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Assessment of Community Participation in Solid Waste Management in Kano Metropolis, Nigeria

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Abstract

Increases in volume of waste materials discharged to the environment have been an issue of major concern due to its public health and environmental sustainability implications. To improve effectiveness and efficiency in the delivery of waste management services therefore, involvement of the community is needed. The study therefore assessed the community participation in solid waste in Kano metropolis, by identifying the different forms of participation by communities, examine the multiple factors influencing participation in solid waste management in the study area. Data were collected using multi stage sampling technique involving stratified, purposive and systematic methods from 400 individuals. Multiple regression analysis was employed for the analysis of the data. The findings of the study revealed that majority of the respondents (62.1%) do not participate in solid management in their communities and for those that participate; they collect their waste at home which implies that, they only participate at the household level and not communal level. Fulfillment of religious obligation, Available land provided by community members as refuse dump site, Low level of awareness about sanitation and Age reported to be main variables that influence participation in waste management with the frequency and mean value of 315 (3.176), 279 (3.156), 261 (3.136) and 223 (3.117) respectably. There was a limited effort from the voluntary group/ organizations that complementing the activities of community in solid waste management as revealed by 30.6% respondents. The study further revealed that most of the areas do not have any environmental sanitation committee in their community to regulate and coordinate a proper solid waste handling as reported by 72.3% of the respondents. The study concludes that, the efforts of both, the community and the voluntary groups is needed to efficient waste management in the metropolis. The study recommends that, awareness campaign and education to the community should be given a priority which will eventually make them understand the benefit of Solid waste management.

Keywords: Community, Participation, Solid waste, Management and Municipal

Introduction

A major consequence of urbanization is a huge volume of solid waste generation [9]. It is estimated that about 1.5 billion metric tons of municipal solid waste was generated globally in 2011 with a projection of 2.2 billion by 2025 [14]. A considerable amount of money goes into managing huge volumes of solid waste. Asian countries alone spent about US$25 billion on solid waste management per year in the early 1900s and the figure is expected to grow to about US$50 billion by 2025 [15]. These figures suggest that solid waste management (SWM) has become a complex and costly service. In developing countries it is estimated that one to two thirds of the solid waste generated in most urban areas are not collected [1]. Solid waste management is major environmental problem due to urbanization which leads to increasing waste generation thereby changing the composition of the waste and also creating management problem [6]. Kano metropolis is among the urban centres in Nigeria faced with the problem of improper waste disposal for example, an estimated 3085 tons of solid waste were reportedly generated daily in Kano municipality [24] but the municipal waste management agencies (Refuse Management and Sanitation Board [REMASAB'S]) can only collect and dispose less than 30% of the generated waste. Of the uncollected waste, about 59% is disposed in open dump site, while about 14% is dumped in streets, streams and rivers [13]. As it is currently if not properly managed, solid waste creates favourable breeding ground for vermin and insects and causes serious risks of communicable diseases. For example, the blockage of waterways by waste not properly disposed can result to flooding during heavy rainfall which if not properly drained becomes a breeding sport for mosquitoes [17; 9]. For the quality solid waste management, community participation is needed to aid and support government institutions.

Community participation in solid waste management has been in Nigeria**,** and which has been introduced since 1960s, however much emphasis was not given not until the late 1990s. Though, it may be appropriate to state that community participation in development activities has been widespread in Nigeria. Very little is known on operational strategies, success and challenges of community participation in solid waste management [5; 41]. Community participation in solid waste management such as public awareness, social ideals, beliefs and attitudes to waste can affect all stages in the waste management process [3]. To keep any solid waste management systems running, at a minimum, participation of the community is required the study therefore, derives its basis from the background on community participation in managing solid waste in Kano metropolis.

Statement of the Research Problem

In Kano metropolis, like most cities in the developing world, several tons of municipal solid waste are left uncollected living large portion of the population without access to solid waste management services. Indeed only about 20% of the waste generated in Kano metropolis is actually collected hence vast majority of users of the service (92%) consider the service very poor [25; 27]. Municipal solid waste challenge in Kano metropolis is not new hence some other researchers have addressed some of its aspects. [12], examined the various municipal solid waste disposal systems in some parts of Kano metropolis along with the environmental issues associated with these wastes. [28], also examined the prevailing management of municipal solid waste in Kano metropolis and highlights the problems that impede efficient solid waste management. Observation in Sabon Titi Mandawari, Jakara, Kofar Mata, Dakata to mention just a few areas reveals heap of uncleared waste. It then lead to curiosity whether public waste management agencies such as REMASAB are unaware of these areas. It was observed further that in few areas like Nasarawa GRA, Hotoro GRA, Tarauni, Bompai, people's participation are mainly through individual household efforts not at communal collective efforts. Apparently in many parts of Kano metropolis, there are no organized house to house or street to street collections of solid waste and even in few areas where large waste bins are provided, they are hardly used by the community.

Over the years, there is a high frequency of flooding in the Kano metropolis which can be attributed to poor municipal solid waste management in Kano metropolis, likewise the study area has the prevalence of water borne diseases particularly during

the rainy season, which equally can be attributed to the dismal solid waste management practice in the study area [13]. Households wastes are indiscriminately dumped on land, water ways, excavated pits and also burnt which shows that 81% depends heavily on REMASAB and do not want to pay fee for refuse collections [21]. How communities are participating in this waste management processes are unclear. The study therefore fills a knowledge gap as it assesses the efforts of community participation in solid waste management in Kano metropolis, by indentifying community's forms of participation and multiple factors that influence people participation in municipal solid waste management.

