on motor vehicle transport and conversion of land in the city fringe to uban status thereby reducing other economic activities like cash crop farming, livestock rearing and forestry, Sundra et al (2011).

Plate 2: Undeveloped parcel of land near Makutano Area in Rongo Town.

Besides, observation revealed that there were only 50 storey houses in Rongo Town whereby 60% of them were commercial houses which were being rented and used by the business people as shops, restaurants and for accommodations. This means that only 40% of these storey houses were used for residential purposes. This again was causing stress in rental residential houses because there were more people who needed rental residential houses than those who needed commercial houses. Out of the total number of houses within Rongo Town, only 0.5% were storey houses. This was a clear fact that vertical space was underutilized and therefore there was more horizontal development towards the outskirts.

Single-family houses where individual land buyers bought land and built their homes in the villages were many in Kabuoro and was 71.4% of the total number of single-family houses in Rongo Town. This means that Rongo urban sprawl was moving towards Kabuoro Sub Location, and mainly towards Nyarach and Dago areas than the other two sub locations. Single-family homes in Koderobara were found to be 23.8% of the total single-family homes in the villages around the town. This percentage was lower than Kabuoro may be because Koderobara had fertile soils for crop farming so the local residents were still unwilling to sell parts of their land to urban developers. Kanying'ombe had 4.8% of single-family homes in the villages because it was observed that land parcels in Kanying'ombe were very small compared to the other two sub locations and this made the local residents to slow down the sale of their land to town developers. These land sizes were limiting the sprawl of Rongo Town towards Kanying'ombe, (Table 4).

Table 4: Percentage of single-family homes in the villages of Rongo Town.

Sub location	Number of houses	Percentage of total
Kabuoro	1,500	71.4%
Koderobara	500	23.8%
Kanyingombe	100	4.8%
Total	2,100	100%

Correspondingly, there were more rental houses in Kabuoro than the other two sub locations. In Kabuoro, there were 60% of the rental residential houses, (Table 5). This could be due to the fact that most of the land in Kabuoro was sandy soil which made the construction of the houses slightly cheaper and also most of the residents of Kabuoro Sub Location were willing to sell their land to private developers which made most of the land buyers to prefer those areas. The small parcels of land that were fenced between the parcels of original land owners were very many with some of them already developed and while some still undeveloped. This was a clear indication that there was more land buying in Kabuoro than Koderobara and Kanying'ombe where there were parcels of land which were bought by landbuyers but they were fewer than those ones of Kabuoro. Besides that, the original landowners of Kabuoro had smaller parcels of land compared to the original land owners of Koderobara and Kanying'ombe which indicated that there was more land buying in kabuoro.

The sandy soils made the movement in the area of Kabuoro easy because vehicles and other moving machines did not get stuck in the mud whenever there was any form of transportation. Hence there were more developers who preferred Kabuoro area (Table 5). Koderobara and Kanying'ombe had small percentages of rental houses because few people had bought land in those areas. This could be due to the fact that many local residents in Koderobara and Kanyingo'mbe still preserved their land for subsistence farming. This could be observed by the sizes of farms in Koderobara and kanying'ombe which were still larger compared to the sizes of farms in the areas of Kabuoro which was closer to the town. In Kabuoro areas, some people had sizes of farms which were less than half an acre whereas in Koderobara and Kanying'ombe the sizes of farms were ranging from half an acre to one acre and above in areas which were closer to the town. Besides, individual plots of land owned by local people in Koderobara and Kanying'ombe were small compared to those of Kabuoro.

Through observation and discussion with the residents in the neighbourhood, there was still active land buying in the villages around Rongo Town as there were parcels of land which were fenced but not yet developed, (Plate 1). This trend was depicting scattered development in Rongo Town. This even made some parcels of land which were used for agriculture to become part of urban land as was observed by Rahma and Michael (2011), who documented that scattered development in urban centres leads to conversion of agricultural land to urban status which reduces agricultural production in the plots around urban centres and this could finally lead to escalation of food prices. As the land under food crop and livestock production decreases, the food supply in the urban area also decreases causing the prices of food to go up.

Table 5: Percentage of the number of rental houses in Kabuoro, Koderobara and Kanying'ombe sub locations.

Sub location	Number of rental houses	Percentage of total houses
Kabuoro	5,160	60%
Koderobara	3,010	35%
Kanying'ombe	430	5%
Total	8,600	100%

V.   CONCLUSION

There were so many undeveloped areas within Rongo Town which was causing inadequate housing to the town residents. These undeveloped areas were propelling the development of infrastructure and particularly houses away from the town towards the neighbourhood. This was increasing the cost of providing services like water, electricity and transportation to the urban residents. Besides, vertical space was not used well because there were very few storey houses for rental purposes. This again was encouraging scattered development which did not ensure economical use of land.

