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Achieving Effective Vegetation Cover in Katsina Urban Area, Katsina State Nigeria

By Suleiman Iguda Ladan
Hassan Usman Katsina Polytechnic, Nigeria

Abstract- Urban areas in many countries of the world in both developed and developing nations have today realized the relevance of achieving effective vegetation cover towards improving the built environment. This paper focuses on one of the urban areas in northern Nigeria located at the fringes of the Sahara desert. Data for the study were generated through field visits to the different areas and interview with the relevant officials. The results identified seven major forms of vegetation in the urban area many of which are not in good condition. This area due to some factors hindering achieving effective vegetation cover in the urban area. These factors include high demand for fuel wood, poorly enforced laws, the semi-arid climate of Katsina, uncontrolled urbanization, lack of awareness and misguided government action. It therefore recommended adequate measures should be adopted towards achieving effective vegetation cover in the urban area.

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Achieving Effective Vegetation Cover in Katsina Urban Area, Katsina State Nigeria

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I. Introduction

Vegetation is the general term for the plant life of a region. It refers to the ground cover provided by plants and is by far the most biotic element of the biosphere (Science Daily, 2014). Vegetation is the plant cover of the earth consisting of assemblages of plants such as trees, shrubs, herbs and grasses which constitutes the most observable element of the landscape (Online Nigeria, 2014). Vegetation performs vital functions and services which make the planet earth lively and habitable by playing a key role in the efforts to fight climate change, releasing oxygen into the atmosphere while storing carbon dioxide (UNEP, 2011). Vegetation is essential for water supply, creating and maintaining soil fertility, and assisting to reduce the devastating impacts of storms, floods and fires. Vegetation provide home to a wide variety of terrestrial species of animals, plants and insects. Vegetation also provides source of fuel, job security and cultural relevance for vegetation dependent populations (UNEP, 2011).

Effective vegetation cover is adequate vegetation cover that provides sufficient services to the people in form of providing shade from the sun, break the force of wind, cover bare soil from erosion, absorb carbon emissions, combating desertification and performing other ecological functions.

Author : Department of Basic and Applied Sciences, Hassan Usman Katsina Polytechnic, Katsina Nigeria.
e-mail: suleimaniguda@yahoo.com

Vegetation in Nigeria is influenced by physical and human factors. Among the physical factors, climate is the most important factor influencing vegetation as the different types of vegetation grow in response to the amount and seasonal distribution of rainfall (Dingba and Adamu, 2007). In terms of human factors natural vegetation is influenced and modified by the activities of man for example through clearing for agriculture, lumbering, cattle rearing, fuel wood extraction and construction projects.

