THE INTERRELATIONSHIP BETWEEN URBAN FOREST AND RESIDENTIAL AREA CLASSES - CASE STUDY OF THE AYAWASO SUBMETRO DISTRICTS IN THE ACCRA METROPOLIS, GHANA

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ABSTRACT

Forests and trees are very prominent features of urban landscape because of the health benefits they provide thus ensuring the quality of the urban environment for urban dwellers. These forests are also important indicators of spatial heterogeneity within and between cities due to differing socio-cultural contexts. It can be assumed that the contrasting forest cover in Ayawaso is the result of complex interplay of social systems. This study aimed at finding out the interrelationship between urban forest and residential area classes/social system. The last rating zone exercise of the Accra metropolis conducted in 2007 that divided study area into first, second and third class residential status was used.

A total of 103 residents in all three classes were interviewed using a structured questionnaire. Additionally, Geographic Information System (GIS) was used to develop a 200 m² grid to account for the trees in the classes. Spatial data were analysed using Red Green Blue (RGB) colour model that expressed the density of trees across the study area and SPSS 23.0 was used to analysed non-spatial data.

The results show that first class areas have relatively denser urban forests, and urban forests in these areas received a higher residents’ prioritization ranking than those in lower classes. Irrespective of the classes, most of surveyed respondents (88%) knew of the benefits of trees with as low as 5 % ignorant and 7% thinking it is of no value. Status of forests in the urban landscape is also influenced by institutional management and suggests that an effective coordination among forestry and stakeholder institutions could enhance forestry development in urban areas, particularly lower class area. The study recommends that urban area forests should be inventoried to understand the tree diversity and cover status, which can be helpful designing an improved community-based management strategy for urban forestry development.

Keywords: Urban greening, Ayawaso, orthophotos, social systems, urban forest values
FORWARD

The dynamic nature of the urban ecosystem requires that its three components of the natural, built and socio-economic environments be connected, integrated and balanced to absorb the shocks and stresses of urban living. However, the two latter components always come to the fore as regards urban development. For instance, most areas with trees are cleared to make way for buildings and economic activities with very minimal to no integration of urban forest. This results in the reduction of natural ecosystem services (i.e. stress on land resources, loss of biodiversity and locational vulnerability/heat) posing a threat urban life.

It is therefore important to conduct a research on the relations of the urban forests and neighborhood status to ascertain their interdependence to inform decisions on sustainable urban development. Like all other research that are conducted, many other persons performed equally momentous and dutiful roles. For that I extend my profound gratitude to Adjunct Prof. Dr. Mark Appiah of the University of Eastern Finland my academic advisor who provided valuable advice and support as well as guidance for the completion of this thesis.

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<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AMA</td>
<td>Accra Metropolitan Assembly</td>
</tr>
<tr>
<td>APDP</td>
<td>Accra Planning Development Programme</td>
</tr>
<tr>
<td>DPG</td>
<td>Department of Parks and Gardens</td>
</tr>
<tr>
<td>EPA</td>
<td>Environmental Protection Agency</td>
</tr>
<tr>
<td>ESRI</td>
<td>Environmental Science Resource Institute</td>
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<tr>
<td>FAO</td>
<td>Food and Agriculture Organisation</td>
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<tr>
<td>FORIG</td>
<td>Forest Research Institute of Ghana</td>
</tr>
<tr>
<td>FT</td>
<td>Forest and Trees</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>HRI</td>
<td>Heat-related health Impacts</td>
</tr>
<tr>
<td>PET</td>
<td>Physiological Equivalent Temperature</td>
</tr>
<tr>
<td>PHC</td>
<td>Population and Housing Census</td>
</tr>
<tr>
<td>RGB</td>
<td>Red Green Blue color model</td>
</tr>
<tr>
<td>RSPM</td>
<td>Respirable Suspended Particulate Matters</td>
</tr>
<tr>
<td>SS</td>
<td>Social System</td>
</tr>
<tr>
<td>SES</td>
<td>Socio-economic System</td>
</tr>
<tr>
<td>TCPD</td>
<td>Town and Country Planning Department</td>
</tr>
<tr>
<td>UMLIS</td>
<td>Urban Management Land Information System</td>
</tr>
<tr>
<td>UNCS</td>
<td>United Nation Conference for Sustainable Development</td>
</tr>
<tr>
<td>UNFPA</td>
<td>United Nations Fund for Population Agency</td>
</tr>
<tr>
<td>WDI</td>
<td>World Development Indicator</td>
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1. INTRODUCTION

1.1 Study Background

Forest and trees form a significant portion of the urban landscape. The benefits obtain from urban greening contribute enormously to the well-being of urban dwellers. However, the built environment is dominating the urban space due to population expansion and building of infrastructure (Nowak et al., 2010). Thus, forests and tree population are dwindling at an alarming rate even in communities that hitherto had more green spaces (Nowak et al., 2010). Consequently, the values of forest and trees within urban and communities are being lost.

Around most settlements in Ghana, trees and green spaces are specially left at the entrance, along or at the center/squares of the town as a convention. It is common to find consciously planted greenery in most public places as church, schools, and clinics, government administration areas among others and also alongside streets or roads. Most of such trees were mostly left untouched during human housing development or planted thereafter. When deliberately planted, a well-designed pattern of the greenery gives an aesthetic impression of the urban landscape. These green spaces also serve as a convergence point during social events like funerals, parties and games. Community elders meet to discuss issues and play games. Culture is thus passed on to the next generation through storytelling or social information that is addressed at such green social spots. Interestingly, latest news (also gossip) of the town is also heard or confirmed at such place where people meet especially after working hours to recreate their energies. Such places foster social interaction, cohesion and a sense of belongingness to the community. Such popular areas patronized by the community are locally called “Nkwankwaanmuase” especially in the middle and southern portions of Ghana. The deeper sense of the word means - life or energy giving tree. The wisdom of the elders indicates that tree has energy which refreshes people (recreating their energies) when they have their activities closer or under the trees. Trees also provide them with protection from the scorching sun, windstorm and prevents or delays the spread of fire within the community. While such folks farm far away from their homes they also cultivate backyard gardens. Such back yard gardens in addition to the community trees especially fruit bearing ones provide seasonal food to the household. Such backyard greening for agricultural purposes was popularized
even in urban areas of Ghana by the “Operation-Feed-Yourself” - an Agricultural action policy for food supply sufficiency by the then National Redemption Council in 1972. (National Agricultural Food Programme, 1972)

The communities in urban areas try to protect tree cover areas for public social good, and voluntarily maintain and prohibit the cutting down of such trees. Such arrangements are not guided by any laid down legislations but as a cultural practices. Nevertheless, such local protection practices have not had the desired results and urban forest and associated values continue to be lost. Buttressing this assertion in general the Ghana Forest Investment program (2015) estimates that almost 3 percent of the total forest cover is lost annually representing over 330,000 acres. This has consequently lead to an increasing cost of the natural environment degradation in general representing a whopping 10 per cent of annual Gross Domestic Product (GDP) loss due to vegetation cover removal.

In view of the vegetation cover removal, large portions of green lands has come under low density and lateral human settlements rendering them as sealed lands preventing any meaningful natural productive use of the soils below. This has resultant effects of erosion and flooding in the city due to intense run-off and encroachment or blockage of vegetative areas and waterways. The inadequate provision for greenery could also be attributed to the fact that, as communities expand to become more urban very little attention is often paid to the trees as the economic importance of infrastructure in the short and medium term outweighs that of keeping the trees. Apart from fruit bearing trees like mangoes among others the real socio-economic value of these trees and green spaces becomes far-fetched. The objective of maintaining such urban trees are therefore no longer linked to any direct economic benefits and are felled at the least inconvenience to human pursuit of more direct and realisable output of the built environment. With the values of urban forest at risk of being lost due to the dwindling tree resources in human settlements, many forestry and natural resource managers and town planning professional are keen to improve urban forest conditions to contribute to the wealth of urban settlers. It has also been wondered whether urban forest could be used as a development index for evaluating a community’s class or socio-economic status (Stow et al 2011). It is not surprising that urban forest and its management has become a focus of research in recent times in the face of rapid urbanization (Mougeot, 2006).
1.2 Justification

It is suggested that about 9m² green space is recommended for each city resident. (Kuchelmeister, 1998). This gives a clear indication that urban forests are required to enhance the quality of residential environments. (Shin et al 2001). For instance in areas where there are greener open spaces, air quality is better and respirable suspended particulate matters (RSPM), SO2 μg/M3 and NO2 μg/M3 tend to be lower when measured by any Ambient Quality Standard. (India National Air Ambient Quality Standards, 2009). However, with increased commercial, industrial and technological development intended at creating a modern and civilized urban way of living, urban forest is imperceptibly diminishing in paving way for infrastructures that supports the technological and scientific advancement. This has resulted in man distancing himself from nature with unhealthy and stressful social condition amidst harsh economic circumstances. Thus, cities are becoming congested and polluted (Blanco et al 2009). For example, with very few or no recreational areas in some urban settings, the poor quality of air and heat islands compounded with socio-economic stress has become a major killer disease in the city (Blanco et al 2009).

Data from around the world consistently show a relationship between increased daily temperatures and rising death tolls, illnesses and hospitalizations (Vutcovici, et al, 2013). Particularly older adults are vulnerable to such temperature illnesses. Heat-related health impacts (HRI) range from mild symptoms of fatigue and heatstroke to the worsening of pre-existing illnesses, hypotension and death (Bernardo et al 2006; Bouchama & Knochel, 2002; Semenza, 1999). All these are related to adverse changes in forest landscape in cities.