Conceptual Frame Work

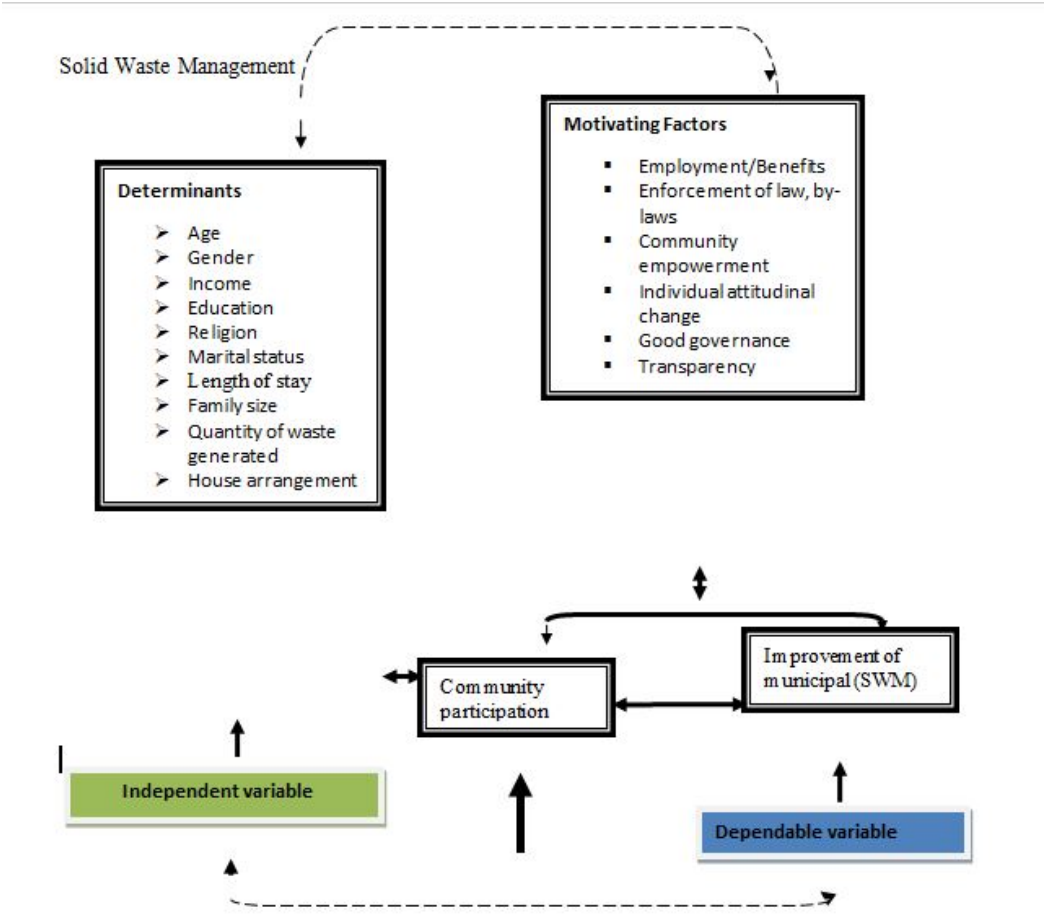

Figure 1: Model/Conceptual frame work for community participation in solid waste management

Source: Adopted from [36]

Most waste management models consider economic and environmental aspects, but very few consider social aspects. For a waste management system to be sustainable, it needs to be environmentally effective, economically affordable and socially acceptable and for a waste management system to be effective, it must be accepted by the population [30].

The determinants and motive factors for the community participation in solid waste management can be summarized by the model/conceptual frame work. The model explains the determinants of community willing to participate in solid waste management in relation to motive factors that influence an individual to take part in solid waste management. When these determinants and motives factors are considered effective as the driving force for community to participate in solid waste management we anticipation the condition of solid waste management will be improved.

Materials and Method

The Study Area

Kano metropolis is the second largest city in Nigeria and the largest city in the Sudan Savanah ecological zone of Nigeria [25]. Initially Kano metropolis covered 137 square kilometers (53 square miles), and comprised six local government areas (LGAs) namely:-Kano Municipal, Fagge, Dala, Gwale, Tarauni and Nasarawa. Now it includes two (peri-urban) additional LGAs which are Ungogo and Kumbotso [11; 21]. The total area of Metropolitan Kano is now 499 square kilometers (193 square miles). It is located between Latitudes $12^0$05'02" to $12^0$22'43.92"N and Longitudes $8^0$21'49.95" to $8^0$37'24.90"E (Figure 2).

