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Urban Forest Development in West Africa: Benefits and Challenges

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Abstract

Urban forests have played important roles in social, cultural, economic and environmental development of urban centers in West Africa through benefits such as landscape enhancement, provision of recreational and cultural facilities, erosion control, watershed protection and supply of fruits and fuelwood. The growing population and rapid urbanization occasioned by demographic switch from rural to urban society is outstripping the planning and carrying capacity of municipal authorities in West Africa. West African population increased from 132.2 million in 1980 to 234.0 million in 2000 and projected to attain 344.0 million by 2020. This study assessed development of urban forestry, evaluated the effect of population growth on urban forests landscape and designed innovative strategies that will ensure sustainability and improvement of urban living environment. Urban forestry development was investigated through secondary data, directed enquiries to relevant stakeholders, on-the-spot assessment and observations of urban and peri-urban forest facilities in selected West African cities. The result revealed that numerous environmental and material benefits are derived from urban forests in West Africa. The types of tree species planted for landscape enhancement, environmental protection and other benefits varied with ecological zones and cultural values. In Sahel savannah, the preponderance of *Adansonia digitata*, and *Acacia species* were observed while in Guinea and Sudan savannah, *Azadirachta species*, *Eucalyptus* species, *Acacia* species *and Gmelina arborea* dominated. *Terminalia species, Gmelina arborea, Tectona grandis, Delonix regia,* species of palm, etc were common in tropical rainforest zone. Rapid urban population growth, limited land area, and poor implementation of government policies are some factors affecting urban forests development in West Africa. To ensure sustainable development, forest management technique that accommodates human, social, political, cultural and economic factors should be adopted. Political goodwill should be secured while appropriate social awareness should be promoted to guarantee that forest initiatives are upheld.

Key-words: *Urban forestry, landscape, sustainable development, West Africa, Ecological zones*

Introduction

Over the past five decades, population growth in West Africa has more than quadrupled. Total population increased from 64.1 million in 1950 to 239.5 and 272.5million in 2000 and 2005, respectively with a projected rise to 382.9 million in 2020 (Tab. 1). This trend is evident in all the countries in the sub-region. Within each country, population growth is much higher in urban settlements than in rural ones. Though West Africa has nurtured great empires and developed large settlements for commercial and religious purposes (Chandler, 1994), urbanization in the sub-region is mostly a recent phenomenon. The current trend of urbanization in West Africa is linked with colonization that developed new centers for control, administration and export of exploited natural resources from the sub-region.

The rate of urbanization in Africa and other developing countries is quite different from what happened in developed countries during their development period (Butler & Crooke, 1973, Okpala, 1987; Palen, 1997, Tattey, 2005). Demographically, migration in Europe and America is a result of urban pull which was the chief cause of urbanization (Dutt and Parai, 1994). In addition, urbanization rates were also gradual in the developed countries. Contrary to this, in Africa and other developing countries, both migration and natural population increase were the main cause of urbanization, with migration attributed to rural-push (Tattey, 2005). The rate of urbanization is also rapid. Thus, the factors that contributed to urbanization in the developed countries were different from what Africa has experienced and continue to experience.

Urbanization rate in West Africa increased from 5% in 1900 to 12% in 1950, 28% in 1980 and 17% in 2000 (Tattey, 2005). Its current annual population growth rate of 4.0% is the second highest in the world, a value that is much higher than the world average rate of 2.1% (UN, 2007a). Though urban settlements account for only 0.7% of West Africa's land area, about 42% of its population live in urban centers, which is expected to increase to 67% by 2050 (UN, 2007a; UNOWA, 2007; Carrieiro, 2008), indicating that the urban centers are highly populated and congested. For example, while the sub-region's mean population density in 2005 was 67 per square kilometer, it was 2,886 per square kilometer in urban settlements (Tab. 2). The average annual population growth in urban settlements (4.0%) is two times higher than that of rural settlements (2.0%) and the mean for the entire sub-region (2.3%) (Tab. 2).

West Africa's demographic landscape presents a mix of high natural growth and intense rural – urban migrations (UNOWA, 2007). . Population growth in

West African cities far outstrips the planning capacity of municipal governments and essential and available infrastructures, especially in urban fringes or peri-urban areas, where planned city usually give way to spontaneously growing settlements and where controlled planning by municipal government is lowest. Though most cities have master plans to govern and cope with heavy population pressure, their implementations have been poor. Urban population growth in developing countries brings with it a wide range of challenges and puts pressure on land, scarce natural resources, infrastructures and the environment, which could lead to social tensions among different interest groups. Other challenges of urbanization include: shortage of land, provision of food, energy and wood for construction, deteriorating air quality, higher air temperatures, increased noise levels, greater psychological stress, etc.

