



# **ASSESSMENT OF SOCIAL NETWORKS IN INFORMAL SOLID WASTE RECYCLING ACTIVITIES AND SUSTAINABLE SOLID WASTE MANAGEMENT, NORTH CENTRAL NIGERIA**

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Literature suggest that the fabrics of social relationships in informal solid waste recycling activities is making contributions to the challenge of municipal solid waste management in many developing countries. Despite this, they do not seem to engage the attention of some city authorities in Nigeria where urban solid waste management challenges persist amid high population growth rate and urbanization. Currently, there is paucity of data on social networks in informal solid waste recycling activities in Nigerian cities. This paper examined the contributions of the social connections in informal solid waste recycling activities in Makurdi and Lafia cities, North Central Nigeria. Survey research design was adopted, relying on primary and secondary sources of data. Stratified, purposive and random sampling techniques were used to select the sample. Data was collected from 770 waste collectors using questionnaire while interviews were conducted each with the chairmen of waste dealers' association for Makurdi and Lafia. Similarly, key informant interviews were carried out on the heads of waste management agencies in Makurdi and Lafia cities. Data collected using the questionnaire were coded and entered into Statistical Package for the Social Sciences (SPSS) Software (version 23) to generate the percentages and means while excerpts of the interviews used content analysis. Findings indicate that the networks and their activities collect an average of 79.75kg of recyclables per day and that significant difference occurs in the mean weight collected between Makurdi and Lafia using 0.05 alpha values. Social relationships sustaining the activity include personal ties with households ( $x = 3.87$ ), private business institutions ( $x = 3.78$ ) and the role played by waste dealers associations. The study concludes that although social networks in informal solid waste collection activity is contributing to solid waste management in the study area; it has not been engaged by formal authorities. The network and their activities call for inclusive planning decisions and policies to foster sustained contribution to solid waste management.

**Keywords:** informal solid waste recycling process, social network, solid waste management, sustainability, urban governance, urbanization

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## **INTRODUCTION**

It is a truism that global trends in population growth rates and high level of urbanization especially in developing countries presents a challenge for sustainable municipal solid waste management. In Nigeria, urban population growth rate is estimated at 5.5% while projections suggest that urbanization level will reach 65% by 2020 (Nwaka 2005). This has raised several challenges for sustainable solid waste management amid acute financial limitations. The United Nations Millennium Declaration identified environmental protection as one of the key indices for Sustainable Development (UNEP, 2010). Recycling is the act of transforming waste materials into reusable commodities or goods. According to Liu (2009), it is viewed by many scholars as an invaluable principle of environmental protection and sustainability. On the other hand, George (1996) define solid waste as non-biodegradables that are characterised by a mixture of substances including plastics, metal scraps, paper and glass among others. Several efforts by city authorities including the use of municipal collection crew, public-private partnerships among others to manage solid waste seem not to yield the desired result (Ogbazi, 2009). Estimates have shown that although 30-80 percent of operational budget in developing countries is expended on waste management, only 30-70 percent of wastes generated in the cities were collected for disposal (Ezeah,, Fazakerley & Roberts, 2013; Medina, 1998). In the midst of this inadequacy, informal collection and disposal seem to be trying to fill the gap in many countries. For instance in Egypt, the Zabbaleen a discreet Christian majority group with an estimated population of 60,000 partners with municipal authorities, collect and sort nearly 50 percent of household waste produced across Cairo, since 1930s (Fahmi & Sutton, 2006; Wilson et. al. 2006).

The studies emphasized that when the Zabbaleen attempted to withdraw their partnership services in a protest, the city waste challenges became unbearable. In many Indian cities including Delhi, partnerships of solid waste collection exist between waste pickers and municipal authorities (Tremblay, Peredo & Juta, 2010). In cities of Brazil there exist over 500 waste picker cooperatives with 60,000 members engaged in solid waste collection (Medina, 2008). ASMARE (Associacao dos Catadores de Papel, Papelao e Material Reaprovitavel) has 380 members and recycles 500 tons of material a month while the COOPAMARE (Cooperativa de Catadores Autonomos de Papel, Aparase Materiais Reprovitaveis) collects around 100 tons of recyclables a month (Medina, 2008). Similarly, a study in three Mexican cities found that nearly 3000 informal refuse pickers collect 353000 tons of waste a year and earn up to five times the minimum wage (Medina, 2008). Furthermore, Ezeah et.al (2013) avers that in China the role of itinerant waste buyers and merchants in separation, collection and utilization of reusable solid waste materials collectively increased local demand for secondary raw materials for the local industries. This has influenced solid waste collection activities. According to Medina (1998 cited in Kwaghsende, 2018), recovery activities of recycling collectors saved each city at least 23million dollars per year in Bangkok, Jakarta, Kanpur, Karachi and Manila. Gunsillus (2011) reported that in Asian and Latin American countries waste pickers have managed to

