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Socio-Economic Factors Influencing Peoples' Participation in Solid Waste Management in Kano Metropolis, Nigeria

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Abstract

Solid waste materials discharged in the environment require people commitment to be effectively managed but the extent to which this is done in Kano metropolis is not known. This study assessed the socio-economic factors influencing peoples' participation in municipal solid waste management in Kano metropolis, by identifying the different forms of participation by communities, examine the socio economic factors influencing peoples' participation in solid waste reduction and examine the complementary role play by voluntary organizations in solid waste management in the study area. Data were collected using multi stage sampling technique from 400 respondents. Mean, Standard deviation, multiple ordinal regression were employed for data analysis. Majority of the respondents in communities across Kano metropolis do not participate in municipal solid waste management activities, as revealed by 60.5% of the respondents. Major reasons identified herein for this action is that, majority of the communities do not have central waste storage facilities for community to take their collected waste to. On the other hand, the results of the Multiple Ordinal Regression (MOR) analysis also revealed that the independent variables appears to have a significant relationship with the dependent variable ''waste management'' with R-square value of 89%. There is the absence of corporate groups in the study area to mobilize waste disposal and management. The study conclude that as long as factors that prevent community participation in solid waste are stronger than motivational factors, the people will not participate in it even if beneficial. It recommends that communities should play the role of reducing generated waste in the town through re-using, reducing usage and recycling. More awareness should be created among families at the house hold level.

Keywords: Factors, Socio-economic, Solid waste, Management and Municipal

Introduction

A major consequence of urbanization is a huge volume of solid waste generation (Buenrostro, 2011). 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 (Hoornweg and Bhada-Tata, 2017). 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 (Hoornweg and Thomas, 2009). 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

(Adamu *et al.*, 2014). 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 (Akpu and Yusuf, 2011).

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 (Nabegu, 2017) 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 69% is disposed in open dump site, streets, streams and rivers (Gaya *et al*., 2018). As it is currently if not properly managed, solid waste creates breeding ground for vermin and insects causes serious risks of communicable diseases. For example, the blockage of waterways by waste that are not properly disposed can result to flooding during heavy rainfall which if not properly drained becomes a breeding sport for mosquitoes (Lawal *et al*., 2014; Salami *et al*., 2019). For the quality solid waste management, community participation is needed to aid and support government institutions.

Community participation in solid waste management has been introduced Nigeriasince 1960s, however much emphasis was not given not until the late 1990s. But, Very little is known on operational strategies, success and challenges of community participation in solid waste management (Adogu *et al*., 2015; UNEP, 2018).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 (Adebisi *et al.*, 2018). 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.

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 (Nabegu, 2015). Butu and Mshelia (2014) examined the various municipal solid waste disposal systems in some parts of Kano metropolis and some of the environmental issues associated with these wastes. Nabegu and Mustapha (2014) also examined the prevailing management of municipal solid waste in Kano metropolis and highlight some of 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 as to 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 (Gaya *et al*., 2018). 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 (Mshelia *et al.*, 2020). How communities are participating in this waste management processes are unclear. The study therefore fills a knowledge gap as it identify the factors influencing people participate in solid waste management in Kano metropolis, by indentifying community's forms of participation and socio-demographic factors influencing participation of the people in municipal solid waste management.

