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Urban Dwellers' Attitude and Preferences for Forest Ecosystem Services Provided by Urban Forests in Nigerian Cities

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Abstract

The existence of trade-offs and synergies between ecosystem services emphasises the need to understand the preferences of ecosystem service beneficiaries. This study aims to empirically investigate the public's willingness to pay (WTP) for the conservation of urban forests and the derived ecosystem services in two selected cities (Kano and Sokoto) in northwest Nigeria. Three hundred (500) respondents were selected for the questionnaire administration through interviews and group discussions. Descriptive statistics, contingent valuation method (CVM) and Pearson regression model were employed to analyse the data generated. The results of this study indicate that a substantial portion of respondents in these two cities are aware of the various benefits and importance of urban forests to the peoples' well-being, as revealed by the study results. The mean, frequency counts, and percentages of respondents' preferences for forest ecosystem services were lower than those of the other two cities. The proportion of respondents who are willing to pay for urban forest services is higher than those who do not pay for forest services. This study provides insight into the necessity of citizen participation in managing urban trees as part of their citizen rights and obligations to society. It is envisaged that this study will open up public discourse with decision-makers, town planners and other change agencies concerned with forest and tree resource management on including the total economic value of urban trees in policy, planning and future development projects in cities in developing countries.

Keywords: Willingness-to-pay, conservation, ecosystem services, urban forests.

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Introduction

Urban forests contribute to the natural forest ecosystems vital to public health and increase the quality of life of the urban population (Arnberger and Haider 2005; Bolund and Hunhammar 1999; Raudsepp-Hearne *et al.* 2010). The increasing rural-urban migration in search of greener pastures has created an atmosphere for the increasing population of urban settlements across the globe. Nigeria's demographic landscape presents a mix of high growth rates and intense rural–urban migrations in search of a better life and increased infrastructure within the urban settlement. Adekunle *et al.* (2008) indicated that half of the world's population already lives in cities, with no exception in Nigeria's context. Dye's (2008) study opined that half of the world's population already lives in cities. United Nations predicted that the proportion of the urban population will exceed 67% of the world's entire population (UN 2010). The urban population growth in Nigeria has been

increasing rapidly over the past five decades, increasing from 34 million in 1950 to 141.4 million in 2005, with a projected rise to 193.1 Million in 2020 (UN, 2021; Fuwape and Onyekwelu, 2011).

This incremental population trend has increased the pressure on urban forests, thereby demanding a high level of urban forest management, which influences the provision of ecosystem services to the people and has become an important issue in urban management policy. Urban forests perform ecosystem functions as elements of urban areas and ecosystems (Adamowicz *et al.* 1994; Bolund and Hunhammar 1999; Higgins *et al.* 1997). These ecosystem functions transpire into ecosystem services, which are the tangible or intangible resources that ecosystems provide to humanity and contribute to promoting a healthy environment (Arnberger and Eder 2011; De Groot *et al.* 2002; MEA 2005; TEEB 2010). The management of urban forests would enhance the forests' healthy nature and form the basis of a a sustainable metropolitan city. Healthy urban forest contributes significantly to the well-being of humans, support healthy ecosystem functions and provide adequate provision of ecosystem services, which leads to the efficiency of the city (Agbelade *et al.*, 2022; Arabomen *et al.*, 2019; Mcpherson *et al.,* 2005). Research has indicated numerous valuable products derived from urban forests. There is a growing number of researchers who tend to determine the economic benefits of urban forest trees based on the level of population attitude and preference for urban forest ecosystem services (Bernath and Roschewitz 2008; TEEB 2011; Hoyos *et al.* 2009; Tyrvдinen and Miettinen 2000).