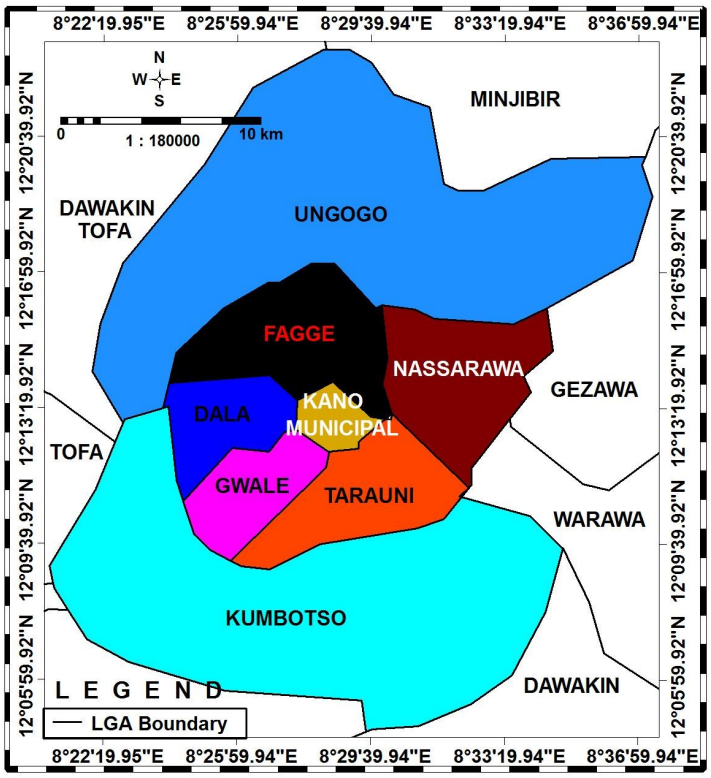

Figure 2: Kano State showing Kano Metropolis

Source: From Administrative Map of Kano State 2023.

Climatic factors play a crucial role in the decomposition and appearance of MSW. For example, during the wet season, heat and humidity cause the solid waste to be of higher moisture content thus increasing the weight of the refuse [25].The climatic nature of the study area its imperative that the solid waste management requires adequate and proper community participation to reduce the unpleasant nature of waste.

Kano Metropolis being the most important commercial and industrial nerve centre of Northern Nigeria attracting millions from all parts of the country and beyond. In-migration and natural growth rate (of 3%) are expected to continue in the increase of the population and waste stream in the years to come. with a population presently estimated at 3.5 million and a population density of about 1000 inhabitants per Km^2 within the Kano closed-settled zone compared to the national average of 267 inhabitants per km^2. It is one of the most crowded cities in Nigeria, hence generation of municipal wastes in heaps on daily basis is enormous [23]. These figures indicate that solid waste generation is likely to be significant in Kano metropolis and that its management would require innovative strategies. On the Economic growth of Kano is a collective result of cultural, religious and commercial orientation the city has. Kano metropolis is the commercial nerve center of Kano state and is noted for its famous

markets amongst which are:-Kurmi market, Kwari market, Sabon Gari market, Kofar Wambai, Rimi, Kurmi, Singer, Dawanau and other smaller markets [10]. Kano metropolis has also witnessed the establishment of industries majorly situated in Bompai, Sharada, Challawa and Tokarawa industrial estates. These further strengthened the economic activities of Kano [18]. Undoubtedly, the presence of different economic and commercial activities have resulted in the production of large quantity of solid waste seen around the markets across the metropolis.

Methodology

S/N	Local Gov't Area	Population (Census 2006)	Projected Population (2021)	Sample Size per LGA	Selected Locality	Sample Size per Locality
1	Dala	418759	652412	59	Dala	47
2	Fagge	200095	311741	28	Yalwa Kwachiri Fagge C	12 23 5
3	Gwale	357827	557482	51	Dorayi Mandawari	42 9
4	Kano Municipal	371243	578384	53	Jakara Sharada Phase II	45 8
5	Kumbotso	294391	458651	42	Panshekera Naibawa, Mariri	33 9
6	Nasarawa	596411	929188	84	Gama Hotoro GRA	69 15
7	Tarauni	221844	345625	31	Unguwa uku Tarauni GRA	22 9
8	Ungogo	366737	571364	52	Rimin Kebe Rijiyan zaki	41 11
	Total	2828861	4407273	400		400

Table 1: Sample Size by Local Government Area

Source: Author's Computation 2006 census.

The study area comprises of eight (8) local governments area (LGAs) which form the sample frame for this study. These LGAs as listed under the scope of the study are Dala, Fagge, Gwale, Kano Municipal, Kumboso, Nasarawa, Tarauni and Ungoggo. The population of Kano metropolis which is 2,828,861 according to 2006 census [22] was projected to 2023 and the projected number is 4,407,273. This aggregate number of the population (4,407,273) was used as the population size for this study. In order to determine the sample size for this study, [42] formula method was adopted to ascertain exact proportion of questionnaire to be administered in the area. These approaches provide the bases for Table 1 where the sample size is clearly presented.

Sampling Method

Stratified random sampling method was used since the metropolis is large and can be divided in to zones. For the purpose of

questionnaire administration, two localities were purposively selected from each LGAs, one with the highest and one with lowest population density residential areas, in the study area 400 adult household heads/ representative of sixteen localities were selected. Focus group discussions (FGDs) session was conducted with a group of six people in the study area. Areas purposively selected for field observation were based on the level of population characteristics, commercial and social activities and population size. Data were also sourced from Kano State Refusal Management and Sanitation Board (REMASAB) to strengthen the findings of primary data obtained.

Data Analysis and Presentation of Results

The SPSS (Version 23) was used to analyze data, this is because it can handle large amount of data and given its wide spectrum of statistical utility for social sciences Also Multiple Regression analysis was adopted to examine the relationships between identified factors. The identified factors were cross tabulated with socioeconomic and demographic characteristics of the respondents. Each of the identified factors is a variable of its own; therefore, multiple factors could be identified by one respondent. And this suitable for the study because of the dependent variable and independent variable that the study is dealing with.

$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 \ldots\ldots\ldots B_{10}X_{10} + e$ ……..(3.10)

Where: Y = (participation of people (dependent variable)

X = (socio-demographic factors (independent variables)

Results and Discussion

The data were analyzed using 375 copies of questionnaire which were properly filled and returned accounting for 94% of the sampled population and this was used for the analysis.