Urban forestry is one of the promising strategies to address the multifaceted problems associated with urbanization Although the planting of trees have been integral and important part of human settlements in West Africa, the full value of trees to urban dwellers were only recently considered. Traditionally, people in West Africa planted trees around their houses, which provided fruits, nuts, seeds, leaves, fuelwood, fodder and raw materials for handicrafts and building and served for shade and windbreaks. It was common to plant trees in village squares, which provided shade during meetings, ceremonies, education, recreation, etc. Also trees were planted along rivers and stream banks, major village roads and around cultural and religious centers. Thus, the planting and management of trees around settlements in West Africa was largely based on their nutritional, social, cultural and spiritual values than on aesthetic benefits.

The current trend of urbanization in West Africa, coupled with the growing urban population, is redefining urban forestry practices in the sub-region and has presented new challenges and opportunities. In addition to providing essential goods and services, current urban forestry practices are services and amenity oriented. Urban green spaces with trees as major component play important roles for healthy, livable and sustainable cities. Trees and green spaces help keep cities cool, act as natural filters and noise absorbers, improve microclimates, conserve biodiversity, protect and improve the quality of natural resources, including soil, water, vegetation and wildlife. Trees contribute significantly to the aesthetic appeal of cities, thereby helping to maintain the psychological health of their inhabitants. Consequently, urban forestry management is an important strategy to improve urban living and working environments (Jiang, 2003). Since the concept of urban forestry entails planning, design, establishment and

management of trees in and near urban areas (Forrest and Konijendijik 2005; Konijnendijik *et. al*. 2006), it is important to consider the effects of population growth and rapid urbanization on the development of urban forests. The objective of this study was to assess the development of urban forestry, evaluate the effect of population growth on urban forest landscape and recommend innovative strategies that will ensure sustainability and development of urban environment in the West African sub-region.

Characteristics of some West African cities

The high rural – urban rush in West Africa has lead to the situation where the few cities are highly populated and congested (Plate 1). In some cases, a single city could account for over 15% of the entire population of the country. The characteristics of some of these cities are briefly discussed below.

Lagos, Nigeria is the most populous city in West Africa, second in Africa and 25th in the world (City Population, 2008). Its population of about 11,300,000 accounts for 8.1% of Nigeria's population. Lagos is probably the most congested city in West Africa (Plate 1), with annual population growth of 275,000 persons, average density of between 2,594 and 10,400 persons per square kilometer (Demographia, 2008). According to 1999 UN study, Lagos population is expected to rise to 24.5 million in 2015, although this projection must be revised downward given the city's current population figure.

The second most populous city in West Africa and the 4th in Africa (City Population, 2008).is Abidjan, Côte d'Ivoire. The city, which had a population of only 50,000 by 1948, grew to an estimated 4,325,000 inhabitants by 2005. Due to Abidjan's thriving economy, it has become congested as a result of in-migration from rural areas and less prosperous neighboring countries. However, Abidjan's annual population growth rate has been on the decrease. It decreased from about 12% between the 1950s and 1970s to about 6% towards the end of the 20th century and has remained virtually unchanged since then.

Accra, Ghana occupies only 185 km² of land but has a population of about 3,450,000 and accounts for about 6.5% of Ghana's population. Following British colonial administration in 1877, the city expanded rapidly, transforming from a once-sleepy coastal fishing village into one of Africa's largest cities. Depending on the part of the city, population density could range from 1,200 to 7,000 per square kilometer. Accra has experienced an influx of inhabitants from rural areas, leading to its congestion.

Dakar, Senegal accounts for about 15% of Senegal's total population. Dakar's

population growth has been on the increase since the middle of the 20th century. This has been attributed to rural exodus and a general movement from the north to the south. The city has the smallest land area out of the ten administrative regions of Senegal but has the largest population (2,600,000) and the highest growth rate and population density (2,707 per square kilometer). Dakar accommodates a substantial percentage of Senegal's population. In 1960, about 14% of Senegal's population lived in Dakar, which increased to about 21% by 1988.

Material and Methods

The development of urban forestry in West Africa was investigated through the analysis of secondary data derived from literature, directed enquires to relevant stakeholders and on the spot assessment and inventory of urban and peri–urban facilities in selected urban centers in West Africa. Questionnaires survey was also conducted in order to determine the benefit and problem of urban forestry. The rate of urbanization in nineteen West Africa countries was determined from United Nations data (UNOWA, 2007). The influence of population growth and urbanization in the selected countries on urban forests was also evaluated.

