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RESEARCH ARTICLE

Exploring residential characteristics as determinants of environmental sanitation behavior in Ibadan, Nigeria

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ABSTRACT

This study investigated residential characteristics as determinants of environmental sanitation behavior in Ibadan, Nigeria. The municipality was stratified into three residential zones (core, transition, and suburb). Three political wards were selected in each of the residential zones for questionnaire administration. Using systematic sampling technique, every 20th residential building was selected in the selected wards. Questionnaire was administered in 1,082 residential buildings with a success rate of 84.8% comprising 436 in the core, 351 in the transition, and 295 in the suburb based on the building density in the zones. Focus was on residents with minimum age of 18 years. Findings revealed that environmental sanitation behavior is influenced by residential characteristics such as place of residence, gender, educational attainment, length of residence, household size, and house tenure in Ibadan. All these together can enhance environmental sanitation behavior and preserve sanitary urban environment.

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Environmental sanitation is rooted in pro-environmental behavior (Blaikie and Brookfield, 1987; Hueting, 1980). It refers to efforts or activities aimed at maintaining a clean, safe, and pleasant physical environment and ensuring the safety of the environment in all human settlements towards the promotion of social, economic and physical well-being of all sections of the population (Acheampong, 2010; Daramola, 2015, 2016; Dwivedi and Sharma, 2007; Franceys et al., 1992; IRC, 2006a, 2006b; Ojewale, 2009; WHO and UNDP, 1997; WHO and UNICEF, 2000). Therefore, as opined by Daramola (2016), environmental sanitation connotes the habit of living where every second, minute, hour and day counts in order to make the home environment sanitary and aesthetic.

In achieving this liveable environment, environment sanitation can be primarily assessed based on two dimensions which work together to form a hygienic environment: change in behavior and availability of facilities (Mmom and Mmom, 2003; World Bank, 2002). In the light of these dimensions, environmental sanitation comprises certain components. These include provision and

maintenance of sanitary facilities and services (water supply; toilet; and management of wastewater, storm water, and solid waste), public education, legislation, and individual and community actions (Federal Government of Nigeria, 2005; IRC, 2006a). This implies that environmental sanitation is a behavioral issue and it strongly depends on human behavioral patterns.

In this study, environmental sanitation behavior refers to the activities of the residents in the provision, utilization and maintenance of environmental sanitation facilities and services and adherence to environmental sanitation legislation both in their homes and neighborhoods (Daramola, 2016). This implies that despite the fact that availability of infrastructure contributes towards residents' promotion of sanitary environmental condition, the sustainability of these conditions should be based on the characteristics of the people. This is because environmental quality strongly depends on human traits (Steg and Vlek, 2009). Thus, the importance of studying environmental sanitation behavior is based on the intrinsic link between environmental sanitation and other sustainable development issues such as poverty, hunger, health,

education, gender inequality, ecosystems integrity, climate change, and disasters (Bernhardt, 2015; UNESCO International Hydrological Programme, 2014). In actual fact, Bernhardt (2015) pointed out that some components of environmental sanitation are seen as fulcrum for Sustainable Development Goals (SDGs).

Issues pertaining to environmental sanitation have been explored by many studies (Acheampong, 2010; Afon, 2005; Daramola, 2011; Mmom and Mmom, 2011; Narayan, 1995; Olawuni, 2007; WHO and UNICEF, 2000). Nevertheless, the major limitation of these studies is that they focused mainly on contextual aspect of environmental sanitation which has to do with provision of facilities and services such as water supply, sanitation, solid waste management, and wastewater disposal. A particular recourse to the motivational (intra-personal) aspect (habits and the factors affecting them) has not well documented, especially in African setting. Thus, it is expedient to investigate the personal and social factors of environmental sanitation as the complement of the contextual aspect.

In the study of environmental behavior, several factors that have implication for environmental sanitation have been identified. They are both personal factors and social factors (Kollmuss and Agyeman, 2002). These include age (Buttel and Taylor, 1999; Howell and Laska, 1992; Kalantari et al., 2007; Nord et al., 1998), gender (Arcury, 2000; Caiazza and Barrett, 2003; Dietz et al., 2002; Hunter et al., 2004; Stern, 1998; Tarrant and Cordel, 1997), education (Daramola, 2012, 2015; EORG, 2002; Kalantari et al., 2007), and income (AWDR, 2006). Other identified factors include place of residence and household size (Arcury, 2000; Daramola, 2015; Dunlap, 1998; Kalantari et al., 2007; Poortinga et al., 2004). All these factors are termed residential characteristics that are capable of influencing residents' environmental sanitation behavior.

