Review Article

Multi-criteria Analysis of Value Perceptions of Urban Native Tree Species by Residents, Estate Developers and Construction Companies in Abuja City, the Nigeria's Federal Capital Territory

ABSTRACT

This study was conducted to investigate the value perceptions of native tree species in urban landscape by three groups of environmental stakeholders – residents, estate developers and construction companies that reside in Abuja, the Nigeria's Federal Capital Territory. A Multi-Criteria Analysis (MCA) of landscape scale ecosystem functions and services valuation scenarios were used. A total of one hundred and eighty (180) sets of questionnaire were distributed equally among the three stakeholders (60 each) to ascertain their perceptions on the need to protect native tree species by asking them to rank eight reasons why the protection of native tree species is important in urban/city landscape. The reasons ranked were (i) Aesthetics and beautification of environment, (ii) Microclimatic and cooling effect, (iii) Windbreak, (iv) Erosion control, (v) Conservation of native tree species, (vi) Obstruction of view to enhance privacy (vii) Economic value of the species and, (viii) Any other reason. Results showed that Aesthetics and beautification of environment ranked first by a combination of all stakeholders, and also by Estate Developers alone, while Erosion control and Economic value of the species were ranked first by the Residents and the Construction Companies, respectively. Stakeholders' mean scores for Aesthetics & beautification of environment, Microclimatic & cooling effect, Conservation of native tree species, and Obstruction of view to enhance privacy, varied significantly ($p < 0.05$) while there was no significant differences in their mean scores for Windbreak, Erosion control, and Economic value of the species. The differences in the stakeholders' perception of the value of native trees as revealed by the rankings and significant differences in scores for some of the value criteria to a large extent underscore the values they place on them which in turn will influence their attitude towards the conservation and protection of the species. Therefore, the need for effective environmental education and enlightenment campaigns to sensitise all stakeholders on the overall values and roles of native trees in the city, is emphasized.

Keywords: Native trees, perception of values, environmental stakeholders, urban greening, Abuja

INTRODUCTION

Urban ecology, as it relates to cityscape, environmental planning and development, is rarely in focus in most cities across the globe at the early stage of town planning. In essence, urban areas modify their local and regional climate, and this happens through the urban heat island effects by altering precipitation patterns, which have significant impacts on net primary production, functions of ecosystems, and the biodiversity of the area (Elmqvist, *et al.,* 2013).

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One observed situation in some cities that is worrisome is the modification of the environment by the removal of natural vegetation/native tree species and their subsequent replacement with exotic/alien tree species, probably for enhanced beautification. The conservation of native tree species diversity in urban environment is very important for ecological, economic and social values. However, the extent to which native trees are conserved may largely depend on the perceptions of city planners, developers and residents towards them.

Cities need to be designed in a manner that ecosystems and biodiversity are supported in order to enhance the well-being of humans. Native tree species are important part of that natural ecosystem that is needed for such ecological systems' welfare. Native tree species are adjudged to have coevolved with their biotic dispersers and pollinators, and by this reasoning, there is coupling between the species (native plant and animal species) in order to have effective seed dispersal and pollination. Seed dispersal and pollination are the only indirect ways in which genes are transferred between and amongst populations, and these functionalities are important in sustaining a lively and healthy unban ecosystem that could support human populations, in the face of burgeoning global populations in the cities, especially in an era of climate change and its concomitant effects.

All over the world, cities provide the daily living environment for a growing part of the global population, and there has being an unprecedented rates of people moving into cities in Asia and Africa along with Latin America leading to urban land expansion (Maria *et al.,*2014). These rapid and expansive changes lead to considerable challenges for biodiversity, and also create new opportunities to protect nature in cities and beyond, and to enhance the values that nature in cities generates as prospects for inhabitants.