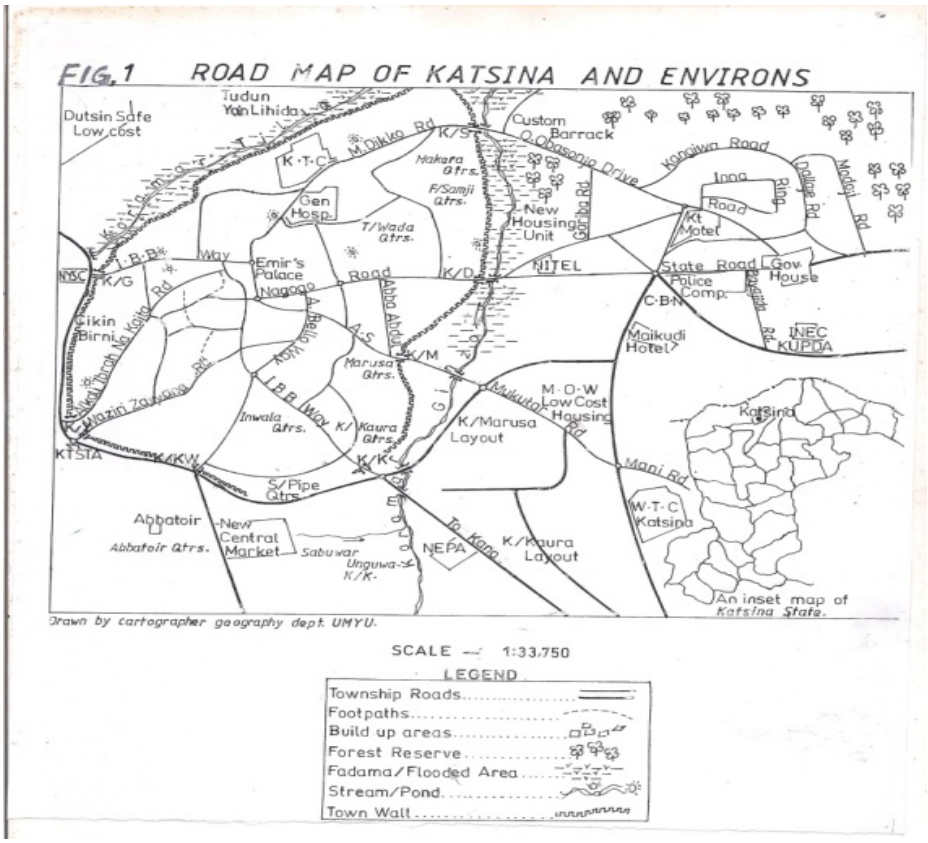
The main types of vegetation in Nigeria are mangrove swamps, fresh water swamps, high forest, guinea savanna, Sudan savannah and Sahel savannah. Katsina urban area falls within the Sudan savannah vegetation belt. The climate of Katsina is Tropical Continental type that is hot and dry for most of the year. Maximum day temperatures of about 38^{0}C in the months of March, April and May are common and the minimum temperature is about 22^{0}C in the month of December and January. Annual rainfall average is about 780mm (Rumah and Sheikh, 2010).

Urban areas in both developed and developing countries consists not only of built environment which man uses for shelter but also biotic components that contribute to human wellbeing. Thus urban built environment also consist of different types of vegetation that transforms urban streets, dwelling places, schools, institutions and open spaces into attractive landscapes (Akpan, 2007).This paper is therefore on urban vegetation or urban greenery, a field of study that have not been given proper attention it deserves among scholars in the developing countries.

II. The Study Area

The study area Katsina urban is located at the extreme margin of northern Nigeria that lies on geographic coordinates of 11^{0}08'N and 13^{0}22'N and longitudes 6^{0}52'E and 9^{0}20'E. Katsina urban area covers a total land area of about 3,370km2 (Rumah and Sheikh, 2010). Katsina is one of the oldest urban centers of Nigeria believed to have been established in 1100AD as citadel and political capital in the pre and post Danfodio's Jihad, of the 19th century. It has its roots stretching back considerably before the advent of British colonizers and has served as entre port to the Saharan and trans-Saharan trade (Isah, 2011). Katsina

city is surrounded by an ancient wall that is presently in ruins of about 21km in length and the walled city enclosed an area of about 8 sq km that exited through eight major gates (See fig.1).



Katsina is a local government headquarters and the capital of Katsina state created in 1987. Since 1987 Katsina has witnessed rapid urbanization manifested in the extensive qualitative and quantitative land use transformations (Danjuma, 2012). The population of the urban area has increased since then and has further been increasing as a result of migration of people from the troubled north eastern Nigeria due to insecurity. Katsina is the center of an agricultural region that produces food and cash crops such as guinea corn, millet, groundnut, beans, cotton and hides (Ladan, 2014).

Katsina's location at the extreme margin of northern Nigeria at the fringes of the Sahara desert makes it necessary to thrive towards achieving effective vegetation cover to combat desertification and halt desert encroachment among others.

