

## **Effects of Population Growth on Urban Infrastructure and Services: A Case of Eastleigh Neighborhood Nairobi, Kenya**

**Gilbert W. N. Asoka**

Department of Environmental Planning and Management  
Kenyatta University, P.O Box 43844-00100  
Nairobi, Kenya

**Aggrey D.M. Thuo**

Department of Land Resources Planning and Management  
Jomo Kenyatta, University of Agriculture and Technology  
P.O Box 62000-00200  
Nairobi, Kenya

**Martin M. Bunyasi**

Department of Environmental Planning and Management  
Kenyatta University, P.O Box 43844-00100  
Nairobi, Kenya

### **Abstract**

*There is an increasing recognition that the growth of cities is inevitable and the solution to urban problems depends heavily on effective urban planning, infrastructure development and management. Rapid and often unplanned population growth is often associated with population demands that outstrip infrastructure and service capacity and leading to environmental degradation. This study, therefore sought to put into perspective impacts of population growth on infrastructure and service provision in Eastleigh neighbourhood. Its main themes were first, to understand trends in population growth; secondly, to understand the impact of population growth on infrastructure and services; thirdly, to explore available initiatives and their effectiveness in guaranteeing sustainable infrastructure and effective services in the neighborhood. The study interviewed 30 households, 20 businesses and 3 institutions in infrastructure development and service delivery. For households, simple random sampling technique was adopted while for institutions and businesses a purposive technique was utilized. The data was analysed with the aid of computer packages SPSS and Microsoft Excel programs. The packages generated outputs that were illustrated using percentages and bar graphs.*

### **Introduction**

The 21<sup>st</sup> century saw a continuous transformation of the world's population into urban dwellers. Thus, urban population has increased from less than 30% in 1950 to more than 47% in 2000. Europe, North America, Latin America and the Caribbean are already largely urbanized regions with 75 % of their populations residing in cities. United Nations Report of 2009 on Global Human Settlements indicates that currently, Africa is the fastest urbanizing continent in the world.

In 1980, only 28 % of the African population lived in cities. However, in 2006 the number rose to 37 %. In Kenya, consecutive census reports indicate progressive growth of urban population which is attributed to natural population growth, rural to urban migration, influx of refugees and immigrants from neighboring countries (Goldsmith 1997 and Sirola 2001). The growth and development of Eastleigh neighbourhood is attributed to a variety of factors or forces driven by diverse cultural actors as a result of decisions made by both colonial and independence governments (CCN, 2008). During colonial period, Eastleigh was limited to a residential area for especially Asian population and a few African elites.

However, due to its strategic location, accessibility advantages and potential to support trade attracted extreme functional land uses such commercial activities that were outside the original planning framework for the area. This is an indication of how the neighborhood began to develop as a residential and a commercial center. Currently, social-cultural dynamics of the area have evolved, resulting in an integration of Africans and more also Kenyans of Somali descent who dominate the Northern parts now dubbed “Mogadishu ndogo” (meaning, little Mogadishu) due to the high presence of Somalis traders and the capacity of the neighborhood to host high profile peace conferences for the political leadership of troubled Somalia (Goldsmith, 1997).

## ***Materials and Methods***

### **The study area**

#### **Physical Set-up**

Eastleigh is located in the Eastern part of Nairobi city within Pumwani and Kamukunji Divisions of Nairobi County. It is surrounded by high density residential areas to the West and East and it lies within two major primary roads; namely Juja and Jogoo. Functionally, the neighborhood is related to the Central Business District as the main Commercial District of the city and hosts various high residential density areas. It is one of the oldest residential estates in Nairobi and lies approximately 4 km East of the City centre covering an area of about 120 hectares (CCN, 2008 and GoK, 2009). Eastleigh in Pumwani division; Kamukunji Constituency and can be located between longitudes 36° 50' and 37° 00 East and latitudes 1° 15' and 1° 10' South.

In addition, the streets in the neighborhood are laid out in a chessboard like pattern, with six wider avenues in North-South direction and intersected by 19 streets in East-West orientation (CCN, 2008). The area is bounded by 82 Air Base to the East, Juja road to the Northwest, Nairobi River to the South and the new Pumwani estate to the West. The area is divided in to two major parts, Eastleigh North and Eastleigh South.

#### **Climatic Information**

Eastleigh lies at the southern end of Kenya's agricultural heartland. Its altitude varies between 1,600 and 1,850 metres above sea level. The climate is generally a temperate tropical climate, with cool evenings and mornings becoming distinctly cold during the rainy seasons. The area experience bi-modal rain pattern; the long rains occur between April and June, while the short rains come in November to early December. These seasons are referred to as the wet season and dry season. The roads, especially access roads are dilapidated and impassible during rainy seasons. The roads are characterized with deep mud during the rainy season and rising dust in dry seasons. Drains, sewers and rubbish collection are visibly inadequate, making the area filthy during both seasons.

The area has 12 hours of constant daylight with average daily temperatures range between 29<sup>0</sup> C in the dry season to 24<sup>0</sup> C during the rest of the year (CCN, 2008).

### Population profile

As at 2009, the official population size for Eastleigh was 315,496 (GoK, 2010). However, the African Population and Health Research Centre (2002) and Campbell (2005) indicated that the population ranged between 300,000- 500,000 (table 1).

**Table 1: Trends and Patterns of Population Growth Between 1969 and 2009**

Year	Location	Area in Hectares	Population			Grand Total	% Growth	Density
			Male	Female	Total			
1969	Eastleigh North	120	15,088	4,610	19,698	36,616	19.458	
	Eastleigh South	120	13,486	3,432	16,918			19.374
1979	Eastleigh	120	30,343	23,219	53,562	53,562	46.2%	74.39
1999	Eastleigh North	120	76,768	63,694	140,462	246,420	360%	56.984
	Eastleigh South	120	57,330	48,628	105,958			103.745
2009	Eastleigh North	120	80,173	72,639	152,812	315,496	24%	38.554
	Eastleigh South	120	79,639	73,045	152,684			107.214

**Source: GoK 1969, 1979, 1999 & 2010**

Figure 2 expounds on trend in population growth of Eastleigh from 36,616 in 1969 to 315, 496 in 2009 as indicated in table 1. Thus, the neighborhood has exhibited steady population growth between 1969 and 1979 and also between 1999 and 2009. However, between 1979 and 1999 saw a remarkable increase in population at a rate higher than what normal population dynamics would support (the birth and death rates). Since 1990, Eastleigh has developed rapidly and is shaped by its growing population from urban and rural areas in Kenya and beyond.