There are numerous ecosystem services and other important services that are generated from urban forests, such as improvement in air quality, watershed protection and purification, regulation of environmental temperature, biodiversity conservation and improved landscape structure for environmental beautification (Adekunle *et al.* 2012; Agbelade *et al.* 2017; MEA, 2005; Koo *et al.* 2013). Urban forests deliver tangible and intangible goods and services justifiably, including them as part of basic urban infrastructure (Arabomen et al. 2019; Hanley et al. 1998; Konijnendijk *et al.* 2004). Urban forestry could be a means of catalysing community development, especially in developing countries. This study sought to investigate the urban dwellers' attitudes and preferences for forest ecosystem services provided by urban forests in Nigeria. Urban forests' social and cultural dimensions (such as recreation, parks and gardens) are more popular in developed than developing countries (Agbelade and Onyekwelu 2020; Ahn 2013). Urban greens can positively impact physical and mental health by providing physical exercise settings and reducing air pollution and stress (Adekunle et al. 2008; Ajewole and Popoola 2001; Fisher *et al.* 2009). The high population density and limited urban forest ecosystem services in city centres further emphasise the need to pay more attention to urban forest design, planning and management to deliver the maximum benefits. In addition to extensive research on ecosystem services over the past decade, several studies have been conducted to value the ecosystem services provided by urban ecosystems (Adekunle *et al.* 2012; Koo *et al.* 2013). Various studies have indicated preferences for urban forest ecosystem services to be based on the social status of the urban populace (Adekunle and Sanni 2009; Adekunle and Agbaje 2012; Faleyimu and Akinyemi 2014). However, in Nigerian cities, there has been a lack of research(es) on the urban dwellers' willingness to pay for restoration and conservation of urban forests to provide the resultants ecosystem services by urban forest users to provide decision-makers with key information for the development and management of urban forests. This research aims to provide information on urban dwellers' attitudes and preferences of forest ecosystem services and, based on this information, make recommendations for efficient urban forest management.

Methodology

Study Area

The study was conducted in two selected cities (Kano and Sokoto), Northwest of Nigeria (Figure 1). The cities selected are the capital cities of these States with the highest population density and improved infrastructural development. Kano metropolis is located between latitudes 11° 51' to 12° 08' north and longitudes 8° 25' to 8° 39' east at an average altitude of approximately 472 m above sea level. It is situated centrally in Nigeria's northern region, about 900 km from

the edge of the Sahara desert and approximately 1140 km away from the Atlantic Ocean within the Sudano-Sahelian ecological zone of Nigeria (Mohammed *et al.* 2015). Kano metropolis comprises eight local government areas, and the city's climatic condition is characterised as a tropical wet and dry savannah, according to Koppen's climatic classification. The wet season often begins in June and September annually, while the dry season typically commences in October and May. As such, the climatic features of the city are similar to those of West Africa's savannah region. The city's mean annual temperature ranged from 26 °C to 28 °C. The vegetation is categorised under the Sahel, Sudan, and Guinea savannah types due to the natural surroundings and human activities (Ahmed 2010). Kano has vast fertile agricultural land supporting numerous food and cash crops such as millet, rice, sorghum, wheat, cowpeas, groundnut, and other vegetables. The metropolis is one of Nigeria's fastest-growing urban centres and has continuously attracted population due to the city's commercial and agricultural activities (Koko *et al.* 2021).

Sokoto State is situated in the Northwest of Nigeria. It is located between latitudes 11° 30" to 13° 50" N and longitudes 4° 00" to 6° 00" E. The State shares common boundaries with the Republic of Niger to the North and West, Zamfara State to the East and Kebbi State to the South. The area has a tropical continental climate with a fragile ecosystem. Temperatures are high throughout the year, while rainfall is low and erratic, barely lasting for more than five months in a year. Average annual rainfall barely exceeds 629 mm, while temperatures could be as high as 40 °C or even higher, particularly during April, which usually records the highest temperature. The city is also characterised by Sudan Savannah, a vegetation type dominated by short grasses interspaced by short woody trees and shrubs. Grasses look green during the rainy season but eventually wither and die during the dry season (Davis, 1982).

Method of Data Collection on the Determination of Ecosystem Services

A multistage sampling technique was adopted for this study. The first stage deals with selecting two (Kano and Sokoto) capital cities from northwest Nigeria, while the second stage is the selection of 150 respondents from each city. Three hundred respondents were selected for the questionnaire administration through interviews and group discussions. A semi-structured questionnaire and interview guide were developed and administered for the data collection for this study. This questionnaire was divided into two parts (sections A and B). Section A was used to determine the respondents' demographic information and the economic importance of ecosystem services to the respondents. Section B was used to determine the available ecosystem services and the respondents' attitudes and preferences regarding ecosystem services within the urban forest estate. The questionnaire was pre-tested to the respondents in these urban cities before final administration. The questionnaire was administered to the head of each household. Urban forest products are divided into two major types: tangible and intangible. These services are essential to the living conditions of the urban population. The intangible services are vital environmental goods and services provided by the forest ecosystem which are not subjected to pricing and are not traded in the market. Economic valuation of natural resources and ecosystem services they provide might reveal areas of the market where the goods and services are underpriced as they represent non-marketable services of the environment (Mamat *et al.*, 2020).