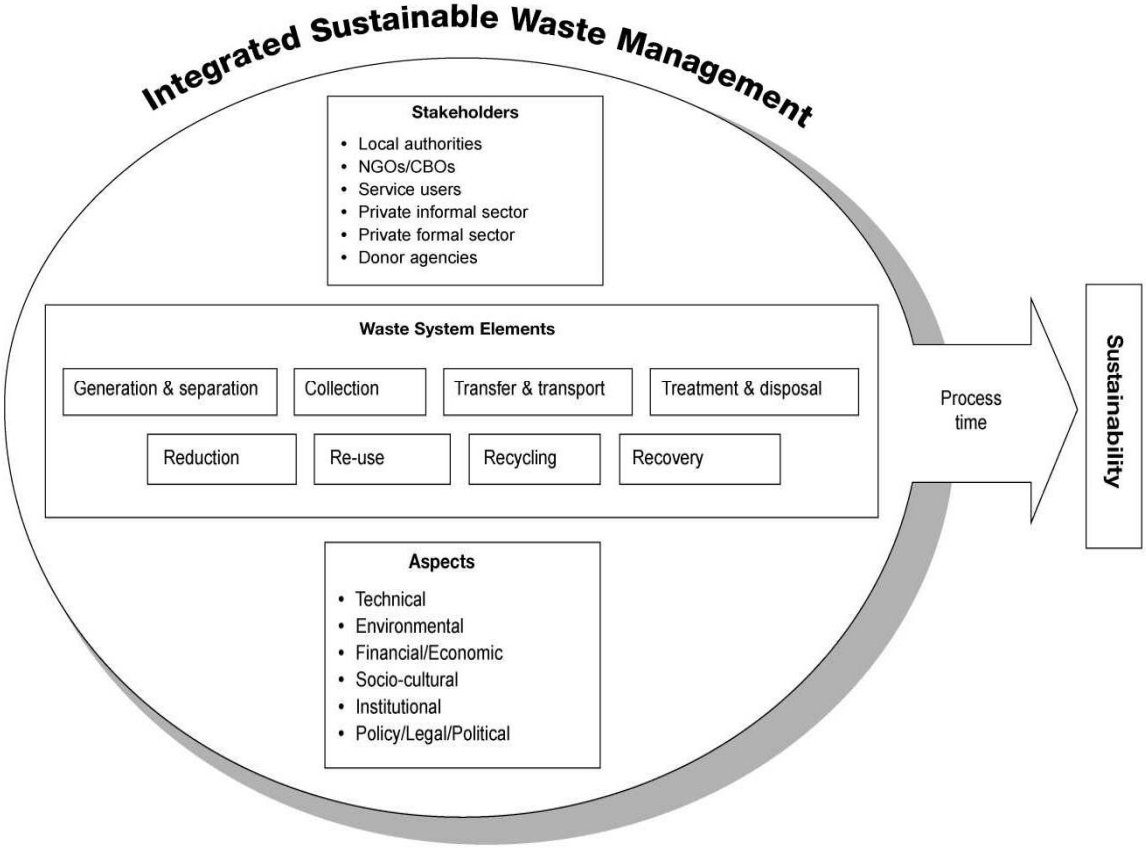

Figure 1: ISWM model
Source: Adopted from WASTE (2023)

Theoretical Framework: Integrated Sustainable Waste Management

Integrated Solid Waste Management, ISWM, is a planning framework for solid waste management and was initiated by the Urban Waste Expertise Programme (UWEP). The ISWM insight is that, problems with solid waste management often have to do with more than lack of money and equipment. It can be attitude problems among the residents, waste management staff or private enterprises, or more serious factors as the institutional framework or social or cultural context. In these cases money is not the only solution, but a change in social, institutional or political conditions is. It is important to remember that there is no absolute solution of solid waste management that fits to all cities and towns. Different systems in different parts of a city can also be needed. What works in the rich areas, might not be suitable in low income areas or on hillsides (Scheinberg *et al.*, 2011).

The theoretical framework applied in this study follows that of the model of Integrated Sustainable Waste Management (ISWM), a model that "allows studies of the complex and multi-dimensional systems in an integral way" (Guerrero *et al.*,2013). This approach incorporates three key dimensions by which to analyse a waste management system: first; inclusion of the stakeholders who have an interest in solid waste management, second; an understanding of the flow of waste materials from generation points until final disposal, and third; identification/selection of aspects that frame the analysis (such as technical, socio-political, financial aspects). Application of the model has assisted in isolating barriers to effective MSWM in Kano metropolis. Clearly defining the barriers may contribute to development of solutions to waste problems both in this region and in other in newly urbanized areas in places suffering similar problems, leading to better MSWM.

ISWM concept takes as a point of departure four basic principles: Equity, Effectiveness, Efficiency and Sustainability. Equitymeaningthatall citizens are entitled to an appropriate waste management system for environmental health reasons; Effectivenesssayingthe waste management model will lead to the safe removal of all waste. Efficiencymakesthe management of waste maximizing the benefits, minimizing the costs and optimizing the use of resources and Sustainability refers to the fact that the waste management system should be appropriate to the local conditions and feasible from a technical, environmental, social, economic, financial, institutional and political perspective. It can maintain itself over time without exhausting the resources upon which it depends (Scheinberg *et al.*, 2011). ISWM has also three major dimensions to focus on Figure 1: (1) The practical and technical elements of the waste system, (2) the aspects of the local context that should be taken into account when planning a waste management system and (3) the stakeholders involved in the waste management (Scheinberg *et al.*, 2011).

Materials and Method

The study area

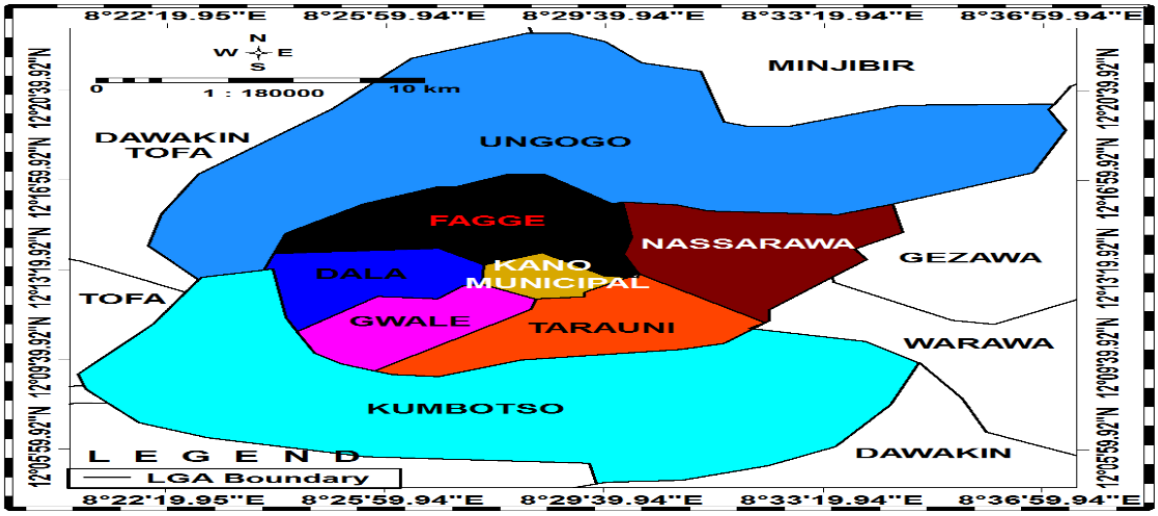

Figure 2: Kano State showing Kano Metropolis.