Results and Discussion

The most obvious dimension of the urbanization processes is the spatial dimension and the changes of urban space when cities and human agglomerations grow (Akerlund *et al*., 2006), which could be seen either as a densification of the core or as spatial expansion where the urban territory increases (i.e. urban sprawl)(UN Habitat, 2004). In a densification process, existing buildings could either be extended or new construction takes place on non-built up lands (Akerlund *et al*., 2006). Densification refers to both population density (people living per km^2) and the volume of built up structure in relation to open space while urban sprawl refers to expansion taking place in the urban fringe, on former agricultural land or in the urban green resource such as urban and peri-urban forests, orchards and woodlots.

Major West African cities tend to grow through densification and urban sprawl, which is indicated by the increasing population density and the active city expansion. Some cities are merging with adjacent cities. Lagos, Nigeria has expanded into cities in Neighboring Ogun state. This situation has resulted in parks, gardens, orchards, urban agricultural land, forests etc disappearing in favor of construction of houses and industries. The new strategies for spatial development planning adopted by West African cities are characterized by several weaknesses, such as spontaneous land privatization and inconsistent land reform, insufficient information on land-use and ownership. Strategies also reflected imperfect and incomprehensive legislative

frameworks regulating spatial development planning, undivided competencies among central, regional and local state bodies in matters of land regulation, weak coordination of activities and lack of cooperation among agencies.

Slums and shanty towns exist in almost all West African cities, but they occur mostly in countries with a high urbanization growth rate and large rural population. There is unprecedented rise in inequality, rapidly declining living standards and more households living in slums, which is similar to UN Habitat (2004) reports for countries in West and Central Asia. In most cases, slums developed in countries severely hit by conflicts and affected by poor governance. Though there is no reliable information on urban poverty level in the sub-region, there are indications that urban poverty is a current and future problem in West Africa.

Urban Forestry and People in West Africa

The major types of urban forestry resources in various West African cities include: (i) semi-private space like green space in residential and industrial areas (ii) designated parks, street trees and roadside plantations (iii) public green areas like green parks, botanical gardens, recreational gardens (iv) public and private tree plantations on vacant lots, green belts, woodlands and peri-urban tree plantations (v) rangeland, and forests close to urban areas (vi) natural forest under urban influence, such as nature reserves, national parks, forests for eco-tourism (vii) trees planted for environmental protection such as wind break, watersheds protection, etc.

The floristic features, physiognomy, characteristics and socio-economic importance of these forests vary with ecological zones in which they are located. The West African sub-region has seven distinct vegetational zones: mangrove forest, Fresh water swamp, rainforest, guinea savanna, Sudan savanna, Sahel savanna and desert (Fig 1). Mangrove and fresh water swamps are found around the coast while the rainforest spans from Sierra Leone, Nigeria to Cameroon. The savanna occupies the largest portion of the landscape spreading through a belt from Senegal, Gambia to Mali, Burkina Faso and northern parts of the Ivory Coast, Ghana Niger, Nigeria and Cameroon. The ecological factors in these vegetational zones have significant effects on the urban forest landscape and their contributions to livelihood (Fuwape *et al*., 2006).

Urban forest trees species and their characteristics

The types of tree species planted in West African urban centers for landscape enhancement, environmental protection, provision of timber and non-timber forest products and other benefit varied with ecological zones and cultural values of the

people (Tab. 3). In Sahel savannah the preponderance of *Adansonia digitata*, *Acacia* species, *Eucalyptus* species and *Azadirachta indica* were observed in strategic locations in the cities while in urban areas in the Guinea and Sudan savannah ecosystems *Azadirachta indica*, *Eucalyptus* species, *Acacia* species *and Gmelina arborea* dominated the landscape. *Terminalia catapa, Gmelina arborea, Tectona grandis*, *Delonix regia* and different species of palm were common in urban areas in the tropical rainforest zone. Only few species are used for urban forestry in the mangrove and swamp forest zones, prominent among which are: *Rhizophora* species, *Avicennia* species, *Ornamental palms and* Coconut trees, etc (Tab. 3). Both indigenous and exotic species were used for urban forestry in West Africa.

In order to restore human carrying capacity of peri-urban forest in arid region of West Africa, Gonzatez (2001) recommended regeneration with indigenous species. Ecological and socio-economic factors have indicated preference for indigenous species over exotic species due to low survival rate of exotics. The trees provide natural habitat for birds and wildlife. Small businesses and community meetings in cities, religious worships are sometimes conducted under the shades of forest groves in urban centers.