Analytic Hierarchy Process (AHP) on Attitude and Preference

The analytic hierarchy process (AHP) was used to provide quantitative data on the people using a ratio scale to determine their preference for ecosystem services. This process is widely recognised as a useful tool for systematically structuralising analytical problems in a way similar to how the human mind works (Hoyos *et al.* 2009). (Saaty 1996) suggested a way to evaluate the weight of a decision-making factor.

$$Q' \text{ x } T' = \lambda_{max} \text{ x } T' \qquad (1)$$

Where Q is the square matrix resulting from pairwise comparison, λ_{max} is the maximum eigenvalue, and T is the eigenvector.

The contingent valuation method (CVM) was adopted to determine services derived from ecosystems and urban population preferences for conserving urban forests for the good of the people and environment. Hence, CVM is a method of estimation for non-market services of environmental features for green

infrastructure conservation, such as the value of particular places, the status of endangered species, recreational opportunities, scenic resources, environmental services and others (Arnberger and Haider 2005 Birol *et al.*, 2020; Hassin *et al.*, 2020). This method is closely related to the individual's behaviour in a hypothetical setting. This method is also based on the price observed or willingness to pay to conserve urban forests for the goods to be valued. Ideally, CVM is the only valuation method capable of capturing all advantages, including use-value, non-use-value, and even existence-value (Camille, 1999). Therefore, this study adopted CVM to determine the economic valuation of the forest ecosystem, such as urban forest services generated by these two cities (Kano and Sokoto metropolitan cities). This economic study involved a single and double-bounded dichotomous choice survey to empirically investigate the public's willingness to pay (WTP) for the conservation of urban forests and the derived ecosystem services. The use of CVM in this study is to set up a hypothetical market that describes how funds would be raised for urban forest ecosystem services. The payment vehicles are in-forms (bid) such as taxes, utility bills, entrance fees, or thrust fund payments that the respondents must decide. The questionnaire was administered through interviews, survey guides and face-to-face contact with the respondents. During the questionnaire administration, respondents were asked to state the maximum amount they were willing to pay (WTP), and the dichotomous choice technique was applied to this study. After the survey, the mean WTP and respondents unwilling to pay were also estimated.

Data Analysis

The data collected for this study were subjected to descriptive statistics by Agbelade *et al.* (2022). Descriptive statistics, contingent valuation method (CVM) and Pearson regression model were employed to analyse the data generated. This was employed to identify and categorise the socioeconomic characteristics of respondents and their ecosystem services preference patterns using the mean, frequency counts and percentages. The contingent valuation method (CVM) was used to evaluate the monetary value range the respondents are willing to pay for urban forest ecosystem services. This involves interviewing the respondents about how much they are willing to pay and contribute, the mode of payment, and the frequency of such contributions. These variables were incorporated into the models because they were considered important to the respondents' WTP for urban forest conservation as predictors. The Pearson regression model analysed as explanatory variables in this study are stated as follows:

$$Y = \alpha + \beta_1 AGE_i + \beta_2 GEN_i + \beta_3 EDU_i + \beta_4 POC_i + \beta_5 UFC_i + \beta_6 AUFB_i + \beta_7 AINC_i + \beta_8 ES_i + \beta_9 MAR_i + \beta_{10} HT_i + \beta_{11} HO_i + \beta_{12} REC_i + \beta_{13} LBD_i + \beta_{14} BD2_i + \varepsilon_i$$

