

Assessment of the Factors and Challenges Related to Solid Waste Management in Bor Town, South Sudan

Garang Manyok John Wilkister Nyoara Moturi Millicent .A. Mokua
Department of Environmental Science, Egerton University, P.O. Box 536-20115, Egerton, Kenya

Abstract

In South Sudan like in many other developing countries, one to two thirds of the solid waste generated is not collected. There is a great problem in the household' management of solid wastes in the rapid growing town of Bor in South Sudan due to fast growing population and rapid urbanization. This study sought to generate information on factors and challenges related to solid waste management in the study area. The research focussed on 384 respondents in Bor Town. The study used questionnaires, interview guide, observation checklist and Likert scale during the data collection in the field. Descriptive statistics and pearson' correlation were used to analyse the data. Long distance to the dump site, lack of environmental policies, ignorance, lack of collection space and lack of funds by municipal council were some of the challenges faced by residents on solid waste management. This study recommends that the government efforts to build more waste disposal sites in the study area should be supported and necessary budget allocated. There should also be efforts to improve road infrastructure in the area to support easier waste disposal.

Keywords: Solid waste, solid waste management, disposal, practices

1. Introduction

Solid waste (SW) refers to municipal waste and can be categorized into seven groups (Rushbrook and Pugh 1999) and these groups include residential, commercial, Industrial, institutional, construction and demolition, sanitation and street sweeping. The management of various types of solid waste has been over the years a difficult and challenging issue worldwide including South Sudan. Research reports on waste management show that levels of knowledge, attitudes and practices have influence on waste management (Brown 1994; Ghosh 2001; Palczynski 2002). Most urban authorities have the responsibility to ensure safe, reliable and cost-effective disposal of solid waste (NEMA 2000). Unfortunately, public agents and urban authorities do not have adequate capacity to handle the increased solid waste mainly due to limited public budgets (NEMA 2000).

There is evidence that Africa is littered with open dump sites and other inefficient means of waste disposal mechanisms and South Sudan is inclusive (NEMA 1998). This unpleasant development has led to uncounted number of human death which was approximated to be up to 20000 in one year (NEMA 1998).

In South Sudan like in many other developing countries, one to two thirds of the solid waste generated is not collected (Zerbock 2003). In Bor town, there is a great problem in the households' management of solid wastes in the rapid growing town of Bor in South Sudan due to fast growing population and rapid urbanization. The current population of the town is estimated at 221000 (UNMIS 2010). Such conditions have been associated with increased occurrences of diseases like diarrhea, malaria, cough and cholera in the town. However, there is little or no documented data on factors and challenges encountered in solid waste management in Bor that can be used in planning. There is therefore an urgent need to document the factors and challenges related to solid waste management in the study area.

2. Methodology

2.1 Study Area

The study was carried out in Bor, the capital of Jonglei State, which is in the central South Sudan, approximately 190 km north of Juba city by road and the largest city in the country. The study area lies between latitude N 6°33' and longitude E 31°33' respectively and covers an area of 25sq km and has eight (8) Bomas (locations), namely, Akoybany, Panapet, Pakwaw, Leekyak, Nigél, Leudier, Malou and Langbar Boma. The town is located along the east bank of White Nile (figure 1).

Bor town is inhabited by six Nilotic Ethnic groups, namely, Nuer, Dinka, Murle, Anyuak, Kachipo and Jieh. According to United Nations Mission in Sudan, Bor town has an estimated population of 221,000 people (UNMIS 2010). The socio-economic activities of people of Bor rely mainly on agro-pastoralists and fishing activities along the River Nile. The main livelihood activities in the town include farming, cattle keeping, fishing, hunting and trading.