establish organizations, cooperatives and other networks that partners with municipal government and private enterprise in the collection of waste and sale of recycled products.

In spite of the reported contributions of social networks and informal recycling activities in solid waste management some critics argue that their activities often contribute to the challenge of urban environmental management. For instance Bromley (2000) argued that, the activities of those involved in the recycling chain such as collectors who move around the town with their cart sometimes obstruct vehicular and pedestrian movement. Similarly, Lourenco-Lindell (2002) affirmed that many city authorities complain about the negative image created by the appearance of the waste pickers. It is also argued that sometimes social networks may become too strong and may operate as a conspiracy and obstruction against government policies (Meagher, 2005; Portes, 1998). As a result they and their activities are perceived as illegal and are viewed more or less as incompatible to the ideals of modern cities and may be arrested or persecuted (Schilfgaade & Schilfgaade, 2013). The general public and many city authorities often perceive informal solid waste recycling activities as social nuisance and aesthetic problem; because they operate outside formal institutions. Of course it is forgotten that because they are outside the formal institutions they also have fewer rights and benefits of employment and are subject to exclusion from government institutions (Oguntoyinbo, 2012; ILO, 1993; Chen, Vanek, Lund & Heintz, 2005). In view of the above critique, this research aligns with the debate that the activities of social network in informal solid waste recycling activities do not seem to engage the attention of some city authorities and agencies responsible for solid waste management in Nigeria. It is argued that this attitude is informed more by ignorance and prejudices of the contribution of these actors than fact, especially in a country like Nigeria where few studies exist that addresses this phenomenon.

In an Environment of resource scarcity and major challenges, every avenue should be explored to solve existing problems. In urban Nigeria, one of the biggest challenges is managing urban solid wastes. Government agencies have made many efforts including heavy investment of finance and in equipment as well as partnership with the private sector. None of these seem to be yielding the expected results. According to Ogwueleka (2009), out of the 24,242 tons of solid waste generated per month in Makurdi a greater percentage remains uncollected. Similarly, Ogah, Alhassan, Medugi and Mohammed (2014) assert that the problem of municipal solid waste in Lafia city still remains a challenge despite the creation of Nasarawa urban development board in 1996. Kiyanjui and Khayesi, (2005) suggests that an understanding and possible integration of the informal sector solid waste collection activity into program design can create positive outcomes for solid waste management. While there have been multiple studies involving individuals and or groups involved in informal waste management networks that exist in some developing countries, there is no empirical study that has focused on social network and informal solid waste management in Nigeria to engage the attention of city authorities and other agencies responsible for solid waste management. Whiteman, Barrat and

Westlake (2006) focused on solid waste management as a catalyst for governance reforms: Micro-licencing for private sector participation in Nigeria while Akpen and Aondoakaa (2009) investigated solid waste management in Gboko, Benue state north central Nigeria. Similarly, Magaji and Dakyes (2011) assessed the impact of waste scavenging in Gwagwalada, Abuja while Adeoye, Sadeeq, Musa and Segun (2011) researched on solid waste management in Minna, Niger state, Nigeria. Although Kwaghsende and Ajene (2018) analysed social networks in recycling enterprise, they did not examine how the networks identified contribute to the enterprise. Empirical data on social networks and the informal solid waste recycling activities in the study area that might influence policy decision is lacking hence the need for this study. This study therefore seeks to fill this void. The study aim is to assess social networks in informal solid waste recycling activities in Makurdi and Lafia cities, with a view to providing empirical data that will guide urban planning decisions. The specific objectives were to: (i) explore the social networks that sustain informal solid waste recycling chain, (ii) examine the ways social network support the activity (iii) determine the implications of the role social networks play in informal solid waste collection on urban development in Makurdi and Lafia cities, and (iv) determine the response of city authorities to social network activities. The core research problem is how to engage the attention of city authorities' towards social networking as a sustainable solution to solid waste management challenges in Nigerian cities. The central research question is; how is the neglect of social network by city authorities and waste management agencies affecting solid waste management in Nigerian cities?