Unfortunately, urban forest in Ghana has not received parallel management attention compared to forest outside the urban areas. For instance the Forest & Plantation Development Act 583 of 2000. Act, Forest Commission Act 571 of 1999 among many land and Natural resource laws and projects in Ghana serve as a strong regulatory framework for both off-reserve and reserve forest areas (Forest Commission Act, 1999, Forest & Plantation Development Act, 2000). Comparatively, there are fewer, weaker and difficult-to-enforce regulations regarding trees in the cities. Example is the Felling Permit clause by Environmental Protection Agency (EPA Act 480, 1994) and maintenance of soft landscape permit condition by the Town & Country Planning Department (Town and Country Planning Ordinance CAP 84, 1945). However, as indicated by Shin et al 2001, urban forest
is essential in fast advancing cities and require proper regulatory arrangement. As some research have related urban vegetation to housing quality (Stow et al 2011), it is imperative, for management purposes, to find out to what extent urban forest has deteriorated and the value placed on urban forest by communities in different residential classes. Of particular importance is understanding the perception of the residents of the different income groups as regards the three residential class areas on how they value, utilize and will like to prioritize trees and on how it affects their well-being.

1.3 Problem Statement

Even though forests in the city is a promising means to enhance and support the livability of a community, many of the social, economic and environmental problems as health, water and air pollution, can be attributed to the consistent imbalance between the natural environment, built and socio-economic environments. Ghana has crossed the urban divide since 2010 with a current urban population of 54 percent (GSS, 2014) and it is expected to increase. However urban forest, which provides environmental serenity to urban dwellers is increasingly coming under serious threat form infrastructure development. For example during construction of new buildings, trees even not in the actual construction floor areas of the parcel are considered as a hindrance to projects and often cleared. Also out-door advertisement has become the salient feature of the city landscape replacing trees. No wonder a strong Advertiser Association of Ghana (AAG) is formed and very active in the metropolis of Accra.

The legal, institutional, economic and operational systems attached to trees in forest outside human settlement (both reserve and off-reserve) are far esteemed compared to urban forest. In this regards very limited attention is given urban forests in Ghana. There is limited knowledge about the potentials of urban forest in Accra due to lack of research information on the subject. As a result urban forest is hardly integrated into the national, regional and district planning processes and other development initiatives. It is not counted as a development indicator across any levels of development in cities of Ghana. For instance, in the 2007 Rating Zones for the Accra Metropolis (Yeboah et al, 2007) urban forest was not included in the criteria for assessing the Residential classes for purposes of property taxation. However, the little observation during the exercise indicates that to some extent there may be a correlation between the classes of an area to the amount
of urban greenery in that area. Pointing to the assumption that, for instance, low greener area might be rated as a lower class areas due to the quality of the environmental conditions and property values compared to greener areas. There is a need for a research to validate this assumption and also to develop a formative baseline data on urban forest to ascertain the trade-offs that are made where they exit and where there are complete lack of it.

1.4 Objective of the Research

1.4.1 Development objective

The overarching objective of this thesis is to determine the relationship between urban forests and community classes and determine how urban forest could be used an indicator for improved residential environment.

1.4.2 Specific Objectives

Specific objective include;

(1) to analyze the extent of urban forest distributions in Ayawaso
(2) to assess how local residents value urban forests
(3) to measure the local residents’ prioritization of some public community development initiative including urban forest
(4) to examine the institutional arrangement governing urban forest.

1.5 Research Questions

1. What is the extent of urban forest in relation the classes of residential areas
2. What value do local residents place on urban forest within their vicinity?
3. Is urban forest a key development initiative that communities would prefer?
4. Are there strong management and institutional arrangement in place for urban forest?
1.6 Hypothesis

a. First Class residential areas will have relatively denser urban forest than lower class areas
b. Urban forest in first class will receive a higher residents’ prioritization ranking than in lower class areas
c. Weak institutional arrangements account for minimal attention on urban forest

1.7 Significance of Study

The study will give a clear status of forests and trees situation in Ayawaso which will enhance and serve as input in urban forest management policies for the city. This can go a long way to provide guidance in all city administration policies including education, health, agriculture, planning, infrastructure development among others to determine the city’s form and structure. By first giving a hands-on information on urban forest within specific areas and their interdependencies it would contribute to urban forests efforts for an enhanced morale for further research on innovative urban forest management for sustainable residential livelihoods.

Secondly, the study will provide some guidance and recommendations to all interested in forests in the city and serve as a reference source to policy makers, researchers, students, as well as residents in understanding the challenges and impact within a residential area as well as provides information for improvement.

1.8 Structure of Study

The study has been divided into six (6) different chapters starting with chapter one which highlighted the general background of urban forest in settlements in Ghana from the rural to urban areas. It also highlighted the rapid urbanization in our cities. The objective and problem statement are also discussed alongside with the research questions, scope and limitations as well as how the study is being organized.
Chapter 2 related the status of knowledge prior to this study in a conceptual model. Literature review on urban forest issues was thus brought to the fore. Chapter 3 discussed the methods and materials, including research design and procedures used in the entire study as well as data analysis. Presentation of results are found in Chapter 4. Chapter 5 threw light on discussions and key finding summaries. Conclusion of the study with some key recommendation for further action are presented in Chapter 6.

2. CONCEPTUAL MODEL

2.1 Urbanization

Ur was the first and the largest city within Mesopotamia with a population of about 24,000 dating back around 3,500 BC (World Bank, 2013). Extending over 600,000m² in an arid area, it was an irrigated city providing ecosystem services, markets and defense services with well laid out streets and sanitation for its dense populace.

With this backdrop, settlements with over 20,000 residents co-habiting in a defined geographic area is considered as urban. (UNFPA 2010). However, many countries use different indicators to determine which place is urban. For instance, the United States, consider a place with over 2,000 as urban (U.S. Census Bureau, 2010).

That notwithstanding, Weeks defines Urban as an areas specific physiognomies that embodies the features of social, economic organization and population density where the natural environment have been converted to a built environment (Weeks, 2010).

Even though Ghana uses the statistical method in defining urban areas as settlements with population of 5,000 (GSS, 2000), Ghanaian urban areas are organized around non-agricultural activities making them as typical of urban areas as described by Weeks (2010). As the population of settlements expands so does the number of houses and activities increases. In the light of this ‘agglomeration’ is used as synonymous to urbanization.
2.2 World Urbanization Trends

Throughout the world, as many as 54 per cent people live in urban areas of the world and it is projected to be about 66 per cent by 2050 according to the UN-Habitat (1991). This has not been the case many years ago. Even more, the world has crossed the urban divide with some regions being more urbanized as in the case of Northern America recording 82 per cent persons living in urban areas as of 2014, UN (2014). The same source cited Latin America and the Caribbean (80 percent), and Europe (73 percent). For instance, according to World Bank Centre for Liveable Cities (2013) Singapore is outstandingly 100 percent urbanized.

Ironically, even though more than 50 per cent of urban population in the world lives in Asia, it has lower level of urbanization of 48 percent (UN-Habitat, 2012). That said, Africa with 40 percent urban population will experience rapid growth compared to the more urbanized regions of the world in the coming years. Thus with Nigeria being the 9th largest urban population in the world and ranked first in Africa, it gives an explicit foregleam of the spate of urbanization across most African countries. (World Bank, 2013).

Directly linked to urbanization is Gross Domestic Product (GDP) levels as a result of economic transformations. From the citation by the World Bank (2013), as at 2012 a third of countries in the world were below US$7,000 as whiles second third within about US$7,001 and US$28,100 with the remaining third being above US$ 28,100. This statistic correlates with urbanization trends of regions and countries presented above. That is to say, all things being equal the more urbanized an area, the higher the GDP.

To buttress this, much recognition is given cities as important to poverty reduction in view of the role they play as centers of economic growth. (Hildebrand et al., 2013). The UNDP Strategy paper as stipulated by Hildebrand (2013), enumerate reasons why cities evolve as economic centers as; dominance of service and industrial sector, trade and market boom, inventions and innovations, advancement of information technology, tax systems, higher learning and health infrastructures.

Inextricably linked to the above is the survival of most rural economies on the urban market services. For instance, UN-Habitat emphasizes that South-East Asia’s cities have about 81 per cent of its Gross Domestic Product even though less than 50% of the population are housed in the cities.
However, Mathur (2013) found that many people escape from poverty by migrating to cities. Cali and Menon (2009) buttressed this that in India, rural poverty has been reduced to about six per cent due to urbanisation.

In lieu of this, the World Bank indicated that urbanization removes surplus workers from rural areas and generates both remittances and more geographic balance and help regional income convergence over time, though in the short term disparity may increase (World Bank, 2009).

Even though urbanization has its positive dimension, there comes along with it a host of negative environmental and social issues. For instance, according to UN-Habitat (2014), rapid growth of cities is considered as the greatest challenges of the twenty-first century. McPherson highlighted that these negative environmental and social issues are related to urban poverty, economic growth and effluence. Urban poverty related issues include unhygienic sanitation conditions, lack of access to clean energy, water and food whilst air and water pollution, congestion and loss of biodiversity are those related to economic growth and effluence (McPherson, 2006).

2.3 Urbanization in Ghana

Urban areas in Ghana provide interesting economic opportunities. It is significant to know that in Ghana the population in urban areas increased from about 8 per cent in 1921- then called Gold Coast to about 24 percent during 1960. In 1984 however, it rose to about 33 per cent while the 2000 Population and Housing Census (PHC) recorded a 44 percent (GSS, 2005). The UNFPA (2009) estimation of 51 per cent was confirmed by the 2010 Population and Housing Census as 51.3 percent implying that Ghana has crossed the urban divide. Ghana has thus experienced rapid urbanization since the mid-1980s, as the total population has doubled between 1984 and 2013 (WDI, World Bank, 2014).

However, the urban population distribution is skewed to few cities of Tamale, Kumasi, Takoradi, Sekondi, Accra and Tema (ISSER 2007, Owusu 2005). The situation is alarming with most peri-urban areas of Accra having the highest growth rates (about 12% compared to about 4.5% in the city of Accra) and receiving up to 80 percent of migrant workers from rural areas of Ghana and other migrants from mostly West African countries. Such areas have growth rates larger than five
percent over and above the national average of 2.5 % (GSS- PHC 2010). With current urbanization rate, vast areas of Accra and its environs will continue to sprawl.