Benefit of urban forestry in West Africa

Urban forest resources in West Africa can play active roles in providing goods and services to alleviate poverty, improve livelihoods, and enhance the wellbeing of inhabitants. The benefits of the different elements of urban forestry is enhanced by policies and legislation, strategic planning and management, urban forestry practice, financial mechanisms and operational maintenance, ownership and access, key actors and stakeholders, education and capacity (Åkerlund *et al*., 2006).

Tangible benefits

Urban forest trees in West Africa provide wood for construction and non-timber forest products such as mushrooms, fruits and nuts, medicinal herbs, rattan, vegetables, etc In West Africa, urban forestry practices that have contributed to improvement in food security include the collection of wild edible plants, planting of fruit bearing street trees and establishment multifunctional parks or medicinal public parks. Many compounds, especially those in urban fringes and new urban settlements have fruit trees planted in them. Agroforestry gardens are probably the most significant urban green space in West African countries. In arid and semi-arid areas, it is a common urban forestry practice to establish windbreaks to protect housed and agricultural land and at the same time enhance land productivity.

A large part of the urban population in Africa is still heavily dependent on fuelwood. The urban poor usually spend a

significant proportion of their income or time securing woodfuel (Kuchelmeister, 2001). Many urban forestry projects in West African cities have been dealing with urban woodfuel issues. Inexpensive woodfuel (e.g. charcoal) is as close to many households in poor urban neighborhoods as modern fuels is to the urban rich. Variation in woodfuel collection depends on forest cover, population density, availability and stability of alternative sources of energy. With the increasing number of urban poor in most West African cities, woodfuel will remain a major source domestic energy for a long period of time in spite of the massive rural – urban migration.

Another tangible benefit of urban forestry is the provision of timber for building and construction. Many urban dwellers, especially those living in urban fringes, shanties and slum obtain timber for building from avenue trees and trees from peri-urban plantations. Systematic planting of street trees for timber production is widely practiced in China and Malaysia (Webb, 1999). However, timber production from urban forests in West African cities has not been optimized due to a mix of ignorance, tenure insecurity and deficits in technical know-how.

Intangible benefits

One of the most important benefits of urban forestry is its environmental services. Most congested West African cities are characterized by environmental pollution occasioned by annual bush burning, industrial pollutions, and automobile exhaust. Concern about global warming has facilitated the dissemination of in-depth knowledge about the functions of urban trees in creation of microclimates and air quality improvement. By providing settings for physical exercise, intercepting particles and reducing air pollution, acting as carbon sinks and mitigating global warming (Harris *et al*., 1999; McPherson and Simpson 1999; Konijnendijk *et al*., 2004), urban forests can have a positive impact on physical health of urban dwellers. In many cities in West Africa, trees often have cultural and spiritual values, thus impacting positively on the mental health of the people. Trees are planted around houses and public institutions to ameliorate high temperature. This is most evident in cities in the Sudan and Sahel savanna zones, a good example being Ouagadougou in Burkina Faso. The benefits of urban forests for the protection of urban water supply, waste water treatment systems and storm water management are increasingly being articulated, especially in peri-urban areas, arid and semi-arid zones of West Africa.

One of the most appreciated characteristics of trees used for urban forestry in West Africa is their wide spreading crown, which serve for shelter. Car parking lots in private and public

buildings are usually lined with such trees. Cars are parked under these trees to protect them from the scotching sun. Humans and domestic animals also take shelter under urban trees because the trees reduce the effect of ultraviolet radiation from the sun (Konijnendijk *et al*., 2004). Most schools in urban areas are adorned with trees for students to sit under and relax during break period. Open markets are planted with trees and traders take advantage of the shade to display their goods and services.

Urban trees protect soils and moderates harsh urban climates by cooling the air, reducing wind speeds, and shading (Konijnendijk *et al.*, 2004). In arid regions e.g., Ouagadougou, Yola, Kano, forest shelterbelts around cities help combat desertification and dust storms (Kambou, 1992). The micro–climate created by the trees moderate diurnal range of air temperature and maintains atmospheric humidity levels. The trees are described as the lungs of the cities; they absorb carbon dioxide and other gaseous pollutants and replenish oxygen into the air. In the Sahel and Sudan savanna regions of West Africa where strong winds affect buildings and other municipal facilities, trees are planted to provide wind breaks. The trees reduced wind speed thereby protecting urban structures from destruction. In northern Nigeria, Burkina Faso and Gambia, *Eucalyptus* species interspersed with *Acacia*, *Anacardium* and *Azadirachta indica* provide effective wind breaks (Fuwape, 2005). Avenue trees beautify the urban centers and provide aesthetic green features to break the monotones link of concrete buildings.