III. The Objectives of the Study

The objectives of this paper are to identify the major types of vegetation cover in Katsina urban area, examine the conditions of the vegetation cover, find out the factors hindering achieving effective vegetation cover, and identify the recent developments towards achieving effective vegetation cover and offer recommendations for achieving effective vegetation cover in the urban area.

IV. Methodology

The method used to collect data for the study include field work which involved visits to the eight major roads to observe and examine the road side planting, to six secondary schools to observe school plantations/compound planting, to five private, commercial and institutional gardens to observe the garden plants, to areas outside the city wall to see the Green Belt Area, the forest reserve, and Children's Park at Government Residential Area (GRA).

The field visits to the study sites were accompanied with interview and those interviewed include officials of Katsina State Afforestation Project Unit (KTAPU), Forestry Department Ministry of Agriculture, Principals of Secondary Schools, and garden owners, officials of Katsina State Urban and Regional Planning Board, and staff of Maryam Babangida Children's Park. The interview question are on the condition of the plants, problems encountered, recent developments and recommendations for achieving effective vegetation cover in the urban area.

The data collected were complemented with secondary sources of data such as journal articles, conference papers, textbooks and internet sourced materials. The data was then edited, analyzed and presented using descriptive analysis in forms of tabulations, averages, percentages etc.

V. Review of Related Literatures

According to Cunningham and Cunningham (2006), urban sustainability in the developed world has brought about maintaining green belts in and around cities which provide recreational space and promote efficient land use as well as help ameliorate air and water pollution. Historically the main benefits of urban trees and forests relates to health, aesthetics and recreational benefits in industrialized cities such as New York and Paris where parks and other green areas are found even at the city centre or the central business district.

Chaudhry et al (2011) examined urban greenery status of some Indian cities and the results of the study indicate that urban greenery/forestry is one of the ways to bridge the gap between people and nature. According to the study most of the Indian cities are far behind inequality as well as quantity of urban forests than their counterparts in Europe and North America. High population density they noted is one of the reasons for underdevelopment of urban greenery sector in India.

In another study on Chandigarh, northern India Chaudhry et at (2013) observed that urban parks/gardens, wetlands, rivers and good landscaped environment provide intangible benefits that contribute to the quality of urban life. Also the enhancement of urban vegetation is one of the ways which has the potential to mitigate the adverse effects of urbanisation mainly pollution in a sustained manner. The study reported that Chandigarh, the beautiful city is one of India's planned cities where trees, plants and other green areas are as much as part of the construction plans as the buildings and the roads.

Akpan (2007),undertook a study on enhancing the value of trees in the urban environment of Akwa Ibom State south eastern Nigeria and concluded that majority of Nigerian cities fall short of enjoying the unquantifiable benefits trees provide urban environment such as beautification, micro-climate regulation, purify-cation of rain, protection from rain and wind erosion and conservation of biodiversity.

Umar and Kanu (2007) reported that in Nigeria's Federal Capital territory Abuja parks and gardens are created as part of Abuja Master Plan and they were established to make people to go there to relax at their leisure time as people need to refresh their minds after work, to recreate for the next day. It is based on this that today there are several parks such as Millennium Park, Abuja Zoological Park and gardens such as Abuja gardens, Apo Legislative Gardens which not only serves as places for recreation but improve the landscape of the Abuja environment.

Daramola and Ibem (2010) noted that in many urban areas of Nigeria the absence of updated master plans, lack of enforcing urban planning regulations, rapidly growing urban population and uncoordinated spatial urban growth have led to depletion of green areas and open spaces resulting in the loss of biodiversity with detrimental effects to the urban environment.

Alabi (2012) noted that in many towns that attained the status of State capital such as Lokoja, Jalingo, Gombe etc in 1991 to date there was an increase quest for land for urban development and consequently clearing of land for housing and road construction which consequently led to the clearing of natural landscape, the destruction of ornamental plants and trees which were left to rot due to negligence and lack of maintenance and a resultant increase in bare surfaces as a consequence areas that were once parks were taken over by buildings.

