ASSESSMENT OF SOFT LANDSCAPE ELEMENTS PROVISION IN RESIDENTIAL BUILDINGS IN MINNA: TOWARDS LESSENING THE IMPACTS OF GLOBAL WARMING.

ADEBISI, G.O. and ONUWE, J.O.
Department of Architecture
Federal University of Technology, Minna, Niger State.
E-mail: adebisi.olabamiji@futminna.edu.ng, julius.onuwe@futminna.edu.ng

Abstract

This study assessed the soft landscape elements provision in residential buildings in Minna. Four neighbourhoods namely, Bosso Town, Minna central, Chanchaga and Kpakungu, being the most populated in Minna according to 2006 census were used for this study. Review of relevant literature, physical observation, and oral interview and structured questionnaire were used to obtain data. 100 houses were selected at random from each neighbourhood, 90, 92, 85, and 83 questionnaires were returned from the neighbourhoods respectively, making a total sample size of 350. Frequency table, and pie charts and percentages were used for data analysis. The result revealed that none of the neighbourhoods had up to 40% provision in any of the soft landscape elements under consideration, 32%, 47%, 69%, 68% respectively were the percentages of the residences with no provision for element of soft landscaping. The study further revealed that literacy level, income strength, and nature of ownership affects residents' perception of soft landscape elements provision in and around their buildings. It is recommended that government through Niger state Urban Development Board (NUDB) should ensure that all development proposals should be accompanied with landscape drawings for approval and must be adhered to and also stakeholders in built environment should embark on sensitization programme (public awareness) on the reality of global warming and enlighten the populace on the inherent benefits of soft landscape elements.

Keywords: Climate change, environmental crisis, global warming, soft landscape elements, thermal control.

Introduction

Climate change is unarguably the biggest environmental issue of our time. The persistent increase in the global temperature as a result of global warming has its negative effects cut across the natural, ecological as well as social system of our environment. At present, the earth is facing a rapid warming, and most scientists agreed that human activities have contributed in no small measure to this menace. The main cause of this warming is said to be the result of burning of fossil fuels, such as coal, oil, and natural gas which releases into the atmosphere carbondioxide and other substances known as greenhouse gasses. Micheal (2007) explained the theory behind global warming as an increase in greenhouse gasses causing a general warming over the earth and that is affecting global climate. Intergovernmental Panel on Climate Change (IPCC, 1990) defined climate change as, a phenomenon created by human beings and nature, which devastates the earth and causes hardship of unpredicted magnitude to the living. Also, United Nation on Environmental Programme (UNEP, 2000) defined climate change as, extreme reactions of the weather phenomenon which creates negative impact on agricultural resources, water resources, human health, and depletion of ozone layer, vegetations, soil and doubling of CO_2 in the ecosphere. A

report by the British Risk Consultancy, Maplecroft, published on October 31, 2013 has ranked Nigeria sixth among countries that are most vulnerable to the effects of climate change. The rating index was developed to identify climate risks to populations, governments and businesses over the next 30 years. Earlier study in 1991 by Oak Ridge National Laboratory, United State Department of Energy confirmed that Nigeria's contribution to climate degradation on the average is estimated at 0.2 ton of carbondioxide released into the atmosphere per person per year. In the same vein, World Bank in 2007 indicated that, Nigeria accounts for roughly one-sixth of the world-wide gas flaring which in turn spews some 400 million tons of carbon dioxide into the atmosphere. The 4th IPCC assessment report in 2007 concluded that Africa will be worst hit by the effects of Climate Change. Nigeria agricultural sector is climate driven, (Dinar, Hassan, Kurukulasuriya, Benhin, Mendelsohn (2006) submitted that many African countries which have their economies largely relied on weather-sensitive agricultural productions systems are particularly vulnerable to climate change even minor climate deterioration can cause devastating socio-economic consequences. IPCC (2007) supported by Deressa, Hassen, Alemu,Yesuf, and Ringler(2008) and Apata, Adeola and Samuel (2009) stated that there are enough evidences that climate change negative impact is already affecting crop yields in many countries, particularly in low-income countries, where climate is the primary determinant of agricultural productivity and adaptive capacities are low. Thermal control in buildings is highly essential in the tropics where high solar radiation is received throughout the year (Adegbie, Morisade, Ayeni and Dorcas, 2013). Nigeria, like many others in the tropics thus expended so much energy on the cooling of buildings through mechanical gadgets (generators) in the absence of