Source: From Administrative Map of Kano State 2025.

Kano metropolis is the second largest city in Nigeria and the largest city in the Sudan Savanah ecological zone of Nigeria (Nabegu, 2015). 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). 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 (Butu, and Mshelia, 2017; Mshelia, *et al.*, 2020). The total area of Metropolitan Kano is now 499 square kilometers (193 square miles).

Climatic factors of the study area 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 **(**Nabegu, 2015).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 Km² within the Kano closed-settled zone compared to the national average of 267 inhabitants per km². It is one of the most crowded cities in Nigeria, hence generation of municipal wastes in heaps on daily basis is enormous (Nabegu, 2019). These figures indicate that solid waste generation is likely to be significant in Kano metropolis and that its management would require innovative strategies.

On theEconomic 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 (Bugaje *et al.,* 2017). Kano metropolis has also witnessed the establishment of industries majorly situated in Bompai, Sharada, Challawa and Tokarawa industrial estates. 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

The population of Kano metropolis which is 2,828,861 according to 2006 census (NPC, 2009) was projected to 2025 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, Yamane (1976) 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 and random sampling method were 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. Also Ordinal Multiple Regression (OMR) analysiswas used to examine the relationships between the identified factors influencing solid waste management. Related variables were cross-tabulated to identify relationships as well. And this is portrayed in the equation form: The model can be specified as:

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

Where: Y = (participation of community in waste management)

X1 = Age (Age)
X2 = Sex (Sex)
X3 = CSA (Contribution to the societal aesthetics)
X4 = HPE (Help protect the environment)

X5 = FRO (Fulfillment of religions obligation)
X6 = MAP (Monetary advantage on proper waste handling)
X7 = ALP (Availability of land for waste disposal)
X8 = FDI (Far distance to dump site)
X9 = LLA (Low level of awareness)
X10 = FDA (Fear of disciplinary action)
a = Constant

$b_1 - b_n$ = Co-efficient of the endogenous variables of the independent variables

e = Represent the collective omitted unobservable socio-demographic indicators variable.

The Ordinal Multiple Regression analysis was used to establish the socio-demographic factors that influence people participation in solid waste management in the study area. As used by Said (2018) in a study factors affecting community participation in solid waste management in Lindi Municipal Council, Tanzania Descriptive statistics was used to represent the factors. Tables and Percentages were used to describe the data and similar method has been used by Mshelia *et al.* (2020).

Results and Discussion

A total of Four hundred questionnaires were administered to residents of the metropolis using systematic sampling method. Only 375 copies of questionnaire which were properly filled and returned accounting for 94% of the sampled population and this was used for the analysis.

Socio demographic characteristic of Respondents

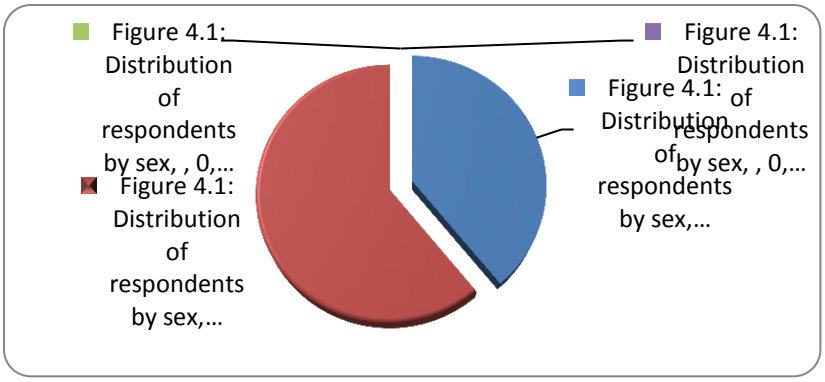

Figure 3: Distribution of respondents by sex

Source: Field survey, 2025

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. The respondents are 375 with 61% female and 39% male. The high number of female distribution is due to the fact that female were more readily available during the questionnaire administration. This variation may be linked to the time when the data was collected and by the socio-cultural setting of the study area, men are the ones who cater for the needs of the family, are mostly not at home. This result is contrary to what was observed byRigasa *et al*. (2016) in their

finding indicated that majority of respondents are males (85%) from high density neighbourhoods.

Age and Marital Status of respondents

Table 1 presents age groups of respondents participating in community activities ranging from 18 years of age to 60 years and above. Results in Table 1, indicate that about two third 64.8 % of respondents in the study area are 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.

Table 1: Distribution of Respondents by Age Group and marital status

Age Group (years)	Frequency	Percentage
Below 18	30	8.0
19-39	243	64.8
40-60	72	19.2
61 and above	30	8.0
Total	375	100
Marital Status		
Never Married	38	10.1
Married	199	53.1
Divorced	68	18.1
Separated	45	12.0
Widowed	25	6.7
Total	375	100

Source: Field survey, 2025

As reported by Adesina and Bandu (2018) adults have the experience and are able to access characteristics of new technologies/ideas. And again, 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 1 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 Nanai (2019) 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 also in Table 1 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 Mahmood *et al*., (2021). Adesina and Bandu(2018) 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 (Naab *et al*., 2018). The findings of this study indicate that, the majority of the respondents had tertiary education. The results therefore explains that the majority of community members had basic education and therefore are likely to adopt new practices and ideas, its expected that majority of the respondents in the study should be helpful in relation to participation in SWM because of their literacy level. Basic education is higher than the national average in the study area which is reported to be 56% (NBS, 2020), suggesting the likelihood of effective participation in community activities. Respondents determined household size by considering all members who live in their household including parents, children and dependants.