It is however, undeniable fact that large economic and social benefits are derived from urbanization. These benefits include access to jobs, large markets, good education, increased health care, access to government administration and essential services among others. These developments continue to be the basic pull factor of urbanization and are used as key indicators of how urbanized a settlement is aside population size. The Ghana urban review report (2015) indicates that Ghana has experienced growth through urbanization.

That notwithstanding, there are some associated problems faced by most cities and urban areas including Accra which led, Grant et al. (2003) to conclude that the social and economic morphology of the city of Accra is inundated with unstructured informalities that cannot achieve meaningful urbanization benefits.

2.4 Residential Area Classes in Urban Areas

Within urban areas population groups are organized in geographic corridors based on urban living arrangements and variation in urban neighborhood characteristics. With most countries using income and place based valuation, the Ghana Living Standard Survey classify community using income levels, household income, household expenditure, credit, assets and savings, non-Farm enterprises, employment, health, demography, education, tourism, education, (GSS, 2008).

However, for the purpose property taxation Local Authorities, categorize communities/ areas under their jurisdiction into classes often based on land values and the types of properties which goes hand in hand. Factors as house condition/density, population and household densities, and essential facilities. For instance, about 60 persons occupying a hectare of land in the Accra Metropolis are classified as high-income areas while about 300 persons per hectare are classified as low-income areas (AMA, 2006).

Additionally, Housing Needs Assessment Study, (APDP, 1990) highlighted that most essential facilities for households include water and electricity, toilets and bathrooms. The infrastructure in
place must be able to cope with the population density to maintain its high class, lest it would be classified as low class residential area.

2.5 Urban Forest Issues

Urban forests remain the topical issue in most cities the world over. It refers to all trees within an urban area whether publicly or privately owned. Thus it includes street furniture trees as well as and in green parks or gardens in private homes or public squares. (Nowak et al., 2001). This definition refers to all forests and tree resources including green landscape/belt and open spaces close to and within an urban area.

Urban Forestry on the other hand is an all embracing city strategy and actions to plant and manage forest and trees (FT) in or near the city for an enhanced environmental benefits. (Miller, 1988). This involves conscious planning ahead, institutional mandates and regulatory framework as well as financial and operational management.

Unlike remote primary forests, urban forests blend with the built environment and the population. In view of its proximity to human activities, urban forests thus provide significant environmental, social and recreational as well as economic benefits (McPherson, 2006).

Even though a lot of literature have given clear indications of how important urban forests are to cities’ economies in view of its proximity to people, Carter (1992) cited that the literature are more concentrated on trees, rather than the people who benefit from them. Therefore knowing the extent of spatial distribution and values placed on urban forests by people as well as existing institutional arrangements with respect to urban forests is of major essence of this study. This will to an extend impact how urban forests are managed within the metropolis.

2.5.1 Urban Forest Recognition

The recognition of numerous benefits and growing literature on urban forests around the world especially in the Americas and Europe give clearer evidence of the indispensability of urban forests
to the wellbeing of urban residents. For instance, United States Forest Service carried out a first national comprehensive assessment of urban forest resources in 2000. (Dwyer et al., 2000).

However traditionally speaking, forestry has not fully recognize its urban jurisdiction even though the urban areas constitute formerly forested areas. Due to the abundance of forest resource in the rural areas, forestry basically concerns itself as a rural activity with no or limited human agricultural interactions. Topfer (2001) underscores the confusion of the rural-urban tradition of forestry which has affected sustainable land use orderliness. Most agencies in forestry as FAO has recently recognized their urban responsibility (Konijnendijk, 1999; FAO, 2002). Many professionals have however maintained that inadequate forestry methods and approaches have been especially the lot of urban areas (Krott, 1998; Konijnendijk, 1999).

Closely connected with urban forests are a number of cultural values, symbolic functions, environmental, social, ecological, economical and emotional benefits that sustain urban life. Among the direct services they provide are air and water purification, recreation and aesthetic beauty, and maintenance of biodiversity (Dumenu, 2013)

Despite these benefits, agricultural activities and physical development have to a large extent changed the forest characteristics of Greater Accra leaving remnants of non-woody and shrub vegetation. (Stow, 2013)

However, Stow, (2013) found out that, there are differences within residential neighborhoods with levels of Social Economic Status (SES) based on the availability of vegetation cover and the form of the area. Thus areas known to have vegetation cover identified with high Social Economic Status and the vice versa for low Social Economic Status areas.

In spite of Stow’s findings, a handful of literature can be found in Ghana on the institutional, residents’ perceptive and the use of urban forest as a development tool in addressing social and economic inequality. Since urbanization determines the impact on urban forests (Konijnendijk, 2003), it is very important to assess the geographies of urbanization in relation to urban forests and how it is positioned in the minds of residents and the work of mandated institutions.
2.5.2 Merits and Problems of Urban forest

Urban forest provide numerous benefit to humans namely; food, shade, clean air and water, fuel wood, wind storm and storm water reduction, fodder, carbon sequestration, soil protection among many others. Highlighting on man’s need of urban forests Zhang et al (2012), said parks have greater significance for human recreation especially for an enhanced social refreshment.

Secondly, since urban forests are close to where substantial carbon emission take place, that is the city, they comprise the first entry way to sequester carbon. In this regard, cities with high amount of forests and tress are healthier than those with less or none.

That being said, it has been strongly evidenced in literature that urban forest could cure the ills of urban life to a large extent. Some of the health problems commonly associated with urban areas are related to the quality of air. Therefore, urban forest in close proximity to humans provide enormous benefit including air purification, conducive temperature and minimize energy use in buildings. It thus can help improve air quality by reducing air temperature, directly removing pollutants from the air, and reducing energy consumption in buildings especially during the day in tropical countries as Ghana. Along this line, trees contribute to formation of ozone by given out organic compounds. (USDA, Chicago Urban Forest 2010)

Moreover, as a worldwide concern climate change has become a phenomenal issue, urban forest could provide thermal comfort in a hot and humid setting. Cao et al, (2010) points to the fact that compact multilayered plants are suggested over large grassy areas for cooling. With the shade that trees provide is it is estimated to reduce global temperatures by up to 7% with over 18°C Physiological Equivalent Temperature (PET). Armson et al., (2013) claimed that this provide the greatest reduction of heat stress in heat islands.

2.5.3 Limitation to Urban Forest

The built environment is constantly out-competing urban forest with regard to space. As said by Stow (2013), urban development have greatly modified the vegetation composition in most urban
communities. In this regard urban forests get marginal areas where soil quality is poor. To make it worse, such areas are used as waste disposal sites denying the vegetation its proper space in the city. Additionally, continuous expansion of the urban infrastructure- market, roads, etc has deprived urban trees the needed space. A practical example in Ghana is the Kwame Nkrumah Circle where the beautiful fountain garden with trees had been completely cleared to give way to the new flyover under construction.

However, conscious urban forest development beyond private home based gardens can be a very expensive undertaken. (Cater 2010). To avoid the regular management cost, most people resort to concrete sealing of the limited space that should have been used for planting vegetation.

Despite the limited space for urban trees, infrastructure are almost built so close to it resulting in cracks of the hard landscape by the roots of the trees or obstruction to utility lines. Damage to buildings and human life can also result through falling of mature or diseased tree.

To address the human safety issues and invasion of pest Nowak (1993) cited that the difficulties can be minimized through proper selection of tree species with appropriate maintenance strategy.

Inadequate governance mechanism has left urban trees in most cases to be vandalized indiscriminately through grazing and cutting for fuelwood. In some place trees are completely stumped out without replacement for fuel wood and to give way to construction of new development.

2.6 Institutional Arrangement for Urban Forests in Ghana

In Ghana four key institutions comes to mind when we talk about urban forests. These institutions include the Town and Country Planning Department (TCPD), Environmental Protection Agency (EPA), the Department of Parks and Garden and Forestry Commission (FC). At least the TCPD and the Department of Parks and Gardens have decentralized departments under the various local authorities that work hand-in-hand with the several (216) Municipalities. The Department of Parks and Gardens are involved in the planning and management of green spaces in the Kumasi. The TCPD plays a coordinating role to ensure that there is effective land use orderlines and
management. The EPA works to manage and protect green spaces and the environment at large as part of their working processes. Environmental landscape development and management of urban greenery is under the charge of the Department of Parks and Gardens. The Forestry Commission (FC) also creates, protects and manages the forests and protected cluster of forested areas in the city. It is also responsible to plan and execute forest and wildlife management policies and actions. That notwithstanding most activities of the commission are concentrated in forest outside cities.

Some collaborating institutions include the Community Water and Sanitation Agency (CWSA) and Non-Governmental Organizations (NGOs) concerned with the protection of green spaces (e.g. Friends of the Earth).

Most of these institutions derived their mandate from laws as the Forest Protection Law, Wetland Management Regulation, Town Planning Ordinance, The Environmental Protection Act and the Parks and Gardens Act.

2.7 Urban Forests for Sustainable City Development

The United Nation Conference for Sustainable Development (UNCSD) explains Sustainable Development as the one that is capable of meeting the needs of the present generation, but does not deprive the future generations of their needs. In step with this Rio + 20 introduced Sustainable development as an embodiment of strategic, equitable approach in levels of decision making. It reveals not only the economic progress but also social development across generations. Thus it involves decision-making with regard to a balance environmental, social and economic considerations.

Following that concept, Clark et al. (1997) held that healthy tree and forest resources are the basic requirements for sustainable urban forests.

In view of the importance of urban forests (Social, Economic, Cultural and Environmental benefits) their sustainability has become a growing concern. In defining sustainable urban forest as one that maximizes the benefits to the community, Kitchener, (2011) meant its use at the least cost for present and future population.
In furtherance for an effective management, sustainable urban forest can be categorized in four components of social, economic, environmental and institutional. The social component relates to the health, education and poverty issues. The pressures and stresses of urban living come along with associated human health risk. This makes people to resort to the natural environment especially urban forested areas for physiological and psychological well-being. As cited by de Vries et al. (2003), persons who live in greener environment show signs of healthy living. Further laying emphasis, Stow et al (2013) cited that the local circumstance promotes quality of life in the city. Secondly learning about the forest begins with learning from the trees in the city. Urban forests thus serve as an educational tool for the learning about horticulture and help individuals to well relate lessons of forest outside cities. Such knowledge goes a long way to help in urban forest restoration. In handling poverty in the city, McPherson (2003) underscored the fact that planting of trees and stewardship jobs are providing economic opportunities for the youth. In this way the economic disadvantaged neighborhoods are able to reduce the shocks and stresses of urban poverty.