Enete et al (2013) examined the air pollution tolerance indices of tree species around Enugu urban area and reported that that the species provide good shade and high air pollution tolerance for the benefit of the residents of the city located in south eastern Nigeria. The results of the study can be handy for future planning and as well as providing tolerant species for landsc-aping and urban heat island mitigation.

One of the few vegetation studies in northern Katsina State was undertaken by Tukur et al (2013) who examined indigenous trees and their multipurpose uses in Dutsin ma area of Katsina State. The study found out that indigenous trees in the area play vital roles on the socio-economic development of the people and has made it possible for the people to undergo various trading activities of some useful parts of the trees.

Ene (2014) observed that in Nigeria in order to ensure a healthier urban environment for sustainable development there is need to create aesthetic values and beautify our cities using effective vegetation. Ene (2014) further observed that good landscaping is a powerful tool to achieve a pleasant environment. Landscaping contribute to visual satisfaction which could have a profound effects on the psychological nature of man (Ene, 2014).

VI. Results and Discussion

a) The vegetation covers in Katsina urban area and their present condition

A total number of seven (07) different types of vegetation cover were identified in Katsina urban area. These are road side planting, secondary schools planti-ng, gardens, green belt area, forest reserve, recreational parks and home planting. These were highlighted below:-

i. *Road side planting*

These are trees planted along the major roads from the city center through the city gates to roads outside the city (See fig.1). Road side planting has a long history dating back to the colonial period around 1910 when the then Emir of Katsina directed for the

planting of tree seedlings mainly neem (Azadirachta indica) along the major roads of the city. Today these trees mainly neem have grown big providing shade and place of business for petty traders and a resting place for people who sit in the day time. The table below shows the road side planting along the major roads.

Table 1 : Road side planting along major roads in Katsina city

S/N	Name of road	Dominant tree specie	Present conditions
1	IBB Way (A) (Kofar Kaura Road)	Neem trees (*Azadirachta indica*) India Almond trees (*Terminalia catappa*)	Trees in good condition but widely spaced in between
2	Nagogo Road (Kofar Durbi Road)	Neem tree (*Azadirachta indica*) Few other species	Some tree were cut due to road dualization project
3	Ahmadu Bello Way (Kofar Kwaya Road)	Neem Trees (*Azadirachta indica*) Other species planted by people	Trees in good condition but found mainly on one side of the road
4	Waziri Zayyana Road (Rafindadi Road)	Neem Trees (*Azadirachta indica*) Other species	Trees in good condition and the road has the dense collection of trees
5	Alkali Ibrahim Na Kaita Road (Kofar Yandaka Road)	Neem Trees (*Azadirachta indica*) Few other tree species	Trees in good condition but few and far in between. Need for more trees
6	IBB Way (B) (Kofar Guda Road)	Neem trees (*Azadirachta indica*) Few other tree species	Trees in good condition but few, others cut due to development
7	Muhammad Dikko Road (Kofar Sauri Road)	Neem trees (*Azadirachta indica*) Few other tree species	Trees in good condition but more trees need to be planted especially behind general hospital
8	Abdullahi Sarki Mukhtar Road (Mofar Marusa Road)	Neem trees (*Azadirachta indica*) Few other tree species	Trees in good condition Road narrow thus few trees near gate

Source : Field work, 2014

From table 1 could be observed that the trees are in good condition in about 80% of the roads. Most dense trees found along Waziri Zayyana Road where in some section of the road the trees form a canopy. But more trees need to be planted especially Alkali Ibrahim Na Kaita Road and Abdullahi Sarki Mukhtar Road this is because few trees where found along these roads as the roads were narrow along many sections. It was observed that some trees were cut as a result of the road dualization project of Nagogo road that leads to the Government Residential Area (GRA).There is the need for tree seedlings be replanted to replace those that were cut particularly fast growing tree species such as Incense tree (Eucalyptus sp.) that will grow within a short time and provide the services needed along the dual carriage road when completed.