electricity which in turn releases more carbondioxide into the atmosphere. The need to engage in activities that reduce emission of greenhouse gasses (GHG) or enhance the capacity of carbon sink to absorb greenhouse gasses from the atmosphere has become a subject of discourse in recent times all over the world. Soft landscape elements like trees, shrubs and groundcover, climbers have been found very helpful in this respect. Since it is currently impossible globally to stop burning of fossil fuel and most especially in Nigeria, the easier means is to re-absorb carbondioxide from the air. Trees absorb the carbondioxide that contributes to global warming, as well as other gases that contribute to urban pollution. Wagner (2003) submitted that trees combat global warming by absorbing the carbon emitted by vehicles, lowering carbon emissions from fossil fuel, and reducing the energy used for climate control in buildings.

Benefits of Soft Landscape Elements
Soft landscape elements provide numerous benefits in our environment; which include environmental, health and psycho-social and economic benefits. James (2008) submitted that trees on a site are assets that can yield multiple ecological, economic and social benefits. The presence of adequate soft landscape elements most especially, trees and shrubs can be used to take carbondioxide out of the air. This absorption is based on the principle of photosynthesis; all plants make their food from carbondioxide from the air, water and solar energy. This food is used by the stem or trunk, roots, leaves, flowers and fruits. The absorption is possible because of the unique nature of trees and shrubs, they have woody stem and roots that grow larger on a yearly basis and this woody parts can last for decades or even centuries. Since tree stem and roots are made of carbon from carbondioxide, they serve as a long term storage place for carbon. Washington State Nursery and

Landscape Association (1988) submitted that an average tree absorbs 26 pounds of carbon dioxide from the air each year and releases enough oxygen each day to supply a family of four. In the same vein, Virginia Cooperative Extension (1996) submitted that Plants improve air quality. "One tree can remove 26 pounds of carbon dioxide from the atmosphere annually, equalling 11,000 miles of car emissions and also remove smoke, dust, and other pollutants from the air. Another study by Herrington (1980) stated that, in urban microclimates plants are useful in moderating the temperature effects of solar and infrared radiation, thus increasing comfort levels. Quite a number of studies were also carried out on the economic advantages of soft landscape. Trees as element of soft landscape provide shade, and can reduce heating and cooling cost of building. A study by The National Gardening Association (2002) in United States revealed that 85 million (79 percent) of U.S. households participated in some form of gardening activity in the year 2002. American consumers spent a total of $39.6 billion on their lawns and gardens in 2002, which was an increase of $1.9 billion or 5% over 2001. Equally, Taylor (2003) submitted that, spending 5% of the value of a home on the installation of a quality low maintenance landscape could boost the resale value by 15%, earning back 150% or more of the landscape investment. Workers with a view of natural elements, such as trees and flowers, experienced less job pressure, were more satisfied with their jobs and reported fewer ailments and headaches than those who either had no outside view or could only see built elements from their windows (Kaplan, Talbot and Kaplan, 1988), also in a survey of residents at nine multi-family housing sites, the most important factors in neighbourhood satisfaction were the availability of trees, well landscaped grounds and places for taking walks (Kaplan, 1985).

Statement of the Problem

Researchers have shown that there is a persistent increase in the average temperature of the atmosphere, oceans, and landmasses of Earth as a result of global warming and its effects is very devastating on natural, ecological as well as social system of our environment. Nigeria was sixth on vulnerability ranking by Maplecroft in 2013 with respect to effects of climate change. Minna, the capital of Niger State in the northern part of Nigeria, been in the tropics received high solar radiation throughout the year, and coupled with increasing global temperature requires adequate thermal control resulted in much energy been used to cool buildings. United Nations Environmental Programme (UNEP) in 2000 submitted that building construction and its related activities has been the major consumer of between 30 to 40% of the global energy consumption. In order to reduce the cost of energy for thermal control in buildings and consequently reduce the effect of global warming, provision of soft landscape elements is seen as a sustainable alternative.