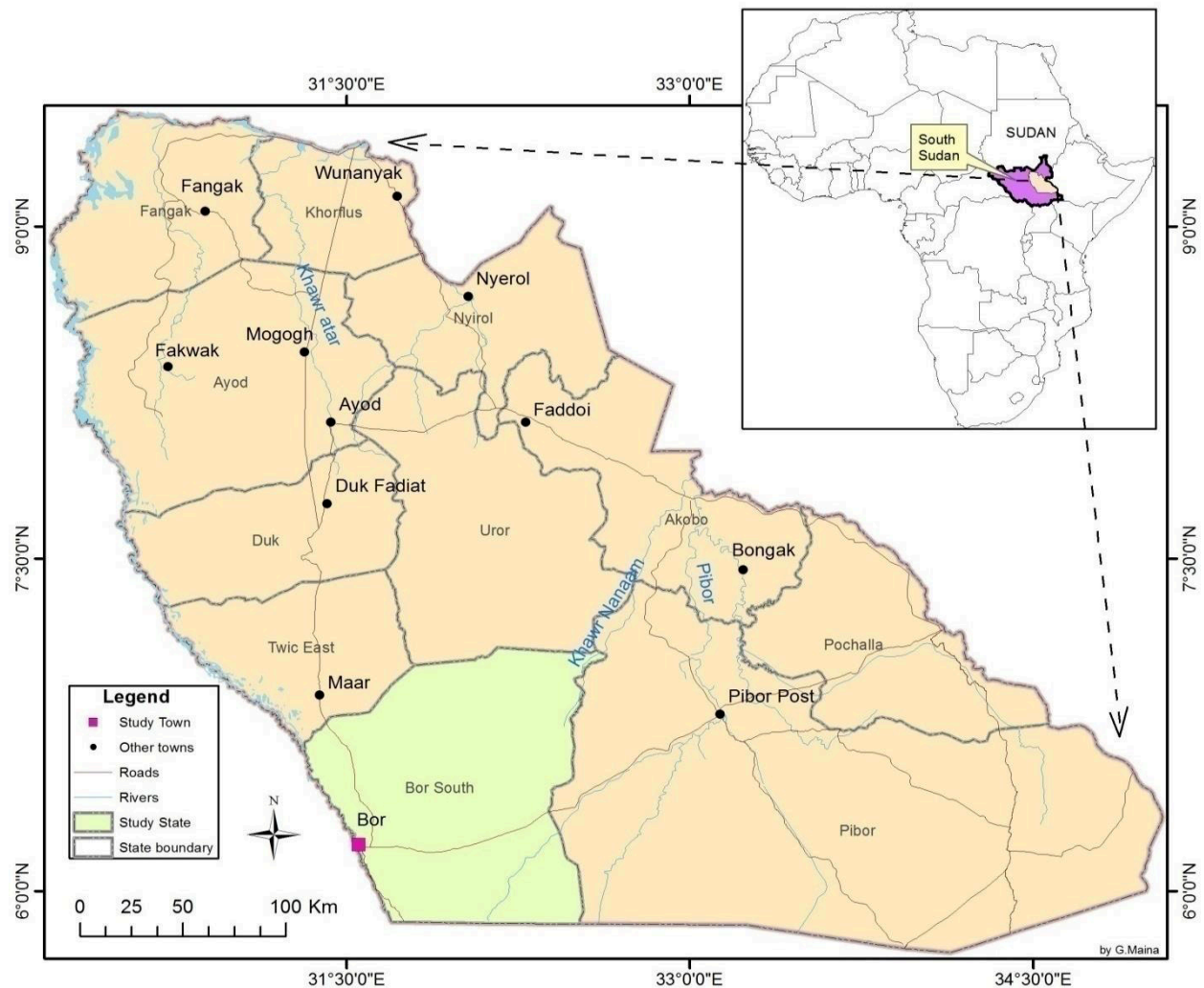


Figure 1.Map of Jonglei State showing the study area

Source: Maina (2015)

The descriptive research design was used in the study. Household respondents formed the target population and a total of 384 respondents were administered questionnaires that were obtained using Anderson *et al* (2007) theorem at 95% confidence level. The population for Bor town was approximately 221,000 people (UNMIS 2010) which was equivalent to 31,571 households given that on average a household has seven person; hence the sample size was determined as follows:

$$n = \frac{Z^2pq}{e^2}$$

Where,

n = required sample size

Z = the standard normal deviate at the required confidence level. In this research Z = 1.96 at 95% confidence level

P = Population proportion estimated with the desired characteristic being measured. In this research p = 0.5

q = 1- p

e = Acceptable error precision, e = 0.05

Therefore, Sample size (n) = $1.96^2 \times 0.5 \times 0.5 / 0.05^2 = 384$.