According to McDonald *et al.* (2013), much had being written about the challenges of urbanization in areas of hardware of cities which includes built city infrastructure, organization, governance, transportation systems, housing, water works, sanitation, and slums. However, much has not been written about the software of cities such as creativity, lifestyle, culture and learning institutions that enable the creation of pools of human capital, which gather critical mass and become drivers of innovation and prosperity. And even less is written about the ecological infrastructure of cities like the parks, gardens, open spaces, water catchment areas, ecosystems services and biodiversity (McDonald *et al.,* 2013).

In respect of ecosystems services, Barthel (2008) posits that the human economy depends upon the services performed free by ecosystems and that the ecosystem services supplied annually are worth

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many trillions of dollars. In a similar vein, economic development that destroys habitats and impairs services can create costs to humanity over the long term that may greatly exceed the short-term economic benefits of the development. These costs which are generally hidden from traditional economic accounting are real and are usually borne by the society at large. Ecosystem services are defined as benefits that humans obtain from ecosystem functions or as direct and indirect contributions from ecosystems to human wellbeing, such as clean air, food, water filtration, flood prevention, noise reduction, recreation, climate regulation, and nature education. Aesthetic values, beautification of environment, use of tree species as windbreaks and for microclimate amelioration, erosion control, conservation purposes, observing the landscape architecture, improving privacy and preserving the economic value of the native tree species all contribute to the important software component of the ecosystem. It is also important to note that perceptions by individuals on the functionality and benefits derived from ecosystems services vary.

Throughout the centuries the perception and preferences for landscapes by humans have been studied in such disciplines as aesthetics, environmental philosophy, landscape architecture, geography, ecology, psychology, social sciences and forest sciences (Daniel, 2001; Karjalainen, 2006). This study therefore, evaluated the perceptions of major stakeholders – residents, estate developers and construction companies, on the value of native tree species in Abuja, the Federal Capital Territory of Nigeria. An understanding of their perceptions could be useful in the designing and developing of environmental education/advocacy policies and programmes aimed at conserving native tree species in Abuja and other cities.

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MATERIALS AND METHOD

The Study Area

The study was conducted in Abuja City, the Nigeria's Federal Capital Territory (FCT). According to NAPEP (2003), this city lies on 8,000 square-kilometer land area. The FCT is located between latitude 8^0 25' and 9^0 25' north of the equator and longitude 6^0 45' and 7^0 45' east of Greenwich Meridian and shares boundary with Niger State in the West and North West, Nasarawa State in the East, Kogi State in the South, and Kaduna State in the North.

This enormous area was considered essential in order to allow room not just for the capital city but also for a city region that will provide most of the needs of the city, including parks, gardens, reserved green areas, water, forestry, industry, agriculture, defense, air transport and other needs

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(Danmole, 2004). The Federal Capital Territory is expected to cover an area of about 250 square kilometers, while the rest of the city region covers about 7,750 square kilometers (NAPEP, 2003).As shown in Figure 1 below, FCT has six (6) Council Areas that include Gwagwalada, Kuje, Kwali, Bwari, Abaji and the Abuja Municipal Area Council (AMAC) (OSGOF, 2015).

The area now designated the Federal Capital Territory (FCT) falls within the Guinean forest-savanna mosaic zone of the West African sub-region (Danmole, 2004). Patches of rain forest, however, occur in the Gwagwa plains, especially in the gullied terrain to the south and the rugged south-eastern parts of the territory. These areas of the FCT form one of the surviving occurrences of the mature forest vegetation in Nigeria. The vegetation of the FCT is divided into the three Savanna types, namely, the park or grassy Savanna, woodland Savanna and the shrub Savanna and they occupy about 53 percent of the total area. The Savanna woodland occurs mostly in the rugged and less accessible parts on the Gurara, Robo and Rubochi plains and the surrounding hills. Some native tree species found in the FCT include *Afzelia africana*, *Anogeissus leiocarpa, Annona senegalensis, Ceiba pentandra, Entada africana, Anthocleista vogelii, Bridelia ferruginea, Hymenocardia acida, Vitex doniana, Parkia biglobosia, Kigelia africana,Nauclea latifolia, Prosopis africana, Lophira lanceolata Ficus* Sp, *Daniella olivera* (Danmole, 2004), among others. Figure 1 is the Map of the Federal Capital Territory showing the Area Councils and some important landmarks.