## **REGIONAL SETTING AND BACKGROUND INFORMATION**

The study was carried out in north central Nigeria, one of the six geo-political zones in Nigeria. North central zone covers six states, namely Benue, Kogi, Kwara, Nassarawa, Niger, and Plateau as well as the Federal capital territory (F.C.T), Abuja (see Figures 1 and 2). Makurdi and Lafia are the capital cities of Benue and Nasarawa. In 2006, the region had a population of 20, 369,956 (NPC, 2006), representing 14.5 percent of the population of Nigeria. The distribution shows that Benue state is the most populous with 4,253,641(20.9%), while Nassarawa is the least populated among the states with 1,869,377(9.1%). With the National annual growth rate of 2.6%, the population of the region is about 28,438,441 in 2019. Makurdi and Lafia cities were purposely chosen in the region to represent cities where people are known to be involved in the activity. Furthermore, Makurdi was also chosen by virtue of its highest contribution to National population growth rate in the area (3.0%). Lafia with the least contribution to the National population growth rate (1.33) was also chosen to represent cities with low population growth rate in Nigeria. Both cities represent the population that generate solid waste which management remains a daunting challenge. Figure 1 shows the regional setting of the study in Nigeria while Figure 2 illustrates the cities where the study was carried out.

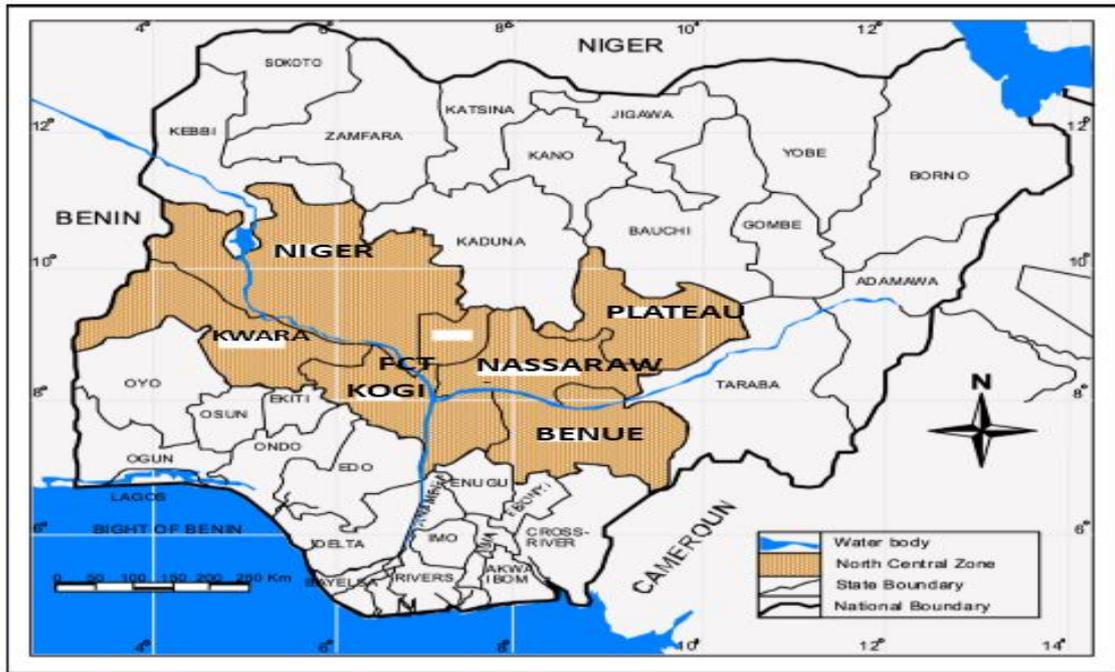


Fig.1: Nigeria showing North-central Geo-political Zone  
 Source: Benue state Ministry for Land and surveys (2016)