Aim and objectives The study is aimed at assessing the provision of soft landscape elements in residential buildings in Minna, towards lessening the impacts of global warming. The objectives of the study are:

1. Evaluation of existing soft landscape elements provision (Trees, Shrubs, groundcovers and climbers) in the study area.
2. To assess the relationship between provision of soft landscape elements and literacy level of the residents.
3. To assess the relationship between provision of soft landscape elements and earning capacity of the residents.
4. To assess the relationship between provision of soft landscape elements and nature of ownership structure of the houses.

Study area

Minna, the capital of Niger state, the state is located between Latitude 8° 22N and 11° 30N and 7° 20E. The state currently covers a total land area of 74,244km, which make 8% of Nigeria's total area which make the state the largest in the country (NIGIS, 2014). Minna, according to the National Population Census (2006) has a population of 201,429 and the projections (2012) at 3.5% growth rate put the population of the town at 256, 274, with twenty four (24) neighbourhoods as shown in table 1.

Table 1: Population of Minna by Neighbourhood (2006) and 2012 Projection

S/n	Neighbourhood	Population 2006		Total population 2006	2012 population Projection
		Male	Female		
1	Kpakungu	9154	8621	17775	22615
2	Minna central	10040	9456	19496	24804
3	Barkin- Sale	3010	2843	5862	7458
4	Sauka-Kahuta	2201	2073	4274	5438
5	Bosso Town	22586	21270	43856	55794
6	Tundu Fulani	300	283	585	742
7	Chanchaga	11967	11269	23236	29586
8	Bosso Estate	300	283	583	742
9	Tayi Village	730	687	1417	1803
10	AngwaDaji	315	297	612	779
11	Shango	3344	3150	6469	8262
12	Tunduwada south	2201	2073	4274	5438
13	Tunduwada North	3344	3150	6469	8262
14	Makera	3401	3203	6604	8402
15	Maitumbi	9154	8621	17775	22615
16	Tunga	3344	3150	6469	8262
17	SabonGari	3401	3203	6604	8402
18	Fadipe	2201	2073	4274	5438
19	F- layout	3401	3203	6604	8402
20	Nasarawa	2201	2073	4274	5438
21	Dutse Kura	3401	3203	6604	8402
22	Limawa	2201	2073	4274	5438
23	Jikpan	3401	3203	6604	8402
24	GRA	2201	2073	4274	5438
	Total	**103,736**	**97,693**	**201,429**	**256,274**

Source: National Population Commission (2006) in Shaibu (2014)

Research Methodology

This research focuses on assessment of soft landscape elements (trees, shrubs, groundcover and climbers) provision in residential buildings, which include both rented and private residences. This study was conducted in Minna, the capital of Niger state. Four neighbourhoods were selected for the purpose of this research namely Bosso Town, Minna central, Chanchaga and Kpakungu. The choice of these neighbourhoods was based on the fact that they were the most populated in Minna according to 2006 National Population Commission census projected 2012 as presented in table 1, on serial number 1, 2, 5 and 7. The study adopted the review of relevant literature, physical observation, and oral interview, as well as structured questionnaire to obtain necessary data. 100 houses were selected

at random from each neighbourhood. At the end of the survey, 90, 92, 85, and 83 questionnaires were returned from Bosso Town, Chanchaga, Kpakungu and Minna Central respectively making a total sample size of 350. The data was analysed using simple statistical methods like frequency table, and pie charts and percentages.

Results and Discussion

The results of the evaluation of soft landscape elements provision (trees, shrubs, groundcover and climbers) in all the four neighbourhoods are presented in table 2 with their respective pie charts as presented in figure 1- 4.