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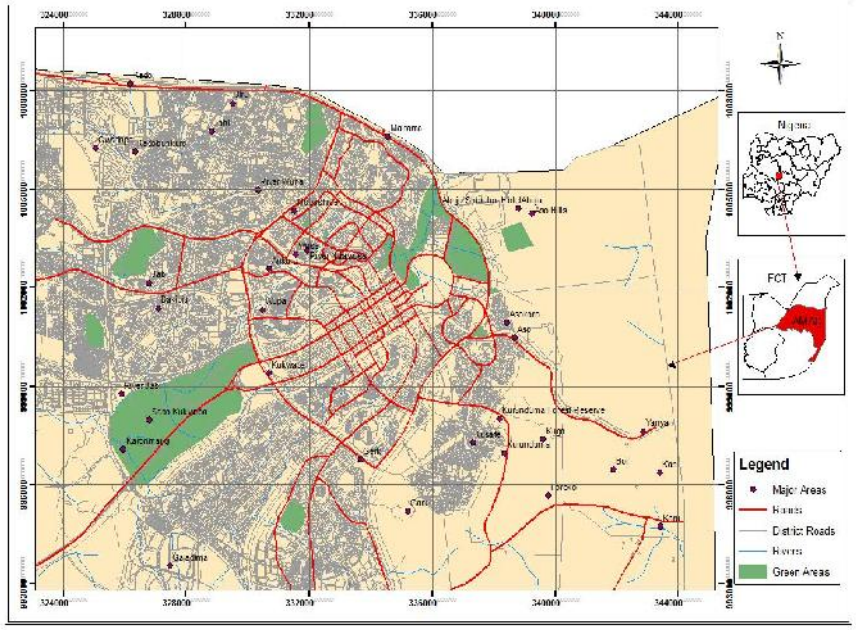

Figure 1: Map of FCT, Abuja, showing some public parks and gardens.
Source: OSGOF, 2015

Data Collection

A total of One hundred and eighty (180) sets of structured questionnaire containing eight (8) value items (Aesthetics and Beautification of Environment, Microclimatic and Cooling Effect, Windbreak, Erosion Control, Conservation of Native Tree Species, Obstruction of view to enhance privacy, Economic Value of the species and Any other reason) were administered to three (3) groups of environmental stakeholders (Residents, Estate Developers and Construction Companies) in order to ascertain their perceptions on values of protecting native tree species. The administration of questionnaire to the stakeholders (respondents) was done systematically to cover the three developmental phases of the Abuja Municipal Council (AMAC) and the suburb (Table 1). On a single questionnaire document, a scale of five (a, b, c, d, e) levels of scoring were categorized as: a = 70% and above; b = 60-69%; c = 50-59%; d = 45-50%; e = 1 - 44%, for each native tree species value item. The highest category of score was "a" which as indicated is 70% and above. A score of 70% and

above indicates high acceptability of a perceived native tree species value item by a stakeholder over other items. Not all value items were scored in all the questionnaires by the participants.

Table 1: Allocation of questionnaire to respondents

Location		Respondents			
	District	Residents	Construction Companies	Estate Developers	Total no of questionnaire administered
Gwagwalada	Area Council	10	10	10	30
Kuje	Area Council	2	2	2	6
Lugbe	Satellite town	5	5	5	15
Kubwa	Sub-urban district (AMAC)	3	3	3	9
Nyanya	Sub-urban district (AMAC)	3	3	3	9
Central Business District	District (AMAC)	3	3	3	9
Asokoro	District (AMAC)	3	3	3	9
Garki	District (AMAC)	9	9	9	27
Wuse	District (AMAC)	11	11	11	33
Jabi	District in Phase II (AMAC)	2	2	2	6
Gwarimpa	District in Phase III (AMAC)	7	7	7	21
Maitama	District in Phase I (AMAC)	2	2	2	6
TOTAL		**60**	**60**	**60**	**180**