### Economic Activities

Eastleigh is inhabited by both low and middle-income earners, a fact that was validated during the survey that over 63% of the population earns a monthly income of between Kshs. 10,000 and 20,000. Since 1990, Eastleigh has developed dramatically, shaped by its growing population of people from Sudan, Eritrea, Ethiopia and Kenya, but above all, the largest numbers are people of Somali descent (Goldsmith 1997 and Sirola 2001). Eastleigh has since become predominantly Muslim and a major business and shopping district in Nairobi and beyond.

Business people and organizations have invested in banking, import and export businesses, property agents and retail outlets ranging from small-scale hawking on streets to large shopping malls. Other investments include lodges, miraa (khat) outlets, cafés, restaurants, transport companies, phone and internet bureaus, international money transfer and money exchange services (Lindley, 2007).

**Methodology**

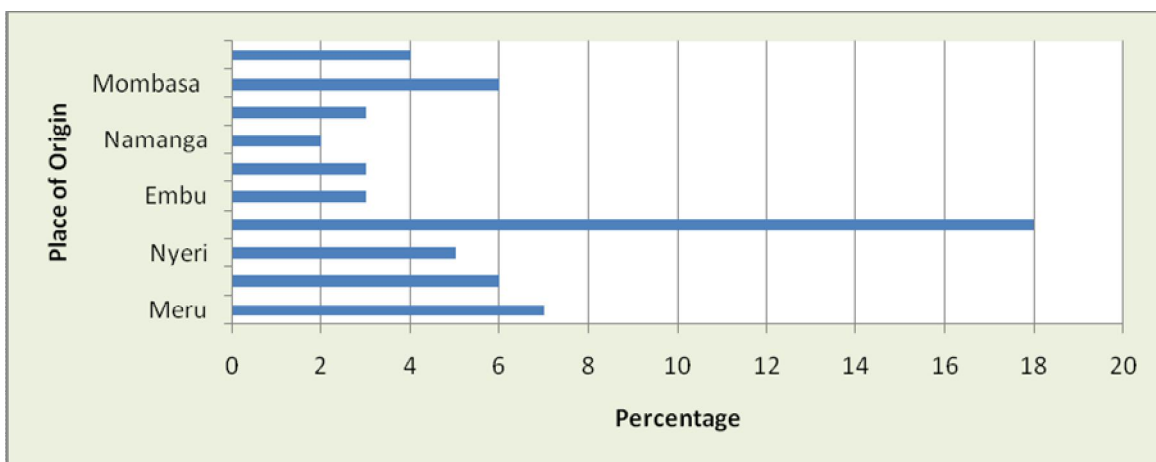
To sufficiently address research objectives both primary and secondary data was utilized. Data collection techniques broadly engaged questionnaires to collect households’ data; face to face interviews were of essence in collecting data from households, business premises and relevant government institutions; in-depth interviews were conducted with government institutions and business community; observation and photography was utilized to identify physical parameters that are associated with infrastructure dilapidation and service negligence as a consequence of population growth. The study adopted sampling size and procedure as advanced by Fisher’s formula ( $n = Z^2PQ*1/d^2$ ) ( Mugenda and Mugenda, 1999).

Snow balling was vital in identifying key stakeholders in salt mining industry in the region. A sample size of 30 households, 20 businesses and 3 relevant government institutions provided data which was then collated, cleaned and analyzed using the Statistical Package for Social Science and Microsoft Excel.

**Results And Discussions**

**Population Growth in Eastleigh Neighbourhood**

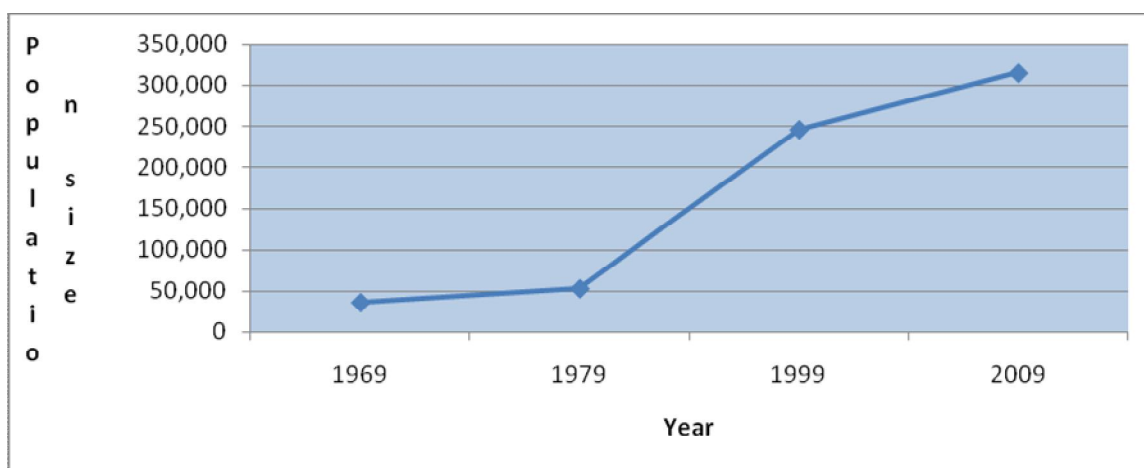
The survey findings indicated that population growth in the neighborhood has been occasioned by pull factots such as trade and investment opportunities at, 50%. Kenyan Somalis started migrating into Eastleigh in the 1980s when North Eastern Province was experiencing devastating droughts causing inhabitants (Somalis) to lose their livestock, which was their main source of income. These events stirred their desire and need to diversify their source of livelihood base from over reliance on livestock to business. Thus, most of inhabitants from North Eastern Province migrated to Eastleigh and established small scale businesses. The percentage of those seeking employment stands at 30% while 20% of immigrants are due to political instability in Somalia and the Horn of Africa.