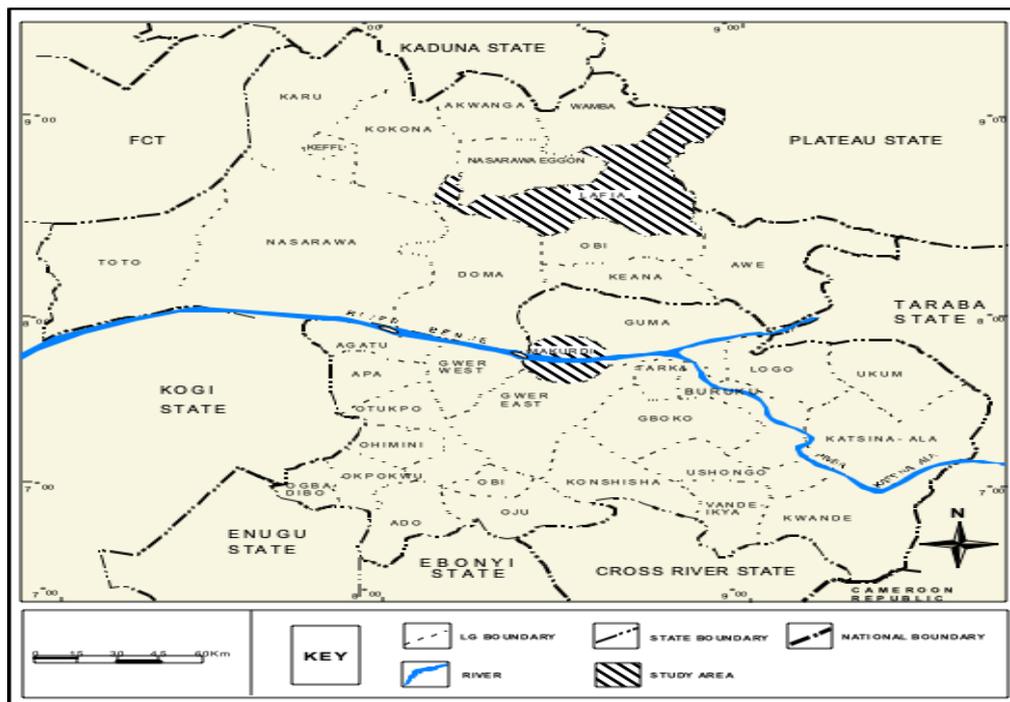


Fig.2: Nasarawa and Benue state showing Makurdi and Lafia Towns  
 Source: Benue state Ministry for Land and surveys (2016)

## RESEARCH DESIGN

The research used survey research design approach-: it also utilised qualitative and quantitative research methods. The perception of waste pickers on the social networks that support recycling activities and the average amount of waste collected per day(in kg) were elicited using structured questions ; the questions were made up of both close and open ended questionnaires.

Similarly, interviews with some of the waste pickers targeted information on how the social networks identified foster waste collection activities. Furthermore, interviews were also conducted with chairmen of waste dealers' associations for Makurdi and Lafia. Information elicited here includes, ways the network support members as well as reaction of city authorities to their activities. In addition, interviews were conducted with heads of relevant Ministries and Waste Management agencies on the way they perceive the activities of informal waste pickers, their social networks and whether they engage them.

### **Population, sampling and sample size**

The target population for data collection was 1100 waste pickers (600 in Makurdi and 500 in Lafia) derived from total registered membership population of the dealers' association in Makurdi and Lafia cities. Taylor, Sinha and Ghoshal (2006) averred that for a population that is homogenous in characteristics like that of waste pickers any sample used does not make any significant difference. In view of this, 70% was used to sample 770 respondents as indicated in Tables 1 and 2.