Where Y = Individuals' willingness-to-pay for the conservation of urban forests or planting trees in urban areas, which takes the value of 1 for willingness-to-pay and 0 for otherwise).
β = Vector of the respective parameter
ε_i = Independent distributed error term
α = Vector of explanatory variable
The explanatory variables are:
X_1 = Age (years)
X_2 = Gender (male =1, female = 0)
X_3 = Educational qualification
X_4 = Employment status
X_5 = Respondents involved in urban forest conservation and planting trees (1=Yes; 0=No)
X_6 = Respondents awareness of the benefits of urban forests conservation (1=Yes; 0=No)
X_7 = Respondent's actual income
X_8 = Respondents usage of ecosystem services (1=Yes; 0=No)
X_9 = Marital status (married=1, 0 otherwise)
X_{10} = Type of house (face to face=1, others=0)
X_{11} = Ownership of house (owner =1, tenant =0)
X_{12} = Respondents' perception of the use of urban forest for recreational purposes
X_{13} = LBD Dichotomous-choice bid assigned
X_{14} = BD2 Follow-up bid assigned

Questionnaire Processing

After the administration of the questionnaire and retrieval, the questionnaire was coded to obtain quantitative data for statistical analysis. The data obtained were entered into a Microsoft Excel Spreadsheet, refined from their raw State and presented in a tabular or graph form. Descriptive analysis was done to summarise the data into charts and tables. Student T-test was used to test the level of economic importance, attitude and

preference of these ecosystem services by the respondents in this study.

Results

Demographic characteristics of respondents

The socioeconomic characteristics of respondents considered in this study include age, sex, marital status, household size, educational status, monthly income, employment status, housing ownership and purpose of conservation of urban forests. The demographic characteristics indicated that the majority of the respondents are male in the two cities. The respondents' age range shows that a higher percentage of the respondents in these two cities were between 31 and 50. The majority of the respondents in these cities indicated their marital status as married; between 39 and 46 of the respondents are illiterates (no formal education), while the majority of the respondents attended only elementary (58 and 61) and secondary (22 and 32) schools in the two metropolitan cities. The larger percentage of respondents has a household size of 4 and above 5 in the two metropolitan cities (Table 1). This indicates that most of the respondents interviewed are literate, and the high literacy level is expected to influence their attitude towards tree planting and the conservation of urban forests. The highest number of respondents with a monthly income in Kano was 31 (31,000 – 50,000), 36 (51,000 – 70,000), and Sokoto 34 (< 10,000); 39 (51,000 – 70,000). Most of the respondents are landlords in the two metropolitan cities. The majority of the respondents interviewed have their primary employment as business owners and used trees in these cities as shades for their businesses and prevention as a wind break.

Attitude and usage of ecosystem services by the respondents

Urban forest benefits are numerous, important and beneficial to human livelihood. They contribute to food security, health care delivery, economic empowerment, and amelioration of micro and macro-climate, as revealed by the results of this study. Between 14.7 to 18% of the respondents in the cities selected from urban forest ecosystems are used as business centres. The result in Kano indicated that 12.7% of the respondents showed a clear understanding that purification of air is of interest, and windbreak contributes 12.0 to 14.0% interest in the two cities. Erosion control and mitigation, animal folder, shades as parking lots, recreation centres for social gatherings and meetings, and nutrition components of the people's foods (provisions of fruits, vegetables, nuts, herbs). There are positive attitudes among the people, which clearly indicates that the urban population is aware of the numerous benefits of urban forests. The citizens' willingness to pay for conservation was based on the premise that ecosystem services from the urban forests are made available to them in exchange for their commitment. The highest number of citizens willing to pay for urban forest conservation was recorded for ₦100 to ₦500, followed closely by ₦501 to ₦1000. There are fewer numbers of citizens willing to pay above ₦3000 for the conservation of urban forests and planting of trees in the urban environment. The results of the willingness to pay for the conservation of urban forests and planting of trees were based on the high level of awareness of the various benefits of urban forests and ecosystem services derived from them.