Sex of Respondents

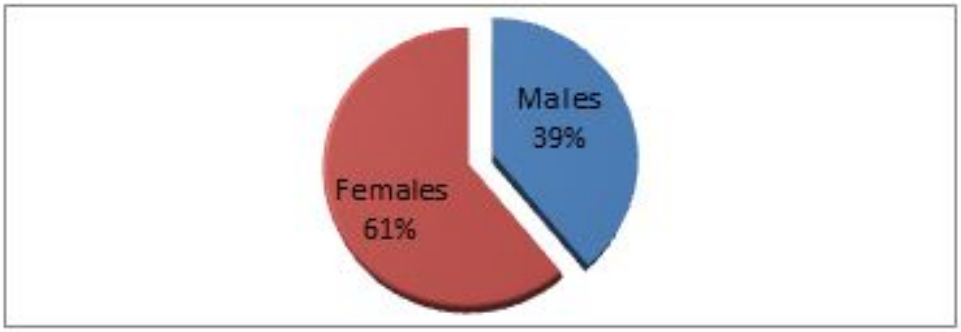

Figure 3: Distribution of respondents by sex

Source: Field survey, 2023

Sex of the respondents is very significant because of its influence on decision making. Fig. 3 shows that sex of respondents in the study area. Out of the 375 respondents interviewed, the highest proportion was females 61% and 39% were males.

Age and Marital Status of respondents

Age Group (years)	Frequency	Percentage
Below 18	30	8
19-39	243	64.8
40-60	72	19.2
61 and above	30	8
Total	375	100
Marital Status	**Frequency**	**Percentage**
Never Married	38	10.1
Married	199	53.1
Divorced	68	18.1
Separated	45	12
Widowed	25	6.7
Total	375	100

Table 2: Distribution of Respondents by Age Group and according to marital status

Source: Field survey, 2023

Table 2 presents age groups of respondents participating in community activities ranging from 18 years of age to 60 years and above. Results in Table 2, indicate that about two third (64.8 %) of respondents in the study area were aged between 19 – 39 years followed by 19.2% of the respondents aged 40-60 years and 8% representing each of the age group of 18 years and below 60 years and above. The findings therefore revealed that majority 64.8% is within the labour force age group therefore have more potential labour contribution in environmental conservation and other social communal activities such as solid waste management.

As reported by [4] adults have the experience and are able to access characteristics of new technologies/ideas. This finding supports the observation made by [2] that the age between 26 – 57 years is within the labour force age group, that is, people in this age group tend to be active, creative and participate in many social and economic activities. In addition, the findings in Table 2 show that 8.0% of the respondents were below the ages 18 years. Similarly, findings indicate that 8.0 % of the respondents aged 60 years and above account for low percentage which is in line with [29] who reported that the level of participation in social and development activities tends to increase with the optimum age group, after which participation starts to decline with increase in age. Respondents were also asked to state their marital status based on the option of whether they are single, married, separated, divorced or widowed. The findings in Table 2 indicate that about 53.1% of respondents were married, 6.7% widowed, 10.1% single, 18.1% divorced and 12% separated. The higher proportion of the married couples may suggest that there is high possibility of participation in solid waste management due to complementarities of men and women labour roles within the household as observed by [20]. [4], reported that married couples show a high level of participation in community development activities probably due to cooperation among them in the marriage institution in the society.

Educational Level of Respondents

Education is always valued as a means of deliverance from ignorance and enables one to perform effectively to any given task within a specified period [22]. Respondents were asked to state their level of education. Results in Fig. 4 indicate that the majori-

ty of the respondents 42.4% had tertiary education whereas 26.4% of the respondents had secondary education. The rest 15.2%, 8.8% and 7.2 of the respondents who were sampled had attained Quranic education, no formal education and primary education, respectively.

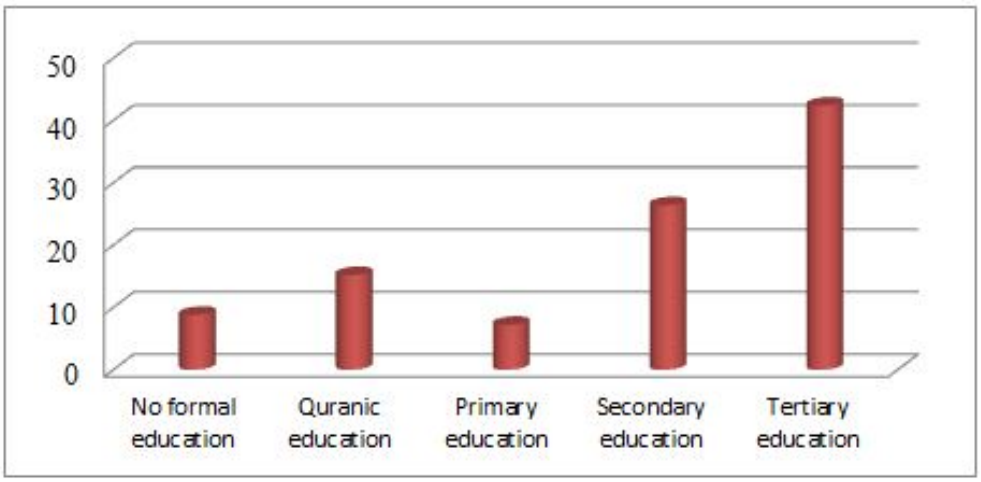

Figure 4: Distribution of respondents according educational level

Source: Field survey, 2023

The results therefore suggest that the majority of community members had basic education and therefore are likely to adopt new practices and ideas. From Fig. 4, its expected that majority of the respondents in the study should be helpful in relation to participation in SWM because of their literal level. The results further revealed that high literacy level in the study area with majority of the respondents had attained ordinary level of secondary education. Primary education is higher than the national average in the study area which is reported to be 56% [31], suggesting the likelihood of effective participation in community activities.