Responses generated from the interview conducted, majority of household consist of member from between 6 to 8 people which is relatively higher than 2020 NBS reports in which the average household size of the Nigeria is about 4.8 members. The implication of this is that, as the number of people in the household, is higher the waste to be generated will be higher hence disposal becomes a problem. Therefore it is expected that the respondents should be more willing to participate in order to keep a clean environment (Niringiye, 2019). However, this result explains the possibility of high generation of solid waste from larger size household. Perhaps if such large size is properly utilized they may provide labour or job for solid waste managers in the community.

Participation in Solid Waste Management

Table 1: Participation in solid waste management among respondents

Community participation	Frequency	Percentage
Yes	148	39.5
No	227	60.5
Total	375	100

Source: Field survey, 2025

Majority of the respondents do not participate in solid waste management in their communities, as presented on Table 1, their belief is that, municipal authority has the sole responsibility for solid waste management services. The study of Dimani Tharuka Hapuarachchi (2024) underscores the instrumental role of community participation in achieving sustainable municipal solid waste management; in his Recommendations include

prioritizing the 3R approach, investing in composting initiatives, and fostering greater community engagement in waste management practices. By adopting these strategies, municipalities can effectively address solid waste challenges while promoting environmental sustainability and public health. Olukanni, *et al*. (2020) reported that age, income, and education levels affect theperceptions, practices, and attitudes of the people towards solid waste management. The study further revealed that majority of the residents hold the opinion that, sanitation services are too costlyand should be the responsibility of the local and state governments. Although, Isa *et al*. (2017) pointed outthat, creation of awareness on the danger and utilization of solid waste in the study is essential in the study area.

On the availability of waste storage facility, majority of the respondents seem not to have waste storage facility in their house hold. As reported by Nabegu (2012) about 66% of the respondents in Kano metropolis use unauthorized dumping plots for their refuse dump. The finding further supported Balogun *et al*., (2020) in which only 4% use authorize dump site, while 6% use REMASAB'S bin for disposing their waste.

The majority of the respondents further revealed that they handle their generated waste by dumping it in drainages while some make use of dustbin, others burn it immediately. 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. This confirms the study of Nabegu (2015) that, 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.

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 through proper storage, not at a community level.'' (R1 Mandawari, 5th Mar., 2025)

For respondents who reported participating in solid waste management in their communities in Table 1, Table 2 presents what they do to participate in solid management in their community, 53.4% of them do collect waste at home.

Table 2: Participatory activities mostly done by the respondents

The activities they do	Frequency	Percentage
Waste collection at home	79	53.4
Waste transportation to refuse dump site	49	33.1
Provision of waste receptacle at home	15	10.1
Advocating for proper waste management practice	5	3.4
Total	148	100

Source: Field survey, 2025 ***No response= 227**

Furthermore 33.1% of respondents carry out waste transportation to refuse dump site which are provided by REMASAB'S, frequently involving their children in waste disposal by tasking them to take the waste to the disposal site, as against 10.1% of respondents who chose to go by waste receptability at home. Only 3.4 % of the respondents participate by advocating for proper waste management practice. For the majority of the respondents in Table 2, who reported to participating in SWM through waste at home either the use of private waste collectors or the scavengers probably may be because most of them are females and 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'' they only participate by waste collection at home. As reported by Ngugi (2017) majority of the respondents often involve their children in waste disposal.

Plate 1

Source: Field Survey, 2025

Plate 1: Solid waste disposal container provided by REMASAB'S at Tarauni, Tarauni

Plate 2

Source: Field Survey, 2025

Plate 2: House to house solid waste collector by scavengers at Danladi Nasidi Housing Estate

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’’ (R2 Hotoro, 3rd Mar., 2025)

Figure 4,showshow the respondents handle generated waste from their household the interviewed respondents indicated that a significant proportion of about 24.3% of the households make use of other means, followed by 23.2% who reported 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.

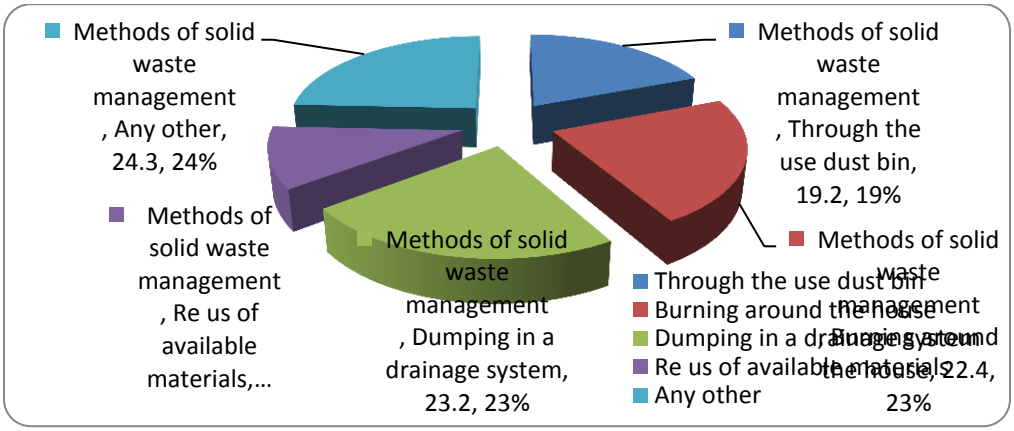

Figure 4: Means of handling generated waste in the house hold
Source: Field survey, 2025

This reveals that majority of the respondents do not handle their generated waste from their household appropriately as hinted by Gaya *et al*. (2018) where it was reported that 59% of the respondents openly dump their refuse. Also Nabegu (2012) reported that about 66% of the respondents in Kano metropolis use unauthorized dumping plots for their refuse dump. The finding further supported that Balogun *et al*. (2020) and REMASAB’S, (2020) that only 4% only people on a locality used authorize dump site as 6% only used REMASAB bin for disposing their waste.