Table 2: Evaluation of soft landscape elements in the four neighbourhoods

NEIGHBOURHOOD	SAMPLE SIZE	NO OF RESIDENCE WITH SOFT LANDSCAPE ELEMENTS (%)				
		TREES	SHRUBS	GROUNDCOVER	CLIMBERS	NONE
BOSSO TOWN	90	35 (37%)	13 (14%)	15 (16%)	1 (1%)	30 (32%)
CHANCHAGA	92	28 (30%)	10 (11%)	9 (10%)	2 (2%)	43 (47%)
KPAKUNGU	85	15 (17%)	10 (12%)	2(2%)	0 (0%)	59 (69%)
MINNA CENTRAL	83	20 (24%)	5 (6%)	2 (2%)	0 (0%)	56 (68%)

Source: Author's survey June, 2014
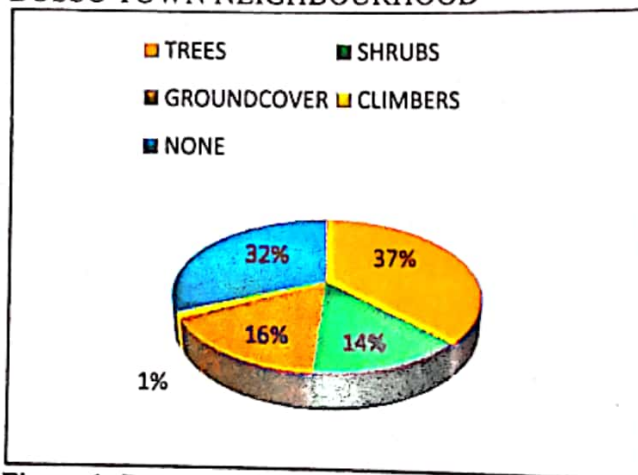
BOSSO TOWN NEIGHBOURHOOD

Figure 1: Percentages of soft landscape elements provision in Bosso Town.
Source: Authors' survey June, 2014
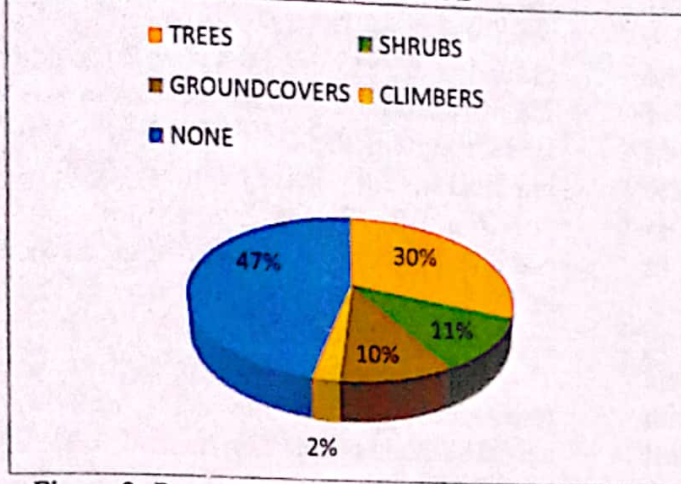
CHANCHAGA NEIGHBOURHOOD

Figure 2: Percentages of soft landscape elements provision in Chanchaga neighbourhood.
Source: Authors' survey June, 2014
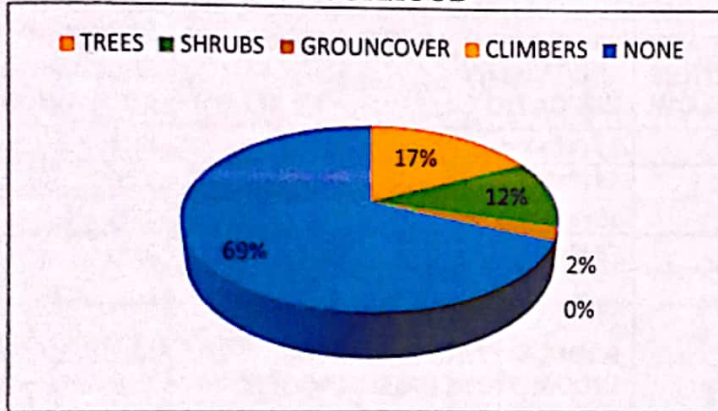
KPAKUNGU NEIGHBOURHOOD