Related to the above is the economic component that involves increasing gross domestic products, employment and energy use. As asserted by Derkzen (2012), the ecological, production and employment functions of urban green space are better quantifiable and may lead to economic gains, for example on the community level where temperature moderation, run-off retention and dust filtration can lower the costs for households and the municipal government medical and energy expenditures.

The economic potential of urban forest led Kennedy et al (1998) to recognize the acceptability in Europe of the multiple use management of urban forest ecosystem. Emphasizing this, Derkzen (2012) again notes that there is a market value in the natural produce of FT such as fuelwood, young trees and compost with capacity for energy production. Emphatically, Nowak (2010) cited that the cost of energy by residential properties in Chicago is reduced by about some US$ 400,000 per year. For instance, as stated by Baycan-Levent et al (2010) a decrease in temperature of about five degrees Celsius can substantially lower the costs for air-conditioning and the permeable soils of green space reduces flood risk and the costs of repairing, rebuilding and insurance claims.

Talking about the third component which is the environment, trees aside providing a mitigation effect to urban effluence (air, water and noise), also gives the urban area its structure making it unique from other places. The aesthetic effect is admirable by all. More importantly, it improves air and water quality and thus positively impact on urban dwellers health. Goldberg (2011) found
out that there is a strong association between increased daily temperatures increased counts of deaths, illnesses and hospitalizations. Urban tree canopies provide shade, thus reducing temperatures and modifies the climate to the benefit of man.

Lastly, good institutional arrangements comprising governance, regulation, information and stakeholder participation are really essential for a functional urban forest development. Values and needs of key stakeholders including users as well as mandates and operational management practices are critical concern in devising urban forest as a development tool indicator despite the numerous benefits it already provides. It is therefore proposed that good institutional arrangement can be used as a special purpose vehicle for the attainment of sustainable urban forest development. However, all the four components have interlinkages with direct provision of functional services by urban forest.

![Figure 1: Conceptual Model of Sustainable urban forest](image)

3 RESEARCH METHODOLOGY

The research is premised on mixed method design involving collecting both qualitative and quantitative data. According to Creswell, (2012), a mixed methods design is a collection and
analysis process of combining both qualitative and quantitative research methods in a study in understanding the research problem. This approach enables the resolution of different problem types. The reason why this methodology is adopted for this study is that it provides the only means through which the complex set of research questions raised can be dealt with. (Yin 2003 cited in De’ & Ratan, 2009).

Studies according to Yin (2003) offer an evidence based criteria of establishing the clear dichotomy of context and phenomenon. Thus the case study methodology provides the best means of a phenomenon under scrutiny. (Schwandt, 2001).

Of great concern to every researcher is the consideration of issues relating to ethics which is inevitable especially during the collection of data. Ethical issues especially arise over privacy and security of the data that is collection. In addressing this, respondents were educated on the method and objectives of the study. The consent of participants were sought to gather the set of data.

Respondents were given the opportunity to accurately express themselves without interactions. The study ensured that questions were also worded accurately for the understanding of the interviewee. Accuracy were derived through setting questions directly linked to the objectives of this thesis. With secondary data, its relevance to the study was also assessed.

3.1 Background to the location of study region

Accra is a national and economic nerve capital of Ghana of the West African sub- region. It has been Ghana’s capital since 1877 when it was transferred from Cape Coast and reached a city status in 1961. It comprise one of the most populated and fast growing Metropolis in Africa having an estimated day time population of more than 3 million even though about 2.4 million population are resident. Its annual growth rate is about 4.5 per cent and also serves as the capital of the Greater Accra Region as part of the 10 regions in Ghana.

That aside, Accra is governed by a political system of deliberative, legislative and executive powers. Corporately administered as a local government authority, the Accra Metropolitan Assembly (AMA) comprise 90 assembly members out of which 60 are elected and 30 are appointed by the presidency. As per the Legislative Instrument (L.I. 1500) the functions of this local authority
includes, planning and development control of all infrastructure, maintenance of peace and security for public comfort and security, educational infrastructure, and other services like the provision of lorry parks, markets and healthy living conditions.

The AMA performs these functions through its over 20 departments and units namely; Town and Country Planning Department, Metropolitan Planning Co-ordinating Unit, Waste Management Department, Metropolitan Works Department, Metropolitan Road Department Budget and Rating Department, Public Relations Unit, Department of Food and Agriculture, Metropolitan Health Department, Security Department, Metropolitan Education Department, Legal Department, National Disaster Management Organization, internal and external unit, as well as the Metro Administration, where the Mayor, Co-ordinating Director (City Manager) treasury and other functional administrative units are located.

In addition to departmental set-up and to make city administration more felt, the city is geographically sub-divided into 11 Sub-Metropolitan District, commonly referred to as "sub-metros" which include Ashiedu Keteke, Osu Klottey, Okaikoi South, Okaikoi North, Ayawaso West, Ayawaso Central, Ablekuma South, Ablekuma North, Ablekuma Central, Ayawaso East and La. These sub-metros also perform functions through its units of Administration, Treasury, Roads, Building Inspectorate, Health, Waste management, Audit, Birth and Death and Guard units.

Regarding climate, Accra lies in the Coastal Savannah zone with two major rainy seasons (i.e. from the beginning of May to Mid-July and from Mid-August to October ending). As the closest country at the centre of the world, temperatures are relatively constant (between 24°C and 32°C), but humidity varies from about 60 percent at day time to about 96 percent during the night. (Meteorological Service Department, 2012)

Consisting of 3 major vegetation zones of coastal, grass and shrub lands the Greater Accra region have dense trees and shrubs, which can grow to a height of five meters on the average with mixture of grasses barely one (1) meter high found underneath. The vegetation cover in Accra comprise urban gardens, parks, fallow areas, wetlands and soft landscaping within and around public and private facilities.
Accra used to have green vegetation at the fringes called the greenbelt. Urban greenery could also be found in most government residential and non-residential compounds. However, the current situations of sprawling development has been seen by many a professional as a city on a trajectory of disjointed spatial and economic development with urban planning at the tail end, making sustainable urban development problematic (Grant and Yankson, 2003).

The low income housing zones comprise areas that are occupied by natives and non-native migrant workers. Some of the areas are Osu Anohor, Chorkor, Jamestown, Usshertown and few others constitute low income native areas. These together with non-native low income areas as Nima, Sukura, Odorkor and Maamobi caters for more than 65 percent of the inhabitants of Accra where most informal employment can be found.

As illustrated by Figure 2 below the growth of Accra since 1903, 1929, 1966, 1985 to 2000 has been clearly shown in colours.
3.2 Description of the Study Area

The study area chosen is Ayawaso sub-metropolitan area in Accra as shown in the Figure 3 below. The Ayawaso Sub-metropolitan District Area consist of three sub-metros; - Ayawaso East Ayawaso West Wuogon and Ayawaso Central. It is estimated that the entire study area has a population of 335,000 and 396,322 as per the 2000 and 2010 Census respectively with a total Area of 36.6 km². The total number of properties of which almost 80 percent are residential is 65,540. (UMLIS, AMA 2009).

As per the 2010 population and housing census (GSS 2010), Ayawaso West Wuogon had 70,667, Ayawaso East 183,498 and Ayawaso Central 142,322 population. Using the inter-censal growth rate of 4.3 it is estimated that the populations stood at about 414,000 in 2014.

Ayawaso East is the most densely populated even though the least among the three in terms of geographical area. It is the sub-metro with about 90 percent unstructured areas. All three communities within this sub-metro namely; Nima, Maamobi and Accra Newtown are all unstructured settlements with the exception of the southern portions of Nima towards the Ring
Road. The only structured community of this sub-metro which is also the fourth is Kanda which had State Housing interventions in land administration and development.

Ayawaso Central has four (4) communities namely kokomlemle, Kpehe, Alajo and Kotobabi. It has about 50 percent structured mostly within the Kokomlemle (turning more into a business community) and Kpehe with formal public infrastructure.

Ayawaso West is the biggest and has the highest numbers a communities numbering 12 namely East Legon, Dzorwulu, Abelenkpe, Roman Ridge, South Legon, University of Ghana, Airport Residential area, Airport West residential Area, Shiashie, East Legon Extension (Bawleshie), Tesano and North Dzorwulu. This sub-metro is 90 percent structured with access to formal public infrastructure.

As indicated most of the communities especially within Ayawaso East are characterised by high degree of informality and have denser lateral development with low level of formal infrastructure. This to a greater extent relates to the widening social, economic and environmental inequalities. This also influences the class rating of the communities and strongly connected to that is the quality of life of the residents with regard to accessibility to services.

Thus, during field data gathering socio-economic data was also gathered to determine the social status (SS) of respondents in different communities. Since population with the same status tend to live together (with minimal exception) higher SS related to first class residential areas where as lower SS relates to third class areas. Most of the low class areas is characterized by high-density population and lateral housing development, with high level of informality, few greenery cover and largely sealed land surface.
3.2.1 Criteria for choice of study Area

The area was chosen for the study because of its uniqueness in terms of land use and tenureship. Ayawaso has mix of commercial, industrial, institutional and large area of residential land uses. The residential properties can be sub-divided into first, second, and third class areas with subclasses. Even more, land tenureship varies from public, private, institutional stool and family lands. The study area is more or less a microcosm of land use patterns, urban forest and general living conditions of entire country.

The following criteria were used for the choice of pilot area:

*Urban area* – The selected area comprise substantial part (30 per cent) of the city of Accra administrative area. Also by population and housing density, employment type and infrastructure the study area qualifies as an urban area. Ayawaso is an area undergoing rigorous transformation relating to buildings and livelihood due to the intense development in land resources.