House Size of respondents

Respondents determined household size by considering all members who live in their household including parents, children and dependants. Fig.5 indicates that 31.2% of the interviewed respondents had equal or less than two people (≤ 5), 44.0% had between 6 to 8 people, 8.8% had 9 to 11 people and 16.0% had 12 and more than 12 household members.

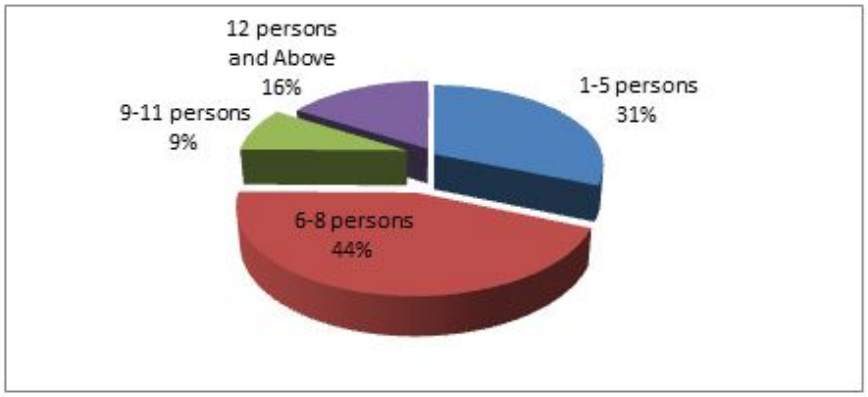

Figure 5: Distribution of the family house hold by Size

Source: Field survey, 2023

This indicates that about 44% of the respondents had household average size of six to eight persons which is much higher when compared with 2020 NBS of Nigeria in which the average household size of the Nigeria is about 4.8 members. The implication of these is that, more number of people in the household, the more the waste generated, hence disposal becomes a problem, therefore it expected to be more willing to participate in order to keep a clean environment [32]. However, these results suggest a possibility of high generation of solid waste for the larger household sizes. If such large size is properly utilized they may provide labour for community activities such as solid waste management.

Community Participation in Solid Waste Management

Community participation	Frequency	Percentages
Yes	142	37.9
No	233	62.1
Total	375	100

Table 3: Participation in solid waste management among respondents

Source: field survey, 2023

Table 3 present the responses on participation in waste management. The respondents were asked if they do participate in solid waste management in their community. Exactly 37.9% of the respondents do participate in solid management in their community, as against 62.1% who say they do not participate in solid management in their communities. This therefore implies that majority of the respondents 62.1% do not participate in solid management in their communities, their perception is that municipal authority has the sole responsibility for solid waste management services. [33], reported that age, income, and education levels affect the perceptions, practices, and attitudes of the people towards solid waste management. The study further revealed that majority of the residents 54.4% still with the opinion that sanitation services are too costly and should be the prerogative of the local and state governments to carry out.

Although, [19] pointed out that there are some municipalities which have addressed the waste management problem using community participation in their localities. But general findings indicated community participation at the planning level is very poor. [16], added that awareness is necessary with the issue of waste management problem, community need to be aware that solving this problem is to their benefit. For respondents who reported to participate in solid management in their community.

The activities they do	Frequency	Percentages
No response	233	62.1
Waste collection at home	79	21.1
Waste transportation to refuse dump site	43	11.5
Provision of waste receptacle at home	15	4
Advocating for proper waste management practice	5	1.3
Total	375	100

Table 4: Participatory activities mostly done by the respondents

Source: Field survey, 2023

Table 4 presents what they do to participate in solid management in their community, 62.1% of the respondents gave no response to this question, while 21.1% of them do collect waste at home. Furthermore 11.1% of respondents carry out waste trans-

portation to refuse dump site which are provided by REMASAB'S, as against 4.0% of respondents who chose to go by waste receptability at home. Only 1.3 % of the respondents participate by advocating for proper waste management practice. Majority of the respondents on Table 3 and 4 respectably, did not respond to participating in SWM probably most of them are females, looking at the socio cultural setting of the study area, women are not allowed to go out without the permission of their husbands and majority of the men are mostly not at home that may limit their participation for proper waste disposal. For those who said yes, only participate by waste collection at home.

This is supported by excerpt from FGD with women where a participant clearly stated that:

It is very unlikely to arrive into consensus on how to go about with solid waste. Because some times we do engage the services of scavengers '' known as yan kura" in our area, but some when they collect the wastes from our household, they pick the valuable materials they need from the waste and immediately they notice we are not seeing them, they either dump it into a nearby empty plots of land or even in drainages (Rijiyan Zaki, 3rd Oct., 2023)

Storage facility	Frequency	Percentages
Yes	127	33.9
No	248	66.1
Total	375	100

Table 5: Availability of Waste storage facility in the house hold

Source: Field survey, 2023

Table 5 shows the availability or otherwise of storage facility in their household, where a total of 33.9% of them have waste storage facilities in their household while the rest 66.1% of them do not have waste storage facility in their house hold. Therefore majority of the respondents seem not to have waste storage facility in their house hold as only 33.9% of them possess waste storage facility in their house hold. As reported by [26] about 66% of the respondents in Kano metropolis use unauthorized dumping plots for their refuse dump. The finding further supported [7] only 4% used authorize dump site as 6% only used REMASAB'S bin for disposing their waste.