Households were randomly selected from Bor Municipal Council, Akoybany boma and Malou Boma. The study used purposive sampling to select key informants from Bor Municipal Council (BMC), Department of Environmental Science of Dr. John Garang Memorial University of Science and Technology and Ministry of Health and the participants included 5 from BMC, 10 from Department of Environmental Science of Dr. John Garang Memorial university of science and Technology and 5 from ministry of Health which were purposely selected based on their knowledge on solid waste management.

Close and open- ended questionnaires were used to collect data on the socio-economic characteristic of the respondents, solid waste disposal methods, factors and challenges related to solid waste management. Interview guides were used in three sites (Bor Municipal Council, Department of Environmental Science of Dr. John Garang University and Ministry of Health) to collect data on disposal methods, factors and challenges of solid waste management. Observation checklists were also made on the types of solid waste generated and solid waste management practices observed along the streets and homesteads. Likert scale was also used to collect information on knowledge levels of the household' respondents.

A pilot study was conducted on 20 households in Juba town in Central Equatoria, which was not part of the study area; although it had similar characteristics as the study area. The questionnaires were found to have 0.96 reliability index and thus considered appropriate for data collection.

Data was collected, edited, coded, cleaned, organized and analyzed using Statistical Package for Social Sciences (SPSS). The analysis of the data employed descriptive statistics (means, percentages, and frequencies) which was used to analyse the data on socio-economic characteristic of the respondents, solid waste disposal methods, factors and challenges related solid waste management and Pearson correlation was also used to find relationships between socio- economic factors and solid waste disposal methods.

3. Results and Discussion

3.1 Socio-Economic Characteristics of the Respondents

About 75.8% of the respondents were female while 24.2% were male. Majority (24.0%) of the respondents were aged 34 - 41 years. This was closely followed by respondents in the age bracket of 26-33 years and 42-49 years who comprised a proportion of 22.1%, each. About 11.8% and 11.6% of the total respondents were aged 58 - 65 and 50-57 years, respectively. There were very few respondents aged between 18-25 years as represented by 8.4% of the total respondents.

The mean age of the respondents was 40.85 with a standard deviation of 14.97 years. All the respondents (100.0%) in this study were aged not more than 65 years. This implies that all the respondents were either in their youthful or middle age. Age have an influence on the respondents level of knowledge, attitudes and practices (KAP) toward solid waste management. Young and middle aged persons are not only receptive to adoption of new technology but due to their level of knowledge are likely to have a more positive attitude towards modern waste management practices (Smith 2014).

Majority (64.7%) of the respondents had not gone to school and thus lacked formal education. About 14.7% of the respondents had tertiary level of education while 11.6% and 9.0% had primary and secondary level of education, respectively. These results imply that majority of the respondents lack adequate formal education which is a prerequisite to better solid waste management practices. In addition to this, the level of education of the household heads can influence the kind of decision that may be made on behalf of the entire household with regard to handling of solid wastes. More educated persons are likely to make better decisions towards the various types and sources of solid waste produced due to their high knowledge and their attitudes toward solid wastes as compared to their less educated counterparts (Clein 1999).

Majority of the households in the study area had 5 - 6 members as represented by 35.7% of the respondents. About 27.7% of the households had 3 - 4 members while 26.1% had 7 - 8 members. About 8.7% of the households had 1-2 members. It was just 1.8% of the households who had more than 8 members. The mean household size in the study area was 5.14 with a standard deviation of 2.0. The average number of household members in the sampled households is lower than the national (South Sudan) figures of seven members UNMIS (2010).

