



## Stakeholder Views on Waste and Its Management in Tamale Metropolis, Ghana

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### Authors' contributions

*This work was carried out in collaboration between all authors. Authors RA and ABD designed the study and wrote the first draft of the manuscript. Authors WA and CJWK managed the literature searches and review while author VA and EEA carried out the data collection and analysis. All authors read and approved the final manuscript.*

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### ABSTRACT

Management of waste in Ghana is primarily the responsibility of District, Municipal and Metropolitan Assemblies in partnership with private waste management companies. The main objective of this study was to assess stakeholder views on waste and its management in Tamale Metropolis. Purposive sampling was used to interview a total of 11 stakeholders from both private and public sectors to solicit their views on the problem of waste generation and its management in the Tamale Metropolis. The study revealed that 100% of the stakeholders considered waste and its management as a serious problem in the Tamale Metropolis. The stakeholders considered improper waste disposal as the major problem in the Metropolis. It is therefore eminent that the fastest growing city in West Africa in recent years is gradually becoming a slum despite being

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adjudged the cleanest city in Ghana on three occasions. Out of the 11 respondents, 91% of them believed there is consultation and collaboration among waste stakeholders in the Metropolis whilst only 9% disagreed. The study also revealed that 91% of the stakeholders participated in waste management decision making whilst 9% have never participated in waste management decision-making in the Metropolis. This infers that there is a comprehensive collaboration between stakeholders in the management of waste in the Metropolis. The study revealed that waste management challenges in the Metropolis are as a result of deficiencies in technical, financial and institutional frameworks as well as social constraints.

*Keywords: Stakeholder; views; Tamale metropolis; waste generation; waste management.*

## 1. INTRODUCTION

Stakeholder involvement and cooperation in waste management could be a panacea to effective waste management. It is increasingly becoming common in major cities in Ghana and Africa to see waste indiscriminately disposed in the environment. To address the waste management issues and to achieve sustainable waste management, it is incumbent to assess the various roles, interests and power structures in waste management. Countries where there is co-operation and co-ordination between stakeholder groups such as government, city council, service users, community based organizations, non-government organizations, the private sector and donor agencies, there have been indications of increased sustainability in waste management. The concept of integrated waste management distinguishes six aspects (that include technical/operation, environmental, financial, socio-economic, institutional/ administrative and policy/legal), which draw on the extensive experience of waste management experts and other organizations with solid and liquid waste management systems all over the world [1].

In developing countries, it is common for municipalities to spend 20 to 50% of their available budget on solid waste management, even though 30 to 60% of all the urban solid waste remains uncollected and less than 50% of the population is served [2]. Waste management is poorly financed because it is not a prioritised activity in all urban assemblies. Funds for the operation of the urban assemblies are mainly from external sources (over 50%) like central government and donors in the form of grants [3]. The problem is compounded by the inability by a large percentage of urban community to pay for waste collection services due to low income levels and other unspecified reasons. Waste management is very crucial because it pertains to the economic status of a country and the lifestyle of its people.

Waste becomes a threat to human health and environmental sustainability when uncollected or illegally dumped. Waste increased in quantity and greatly varies due to increasing urbanization, income and changing consumption habits caused by globalization. This scenario places the already desperate urban assemblies in an unmanageable situation especially as they have to develop new strategies to deal with increasing volumes as well as extraordinary varieties of wastes. Poor waste management practices, widespread dumping of waste in water bodies and uncontrolled dump sites aggravates the problems of generally low sanitation levels across the African continent [4]. The roles and responsibilities of producers, manufacturers, brand owners, importers and consumers in respect of the environmental impact of their products have been totally ignored. Extended producer responsibility, product take-back programme and the recycling of packaging products are identified as forms of stakeholder participation in solid waste management [5].

Stakeholder participation in the form of public-private partnership is another important dimension of modern solid waste management [6]. Public-private partnership involving stakeholder participation is offered as an effective solution for integrated solid waste management [7,8]. Often this concept of public-private partnership emphasises community consultation, raising awareness and active participation in decision-making for solid waste management [8]. Solid waste management is a multi-dimensional challenge for the urban-local authorities in developing countries. Developing countries lack financial and technological capacities to handle the ever increasing demand for solid waste management as the rate of urbanisation is higher in those countries. There are increasing problems with ever changing population and affluence in most of the developing countries and the consequent generation of more solid waste [7,9]. Health and

social effects are equally as important as environmental impacts when considering municipal solid waste management.

Some authors [3,10,11] identified inadequate policy and legislation, lack of political will, lack of public commitment, lack of technical capacity and poor financing as common causes for poor waste management services. There is poor prevailing attitude of the general public towards waste collection and disposal or treatment [3,10]. The urban communities generally do not participate in the waste management responsibly and this hinders urban assemblies' ability to enforce existing waste management laws [3]. Some negative factors of attitude and culture that have also hindered the very important element of public participation in some cases [12,13]. Waste management recently have been a big challenge facing local authorities responsible for waste management in Ghana as the quantum of solid waste generated increases at a very faster rate that out paced capacity of the authorities to improve on the financial and technical resources needed to curb this growth.