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Data Analysis

Ranking of Native Tree Species' Value Items

The different score categories/ranges were assigned discrete scores [i.e. a (70 and above) = 5; b (60 – 69) = 4; c (50 – 59) = 3; d (45 – 50) = 2; and e (1 - 44) = 1] to enable the ranking of the different native tree value items according to the stakeholders' perceptions. For the overall ranking, scores for each native tree species value item were summed for all respondents and the total scores were used to rank them in a descending order. At the stakeholders' level (Residents, Estate Developers and Construction Companies), the scores for each native tree species value item were summed for each of the stakeholders and the total scores used to rank them in a descending order.

Analysis of Variance (ANOVA)

One-way analysis of variance was used to test for significant difference ($p < 0.05$) in the perceived value of the native tree species among stakeholders (Residents, Estate Developers and Construction Companies) for each of the value items. Fisher's Least Significant Difference (LSD) test was used for mean separation where significant difference occurred.

RESULTS

Value perceptions of Native Tree Species by a combination of all Stakeholders

The ranking of the perceived values of the native tree species by a combination of scores from all stakeholders is presented in Table 2. Aesthetics and beautification of the environment ranked first, followed by erosion control, microclimatic and cooling effect, economic value of the species, conservation of native tree species, windbreak, obstruction of view to enhance privacy, and spiritual/religious/medicinal reasons, respectively.

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Table 2: Ranking of value perceptions of native tree species by a combination of all Stakeholders

S/No	Perceived Values of Native Tree Species	Score Criteria a x n	b x n	c x n	d x n	e x n	Total Score	Rank
1	Aesthetics and Beautification of environment	255	12	63	36	53	419	1st
2	Microclimatic and Cooling effects	120	144	72	36	41	413	3rd
3	Windbreak	45	72	90	66	54	327	6th
4	Erosion control	60	168	90	78	20	416	2nd
5	Conservation of native tree species	60	144	54	30	62	350	5th
6	Obstruction of view to enhance privacy	0	60	36	24	86	206	7th
7	Economic value of the species	225	36	27	30	65	383	4th
8	Any other reason (s) (spiritual, religious and medicinal)	0	0	0	0	9	9	8th

a = 5; b = 4; c = 3; d = 2; e = 1; n = number of respondents that scored a value item in each score category

Value perceptions of Native Tree Species by Different Stakeholders

The ranking of the perceived values of the native tree species by the scores from each stakeholder is presented in Table 3 for Residents, Table 4 for Estate Developers and Table 5 for Construction Companies.

According to the residents (Table 3), erosion control ranked first, followed by microclimatic and cooling effect, conservation of native species, aesthetics and beautification of the environment/economic value of the species, windbreak, obstruction of view to enhance privacy, and spiritual, religious and medicinal reasons, respectively.

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Table 3: Ranking of value perceptions of native tree species by the residents

S/No	Perceived Values of Native Tree Species	Score Criteria					Total Score	Rank
		a x n	b x n	c x n	d x n	e x n		
1	Aesthetics and beautification of environment	45	12	18	18	18	111	4th
2	Microclimatic and cooling effects	45	0	54	12	12	123	2nd
3	Windbreak	30	24	18	6	24	102	6th
4	Erosion control	30	72	9	24	6	141	1st
5	Conservation of native tree species	15	60	18	6	18	117	3rd
6	Obstruction of view to enhance privacy	0	12	0	18	33	63	7th
7	Economic value of the species	60	12	9	6	24	111	4th
8	Any other reason (s) (spiritual, religious and medicinal)	0	0	0	0	9	9	8th

a = 5; b = 4; c = 3; d = 2; e = 1; n = number of respondents that scored a value item in each score category

The estate developers' perspective (Table 4) ranked aesthetics and beautification of the environment first, followed by microclimatic and cooling effect, erosion control, economic value of the species, windbreak, conservation of native species, obstruction of view to enhance privacy and spiritual/religious/medicinal reasons, respectively.

