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ASSESSMENT OF PUBLIC PARTICIPATION AS MECHANISM FOR SUSTAINABLE WASTE MANAGEMENT IN BARNAWA, KADUNA SOUTH, KADUNA STATE, NIGERIA

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ABSTRACT

The study was an assessment of public participation as a mechanism for sustainable waste management in Barnawa, Kaduna South, Kaduna state. The study was descriptive cross-sectional survey that employed the use of both primary and secondary data obtained from field survey, journal, articles, and text books. The sampled size of the participants of the study was 100 residents in the study area, while the statistical method of analysis adopted in analysing the results obtained was descriptive statistics. The results revealed that the most common waste generated are; residential waste, paper waste, plastic waste, textile waste, bottle waste and commercial waste. More so, the results revealed that these wastes as well as solid waste were generated on a frequency of daily basis, weekly basis and twice a week basis in the study area. The result collected from the field survey to this respect revealed that there are basically three stakeholders responsible. More so it was reviled the cost of solid waste disposal in the study area, as well as the willingness of the residents of Barnawa community to pay for disposal of solid waste in the community. From the result, it was discovered that majority of the residents of the study area were of the view that they do not encounter challenges in disposing their waste, while a significant share of the resident of the study area were of the opinion that they do encounter challenges in disposing the waste they generate. The study concluded that Long-term sustainability of the solid waste management system also depends on the level of segregation of waste. Segregation of waste should be three streams this will also help in finding appropriate disposal options. Segregation of waste should be done at the source itself. Segregated waste can be collected on a weekly basis from households and on a daily basis from business establishments.

Keywords: Waste, Public, participation, Sustainable, Management.

INTRODUCTION

Waste is any unwanted and discarded object or material, which could be in the form of plastics, rubber, metals (liquid, gaseous and solid forms), oil and other inorganic and organic matter, which is a by-product from industrial, institutional, agricultural or household activities (Benedine *et al.,* 2011, Bogoro &Babanyara, 2011). Waste

is something for which we have no further use and which we wish to get rid of. Solid wastes arise from unusable residues in raw materials, leftovers, rejects and scrap from process operations, used or scrap packaging materials and even the saleable products themselves when they are finally discarded. The management of municipal solid waste has been a persistent challenge to the government of most cities in developing countries, Nigeria inclusive and a considerable amount of money goes into the management of such huge volumes of solid waste. Consequently, vast uncollected waste results in different social menaces e.g., it causes diseases, clogs drains causing flooding and also environmental. Pollution in developing countries it is estimated that one to two thirds of the solid waste generated in most urban areas is not collected (Zurbrugg, 2003).

Medina, (2000) defined solid waste as materials generated from the result of human daily activities resulting from areas such as households, public places and city streets, shops, offices and hospitals. Solid waste management can be defined as a discipline associated with control of generation, storage, collection, transfer, processing and disposal of municipal solid waste in a way governed by the best principles of public health, economics, engineering, aesthetics and other environmental considerations. Public participation as concept is defined by Phago and Hanyane (2007) as a constitutional mandate that involves exchange in information between the public at the grass roots level and the legitimate government structures. The authors believe that communities are stakeholders in the government sphere and should therefore be encouraged to participate in matters of local government to sustain waste management service delivery.

Smith and Vawda (2003) point out that public participation is a key strategy for building democracy. The authors maintain that the scope of public participation should be widened to determine distribution and allocation of resources to improve the quality of lives of the poor. The authors advocate that by capacitating people to participate in public issues, the public will be developed to engage in the community matters. According to Tsenoli (2010) it is of vital importance to improve and encourage public participation, especially in government policy formulation and implementation.