**Figure 1: Popuation catchment areas**

**Source: Field Survey, 2012**

In addition, the study found out that migrants into the neighborhood originated from different places both rural and urban areas of Kenya and beyond. Based on figure 1, it's evident that since 1990, Eastleigh has developed rapidly and is shaped by its growing population from urban and rural areas in Kenya and beyond. North Eastern Province previously recognized as the Northern Frontier District under British rule has the highest percentage of migrants into Eastleigh at 20%. This may be attributed to lose of livelihoods through draughts since the area is semi-arid and as Lindley (2007) pointed out that high insecurity may be a contributing factor for inhabitants majorly Kenyan Somalis to migrate to urban centres. Moreover, political instability in Eastern and the Horn of Africa in early 1980s and 1990s saw immigrants from countries such as Sudan, Eritrea, and Somalia seek refuge in Kenya and specifically in Eastleigh.



**Figure 2: Trend in population growth**

**Source: GoK 1969, 1979 & 2009**

The overall population percentage growth for the neighborhood rose from 46.25% in 1969, to as high as 360% in 1999 and normalized to 24% in 2009. The growth rate especially the 1979-1999 appear unnatural and could be attributed to political instability that engulfed Kenya's neighboring countries of Sudan, Ethiopia, Rwanda, DR Congo and Somalia, figure 2.

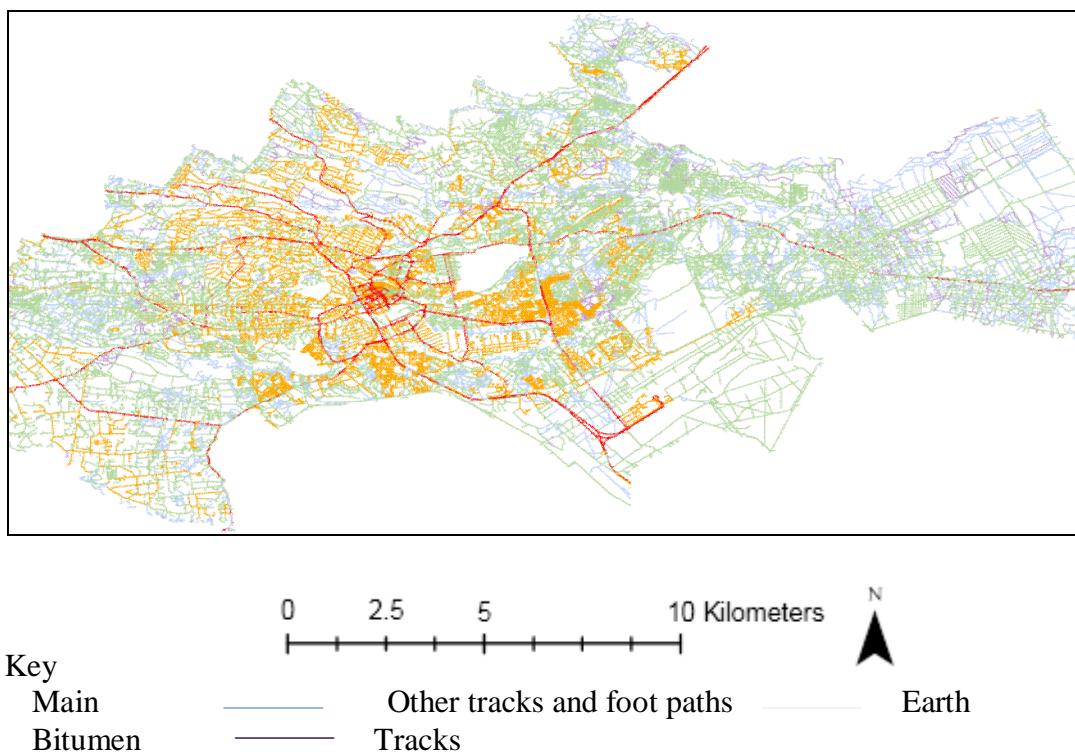
### **Impact of Population Growth on Infrastructure**

A number of views have been advanced in an effort to understand the relationship between infrastructure demand and development. First, the supply of infrastructure leads to social economic development and secondly, the development potential creates demand for infrastructure. Thus, infrastructure facilities are vital to social-economic development of urban and rural areas through direct and indirect benefits.

The exponential growth in population and the escalating developments have put insurmountable strain on basic infrastructure in the neighborhood. This trend that require an expanded or enhanced infrastructure and service to be able to effectively and efficiently deliver basic infrastructure and services such as housing, water supply, security, education, health and waste management mechanisms to address the needs of the increased population.

### Impact of Population Growth on Road Network

The structure of road networks and public transport systems shapes the spatial organization of many cities. The quality of the road network is equally significant in enhancing development in terms of accessibility, connectivity and to some extent the aesthetic value through road designs. Eastleigh has a grid system of road network that defines its spatial formation. These are the two avenues that run parallel to each other from North to South and nineteen streets that run from East to West. This road design has an advantage of facilitating accessibility and high connectivity as indicated in figure 3. The grid system up in which the roads were designed gives Eastleigh the spatial character up on which the land use and activity systems are developed.