*Well defined boundaries* - The study area boundaries are well defined both geographic and structurally. It is bounded by the Ring Road Central and Nsawam Road from Kwame Nkrumah Circle to Achimota overhead, through portions of the Motorway at Noga Hill hotel and behind Achimota forest including University of Ghana and within the IPS Road and the Boundary Road.
to Tetteh Quarshie Roundabout. It then continues from the Tetteh Quarshie Roundabout on the Liberation road back to the Ring road central at Ako Adjei Interchange. The map below illustrates.

*A mixture of planned and informal settlements.* - Nima, in the Ayawaso East sub-metro district is the largest informal (unstructured) settlement area in Accra whilst Airport residential area is the most exclusive structured residential area of the city.

*A mixture of public- and customary land tenure* - The study area comprise largely family land, State land, and vested land with isolated individual lands.

*A mixture of different class areas.* For example: 1st, 2nd and 3rd class residential areas, government use, commercial use and industrial use are found within the study area. Residential areas can be grouped in 3 broad categories: first, second and third class areas with subclasses.

![Map of Ayawaso Submetros and Orthopoto covering Ayawaso](image)

**Figure 4:** Map of Ayawaso Submetros and Orthopoto covering Ayawaso

### 3.2.2 Population Trend in Accra and The Study area

The tables below show that the population trends in the both within the study area and the Metropolis has experienced tremendous growth.
Table 1: Population and population growth rate of 1960-2000 of Ayawaso.

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>22,663</td>
<td>40,802</td>
<td>64,441</td>
<td>70,463</td>
<td>131,355</td>
</tr>
</tbody>
</table>


Housing in the inner city of Accra comprises a mix of both areas with high service public facilities with low density development and high density areas with overstretched public infrastructure. This contrast peripheral development which are haphazard, with barely sufficient infrastructure to support them. The table below shows the growth rate in the Accra.

Table 2: Human population growth rate in Accra

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop. Growth rate</td>
<td>-</td>
<td>6.32%</td>
<td>7.51%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Population</td>
<td>338,396</td>
<td>636,667</td>
<td>969,195</td>
<td>1,658,937</td>
</tr>
</tbody>
</table>

Source: Ghana Statistical Service, National Population Census

3.3 Methodology used for Residential Area Classification in 2007 by AMA.

The main methodologies used in carrying out the rating for property tax purpose in 2007 by the Accra Metropolitan Assembly (AMA) in the class demarcation for which this study was based include:

i. Definition of class zones: this involved clearly defining the various zonal classes and uses. That is to say first class, second class residential, commercial, industrial uses etc.

ii. Definition of variations within known zones using Town Air sheets: with the help of the Town Air sheet, areas with different characteristics or features from known zone within which they fall were defined. For example, an area within a first class zone with
characteristics slightly different from general features of the first class zone were mapped out differently.

iii. Determination of indicators and measurement criteria: this involved setting out very clear indicators and measurement criteria to be used to group or identify which particular class/use zone a particular area falls. The indicators include; housing quality and density, environmental conditions (eg. Waste management, drainage, pavements), level of services at the community etc.

iv. Field inspection and survey: a field inspection and survey was carried out in the area of coverage to ascertain the real situation on the ground using the indicators as a point of reference.

v. Analysis, Ranking, Scoring and mapping: Finally the data gathered from the field survey was analyzed and the various areas visited within the coverage area were assigned scores based on the indicators set. The settlements were then ranked into different zonal class zones based on the scores obtained by each settlement. Maps were also produced to give a pictorial perspective to the exercise.

3.4.1 Indicators for the year 2007 Classification of the Rating Classes in general by AMA

As mentioned above, some indicators and measurement criteria were used by the AMA in 2007 to determine and serve as a benchmark to identify which class or use zone communities falls. However Trees and Forest were not used as one of the indicators as witnessed below;

a) Development Density: This indicator looks at the intensity/concentration of development in the area e.g. the number of buildings/structures on an acre of land.

b) Community service/infrastructure: This takes into consideration the services or infrastructure available in the area e.g. water, electricity, drains, roads and sanitation services among others.

c) Road Density and Road Quality: This indicator aimed at assessing the concentration of roads and their surface quality within an area.

d) Development type: This indicator looked at the types and nature of buildings or structures within area e.g. compound houses, semi-detached, flats, barracks, detached self-contained houses, etc, and also the quality / finishing of the structures.
e) Household and housing services: Apart from the services available in an area, this indicator took a particular look at the services (e.g. Waste disposal system, toilet facility, drainage condition) available to households within the area.

f) Land use class/Development mix: This looked at the use to which the land or area in question is put to, be it residential, commercial or industrial etc.; or whether the area has been put to mix use.

3.5 Study Instruments and Approach

3.5.1 Study Design

This research employed the descriptive and observational technique in collection of text data and spatial data. Text data showed individual opinions as well as that of specified institutions. Before gathering data from individuals and organizations the relevance of the study was made known.

3.5.2 Questionnaire and Sampling Design

Stratified random sampling method was employed in selecting respondents in all three residential classes to be interviewed. A total of 103 respondents in all three (3) residential classes were interviewed.

A questionnaire comprising of three components – Socio-economic characteristics of the respondent, Environmental Conditions of residence and respondent’s judgment comprising elements as recognition, value, prioritization and willingness was used for the collection of primary data.

A separate questionnaire was also designed for three governmental institutions- Department of Parks and Gardens, Environmental Protection Agency and Town and Country Planning Department within Accra Metropolitan Assembly. This was to collect information on policy and
mandate, value and regular management arrangement of urban trees and also the challenges they faced.

3.5.3 Data Collection

Primary data was collected by administering questionnaires to residents and interviewing three governmental institutions. Real time photograph of areas within the study area were taken. Orthophotos, satellite images, reports and maps of the study area were used as secondary data.

3.5.3.1 Interview Data

In soliciting for respondents’ comments, mostly home-based interview were conducted. In view of the urban nature of the communities the study made sure that respondents reside and experience the conditions in the community on consistent basis. The explorative interviews of 103 respondents were conducted between 8th to 29th September, 2014 during week day evenings and especially mornings of the 3 weekends when residents are more available for conversations. To make it easier and increase the number of face-to-face interviews, 70 percent of the questions were pre-coded with 30 percent left open ended. Additionally during prioritization of street furniture, participants were given nine toffees to share among the five development projects which they will like in their community (namely, drains, roads, tree planting, alley paving and street lights). This sharing method supported weight ranking of the development projects which assisted in understating the comparative value residents place on urban forest.

Individual respondent’s questions asked among other things relate to;

- Perception on recognition and adequacy of urban trees.
- Benefit and Value of urban trees and greenery within their home and immediate environment.

Institutional data were collected by paying visits to the offices of the three organizations during official working hours and engaging the head of the organization. Where the head is not available for the interview a senior officer was delegated.
3.5.3.2 Spatial Data

In accounting for the density of trees within each of the 3 communities, GIS was used to develop a 200m² grid. A vital component the field work was therefore the conducting of a two day ground thruting exercise to count the trees within the each of the three randomly selected grids falling in the three different classes.

3.6 Data Analysis

All the non-spatial statistical analysis of individual respondents were presented using SPSS 23.0. Mainly descriptive statistical analysis was done to bring out the value perceptions and preferences of urban trees in the vicinity as well as the socio-economic status of the respondents. A regression analysis was also done to understand the relationship between residential classes and available urban trees. One of the commonly used methods of processing raster image in Geographic Information System (GIS) is RGB. This method was employed in the analysis of spatial data. This is a model that uses colours comprising red, green, and blue known as the primary additive colours to show raster images on computer screen. Through light emittance, RGB colors are able to be produced. - ESRI.

RGB ranges from Arctic White with value 255 255 255 to Black with value 0 0 0 in Arc Map default ie Ranging from 0 to 100 percent. Inversely this is related the exposure of the community in reference to vegetation cover. An artic white means the community is devoid of greenery whiles Black refers to virgin (natural forest). The table illustrates some of the colour values that were used in the expressing tree canopy density.
Table 3: Esri RGB values

<table>
<thead>
<tr>
<th>Colour</th>
<th>Name</th>
<th>ArcGIS Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peridot Green</td>
<td>170 255 0</td>
</tr>
<tr>
<td></td>
<td>Moss Green</td>
<td>114 137 68</td>
</tr>
<tr>
<td></td>
<td>Sahara Sand</td>
<td>255 235 190</td>
</tr>
</tbody>
</table>

Source: ESRI

Spatial Data was analyzed largely by ArcGIS 10.0 to visually express the extent of tree canopy cover. Polygons maps of residential classes were overlaid on the orthophotos to give a fair distribution of urban trees.

4. RESULTS

This chapter is dedicated to the result of data from respondents, institutions and spatial data from aerial photographs as well as ground truthing activity. In order to fulfil the objective of the research, the data were presented in relation to the research questions. In this regard, the first section mostly spatial data bring to bear the geographic extent of urban forest distributions in Ayawaso. The estimated numeric relationship between urban forest cover and residential area classes are discussed in section 2. Whereas section 3 relates local residents’ perception on the presence, need and value of urban forest within their vicinity, the final section (Section 4) presents the institutional interventions regarding urban forest in Ayawaso and the urban areas in the country as a whole.

Since the research give some empirical analysis it is important to re-iterate the hypothesis that were put forward from the beginning of study. The first hypothesis which stated that; First Class Residential Areas will have relatively dense urban forest is supported as the evidence showed that first class areas have comparatively more tree canopy cover than other lower level residential
classes. However, the comparative density difference of trees canopy cover in Second and First class is minimal. This evidenced in the RGB density presented.

The Second hypothesis that attribute higher weighted prioritization to urban forest in high class areas will receive a higher residents’ prioritization ranking than in lower class areas is supported.

Lastly, the hypothesis that says that weak institutional arrangements account for minimal attention on urban forest is supported.

### 4.1 The Extent of Urban Forest Cover in Ayawaso

The extent of urban forest cover differ in relation to the residential class areas both by spatial data analysis and respondents answers. Figure 5 summarizes the visual extent of urban trees cover in the study areas whereas Figure 6 and 7 gives a bird’s view picture from orthophotos the exiting forest cover in different communities.