It is evident that poverty, high illiteracy level and the economy (low GDP per capita) are influencing factors that can cause low levels of willingness to participate in public waste management matters. Tamale Metropolitan Assembly (TMA) spends a lot of resources on the collection, transportation and disposal of waste in the Metropolis. Inadequate equipment, waste disposal habit of indigenes, corruption in institution and organisation, attitude, over-aged and unreliable equipment makes it impossible for the Assembly to dispose of tonnes of solid and liquid waste generated daily. This is evident by the common scenes of uncollected wastes on roadsides, open spaces and in gutters, water bodies in urban and peri-urban areas. Stakeholder involvement and their subsequent contribution to waste management can bring about environmentally responsible behaviour in the public. The waste managers so far in Ghana have not properly integrated solutions in such areas as collection, treatment, supply for re-use, recycling and final disposal. The aim of this study was to assess stakeholder views on waste and its management in the Tamale Metropolis.

## 2. METHODOLOGY

### 2.1 Study Area

Tamale is the capital of Northern Region of Ghana. Tamale lies between latitude 9° 15' and

9° 05' N and longitude 0° 45' and 1° 0' W at an altitude of 185 m above sea level. Tamale is a fast growing city and as a result, a lot of people move to the city to do businesses [14]. With an urban population of 67.1 per cent; the Metropolis is the only district in the region which is predominantly urban. The population density is about 319 persons per square kilometer for the Metropolis and the regional average density is 25.9 persons per square kilometre [15].

### 2.2 Sampling Procedure and Data Collection

Primary and secondary data were collected for the study; the primary data were obtained mainly from the administration of questionnaire whilst the secondary data were obtained from literature. The data were obtained from the Tamale Metropolitan Assembly (Co-ordinator and Assemblymen), Zoomlion Ghana Limited, Environmental Protection Agency, Sachet Water Producers, Environmental Health and Sanitation Unit, Waste Management section of Tamale Metropolitan Assembly, Food and Drugs Authority, Ghana Education Service, Ghana Health Service and the Disaster Management Organisation which are all organizations with a stake in waste management in the Metropolis.

Purposive sampling technique was used in data collection. The questionnaire developed covers areas such as waste and its management issues, funding of waste management activities; minimizing waste through education and awareness; the community sector involvement; waste disposal to landfill; commercial waste; partnership; stakeholders in waste management and roles in the Tamale Metropolis. Fifteen organizations were given a questionnaire each in the Metropolis that was purposively selected for the study. Four of the questionnaires were rejected due to the stakeholder's inability to complete the questionnaire on time. The data were analysed using the Statistical Package for the Social Sciences (SPSS) version 16.0 and results were presented in the following section; using illustrative Tables and Figures in addition.

## 3. RESULTS AND DISCUSSION

A total of 11 stakeholders from both private and public sectors were assessed to solicit their views on the problem of waste and its management in the Tamale Metropolis.

### 3.1 Stakeholder Views on Waste and its Management in the Tamale Metropolis

The study revealed that 100% of the stakeholders considered waste and its management as a serious problem in the Tamale Metropolis. It is therefore eminent that one of the fastest growing cities in West Africa in recent years is gradually becoming a slum despite being adjudged the cleanest city in Ghana on three occasions. The stakeholders considered improper disposal or indiscriminate dumping of waste by individuals as the major problem. This response is consistent with Oberlin [10] and Okot-Okumu and Nyenje [16] that reported that high percentage of urban solid waste do not reach the legal disposal points but end up in unapproved areas in the environment. Open dumping is the commonest waste disposal method in urban areas because disposal sites are situated fairly a distance from inhabitants or sellers a reason for indiscriminate disposal of waste [17]. Other waste problems mentioned by the various stakeholders include lack of enthusiasm in collaboration, untimely collection of waste, improper management of the land fill site (by the Metropolitan Assembly), indiscriminate defecation due to lack of toilet facilities, no roll-up platforms for receptacles, poor drainage systems and inadequate education of general public on waste management. Almost all of these observations was made by Benneh et al. [18] in Accra, where they argued that because the capacity to handle all of the household waste generated was weak, about 83% of the population dump refuse in either authorized (open dump sites) or unauthorized sites in their neighbourhood.

The challenges of waste management in the Metropolis as indicated by the stakeholders fell into categories of technical, financial, institutional and social constraints. This was consistent with Ogawa [19] who reported that a typical solid waste management system in a developing country displays an array of problems, including low collection coverage and irregular collection services, crude open dumping and burning without air and water pollution control. The study revealed that stakeholders organizations can contribute to waste management in the Metropolis through the following means; creation of public awareness; organization of clean-up exercise in communities and schools; management of waste and supervision of daily cleaning, collection and transportation of waste

from the Metropolis to final dumping site; provision of communal waste receptacles; funding; and law enforcement and networking.