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Table 4: Ranking of value perceptions of native tree species by the estate developers

S/No	Perceived Values of Native Tree Species	Score Criteria					Total Score	Rank
		a x n	b x n	c x n	d x n	e x n		
1	Aesthetics and beautification of environment	165	0	18	6	14	199	1st
2	Microclimatic and cooling effects	45	108	0	18	11	182	2nd
3	Windbreak	15	12	63	36	15	141	5th
4	Erosion control	0	72	54	36	5	167	3rd
5	Conservation of native tree species	0	60	18	18	29	125	6th
6	Obstruction of view to enhance privacy	0	24	18	6	32	80	7th
7	Economic value of the species	105	0	18	12	26	161	4th
8	Any other reason (spiritual, religious and medicinal)	0	0	0	0	0	0	8th

a = 5; b = 4; c = 3; d = 2; e = 1; n = number of respondents that scored a value item in each score category

The construction companies ranked economic value of the species first, followed by microclimatic and cooling effect/erosion control/conservation of native species, aesthetics and beautification of the environment, windbreak, obstruction of view to enhance privacy, and spiritual/religious/medicinal reasons, respectively (Table 5)

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Table 5: Ranking of value perceptions of native tree species by the construction companies

S/No	Perceived Values of Native Tree Species	Score Criteria					Total Score	Rank
		a x n	b x n	c x n	d x n	e x n		
1	Aesthetics and beautification of environment	45	0	27	12	21	105	5th
2	Microclimatic and cooling effects	30	36	18	6	18	108	2nd
3	Windbreak	0	36	9	24	15	84	6th
4	Erosion control	30	24	27	18	9	108	2nd
5	Conservation of native tree species	45	24	18	6	15	108	2nd
6	Obstructing view to enhance privacy	0	24	18	0	21	69	7th
7	Economic value of the species	60	24	0	12	15	111	1st
8	Any other reason (spiritual, religious and medicinal)	0	0	0	0	0	0	8th

a = 5; b = 4; c = 3; d = 2; e = 1; n = number of respondents that scored a value item in each score category

Comparative Evaluation of the Stakeholders' Perception of the Native Tree Species

The extent of variation regarding the views of the various stakeholders on each of the perceived values of native tree species as revealed by their mean scores is presented in Table 6. The mean scores of the three stakeholders did not vary significantly for windbreak, erosion control, and economic value of the species. The mean scores for aesthetics and beautification of environment varied significantly among stakeholders except between residents and construction companies, with estate developers having the highest mean score, followed by residents and construction companies, respectively. On microclimatic and cooling effects, a significant difference was only observed between estate developers and the construction companies, with the two stakeholders also having the highest and lowest mean scores, respectively. A significant difference was also only observed between estate developers and the construction companies in the scoring of the perceived conservation value of native tree species,

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although the highest and lowest mean scores were given by the construction companies and the estate developers, respectively. The mean scores for obstruction of view to improve privacy varied significantly among stakeholders except between residents and estate developers.

Table 6: Variation in the perceived values of native tree species among stakeholders

S/No	Value	Mean Score		
		Residents	Estate Developers	Construction Companies
1	Aesthetics and beautification of environment	2.47 ± 0.23^{a}	3.63 ± 0.23^{b}	2.33 ± 0.23^{ac}
2	Microclimatic and cooling effects	2.73 ± 0.21^{ac}	3.32 ± 0.20^{ab}	2.57 ± 0.24^{c}
3	Windbreak	2.27 ± 0.23^{a}	2.35 ± 0.14^{a}	2.15 ± 0.19^{a}
4	Erosion control	3.13 ± 0.20^{a}	2.83 ± 0.13^{a}	2.77 ± 0.22^{a}
5	Conservation of native tree species	2.60 ± 0.22^{ac}	2.12 ± 0.17^{ab}	2.77 ± 0.26^{c}
6	Obstructing view to enhance privacy	1.40 ± 0.12^{a}	1.70 ± 0.16^{ab}	$1.91 \pm 0.22b^{c}$
7	Economic value of the species	2.47 ± 0.26^{a}	2.73 ± 0.24^{a}	2.85 ± 0.28^{a}
8	Any other reason (Spiritual, religious & medicinal)	1.00 ± 0.00	-	-