Figure 6 shows how the respondents handle generated waste from their household, interviewed respondent indicate that a significant proportion of about 24.3% of the households make use of other means, followed by 23.2% who reported to be dumping their waste on the water ways, where as 22.4% of them handle it through burning their waste around the house, the rest 19.2% of them handle it through the use of dustbin as against 10.9% of them who re use the available materials. This reveals that majority of the respondents do not handle their generated waste from their household appropriately as supported by [13] where it is reported that 59% the respondents openly dump their refuse.

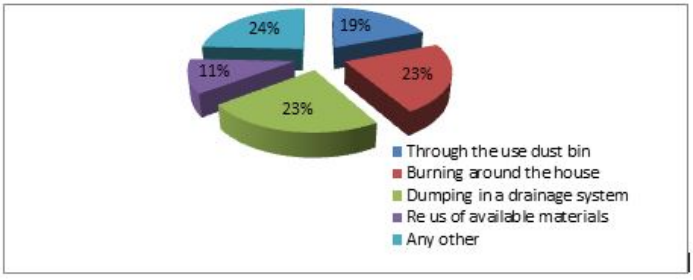

Figure 6: Means of handling generated waste in house hold

Source: Field survey, 2023

On the level of satisfaction with the adopted means of handling waste by respondent, which implies that majority 53% of the respondents are satisfied with the methods they deployed to handle their generated waste, maybe they make use the generated waste for agro purposes as express by the respondents in Fig. 6, then also about 23.2% of the respondents dump their generated waste in the drainages, maybe because of their proximity to the drainages. Out of all the respondents, very few who know the implication of it, but they have little or nothing to do in terms of the evacuation of the generated waste and the provision of waste storage facilities in their community.

Plate 1: Waste Disposal within an Apartment (Field Survey, 2023)

A study done in Khulna, Bangladesh by [20] found that city dwellers thought it was the sole responsibility of the city authority to provide the with a nuisance free habitable environment. This confirms the study of [25], in Kano metropolis, wastes were dumped indiscriminately on the streets and in public places and water bodies. His study shows that households are only interested in their immediate vicinity. As only 11% of the respondents as part of the study expressed concern for environmentally sound and safe waste disposal. This is in contrast to a study by [35] where they reported that 85% of the respondents are unhappy with the status quo and expressed their desire for change, the study showed that expected change lies in increased community participation in solid waste management services across Kaduna metropolis, especially in low income high density areas.

Activities done by men	**Frequency**	**Percentages**
Sweeping	66	17.6
Packaging	159	42.4
Transporting waste to destination (Dump site)	150	40
Total	375	100
Activities done by women	Frequency	Percentages
Sweeping	312	83.2
Packaging	51	13.6
Transporting waste to destination (dump site)	12	3.2
Total	375	100

Table 6: Waste management activities mostly done by men and women

Source: field survey, 2023

Table 6 present the gender issues in tasks associated with waste management practices in households. About 17.6% respondents said sweeping could be done by men, meanwhile 42.4% respondents said packaging could be done by men, while 40.0% respondents said transporting waste to destination dumpsite could be done by men, therefore packaging of waste and transporting

waste to designated dump site are the main waste management activities done by men. The table further presents the waste management activities that are mostly done by women. About 83.2% of respondents revealed sweeping of the house are mostly done by women, meanwhile 13.6% of respondents said packaging of solid waste are actually done by women, while 3.2% of the respondents said transporting waste to designated dump site is done by women, therefore sweeping of waste is mostly a responsibility of women as stated by the female respondents probably due to socio cultural setting of the study area which does not allow women to be doing all kinds of activities such as taking the waste to the designated dump site.

Sustainable waste management	Frequency	Percentages
Waste prevention	48	20.8
Waste reduction/minimization	57	15.2
Material recovery from waste	37	9.9
Re use of waste for agro and other purposes	45	12
Recycling of materials	23	6.1
Disposal of land fills	165	44
Total	375	100

Table 7: Sustainable waste management practices engage by the respondents

Source: field survey, 2023

Table 7 shows the sustainable waste management practices adopted by the community, about 20.8% of respondents said they engaged themselves in waste prevention, 15.2% of them engage in waste reduction/minimization, furthermore 9.9% of them do engage in material recovery from waste, meanwhile 12% of them usually re use waste for agro and other purposes, 6.1% of the respondents engage in recycling of materials and the remaining 44.0% of them do engage in disposal of land fills. We conclude that most of the respondents personally engage in open land disposal.

Sustainable waste management adopted	Frequency	Percentages
No response	111	29.6
Cash contribution	61	16.3
Labour contribution	83	22.1
Materials, tools and material contributions	38	10.1
Contribution of cash and kind (labour and material)	26	6.9
Others	56	14.9
Total	375	100

Table 8: Contribute solid waste management activities during clearing accumulated waste that might lead to the blocked drainages within the community

Source: field survey, 2023

Table 8 shows what the respondents contribute during clearing accumulated solid waste or blocked drainage in their community, which indicate that a significant proportion of the respondents about 29.6% indicate no response, 22.1% of the households interviewed only participate through the use of labor, 16.3% of the respondents said they usually contribute in cash, 10.1% of the respondents give materials, tools and material as their own contributions , as against 6.9% of the respondents make of cash and kind (labor and material) contribution, while the rest 14.9% of the respondents have other forms of contributions. There-

fore one can conclude among those that respondents to the question majority of the respondents make their contributions in form of labor and this may be attributed to the majority are the respondents are youth.