ii. *Secondary schools planting programme*

The secondary schools planting programme is an initiative of Katsina Arid Zone Programme (KAZP) when it was funded by European Economic Community (EEC) now European Union (EU) and the Federal Government of Nigeria in 1990. The school's planting programme was carried out by Young Foresters Club which consists of students interested in forestry who were given tree seedlings to plant either in a school plantation or within the school compound (Ladan, 2004).The programme is aimed at making the youth to imbibe the culture of tree planting at a young age which will in the long run benefit the community and environment in general. The secondary schools planting programme can be seen on table 2 below:

Table 2 : Secondary schools planting programme in Katsina urban area

S/N	Name of school	Name of planting	Condition of planting
1	Government College Katsina	School compound planting	Big trees in a depression Trees intact and in good condition
2	Katsina College Katsina	School compound planting	Few trees could be seen in the school premises
3	Government Girls' College Katsina	School plantation	Plantation intact and in good condition. Another tree planting programme outside the school
4	Sir Usman Nagogo College of Arabic & Islamic Studies Katsina	School compound planting	Trees planted within compound intact, school also maintains a small garden.
5	Government Day Secondary School Kofar Yandaka, Katsina	School plantation	Plantation of trees intact, plans to revive school's garden
6	Government Pilot Secondary School K/Sauri Katsina.	School compound planting	Trees planted in compound have grown well and they are in good condition
7	Government Pilot Secondary School Kambarawa, Katsina	School plantation	Plantation intact and even fenced to avoid encroachment

Source : Field Work, 2014

The school compound planting involved planting of species of trees mainly neem (*Azadirachta indica*) within the compounds of the schools in different locations particularly along roads and paths. In the schools visited such as Government College Katsina and Government Pilot Secondary School Kofar Sauri the trees have grown well forming a canopy providing shade. The school's plantation involved planting of neem (*Azadirachta indica*) trees on a piece of land of about 2 hectares forming a plantation as the trees grow close to one another. In one of the schools visited Government Day Secondary School Kofar Yandaka, the plantation consist of 16 trees planted in 12 rows totaling 192 stands of trees. The school's Young Forester Club is very active as they have recently won a quiz competition on forestry organized by KAZP and the school's old students have planned a paper presentation titled the " The Significance of trees and Forests in Semi-arid Environment of Katsina State" coming up on 5th June, 2014.

iii. *Gardens*

These are planned cultivated pieces of land having fruit trees, ornamental trees specifically flowers or vegetable crops (Bellamy, 2007). In Katsina urban area three types of gardens are found. These are personal/private gardens, commercial/market garden and institutional gardens. One of the prominent private gardens in the urban area is Lambun Khadija owned by the former General Manager of KAZP. The plants found in the garden are mainly fruit trees such as mango (mangifera indica), guava (psidium guajava), orange (citrus sinensis) and other ornamental plants. Private gardens are significant habitats that improve connectivity by functioning as corridors and patches and thus enhance the overall network size of urban green spaces (Singh et at 2010). The commercial/market gardens are found outside the city wall at Kofar Marusa, Kofar Durbi and Kofar Sauri. Crops planted and cultivated for sale to the urban market include lettuce, onions, cucumber, carrots, green beans, peas, maize etc. KTAPU garden is one of the institutional gardens visited for the study. Tree species found in the garden include mango (mangifera indica), cashew (Anarcadium occidentale), gum Arabic (Acacia nilotica), lemon (citrus lemon), incense tree (Eucalyptus sp.), guava (psidium guajava), orange (citrus aurantium) etc. The trees in the garden have attracted different bird species that made nets on the trees and sings in the garden. The gardens with the dominant plant species can be seen of table 3 below.