Residential characteristics connote the factors about the environmental surroundings as well as the social milieu that promote the socio-economic well-being of people residing in a community (Bilgel, Sam, and Bayram, 2012). These factors include gender, age, marital status, income, education, household size, house tenure, length of residence, and place of

residence (Ojewale, 2014). These characteristics have been found relevant, both in the distant past and recent past, in promotion environmental sanitation behavior by being factors influencing individual and household activities in provision, utilization, and maintenance of environmental sanitation facilities and services and adherence to environmental sanitation legislation both in their homes and neighbourhoods (Daramola, 2015; Kasarda and Janowitz, 1974; Ojewale, 2014). Therefore, this article is concerned with the effects of these residential characteristics on environmental sanitation behavior of residents in Ibadan. This study was a novel attempt in this respect because there is hardly any empirical study of environmental sanitation behavior in Ibadan in relation to residential characteristics. Also, the major components of the study (residential characteristics and environmental sanitation) are central in achieving Sustainable Development Goals (SDGs). They have the goals directly related to them (SDGs 6 and 12) and have implication on several others (SDGs 1–5, 9, and 13).

The thrust of this study was to investigate residential characteristics as determinants of environmental sanitation behavior in Ibadan. In achieving this, the study attempted to provide answers to the following questions: What is the profile of residents across the residential zones if Ibadan? Is there any significant statistical difference in environmental sanitation behavior based on residential characteristics? What residential characteristics can predict environmental sanitation behavior in Ibadan? The study sought answers to these questions in order to reveal the need for policy makers to consider residential characteristics in addressing issues and challenges associated with environmental sanitation.

Methods

The study area is Ibadan, one of the largest indigenous urban centres in sub-Saharan Africa. Characterized with cosmopolitan nature, Ibadan can be seen as a metropolis comprising the municipality (main city) and its suburbs (less city). The focus of this study is on the municipality. Politically and administratively, the municipality was under one local government area, Ibadan Municipal Government, before it was split into

five distinct local government areas (LGA) in 1991. These are Ibadan North, Ibadan North East, Ibadan North West, Ibadan South East, and Ibadan South West. As at the year 2006 when the last population census was held in Nigeria, the total population of these five LGAs comprising Ibadan municipality was 1,343,147 people.

As a traditional city in Nigeria, the city reveals three contrasting residential zones linked to three historical periods (Onibokun, 1985) with their nature and characteristics determined by social, economic, and physical patterns. These are: the pre-colonial residential development which is the core or traditional zone; the colonial/pre-independence residential development referred to as the intermediate or transition zone; and the post-independence residential development, also called the suburban. Among the typical Nigerian cities where these zones have been identified are: Ilorin (Akorede, 1975), Benin City (Onakerhoraye, 1977), and Ogbomoso (Afon, 2005; Okewole, 1977).

The sampling procedure for this study started with stratification of the municipality into three residential zones (core, transition, and suburb). This stratification cut across all the five LGAs in the municipality. Following the stratification was random selection of three local government areas out of the five LGAs. Each of the selected LGAs was divided into the existing different political wards, as recognized by Independence National Electoral Commission (INEC) in the conduct of electoral polls. For questionnaire administration, one ward in each residential zone of all the selected local government areas was sampled randomly. Through this method, residents from nine wards cutting across the three different residential zones were surveyed. Using systematic sampling technique, every 20th residential building was selected in the residential zones. Questionnaire was successfully administered in 1,082 residential buildings with a success rate of 84.8% comprising 436 in the core, 351 in the transition, and 295 in suburb. Focus was on residents with minimum age of 18 years. This is because, in Nigeria, 18 years is the minimum age of franchise and responsibility (when somebody is no more a minor).

The questionnaire addressed issues on their residential characteristics. Also, data were collected on components of environmental sanitation behavior such as provision of environmental sanitation facilities and services, environmental sanitation awareness, and compliance with environmental sanitation legislation. To measure these components, five Likert-type scales were used with each containing some items as parameters for measurement. The ordinal data collected were scored and thus transformed to interval data. Thus, it was possible to use parametric tests such Analysis of Variance (ANOVA), correlation analysis, and regression analysis apart from other analytical methods such as cross tabulation.