**Table 1: Questionnaire distribution among sampled residential units in Makurdi**

S/N	Name of Neighbourhoods	Estimated Population	No. Of Questionnaires Administered
1	Wurukum	10,150	120
2	Wadata	8,475	100
3	North Bank	9,222	90
4	High Level	10,640	60
5	Ankpa Ward	7,500	50
Total		45,987	420

**Table 2: Questionnaire distribution among sampled residential units in Lafia**

S/N	Name of Neighbourhoods	Estimated Population	No. Of Questionnaire Administered
1	Old Town Area	6,301	120
2	Sabon Pegi	5020	100
3	Bukan Sidi	7,660	70
4	Tudun Gwandara	4,920	60
Total		23,901	350

Stratified sampling was used to stratify the study area (Makurdi and Lafia) into neighbourhood units from where target respondents (waste pickers) were administered questionnaires. Using random sampling, 5 neighbourhoods were selected from Makurdi while 4 were selected from Lafia using lucky dip (see Table 1 and 2). Relying on preliminary information from the dealers about the number of pickers that supply recyclable waste materials to their shops in the neighbourhoods, the sample sizes in Tables 1 and 2 were randomly selected

across the activity areas in the neighbourhoods. Oduwaye and Farinmade (2013) studying informal sector traders in the streets of Lagos used existing spatial units and obtained valid result. The actual number of respondents per neighbourhood depended on the intensiveness or concentration of receptacle depots in a residential neighbourhood. The already existing spatial neighbourhood structures were used to collect data from the waste pickers. Questionnaires were purposively administered randomly to 770 waste pickers face-to-face at receptacle depots every morning and evening. Any waste pickers that were met at the depot and in the field were used to collect data. In every city, a schedule was drawn (with support from the heads of receptacle depot and research assistants) for the administration of questionnaires to the respondents at the receptacle depots within the neighbourhoods. A list of statement obtained from literature was made for waste pickers to tick the social network that support their activities most (using the 5 point Likert scale) and to state any other not listed. Similarly, information was elicited on average amount of waste collected (in kg) per day by waste pickers every morning. The chairmen of waste dealers' association of Makurdi and Lafia cities were interviewed on ways they support their members as well as how city authorities react to their networks and work. The chairman of Makurdi waste dealers' association was interviewed in his office in North bank, Makurdi, while his counterpart at Lafia city was interviewed in his waste shop in Lafia. Similarly, key interview was also conducted on the Director of Environment, Ministry of Environment, Makurdi in his office while the head of Urban and Regional Planning section of Nassarawa Urban Development Board was interviewed in Lafia city.

### **Data analysis**

In order to analyse data obtained from the questionnaire, the questionnaires were coded and entered into the Statistical package for the social sciences (SPSS) software (version 23) to generate the percentages and means. Using the Likert scale type weighted response (A 5-point Likert scale of strongly agree (SA) = 5; Agree (A) = 4; neither agree nor disagree (NND) = 3; disagree (DA) = 2 and strongly disagree (SDA) = 1), the mean critical value (3.0) was obtained. This mean descriptive statistics was used to rank the networks. Any mean statistics values less than the critical value was termed disagree while any value above it was termed agree. The mean values were used to determine as well as to rank the social networks that drive informal solid waste collection activities. In addition, t-test was used to test for the significant difference in the mean weight of waste involved in informal solid waste recycling activities between the two locations (Makurdi and Lafia cities). The value of 0.05 was used to compare with the p-value (sig.) for decisions. The results of the interviews were presented in excerpts in a tabular form and subjected to content analysis.

## RESULTS

Based on the mean score results as indicated by the waste pickers in Table 3, the result shows that the three most important network agreed by waste pickers as facilitating their activities in order of highest rank were; personal ties with house owners ( $x = 3.87$ ), ability to communicate in local dialect ( $x = 3.81$ ), and partnership with private institutions ( $x = 3.78$ ). Findings obtained from the interaction with the respondents who were members of the waste dealers' associations acknowledged the role played by the membership of waste association (Scrap dealers or Yan Bola associations) in recycling activities. For instance raising money to carter for sick members, transport them home when they were sick. In terms of how the networks support the activity, the result of the interview with the chairmen of waste dealers association is presented in Table 4.