VI.   RECOMMENDATIONS

Spaces between the developed areas and undeveloped areas of Rongo Town should be filled by building more housing units in them in order to increase the carrying capacity of those areas. The vertical space should also be used by building more storey houses. These storey houses accommodate more people. Some spaces could be developed into vehicle parking lots, playgrounds and other recreational purposes. In addition to this, other open spaces between the developed and undeveloped areas may be designed for afforestation in order to improve the quality of the environment. The buildings and the estates should be properly connected by road network in order to improve movement of the residents within and out of the compact estates.

REFERENCE

[1].   Africa Development Bank (2012), Addis Ababa, Ethiopia.
[2].   Burcher, F. Overman, M. Henry, G. and Matthew, A.T. (2006). Causes of Sprawl; A Portrait from Space, Oxford university Press, New York, USA.
[3].   Burges, E.W. (1920). Concentric Urban Theory. Chicago, USA.
[4].   Chaoyi, C. (2013). Environment and Resources at the University of Wisconsin- Madison, USA.
[5].   Ewing, R. (1994). Characteristics, Causes and Effects of Sprawl: World press, Chicago, USA.

[6].   Hartz, G. (2013). Smart Growth America Magazine. New York, USA.
[7].   KNBS- Population Census. (2009). Government of Kenya, Nairobi, Kenya.
[8].   Krejcie, R.V. and Morgan, D.W. (1970). Determining Sample Size for Research Activities, Educational and Psychological Measurement, Minnesota, USA.
[9].   Lyons, R. (2010). Best Practices in Graphical Data Presentation, Ohio, USA.
[10].   Migori County Integrated Report (2013-2017). Migori, Kenya.
[11].   MOS. (2008). Government of Kenya, Nairobi, Kenya.
[12].   Mueller, R. T. and Mitchem, J. D. (2010). Survey of Emergency Management and Preparedness Agencies in Pennsylvania, University of California.
[13].   Mugenda, O.M. and Mugenda, A.G. (2003). Research Methods: Quantitative and Qualitative Approaches, Acts Press, Nairobi, Kenya.
[14].   Municipal Research and Service Centres (2016). Washington DC, USA.
[15].   Nissa, A. K. Sultan, M. B. and Nuzhat, S. (2016). Population Growth, Urban Expansion and Housing Scenario in Srinaga City, India.
[16].   Rahma, F. and Michael, H. (2011). Agricultural Resources and Economics Society Conference, Melbourne, Australia.
[17].   Rahimi, A. (2016). A methodological Approach to Urban Land Use change Modelling Using Infill Development Pattern, Case Study in Tabriz, Iran.
[18].   Roca, J.   Burnsa, M. and Carreras, J. (2014). SentmanaGeomÃtica. Retrieved August 30, 2014, from http://www./sprs.org/publications/related/sentmana-geomatica.
[19].   Rowley, S. And Phibbs, P. (2012). Delivering Diverse and Affordable Housing on Infill Development Sites, Ahuri Final Report No. 193, Melbourne, Australia.
[20].   Sabelo, M. (2012, 2013). Financial and Fiscal Commission, Division of Revenue and Technical Report, South Africa.
[21].   Smith, S.K. (2013). Springer Science Business Media, Dordrecht, South Africa.
[22].   State of Environment of Tasmania (2006). Resource Planning and Development Commission, Hobart TAS – Australia.
[23].   Sundra, C. Folin, G. Mateus, G. M. Rafael, L. S. and Monrique, B. S. (2011). Urban Sprawl and New forms of Urbanisation in Brazil: The Characteristics of Gated Communities in the Valley of Paraiba River, Sao Paulo, Brazil.
[24].   UNFPA, United Nations Report. (2007). Nairobi, Kenya.

Authors' details
1.   Name   Timon Oluoch Auma
        Designation   Student
        Organisation   Jaramogi Oginga Odinga University of Science and Technology
        Department   Geography
        Address   P.O. Box 210-40601Bondo
        Country   Kenya
        Email address   aumatimonoluoch@yahoo.com

2.   Name   Professor Francis Ang'awa (PhD)
        Designation   Lecturer
        Organisation   Jaramogi Oginga Odinga University of Science and Technology
        Department   Geography
        Address   P.O. Box 210-40601Bondo
        Country   Kenya
        Email address   angawa2008@yahoo.com

3.   Name   Dr. Warkach Tonui
        Designation   Lecturer
        Organisation   Jaramogi Oginga Odinga University of Science and   Technology
        Department   Geography
        Address   P.O. Box 210-40601
                          Bondo
        Country   Kenya
        Email address