The role of Kaduna South Metropolis should be to raise awareness of the rights and obligations so that the public is able to play an active role in municipal affairs. Public participation is a process that cannot be ignored. Kroukamp (2000) states that if the public is offered an opportunity to participate in a community's services such as waste management, they become responsible, find meaning in what they do and the municipality is able to mobilize financial and material resources to service the community better. Khoso (2000) maintains that public participation is a prerequisite in waste management infrastructure such as mini-recycling facilities, buy back centres and mini dump transfer stations. A community that involves the public develops partnership with stakeholders and acknowledges that public participation is a cornerstone of a democratic country that benefits politicians, officials and the public itself. The needs of the public become known through their involvement (Kroukamp, 2000). The Waste Act defines waste management as "any activity listed in Schedule 1 or published by notice in Gazette under Section 19 and includes the importation and exportation of waste, the generation of waste including the undertaking of any activity or process that is likely to result in the generation of waste". According to Scheinberg (2008) the process and activity in waste management "give priority to waste prevention and recovery, shifting the destination of materials away from land disposal to formal and informal re-use, recycling and composting". The unwanted waste is managed separately; transported, transferred and disposed at the disposal site.

Kaduna metropolis like most major urban centres in Nigeria is experiencing rapid increase in urban population due to mainly rural - urban migration. The increase in solid waste generation has been found to be the direct result of increase in population growth which as well applies to Barnawa community being one of the major communities in Kaduna South. The management of solid waste in the city of Kaduna is largely carried out by the Kaduna Environmental Protection Agency (KEPA) Result from previous studies and observation as indicated by the heaps of uncollected waste seen across the streets of the metropolis shows that government agencies do not have the capability to consistently rid the city of waste as often as they are being generated. This is further compounded by the high cost of managing waste amidst

the growing demand for funds by other sectors of the economy with only limited resources available both in terms of man power and financial cost. The result of this is the relatively high and substantial quantity of the generated waste is being left uncollected. As a result of this challenge, public participation in solid waste management has become inevitable.

Preliminary observation and studies have shown that with a well-organized and planned structure in place, communities can effectively manage their solid waste. This preliminary observation revealed that there already exist certain practices by the households towards managing their waste. Barnawa has diverse communities with varying needs. Their social characteristics range from affluent to poor socio-economic status. Poor service quality of refuse collection affects the quality of lives of the people in these communities. Poor refuse collection services limit business and industries in an area and deprive the community of job opportunities. If people are consulted about service levels, problems and proposals for new services, irrespective of their socio-economic status, they will see no need to protest about poor service delivery because they have been informed and may contribute to solution of problems.
Some factors contributing to slow public participation in waste management in Barnawa communities are:

- There seems to be much public ignorance on the relationship between active public participation in waste management and healthy environment due to lack of involvement of community in waste management in Kaduna South metropolis.
- Other weaknesses affecting public participation in waste management services are increase in population leading to excessive waste generation in the region.
- People are informed but are not interested. Some people work far from their homes and play a very little role in public meetings as they arrive home late.
- Inadequate consensus whereby people with sufficient knowledge and have ability to debate issues may not be present in the public participation meeting. The inverse may occur where there are professionals who are able to interpret

the policy that is under discussion. This may need a follow-up to the meeting.

- Inflexible project design to promote participation. This may need a series of public meetings and categorize residents into business, community and education sector.

The focus of this study is to determine the extent of community involvement in waste management processes in Kaduna South. That way, the gaps in public policy implementation in waste management would be highlighted for management action.

MATERIALS AND METHODS

Nature and Sources of Data

The study employed the use of both primary and secondary data. Primary data used was a cross sectional survey data from residents of the study area. The natures of the secondary data of the study were existing qualitative data that were relative to the study. The Secondary were sourced from journals, articles, and books.

Method of Data Analysis

The data for this study was processed and analysed both quantitatively and qualitatively. The quantitative data was analysed using both descriptive statistics with the help of Microsoft Excel, and IBM SPSS Statistical package version 26. The descriptive statistics that was used consist of central tendency and simple percentages. The results obtained from the field survey were presented in the form of charts and tables.