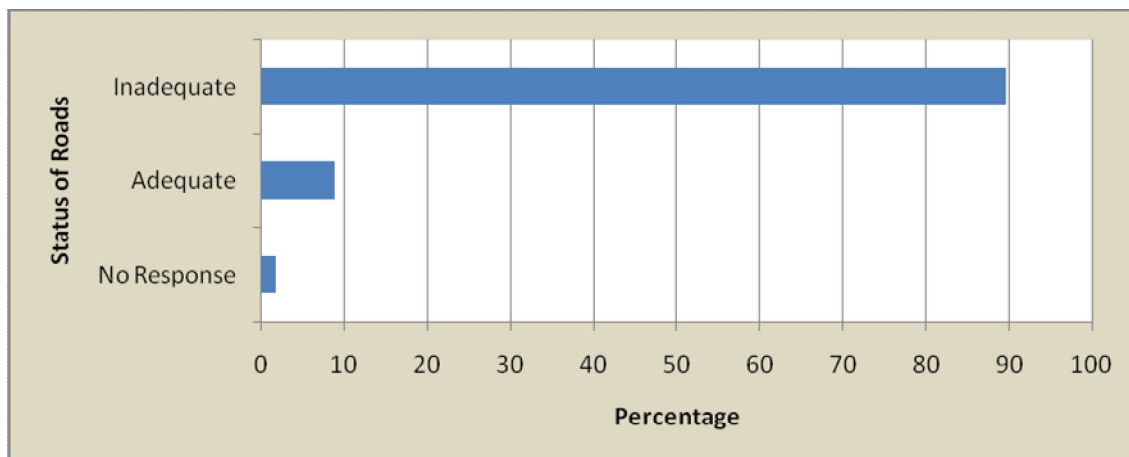


**Figure 3 : Road network in Nairobi**

**Source: Columbia University, 2008**

However, population growth and spatial development of the neighborhood is taking place without roads expansion and in adequate maintenance of the existing road network, figure 3, 4 and Plates 1 & 2.





**Figure 4: The status of Roads**

**Source: Field Surevy, 2012**

Though Eastleigh is just but 4 kilometers from Nairobi city centre, its productivity is adversely affected by traffic congestion due to poor state of roads. The state of road network contributes to the external pressure on Eastleigh, particularly the vehicular and pedestrian access to the Central Business District and Industrial area for business and employment purposes. Initially the roads in the neighborhood were 5.5 metres wide, meant to serve a lean population living in single dwelling units.



**Plate 1: Stagnant water on the Road.**  
**Source: Field Surevy, 2012**



**Plate 2: Dilapidated status of main Roads**  
**Source: Field Surevy, 2012**

According to the City Council of Nairobi, it had become expensive to maintain the 5.5 metres roads due to frequent repairs attributed to high populations. In the early 1990s there was massive population inflow leading to a change in housing units from single units to skyscrapers to cater for the increased population, moreover, the roads were negatively impacted on even with the efforts of the City Council of Nairobi to widen the roads to between 7 and 9 meters for 1<sup>st</sup> Avenue and General Waruinge respectively. In addition, the roads have been narrowed due to illegal structures raised on road reserves; poor parking especially of trailers along the foot paths thus blocking pedestrian walk ways and hawking that greatly hamper traffic flow of both pedestrians and motorist.

Moreover, the carriageway is continually being eroded due to construction of embankments from buildings that encroach on the roads especially on First and Second Avenue. The embankments are constructed in such a manner that they are slanting towards the carriageway, thus, they drain rain and waste water from the buildings to the carriageway which erodes the carriageway and makes the road un-motorable, Plates 1& 2. A discussion with public service operators plying the Eastleigh route and Eastleigh Business Community raised critical issues of the increased cost of doing business in the neighborhood. Transport operators felt that despite its close proximity to the capital, the neighborhood continues to lose productivity due to traffic congestion especially during rush hours.

In addition, the operators associated traffic congestion to dilapidated road infrastructure which greatly hampers vehicle movement, consequently raising the costs of motor vehicle maintenance that reduces profits in transport business. The City Council of Nairobi admits that it has been experiencing challenges in roads maintenance in Eastleigh which it attributes to high population pressure, unplanned developments, and lack of parking space and erection of illegal structures such as buildings on designated foot paths and road reserves. Though the City Council of Nairobi aspires to be a modern and secure city and a world leader in infrastructure provision as stated in the councils mission statement.

However, this may remain a distant dream if the actual or potential impacts of population growth on infrastructure is not determined and planned for, in order to provide a sustainable urban growth. According to McGill (1998) the acid test of efficiency in the management of cities is the state of infrastructure provision. We hold the view that such a test should at the basic level critique the availability of basic infrastructure and analyze for instance if there is clean water for all and if roads are passable without effort.

The next level should then look at the contribution of arterial infrastructure to determine the spatial pattern of urban development. At whatever level the urban test is pitched, provision of infrastructure and services is dependent heavily on the nature of the planning process. Effective and efficient road network ought to serve all needs of a particular community by offering transport infrastructure for pedestrians, vehicles and bicycle ways. However, in Eastleigh, the road network was rated as the most poorly provided infrastructure in the area with over 90% of the respondents indicating that roads in the neighborhood are in a sorry state.

The roads are dilapidated and have become a dumping site for solid and liquid waste and characterized with open man-holes that pose imminent risk to both motorists and pedestrians (Plate 3). Generally, Eastleigh's transport infrastructure is ill-equipped to handle the additional travel generated by the increasing population, and industrial activities. Indeed traffic congestion is a common problem exacerbated by narrow roads, non provision of non motorized transports, drainage and compromised land-use development control. Dealing with urban mobility issues is an economic, social and an environmental priority.



The City Council of Nairobi initiated roads re-carpeting and maintenance projects in many parts of the city in order to address the impacts of the heavy El nino rains of 1989 and early 1990s that had aggravated the status of roads in many parts of the country. In Eastleigh the 1<sup>st</sup>, 2<sup>nd</sup> and General Waruinge roads were among the roads that were indentified for widening and reconstruction through the El-nino Roads Project supported by the Council and World Bank (CCN, 2008). However, due to inadequate implementation of the programs and regular maintenance of the earmarked roads to enhance their capacity, the roads have since remained dilapidated.