Results and discussion

This section discusses the profile of the respondents, tests of difference in environmental sanitation behavior based on residential characteristics and the determinants of environmental sanitation behavior in the study area.

Profile of the respondents

This profile the respondents discussed here are gender, age, educational attainment, marital status, income, household size, house tenure, and length of residence, all these in relation to the residential zones (places of residence) of the respondents. These identified factors of environmental behavior in literature, and by extension, environmental sanitation behavior are discussed and are presented in Table 1 to provide descriptive information on the personal and social aspects of the respondents. Findings from this study revealed representation of the two categories of gender across the residential zones. In all, 50.1% of the respondents were male while 49.9% were female. This representation of both genders will help in ascertaining what studies such as gender Stern (1998), Arcury (2000), and Caiazza and Barrett (2003).

Age is expected to play a significant role as maturity could affect level of environmental awareness. According to Eagles and Demare (1999), the reasoning level of matured adults with respect to environmental attitude and behavior is expected to be high. This implies that older residents are expected to be more environmentally conscious than the younger

Table 1. Profile of the respondents across residential zones.

Parameters	Residential zone			Total
	Core	Transition	Older suburb	
Gender				
Male	241 (55.3)	157 (44.7)	144 (48.8)	542 (50.1)
Female	195 (44.7)	194 (55.3)	151 (51.2)	540 (49.9)
Total	436 (100.0)	351 (100.0)	295 (100.0)	1082 (100.0)
Age (in years)				
<20	-	4 (1.1)	8 (2.7)	12 (1.1)
20–39	146 (33.5)	208 (59.3)	205 (69.5)	559 (51.7)
40–59	224 (51.4)	117 (33.3)	77 (26.1)	418 (38.6)
≥60	66 (15.1)	22 (6.3)	5 (1.7)	93 (8.6)
Total	436 (100.0)	351 (100.0)	295 (100.0)	1082 (100.0)
Educational qualification				
Primary	178 (40.8)	21 (6.0)	17 (5.8)	216 (19.9)
Secondary	40 (9.2)	38 (10.8)	71 (24.1)	149 (13.8)
Tertiary	218 (50.0)	292 (83.2)	207 (70.2)	717 (66.3)
Total	436 (100.0)	351 (100.0)	295 (100.0)	1082 (100.0)
Marital status				
Single	41 (9.4)	95 (27.1)	93 (31.5)	229 (21.2)
Married	376 (86.2)	245 (69.8)	199 (67.5)	820 (75.8)
Have been married	19 (4.4)	11 (3.1)	3 (1.0)	33 (3.0)
Total	436 (100.0)	351 (100.0)	295 (100.0)	1082 (100.0)
Average monthly income (in Naira)				
Low	370 (84.9)	197 (56.1)	128 (43.4)	695 (64.2)
Medium	36 (8.3)	95 (27.1)	111 (37.6)	242 (22.4)
High	30 (6.8)	59 (16.8)	56 (19.0)	145 (13.4)
Total	436 (100.0)	351 (100.0)	295 (100.0)	1082 (100.0)
Household size				
Small	70 (16.1)	144 (41.0)	189 (64.1)	403 (37.3)
Medium	233 (53.4)	181 (51.6)	96 (32.5)	510 (47.1)
Large	133 (30.5)	26 (7.4)	10 (3.4)	169 (15.6)
Total	436 (100.0)	351 (100.0)	295 (100.0)	1082 (100.0)
House tenure				
Owner-occupied	268 (61.5)	239 (68.1)	187 (63.4)	694 (64.1)
Rented	168 (38.5)	112 (31.9)	108 (36.6)	388 (35.9)
Total	436 (100.0)	351 (100.0)	295 (100.0)	1082 (100.0)
Length of residence (in years)				
1–5	224 (51.4)	96 (27.4)	143 (48.5)	463 (42.8)
6–10	113 (25.9)	91 (25.9)	75 (25.4)	279 (25.8)
Above 20	99 (22.7)	164 (46.7)	77 (26.1)	340 (31.4)
Total	436 (100.0)	351 (100.0)	295 (100.0)	1082 (100.0)

ones. The age of the respondents was grouped into four categories: teenagers (those with less than 20 years and specifically of age 18 and 19 years); young adults (20–39 years); elderly adults (40–59 years); and old people 60 years and above). Majority of the residents (90.3%) were adults (20–59 years), 1.1% were teenagers and 8.6% were old people (60 years and above). Across the residential zone, majority of the respondents were in adult category. However, in the core area, no teenager was sampled while the proportion of the old people sampled in the core area is higher than the proportion of that category for the other residential zones. This is further revealed in the mean age across the residential zones: 46 years in the core, 39 in the transition, and 34 in suburb, while the overall mean age was 40 years. The ANOVA results

($F = 125.713$; $p < 0.001$) indicated that age distribution of the residents varied significantly with residential zones.

