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Influence of Socio-cultural Factors in Solid Waste Generation in Bida Town

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Abstract. Waste generation rates vary across countries and cities due to differences in influencing factors. This study assesses the socio-cultural factors and the relationships between socio-cultural factors and solid waste generation in Bida. The study employed a quantitative approach with a structured questionnaire to assess seven (7) socio-cultural factors: geographic location, economic situation, beliefs, religion, urbanization, awareness, and practice. A total of 400 households were sampled using stratified random techniques based on traditional and modern settings in Bida town. Exploratory factor analysis was employed to analyse the factors that influenced waste generation. The relationship between these factors and waste generation was tested using Pearson correlation and regression analysis. The findings show that social factors such as "urbanization" ($\alpha > 0.894$), "geographical location" ($\alpha > 0.757$), "awareness" ($\alpha > 0.719$), and "economic situation" ($\alpha = 0.791$) as well as cultural factors such as "practice" ($\alpha = 0.798$), "belief ($\alpha = 0.782$), 'religion' ($\alpha = 0.715$) influences solid waste generation in Bida. Also, "urbanization" ($r = .124$; $p = .05$), "awareness" ($r = .197$; $p = .01$), and the cultural factor "local practice" ($r = .195$; $p = .01$) were found to have weak and significant associations with solid waste generation in Bida. However, the relationship between variables was moderate ($R = .290$) and accounted for only 8.4% ($R^2 = .084$) of the variance in the waste generation rate in Bida.

Keywords: Awareness. Socio-cultural factors, Urbanization, Urban future, Waste generation.

1. Introduction

The world is moving toward urban agglomeration due to urbanization, and the amount of municipal solid waste, one of the most important by-products of an urban lifestyle, is growing even faster than the rate of urbanization (Hoornweg & Bhada-Tata, 2012), indicating that solid waste generation levels are expected to double by 2025. The higher the income level and rate of urbanization, the greater the amount of solid waste produced (World Bank, 2021). According to Hoornweg and Bhada-Tata (2012), the present global urban solid waste generation levels are approximately 1.3 billion metric tons per year and are expected to increase to approximately 2.2 billion metric tons per year by 2025, representing a significant increase in per capita waste generation rates from 1.2 to 1.42 kilograms per person per day in the next fifteen years. However, global averages are only broad estimates, as rates vary considerably by region, country, city, and even within cities.

Waste generation rates are of different kinds among different countries and cities of the world, as they are influenced by different factors (Tassie Wegedie, 2018; Kolekar *et al.*, 2016). Factors influencing waste generation and composition are diverse in different regions of the world due to variations in local conditions like climate, standard of living, technology, customs, and culture (Chikowore, 2021; Darban & Hajilo, 2017). As a way of life, culture provides the context within which all human activities take place; the influence of culture is felt on a host of societal functions, including the generation of waste (Purcell & Magette, 2010). The significance of culture suggests that many social activities and societal circumstances are linked to cultural considerations, thereby emphasizing the role of culture in solid waste generation (Ajani & Sunday, 2021). Because of this, it is very important to understand how socio-cultural factors and solid waste are related because they have long-term effects on future generations.

Society and culture have a more momentous effect on solid waste generation than other attributes of economic factors like income and education, due mainly to the difficulties in assessing the actual

income of the residents (Mohd *et al.*, 2002). The relationship between socio-cultural factors and solid waste generation is influenced mostly by household attitudes, family size, lifestyle, and indigenous knowledge on the efficient use of materials (Darban & Hajilo, 2017). While its composition varies from country to country and even within a country (Abdel-Shafy & Mansour, 2018; Kolekar et al., 2016), this is because of differences in geography, economy, and waste management rules.

Solid waste generation is growing at a rate beyond the capacity of the city authorities to control for a sustainable urban environment (Umunna, 2011). According to Pardini *et al*. (2019), the increase in waste generation is a significant challenge for enormous urban centers globally and a menace to fast-growing cities with rapid population growth. In many developing countries, the deplorable condition of urban waste management poses a challenge to public health, with more adverse effects in low-income residential areas (McCoy, Hall, & Ridge, 2012). In Nigeria, it is one of the major environmental problems in the cities and urban areas due to the increase in the influx of people into the urban area, which puts a strain on many services, including waste management services (Aderemi & Falade, 2012). Thus, forecasting the production of municipal solid waste (MSW) has become a key tool for decision-making in urban contexts, not only owing to its crucial role in successful waste management but also because it gives insight into the complexity of the variables that drive MSW creation (Izquierdo-Horna, Kahhat, & Vázquez-Rowe, 2022). So, this paper looked at the social and cultural factors that affect solid waste production in Bida, a town with a unique social and cultural setting.