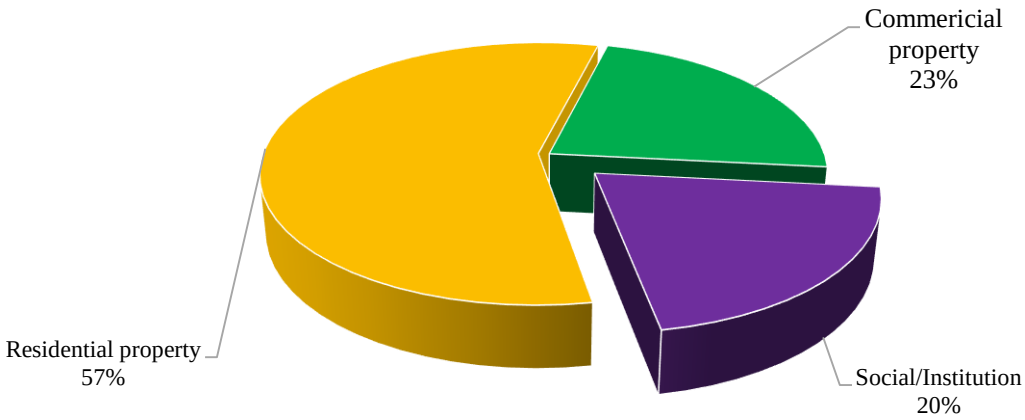
RESULTS AND DISCUSSION

Nature of Property Respondents of the Study

The results depicted in Figure 1 reveals the distribution of the nature of the property of the respondents of the study. From the chart, it can be observed that majority of the nature of property of the participants of the study were residential property. This group of respondents accounted for 57 percent of the respondents of the study. More so, 23 percent of the respondents of the study highlighted that the nature of the property the possessed/occupy are commercial property, while 20 percent of the respondents of the study were of the opinion the nature of the property they

occupy/possessed in the course of this study were social/institutional property.

Fig. 1: Nature of Property of Respondents

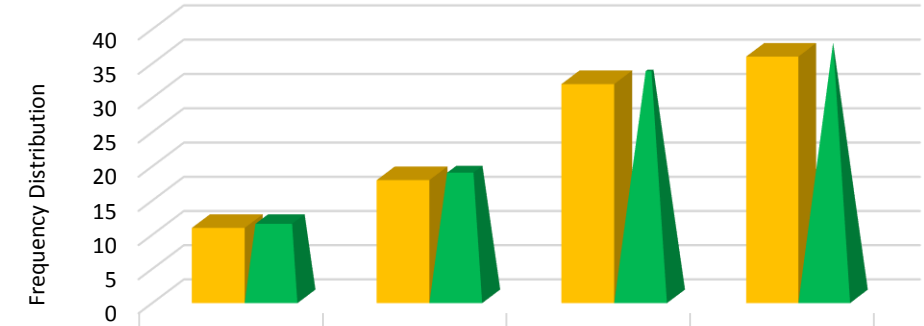


Source: author's computation, 2020.

Income level per month of Respondents of the Study

The results of the study also reveal the income level per month of the respondents of the study, as depicted in Figure 2. The findings revealed that 37.1 percent (36 respondents) respondents of the study earn an average income level of above ₦51,000 per month in the study area. Similarly, the depicted results revealed that 33 percent (32 respondents) of the respondents of the study earn an average income level between ₦31,000-₦50,000. More so, the result further revealed that respondents of the study earning an average income level between ₦11,000-₦30,000 accounted for 18.6 percent (18 respondents) respondents of the study, while respondents earning an average income level below ₦10,000 per month accounted for 11.3 percent (11 respondents) respondents of the study.

Fig. 2: Income per month of Respondents



	Below ₦10,000	₦11,000-₦30,000	₦31, 000-₦50,000	Above ₦51,000
Frequency	11	18	32	36
Percent	11.3	18.6	33	37.1

Source: author's computation, 2020.