This is supported by excerpt from FGD where participants clearly stated that:

People are very difficult and they think in different ways. It is very unlikely to arrive into consensus on how to go about with solid waste. Some of show no corporation to others, but the most satisfying thing in my area is that despite the people being unresponsive, they make really good personal effort in some household to manage their waste… not at a community level. (Mandawari, 5 October, 2023)

Socio Demographic Factors Influencing Participation of People in Solid Waste Management

Sanitation is actually a very important aspect of human life, but in many African areas they dis-regard sanitation as a matter of fact when they actually ask to sanities on a monthly basis many may not even do it, rather prefer to sleep for those hours, it means that they are not aware about sanitation. Table 9 shows the multiple factors influencing participation of people in solid waste management.

s/n	Items	A	UD	D	MEAN	STD
1	Age is a major factor that prevents people from participating in proper solid waste handling	223	27	125	3.117	1.367
2	Men participate more in proper waste disposal than women	209	57	109	2.924	1.397
3	Women participate more in proper waste disposal than men	155	49	171	2.436	1.359
4	People participate in proper solid waste disposal simply to contribute to the societal aesthetics	124	51	200	2.148	1.306
5	People participate in proper solid waste disposal to help protect the environment against solid waste related disease(s)	233	68	74	3.126	0.921
6	Fulfillment of religious obligation makes people to participate in proper solid waste disposal	315	27	33	3.176	1.019
7	There are monetary advantages in community participation in the proper solid waste handling by participants	199	65	111	2.692	1.395
8	People participate in solid waste disposal because their is available land provided by community members as refuse dump site	279	39	57	3.156	1.141
9	Far distance from house to the waste collection site make people dump waste indiscriminately	270	33	72	3.142	1.214
10	Low level of awareness about sanitation is a factor responsible for improper solid waste disposal	261	48	66	3.136	1.232
11	Fear of disciplinary action makes people to participate in proper solid waste collection and disposal	108	36	231	1.776	1.235
12	People participate in solid waste disposal in other to support waste reduction and recycling	126	55	194	2.552	1.222

Table 9: Multiple factors influencing participation of people in solid waste management

Decision/Standard Mean = 3.000

Source: field survey, 2023

The study revealed that religions obligations is a major reason why people participate more in SWM than environmental concerns or aesthetics. The findings here in agrees with the findings from the study of [38] who found out that religion encouraged people participation in solid waste management in the community. But in study by [24] reported a good percentage of the female populations of Kano are not widely educated on environmental impacts of dumping solid waste indiscriminately. Even if they are cautioned on the dangers of municipal solid waste such as diseases they will say *"Allah ne mai kiyaye wa"* that is "God is the one that protects." Their socio cultural and religious belief is that everything (good or bad) comes from Allah (God) and it's only Allah that protects.

With regards to respondent's reason for participation in SWM, it's revealed that more people participate in waste disposal because of the availability of land in the study area. Again this finding in tandem with the study of [39] in Bangolre, who reported that available of land contribute to people's zeal to participate in proper SWD.

It is very clear that without community support and involvement at least at the source before waste collection), even recycling may be very costly to undertake. Here, the community manifests as a very important stakeholder in solid waste management and the level of their participation counts on the success of recycling in particular and solid waste management in general. Level of awareness in SWM and recycling both rank ahead of fear of disciplinary action among the respondents with regards to SWM. A Study by [40] suggest that lack of awareness is one of the barriers to community participation, further state that any development programme could be effective only when people are aware about it and the benefits that will accrue to them as a result of implementing it.

As pointed out by [27] that the level of environmental awareness will influence the effectiveness and sustainability of municipal waste management system, this also supported by [34] noted that participation in recycling of households waste relies largely on the level of awareness and understanding of recycling. However, [25] argues that it is not enough to enlighten the public; his view is that awareness building should be backed up by improvement in waste collection services. This therefore implies that with some enlightenment campaigns coupled with economic gains from recycling, people may invest more in SWM participation in the study area. But [8] noted that "attitudes towards recycling are influenced by appropriate opportunities, facilities, knowledge and convenience". People are diverse in terms of the knowledge base they possess as well as in what they feel is convenient for them.

In summary, socio-demographic variables that influence participation of some people in waste management includes, the fulfillment of religious obligation, proximity to the refuse dump site and to help protect the environment against solid waste related disease(s). Where as, far distance from house waste collection sites and low level of awareness about sanitation were some of the main factor responsible for improper solid waste disposal as revealed by the respondents.

Motivations	Frequency	Percent
No response	131	34.8
Source of income	91	24.3
Sales of reusable waste items	83	22.2
Reuse of some waste items	18	4.8
Left to other less privileged people	39	10.4
Others	13	3.5
Total	375	100

Table 10: Motivational factors for participation in solid waste reduction and recycling

Source: field survey, 2023

Virtually nowadays nothing more is waste, as people uses their used empty container to stored valuable items. To the respondents who affirmed to participate in solid waste reduction and recycling, table 10 presents what possibly the motivational factors for their participation in solid waste reduction and recycling as a total of about 34.8% of the respondent gave no response, which implies that either they don't really see the benefits derived out the waste.