2. Methodology

2.1 The Study Area

Bida Town, a traditional emirate, is the Local Government Headquarters in Niger State. It is located along the A124 highway (a regional road) that connects Ilorin to Minna and Abuja, between longitudes of 6°01'E and 6º017'E of the Greenwich Meridian and latitudes of 9°05'N and 9º08'N of the equator (See Figure 1). It has an overall population of 188,181 people based on the 2006 National Population Census and covers a land area of about 51 square kilometres. The major ethnic group found in this city is the Nupe. It is the home base of Nupe Land, with many districts like Agaie, Baddeggi, Enagi, Katcha, Kutigi, Lapai, Lemu, Mokwa, Patigi, and Lokoja. Bida town is about 240 kilometres from Abuja (the Federal Capital Territory) in the north-east direction. Located in the southwestern part of Minna (the state capital), it stretches along the Bako River, which is a tributary of the popular River Niger.

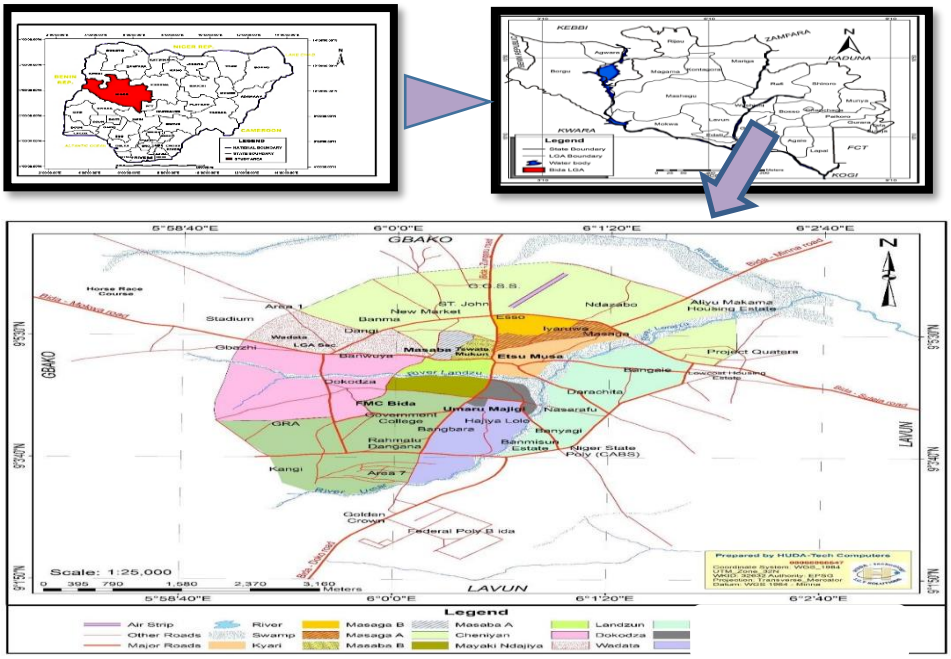

Figure 1: Bida the Study Area

2.2 Methods

The study employs a random number selection to identify four (4) each from both the core traditional and modern areas out of the fourteen (14) administrative wards in Bida. The exponential model was used to project the 2006 National Population Census of 188,181 at 3.87% to 2021. All wards are expected to have a population of 332,515 (332,515 / 14 = 23,758; 23,758 * 8 = 190,064) in 2021.The study sample frame was 31,680 households, calculated by dividing the expected study population of 190,064 by 6. Taro Yemane (1973) was used to estimate 400 households for the sample. Demographics, socioeconomic situation, and home waste management practices were collected through the use of closed-ended questionnaire. Exploratory Factors Analysis (EFA) and Pearson correlation were used to identify socio-cultural factors that affect solid waste generation. Regression analysis was used to estimate how socio-cultural variables affect solid waste creation.