Urban forestry practices such as gardens and parks, peri-urban agroforests, botanical gardens and protected zones play vital role in nature conservation. Incorporating trees in urban landscape improves biological conservation and biodiversity. Greenbelts and greenways can serve as biological corridors, reconnecting a city to its surrounding bioregion. The level of biodiversity of urban green areas is often surprisingly high, representing nature close to where people live (Konijnendijk *et al.*, 2004). Cities such as Kuala Lumpur, Rio de Janeiro, and Singapore have been noted to have tracts of tropical rainforest within their boundaries (Chin and Corlett, 1986; El Lakany, 1999; Webb, 1999).

Trees planted in erosion prone areas in Imo, Anambra, Abia, and Enugu states in Nigeria have enhanced water percolation during rainfall and reduced instances of run-off and soil erosion. Forest cover in steep slopes in different parts of Ghana, Ivory Coast, Benin, Togo and Nigeria were reported to have protected the landscape from development of gully erosion. Urban forests play vital role in global carbon cycle, the tropical forests absorb and sequester large quantity of carbon.

The role urban vegetation plays in watershed management is increasingly

becoming important in developed and developing countries (Konijnendijk *et al.*, 2004). Trees planted along watersheds protect catchment water balance and stream flow.). Many cities have established and conserved forests to reduce water runoff, protect drinking water resources and process waste water (El Lakany 1999). Forests in the watershed intercept excessive rainfall and regulate stream flow by gradually releasing rain water into the streams and rivers thereby reducing flooding and erosion. Trees also protect the watershed from excessive evaporatranspiration.

Recreational facilities are also provided by green parks and botanical gardens in many West African urban settlements. People organize picnics and funfairs in such gardens. The peri-urban population growth and high rate of urbanization have threatened some of the benefits of urban forests and imposed challenges to the development of urban forests.

Challenges to Urban Forestry development in West Africa

The rapid urbanization in West African has brought about a wide range of challenges. Some cities have more than tripled in size and population during the past five decades, thus leading to the lost of large areas of green spaces, which is expected to continue during the coming decades. One of the major challenges of emerging mega-cities in West Africa is managing and catering for the influx of rural population. Continuing urbanization in developing countries has led to major problems in terms of hunger, poverty, inadequate shelter, social segregation, unemployment, pollution of water, soil, and atmosphere etc.

The basic challenge for urban forestry is to develop and maintain a sustainable urban forest resource that meets multiple societal and personal needs. This explains why multi-purpose tree species are widely preferred for urban forestry in West Africa. Thus urban forest management in the sub-region must produce multiple products and services that are of value to the owner and society. Urban forest structure has a major impact on the mix of outputs and determining the best mix requires technical information on trade-offs between the different outputs, costs and values. Urban forest outputs or services can generally be classified as complementary or competitive. They are complementary if an increase in one output is accompanied by an increase in the other and competitive if effort to increase the output of one results in a reduction in the other.

The immediate challenge of rapid urbanization is the demand for land by rural–urban immigrant for housing projects. Many cities in Nigeria, Ghana, Ivory Coast and Senegal have experienced destruction of tree gardens, recreational parks and peri–urban

plantations in the bid to create space for establishment of housing units. Many rural–urban migrants are involved in low income employment and cannot afford expensive house rents or payment of mortgage, thus they embark on self housing projects. In some instances, the houses are erected on watershed thereby disrupting water flow and causing flooding. The houses established in slumps often constitute terrible environmental hazards since they were sited in illegal locations which often lacked municipal facilities.

Another consequence of rapid urbanization is the destruction of urban and peri-urban forest to create land for infrastructural development. Intensive pressures by government and land speculators have resulted in the destruction of schools, hospitals and municipal facilities. Some rural–urban migrants who cannot afford conventional cooking facilities have also been reported to illegally cut down avenue trees along the street and botanical gardens especially in Accra – Tema metropolis, Sokoto and Maiduguri.

Reports indicated that some recreational parks and gardens have been converted into refuse dump in Ibadan, Lagos, Kano and Kaduna in Nigeria; Accra and Kumasi in Ghana and Freetown in Sierra Leone. The rapid urban development has also affected allocation of fund by municipal government, where most of the fund are diverted to provision of education and healthcare, little fund is available for urban forests establishment and management.

Other challenges of urban forest development in West Africa include: (i) little technology transfer, research and information exchange; (ii) inadequate appreciation of the economic value of urban forests; (iii) insufficient government and private participation; (iv) inappropriate land-use policies; (v) ecological and technical constraints ; (vi) sustaining funds for urban forests and (vii) integration of forestry into urban planning and development.