**Table 3: Perception of respondents on social networks that sustains informal solid waste recycling activities in Makurdi and Lafia**

Variable	Survey statement	N	Strongly Disagree (SDA)	Disagree (DA)	Neither Disagree Nor Agree (NDA)	Agree (A)	Strongly Agree (SA)	Sum	Mean (Descriptive Statistics)	Rank
Public partnership	Partnership with state institutions	770	0	112	203	452	3	2658	3.45	11
Private partnership	Partnership with private business institutions	770	2	17	129	619	3	2914	3.78	3
Personal ties	Personal ties with house owners	770	0.0	0.0	107	656	7	2980	3.87	1
Family ties	Partnership with family relations	770	0	43	107	617	3	2890	3.75	5
Faith ties	Partnership with religious institutions	770	9	154	207	391	9	2547	3.31	15
Guidelines	Role by guide lines/sanitations	770	10	117	611	27	5	2210	2.87	18
Slogans	Chanting slogans	770	12	252	217	259	30	2350	3.06	17
Association	Membership of recycling association	770	8	337	217	180	28	2190	2.85	19
Tax	Payment of tax/lobby of formal government institution	770	25	312	241	172	20	2160	2.81	20
Information	Sharing of information among colleagues	770	5	52	228	448	37	2580	3.4	14
Group relationship	Group participation/working relationships	770	9	33	135	583	10	2860	3.72	7
Affluence	Affluence of community where one works	770	16	56	308	379	11	2620	3.41	12
Location	Location of the workplace	770	38	43	261	418	10	2620	3.41	12
Distance	Extent/distance covered per day by person	770	10	109	143	501	7	2690	3.5	10
Crew link	Link with collection crew	770	42	148	212	360	8	2454	3.19	16
Familiarity	Familiarity/regular contact on routes	770	10	16	129	601	14	2900	3.77	4
Communication	Local communication (language)	770	5	14	123	609	19	2930	3.81	2
Finance	Financial standing	770	31	17	237	468	17	2730	3.55	9
Experience	The role of experience/capital	770	2	8	215	523	22	2860	3.72	7
Rapport	Report with community trust	770	0	0	224	511	35	2891	3.75	5

Source: Kwaghsende, F and Ajene (2018)

**Table 4: Relationship between waste associations and waste picker activity**

Respondent	Excerpts from Interview	Location
Chairman Makurdi Scrap Dealers' Association, Makurdi	“We give our members financial assistance through our weekly contribution scheme; we give them security tips on how they can go about their works without hindrance, handle police cases for them and also give them money to go home when they are sick” we also sanction erring members by sending them to the Police or Vigilante for prosecution or reformation or we can send you out of the business here”.	Makurdi
Chairman Lafia Scrap Dealers' Association – <i>Yan Bola</i>	“We give financial assistance to our members who may be out of money, represent our members even in court if we feel they are innocent and protest against unfair treatment by authorities to our members; we also ensure good working relationship among our members”	Lafia

The excerpts of the interview result with the association chairmen as shown in Table 4 indicates that the associations are helping to carter for the problems of their members. To determine the implications of the role social network activities in informal solid waste collection play in the study area, the result of the response of waste pickers on the average amount of waste collected per day in kilograms between the two locations (Makurdi and Lafia) were used as presented in Table 5.

**Table 5: Mean Weight of Recyclable Solid Waste Collected in Makurdi and Lafia Cities**

	Location	N	Total Weight	Mean	Std. Deviation	Std. Error Mean
Kilograms supplied per day on average	Makurdi	420	15,493.8	36.89	19.410	.947
	Lafia	350	15,001	42.86	53.883	2.880
	Total	770	30,494.8	79.75		

Kwaghsende (2018).

A comparison of the average amount of waste collected by waste pickers between the two locations (Makurdi and Lafia) as shown in Table 5 reveals that the total average daily contribution of the activity in the study is 79.75kg. (36.89kg and 42.86kg per person per day for Makurdi and Lafia). This data shows that greater amount of waste is collected in Lafia than Makurdi by the waste pickers. This difference may be explained by differences in the types of waste collected between the two locations. For instance, metal scraps have the tendency of weighing more than plastics or paper and plastic more than paper among others. Furthermore, since the selection of respondents for administering of questionnaires was simply purposive and based on the respondent(s) met, this is capable of bringing about the difference. Finally, the reaction of the city authorities between the two cities and other working environmental conditions may have influenced the difference in the weight of

waste collected between the two locations. Data was collected from waste pickers, heads of waste association for Makurdi and Lafia and from government agencies to determine the neglect or otherwise of social networks in informal solid waste collection activities in the study area by city authorities. The result is contained in table 6.