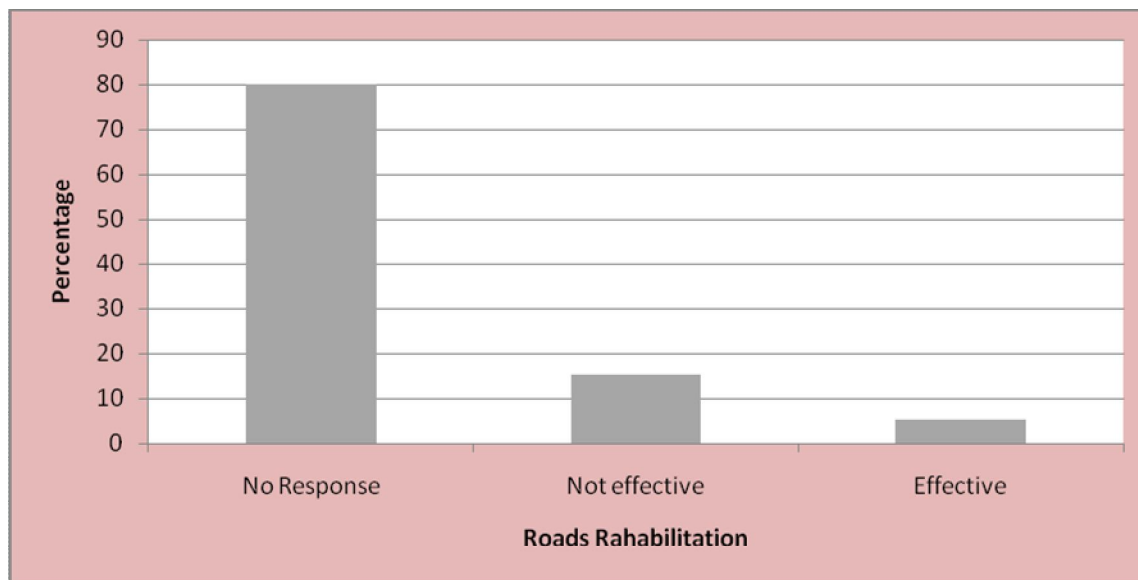
In line with this, neither widening of the roads nor re-carpeting of the earmarked roads was done. To date very little effort has been done to enhance the roads infrastructure by either City Council of Nairobi or the Kenya Urban Roads Authority that is now responsible for construction and maintenance of all roads within Nairobi and other urban centres. Though the first avenue has been earmarked by KURA for re-carpeting through the Urban Roads Upgrading Project, nothing had been done by the time of this study's field work. In addition the survey indicated that 96 % of the respondents had indicated that there were no initiatives by the government, City Council of Nairobi or the Kenya Urban Roads Authority to re-carpet or maintain the roads in Eastleigh. Only 4% of respondents had noticed initiative to address road network in Eastleigh.

Moreover, the 4% presence of initiative to re-carpet the road were made in reference to irregular and unconventional initiative by the youths in the area who would fill potholes with soil along the major roads serving the neighborhood, while most access roads into the neighborhood remain impassible and un-motorable either due to dumping of waste, encroachment by buildings and markets. The Engineering department of the City Council of Nairobi had earlier identified a number of issues facing road network in Eastleigh. These include traffic congestion, narrow roads, inadequate parking space, and poor drainage and poorly defined pedestrian walkways.

Thus, the Council had planned to undertake a comprehensive road widening program in order to expand all major roads in the neighborhood, secondly, to repair and maintain dilapidated roads and expand the drainage network in order facilitate free flow of water to avoid water stagnation that erodes the road network, thirdly, to reclaim all road reserves and public parking spaces and lastly, to construct and provide for elaborate pedestrian and cyclist paths to reduce road utilization conflict and congestion.

### **Effectiveness of the initiatives to enhance Road network**

From the survey, it emerged that there are minimal initiatives to enhance road network despite the fact that the roads were the worst rated infrastructure provided in the neighborhood. Majority of the respondents; 80% to be precise had no response as to whether the initiatives to enhance the road transport network in the area were effective or not, figure 5. Generally, this perception was informed by the understanding that, there is no visible initiative on the ground that is working to improve the status of roads in Eastleigh.



**Figure 5: Effectiveness of initiatives to improve the Road network**

**Source: Field Survey, 2012**

However, 15% of respondents felt that the initiative to enhance the road networks was not effective while 5% thought that the initiative to address road network in Eastleigh are effective. Thus, the status of roads has been exacerbated by lack of implementation of the 1989 Eastleigh District Centre Strategy that had intended to address transport issues such as widening of the road and traffic reorganization in the neighborhood. Currently, the neighborhood is characterized with traffic congestion, inadequate pedestrian facilities and cycle lanes as major setback to the productive capacity of the economy affecting all segments of the neighborhood and the City of Nairobi at large.

### **The Impact of population growth on Water needs**

In Kenya over half of the urban population lives in informal settlements with no direct connection to water or sewage service. According to Nairobi Water and Sewerage Company, the water pipes serving Eastleigh were laid out in the late 1940s and early 1950s and their sizes were 14 inch for the main pipe, 4 inch for the distributor line, while 2 inch for service lines targeting a population of less than 36,616. However, the population of Eastleigh has since increased to 315,496 as at 2009 representing a 430% growth from the initial population size. From the survey, it emerged that, there is 66% inadequate access to clean water in Eastleigh neighborhood. Nairobi Water and Sewerage Company (NWSC) heavily rely on surface water that is 80% and 20% from Ngethu and Sasumua dams respectively.

The water demand for Nairobi city currently stands at 580,000 m<sup>3</sup> per day which is 25% below the supply capacity at 465,000 m<sup>3</sup> per day. This implies that regular access to clean water for Nairobi residents is a challenge. This is the reason behind NWSC's decision to ration water for the three regions that is Western and Southern parts covering the areas of Dagoretti, Loresho, Uthiru and Karen which forms the first Corridor, Nairobi central covers the Central Business District (CBD), Eastlands and Mombasa road which forms the second corridor, while the Northern part of Thika road, Kasarani, Mwiki, Wilson Airport and Ruai forms the third corridor. Thus, clean water is pumped into the three corridors twice a week, while the third day, the dam is left to refill for the consecutive disbursement.