![Figure 5: Extent of forest cover using RGB](image-url)
Figure 6: Aerial photo of Airport residential (First class) showing tree canopy cover

Figure 7: Aerial photo of Nima (Third Class) and Kanda (Second Class) (Dipicting contrasting tree canopy cover in Nima and Kanda)
4.2 Analysis of Residential Classes by Housing types, perceptions, and green availability

In showing the housing typology with perception of green availability Table 4 summarizes the results on cross tabulation of residential class as against the various house types. As illustrated in Table 5 the results showed that 27 respondents and 5 respondents from the first class live in the detached /bungalow houses and flat/ semidetached respectively. It was also observed that majority 27 respondent from the second class live in flat/barracks, 9 respondents living in detached or bungalow house whilst only 3 of them live in compound houses. Out of the total number of 32 respondents living in the third class area in the study area, 23 lives in compound houses, 7 respondents living in traditional houses and 2 interviewees living in flats or semi-detached houses.

Table 4: Residential class and the house type

<table>
<thead>
<tr>
<th>Residential class</th>
<th>Traditional</th>
<th>Compound</th>
<th>Flat/Barracks/ Semi-detached</th>
<th>Detached/Bungalow</th>
</tr>
</thead>
<tbody>
<tr>
<td>First class</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>27</td>
</tr>
<tr>
<td>Second class</td>
<td>0</td>
<td>3</td>
<td>27</td>
<td>9</td>
</tr>
<tr>
<td>Third class</td>
<td>7</td>
<td>23</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>26</td>
<td>34</td>
<td>36</td>
</tr>
</tbody>
</table>

Furthermore, respondents were asked to give their perception on the greenery availability irrespective of their residence type. One (1) respondent living in the traditional house representing 0.97% said there is availability of greenery in the area whilst six (6) representing 5.83% responded otherwise. Whereas nine (9) persons living in the compound (8.74%) said YES, 17 respondents (16.50%) responded NO. When those living in the flats and the semi-detached house were asked, we had 27 (26.21%) responding YES and seven (7) representing 6.80% responding NO. Detached/Bungalows residents constituting 31 respondents (30.10%) responded YES whilst only 5 responded negative to it. Generally, majority (66.02%) of the total respondents indicated that there is greenery availability in their area of residence while the 35 (33.98%) responded NO to greenery availability. The result is summarized in Table 5 below.
Table 5: Perception on greenery availability in their residential area

<table>
<thead>
<tr>
<th>Perception on Greenery Availability</th>
<th>Respondents House type</th>
<th></th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional</td>
<td>Compound</td>
<td>Flat/Barracks/S-d*</td>
<td>Detached/Bungalow</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>%age</td>
<td>Freq</td>
<td>%age</td>
<td>Freq</td>
<td>%age</td>
<td>Freq</td>
<td>%age</td>
</tr>
<tr>
<td>Yes</td>
<td>0.97</td>
<td>1</td>
<td>8.74</td>
<td>9</td>
<td>26.21</td>
<td>27</td>
</tr>
<tr>
<td>No</td>
<td>5.83</td>
<td>6</td>
<td>16.50</td>
<td>17</td>
<td>6.80</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>6.79</td>
<td>7</td>
<td>25.24</td>
<td>26</td>
<td>33.00</td>
<td>34</td>
</tr>
</tbody>
</table>

S-d* - Semi detached

Subsequently, the respondents were probed to ascertain if the greenery of the area has correlation with the residential class. The table below explains it.

Table 6. Frequency of Greenery availability by Classes

<table>
<thead>
<tr>
<th>Perception on Greenery Availability</th>
<th>Respondents Residential Classes</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>First Class</td>
<td>Second class</td>
<td>Third class</td>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>%age</td>
<td>Freq</td>
<td>%age</td>
<td>Freq</td>
<td>%age</td>
<td>Freq</td>
<td>%age</td>
</tr>
<tr>
<td>Yes</td>
<td>28.15</td>
<td>29</td>
<td>28.15</td>
<td>29</td>
<td>9.70</td>
<td>10</td>
</tr>
<tr>
<td>No</td>
<td>2.91</td>
<td>3</td>
<td>9.70</td>
<td>10</td>
<td>21.36</td>
<td>22</td>
</tr>
<tr>
<td>Total</td>
<td>31.09</td>
<td>7</td>
<td>37.89</td>
<td>26</td>
<td>31.01</td>
<td>34</td>
</tr>
</tbody>
</table>

Pearson chi-square = 27.089, Asymptotic. Sig. (2- sided) = .000, P<0.05, n= 103

The chi square test \( (X^2 = \sum \frac{(\text{observed value} - \text{expected value})^2}{\text{expected value}}) \) shown below table 3, shows a statistically significant \( p = .000 \) association between the residential class and the perception of the respondents on the greenery availability of the area.
When asked of the tree species composition of the area, they mentioned: *Adzadiracta indica* (Neem), *Cocos nusifera* (Coconut), *Mangifera Indica* (Mango), *Terminalia catapa* (Almond), Acacia species, *Cinnamomum cassia* (Cassia), *Roystonea regia* (Royal palm), *Anacardium occidentale* (Cashew), *Blighia sapida* (akyee), *Petercobotium saman* (Rain tree) and *Tectona grandis* (Teak).

### 4.3 Local residents’ value of urban forest within their vicinity

This empirical data will help address the values the respondents puts on the urban greenery vis-a-vis its benefits. The 103 respondents were interviewed to reveal their knowledge on values of urban forest. This was started by asking about the tree dominance in their area. 8 of the 103 respondents representing 7.8 percent thought that the trees in their vicinity were too many whereas 42 of them representing 40.8 recognized that the trees in their areas are very few and there should be plans to plant more. However 53 of them that is 51.5 per cent were pleased with the status quo neither wanting more trees or want some to be felled. The table (Table 7) below summaries it

<table>
<thead>
<tr>
<th>Tree Dominance</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very few</td>
<td>42</td>
<td>40.8</td>
<td>40.8</td>
</tr>
<tr>
<td>Just right</td>
<td>53</td>
<td>51.5</td>
<td>92.2</td>
</tr>
<tr>
<td>Too many</td>
<td>8</td>
<td>7.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>103</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

*Table 7. Ranking of tree dominance*
4.4 Benefit of urban forests to Residents

Furthermore when the respondent were asked about if the urban forest gives them any benefit being it directly or indirectly, 91 out of the total respondents said yes to greenery benefit, 7 said no and 5 indifferent if it has any benefit. This response was irrespective of their residential class as shown in figure 7.

![Chart showing residents' opinion on greenery benefit](chart.png)

**Figure 8**: Residents’ opinion on Greenery benefit

Some of the major benefits outlined by respondent comprise:

“Beatification of the area, as a source of food, provision of good oxygen, fresh air, shade, for social gathering, for fuelwood, protect our building from windstorm, for ventilation”

Despite the numerous responses, fresh air became dominant regarding the benefit of trees in communities as 73% of the total respondents mentioned it.

4.5 Prioritizing relaxation location and willingness to pay

The respondents were made to prioritize (building, open area, trees) for resting on a sunny day and how much they were ready to pay for sitting or walking around.
Specifically, the items for prioritization include; in a room, in an open area, and under a tree. Under a tree score was ranked the highest representing 71 percent. This was followed by in a room i.e. 24 percent, and in an open area score least (5 percent). This corresponds with their willingness to pay per hour for relaxation. Given GHC 5 (this is equivalent to 1.30 Euros) to each respondents, fig A and B show the collative mean of how much they were prepared to pay.

**Figure 9:** Preparedness to pay for relaxation (all classes)

The respondents’ preparedness to pay is also expressed cumulatively in figure 9 to give a visual impression of the proportion payment for the three relaxation amenities (namely, room open area and under a tree)

**Figure 10:** Proportionate use of relaxation funds of GHC 5 (€1.30)
In all when given GH₵5 respondents were prepared to give as much as € 0.93 (GH₵ 3.55) representing 71 percent of total amount reserved for relaxation will be allocated for relaxing under a tree.

4.6 Prioritization of some public community development initiative including urban forest

Respondents were further required to prioritize some basic public amenities including tree planting. Prioritization according to the three residential classes reveal different prioritization scenarios. 9 pebbles (toffees) were given for them to share among the five community amenities in order of the most preferred.

Prioritization according to the three (3) Residential classes revealed different prioritization scenarios when the total number of points gained by each street furniture or the public amenities were aggregated.

According to Fig 11 Alley paving was the most preferred while roads were the least.

Figure 11: Prioritization of basic community service in third class area.

The prioritization exercise revealed that Alley paving was the most preferred community service amenity as it will give them easy walking accessibility within the area.
In the second class area, as shown in Fig 12, tree planting received the highest score while the alley paving was ranked the least. This emphasize that they have less need for alley paving.

**Figure 12**: Prioritization of basic community service in third class Area.

For the first class area, Alley paving again received the least preference followed by drains and roads respectively. The street light received the second highest preference.

**Figure 13**: Prioritization of basic community service in First class Area.
The prioritization posits the hypothesis on the right trajectory that first class will have more greenery than lower residential classes. Tress planting received the highest preference in view of the structured nature of the community.

Generally, as shown in figure 13, cumulative response shows that tree planting is the highest preferred amenity.

![Cumulative Prioritization of basic community service](image)

**Figure 14:** Cumulative prioritization of basic community service in third class area,

### 4.7 Institutional operations governing Urban Forests

This aspect gives a gleam of institutional operation regarding urban forests in the City of Accra. Mainly three agencies responded to interviews conducted in their receptive offices namely the TCPD within the AMA, The Department of Parks and Gardens and the Environmental Protection Agencies. The Forest Commission was excluded in view of the fact that most of their activities were concentrated on trees outside urban areas.