Kaiser-Meyer Olkin (KMO) and Bartlett's Test of Sphericity were employed to assess sample adequacy, relationship strength, and EFA data significance. KMO values range from 0 to 1, with a minimum of 0.5 and a significant level of $p<0.005$ (Hair et al., 2010). Spearman correlation analysis determined significance and direction. The consensus is that rho = 0.10 accounts for 1% of the overall variation when small, 9% (.3) when medium, and 25% when high (.5).

3. Results and Discussion

3.1 Socioeconomic Characteristics of the Households

A sample of 400 households was taken from the study area to collect information based on personal and socio-cultural backgrounds. The analysis shows the majority of respondents (41.9%) have an average household size range of 5-7 persons and 29.7% have an average household size range of 8–10 persons. In all, more than 80% of the respondents had an average household size of between 5 and 10, which indicated that a lot of waste generation is expected from the study area. Also, more than 40% of the households earn less than ₦40,000 (the equivalent of $87.55) as monthly income, meaning that the majority of the residents are living below the poverty level as described by the World Bank (i.e., the number of people living on less than $1.90 a day), and it is expected that they will rely more on the food materials that generate waste than the processed foods. The analysis also showed that 60% of the respondents lived in the study area. This shows that the information from the study is reliable and can be used for further analysis (Table 1).

Table 1: Socioeconomic Characteristics of the respondents (n = 400)

Variables	Freq (%)	Variables	Freq (%)
Gender of the household head		Average Monthly Income	
Male	255 (63.6)	less than N20,001	79(19.7)
Female	146 (36.4)	₦20,001- ₦40,000	111(27.7)
Age		₦40,000 - ₦80,000	146(36.4)
< 18	2 (0.5)	Above ₦80,000	65 (16.2)
18 – 25	33 (8.2)	Duration of stay in the area	
26 – 35	90 (22.4)	Less than 3 years	35 (8.70
36 – 45	170 (42.4)	4-8 years	124 (30.9)
46 -55	52 (13.0)	9-13 years	125 (31.2)
Above 55	54 (13.5)	14-18 years	56 (14.0)
Average Household Size		Above 18 years	61 (15.2)
2 – 4	60 (15.0)	Distance to the permitted Dump site	
5 – 7	168 (41.9)	< 50 meters	46 (11.5)
8 – 10	119 (29.7)	50 to 100 meters	190 (47.4)
11 – 13	33 (8.2)	> 200 meters	165 (41.1)
14 above			
Education level	21 (5.2)		
None	31 (7.7)		
Primary	48 (12.0)		
Secondary	175 (43.6)		
Tertiary	147(36.7)		

3.2 Social and Cultural Factors Influencing Solid Waste Generation in Bida

3.2.1 Social Factors Influencing Solid Waste Generation in Bida

Social factors that determine solid waste generation in Bida were assessed using exploratory factor analysis (EFA). The result of Kaiser-Meyer-Olkin (KMO) and Bartlett's Test of Sphericity conducted to verify the sampling adequacy and the significance shows sampling adequacy for social (KMO = 0.843; *p* 0.01) and cultural (KMO = 0.773; *p* 0.01) and is significant for the analysis (Hair *et al.*, 2012). Table 2 presents the results of the social factors that influence solid waste generation in Bida town. Results show that out of nine (9) social factors considered, four (4) extracted factors (eigenvalue > 1) influence waste generation in Bida. The remaining five items had 0.3 loadings and double cross-loading on other factors, so they were deleted.

The first of the four (4) extracted social factors ("urbanization") had an eigenvalue of 6.101 ($\alpha > 0.894$) and consisted of seven (7) items with loadings ranging from 0.769 to 0.706, accounting for 38.129% of the variance explained. The second factor, "geographical location," with an eigenvalue of 2.375 and high reliability ($\alpha > 0.757$), has four (4) items with factor loadings ranging from 0.762 to 0.647 and explains 14.842% of the variance. The third factor ("awareness") has a Cronbach's alpha greater than 0.719 and three (3) items with loadings ranging from 0.747 to 0.709, accounting for 7.397% of the variance. Lastly, the fourth factor, "economic status," had an eigenvalue of 1.004 ($\alpha = 0.791$), with two (2) items (factor loading = 0.837 and 0.722) explaining 6.274% of the variance. Hair et al. (2012) found that the four factors contributed 66.643%, which proves that a cumulative variance threshold of more than 50% is acceptable.