Table 1: Demographic Characteristics of Respondents

			Kano		Sokoto	
Variables	Classification	Code	n	%	n	%
Age	< 20	2	12	8.0	9	6.0
	20 - 30	3	18	12.0	21	14.0
	31 - 40	4	76	50.7	47	31.3
	40 - 50	5	28	18.7	42	28.0
	50 - 60	6	11	7.3	20	13.3
	> 60	7	5	3.3	11	7.3
			12			
Sex	Male	0	9	86.0	136	90.7
	Female	1	21	14.0	14	9.3
Marital Status	Single	0	31	20.7	27	18.0
			11			
	Married	1	9	79.3	123	82.0
Household size	1	1	9	6.0	7	4.7
	2	2	18	12.0	14	9.3
	3	3	21	14.0	17	11.3
	4	4	60	40.0	43	28.7
	Above 5	5	42	28.0	69	46.0
Educational status	No Formal Education	1	46	30.7	39	26.0
	Primary Education	2	61	40.7	58	38.7
	Secondary Education	3	22	14.7	32	21.3
	Tertiary Education	4	12	8.0	14	9.3
	Others	5	9	6.0	7	4.7
Monthly income	< ₦10,000	1	21	14.0	34	22.7
	₦11,000 - ₦30,000	2	18	12.0	21	14.0
	₦31,000 - ₦50,000	3	31	20.7	19	12.7
	₦51,000 - ₦70,000	4	36	24.0	39	26.0
	₦71,000 - ₦90,000	5	18	12.0	11	7.3
	₦91,000 - ₦110,000	6	15	10.0	16	10.7
	> ₦110,000	7	11	7.3	10	6.7
Employment status	Salary Earners	1	22	14.7	27	18.0
	Trading	2	29	19.3	21	14.0
	Business owners	3	87	58.0	92	61.3
	Unemployed	4	12	8.0	10	6.7
Housing ownership	Tenant	0	32	21.3	52	34.7
			12			
	Landlord	1	8	85.3	98	65.3
Purpose of conservation	Relaxation	1	8	5.3	5	3.3
	Parking lot	2	15	10.0	11	7.3
	Social gathering	3	17	11.3	13	8.7
	Beautification	4	12	8.0	10	6.7
	Wind break	5	46	30.7	51	34.0
	Business Centres/Workshop	6	52	34.7	60	40.0

n = Frequency; % = Percentage

Table 2: Attitude and usage of ecosystem services by the respondents

	Kano		Sokoto	
Attitude and usage pattern	n	%	n	%
Food (Provisions of fruits, vegetables, nuts, herbs)	11	7.3	9	6.0
Purification of air	19	12.7	14	9.3
Shade (Parking lots)	14	9.3	11	7.3
Recreation (Social gathering)	11	7.3	7	4.7
Aesthetic (Environmental beautification)	7	4.7	5	3.3
Windbreak and Shelterbelt	18	12.0	21	14.0
Biodiversity reservoir	3	2.0	2	1.3
Animal folder	11	7.3	17	11.3
Erosion control and mitigation	14	9.3	17	11.3
Business Centres/Workshop	22	14.7	27	18.0
Fuel wood (Cooking)	12	8.0	11	7.3
Micro-Climate conditioning	8	5.3	9	6.0

n = Frequency; % = Percentage

Table 3: Actual amount respondents are willing-to-pay for conservation of urban forest

	Kano		Sokoto	
	n	%	n	%
₦ 100 - ₦ 500	49	32.7	51	34.0
₦ 501 - ₦ 1000	22	14.7	27	18.0
₦ 1001 - ₦ 1500	20	13.3	11	7.3
₦ 1501 - ₦ 2000	11	7.3	16	10.7
₦ 2001 - ₦ 2500	17	11.3	13	8.7
₦ 2501 - ₦ 3000	18	12.0	20	13.3
> ₦ 3000	13	8.7	12	8.0