Table 3 : Some selected gardens in Katsina urban area

S/N	Name of garden	Dominant plants	Present conditions
1	Lambun Khadija	Fruit trees and ornamental plants	Garden in good condition
2	Kofar Marusa gardens	Market garden crops	Crops in good condition but part of garden land converted to Filling Station
3	Kofar Durbi Gardens	Market garden crops	Garden plants in good condition, well catered for and watered
4	Kofar Sauri Gardens	Market garden crops and food crops	Garden plants in good conditions, well catered for and watered
5	KTAPU garden	Fruit trees and few others	Fruits trees show signs of physiological stress due to lack of water

Source : Field work, 2014

From the table it could be observed that the plants in both personal and commercial gardens are in good condition, though there is a reduction in the land area used for gardens at Kofar Marusa as part of the land previously used for gardening has been converted to Filling Station. The plants in institutional gardens are drying due to lack of adequate water supply as was seen clearly during field visit to the garden. The plants most of which are not drought resistant show symptoms of physiological stress due to moisture deficiency (Kawo et al., 2010). It was observed that over the last few decades there was a drastic reduction in the number of gardens in the urban area especially at Rafukka a residential area synonymous with gardens as the once green gardens have been converted to residential houses.

iv. *Green Belt Area*

This is a belt around a city where construction work and any form of land development is totally banned and the area is maintained by grasses, shrubs, forests or agricultural land, garden and open space which in some cases control the further expansion of the urban area (Lodha, 2007). A study by Ladan (1989), show that buffer zone or green belt area demarcated for undisturbed plant growth outside the northern part of the city and near Polo ground accounted for 3 per cent of the township land. According to KTAPU officials all the eight (08) city gates used to have a city wall as part of the green belt area. But as of today (April, 2014) only two city gates namely Kofar Durbi and Kofar Sauri have a plantation of plantation of Dum Palm (Hyphaeme thabaica) representing approximately 25 per cent of the former green belt area (see fig.2).

A Pilot project consisting of several stands of date palm (phoenix dectelifera) incorporated with community based irrigation scheme in an area 3.84 hectres outside Kofar Durbi – Kofar Sauri has become part of the remnant of the green belt area (see fig.3).

The situation of the green belt area in Katsina urban area is similar to what is obtained in many cities of Nigeria even Abuja where areas earmarked for green belts were being taken over corner shops and other structures (Aliyu, 2010).

v. *Recreational Parks*

The Maryam Babangida Children's Park established in 1989 is the only park in Katsina urban area serving as a place for children's recreation. The park is presently under Department of Girl Child Education and Child Development. The park comprises metal installations for children's play and variety of plants planted in different parts of the park. Some of the trees in the park include mango (mangifera indica), cashew (anacardium occidentale), guava (psidium guajava), lemon (citrus limon), orange (citrus sinensis), rubber tree (hevea brasiliensis), incense tree (Eucalyptus sp.) etc. A close observation on some of these trees have shown that they are drying due to lack of water examples include lemon and orange trees. Some of the trees were affected by various pests and diseases which affects their normal growth and reproduction.

Interview with staff of the park have reveal that there is lack of watering materials for the watering of the plants even though the park has many taps and overhead tank for that purpose. Also some of the trees were cut under the slight pretext of been affected by diseases and the wood used as firewood in homes.

The park is clearly in need of care particularly the various varieties of trees and shrubs planted which have to be well taken care of if they were to grow well and blossom.

vi. *Forest Reserves*

These are areas where trees were planted and allowed to grow well forming a forest and then declared a reserve where the trees cannot be cut for any purpose or land area used for any development. As Katsina is located at the fringes of the Sahara desert several areas were set aside as forest reserves. In 2003 one of the forest reserves at Goriba Road was degazetted, the trees cut and land used for the construction of Goriba Road Housing Units.