Figure 3: Percentage of soft landscape elements provision in Kpakungu neighbourhood
Source: Authors' survey June, 2014
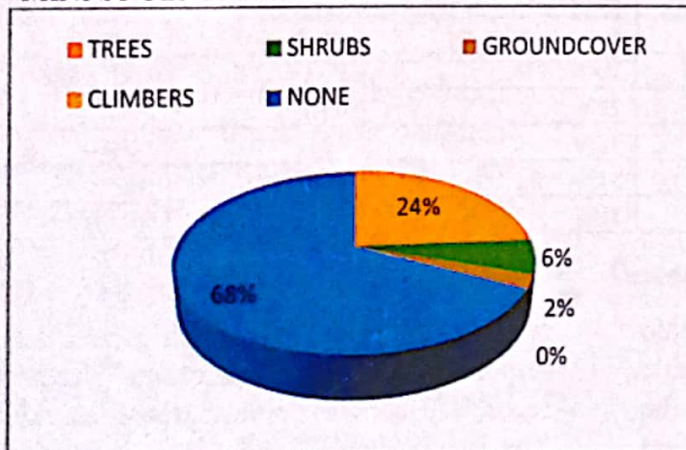
MINNA-CENTRAL NEIGHBOURHOOD

Figure 4: Percentage of soft landscape elements provision in Minna-central neighbourhood.
Source: Authors' survey June, 2014.

Figure 1, revealed that in Bosso Town, the percentages of houses with Trees, Shrubs, Groundcover, and climbers were 37%, 14%, 16%, 1% respectively. It was equally

shown that 32% of the houses did not have any type of soft landscape elements under consideration. Also in figure 2, which represent Chanchaga neighbourhood, the results established that the percentages of houses with Trees, Shrubs, Groundcover, and climbers were 30%, 11%, 10%, 2% respectively, 47% of the residences had no soft landscape elements at all. In Kpakungu neighbourhood, the study shown that percentages of houses with trees, shrubs, groundcover, and climbers were 17%, 12%, 2%, 0% respectively with 69% of the houses had no visible soft landscape elements as indicated in figure

3. Finally, in Minna central neighbourhood, the result revealed that the percentages of houses with trees, shrubs, groundcover, and climbers were 24%, 6%, 2%, 0% and 68% with no visible soft landscape elements provision. The implication of these results is that provision of soft landscape elements was not given priority in Minna despite all the inherent benefits of its presence in and around the building.

The demographic characteristics of respondents from all the four (4) neighbourhoods are summarized in the table 3.

Table 3: Demographic characteristics of the respondents N=350

NEIGHBOURHOOD	VARIABLES	RESPONDENTS (%)				PERCENTAGES OF SOFT LANSCAPE ELEMENTS PROVISION			
		SECONDARY EDUCATION AND BELOW	ABOVE SECONDARY EDUCATION			SECONDARY EDUCATION AND BELOW	ABOVE SECONDARY EDUCATION		
BOSSO TOWN	EDUCATION	7 (8%)	83 (92%)			14%	44%		
CHANCHAGA		6 (7%)	86 (93%)			16%	37%		
KPAKUNGU		30 (35%)	55 (65%)			5%	26%		
MINNA CENTRAL		5 (6%)	78 (94%)			7%	25%		
		LOW INCOME	MIDLLE INCOME	HIGH INCOME		LOW INCOME	MIDLLE INCOME	HIGH INCOME	
BOSSO TOWN	INCOME	11 (12%)	32 (36%)	47 (52%)		10%	18%	40%	
CHANCHAGA		14 (15%)	26(28%)	52 (57%)		9%	15%	29%	
KPAKUNGU		25 (29%)	40 (46%)	20 (25%)		5%	9%	17%	
MINNA CENTRAL		8 (10%)	35 (42%)	40 (48%)		4%	7%	21%	
		PRIVATE	RENTED			PRIVATE	RENTED		
BOSSO TOWN	OWNERSHIP	71%	29%			60%	8%		
CHANCHAGA		68%	32%			43%	10%		
KPAKUNGU		49%	51%			25%	6%		
MINNA CENTRAL		65%	35%			27%	5%		