Findings were also made on the marital status of the residents. This was based on the proposition that marital responsibility affects household environmental sanitation behavior. Marital status was also categorized into three categories: single, married, and those that have been married but no longer are (widowed or divorced). Findings revealed that 75.8% of the respondents were married; 21.2% were single and others comprised 3% of the respondents. Thus, it can be inferred that the respondents were in position of marital responsibility that may affect their household environmental sanitation behavior. On

educational attainment, it was discovered that all the respondents acquired formal education. In the core area, half of the respondents (50%) had tertiary education. This increased in the transition and peripheral zones to 83.2% and 70.2%, respectively. This proportion is followed with secondary education, apart from the core area in which 40.8% of the residents had primary education. Overall, 19.9% of the residents had primary, 13.8% had secondary while 66.3% had tertiary education. This residents' level of educational attainment across the residential zones could serve as the basis for assessment of their environmental sanitation behavior.

Monthly income of the respondents was grouped into three categories: low, medium, and high. Based on these categories, 64.2% of the respondents were low income earners (less than N50,000); 22.4% were of medium income (N50,000–N99,999); and 13.4% were of high income (N100,000 and above) in the city. Across the residential zone, however, there was variation in the categories of the income of the residents. Also, calculation of mean income revealed variation across the residential zones with average income of N38,394.50; N62,569.80; and N80,261.02 in the core, transition and suburb, respectively, while the overall mean income was N7,651.57. These findings revealed that on an average, the respondents in the core residential zone were of low income while those in other zones were in medium income with varying degrees. The ANOVA results ($F = 54.332$; $p < 0.001$) indicated that income distribution varied significantly with residential zones.

A household was defined as a person or group of people with shared cooking and living arrangements. Thus, household size was measured by the number of people living together with common eating arrangement. Based on this, the household size of the residents was categorized into three. The household sizes of one to five members were categorized as small, those with 6–10 members as medium while those with more than ten members was categorized as large. Findings revealed that, in general, 37.3% had small household size with maximum of five members, 47.1% had medium household size of 6–10 members while 15.6% had large household size, with above 10 members. Across the residential zones, it was also

revealed that household size varied with residential zones. There were average of nine household members in the core, seven in the transition, and six in the suburb. The results revealed that household size reduced with increase in distance from the core of the city to the suburb. The ANOVA results ($F = 148.125$; $p < 0.001$) also indicated that household size varied significantly with residential zones.

House tenure of the residents was also considered relevant to this study. This is because it is a factor in provision and maintenance of environmental sanitation facilities for households (Daramola, 2015). House tenure in the study area is of two categories: owner-occupied and rented. Findings revealed that in the study area, 64.1% of the residents sampled lived in their houses while the remaining 35.9% lived in rented apartments. The distribution of house tenure across the residential zones revolved around these overall proportions.

Length of residence refers to the number of year(s) a household has been in the study area and it is considered relevant to this study. This is based on the postulation that environmental concern is a function of length of residence (Kasarda and Janowitz, 1974). This is because the longer the period people live in an area; the more they are likely to understand the problems associated with environmental sanitation in such area. In the study, the length of residence is divided into 3 categories of 1–5 years, 6–10 years, and above 10 years. Findings revealed that almost a third of the residents (31.4%) had lived for more than 10 years in their residential areas; a quarter (25.8%) had spent 6–10 years while 42.8% of the residents had lived for maximum of 5 years in their residential areas. Across the residential zones, it was also discovered that, in the least, almost half of the total number of the residents in each zone had lived in their residential areas. This was as high as 72.6% in the transition zone, followed with 51.5% in the periphery and 48.6% in the core residential zone. From this analysis, it could be deduced that the residents were familiar with their environment and their length of residence could be a factor of their environmental sanitation behavior.

Table 2. Difference in environmental sanitation behavior by residential characteristics.