Management of Urban Forest

In order to cope with the challenges of rapid urbanization on urban forests, there should be a radical review of forest policy by Governments in most West African countries. The present Government policy on forest management was influenced largely by colonial forest policies. The colonialists developed policies that secured government control over forest resources without the participation of the people. Consequently, this resulted in the indifference of people to urban forest development and the occasional destruction of the forests (Amanor, 2003). For urban forests to be sustainable, there must be a shift to integrated participatory management approach that engages members of the community in planning, designing, establishing and maintaining the forests. It is essential to identify key issues and needs of the people with focus on alleviating poverty, providing livelihoods,

and environmental services such as wastewater handling and combating desertification, which are pressing issues in West Africa.

Lack of information and strategic, coordinated action has hampered implementation of urban forestry development in the developing world (El Lakany, 1999; FAO, 2002). Urban forestry development in West African will require improved information sharing and dissemination through the establishment of network of knowledge and network for people as being promoted by the FAO (Konijnendijk *et al*., 2004). The FAO should be the main provider of information on urban forest development, especially to developing countries.

Urban forest must be appropriately managed for it to continue to perform vital environmental functions and realize their penurious potentials. The people should be enlightened on the importance of forests in urban centers. Creating awareness on the importance of urban forestry is an important component of its development strategy. Members of urban communities should be involved in managing and maintaining avenue trees, botanical garden and peri-urban plantations to curtail incidences of deforestation and encroachment. Non-governmental organizations should be alerted in educating the people and mobilizing them to restrain politician and people in government from diverting designated parks and botanical gardens to other uses.

Since the perception of the people influence their decision in preserving the sanity of forests, effective urban forestry monitoring organization that involves the collaboration of all stakeholders (e.g. community members, private sector and municipal government) should be set up in each urban center. The organization should be responsible for planning, establishing and maintaining urban forests. This will ensure sustainability of natural environment that will enhance social and economic benefits.

Conclusion

Urban forests are essential for healthy environment. The high rates of population growth and rapid urbanization have had negative impact on urban forest and are responsible for vicious cycle of environmental degradation in urban areas in West Africa. This study has shown that the potential of urban forests in providing essential products and services could be maintained if appropriate integrated management approach is adopted. All stakeholders (the public, private, academic and local community members) should be involved in planning, establishment, maintenance and protection of urban forests. Education campaign about urban forest should be intensified. The urban forestry sector should actively work with community

groups, residents and other professional and scientists to keep urban forests in West African cities green and healthy.

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Table 1. Population growth in West African Countries (Source: UN, 2006)

Year	1950		1960		1970		1980		1990		2000		2005		2020	
	Pop. (000)	Den. (km^{-2})	Pop. (000)	Den. (km^{-2})	Pop. (000)	Den. (km^{-2})	Pop. (000)	Den. (km^{-2})	Pop. (000)	Den. (km^{-2})	Pop. (000)	Den. (km^{-2})	Pop. (000)	Den. (km^{-2})	Pop. (000)	Den. (km^{-2})
Benin	2005	18	2,316	21	2,828	25	3,709	33	5,179	46	7,227	64	8,490	75	12,874	114
Bukina Faso	3,983	15	4,563	17	5,449	20	6,827	25	8,871	32	11,882	43	13,933	51	21,034	77
Cape Verde	146	36	196	49	267	66	289	72	355	88	451	112	507	126	690	171
Ivory Coast	2,505	8	3,557	11	5,310	16	8,344	26	12,780	40	17,049	53	18,585	58	24,315	75
Gambia	294	26	360	32	482	43	671	59	962	85	1,384	123	1,617	143	2,301	204
Ghana	5,243	22	7,126	30	9,059	38	11,390	48	15,579	65	20,148	84	22,535	94	29,672	124
Guinea	2,619	11	3,118	13	3,819	16	4,575	19	6,033	25	8,203	33	9,003	37	12,966	53
Guinea Bissau	505	14	554	15	584	16	793	22	1,017	28	1,370	38	1,597	44	2,513	70
Liberia	824	7	1,052	9	1,387	12	1,868	17	2,137	19	3,071	28	3,442	31	5,849	53
Mali	3,329	3	4,015	3	4,866	4	6,069	5	7,669	6	10,004	8	11,611	9	18,034	15
Mauritanea	692	1	892	1	1,150	1	1,503	1	1,945	2	2,566	3	2,963	3	4,153	4
Niger	2,208	2	3,053	2	4,217	3	5,784	5	7,822	6	11,124	9	13,264	10	22,222	18
Nigeria	33,960	37	42,356	46	53,764	58	71,065	77	94,454	102	124,773	135	141,356	153	193,099	209
Saint Halena	5	41	5	41	5	42	5	44	5	45	6	49	6	52	7	61
Senegal	2,543	13	3,277	17	4,402	22	5,871	30	7,896	40	10,334	53	11,770	60	16,442	84
Sierra Leone	1,944	27	2,256	31	2,697	38	3,236	45	4,087	57	4,521	63	5,586	78	7,747	108
Togo	1,329	23	1,572	28	2,138	38	2,784	49	3,961	70	5,403	95	6,239	110	8,984	158
Total pop/ mean Dens.	**64,134**	**17.9**	**80,268**	**21.5**	**102,424**	**26.9**	**134,783**	**33.9**	**180,752**	**44.5**	**239,516**	**58.4**	**272,504**	**66.7**	**382,902**	**94**