Types Waste Generated in the Study Area

The study attempts to establish the types of waste generated by the residents of Barnawa community in the study area. The results of the various responses of the respondents of the study with respect to the various types of waste generated are presented in Table1. From the results, it can be discovered that there are basically six major waste generated by the residents of Barnawa community. These wastes include; residential waste, paper waste, plastic waste, textile waste, bottle waste, and commercial waste. It is however important to note that among these six major types waste generated in the study area, residential and plastic waste are the highest waste generated by residents in the community.

Table 4.1: Types of Waste Generated in the Study Area

I mostly generate residential waste			I mostly generate paper waste		
Reponses	Frequency	Percent	Reponses	Frequency	Percent
Strongly Disagree	10	10.3	Strongly Disagree	25	25.8
Disagree	18	18.6	Disagree	16	16.5
Undecided	17	17.5	Undecided	12	12.4
Strongly agree	34	35.1	Strongly agree	26	26.8
Agree	18	18.6	Agree	18	18.6
Total	97	100.0	Total	97	100.0
I mostly generate metal waste			I mostly generate organic waste		
Strongly Disagree	28	28.9	Strongly Disagree	32	33.0
Disagree	24	24.7	Disagree	25	25.8
Undecided	18	18.6	Undecided	15	15.5
Strongly agree	17	17.5	Strongly agree	17	17.5
Agree	10	10.3	Agree	8	8.2
Total	97	100.0	Total	97	100.0
I mostly generate plastic waste			I mostly generate textile waste		
Strongly Disagree	13	13.4	Strongly Disagree	24	24.7
Disagree	17	17.5	Disagree	18	18.6
Undecided	17	17.5	Undecided	11	11.3
Strongly agree	30	30.9	Strongly agree	24	24.7
Agree	20	20.6	Agree	20	20.6
Total	97	100.0	Total	97	100.0
I mostly generate bottle waste			I mostly generate commercial waste		
Strongly Disagree	19	19.6	Strongly Disagree	17	17.5
Disagree	16	16.5	Disagree	21	21.6
Undecided	17	17.5	Undecided	15	15.5
Strongly agree	19	19.6	Strongly agree	21	21.6
Agree	26	26.8	Agree	23	23.7
Total	97	100.0	Total	97	100.0
I mostly generate industrial waste			Most Generated Waste in the Study Area Based on Responses of the Respondents		
Strongly Disagree	21	21.6	Residential Waste		
Disagree	24	24.7	Paper Waste		
Undecided	16	16.5	Plastic Waste		
Strongly agree	18	18.6	Textile Waste		
Agree	18	18.6	Bottle Waste		
Total	97	100.0	Commercial Waste		

Source: field survey, 2020.

Frequency of Solid Waste Generation and Disposal in the Study Are

The study sought to assess the frequency of solid waste generation by residents in the study area, as well as the frequency of disposal of these solid wastes. The result presented in Table 2 reveals the frequency of solid waste generated in Barnawa community.

Table 2: Frequency of Solid Waste Generation in the Study Area

Period	Frequency	Percent	Valid Percent	Cumulative Percent
Daily	38	38.0	39.2	39.2
Twice a week	31	31.0	32.0	71.1
Weekly	28	28.0	28.9	100.0
Total	**97**	**97.0**	**100.0**	

Source: filed survey, 2020.

From the frequency distribution of the responses of the respondents of the study, it can be observed that an average level, solid waste in the study area is generated on a daily basis. The conclusion was arrived at with respect to 38 percent majority responses from the respondents of the study, who were of the opinion that they generate solid waste in the study area on a daily basis.

Table 3: Frequency of Solid Waste Disposal in the Study Area

Period	Frequency	Percent	Valid Percent	Cumulative Percent
Daily	26	26.0	26.8	26.8
Twice a week	35	35.0	36.1	62.9
Weekly	36	36.0	37.1	100.0
Total	**97**	**97.0**	**100.0**	

Source: field survey, 2020.

In an attempt to establish the frequency to which residents of the study area dispose the solid waste they generate, the results presented in Table 3 revealed that the majority of residents in the study area dispose the solid waste the generate on a weekly or twice a week.