Table 2: Social Factor Influencing Waste Generation in Bida

	Factor			
Indicators	1	2	3	4
Healthy environment	0.769			
Urbanisation	0.764			
Distance to the municipal dump site	0.754			
Awareness waste generation control	0.750			
Household participation	0.729			
Waste as a future treasure	0.727			
Increase income	0.706			
Increase in household size		0.762		
Change in seasons		0.731		
Public participation of waste management		0.680		
More wastes are generated in dry season		0.647		
Environmental sanitation			0.747	
Waste recycling			0.737	
Level of education			0.709	
Family that dines out generate less wastes than the ones that cook at home				0.837
Age				0.722
Eigenvalue	6.101	2.375	1.184	1.004
% of Variance	38.129	14.842	7.397	6.274
Cumulative Variance	38.129	52.971	60.369	66.643

3.2.2 Cultural Factors Influencing Solid Waste Generation in Bida

Table 3 presents the results of the analysis on cultural factors that influence solid waste generation in Bida. The results reveal three (3) cultural factors with eigenvalues > 1 out of nine (9) factors considered to have an influence on waste generation in the town. The first factor, "practice" (factor 1) (eigenvalue = 4.485; $\alpha = 0.798$), consists of five (5) items with loadings from 0.788 to 0.634 and accounted for 34.497% of the variance explained. The second factor (beliefs) had an eigenvalue of 1.850 ($\alpha = 0.782$), had four (4) items with loadings from 0.810 to 0.647, and accounted for 14.228 percent of the variance. Finally, "religion" (factor 3) had four (4) items with loadings of

0.807–0.565 and accounted for 9.404% of the variance, with an eigenvalue of 1.184 (α = 0.715). The total effect of the three factors was 58.129%, which is more than the 50% threshold for acceptable cumulative variance (Hair et al., 2012).

Table 3: Cultural Factor Influencing Waste Generation

	Factor		
Indicators	1	2	3
Regular sweeping	0.788		
Waste separation	0.749		
Religion preaches cleanliness	0.703		
Sweeping of homes during the day times	0.699		
Culture provides the context for waste management	0.634		
What you “see” or “feel” is a dirt		0.810	
Culture definition of dirt		0.786	
Waste is a dirt		0.706	
Time		0.647	
Cleanliness is next to Godliness			0.807
Religion does not support waste of materials			0.733
Waste minimization			0.569
Food stuff			0.565
Eigenvalue	4.485	1.850	1.223
% of Variance	34.497	14.228	9.404
Cumulative Variance	34.497	48.725	58.129

Overall, the social and cultural factors revealed to influence waste generation in Bida demonstrate a high degree of reliability (α > 0.70) and are considered acceptable in corroboration with the findings of Field (2000), who suggests that the items measure the corresponding factors perfectly. Thus, factors such as "urbanization," "geographical location," "awareness," and "economic status," as well as "practice," "beliefs," and "religion," influence the increase of solid waste generation in the sociocultural environment. This finding corroborates with previous studies on waste generation. In the context of geographical location, Nathanson (2020) found that solid waste generation varies among the cities and nations of the world, and the generation rate of different nations varies gradually according to the level of their development. The developed nations like the United States generate 2 kg of solid waste per person per day; Japan generates half of that; Canada generates 2.7 kg; and most of the developing countries generate a little above 0.5 kg per person per day. Hilles (2011), on the other hand, found that awareness of people towards waste management focuses on the role of culture and behaviors, which are believed to control attitudes towards the solid waste management process. Relating these to developed countries, Hilles (2011) found out that the usage of any solid waste management program like recycling schemes is always influenced by demographic factors and attitudinal changes in site usage, due to the specific and individual information on the effects of solid waste management and the billing system. Similarly, other studies (Trang *et al.,* 2017; Senziege *et al*., 2014) found that the socio-economic status (education, income, and occupation) of the population is a determining factor for solid waste generation rates and composition in the municipalities. Alagbe *et al.* (2021) and Khan *et al*. (2016) reported that different socioeconomic groups produced different kinds and quantities of waste, with the middle socioeconomic group generating the most waste.