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

Well we do burn the garbage here, it is very common because it is the cheapest way to manage waste. But personally I do not like it at all. It’s just that we lack alternatives of managing it. You may find that someone is burning the garbage and all of the smoke flows in to someone else’s window and gets inside the house. That is very disturbing… other alternatives can be quite costly for poor people like us because we can’t afford to pay the city garbage collectors even if we want to their operations minimal in our locality or

regularly buying the dustbins because they deteriorate easily due to bad maintenance, so you see this is our problem here?''(R3 Jakara, 4th Mar., 2025).

Also on another excerpt from FGD, a participant commented that:

We have no access to regular solid waste collection. Moreover, although the residents are aware that direct disposal of their garbage into the drainages is a problem, we don't know of any alternative methods of waste disposal other than burning'' (R4 Yakasai, 4th Mar., 2025).

Another supported excerpt from FGD, is where a participant made the comment that:

The community where I lived, burning of tyers around people residence is a business of the day, that was what actually forced me to leave that area for another locality were there is less of that activities. Many other people want to leave too, but they cannot afford to rent a house in the new locality were they think is less harmful.'' (R5 Danladi Nasidi, 9th Mar., 2025).

Table 3: Satisfaction with the adopted means of handling waste

Level of satisfaction	Frequency	Percentage
Highly satisfied	197	52.5
Undecided	45	12
Not satisfied	133	35.5
Total	375	100

Source: Field survey, 2025

Table 3 presents the level of satisfaction with the adopted means of handling waste by respondents indicating that majority (53%) of the respondents are satisfied with the methods they deployed to handle their generated waste this is likely because they use the generated waste for agro related purposes as expressed by some of the respondents. Among all the respondents, very few know the implication of their action, but have little or nothing to do in terms of the evacuation of the generated waste and the provision of waste storage facilities in their communities.

A study done in Khulna, Bangladesh by Mahmood *et al*., (2021) found that city dwellers thought it was the sole responsibility of the city authority to provide them with a nuisance free habitable environment. This confirms the study of Nabegu (2015) that, in Kano metropolis, wastes were dumped indiscriminately on the streets and in public places and water bodies. Nabegu's study shows that households are only interested in their immediate vicinity. As only few of the espondents as part of the study expressed concern for environmentally sound and safe waste disposal.

The findings is in contrast with a study by Rigasa *et al*. (2016) where they reported that 85% of the respondents are unhappy with the status quo and expressed their desire for change. The differences between Kano metropolis and Kaduna metropolis can be

explained by the fact that though the two cities are in same region, enormous variation exists in the level of population and rural influx. The expected change lies in increased community participation in solid waste management services across Kano metropolis, especially in low income high density areas.

Table 4: Waste management activities mostly done by men

Activities done by men	Frequency	Percentage
Sweeping	66	17.6
Packaging	159	42.4
Transporting waste to destination (Dump site)	150	40.0
Total	375	100

Source: Field survey, 2025

Table 4 presents the gender issues in tasks associated with waste management practices in households. About 17.6% respondents said sweeping of waste could be done by men, meanwhile 42.4% respondents said packaging of waste 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 finding is in tandem with similar study by Afon (2017) who reported that all the identified wheel-barrow who transport wastes from the point of generation to the final deposition site are malesbe low the age of 35 years.

On the other hand, Table 5 present waste management activity 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 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.

Table 5: Waste management activities mostly done by women

Activities done by women	Frequency	Percentage
Sweeping	312	83.2
Packaging	51	13.6
Transporting waste to destination (dump site)	12	3.2
Total	375	100

Source: field survey, 2025

The finding is in tandem with the study by Shabani (2015) who reported that female were more willing to pay for municipal solid waste management as compared to the males. Afon (2017) added that waste transportation is too difficult for women to do it because of the dirty nature of the work that poses health hazards and risks to the operators.

Factors influencing participation of people in solid waste management

Socio demographic, economic and geographical factors influencing participation of people insolid waste management amongrespondents were measured using Likert scale. A total of twelve (12) statements were constructed to show the frequency of the socio demographic factors that influence the participation by people insolid 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 mere actually ask to sanitize based on government action on a monthly basis, many do not even do it, rather they prefer to sleep for those hours. This is sign that they are not aware of or deliberately neglecting sanitation. Table 6 shows the factors influencing participation of people in solid waste management.

The overall cumulative mean response of 2.800 is below the decision/standard mean of 3.000, implying that generally, socio-demographic factors do not strongly influence participation of people in solid waste management, but as an item fulfillment of religious obligation seen to be a major factor that influences peoples participate in proper solid waste disposal. This item has the highest mean value of 3.176 as a total of 315 of the respondents who agreed with this view, that religion can go a long way in influencing people's attitude and decision when compared it with standard mean because it is greater than the decision/standard mean value.