		Sum of squares	Df	Mean square	F	Sig.
Place of residence	Between groups	1766.308	2	883.154	7.049	.001
	Within groups	135187.991	1079	125.290		
	Total	136954.299	1081			
Gender	Between groups	1146.395	1	1146.395	9.117	.003
	Within groups	135807.905	1080	125.748		
	Total	136954.299	1081			
Age	Between groups	2132.680	3	710.893	5.684	.101
	Within groups	134821.620	1078	125.066		
	Total	136954.299	1081			
Marital status	Between groups	24.028	2	12.014	.095	.910
	Within groups	136930.272	1079	126.905		
	Total	136954.299	1081			
Educational attainment	Between groups	2809.197	2	1404.598	11.298	.000
	Within groups	134145.103	1079	124.324		
	Total	136954.299	1081			
Income	Between groups	331.131	3	110.377	.871	.456
	Within groups	136623.168	1078	126.738		
	Total	136954.299	1081			
Length of residence	Between groups	6462.780	2	3231.390	26.720	.000
	Within groups	130491.519	1079	120.937		
	Total	136954.299	1081			
Household size	Between groups	777.406	2	388.703	3.080	.046
	Within groups	136176.893	1079	126.207		
	Total	136954.299	1081			
House tenure	Between groups	1799.988	2	899.994	7.185	.001
	Within groups	135154.311	1079	125.259		
	Total	136954.299	1081			

Difference in environmental sanitation behavior based on residential characteristics

One of the research questions raised in this study was centred on assessment of statistical significant difference in environmental sanitation behavior based on residential characteristics. To provide answer to this question, tests of statistically significant difference in environmental sanitation behavior by residential characteristics were conducted using one-way Analysis of Variance (ANOVA). The results of these tests are presented in Table 2. The included factor variables in the tests are gender, age, place of residence, educational attainment, income, length of residence, household size, and house tenure.

The results of the ANOVA tests revealed that there were statistically significant differences in residents' environmental sanitation behavior based on their place of residence, gender, educational attainment, length of residence, household size, and house tenure. The analyses were further subjected to post hoc tests for multiple comparison analysis for those with more than two categories using Bonferroni. Findings revealed that significant difference existed within and

between the groups in residents' environmental sanitation behavior. For instance, significant statistical differences were found between each of the place of residences, and between categories of educational attainment, length of residence and household size in terms of environmental sanitation behavior of residents.

Nevertheless, there are no statistically significant differences in environmental sanitation behavior based on age, marital status, and income in the study area. The implication of these findings is that while residential characteristics such as place of residence, gender, educational attainment, length of residence, household size, and house tenure can be used to explain environmental sanitation behavior in Ibadan, reverse is the case for others such as age, marital status, and income in the city.

Determinants of environmental sanitation behavior

In this part of the study, environmental sanitation behavior was the dependent variable while the independent variables or predictors were the identified residential characteristics. The dependent variable

was determined by making the residents indicate, via a five-point Likert scale, the effectiveness of some notable residents' environmental actions. Responses ranged from "not at all effective" (coded as 1) to "very effective" (coded as 5). The scores for each item were summed to create a composite measure of environmental sanitation behavior. Thus, by transforming the categorical responses into interval data, suitable variables for parametric tests were generated (Daramola, 2015; Kalantari et al., 2007).

The predictors of environmental sanitation behavior comprised the residents' basic characteristics such as gender, age, marital status, education, income, household size, place of residence, house tenure, and length of residence. Data collected on these variables were of various classes. Continuous data were collected for quantitative variables such as age, income, household size, and length of residence. The categorical variables were transformed into interval data to make them suitable for parametric tests. The binary categorical variables (gender and house tenure) among these were coded as "0" and "1" while those with more than two categories were dummied with consideration for reference category.

In order to examine the influence of the residential characteristics on environmental sanitation behavior, a multiple regression analysis was conducted. The interest was to determine whether the identified residential characteristics can predict a significant amount of the variance in environmental sanitation behavior of Ibadan residents. The regression model summarizes these factors in relation to environmental sanitation behavior. Presented in Table 3 are results of the combined effects and the relative contributions of each

independent variable on environmental sanitation behavior.