Source: Authors' survey June, 2014

According to the demographic characteristics of the respondents (Table 3), the educational status shows that the percentages of respondents with education above secondary to secondary and below are as follows 92%-8%, 93%-7%, 65%-35% and 94%-6% in Bosso Town, Chanchaga, Kpakungu and Minna Central respectively (Table 3), which means that respondents with education above secondary school dominated the survey. The percentage rating of soft landscape elements shown that, respondents with education above secondary school made more provision in all the neighbourhoods (Table 3). In reference to the financial

capacity of the respondents, for the purpose of this study, respondents with income below N10,000.00 is termed low income group, between N11,000.00-N50,000.00 is middle income group and N51,000.00 and above as high income group. The results revealed that more provision is made for soft landscape elements in residences of high income category of all the neighbourhoods, and they reside in better apartments (Table 3). According to the percentage rating of soft landscape elements provision with regards to ownership structure in all the neighbourhoods, the study revealed that more provision were made in privately owned residences as shown in table 3.

Conclusion and Recommendations

Within the context of this study, the findings revealed that none of the neighbourhoods sampled had up to 40% provision in any of the soft landscape elements under consideration. The implies that, residents' of these neighbourhoods in Minna did not lay emphasis on the provision of soft landscape elements in and around their buildings, because majority of the residents know little or nothing about the menace of global warming and the benefits of soft landscape provision in and around their buildings. The study further concluded that educational status, income level, ownership structures played a significant role, or influence the residents' perception of soft landscape elements provision in and around their buildings. This study recommended that the government through Niger state Urban Development board should ensure that all development proposals for approval must be accompanied with landscape drawings which must be adhered to. Equally all other stakeholders in the built environment in conjunction with the government, as a matter of urgency embark on effective sensitization programme (public awareness) on the reality of global warming and enlighten the populace on the inherent benefits of providing soft

landscape elements in and around their building, as a simple, affordable and sustainable method of re-absorbing excess carbondioxide from the atmosphere and also controlling the microclimate, so that less energy is expended on cooling buildings.

References

Adegbie, M.O and Ayeni, D.A (2013) Soft Landscape Elements: Importance and Implications on Tropical Buildings, *International Journal of Development Research*, Vol3, Issue, 05 pp055-060, May 2013, http://www.journalijdr.com, ISSN 2230-9926, retrieved on 20th June 2014.

Apata, T.G, Adeola, A.O and Samuel, K.D (2009) Analysis of Climate Change Perception and Adaptation among Arable Food Crop Farmers in South Western Nigeria. *Contributed Paper prepared for presentation at the International Association of Agricultural Economists' 2009 Conference, Beijing,China, 16th - 22nd August.*

British Risk Consultancy, Maplecroft (2013), Nigeria ranks sixth in climate change effect index, http://www.punchng.com/business/homesproperty/nigeria-ranks-sixth-in-climate-change-effect-index/, retrieved on 25th January 2014

Deressa, T, Hassen R,.Alemu T, Yesuf, M, and Ringler, C. (2008) Analyzing the determinants of farmers' choice of adaptation measures and perceptions of climate change in the NileBasin of Ethiopia. International Food Policy Research Institute (IFPRI) Discussion Paper No. 00798. Washington, DC: IFPRI.