Majority of the respondents had monthly income of less than 1,000 South Sudanese Pounds as represented by 61.6% of the total respondents. About 33.4% of the respondents had monthly income ranging between 1,000.00 and 4,999.00 South Sudanese Pounds. It was only 2.9%, 1.6% and 0.3% of the households that had monthly income of between 5,000.00 - 9,999.00, 10,000.00 - 14,999.00 and 15,000.00 - 19,999.00 South Sudanese Pounds respectively. Very few households were in the category of high incomes as represented by just 0.3% of the households who had monthly incomes of 20,000.00 South Sudanese Pounds and above. The per capita income stands at SSP 260.18 or \$43.36. This indicates that low per capita incomes in Bor town will results in low volume generation of solid waste which can poses a lesser threat to environmental quality and human health.

3.2 Challenges and Factors related Solid Waste Management

The major challenges faced by residents in waste management are summarized in figure 2.

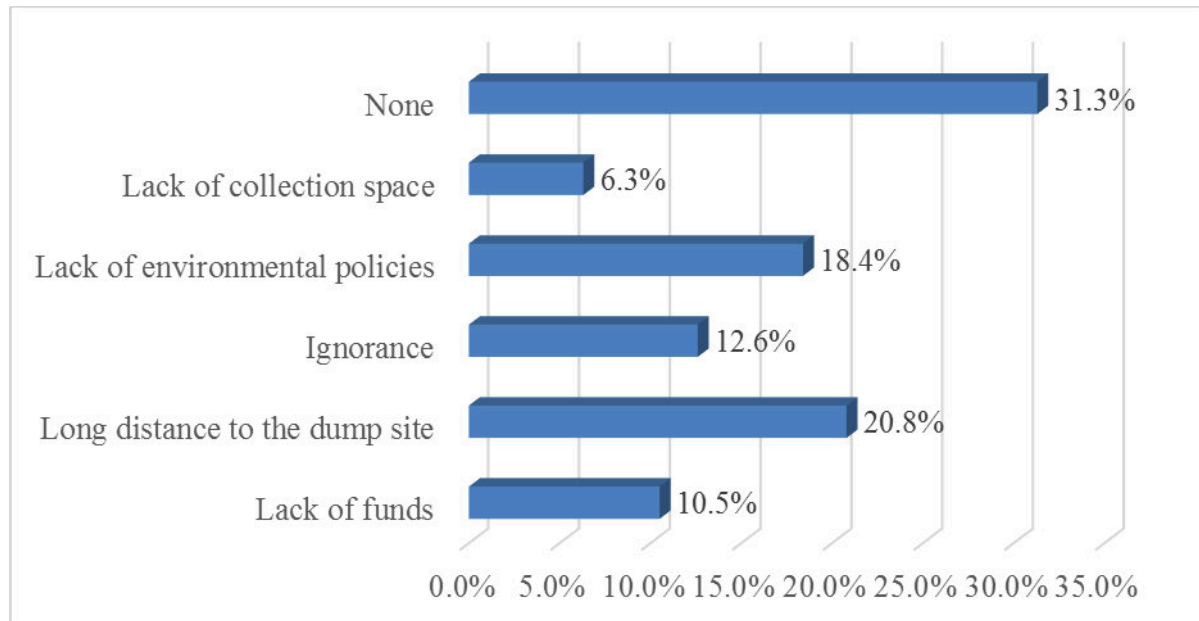


Figure 2: challenges related to solid waste management

The findings of the study in table 2 showed that most of the respondents were faced with challenges such as long distance to the dumpsite, lack of environmental policies, ignorance, lack of funds and negative perception of the community toward solid waste management.

The findings of the study from the interviews with key informants showed that many challenges contributed to poor solid waste management in the study area. First of all, most residents lack proper information on solid waste management and also knowhow on the best practices applicable in waste management in urban setup such as Bor town. There is also lack of funds on the part of residents to be able to finance waste management practices in a consistent manner. Lastly, there is no environmental policy put in place by the government to combat poor solid waste disposal in the study area.