Means with the same alphabet on the same row are not significantly different ($p \geq 0.05$)

DISCUSSION

The importance of a study of this nature cannot be over-emphasized as effective conservation policies and programmes for native trees in urban landscapes and cities will rely to a large extent on a comprehensive understanding of the values different categories of people who make use of them, attach to them. As observed by several authors (e.g. MartinezAlier *et al.,* 1998; Chan *et al.,* 2012; Martín-López *et al.,* 2013), valuation of ecosystem services involves dealing with multiple, and often conflicting value dimensions. Multicriteria analysis of landscape scale valuation scenarios used in this study was tailored towards immediate webs of ecosystem services which are the outcome of certain ecosystem functions. Qualitatively and quantitatively, Aesthetic and Beautification of the Environment, Microclimatic and Cooling Effect, Windbreak, Erosion Control, Conservation of Native Tree Species, Obstructing View to Improve Privacy, and lastly Economic Values are some of these

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services that could emanate from functions like regulating, supporting, provisioning and cultural ecosystems function categories. Value perceptions of these multiple functions were ranked to show the order in which stakeholders value native tree species.

Overall, Aesthetics and Beautification of the Environment ranked first. This outcome is not surprising because, aesthetics is a primary dimension of people-landscape interactions (Gobster, 1996). This finding suggests the influence of good-looking appearance of forest generally, and native tree species in particular on the overall public attitude towards sustainability of forest management practices. –It is therefore not surprising that, integration of aesthetic aspects into landscape management both in research and in practice was suggested by landscape managers (Marina, 2011; Ode, 2003).

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Using the concept of multifunctional landscape, a wide range of data can be integrated into a management process. For instance, and in this study, Erosion Control was ranked second when scores by all stakeholders were pooled. This indicates that most people would like to conserve native tree species for erosion control. The use of vegetation to control soil erosion has been practised for many centuries, with the use of trees to stabilise dams in China dating as far back as the 16th century (Evette *et al*., 2009). As at today, the practice of using vegetation to stabilize slope has been successfully applied throughout the world. The vegetation and erosion control process are interrelated by the ability of the plants growing on soil and the interaction of root and soil (Pret & Giadrossich, 2009). This can be done through removal of water from the soil profile, and subsequently passing it out into the air as vapour. Also, interception of rain by tree canopies from directly impacting the soil is also a way of reducing erosion by trees. The other important function relates to the tree roots' ability to hold the soil together. Roots in the soil provide structural integrity. Trees have deeper, stronger, more extensive root systems when compared with pasture plants, which help to reduce mass movement erosion. It is therefore not surprising that, the motives behind preservation of native tree species can be strongly linked to erosion control. Some of the perceptive factors are co-joined and inseparable; a native tree species spared or protected to salvage erosion could also conveniently render other ecosystem and social functions like microclimatic and cooling effect, windbreak, obstruction of view to enhance privacy, and spiritual/religious/medicinal reasons, without compromising its economic values. These facts underscore the multipurpose nature of many tree species.

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Considering the perceptions of the different stakeholders independently, residents ranked erosion control first. Erosion is physical and has direct devastating effects on both plants and animals.