Specifically, Eastleigh which lies in the second corridor receives water on Saturday and Sundays. This is not sufficient to serve the neighborhood. McGill (1998) observed that the use of groundwater is becoming increasingly important especially in providing adequate service levels and also as a strategic reserve in times of drought. Thus, some residents especially in Eastleigh North have drilled bore holes to complement tap water. Nonetheless, protective measures need to be put in place to guard against overexploitation of ground water resources as this might lead to undesirable effects such as the lowering of the water table. In addition, the water quality of the ground water need to be checked to ascertain its quality as the area continues to experience inadequate waste management practices, ground water is susceptible to contamination.

During the survey, 65% of populations were not satisfied with access to water services within the neighborhood. In a 2004 study by the Ministry of Water and Irrigation on Water Service Program, it was found out that only about 42 % of households in Nairobi have access to proper water connections, with 58% of the city residents having no access to clean water supply. According to the Nairobi Water and Sewerage Company, there is adequate water supply for residents in Nairobi city. The company rates water supply to the city residents as between 90% and 100% adequate. However, the adequacy in this circumstance implies the two days allocated for water supply for the three regions of Nairobi.

Nairobi Water and Sewerage Company attributes the 10 % gap in the supply to water rationing and illegal connections which lead to spillage and may compromise the safety and quality of the water since water pipes runs parallel with the sewerage system and a breakage on either may expose clean drinking water to spillage from liquid waste thus compromising the sanitary state of piped water. It emerged that section 3 receives water regularly throughout the week.

This is due to its low topography as the area gets water which the company refers to as dead stock. That is the water which remains in the pipes due to inadequate pressure to pump it out and it flows to low lying areas. Moreover, the water infrastructure has remained the same although serving 430% population higher than the intended population. This growth in population has negative effects on the supply of this essential commodity that is skewed and ineffective. The company attributes low levels of access to water in the neighborhood to continued population and spatial growth of the neighborhood, small capacity of water supply infrastructure, the size of Sasumua dam and low levels of water catchment.

In addition, Eastleigh was envisaged to be a single unit residential neighborhood, which may utilize low water pressure. However, due to continued growth, high density residential developments have emerged which requires high water pressure to pump water into up floors as opposed to a single units which needed minimal pressure to facilitate access to water resource. Moreover, according to the City Council of Nairobi, Eastleigh is well served with water and sewer reticulation system laid out on the basis of grid system. However, with the increase in both residential and commercial density, the capacity of water and sewer network is constrained as evidenced in the survey where over 60% of respondents rated water supply as inadequate in the neighborhood.

The Vision 2030 and the Nairobi North District Development Plan 2002-2008 categorizes Kenya as a water scarce country (GoK, 2009 and GoK, 2007). The demand for water exceeds renewable freshwater sources together with the potential of annual freshwater resources. Eastleigh is one of the residential neighborhoods in Nairobi County where ground and surface water both play an important role in water supply for Nairobi.

According to the findings, Nairobi City Water and Sewerage Company Ltd, has made progress in the Implementation of the Nairobi Water and Sewerage Institutional Restructuring Project (NWSIRP) and overall improvement in service provision. In this regard, the most important initiatives include first, the incorporation of NWSC in December 2003. Currently, the company is wholly owned by the City Council of Nairobi. Thus, NWSC envision at being the leading provider of reliable quality water and sewerage services in Nairobi and its environs.” Its mission is: “...to provide affordable water and sewerage services through efficient, effective, and sustainable utilization of the available resources in an environmentally friendly manner, and meet and exceed the expectations of its consumers and other stakeholders.”

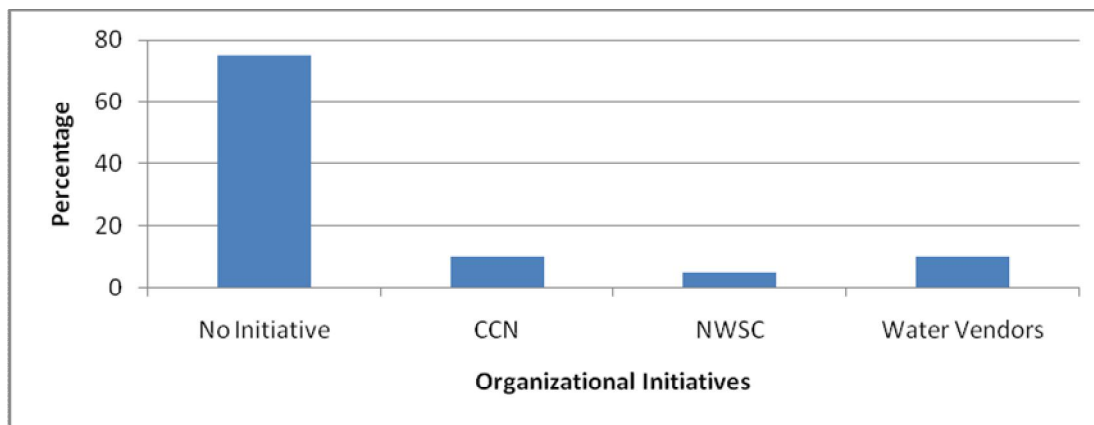
Secondly, by identifying and prioritizing areas that requires improvement such as customer satisfaction; management of resources; access to water in informal settlements, and improvement of technical & operational efficiency. To this end several water and sewerage works, water transmission pipelines and pumping stations have been rehabilitated. In addition, the company’s response time in attending to water and sewerage leaks has greatly improved (GoK, 2008).