**Table 6: Reaction of city authorities to informal solid waste collection activities**

	N	Yes	No
Are you harassed by state authorities in trying to access recyclables?	770	250 (32.5%)	520 (67.5%)
Are your activities regulated by state government?	770	36 (4.7%)	734 (95.3%)
Payment of dues/tax to state government	770	112 (14.5%)	658 (85.5%)
Payment of dues/tax to association	770 (100%)	599 (77.8%)	171 (22.2%)

The percentage response of waste pickers in Table 6 indicates that majority 520 respondents representing 67.5% were not harassed by city authorities in the course of accessing recyclable waste materials. Only a negligible number of persons 250 (32.5%) reported that they were harassed. Those who were harassed however reported that this was by security agencies and hoodlums (area boys). Some of these challenges were addressed through dialogue, lobbying by individual waste pickers, junk dealers (their masters) and at worst intervention by the associations leaders.

Interview with Chairmen of Waste dealers’ Associations for Makurdi and Lafia and with City Authorities.

The researcher also sought to know from the chairmen of waste dealers’ association of Makurdi and Lafia whether or not they were assisted by city authorities, all the chairmen in separate response replied:

We do not receive any support (financial or otherwise) and no incentive from the state authorities. According to the Lafia Chairman, “they promised us financial assistance but nothing is given to us”. In the same way, the waste dealers Chairman for Makurdi interjected “even though I often meet the governor on behalf of our members they promise to assist us but fail”. The Makurdi Association Chairman admitted that they do experience conflict with city authorities on issues of sanitation, because some of their members litter the town with filth. In Lafia, however the response was that “we do not have conflict and we are not prevented from doing our work”.

In an interview with the Director of environment in the Ministry of Environment, Makurdi and that of Nasarawa Urban Development Board, the study found that all of them were aware of the activities of the waste pickers and their social networks in the states. They however opined that the state has not made efforts to assist or engaged them for any purpose.

## **DISCUSSION OF RESULTS**

The findings from the study have unveiled a catalogue of social networks or connections and how they are helping to sustain the informal waste recycling enterprise. The result shows that irrespective of the amount collected generally, the enterprise portends an opportunity for contributing to sustainable solid waste management in the study area. The findings are in tandem with those by Kebede (2015) in Addis Ababa, Ethiopia. Social network (individual and group networks) is contributing to solid waste collection activity. Both the connections, contacts or relationship were found to be the bases that were driving the activity in the study area and by implication contributing to solid waste management. This represents the role played by social networks in informal enterprise and service delivery reported earlier in literature. The network structures are helping to cater for welfare of their members because excerpts of the interview with the chairmen of the dealers' association in Table 4 affirmed that they work for the welfare of their members by providing financial support, protection and ensuring discipline among members for peaceful working relationship. These supports are in tandem with submissions by Granovetter (1973 cited in Williams, 2008) which uphold social networks as an asset in fostering enterprise. The responses from the waste pickers also showed that they work under guidelines from their masters (Ogas), relate with their co-workers as well as interact with house owners who also supply materials for them apart from picking in the open dumps. This usually increases the amount collected by members. Furthermore, they were reportedly guided by operational guidelines handed down to them by their masters (dealers) so they can be defended by their masters. In Vancouver, the code of conduct used by the United We Can (UWC) members (Waste pickers) includes positive behaviour and attitude towards environment while binning as well as relating properly with other binners and maintaining territorial boundaries (Tremblay et al., 2010). This is however in discordance with the situation in the study area where it was found that the workers were not regulatory conscious about the need to keep the environment clean in the course of recovery of materials. The interview with the chairman of Makurdi dealers' association indicated that they sometimes experience conflict with city authorities on issues of sanitation, because some of their members litter the town with filth. Findings also showed that the workers have developed a relationship with business owners to access their premises apart from the general picking at garbage dumps, thus they collect materials of different types. For instance, some respondents explained that one of the sources they obtain solid waste materials was from mechanic villages. This is similar with finding by Mamphitta (2011) in a study in Pretoria, South Africa where some waste pickers have developed relationship with generators of particular waste types and collect them for their earnings. The study also revealed that most of the waste pickers were not harassed by city authorities in their quest to access recyclables as shown in Table 6. Only a negligible number of the waste pickers opined that they experience harassment in the course of their activities. When interrogated the Director, Ministry for Environment, Makurdi and his counterpart, head of Urban and Regional Planning in Lafia all affirmed that