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It constitutes an ecological danger in settlements, is therefore an important factor to consider by the residents. Microclimatic and cooling effect, conservation of native species, aesthetics and beautification of the environment were also highly valued by the residents. This is because trees can ameliorate the harsh effects of the environment by creating suitable microhabitats, which benefit the residents hugely. Direct benefits of native tree species are enjoyed by residents. Economic value of the species, windbreak, obstruction of view to enhance privacy, and spiritual, religious and medicinal reasons are some of such vital values that residents enjoy on daily basis unannounced. This undoubtedly, affirmed the claim that, plant species are vital components of both religious belief and traditional medicine (Sofowora, 1982).

Estate developers build cities bearing in mind the need to meet the expectations of the end users (the residents). It is therefore not surprising that aesthetics and beautification of the environment ranked first. Estate developers are themselves residents somewhere and therefore are knowledgeable about the needs of other city inhabitants. Factors like microclimatic and cooling effect, erosion control, and economic value of the species, windbreak and conservation of native species are essentially aspect of environmental protection elements that are traditionally incorporated into city planning and development. Obstruction of view to enhance privacy and spiritual/religious/medicinal reasons might rank least because; it may not generally be acceptable that native tree species can obscure view and thereby enhancing privacy. Moreover, estate developers of international standard might not think about spirituality, religiosity and medicinal values of tree species in developing building concepts.

In respect of the construction companies, economic value of the native species ranked first. This may not be far from the fact that companies are out to make profit, and could mostly do valuations through economic prism of financial gains. All things being equal, other associated value perceptions are complementary and therefore are hidden, and exist in inform of software packages (McDonald *et al.,* 2013). Construction companies are not likely to conserve any native species, maybe due to speculations that such trees are good for religious or medicinal values, not even for any of the perceptions.

Looking at the stakeholders' perceptions comparatively, it is not out of place that the mean scores of the three stakeholders did not vary significantly for windbreak, erosion control, and economic value of native tree species because these values have direct influence on the wellbeing of individuals comprising all the stakeholders. However, aesthetics and beautification of environment varied significantly among stakeholders except between residents and construction companies, with

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estate developers having the highest mean score, followed by residents and construction companies. The construction companies have zero tolerance for native tree species conservation, as that will rather obstruct construction. The value perception gaps between residents and construction companies is so wide because residents are closer to nature, and they are knowledgeable about the usage of plant species for several reasons including ecological and social values. In addition, microclimatic and cooling effects, and conservation value of native tree species perceptions, unarguably varied significantly between estate developers and the construction companies. As earlier stated, estate developers usually uphold the satisfactions the end users of their properties will derive in the designing and building of their properties. However, construction companies only focused on getting their jobs done to earn their money. That may also be the reason why obstruction of view to improve privacy varied significantly among stakeholders except between residents and estate developers. The ecological, social and economic values of native tree species perceived by the two stakeholders are strikingly similar.

Conclusion and Recommendations

There were differences in the stakeholders' perceptions of the value of native tree species. To a large extent, the residents' and estate developers' perceptions of the value of native tree species in the City were more similar than when those of each of the two stakeholders were compared with those of the construction companies. These differences in the stakeholders' perception of the value of native trees to a large extent underscore the values they place on them which in turn will influence their attitude towards the conservation and protection of the species. Inasmuch as all tree species have vital ecological, social and economic roles to play in an ecosystem, species indigenous and native to a particular region have more fundamental roles to play. For instance, co-evolution or coupling between plants and animals species is essentially needed for both seed dispersal and pollination, without which genetic diversity could degenerate. Also, residents benefit directly from natives tree species by enjoying a more serene environment, native fruits and other tree products, and more species of birds visiting their home gardens.

-Therefore, the need for effective environmental education and enlightenment campaigns to sensitise all stakeholders on the overall values and roles of native trees in the city, is emphasized. This is because; estate developers in Abuja are not necessarily always educated professionals but rather sometimes not very educated investors. The professionals that work for them just do what they say, it

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appears that estate developers are not knowledgeable about the value of biodiversity as it relates to well-being of residents. Again, it may require legislation requiring the preservation a certain proportion of native vegetation in any development plan.