Table 2. Urban and Rural population growth in West Africa

Country	Total Pop. (000) (2005)	Denity (km^{-2})	% Aver. Pop. Growth rate	Urban Population Development				Rural Population Development	
				No. of dwellers (000)	Density (km^{-2})	% Annual growth (2000-2005)	% Annual growth (2005-2010)	No. of dwellers (000)	% Annual growth (2000-2005)
Benin	8,490	75	3.0	3,397	2,370	4.1	4.0	5,093	2.7
Bukina Faso	13,933	51	2.9	2,555	852	5.2	5.1	11,379	2.8
Cape Verde	507	126	-	291	1,684	3.8	-	216	0.6
Ivory Coast	18,585	58	1.2	8,704	2,506	3.2	2.7	9,880	0.5
Gambia	1,617	143	2.3	872	1,670	5.0	3.9	746	1.1
Ghana	22,535	94	1.9	10,763	2,092	3.9	3.4	11,772	0.8
Guinea	9,003	37	2.2	2,970	2,761	3.1	3.6	6,032	1.3
Guinea Bissau	1,597	44	2.9	473	1,705	3.0	3.2	1,124	3.1
Liberia	3,442	31	2.9	2,000	5,936	3.6	4.1	1,442	0.5
Mali	11,611	9	2.9	3,537	1,117	4.8	4.7	8,074	2.2
Mauritanea	2,963	3	2.7	1,197	2,076	3.1	3.3	1,766	2.7
Niger	13,264	10	3.3	2,161	1,323	3.6	4.4	11,103	3.5
Nigeria	141,356	153	2.1	65,270	4,390	4.1	3.7	76,086	1.2
Saint Halena	6	52	-	2	-	1.3		4	1.6
Senegal	11,770	60	2.3	4,891	2,959	3.0	2.9	6,880	2.3
S. Leone	5,586	78	2.1	2,057	2,483	5.0	3.8	3,529	3.8
Togo	6,239	110	2.5	2,492	1,669	4.7	4.3	3,746	1.8
Total pop/ mean dens.	**272,504**	**66.7**	**2.3**	**113,632**	**2,886**	**4.0**	**3.7**	**158,872**	**2.0**

Adapted from: UN (2007a & b) and UNOWA (2007)

Table 3.Common trees grown in Urban forests in different ecological zones in West Africa

Mangrove Forest	Swamp Forest	Rainforest	Guinea savannah	Sudan savannah	Sahel Savannah
Rhizophora racemosa	*Rhizophora racemosa*	*Terminalia catapa*	*Azadirachta species*	*Azadirachta species*	*Adansonia digitata*
Ornamental palms	*Ornamental palms*	*Gmelina arborea*	*Eucalyptus species*	*Eucalyptus species*	*Acacia species*
Coconut trees	*Coconut trees*	*Tectona grandis*	*Acacia species*	*Acacia species*	*Borassus aethiopum*
Avicennia africana	*Rhizophora mangle*	*Pistula alata*	*Gmelina arborea*	*Gmelina arborea*	*Hyphaene thebaica*
Rhizophora mangle	*Chrysopyllum albidum*	*Ornamental palms*	*Terminalia catapa*	*Azadirachta indica*	*Tamarindus indica*
Rhizophora. harrisonii	*Alstonia congensis,*	*Terminalia catapa*	*Azadirachta indica*	*Balanites aegyptiaca*	*Azadirachta indica*
Langucularia racemosa	*Berlinia auriculata,*	*Pinus caribea*	*Magnifera indica*	*Vitellaria paradoxa*	*Cassia siamea*
Nypha fruticans	*Ficus spp.,*	*Polyathia longifolia*	*Cassia species*	*Magnifera indica*	*Eucalyptus species*
Avicenia nitida	*Clerstopholis patens,*	*Delonix regia*	*Daniellia oliveri*	*Cassia species*	*Vitellaria paradoxa*
	Raphia spp	*Casuarina equisetifolia*	*Irvingia gabonensis*	*Combretum species*	*Hyphaene thebaica*
		Magnifera indica	*Chrysopyllum albidum*		*Dalbergia sisoo*
		Treculia africana	*Tectona grandis*		*Combretum species*
		Irvingia gabonensis			*Bauhinia species*
		Chrysopyllum albidum			
		Tetrapleura tetraptera			