All the institutions were asked similar questions regarding regulatory frameworks, management and operational challenges.
When asked the policies in place in the organization regarding urban forests, The Town and Country Planning Department (TCPD) recounted on the Town Planning Ordinance CAP 84 spells out conditions given to applicants as part of their development permit to maintain soft landscape including tree planting. Applicants seeking permits are asked to collaborate with the Department of Parks and Gardens to comply with this condition. As an institution which have regular field inspection activities however these condition for individual developers are not enforced or verified after the permit has been issued. Therefore there are no sanctions for non-compliance. According to the Director, “the developers must comply for their own good even though currently the department does not strictly monitor this condition. “. The TCPD respondent indicated that trees in the city provide service to support city living namely reduction of heat and making the city walkable during the day. It was emphasized that the provision of such service is invaluable to the city and its dwellers. It was finally pointed out that areas that are well planned and the planning scheme followed are areas where urban forest does well. In effect spatial planning has supported conscious planting of tress along streets and in homes.


The EPA which derives its mandate from the Environment Protection Agency Act (Act 480) of 1994, responded to the interview that specifically the only regulation they have that protect urban trees is the tree felling permit under the Environmental Protection Act. Two trees were found on the compound of the Agency. It was stated categorically clear that this permit is loosely enforced. For instance the tree cutting permit see to it that three (3) seedling are planted in place of the felled one, but people continue to cut trees without reference to the Agency. The interview with the EPA however revealed that it collaborate with various agencies (eg Banks, NGOs, Associations, Industries etc..) to plant trees on environmental days during the year. However monitoring of such collaborative activities are left to the parks and Gardens Department and local authorities that are poorly equipped to maintain them.

The Parks and Gardens Department (DPG), an agency under the Ministry of Local Government and Rural Development holds responsibility for the maintenance of the country’s park and gardens and the protection of the environment and beautify the cities and urban places.
The Department of Parks and Garden (DPG) responded that its core mandate is the management of urban forest landscape. They also offer training programs for individual homes and private business on the management of their landscape. Even though the department is doing its best it was the most deprived of the three institutions successfully interviewed.

However, all the institutions face numerous challenges which inhibit their smooth operation. Some of the challenges were; lack of overall coordination mechanism amongst stakeholders in urban management for ensuring effective delivery of services, lack of enforcement of laws and bye-laws leading to unauthorized developments. Others include financial constraints, inadequate staff and logistics and political interference. The Department of parks and Gardens also made it clear that they continue to face problems with non-cooperative advertising agencies whose cut down trees for their adverts to be seen especially along streets coupled with limited means of transport to ensure monitoring. For instance that Parks and Gardens had only 2 tipper trucks and 1 Tanker bought in the 1980s with high maintenance cost.

4.7.1 Tree Availability on Institutional Premises

To compare their mandate and the setting of good example with what they purport to do, an inventory of trees on the agencies premises was conducted. The premises of the DPG has as many as 52 different species of trees amidst flowers and shrubs which gives a very good impression of its function to promote urban forest landscape. Most of the trees are used for beautification in enhancing the image of the Department, educational purposes and for regeneration of new ones. Notwithstanding the constraints of the Department, the presence of a number of greenery makes it the exemplary department. The TCPD had 5 trees with some flowers and grasses. The EPA had the least of 4 recorded trees with very little flowers. The inventory is graphically presented in Figure 14.
4.7.2 Institutional Value placed on Trees

The value the three (3) departments would put on a medium size trees per month is expressed in Figure 15. The DPG valued trees compared to the other two agencies by a margin of GHC54 (€13.5) compared to TCPD and GHC48 (€12) compared to EPA.

Figure 15: Number of trees on responsible agencies premises

Figure 16: Monetary value placed on medium size tree per month by agencies
5. DISCUSSION

5.1 The Extent of urban forest distribution in Ayawaso.

The results on the distribution of trees and forests in Ayawaso Sub-metro districts of the Accra Metropolis show the presence of different tree species including ornamental, avenue and fruit trees. The distribution is however skewed to the first class residential areas compared to second and third class areas. The trees in first class areas are found especially in well-arranged dense pattern along streets and within private houses and offices within residential areas. Whereas in third class areas urban trees are sparsely distributed and unstructured.

This is attributed to the land tenure arrangement in the first and second class areas. For instance Kanda which was a second class are was largely vested in the state and managed by the State Housing Company. Additionally Airport Residential Area which is also vested land benefitted from the windfall of spatial planning as opposed to stool and family lands in the third class Nima area where development was ahead of planning.

Moreover, the third class areas have high housing density compared to the higher residential classes. This gives the indication that there were relatively limited space to grow trees in these areas. As revealed by the orthophoto, the first and second classes were more structured which gave spaces for trees which is not the case in the third class areas of haphazard development. This observation buttresses Stow (2010) findings that, the presence of greenery cover in residential areas of varying social economic status (SES) is related to the population, density, size and structured space or developments. Stow (2010) also suggested that high class areas have relatively a higher urban greenery compared to low class areas where there is very little greenery. This, in conformity with current study results, validates the first hypothesis of this study that the first class area will have relatively denser urban greenery than the lower class areas.
Forest resources in urban areas are associated property value (Tyrväinen, et al. 2000). For instance, the farther away a settlement is from a forest resources leads to about 6 per cent decline in the market value of a property where as the proximity of a property to forests and trees result in about 5 per cent increase in the market value (Tyrväinen, et al. 2000). For instance according to AMA- UMLIS (2009) the market value of houses is forested and non-forested residential areas could vary between 10 to 35 percent. Some of the reasons attributed to the increase in property value in forest dominated landscape is health related. According to Agyei-Mensa, S and Aikins A, 2010, low density urban forest areas experience higher incidence environmental related health conditions than relatively dense urban forest areas of Accra.

Regarding the management of forest trees, it was found that trees and forests are not considered in regular municipal administration and management. It is not an unexpected result as attention is mostly given to the management of protected areas than non-protected ones.

5.2 Value of urban forest in the study area.

As determined by the results, the value respondents put on urban forest is related to their perception on dominance (adequacy), awareness of the known and potential benefit as well as preparedness to pay. This is directly linked to Woodall et al (2010) research findings that the respondent relationship with forest and trees relate to value benefits they derive.

About, forty percent said their settlement landscape had fewer trees. This indicate their awareness of the need for more trees and their knowledge about the potential benefits of trees. For other group of respondents, mostly from high density low class areas, the “just right” or adequate amount of trees were present in the landscape. The results suggests the lack of space or unsealed land to plant additional trees. With increasing human population and a corresponding increase in buildings, space for planting trees become limited as indicated by Topfer (2001). For instance, in areas with more office buildings, hard landscape to allow for parking of vehicles is preferred to trees. Such conversions and development of high rise dwelling apartments in most instances give little recognition to trees on the premises. As a result most soft landscape reflects in small pockets of flowers and lawns.
Since as many as 88 percent knew that urban trees are beneficial, it gives a clear indication that the general populace value and will be in support urban forest initiative. However, since their responses were limited to aesthetics, “source of oxygen” and fuel wood among few others, members of the communities are aware of the functions of urban trees as the lungs of the city as first used by Gil (2009). This constitute an incentive to sustain the urban forest resources and developing a public communication strategy and a sense of focus to bring about the desired sustainable urban forest development and use.

The motivation for paying is very high given the three option of room, exposed open space and under tree space. This gave the impression of the value of trees to the respondents. Interestingly, rate impost for property taxation in denser urban forest areas are higher (0.00615) compared to (0.001278) in less dense urban forest by the AMA. Rate Impost is the rate multiplied by the market value of the building to give the property tax for a property unit. Coincidentally, these areas fall as First and third residential class areas respectively supporting the first hypothesis.

5.3 Prioritization of public community development initiative.

Increasingly, community initiative regarding greening depended so much on the tenure system in place. Most of the areas especially third class areas where most of traditional and compound houses existed gave an indication of high rate of tenants occupiers as opposed to flats and detached most of which were owner occupier. In this regard respondents will have limited interest and or decision right especially with regards to trees that must be planted within the compound of his residence which is similar to Moyer’s (2006) findings. This also affirms Clark et al. (1997) findings which shows that a prominent feature of the urban forest is that most of them are found on privately owned sites.

This could account for the preference of alley paving in the third class areas vis-à-vis urban forest in first class areas and substantial amount of preference in the second class areas.

In addition to residential status of the respondents, prioritization of the five (5) street furniture (namely; pavement of alleys, tree planting, drains, street lighting, and roads) might be deduced to depend on space availability and the current need of the respondents. The cumulative prioritization
showing more attention for urban trees indicated a new consciousness for something unique than the ordinary. However, the number of years a member of the community has stayed in that area was a great determinant for his or her preference.

5.4 Institutional and policy framework of urban forest

More worldwide policy initiatives on urban forestry maintain that management of urban forest resources on sustainable manner institutions are strengthened and most especially consider the role of all major stakeholders of which urban residents are actively involved. (Society for Ecological Restoration International, 2002). This is instrumental as they are the ultimate beneficiary as well as have regular presence in the field than any single institution. As noted by M McPherson, et al. (1997) an effective collaboration with industry players, businesses and residents to offer their support is of greater relevance for sustainable urban forest development and management.

However, there exist huge institutional gaps in the study area and operations are carried out in an uncoordinated manner in most cases without the residents. As Miller et al., 2015 emphasized, several agencies without clear roles often results in abject neglect or conflicts. This was also confirmed by Carter (2010) with the Bangalore experience of rift among government agencies. The gaps include among other things whose clear mandate is it to enforce regulations and loose decentralized system on urban forests. Again lack of appropriate logistics are problematic for the agencies that in one way or the other support urban forests. As witnessed in several Latin American countries (Carter, 2010), the role of Local authority leaders in the urban forests efforts tend to be more effective than central government agencies. That notwithstanding, community public education, information and communication for the majority of the residents remain an unaddressed issue in Ghana.
5.5 Limitation of Study

Some of the research information from the gathered data can be evidenced graphically, the research also depended on perception of individuals and responsible persons from different institutions which might be subjective. Also there was no prior inventory of urban trees done in Accra which would have given a sound basis for the research. In view of this, most of the narratives presented here are subjective which makes the results dependent on the trustworthiness of respondents. In view of limited resource (funds and time) the various species and number within the study area could not be counted to form the first ever tree inventory in at least a portion of the city.