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REFERENCES

Barthel, S. (2008). Sustaining urban ecosystem services with local stewards participation in Stockholm (Sweden). *Ecology and Society* 21, 305-320.

Chan, K. M. A., Satterfield, T., & Goldstein, J. (2012). Rethinking ecosystem services to better address and navigate cultural values. *Ecological Economics,* 74, 8–18.

Daniel, T.C. (2001). Whither scenic beauty? Visual landscape quality assessment in the 21st century. *Landscape and Urban Planning* 54, 267–281.

Danmole, T. O. (2004). Sustainability and City development: A Critique of the Implementation of the Abuja Master Plan. Unpublished paper presented by Environmental Conservation Research Team, FUT- Akure, Nigeria, September, 2004.

Evette A. Labonne S. Rey F. Liebault F. Jancke O. Girel J. (2009). History of bioengineering techniques for erosion control in rivers in western Europe. *Environmental Management* .43, 972-984.

Gobster P. H. (1996) Forest Aesthetics, biodiversity, and the perceived appropriateness of ecosystem management practices. In: Brunson M. W., Kruger L. E., Tyler C. B., and Schroeder S. A. (Eds.). *Workshop on Defining on Social Acceptability Forests and Forestry Practices* . General Technical Report PNW-369, 77–98. Seattle: USDA Forest Service, Pacific Northwest Research Station.

Karjalainen, E. (2006). The Visual preferences for Forest Regeneration and Field Afforestation – Four Case Studies in Finland. Doctoral Dissertation. Faculty of Biosciences, Department of Biological and Environmental Sciences, The Finnish Society of Forest, Helsinki.

Elmqvist T., Karen C. S. and Susan, P (2013). A Global Outlook on Urbanization in *Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities: A Global Assessment*, (eds.). doi: 10.1007/978-94-007-7088-1

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Maria, S., Maria, T., Harini, N., Madhusudan, K., & Thomas, E. (2014) What is the Scope of nature in the city? *Current Conservation* 8(1) 4-5 https://www.currentconservation.org/ .

Marina, G. (2011) Aesthetic Values of Forest Landscapes. Master thesis, Swedish University of Agricultural Sciences. Alnarp.

Martín-López, B., Gómez-Baggethun, E., García-Llorente, M., & Montes, C. (2013). Trade-offs across value-domains in ecosystem service assessment. *Ecological Indicators* doi: 10.1016/j.ecolind.2013.03.003

MartinezAlier, J., Munda, G., & O'Neill, J. (1998). Weak comparability of values as a foundation for ecological economics. *Ecological Economics,* 26 (3), 277–286.

McDonald, I., Elmqvist, T.; Fragkias, M.; Goodness,J.; Güneralp, B.; Marcotullio, P. J.; Parnell, S.; Schewenius, M; Sendstad, M; Karen C. S. and Wilkinson, C. (2013) Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities A Global Assessment and A Part of the Cities and Biodiversity Outlook Project DOI 10.1007/978-94-007-7088-1. Springer Dordrecht Heidelberg New York London Library of Congress Control Number: 2013950081.

National Poverty Eradication Programme (2003) *Overview of Abuja: Federal Capital Territory.* www.napep.com/states/abuja_states.html

Ode, A. (2003) Visual aspects in urban woodland management and planning. Doctoral dissertation, Swedish University of Agricultural Sciences, Department of Landscape Planning, Alnarp.

Office of the Surveyor General of the Federation Republic of Nigeria, OSGOF (2015) Map of Abuja, Federal Capital Territory, Nigeria Showing Public Parks and Gardens.

Preti F. & Giadrossich F. (2009) Root reinforcement and slope bioengineering stabilization by Spanish Broom (*Spartium junceum* L.). *Hydrology and Earth System Sciences*.13, 1713-1726.

Sofowora, A. (1982). *Medicinal Plants and Traditional Medicines in Africa*.2nd edition. Spectrum Books: Ibadan, Nigeria.

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