### **Initiatives to enhance water supply in Eastleigh neighborhood**

Nairobi Water and Sewerage Company initiated a number of programs to address inadequate water supply in Eastleigh and entire Nairobi area. These efforts are intended to commence from water catchment area and trickle down through distribution and utilization of water resource. These include efforts to expand Ngethu dam in order to broaden its storage capacity. In addition, two years ago, the company rolled out a tree planting and catchment conservation initiatives as provided for in the Water Act of 2002. This was with a view of actively integrating communities in catchment conservation and increasing the inflow of Rivers draining into the dams.

In addition, the company has embarked on rigorous mobilization activates on effective water storage and frugal utilization of water resources. Structurally, the company has undertaken various structural adjustment activities such as replacing the metallic pipes with the plastic pipes which the company considers more hygienic and rust-free and lasts longer to ensure minimal disruption in water supply. Equally, the company has envisaged investing in expansion of water and sewerage network in order to increase its capacity to meet the rapid water demand.

The Company also plans to curb illegal water and sewer connections through regular surveillance and maintenance services. Lastly, the NWSC has launched a program to supply water to residents. However, figure 6 indicates that over 75% of the residents had not noticed or observed any initiative by either the CCN or the Nairobi Water and Sewerage Company to try and address water demands or undertake repair or maintenance services especially of the broken sewer line. Nonetheless, 25% of the respondents were able to identify water vendors who supply water to residents at a cost of Kshs. 20 per 20 litre for domestic use, as the only initiative by the private sector to address water needs figure 6.



**Figure 6: Initiatives to facilitate access to Water**

**Source: Field Survey, 2012**

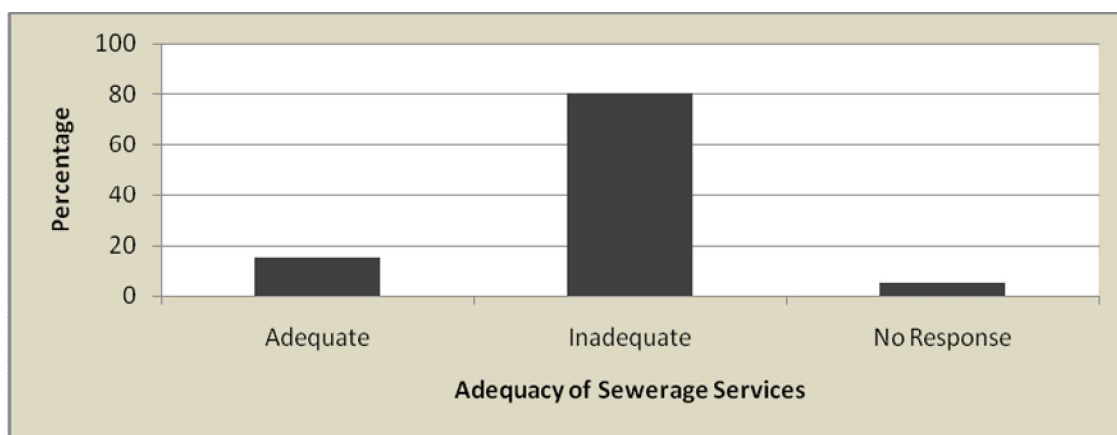
According to the water rationing schedule administered by Nairobi Water and Sewerage Company, Eastleigh lies on Nairobi central corridor which receives clean water on Saturday and Sunday in a week. Moreover, the company has special trucks that supply water to the neighborhood at a cost of Kshs. 5 per 20 litres. In addition, the City Council of Nairobi in its strategy to address the water and sewerage needs for Eastleigh had identified a host of stakeholders to be involved in enhancing this essential services to the residents. They included the Council, Nairobi Water and Sewerage Company, Residents, Athi Water Board and the Business Community. However, during the study only two institutions had registered minimal efforts of 10% and 2% for City Council of Nairobi and Nairobi Water and Sewerage Company respectively figure 6. It emerged from the findings that Nairobi Water and Sewerage Company spends large amounts of money to undertake regular repairs and maintenance of water pipes. The company associated repairs to illegal water connections especially in mushrooming informal settlements of Motherland, Biafra and Kiambui slums in Eastleigh. In an effort to meet water demands of the increased population in Eastleigh and Nairobi County as a whole, the company has put in place several measures to address water supply to city residents.

This includes partnership with Athi-River Water Service Board in reconditioning the water catchment dams for Nairobi region and the Ministry of Local Government in developing new building guidelines that will have a component of rain water harvesting plan for every buildings in urban areas. The company envisages that this initiative of rain water harvesting and storage would increase per capita storage 16 times from the current five cubic meters to 80 cubic metres when fully enforced. This would complement and effectively meet water demands in Eastleigh and other urban areas. The survey reported 75% presence of initiative to address water needs in the neighborhood. However, only 38% of the residents felt that the initiative by CCN and private firms to enhance access to supply water to residents were effective. In addition, the residents raised concerns about the safety of water supplied by water vendors of which they noted is from unknown source and therefore its safety is not guaranteed. It emerged from the survey that the effectiveness of initiatives to address water needs in the neighborhood stood at 38%. The residents are of the opinion that population has continued to grow in the neighborhood while the size water pipes that were installed many years ago have virtually remained the same. This tends to hamper the capacity of water pipes to meet their water demands. This indicates that, access to clean water by the residents is still a challenge and may strongly be attributed to rapid population growth and inability of the institutions to provide this essential commodity.

### Impacts of population growth on sewerage system

The state of sanitation and the inadequacy of sewerage management pose a health hazard to residents. In 2005, a study by Practical Action (2005) indicated that about 50% of all preventable illnesses in Kenya are water, sanitation and hygiene related. In Eastleigh, the Sewerage system is designed as a combined system of both Sewer line and storm water drainage running concurrently. The Nairobi Water and Sewerage Company is the body bestowed with the responsibility to manage the Sewer line while Nairobi City Council is responsible for maintenance of the storm water drainage. From the survey over 80% of the respondent rated the sewerage services as inadequate, figure 7.

This is significantly attributed to the current state of the sewer line which is characterized by blockages and breakages leading to the spill of the waste water on the roads within the neighborhood. This is poses a major health problem to the residents of the city at large.