Today the only forest reserve located within Katsina urban area is the Modoji forest reserve (see fig.1). The reserve was created in 1950, located at an area of land outside Kofar Sauri to GRA extension and the dominant tree species is the neem tree (Ladan, 2013). It was observed during field visit to the reserve that only about 40 percent of the reserve remains as the remaining 60 per cent of the trees have been cleared and the land is used for extension of GRA, Katsina city ring road development project and the new Katsina State Government House. Furthermore it was also noted that some people have gradually started cutting of the trees in the reserve for use as fuel wood.

vii. *Home Planting*

This is the planting of different species of plants in people's homes to provide shade, good landscape and beautify the homes. Trees, shrubs and grasses used are the exotic or ornamental types that beautify the homes and their surroundings. Examples include Dodonia viscoser, Bouganvellia, Calyptus,Fan Palm, Rose flower, carpet grass, casuarinas, olive plant etc. Also planted are fruit trees such as mango- (mangalifera indica), guava (psidium guajava), cashew (Anacadium occidentalle), lemon (Citrus limon), paw-paw (Carica papaya), banana (Musa sapientum), ficus tree (Ficus sp.) etc. These are mainly planted in spacious bungalows, flats and mansions in GRA, Kofar Kaura residential layout, Goriba Road and Barhin housing units. They are also planted in the homes of well to do and VIPs found within the city wall. The plants are well maintained and catered for to serve the purpose of planting them.

b) Factors Hindering Achieving Effective Vegetation Cover in Katsina Urban Area

From the foregoing discussion on the condition of the plants in the seven vegetation types it is obvious that majority of the types are not in good condition and as such could not provide effective vegetation cover in the urban area. This arises due to the following factors:

i. *High demand for fuel wood*

There is high demand of fuel wood as a source of domestic energy for cooking. This is so as majority of the people of the urban area uses fuel wood and thus any tree that shows symptoms of ailment is quickly cut for fuel wood instead of been treated. People even encroach into forest reserves to obtain fuel wood and the situation is further aggravated by lack of cheap alternative such as kerosene or biogas.

ii. *Poorly enforced laws*

There are several laws enacted towards protecting trees planting on the road side and those in the forest reserves. These laws are ineffective as they are not fully enforced to punish offenders and serve as a deterrent to other people. The result is that people cut trees planted along the roads or even encroach into forest reserves without been apprehended by the law enforcement agents.

iii. *Uncontrolled Urbanization*

Katsina urban area has in the last few decades witnessed uncontrolled urbanization. Residential developments have taken place in environmentally sensitive areas such as fadamas/flooded area, wetlands, green belt areas, gardens and once proposed green areas. Also many areas that were once occupied by farm crops have been converted to residential use (Ruma and Sheikh, 2010). This uncontrolled and unguided urban expansion has drastically led to the reduction of areas covered by trees, shrubs and grasses

iv. *Lack of awareness on the relevance of vegetation*

There is lack of awareness from the people on the relevance of vegetation particularly forests in combating climate change. Many people in the urban area are not aware of the relevance of trees in assisting to reduce some of the environmental challenges facing the urban centre such as flooding, windstorms, hailstorms and heat waves. Furthermore, due to lack of awareness many local people see trees in their fuel value instead of their environmental relevance.

v. *Semi-arid climate of Katsina*

Katsina has a semi-arid climate which means that rainfall is seasonal falling mainly with four month and the annual rainfall average is about 780mm which are not sufficient for proper growth of plants. The result is that many trees shed their leaves thus unable to provide shade and other services needed. Also some of the trees in institutional gardens such as lemon, orange, tangerine and flowers face physiological stress and thus their growth and reproductive rates fall (Kawo et al., 2006).

vi. *State Government Negligence*

The Katsina state government has shown clear negligence towards protecting trees, forest reserves and green belt areas. This is demonstrated by failure to enforce laws to punish those who cut trees or encroach into forest reserves. The government has not attached importance to forest and forest protection by recently de-gazetted the Kabakawa forest reserve and using the land for the building of Peoples Democratic Party (PDP) secretariat and other commercial uses. The government has also failed to ensure the sale of Kerosene in Filling Stations at the official rate of N50 per liter to reduce the use of wood for domestic cooking which is very important as Katsina State in general is a state prone to desertification.