Table 6: Multiple factors influencing participation of people in solid waste management

s/n	Items	SA	A	UD	D	SD	MEAN	RANK
1.	Age is a major factor that prevents people from participating in proper solid waste handling	120	103	27	77	48	3.117	6th
2.	Men participate more in proper waste disposal than women	198	11	57	109	0	2.664	9th
3.	Women participate more in proper waste disposal than men	150	96	36	84	9	2. 936	7th
4.	People participate in proper solid waste disposal simply to contribute to the societal aesthetics	57	90	6	150	72	2.148	11th
5.	People participate in proper solid waste disposal to help protect the environment against solid waste related disease(s)	62	171	68	42	32	3.126	5th
6.	Fulfillment of religious obligation makes people to participate in proper solid waste disposal	215	100	27	23	10	3.176	1st
7.	There are monetary advantages in community participation in the proper solid waste handling by participants	78	121	65	68	43	2.692	8th
8.	People participate in solid waste disposal because their is available land provided by community members as refuse dump site	156	123	39	37	20	3.156	2nd

9. Far distance from house to the waste collection site make people dump waste indiscriminately	169	101	33	64	8	3.142	3rd
10. Low level of awareness about sanitation is a factor responsible for improper solid waste disposal	144	117	48	53	13	3.136	4th
11. Fear of disciplinary action makes people to participate in proper solid waste collection and disposal	12	96	36	195	36	1.776	12th
12. People participate in solid waste disposal in other to support waste reduction and recycling	20	106	55	155	39	2.552	10th
Cumulative Mean							*2.800*

***Standard/Decision Mean** = 3.000* **N.B: SA= Strongly Agreed A= Agreed, UD= Undecided,**

Source: Field survey, 2025 **D= Disagreed and SD= Strongly Disagreed**

The likert scale in Table 6 clearly revealed that 223 person/respondents agreed that age comes into play as regards participation in solid waste management as majority of the respondents agreed that age is a major determining factor for people's participation in proper SWD. Older people may be willing to participate more than younger people because the older citizens are more matured decisions related to evaluating health and environmental issues, possibly due to their age, leading them to express high willingness to participate.

In confirmation with the previous findings, Addai & Danso-Abbeam (2014) reported that middle aged group in the age range of 21 to 60 are found to be more willing to participate in improving municipal solid waste management than older ones (above 60) and younger ones (below 20). This is because old people (above 60) consider solid waste management as government's responsibility while young ones (below 20) just do not feel they are responsible for improving solid waste management and are therefore less willing to participate. Furthermore, the scaling reveals that more men participate in proper SWD than women. This could be linked to the socio-cultural beliefs of where this study was carried out, even though the role of women is very critical in municipal solid waste management as stated by Liman*et al.* (2025) that women are responsible for maintenance of the living space and health of the children and therefore have a strong sense of civic responsibility and desire to improve the living conditions and health. This is in line with the view of Mshelia *et al.*, (2020) which states that in Kano men are culturally given right to decision power on matters affecting household, health and sanitation decision making in the metropolis without necessarily consulting their wives. This is because most of the women are prohibited from going out of the house (*kulle*).

In another study, Sophaphan *et al*. (2017) observe that women suffer the direct consequence of unsanitary environments such as infectious and childhood diseases and this is why they are usually associated with the duty of cleanliness of the home and family. In the study area, women are mostly not allowed to work out of home without the permission

of their husbands based on socio-cultural and religious belief. As such, they are expected to perform all the house chores, while the men are usually out of home fending for the family.

The study again reveals that religious obligations are major reasons why people participate more in SWM than environmental concerns or aesthetics. Most of the respondents believe that fulfillment of religious obligation makes people to participate in proper solid waste disposal. This item has the highest mean value of 3.18 as a total of 315 respondents who agreed that religion can go a long way in influencing people's attitude and decision. The findings here, agree with the findings from the study of Sophaphan *et al.* (2017) who found out that religion encouraged people participation in solid waste management in the community, the more religious the person is, the cleaner that person would be.

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 is in tandem with the study of Subash, (2018) in Bangolre, who reported that availability of land contribute to peoples zeal to participate in proper SWD.

Distance from waste dump sites makes people dump wastes indiscriminately. As revealed by the study, a total of 270 respondents affirmed this. Therefore, it means that areas where refuse dump sites are not far from homes would probably be cleaner than areas where refuse dump sites are further away. As observed by (Nabegu, 2015), wastes are dumped in the open spaces on the streets at close proximity to the houses and public places.

Level of awareness also has impact on domestic waste storage, segregation, littering and fly tipping, recycling, collection frequency among others. 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 Nabegu (2019) 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 Nabegu (2019) that the level of environmental awareness influence the effectiveness and sustainability of municipal waste management system, this is also supported by Rehardyan *et al*. (2018) who notes that participation in recycling of households waste relies largely on the level of awareness and understanding of recycling. But 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 indiscriminate dumping of 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 (Nabegu 2017).

However, Nabegu (2010) 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 be willing to invest more in SWM and recycling in the study area. But Barr (2014) notes 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 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 are some of the main factors responsible for improper solid waste disposal as revealed by the respondents.

Multiple Ordinal Regression Model: Factors influencing peoples' participation in Solid Waste Management

The Multiple ordinal regression models is also used in achieving the second objective of the study which entails examining the socio-demographic factors influencing the participation of people in solid waste management in the study area.