**Figure 7: Adequacy of sewerage system**

**Source: Field Survey, 2012**

The Sewer line was laid in 1943 to serve an estimated population of 36,616. The Sewer line is 9 inches wide which was efficient to serve the neighborhood that had sparse population living in single housing units. However, due to the rapid population growth, the Nairobi North Region Sewerage Technical Officer indicates that the Sewer line only has 65% capacity to be effective and efficient. The company attributes this moderate percentage to rapid population growth and physical developments in the area. Initially, the Sewer line in Eastleigh had been laid to serve as a low density area as per the infrastructure size.

However, due to the change of user in certain areas of the neighborhood, this has led to overstretching of the sewerage system and the results have been frequent bursts of the sewer line and spill over of the waste water in unplanned areas, posing a health risk to residents.

Moreover, the sewer has experienced illegal development along the Way leaves which has been closely linked to population growth and weak enforcement of the City Bylaws. This has continually hampered the efforts by the company to offer high quality of regular preventive sewerage services. In addition, in most areas of the neighborhood, the storm drain covers have been vandalized, posing an imminent danger to road users and consequent blockage of the sewer line.





**Plate 3: Vandalized storm Water drainage manhole cover**

**Source: Filed Survey, 2012**

In addition, ineffective solid waste management in Eastleigh which is characterized by open dumping has found their way into the sewerage line. Most of the Man- hole covers within the neighborhood and other areas of Nairobi have been vandalized, creating an opportunity for dumping of the solid waste direct into the sewer line and siltation of the line. This cause blockage in the flow of the Sewer line and consequent spillage of waste water along the roads as frequently exhibited. However, it's evident from the survey that 80% of residents are not aware of any initiative to fix the sewerage system.

Moreover, during the survey over 70% of the respondents attribute the poor state of the sewer line to the CCN while only 2% actually identify NWSC as the body responsible for enhancement and maintenance of the sewerage system. Interestingly, NWSC blames the CCN on the state of the sewer line, it postulate that due to ineffective maintenance of the Storm Water Drainage which has in turn resulted in siltation of the Sewer line causing blockages and increased expenditure of NWSC in the management of both the storm water drain and the Sewer line, Plate 3. NWSC attribute lack of comprehensive initiatives to expand the Sewerage system to inadequate investment in water and sewerage system or networks leading to a mismatch between rapid physical developments and the momentum or pace with which the sewer line is enhanced and maintained. Hence, the sewerage line bursts often due to the increased volume of waste as opposed to the volumes of waste it was initially meant for and due to irregular maintenance services.

### **Initiatives to enhance sewerage services in Eastleigh Neighbourhood**

In 2004, the CCN privatized water and sewerage services to National Water and Sewerage Company in order to improve access to clean water and secondly to improve maintenance services of the sewer-line within Nairobi. In addition, according to NWSC during the 2010/2011 financial year the office of the Prime Minister received a budgetary allocation for maintenance of the Sewerage system in Eastleigh. The funds were used to undertake maintenance services to a few sections of the Sewer line.

## **Conclusions**

The findings from the survey indicated that 90% of the basic infrastructure and services have been negatively affected by population growth. The neighbourhood is overwhelmed by the escalating human population which has strained its basic functioning. Moreover, there is evidence of haphazard physical development and encroachment to roads, road reserves and way leave. These developments are occurring in complete disregard of the existing legal and regulatory framework guiding urban development that are geared towards guarantee high quality of life in the neighbourhood.

Thus, the study recommends that future planning of Eastleigh and other urban neighborhoods ought to pay attention to the demographic, environmental, economic and socio-spatial issues that are influencing the development of cities and their neighborhoods.

## **References**

- African Population and Health Research Center (2002) Population and Health Dynamics in Nairobi's Informal Settlements, Nairobi: African Population and Health Research Center.
- Campbell, E.H. (2005), Formalizing the Informal Economy: Somali refugee and Migrant trade networks in Nairobi. Global Commission on International Migration, Geneva.
- City Council of Nairobi (2008), Eastleigh Local Development Plan, (Unpublished Report). Department of Forward Planning, Nairobi.
- Goldsmith, P. (1997), The Somali Impact on Kenya 1990-1993: The View From Outside the Camps. Red Sea Press, Lawrenceville.
- Government of Kenya, (2010), The 2009 Kenya Population and Housing Census: Kenya National Bureau of Statistics. Government Printer, Nairobi.
- Government of Kenya, (2009), Ministry of Planning and National Development: Nairobi North District Development Plan 2008-2012. Government Printer, Nairobi.
- Government of Kenya, (2008), A Forum for Analysis and Debate on Water and Sanitation Issues in Kenya. Ministry of Water and Irrigation. Government Printer, Nairobi.
- Government of Kenya, (2007), Ministry of Planning and National Development: Kenya Vision 2030. Government Printer, Nairobi.
- Government of Kenya, (2007), Economic Recovery Strategy 2005-2006: Ministry of Planning and National Development. Government Printers: Nairobi.
- Graduate School of Architecture, (2008), Roads in Nairobi: Columbia University, New York.
- Lindley, A. (2007), Protracted Displacement and Remittances: The Case of Somalis in Eastleigh Nairobi, Kenya. Policy and Society of Oxford, United Kingdom.
- McGill, R. (1998), Institution Building for a Third World City Council: Some Lessons from the Practice. International Journal of Public Sector Management St Martin's Press, New York.
- Mugenda, O. and Mugenda, A. (1999), Research Methods: Quantitative and Qualitative Approaches. African Centre for Technology Studies, Nairobi, Kenya.
- Practical Action (2005), Livelihoods and Gender in Sanitation: Hygiene Water Services among the Urban Poor. Practical Action, Nairobi.
- Sirola, S. (2001), A Comparative Study of the Psychosocial Situation of the East African Refugees in Kenya and Finland. Centre for Continuing Education, Finland.
- UN-Habitat (2009), The State of the World's Cities, UN-Habitat, Nairobi.