Stakeholders Responsible for Solid Waste Management in the Study Are

The study attempts to identify the various stakeholders involved in solid waste management in Barnawa community. The results presented in Table 4 reveal the finding made with respect to this

objective of the study. From the frequency distribution of the various responses of the respondents of the study, it can be observed that that major stakeholders involved in solid waste management in the area of study are; government waste management agency, private waste management companies, and community based voluntary waste management group.

Table 4: Stakeholders Involved in Solid Waste Management in Study Area

Stakeholders	Frequency	Percent	Valid Percent	Cumulative Percent
Government waste management agency	36	36.0	37.1	37.1
Private waste management companies	31	31.0	32.0	69.1
Community based voluntary waste management group	30	30.0	30.9	100.0
Total	**97**	**97.0**	**100.0**	

Source: field survey, 2020.

Having identified the various stakeholders involved in solid waste management in the area of study, the study sought to highlight the effectiveness of these stakeholders in the management of solid waste in the study area. To this end, the participants of the study were asked whether these stakeholders were effective in managing sold waste in Barnawa community via one of the items on the research instrument. The data presented in Table 5 depicts the various responses of the participants of the study, vis-à-vis the perceived effectiveness of these stakeholders.

Table 5: Effectiveness of Stakeholders in Solid Waste Management in the Study Area

Responses	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	33	33.0	34.0	34.0
No	44	44.0	45.4	79.4
No idea	20	20.0	20.6	100.0
Total	**97**	**97.0**	**100.0**	

Source: field survey, 2020.

From the above results depicted in Table 5, it can be observed that majority of the respondents of the study (45.6 percent) were of the view that the stakeholders involved in solid waste management were not effective. Having established the effectiveness of

stakeholders in solid waste management in the study area, the study sought to identify the various means by which waste are collected by the various institutions involved in waste management in the study area. The results presented in Table 6 reveals these means, as indicated by the degree of responses of the participants of the study.

Table 6: Means of Waste Collection in the Study Area

Means	Frequency	Percent	Valid Percent	Cumulative Percent
Trucks	14	14.0	14.4	14.4
Wheel barrow	51	51.0	52.6	67.0
Other	32	32.0	33.0	100.0
Total	**97**	**97.0**	**100.0**	

Source: field survey, 2020.

From the above results presented in Table 6, it can be observed that most common mean of waste collection in the study area was by wheel barrow. Although trucks are used for waste collection, there usages however, are not popular. The respondents of the study however did point out that other mean of waste collection not highlighted in the research instrument were used for waste collection in Barnawa community.

Table 7: Frequency of Waste Collected by Stakeholders Involved in Waste Management in the Study Area

Frequency of Collection	Frequency	Percent	Valid Percent	Cumulative Percent
Daily	11	11.0	11.3	45.4
Twice a week	16	16.0	16.5	61.9
Weekly	26	26.0	26.8	88.7
Monthly	44	44.0	45.4	100.0
Total	**97**	**97.0**	**100.0**	

Source: field survey, 2020.

The result presented in Table 7 reveals the frequency of waste collection by the various stakeholders in waste management in the study area. From the above results, it can be observed that the majority of the respondents of the study were of the opinion that waste was collected monthly. This group of respondents accounted for 45.4 percent of the respondents of the study. Although other respondents of the study pointed out different frequency of waste collection by stakeholder of waste

management in the study area, it is prudent to conclude that these frequencies of waste collection are carried out independently by different stakeholders. However, the majority of waste collection in the study area is usually done on a monthly basis.

Table 8: Method of Waste Disposal by Stakeholders Involved in Waste Management in the Study Area

Method	Frequency	Percent	Valid Percent	Cumulative Percent
Incineration	61	61.0	62.9	62.9
Burying	36	36.0	37.1	100.0
Total	**97**	**97.0**	**100.0**	

Source, field survey, 2020.