6. CONCLUSION AND RECOMMENDATION

6.1 Conclusions

The research suggests that the amount of vegetation cover in residential areas tends to be associated with class status of the community. That is to say, first class areas have at least 30 percent of vegetation cover of the total areas compared with less than 10 percent of the lower class areas. The first class areas have lower building density with adequate spaces for landscape vegetation whereas third class areas have higher building density with very limited space for vegetation.

Forest and trees in the first class areas are mostly consciously planted alongside streets, drive ways, public parks and squares and individual homes. On the other side vegetation in third class areas are less consciously planted and incidentally located on marginal lands, and within compound houses.

With the ever-growing population and intensification of land development, trees in first class areas are dwindling. Although, low class areas have lesser forest cover, they remaining trees are still being depleted.
The findings give a clear indication that urban forest could to a large extent influence the class status in a residential geography. As evidenced in the research, low residential classes have very little urban forest cover than Second class areas in that other. Undeniably, spatial planning has contributed to the urban forest cover as first class areas are well structured making available space for urbans forest whereas unplanned third class areas have fewer incidental trees on marginal lands.

Unfortunate the study did not find any clear mandate and co-ordination by an institution for an effective urban forest management even though most urban population know about the benefits and regard urban forest as a key fabric of their sustenance. Thus, there is a need for adequate institutional arrangements and coordination in urban forestry development.

6.2 Recommendations

In view of the fact that the contribution of urban forest has been established as a key dependent variable for achieving a desired residential class status, it has to be institutionalized as a development indicator and made operational in all levels of government and private business agencies.

Planning, development and management of urban forests should be community-based. This agrees with Jim C.Y, 2004 assertion that government, residents and developers should foster a stronger community level resolve and competence to enhance community greening. According to Miller, 2015, this would requires public education, information and communication as well as regulation to direct, guide and meet communal values. In addition, such community level planning and management should be annexed with budgets.

Forests and trees baseline data at the community level should be captured and monitored on regular basis. The results of this current study should form a good basis for future inventory studies on tree-residents ratio, green public open spaces-sealed land ratio, among others, to ascertain the status.
To support community-based urban forestry, like the Functional Organizational Assessment tool (FOAT) and sharing Formulas for the District Assembly Common fund (DACF), the criteria for assessment 216 districts in Ghana should also be expanded to cover the physical evidence of urban trees in the respective districts. This will make sure that the Town & Country Planning Department within the Assemblies ensure that landscape conditions given as part of Development Permissions is adhered to. Policy wise it is recommended that the mandate to grow and maintain urban forest is giving to the District Assemblies (DAs) with the supporting departments working hand-in-hand to achieve sustainable urban forest at the local level.

It is important to secure the few places available now in low residential classes for plating of trees especially drought resistant and fast growing species as well as embark on education, promotional and community patronage campaigns. Together with other planning measures, it is expected that conscious efforts are made to select species that minimize the problems that respondents’ cited as excessive littering.

6.2.1 Recommendation for Further Study

Even though the stakeholder view of the relevance of urban forest in the city has been established, it is important that a comprehensive inventory of both public and private trees in the city from the community levels are made. It is therefore recommended that further studies should focus on urban forest inventory using an ICT tool as “Argo Mark” to collect the geo-coordinate of the urban trees (with attribute data) in real time and make it publicly accessible on a website. This will ensure effective operational monitoring by mandated institutions and help businesses in decision making.
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APPENDICE

Appendix 1 – Questionnaire for Institutions.

THE INTERRELATIONSHIP BETWEEN URBAN FORESTRY AND RESIDENTIAL CLASS AREA

Case study of the Ayawaso sub-metros of the Accra Metropolis (Institutional respondents)

Questionnaire for 3 Institutions:
(Department of Parks and Garden, Environmental Protection Agency, Town & Country Planning Department - Accra Metropolitan Assembly)

<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>Respondent’s Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>What policies on urban forest is place for this organization?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(quote laws, operational manuals, regulations etc)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>What regular activities indicate that this organization is committed to this policy?</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Are there sanctions for those who do not want to go by the rule?</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>What are the management plans for maintenance for the urban forest?</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>What are the potential benefits of urban forestry?</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>How do you quantify these benefits?</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Then what monetary value can be placed on a medium size tree.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>What are some challenges faced in urban forestry?</td>
<td></td>
</tr>
</tbody>
</table>
In your personal view where does urban greening do well in the Ayawaso area? *(Show map)*

Give Reasons for your answer ……

No of trees on premises (observe and count)
Appendix 2 Questionnaire for Individual Respondents

THE INTERRELATIONSHIP BETWEEN URBAN FORESTRY AND RESIDENTIAL CLASS AREA
Case study of the Ayawaso sub-metros of the Accra Metropolis (Individual respondents)

<table>
<thead>
<tr>
<th>Section A : Personal Details</th>
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<tbody>
<tr>
<td>Name of Respondent:</td>
</tr>
<tr>
<td>Sex: □ Male □ Female</td>
</tr>
<tr>
<td>Age  Pls prompt &amp; circle:</td>
</tr>
<tr>
<td>19 and below, 20-29, 30-39, 40-49, 50-59, 60+</td>
</tr>
<tr>
<td>Locational Address:</td>
</tr>
<tr>
<td>(indicate also on map)</td>
</tr>
<tr>
<td>How long have you lived in this location?</td>
</tr>
<tr>
<td>Average Income (monthly): Pls prompt</td>
</tr>
<tr>
<td>Tick only one</td>
</tr>
<tr>
<td>□ 0-200  □ 2,001 – 3,000</td>
</tr>
<tr>
<td>□ 201-500 □ 3,000 – 5,000</td>
</tr>
<tr>
<td>□ 501 -1000 □ 5,001 +</td>
</tr>
<tr>
<td>□ 1,001-2,000</td>
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<tr>
<td>Phone Number:</td>
</tr>
<tr>
<td>Last Educational level:</td>
</tr>
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<td>Email:</td>
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<td>Occupation:</td>
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### Section B: Environmental Conditions

<table>
<thead>
<tr>
<th>No of trees within respondent’s house/ area (10 meters radius):</th>
<th>Count</th>
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<table>
<thead>
<tr>
<th>House Type:</th>
<th>House Service Quality:  (circle all that apply)</th>
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<tbody>
<tr>
<td>☐ Traditional</td>
<td>☐ TV, Radio, Wi-Fi</td>
</tr>
<tr>
<td>☐ Compound</td>
<td>☐ No maintenance,</td>
</tr>
<tr>
<td>☐ Flat/barrack/semidetached</td>
<td>☐ Sound system/DVD</td>
</tr>
<tr>
<td>☐ Detached/bungalow</td>
<td>☐ Some maintenance</td>
</tr>
<tr>
<td></td>
<td>☐ Refrigerator, LPGas</td>
</tr>
<tr>
<td></td>
<td>☐ Well maintained</td>
</tr>
<tr>
<td></td>
<td>☐ Electric Cooker,</td>
</tr>
<tr>
<td></td>
<td>☐ Decoder/satellite Dish</td>
</tr>
<tr>
<td></td>
<td>☐ Car, Hot water system</td>
</tr>
</tbody>
</table>

**Environmental Quality:** *(take photograph and label as per the questionnaire)*

- ☐ Unkempt (litter around, no proper access/drains)
- ☐ Poor access condition, broken drains, Central waste dump
- ☐ Partly tarred access, -partly good drains, some maintenance/management of waste
- ☐ Doorstep waste collection, well paved access, engineered drains, side walk ways

### Section C: Interview Questions

<table>
<thead>
<tr>
<th>Do you have a tree or greenery in or close to your home?</th>
<th>☐ Yes ☐ No</th>
<th>If Yes what species are the tree/greenery?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interviewer must verify</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------</td>
<td></td>
</tr>
<tr>
<td>Do you think the trees in this area are? <em>(prompt)</em></td>
<td>What factors do you think account for few or many trees in this area? <em>Pls List</em></td>
<td></td>
</tr>
<tr>
<td>□ Very few, □ Too many □ Just right.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you think there is a relationship to the status of this community to the greenery here? <em>(prompt)</em></td>
<td>Yes □ No □</td>
<td></td>
</tr>
<tr>
<td>What species of urban trees easily comes to mind? <em>(mention them)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you think the greenery around you provide some benefits?</td>
<td>If Yes what are they?</td>
<td></td>
</tr>
<tr>
<td>□ Yes □ No □ Don’t Know/ May be</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have a space to plant a tree in your home?</td>
<td>If yes how many mature trees can occupy the space in your home?</td>
<td></td>
</tr>
<tr>
<td>Are there spaces for tree planting in your community?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Not much space □ Much space □ No space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What in your personal opinion do you think could be the disadvantages/ problems of trees in the neighbourhood or your home?</td>
<td>How will you prioritize the following development initiative in your community?</td>
<td></td>
</tr>
<tr>
<td>Order as mentioned</td>
<td>How could these problems be resolve?</td>
<td></td>
</tr>
<tr>
<td>--------------------</td>
<td>-------------------------------------</td>
<td></td>
</tr>
<tr>
<td>□ Street light</td>
<td>□ Tree Planting / greening</td>
<td></td>
</tr>
<tr>
<td>□ Drains</td>
<td>□ Roads</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ Alley paving</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>On a sunny afternoon which of the following available places will you prefer to relax/ rest</th>
<th>Given GHC 5 how much will you pay for each one of relaxation areas areas per hour?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tick only one</strong></td>
<td>□ under a tree, GHc______</td>
</tr>
<tr>
<td>□ under a tree, ______</td>
<td>□ near a building, GHc ______</td>
</tr>
<tr>
<td>□ near a building, ______</td>
<td>□ in the open, GHc______</td>
</tr>
<tr>
<td>□ in the open, ______</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Would you plant a tree and care for a tree in your home?</th>
<th>How do you care for the greenery around you?</th>
</tr>
</thead>
</table>