n = Frequency; % = Percentage

Urban forest ecosystem services preference in the two metropolitan cities

Citizens' preferences for urban forests are influenced by the provision of various ecosystem services (ESs) derived from the forests. The ranking of the citizens' preferences in Kano metropolitan city for these urban forests ecosystem services is as indicated in Table 4: (1) Business Centres/Workshop (2) Purification of air, (3) Windbreak and Shelterbelt, (4) Erosion control and mitigation, (5) Shade (Parking lots), (6) Fuel wood (Cooking), (7) Food (Provisions of fruits, vegetables, nuts, herbs), (8) Animal folder, (9) Recreation (Social gathering), (10) Micro-Climate conditioning, (11) Aesthetic (Environmental beautification), (12) Biodiversity reservoir. The ranking of the citizens preferences in Sokoto metropolitan city for these urban forests ecosystem services differs as indicated in Table 4: (1) Business Centres/Workshop (2) Windbreak and Shelterbelt, (3) Animal folder, (4) Erosion control and mitigation, (5) Purification of air (6) Fuel wood (Cooking), (7) Shade (Parking lots), (8) Micro-Climate conditioning, (9) Food (Provisions of fruits, vegetables, nuts, herbs), (10) Recreation (Social gathering), (11) Aesthetic (Environmental beautification), (12) Biodiversity reservoir. The result of the Probit regression analysis indicated a positive relationship between the factors that influence the respondents' decision to pay for ecosystem services and their socioeconomic characteristics. Table 5 indicates that age, sex, marital status, household size, educational status, monthly income, employment status, housing ownership, and purpose of conservation are the factors, and they all show a positive relationship with willingness to pay for ecosystem services. Consequently, a decrease in the number of each of these variables could be vital in the probability of respondents' willingness to pay for urban forest conservation and support for planting trees. Table 6 indicates that food provision, purification of air, parking lots, social engagement, beautification purposes, shelter belts, biodiversity reservoirs, mitigation of climate change, water and wind erosion mitigation and business centres/workshops are the ecosystem services that influence the citizens' positive relationship with willingness-to-pay for ecosystem services.

Table 4: Urban forest ecosystem services preference in the two metropolitan cities

	Kano	Sokoto
Order of Priority	Citizens preference	
1st	Business Centres/Workshop	Business Centres/Workshop
2nd	Purification of Air	Windbreak and Shelterbelt
3rd	Windbreak and Shelterbelt	Animal folder
4th	Erosion control and mitigation	Erosion control and mitigation
5th	Shade (Parking lots)	Purification of Air
6th	Fuel wood (Cooking)	Fuel wood (Cooking)
7th	Food (Provisions of fruits, vegetables, nuts, herbs)	Shade (Parking lots)
8th	Animal folder	Micro-Climate conditioning
9th	Recreation (Social gathering)	Food (Provisions of fruits, vegetables, nuts, herbs)
10th	Micro-Climate conditioning	Recreation (Social gathering)
11th	Aesthetic (Environmental beautification)	Aesthetic (Environmental beautification)
12th	Biodiversity reservoir	Biodiversity reservoir

Table 5: Factors influencing the willingness-to-pay for urban forest conservation

	Kano			Sokoto		
Variables	Coefficient	Standard error	P>/z/	Coefficient	Standard error	P>/z/
Age	4.243	-2.176	2.122	8.485	-4.192	4.244
Sex	76.368	-39.177	38.190	86.267	-42.616	43.152
Marital Status	62.225	-31.922	31.118	67.882	-33.534	33.956
Household size	6.364	-3.265	3.183	4.950	-2.445	2.476
Educational status	10.607	-5.441	5.304	13.435	-6.637	6.720
Monthly income	2.121	-1.088	1.061	9.192	-4.541	4.598
Employment status	4.950	-2.539	2.475	4.243	-2.096	2.122
Housing ownership	67.882	-34.824	33.947	32.527	-16.068	16.270
Purpose of conservation	4.950	-2.539	2.475	4.243	-2.096	2.122

Table 6: Respondents willingness-to-pay for urban forest conservation

	Kano			Sokoto		
Variables	Coefficient	Standard error	P>/z/	Coefficient	Standard error	P>/z/
Food provision	96.167	-49.430	48.088	68.000	1.97	48.11
Purification of air	103.238	-53.064	51.624	61.000	1.77	43.16
Parking lot	49.497	-25.442	24.751	3.000	.09	2.12
Social engagement	.000	.000	.000	43.000	1.25	30.43
Beautification purpose	77.782	-39.980	38.895	47.000	-1.36	33.26
Shelterbelt	91.924	-47.249	45.967	64.000	1.86	45.28
Biodiversity reservoir	63.640	-32.711	31.823	45.000	1.30	31.84
Mitigation of climate change	7.071	-3.635	3.536	53.000	1.54	37.50
Water and wind erosion mitigation	77.782	-39.980	38.895	55.000	1.59	38.92
Business centres	91.924	-47.249	45.967	65.000	1.89	45.99