The study attempts to establish the most common method of waste disposal employed by the various stakeholders involved in waste management in the study area. The results presented in Table 8 highlight the responses of the respondents of the study. From the frequency distribution of their responses, it can be concluded that the most common method of waste disposal employed in waste management in the study area was by incineration.

Cost of Solid Waste Disposal and Willingness to Pay for Disposal of Solid Waste

One of the objectives of the study was to assess the willingness of the residents of the study area to pay the solid waste management, vis-à-vis its cost affordability. To this respect, respondents in the study area were asked whether waste management institutions charge fees for disposing solid waste in the study area, their perception on the affordability of these fees, and the willingness of households in the study area to pay for solid waste management services.

Table 9: Do Waste Management Institutions Charge Fees for Disposing Waste in Barnawa community?

Responses	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	63	63.0	64.9	64.9
No	34	34.0	35.1	100.0
Total	**97**	**97.0**	**100.0**	

Source: field survey, 2020.

The results presented in Table 9 shows that majority of majority of the institutions responsible for solid waste management in Barnawa community charge service fees for disposing solid waste in the study area. Although some of the response of the respondents of the study suggest that waste management institutions do not charge services fee for waste disposal, the study concluded that some of the waste management institution in Barnawa community do not charge services fees for solid waste management.

Table 10: Affordability of Charges Fees Affordable for the Average Household in Barnawa Community

Responses	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	32	32.0	33.0	33.0
No	40	40.0	41.2	74.2
No idea	25	25.0	25.8	100.0
Total	**97**	**97.0**	**100.0**	

Source: field survey, 2020.

The results presented in Table 10 represents the responses of the respondents of the study as to whether these charges fees charged by waste management institutions in the study area are affordable. From the frequency distribution of the responses of the participants of the study, the study concluded that the service fees charges by these institutions are not affordable for the average household in the study, as indicated by 41.2 percent majority response.

Table 11: Willingness of Households in the Study Area to Pay for Solid Waste Management Services

Responses	Frequency	Percent	Valid Percent	Cumulative Percent
Always	26	26.0	26.8	26.8
Sometimes	36	36.0	37.1	63.9
No	35	35.0	36.1	100.0
Total	**97**	**97.0**	**100.0**	

Source: field survey, 2020.

With respect to the willingness of the residents in the study area to pay for solid waste management services in the study area, the result presented in Table 11 represents the opinions of the participants of the study with respect to the subject. From the results, it can be observed that 37.1 percent of the respondents of the study were of the notion that households in the study area are sometimes willing to pay for solid waste management services provided in the study area, while 36.1 percent of the respondents were of the response that households in the study area are not willing to pay for this service. More so, the result reveals that 26.8 percent of the respondents were of the opinion that households are always willing to pay from these services. Hence, from these results the study concluded that households in the study area are not willing to pay for solid waste management service in Barnawa community, and when they eventually do, they only do so on occasional cases.

Table 12: Ways of Waste Disposal Employed by Residents of the Study Area

Responses	Frequency	Percent	Valid Percent	Cumulative Percent
I employ the services of waste management institutions in my community	29	29.0	29.9	29.9
I incinerate the waste i generate	24	24.0	24.7	54.6
I bury the waste i generate	24	24.0	24.7	79.4
I dump the waste i generate in open dumpsites	20	20.0	20.6	100.0
Total	**97**	**97.0**	**100.0**	

Source: field survey, 2020.

The study further attempts to assess the various ways residents in the study area employ in disposing the waste they generate. The data presented in Table 12 represents the various ways employed

by the residents of Barnawa community is disposing the waste they generate. From the frequency distribution of the responses of the respondents, it can be observed that majority of the residents in the study area employ the services of waste management institutions in the community. The results of the study also revealed that some residents of the study area incinerate the waste they generate. More so, the result revealed that some residents in the study area bury the waste they generate, as a way of disposing such waste. The results also revealed that dumping of waste in open dumpsites is one of the ways used residents in the study area indisposing the waste they generate. The study attempts to assess whether the residents of the study area usually encounter challenges in disposing their waste. From the results presented in Table 13, it can be observed that 49.5 percent of the respondents of the study were of the opinion that they encounter challenges in disposing waste, while 50.5 percent of the respondents were of the opinion that they do not encounter and challenges whatsoever in disposing their waste in the study area.