they do not restrict or harass the waste pickers in the course of their activities. They reported that they were aware of the usefulness of waste picker activities particularly in terms of reduction of non-biodegradable waste in the environment. The officers however said they have no policies about this activity and do not partner with them nor give them incentives or operational guidelines. Oklo (2013) in Ghana reported that the workers were constantly threatened with eviction and harassment. Generally, empirical findings from the study have shown that the informal solid waste collection activity in the study area is making some contributions to solid waste management by collecting an average of 79.75kg of waste daily or 2.39 tons per month. The implications of the findings are that the reduction of the amount of waste in the environment left for the authorities to collect may have cost reduction effect. It also implies that, the networks if formally engaged may save city authorities from the capital intensiveness and environmental pollution reportedly associated with the conventional approach to waste management which some researchers argue produce no better results. This is in concordance with findings in Delhi and Madras, India (Medina & Dow, 2000; Ezeah *et al.*, 2013), Rio de Janeiro, Brazil (Medina & Dow, 2000; Trembley, 2010), Pretoria, South Africa (Mamphitta, 2011) as well as some Mexican cities (Medina, 2008). In spite of the role being played by the social networks and waste recycling activities in solid waste management, the association leaders decried their non-inclusion in government welfare packages. This suggests that while the waste workers are carrying out what should be the core mandate of the authorities their activities are not supported as in other countries such as Curitiba, Brazil. The waste dealers' associations (Scrap Dealers Association and Yan Bola) in the study area like in other climes act as arbiter and present a potential platform for engagement for sustained informal collection services in Nigerian cities. The empirical data portends an opportunity for advancing inclusive measures that would engage the workers for urban solid waste management services. All these thus affirm to the justification of the study.

## **CONCLUSION AND RECOMMENDATIONS**

The study revealed the fabrics of social connections and how they are supporting informal solid waste recycling enterprise in the study area. The findings also show that despite the seeming inadequacy of data, the networks and their activities has potential for contributing to sustainable solid waste management, they and their activities are however not supported. The findings also affirm that informal solid waste recycling enterprise in the study area depends on social relationships just like other economic enterprise. In generic terms, the findings have shown that the role played by social networks in informal collection is a representation of its contribution informalisation. This is generally viewed by contemporary scholars as a feature of modern enterprise that has a relationship with the formal institutions. Informal collection activity is not only contributing to augment solid waste management by municipal authorities but also diversification of sustenance opportunities. It is helping stakeholders in the enterprise to contribute to urban governance in the area. The activity and its structures therefore present a potent asset and platform of

engagement for sustainable solid waste management. The network has potentials for urban development challenges, social organization as well as political administration in the study area. The size of the activity and its networks has thus been expanding especially in developing countries based on available evidence in literature. It is thus worth exploiting and expanding as a sustenance opportunity especially in Nigeria and many other developing countries struggling to cope with solid waste management challenges amid economic challenges and failure of city authorities in urban service delivery. Despite the all-important contribution of informal solid waste workers in collection activities, they and their activities are accused of interfering with sanitary operations by authorities in Makurdi. The study represents to a reasonable extent an addition to the current knowledge on the subject matter in the study area, the findings avails itself to policy decision. This sector and its ancillaries thus demand the attention of urban planners as well as other development professions to synergies for stronger support for the sector to expand more. The many fronts of cascading ripple effects of social networks in informal solid waste collection and recycling activities demand for a rejig of the waste management mechanism and policies by authorities to accommodate informal recycling workers. Policy implications of the study include the fact that in many countries organised social networks are engaged in service provision such as solid waste management. Government in Nigeria could under study and identify the networks, organize and build their capacity so that they can serve as formal bureaucratic channels for engagement in different ways. Like in cities of Brazil, Colombia and Egypt, the networks and their activities calls for inclusive urban development planning decisions by authorities. This can be done using appropriate policies and regulations to help sustain its contribution to solid waste management in Nigerian cities.

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