Table 7: Multiple ordinal regression model

Parameter Estimates

		Estimate	Std. Erro	Wald	df	Sig.	95% Confidence Interval		Lower Bound	Upper Bound
Threshold	[PARTICIPATION = 1.00]	.533	1.301	.167	1	.682	-2.018	3.083		
	[PARTICIPATION = 2.00]	1.925	1.296	2.208	1	.137	-.614	4.465		
	[PARTICIPATION = 3.00]	2.574	1.303	3.902	1	.048	.020	5.129		
	[PARTICIPATION = 4.00]	4.879	1.359	2.889	1	.000	2.215	7.542		
Location	MEN	.229	.149	2.353	1	.125	-.064	.522		
	WOMEN	.507	.157	10.396	1	.001	.199	.816		
	AGE	-.219	.131	2.790	1	.095	-.476	.038		
	ENVIRONMENT	.339	.190	3.175	1	.075	-.034	.711		
	RELIGION	.267	.203	1.719	1	.001	-.132	.666		
	MONETARY	-.068	.135	.258	1	.612	-.332	.195		
	LAND	-.259	.188	1.898	1	.168	-.628	.109		
	DISTANCE	-.212	.163	1.695	1	.193	-.531	.107		
	LAWARENESS	.298	.144	4.285	1	.038	.016	.581		
	DISCIPLINARY	.014	.147	.010	1	.922	-.273	.302		

Link function: Logit.

Source: Field survey, 2025

The results of the model indicate the influence of the independent variables (socio-demographic factors such as religion, gender, environment, etc) on the dependent variable (participation in solid waste management). Also, the coefficient of the individual variables shows the nature and extent of the influence of each of them on the dependent variable. A

positive value implies that, a unit change in an independent variable will lead to an increase or improvement in the dependent variable and vice versa.

The positive value shows for every one unit increase on independent variable, there is a predictedincrease (of a certain value) in the log odds of being in a higher level on the dependent variable where as the negative value shows that for every one unit increase on independent variable there is a predicted decrease of a certain amount in the log odds of being in a higher level on the dependent variable.

Table 8: Model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.943[a]	.89	.887	.31323

Source: Field survey, 2025.

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 8 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 considered in the model largely influence peoples participation in solid waste management.

On the individual variables, women, religion and level of awareness have a p-value of less than 0.05 which means they are significant at 5% level. Also, age and environment are significant but at 10% level. This implies that, the above socio-demographic factors are the key determinants of people participation in solid waste management in the study area as they contribute more. Alternatively, the female gender participates more in municipal waste disposal management in the study area.

Religion is equally a contributing factor as it encourages people to participate actively. The finding of the study is similar to that of Said (2018) who reported that all the independent variables appear to have a significant relationship with the dependent variable (waste management). But contrary to what was obtained by Rahjiand Oloruntoba (2019)whorevealed that out of the seven variables income and age appeared to be the only influencing factors that influence people participation and willingness to pay solid waste management.

The results of the Multiple Ordinal Regression (MOR) analysis also revealed the relationship that the independent variables have with the dependent variable. The influencing factors of people's participation in solid waste management appear to have a significant relationship with the dependent variable ''waste management. The two variables also seem to have a directly proportional relationship, meaning the more the community participates the greater the performance of the waste management in the streets.

Complementary roles of voluntary and corporate organization in municipal solid waste management

The current level of voluntary responsibility for proper solid waste management was low but not negligible. Majority of the people do not seem to assume responsibility voluntarily for solid waste that was not generated by them. When waste is found outside their premises, people are not concerned about such solid wastes. It seems they shift responsibility to the municipal authority over solid waste management in areas like road sides, trenches and public open spaces, play grounds and land reserved for the local government. So far these areas belong to the public, because they are to be used for public interests, people do not show interest in voluntary care by way of picking up such waste rather than putting it in the rightful place.