Table 13: Do You Encounter any Challenge in Disposing the Waste you generate?

Responses	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	48	48.0	49.5	49.5
No	49	49.0	50.5	100.0
Total	**97**	**97.0**	**100.0**	

Source: field survey, 2020.

Given the results presented in Table 13, the attempts were made to identify the possible challenges residents in the study area encountered in disposing waste. The results presented Table 4.14 reveals the challenges pointed out the respondents the study. From the results it can be observed the major challenges residents of the study area encounter as indicated by the frequency of responses are; proximity to dumpsites, and lack of modern waste management facilities. Other challenges included; cost of waste management charges fees, shortage of personnel of waste management institutions and others not captured in the research instruments.

Table 14: Challenge Encountered in the Course of Disposing Waste in the Study Area

Responses	Frequency	Percent	Valid Percent	Cumulative Percent
Cost of waste management charges fee	19	19.0	19.6	19.6
Proximity to waste dumpsites	29	29.0	29.9	49.5
Lack of modern waste management facilities	24	24.0	24.7	74.2
Shortage of personnel of waste management institutions	16	16.0	16.5	90.7
Others	9	9.0	9.3	100.0
Total	**97**	**97.0**	**100.0**	

Source: field survey, 2020

CONCLUSION

Long-term sustainability of the solid waste management system also depends on the level of segregation of waste. Segregation of waste should be three streams i.e., bio-degradable, recyclables and garbage/waste; this will also help in finding appropriate disposal options. Segregation of waste should be done at the source itself. Segregated waste can be collected on a weekly basis from households and on a daily basis from business establishments. Collection of the waste should be undertaken at the doorstep level and people from economically backward sections may be employed for the same. These people should be properly trained and equipped. The collected non-degradable materials should be removed using covered trucks and trailers. Care should be taken not to spill the waste during transportation. All the collection workers should be provided with proper handling equipment and their safety should be ensured by Barnawa community.

Disposal of the waste should be undertaken in a prescribed scientific manner. A sanitary landfill designed specifically for the final disposal of wastes should be built. Sanitary landfills minimize the risks to human health and the environment associated with solid wastes. Formal engineering preparations with an examination of geological and hydrological features and related environmental impact analysis should be carried out before a sanitary landfill is built. Staff working in the sanitary landfill should be properly equipped and trained. Darjeeling municipality should find a proper location for a sanitary landfill. Disposal of hazardous

waste such as medical or toxic waste should be undertaken with the help of the state government. Special provisions should be made to adequately deal with these wastes, and special transportation facilities and specially trained staff should be employed for dealing with hazardous wastes. The municipality should immediately seek help from the State and the Central government in this regard.

Emphasis should be placed on the three R's – reduction, reuse, and recycle. This will help in creating of less waste and in increased material recovery. Reduction can be achieved by starting a deposit-refund system, i.e., it should be made compulsory for certain types of waste to be taken care of by the company producing them under extended producer's responsibilities. In order to ensure that these particular wastes go back to the producers, an extra deposit could be charged when someone purchases these items, and this deposit should be recoverable on return of the items (say cover/foil/plastic bottles etc.). This may reduce the burden of waste to a great extent. Wastes such as chip packages, drinking water bottles, soft-drink bottles, etc. should be included in this system. The recycling of waste is another important requirement for sustainable waste management practices. In the case of the Barnawa community, a formalized waste recycling or recovery system, should be undertaken. NGOs or private firms may be enlisted in organizing and including the non-formal recycling sector as part of the formal system. Rag pickers or itinerant buyers should be allocated in such a manner that the maximum amount of waste is recovered for recycling.

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