c) *Recent Developments towards Achieving Effective Vegetation Cover In Katsina Urban Area*

There are some recent developments that have occurred which are steps forward towards ensuring effective vegetation cover in Katsina urban area. These are outlined below:

1. Katsina State government has created the office of the Special Adviser Department of forestry. Budgetary allocations have been made to the department which allows it to purchase new Toyota hilux vehicles for field activities, motorcycles and bicycles for woodlot patrol guards. Canter vehicle for seedling distribution and water tanker for watering of seedlings. Tree planting by the department now include protection and employment of forest guard.
2. KTAPU presently placed under the department has its office at GRA Katsina fully renovated to boost the morale of staff to carry out their assigned duties and they have already started establishing new plantations across the State that comprise 250 fuel wood plantations and 150 industrial plantations. This besides about 250 hectares of land to be planted with tree seedlings across the length and breadth of the State.
3. The regular sale of kerosene at filling stations within the urban area has been observed which if it continues can reduce the high demand for fuel wood, thus saving the remaining trees and pockets of forests. However some Filling Stations sell at the rate of N110 per litre instead of the official rate of N50 which discourage many people from buying the product.
4. There were plans by the Department of Girl Child Education and Child Development to establish a new recreational park along Mani road complete with different varieties of plant species. The park when established will improve the vegetation cover of that part of the urban area.

VII. Recommendations

The following recommendations were made towards ensuring effective vegetation cover in Katsina urban area.

The state government should make a bold move towards providing an alternative source of fuel for cooking such as biogas and kerosene sold at official rate in all Filling Stations in the urban area. This is necessary in order to reduce the high demand for fuel wood to save the remaining trees within the urban area.

The State government should enforce strictly the relevant laws that were made to protect trees, forest areas and forest reserves. The enforcement of laws concerning the cutting of trees have proved effective in drastically reducing tree cutting in some developing countries such as India and thus can be applied to desert prone states of Nigeria. There should be the creation of improved awareness on the print and electronic media about the relevance of trees and forest in our environment towards reducing hazards such as floods, hailstorm, windstorms etc.

Environmentalists and environmental groups in the State should regularly organize paper presentations, workshops and symposia to further enlighten the general public on the relevance of trees, forests and forest reserves in our environment that is frown to desertification.

The State Regional and Urban Planning Board should henceforth be very strict to ensure that all residential developments are carried out in accordance to the Katsina city master plan recognized the position of green belt area and controlled open spaces. New areas of land should be demarcated and green belt area where tree seedlings, shrubs and grasses will be planted and protected.

The State government should give top priority to matters concerning vegetation in view of their importance towards improving our environment. Appropriate laws and legislations enacted and enforced, budgetary allocation and recognition should be given to the planting and protection of trees and shrubs in the environment.

VIII. Conclusion

Urban areas all over the world are today facing serious challenges as a result of increasing population, increase in their spatial growth and climate change. These challenges called for the need to protect the urban environment from degradation by improving the vegetation cover or the greenery of the urban areas. Katsina urban area is located at the fringes of the Sahara desert which necessitates the conservation and improve-ment of the vegetation to halt desertification among others. However, the various forms of vegetation are either reducing or not in good condition. It is necessary for the people and the government to stand up and improve the vegetation cover of the urban area to improve the environment for people to enjoy the benefits vegetation provides especially in urban areas. More trees, shrubs and grasses need to be planted to achieve effective vegetation cover in the urban area. In areas that need quick intervention such as along the road sides, incense tree (Eucalyptus sp.) should be planted as it is fast growing specie while in other areas such as in the forest reserve neem tree (Azadirachta indica) should be planted as it has been effective in the control of erosion and desert encroachment.

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