3.3 Association between Socio-Cultural Factors and Waste Generation

Social norms are the primary driver of trash production and recycling behaviour. This is especially true in collectivist societies where people are more influenced by other people's opinions (Morren & Grinstein, 2016; Sorkun, 2018). Hence, using the correlation coefficient, the link between socio-cultural aspects and garbage creation in Bida was investigated. The results of Pearson’s correlation coefficient tested on the relationship between social and cultural factors with waste generation reveal a weak but significant correlation in the social factors such as "urbanization" (r =.124; *p =.05*), "awareness" (r =.197; *p =.01*), and "local practice" (r =.195; *p =.01*) in influencing solid waste generation in Bida, as presented in Table 4. This indicated that, despite the level of urbanization, the lack of awareness among the residents about waste handling could not change the local practice of solid waste generation and management.

The results also show that factors such as "geographical location" (r =.030; *p =.546*) and "economic situation" (r =.064; p =.198), "beliefs" (r =.065; *p =.198*), and "religion" (r =.195; *p =.193*) have non-significant associations with solid waste generation in Bida.

Table 4: Correlation between Waste Generation Rate and Socio - Cultural Factors in Bida

Attributes	Waste Generation Rate		Significant Test
	Pearson Correlation (r)	Sig. 2-tailed (*p*)	
Social Factors			
Urbanization	.124*	.013	Significant
Geographical location	.030	.546	Not Significant
Awareness	.197**	.000	Significant
Economic	.064	.198	Not Significant
Cultural Factors			
Practice	.195**	.000	Significant
Beliefs	.065	.193	Not Significant
Religion	.095	.057	Not Significant

**. Correlation is significant at the 0.01 level (2-tailed)
*. Correlation is significant at the 0.05 level (2-tailed).

A multiple regression was performed to predict waste generation from social factors (urbanization, geographical location, awareness and economic) and cultural factors (Practice, beliefs and religion). The results reveal (Table 5) these variables statistically and significantly predicted solid waste generation, F (7, 393) = 5.146, p < .01). The relationship between variables were moderate (R = .290) and accounted for 8.4% (R^2 = .084) of the variance in waste generation rate. The table shows that practice had a statistically significant impact β = .167, t = 2.462, p = < .05, geographical had a statistically significant impact β = -.190, t = -2.702, p = < .01 and lack of awareness had a statistically significant impact β = .251, t =3.552, p<.001. Whereas the remaining 4 variables did not, beliefs β = -.79, t = -1.033, p = .302, religion β = .001, t = .022, p = .983, urbanization β = .139, t = 1.866, p = .063, and economic β = -.073, t = -1.135, p = .257. The effect size of their relationship was tested with the use of Cohen's $F^2 = (R^2 – / (1 – R^2)$ which indicated that F^2 = 0 .084 – (1 - 0.084) = 0.095 small positive effect size (Cohen,1988).

Table 9: Regression Analysis between Socio Cultural Factors and Waste Generation Rate

Waste Generation Rate					
Variables		B	Beta (β)	t	Sig
Practice		.097	.167	2.462	.014*
Beliefs		-.046	-.079	-1.033	.302
Religion		.001	.001	.022	.983
Urbanization		.077	.139	1.866	.063
Geographical		-.109	-.190	-2.702	.007**
Awareness		.129	.251	3.552	.000***
Economic		-.033	-.073	-1.135	.257
R	R^2	Adjusted R^2	Std. Error of the Estimate		
.290	.084	.068	.41265		

Note: Waste generation rate as dependent variable, * p < .05, ** p < .01, *** p< .001

4. Conclusion

The social factors reviewed in the literature that mostly influence solid waste generation in the study area include the economic condition of the residents, the value attached to waste, public enlightenment and awareness campaigns on waste management, public cooperation, urbanization, and geographical factors. On the other hand, the cultural factors reviewed include the lifestyle of the people, their perception of the issue of waste, their norms, beliefs, practices, and religion. Findings from the study revealed that social factors (urbanization, geographic location, awareness, and economic status) and cultural factors (practice, beliefs, and religion) influence solid waste generation in Bida. The degree of reliability was tested to check the acceptability of the items for corresponding factors using Cronbach's alpha value (α > 0.70) and an acceptable internal consistency, indicating that the items measure the factors perfectly. This finding adds

valuable information to future studies on MSW prediction that will aid in achieving more precise outcomes. There is a need for more investigation into the relationship between the amount of solid trash individuals create and the number of households.

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