The composite correlation coefficient of the relationship between residential characteristics and environmental sanitation behavior is 0.323. This value provides a good estimate of the overall fit of the regression model. The regression value (R^2), which provides a good gauge of the substantive size of the relationship, is 0.104 for this model. This implies that 10.4% of the variance in environmental sanitation behavior is accounted for by the predictor variables. Furthermore, presented in the table is the relative contribution of each predictor variable to the variance in environmental sanitation behavior. Length of residence has the highest beta value (-.223), followed by educational attainment (0.147), gender (-.126), house tenure (-.120), place of residence (.103), and household size (-.066). As shown in Table 2, with the exception of age, marital status, and income the predictor variables have significant effect on environmental sanitation behavior.

As shown in Table 3, these findings indicate that a statistically significant relationship exists between environmental sanitation behavior and residential characteristics such as length of residence, educational attainment, gender, house tenure, and household size but not with age, marital status and income in the study area. These findings are consistent with the results of some earlier studies (Arcury, 2000; Caiazza and Barrett, 2003; Daramola, 2012, 2015; Dietz et al., 2002; Dunlap, 1998; EORG, 2002; Hunter et al., 2004; Kalantari et al., 2007; Poortinga et al., 2004; Stern, 1998; Tarrant and Cordel, 1997) which have indicated that there is a significant statistical association between characteristics such as gender, education, household size, and place of residence and residents environmental behavior. Thus, they serve as predictors of environmental sanitation behavior in the study area. On the other hand, the analyses also revealed findings that are not in tandem with findings of some other studies (AWDR, 2006; Buttel and Taylor, 1999; Howell and Laska, 1992; Kalantari et al., 2007; Nord et al., 1998) which have identified age and income as strong predictors of environmental behavior. The rationale for the

Table 3. Environmental sanitation behavior regressed on residential characteristics.

	B	Std. error	Beta	t	Sig.
Constant	34.948	2.844		12.286	.000
Gender	-2.899	.664	-.129	-4.368	.000
Age	.012	.037	.013	.324	.746
Marital status	.400	.947	.016	.423	.673
Educational attainment	2.509	.523	.145	4.797	.000
Income	-8.252E-006	.000	-.041	-1.286	.199
Household size	-.096	.126	-.026	-.765	.444
Type of house tenure	-1.355	.353	-.113	-3.834	.000
Years of living	-.359	.046	-.229	-7.810	.000
Place of residence	1.435	.514	.103	2.791	.005

R = 0.323; R Square = 0.104.

difference in the findings of this study from the findings of the identified previous studies might be due to the empirical nature of this study and the peculiarity of the study area.

Conclusion

This study assessed residential characteristics and difference in residents' environmental sanitation behavior in Ibadan based on their residential characteristics. Also, the study assessed residential characteristics as determinants of environmental sanitation behavior in Ibadan. Based on the findings from the study, it is concluded that residential characteristics such as place of residence, gender, educational attainment, length of residence, household size, and house tenure can be used to explain variance in residents' environmental sanitation behavior. They are among the various factors determining environmental sanitation behavior in Ibadan. Therefore, the influence of residential characteristics on environmental sanitation behavior can enhance environmental sanitation behavior and ensure sanitary urban environment.

These results on environmental sanitation in Ibadan have policy implications for sustainable development both in Nigeria and countries of similar urban settings. According to WHO and UNICEF (2015), components of environmental sanitation such as water supply; sanitation and management of wastewater, storm water, and solid waste are fundamental human needs that are vital for the dignity and health of all people. For instance, the failure of Nigeria to achieve the Millennium Development Goals (MDGs) and the prospects to achieve the Sustainable Development Goals (SDGs) hinge on issues of environmental sanitation. This is because issues in environmental sanitation are intrinsically linked to other sustainable development issues such as poverty, hunger, health, education, gender inequality, ecosystems integrity, climate change, and disasters (UNESCO International Hydrological Programme, 2014; Bernhardt, 2015). The focus of SDG 6 is on environmental sanitation and that of SDG 11 on the city are related to other topics in the 2030 Agenda. These include poverty eradication [SDG 1], better nutrition [SDG 2], healthy lives [SDG 3],

education [SDG 4], gender equality [SDG 5], climate change [SDG 13], and infrastructure [SDG 9]. Therefore, the need for policy makers to consider residential characteristics in addressing issues and challenges associated with environmental sanitation is germane. This is because the contributions of residential characteristics in promotion of the environmental sanitation behavior will go a long way in liberating and enhance some personal and social characteristics of residents such as gender, education, income, and place of residence.

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