Furthermore 24.3% of the respondents saw it as a source of income, like truck pusher and some of the households who use to remove the useful materials from the waste items to sale, 22.2% of the respondents do sale reusable waste items, this is not surprising as one may see some of the household selling valuable items they discovered from their waste like empty cans etc., as against 4.8% of them that reuse those waste materials either to stored things in them, while 10.4% of the respondents usually left such to other less privilege people and the rest 3.5% had other motivation factors behind their solid waste reduction and recycling. In conclusion, the main motivation factor for people participation in solid waste reduction and recycling in the study area is because it serves a source of income. And for the respondents who reported not participate in solid waste reduction and recycling said they were too old to participate some said they don't have business with it, where the remaining said that they didn't have time.

This is supported by excerpt from FGD where participants clearly stated that:

'Yeah, of course I do participate in waste reduction in my street. I want to be in a litter-free environment. You know when you have a lot of waste in an area, especially decaying waste; it attracts those flies that cause pandemic diseases such as Cholera and other disturbances including unpleasant smells. So in my belief, it's better to spend less money controlling the waste rather than spending a lot of money treating yourself from waste related diseases.' (Goron Dute, 7 October, 2023).

Complementary Roles of Voluntary and Corporate Organization in Municipal Solid Waste Management

On the activities undertaken by the volunteer organizations include clearing of accumulated solid waste as well as construction of waste collection point and enlightenment to the public on proper waste handling as the major activities carried out by the volunteer organization Figure 7.

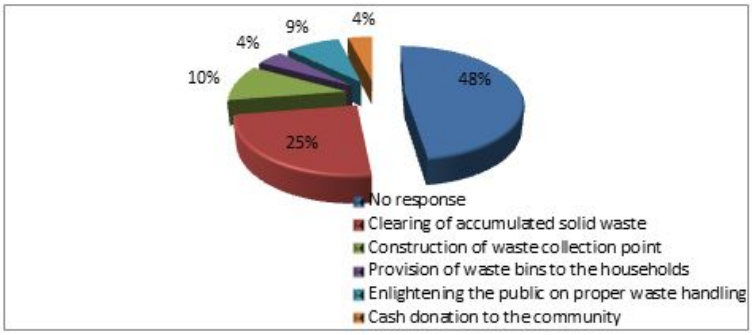

Figure 7: Waste management activities mostly don by voluntary groups and corporate organization

Source: field survey, 2023

On the presence of their activities majority of the respondents revealed that presence of the activities of this voluntary group does not exist in their community which shows that they don't feel the presence of the activities of this voluntary group in their community. And on the level of participation by members of communities in some of their activities in waste management about two third of the respondents have never participated in any of the waste.

The current level of voluntary responsibility for proper solid waste management was low but not negligible. Majority of the people did not seem to assume responsibility voluntarily for solid waste that was not generated by them. When waste was found outside their premises, people were not concerned about such solid waste. It seemed they took the city authority to have responsibility over such solid waste in areas as road sides, trenches and public open areas, play grounds and land reserved for the local government. Much as these areas belong to the public, because they are to be used for public interest, people do not show interest in voluntary care by way of picking up such waste rather than putting it in the rightful place. In summary enlightenment campaign is one of the major role of the environmental sanitation committee as reported by respondents.

This is supported by excerpt from FGD where participants clearly stated that:

About two (2) months ago, some waste bins were distributed in our community by a non registered organization. The group of people came together just to assist our community. Different types of bins in term of color and sizes were distributed and the idea of the color difference was for residents for put particular type of wastes, in a specific color of bin based on their organic contents. In the long run though, we had issues because we didn't know where to dispose off the bins when filled up. The supposed government agency concerned with evacuating wastes failed to show up as such, the efforts and kind gesture of the concerned people that distributed the bins, went to ruins. (Kabuga, 13th October, 2023)

R	R Square	Adjusted R Square	Std. Error of the Estimate
0.943[a]	0.889	0.887	0.31323

Table 11: Model summary

Source: Field survey, 2023

The R –Square is a measure of goodness-of-fit. The value shows the extent of variation in the dependent variable that is accounted for by the independent variables. The R-Square value of 89% in Table 11 indicates that 89% of change in the dependent variable (participation in solid waste management) is accounted for by variation in the independent variables (socio-demographic variables) in the model. This implies that the socio-demographic factors consider in the model largely influence peoples participation in solid waste management.

Conclusion

An efficient solid waste management system remains as appropriate tool for achieving sound environmental health in Kano metropolis. Improving access to safe disposal facilities, in addition to conducting awareness campaigns on health impacts of poor sanitation will help to alleviate the problems of improper waste disposal and eventually improve the quality of the environment in the city. Recycling mountains of waste into useful resource will create jobs for recyclers, while also improving the environment by reducing indiscriminate disposal, the amount of waste being disposal of in open space, and the depletion of resource.

Recommendations

Based on the findings made by this study, majority of the respondents (64.8%) do not participate in solid management in their community, therefore it is suggested that;

- There should be coordinated efforts from the government and other agencies in publicizing and sensitizing the importance of waste management on the basis of health hazards which is associated with waste accumulation around

the homes in their communities.

- The community members also should adhered to Environmental Policy that everybody has the responsibility to make the environment clean through participating in solid waste management services either the one provided by the community members or voluntary organization should be directed towards educating and sensitizing community members about their role in SWM activities, this will enhance their participation in SWM matters.

- Waste recycling is usually undertaken by informal recyclers can be mobilized into cooperative organizations to pull resources together for investment, which can be provided with training, protective clothing, and equipment to reduce accidents, infections, deaths and environmental problems (such as pollution, flooding and erosion.).

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