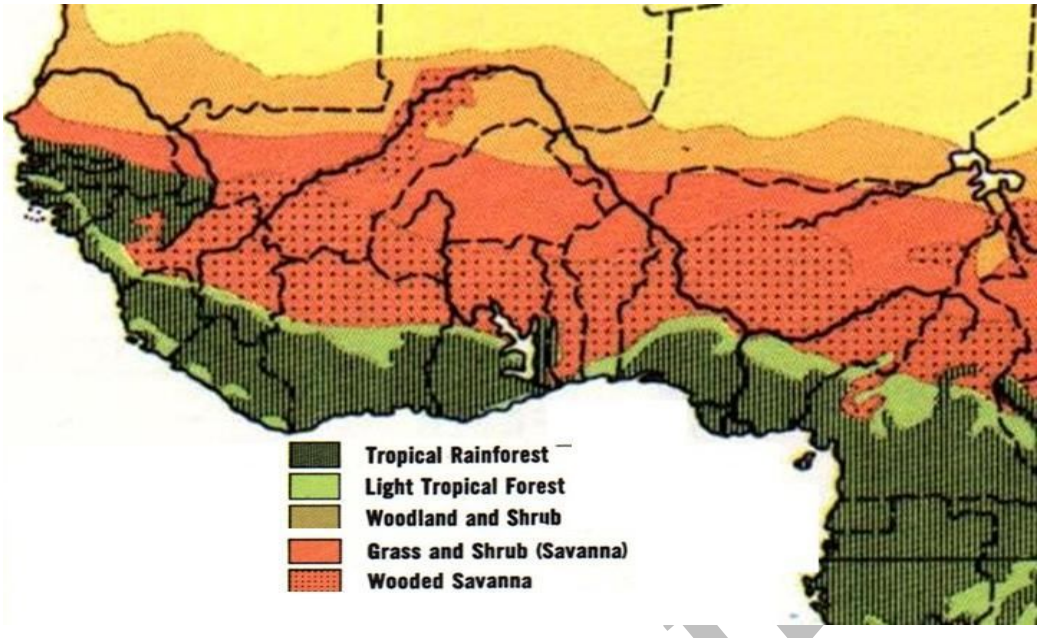

Fig 1. Ecological/vegetation zones of West Africa

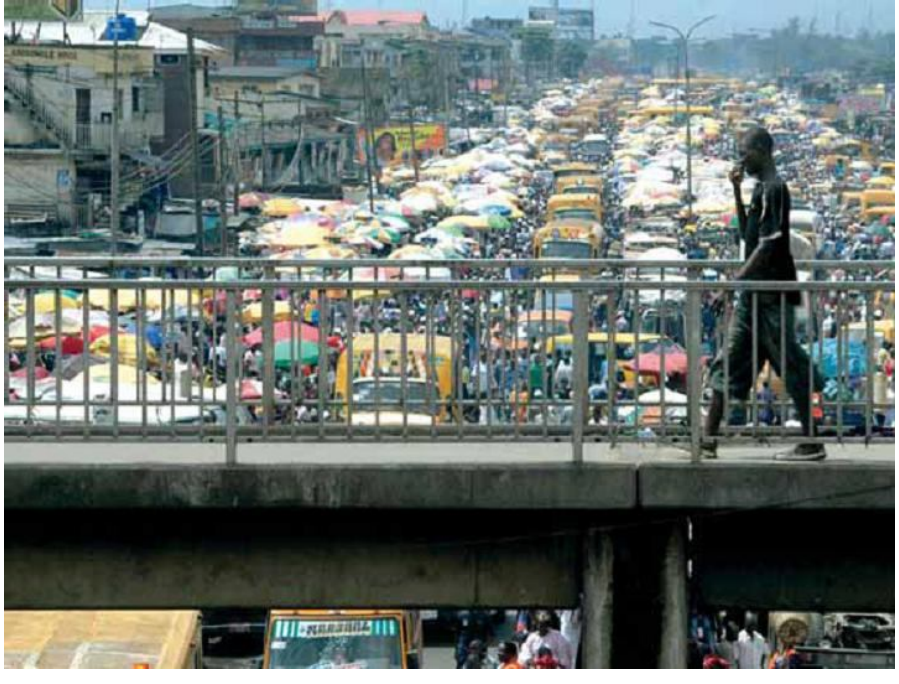

Fig 2. Old Oshodi, Lagos Nigeria