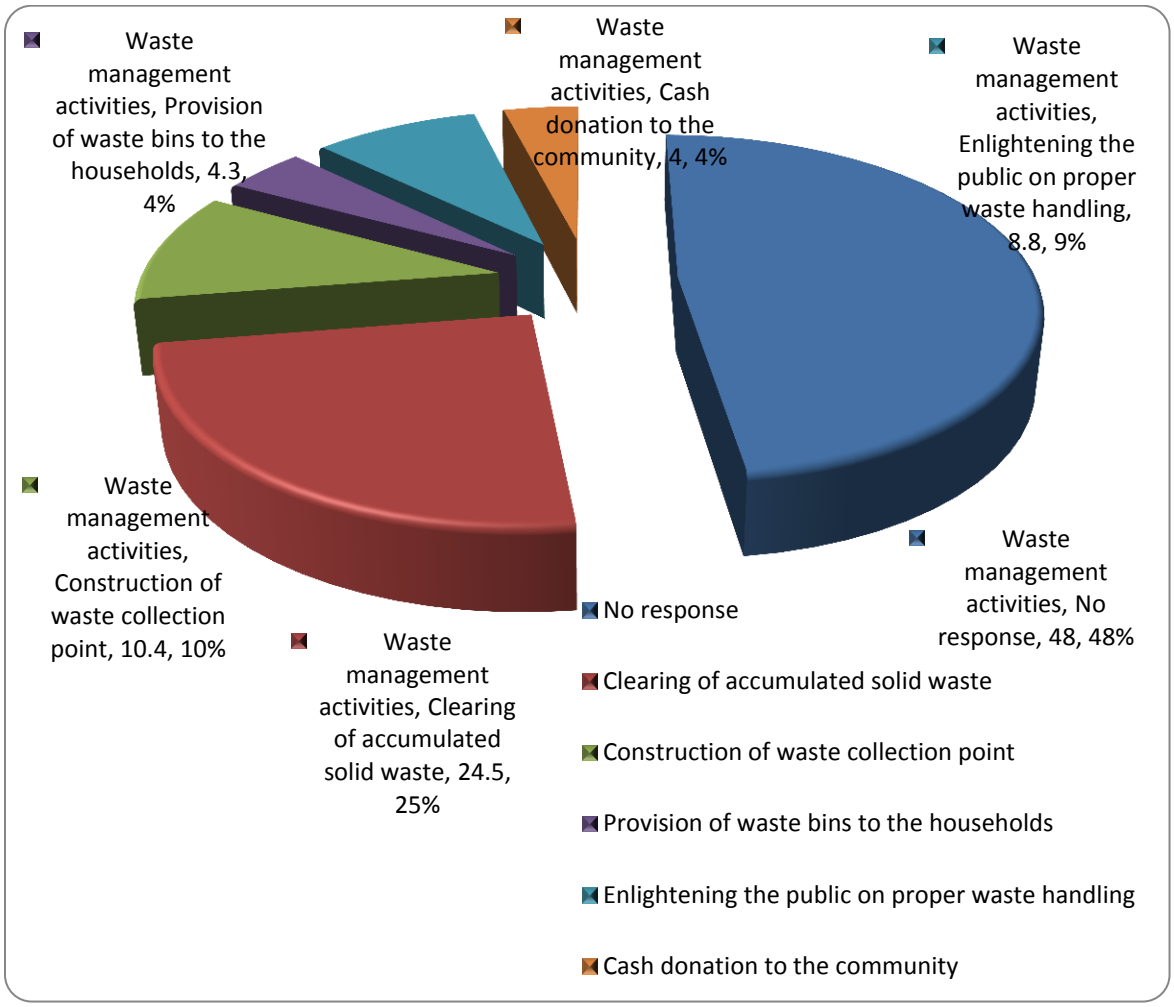

Figure 5: Waste management activities mostly don by voluntary groups and corporate organization

Source: Field survey, 2025

The study also reveals that, the majority of the respondents do not have voluntary groups or corporate organizations to complement the efforts of community in solid waste management. For the respondents who affirmed the existence of voluntary groups or corporate organization in within their community, they further revealed that NYSC and Boys Scout are the major voluntary group (corporate organization) that complements the effort of community in solid waste management. Liman*et al.* (2025) reported that, majority of the communities don't see to have the activities of voluntary group in existence.

Other activities undertaken by the volunteer organizations include clearing of accumulated solid waste, construction of waste collection point and public enlightenment on proper waste handling as the major activities carried out by the volunteer organization as reported in Figure 4. In relation to the activities of these voluntary groups, majority of the respondents reveals that their contribution to solid waste management reduction is less because the communities don't feel the presence of their activities.

Similarly, on the level of participation by members of the communities in some of their activities in waste management since about two third of the respondents have never participated in any of the waste managementas observed by Barr (2014), a society that is willing to work together presents an opportunity for creativity and innovation in dealing with the waste problem. Barr's observation brings out the importance of the will of the people to work together on matters of waste management. Mutual understanding and agreement is vital in having the members of the community to work together.

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.'' (R2 Kabuga, 6th Mar., 2025)

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 awareness campaigns on health activities towards sanitation improvement. Recycling of waste is an important strategy of reducing indiscriminate waste disposal and also of economic benefits. Mountains of waste into useful resource will create jobs for recyclers, while also improving the environment by reducing indiscriminate disposal and the amount of waste being disposal of in open space.

It create job for the recyclers and at the same time improving the quality of the environment. People's participation contributes positively to various solid waste management methods, including waste reduction, recycling, and composting. The active involvement of communities in these practices is directly linked to achieving sustainable waste management goals, fostering a cleaner environment and improving public health. This study on socio economic factors influencing people's participation in solid waste management in Kano metropolis is of great significant to individuals, community, Government and non Governmental organizations.

Recommendations

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 are 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 etc.

Based on the above major findings on solid waste and disposal in Kano Metropolis is mainly done at individual household level than community efforts. There is therefore the need to create awareness for families on the various methods of waste disposal and management by reducing waste generation in the town through re-using, recycling, and compositing in order to reduce waste at home. The need for a sanitized environment to control the menace of insect that spread disease, particularly mosquito that causes malaria and other insect like flies and cockroaches causing other diseases should be known to families.

Provision of cash, materials and moral support should be encourage for those that cannot physically participate in the exercise of waste management activities in the area with emphasis targeted at promoting sustainable alternative approaches of managing Solid waste such as composting and recycling through the use of specific site.

Wealthy individuals within each community should sponsor the various activities of the volunteer groups such as NYSC and Boys scouts through provision of funds and security in their volunteering activities for waste management.

The volunteer groups should make emphasis towards educating and sensitizing community members about their role in SWM activities. In addition women are require to be equip with modern skill on solid waste management which they would in turn pass over to their children who they often involved in waste disposal. Religious leaders also have a role to play by telling the community member the implications of indiscriminate dumping of refuse from the religion point of views.

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