Discussion

The results of this study indicated that a substantial portion of citizens in these two cities are aware of the various benefits and importance of urban forests to the peoples' well-being. This could be due to the high vegetation zone and the increasing rate of desertification, which has improved the knowledge base of the people (Konijnendijk *et al.* 2006). The citizens of these two cities differ considerably in their preferences for ecosystem services due to their ecological zones. This is because the citizens of these cities tend to analyse the situation based on their environment and the climatic changes confronting them. However, citizens tend to make biased judgments on the preferences of the ecosystem services derived, which are influenced by their emotions and environmental appearance (Akerlof and Kranton 2005). The majority of the citizens believe that it is the responsibility of the government to provide forests with the built environment. At the same time, some are of the opinion that only the rich can afford to plant trees in their surroundings and gardens. The result of this study provides insight into the necessity of citizen participation in the management of urban forests as part of their citizen rights and obligations to society. Research indicated that a citizen knowledge base is essential in improving the urban forests and ecosystem functions, which would enable provisions of urban forest ecosystem services to the people through policies and governance (Kim *et al.* 2010; Choi *et al.* 2011; Park and Youn 2013). Nonetheless, this study has provided further insights into the asymmetrical preferences of beneficiaries of urban forest ecosystem services and urban forest ecosystem managers while providing quantitative pieces of evidence.

In agreement with a priori expectation, the positive sign indicates that people who are employed will be willing to contribute towards the conservation program compared to those who were unemployed. In the study, traders and business owners may have expressed WTP owing to the direct benefit they derive from proximity to urban forests to their businesses. In addition, during business hours, people prefer to protect their cars from direct sunlight under tree canopies. This indicates how employment could enhance willingness to pay for the sustenance of environmental benefits. Furthermore, the results from previous studies (Arnberger and Eder 2011; Bernath and Roschewitz 2008; Hoyos *et al.* 2009) and findings from this study confirm that the length of residency and awareness of the environmental service values of urban trees could have a significant positive influence on WTP for conservation and increase urban forests presence. Income and education play a major role in people's attitudes towards the conservation of urban forests. This is significant and could be a strong predictor that could influence people's decision to pay or not to pay. Thus, concerted efforts to improve the sustainable development of the tree resource would be more effective if communication on management is designed to suit the relevant demographic status of residents in the city. Simultaneously, this would assist in actively motivating people to participate in urban tree conservation and management programs.

Economic valuation of environmental services (ES) recognises the perception and attitudes of residents towards urban forest conservation that influences the payment level for environmental services (ES). These ecosystem services should be incorporated into the planning and policy of the various governments for the conservation of forest and tree resources in urban areas (Raudsepp-Hearne *et al.,* 2010). In agreement with previous studies (Fisher et al. 2009, Hoyos *et al.* 2009), years of residency had a significant influence on mean WTP for environmental protection and conservation of urban forests. In addition, people who are employed and have earned incomes were willing to contribute to the conservation program. Adekunle *et al.* (2008) and Koo *et al.* (2013) also observed that an individual's income and employment status can influence their ability to contribute towards conservation programs in cities. In addition, the more learned a person is, the more they are expected to be conscious of and willing to give back to their environment. The monetary estimate can serve as a strong argument against the conversion of areas with trees to other land uses, especially without the consideration for replacement. The information represents a focal point to support management programs to improve forest policies towards enhancing environmental quality in these cities. Thus, decision-makers, town planners, forest managers, and government (at federal, State

and local levels) can access this information as additional input to integrate public values and support for the protection of urban forests in the delivery of goods and services to the people. Moreover, the result highlights that failure to place monetary value on environmental services may lead to excessive removal of trees, loss of economic value and environmental damage.

Conclusion

This study demonstrates that people's perceptions of urban forests and the benefits derived in general are positive in relation to their awareness of environmental services in these cities. Awareness programs must emphasise the numerous intangible and tangible benefits associated with urban forests to increase peoples' willingness to support the conservation of trees and biodiversity. The result from the study indicated that most residents were willing to make a financial contribution towards the continued existence and management of urban forests in the two cities. This study provides a basic way to conceptualise and understand the public willingness to pay for the conservation of urban tree resources in rapidly developing cities in Nigeria. It is envisaged that the results of this study will open up public discourse with decision-makers, town planners and other change agencies concerned with forest and tree resource management on the inclusion of the total economic value of urban trees in policy, planning and future development projects in cities in developing countries. This recommendation is to ensure that this vital resource is not measured not only by its tangible component but also by the intangible benefits of the forests in urban centres.

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