Dinar, A, Hassan, R, Kurukulasuriya, P, Benhin, J & Mendelsohn, R (2006), The policy nexus between agriculture and climate change in Africa. A synthesis of the investigation under the GEF/WB Project: Regional climate, water and agriculture: Impacts on and adaptation of agro-ecological systems in Africa. CEEPA Discussion Paper No. 39. Centre for Environmental Economics and Policy in Africa, University of Pretoria.*CBN Journal of Applied Statistics 2(1) No.1 47.*

Herrington, L.P. (1980). Plants and People in Urban Settings. *Proceedings of the Longwood Program Seminars* 12:40-45. Longwood Gardens, Kennett Squate, Pennsylvania.

Intergovernmental Panel on Climate Change (IPCC), (1990), First Assessment Report, http://www.ipcc.ch/ipcc reports/far/wg_i/ipcc_far_wg_i_ful l_report.pdf, retrieved on 20th January 2014.

Intergovernmental Panel on Climate Change (IPCC), 2007: Climate Change 2007: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fouth Assessment Report of the Intergovernmental Panel on Climate Change [Parry, Martin L., Canziani, Osvaldo F., Palutikof, Jean P., van der Linden, Paul J., and Hanson, Clair E. (eds.)].Cambridge University Press, Cambridge, United Kingdom, 1000 pp.

James A.L (2008) Site Analysis –A Contextual Approach to Sustainable Land Planning and Site design, (2[nd]ed), Hoboken, New Jersey, John Willey and Sons Inc., Pg.133.

Kaplan, R. (1985) Nature at the Doorstep: Residential Satisfaction and the Nearby Environment. *Journal of Architectural Planning Research* 2, Pp.115-127

Kaplan, S, Talbot, J.F and Kaplan, R. (1988), Coping With Daily Hassles: The Impact of Nearby Nature on the Work Environment, Project Report. USDA Forest Service, North Central Forest Experiment Station, Urban Forestry Unit Cooperative Agreement 23-85-08.

Micheal, K. (2007) "Landscape Trees and Global warming" Utah State University Forestry Extension, http://www.landmarkwest.org/gree n/landscapetrees.pdf, retrieved on 25th January 2014.

National Gardening Association (2002), Economic Benefits of Landscaping, http://www.nationalgardening.com/ RSRCH/feature.asp, retrieved 22nd January 2014.

National Population Commission (2006) Nigeria Population Census, http://www.population.gov.ng/inde x.php/censuses, retrieved on 21st April 2014.

Niger State GIS (NIGIS) (2014) Fact and Figure about Niger state, http:// www.nigergis.com/about-niger-state.aspx, retrieved on 10th August 2014.

Oak Ridge National Laboratory (1991) Carbon Dioxide Information Analysis Centre (CDIAC), US Department of Energy, http://www.ornl.gov/epubs/ndp/nd 055/html, retrieved on 12th January 2014.

41

Shaibu, I. S. (2014), An Assessment of Hospital Wastes Management in Minna: Towards a waste management approach in a Growing Urban Area, *Green Journal of Medical Sciences*, Vol4, pp 001-15, March 2014, www.gjournal.org, ISSN: 2276-7797, ICV 2012:5.98. retrieved on 12th October 2014.

Taylor, C. (2003) "Fertile Ground". *Smart Money*, http://www.smartmoney.com/mag/index.cfm?story=march03-cover, retrieved 22nd January 2014.

United Nation on Environmental Programme UNEP (2000) GEO-2000 Global Environmental Outlook, http:/www.unep.org/geo2000/English/001htm, retrieved on 15th March 2014.

Virginia Cooperative Extension (1996), Enhancing Our Environment Through Landscaping.

http://www.ext.vt.edu/departments/envirohort/articles/lawns_and_landscaping/enhanenv.html, retrieved 22nd January 2014.

Wanger, J. (2003), Urban Forestry:Making a Global Difference, *International Society of Arborculture, Arborist News* 12 (2): 26-28, April 2003.

Washington State Nursery and Landscape Association (1988), The benefits of Plants and landscaping, http:\\www.wsnla.org\retail\news\benefits.html, retrieved 22nd January 2014.

World Bank (2007) World Development Report 2007, Sustainable Development in a Dynamic World. Transforming Institutions, Growth, and Quality of Life. World Bank, Washington DC.

42