These findings are consistent with the study carried out in Kampala, Uganda by the Namilyango College (2001) that identified several challenges related solid waste management which included lack of dumpsite, ignorance of the community about the need for proper waste disposal, lack legislation, Lack of finance, lack of awareness among the public, lack of political support and lack of trained personnel for waste management.

Some of the challenges encountered during storage, collection and disposal of solid wastes are summarized in table 1.

Table 1: Challenges encountered during collection, storage and disposal of solid waste

Problems	Collection		Storage		Disposal	
	Freq.	Percent	Freq.	Percent	Freq.	Percent
No Collection bags	250	65.8%	285	75.0%	3	0.8%
No proper roads	2	0.5%	2	0.5%	35	9.2%
No collection sites	100	26.3%	4	1.1%	123	32.4%
No vehicles for collection	18	4.7%;	1	0.3%	127	33.4%
No skills	3	0.9%;	1	0.3%	1	0.3%
Others	0	0.0%	1	0.3%	2	0.5%
None	7	1.8%;	86	22.6%	89	23.4%

The findings of the study in table 1 above showed some of the challenges residents encountered during solid waste collection processes which include lack collection bags, lack of collection sites, lack of collection vehicles, lack of proper roads and lack of skills on solid waste management.

As far as challenges encountered during storage of solid waste was concerned, this study noted that most of the respondents stated that lack of collection bags, lack of proper roads, lack collection vehicles, lack of skills were some of the challenges encountered during the storage of solid waste.

As far as solid waste disposal was concerned, respondents indicated some of the challenges which faced them during solid waste disposal which include lack of collection vehicles, lack of collection sites, lack of proper roads, lack of collection bags and lack of skills.

These are consistent with study done in Ghana by Peter (2002) which states that problems are encountered at all levels of waste management, particularly, collection, transportation and disposal. Generally,

existing public facilities, including sanitary facilities, are inadequate to serve the user population, and the sheer volume of municipal solid waste generated in the country's urban centres is overwhelming. While existing waste disposal facilities are inadequate to deal with the quality and quantity of waste generated, more sophisticated systems are expensive and their maintenance requirements are high.

3.3 Correlations between socio-economic factors and solid waste disposal methods

Table 2: Pearson' Correlation of socio-economic factors and waste disposal methods

Variables	Pearson Correlation	Sig. (2-tailed)
Age	0.006	0.914
Education level	0.012	0.823
Income (SSP)	0.029	0.566
Awareness	0.016	0.845
Sex	0.031	0.552

N= 380

The analysis in table 2 above show that at 95% confidence level, there was no significance difference between socio-economic factors (age, education, income, awareness and sex) and solid waste disposal methods. These are consistent with the study done in Ghana that revealed that sex, age and education level negatively correlated with solid waste disposal methods (Aaniamenga, Felix and Andrew 2014).

4. Conclusion and Recommendations

4.1 Conclusions

Most of the respondents in Bor town lack adequate formal education which is a prerequisite to better solid waste management practices. Open dumping was the most popular method of waste disposal as practiced by most of the respondents. Long distance to the dump site and lack of environmental policies were major challenges faced by residents on solid waste management. Other challenges included ignorance, lack of funds, lack of collection space, Lack of bags for storage, lack of vehicles for collection, lack of skills and lack of proper roads also constrain solid waste management efforts by residents. The study showed that there was no significance difference between socio-economic factors (age, education, income, awareness and sex) and solid waste disposal methods.

4.2 Recommendations

Government efforts to build more waste disposal sites in the study area should be supported and necessary budget allocated. There should also be efforts to improve road infrastructure in the area to support easier waste disposal. Disposal of the waste should be undertaken in a prescribed scientific manner. Since there are no waste collection bins, these should be strategically placed in identified central sites so as to reduce indiscriminate dumping and ease waste collection by municipal vehicles.

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