#### 3.1.1 Decision-making process concerning waste management in the tamale metropolis

The study revealed that 91% (10) of stakeholders have participated in decision making on waste management in the Metropolis, whilst the remaining 9% (1) have never participated in decision making concerning waste management. This infers that there is consultation between stakeholders in the management of waste in the Metropolis. However, the implementation of consultative decisions seems to be where the problem is. This integrated strategy in waste management requires participation at all levels: government, industries, public and the waste management concessionaires [20]. However, 36.4% of the stakeholders indicated that their views were sourced directly in decision making, 36.4% were not involved in any decision making and implementation of waste management strategies and 27.2% were involved in sharing of ideas and implementation (Table 1). Stakeholders also specified, they were involved in ensuring compliance enforcement through assembly's statutory committee meetings on sanitation and environment; education and law enforcement and; implementation of ideas generated at management meetings.

**Table 1. Stakeholders' involvement in waste management decision-making**

Response	Frequency	Percent
Not involved	4	36.4
Ideas sourcing	4	36.4
Ideas sourcing and Implementation	3	27.2
Total	11	100

#### 3.1.2 Funding of waste management activities in the metropolis

The study revealed that 54% of the stakeholder organizations receive external support to assist in waste management activities in the Metropolis whilst 46% of them do not receive any external support to assist in waste management. The kind of support the stakeholders gives and /or receive include training of personnel in waste management, provision of equipment, and funds from both central government and donors, financial and logistics, capacity building,

individual funding and through district assemblies common fund. It is clear from the study that, waste management activities are poorly financed and stakeholder organizations do not coordinate adequate funds for waste management. This finding gains support from Liyala [3] who reported that waste management is poorly financed because it is not a prioritized activity in all urban councils. Funds for the operation of the urban councils are mainly from external sources (over 50%) like the central government and donors in the form of grants. The problem of funding has to do with its inadequacy and late delivery. The stakeholders believed that 28% of funding for waste management in the Metropolis is from the central government, 18% from internally generated funds (IGF), 18% from both government and donor agencies, 18% from government, internally generated funds and donor agencies and 9% from internally generated funds and donor agencies and 9% from government and internally generated funds (Fig. 1).

### **3.1.3 Possible means of support for waste management in the metropolis**

The stakeholders suggested other possible ways to generate funds and resources to support waste management in the Metropolis which included; adding value to plastics by recycling them for both domestic use and for exportation; by sourcing for funds from private organizations and individuals; levying companies and organizations (waste generators); involving donor and environmental agencies in managing waste; ensuring effective waste collection services on franchise basis; fund raising activities involving the general public towards waste management; writing proposals to benevolent organization to source for funds; implementing the polluter pays principle; spot fines on defaulters and effective collection of local cooperate taxes. Stakeholder agreed that the internal revenue generated in the Metropolis is woefully inadequate to finance waste management and suggested sourcing of funds such as waste generators and foreign donors.

### **3.1.4 Awareness on waste management practice in the tamale metropolis**

All the stakeholders interviewed were aware of some waste management practices within the Tamale Metropolis. About 91% of the stakeholders were aware of meetings convened for stakeholders to brainstorm on improved

waste management practices in the Metropolis whilst 9% is not aware of any stakeholders meetings. The study also observed that 90% of the stakeholders are aware of ongoing educational programmes on waste management in the Metropolis whilst 10% were not aware. The most frequent medium respondents receive information on waste management programme in the Metropolis is shown in Fig. 2. It was obvious from the study that, mass media is the most used medium for awareness creation in the Metropolis to successfully adopt sustainable methods of waste management by the communities. This according to Mbeng et al. [21] can change the mindset of urban residents to perceive waste as resources rather than something without value when the awareness programmes are simple and accessible.

### **3.1.5 Seminar on waste management practices in the metropolis**

The study revealed that 64% of the various stakeholders' organizations have organised a workshop / seminar on waste management practices in the Metropolis within the past one year and 36% have not organized any form of seminar within same period. The categories of stakeholders that were involved in the programme by the organisers included: waste experts only; community members only; waste experts, chiefs, community members, unit committee / assembly members and government representatives; waste experts and community members only; and waste experts, chiefs, community members and government representative.

### **3.1.6 Waste minimisation in the tamale metropolis**

All the respondents (100%) supported the principle of waste minimisation in the Metropolis. All the stakeholders urge the assembly to introduce waste collection initiatives to reduce the amount of waste disposed indiscriminately. This suggestion conforms to Hashim et al. [22] statement that, it is everyone's legal and moral responsibility to minimize the amount of waste produced and to dispose waste in a fashion that has the least impact on the environment. The objective of a waste management hierarchy is to reduce the quantum of waste that enters landfill / dumpsites. Three top initiatives in the waste management hierarchy are Reduce, Reuse and Recycle. To ensure effective of 3R culture in a community, it is important to train some groups of

people by creating awareness programme towards implementing 3Rs initiative. The study also revealed that 91% of the respondents support transportation of waste to landfill site whilst only 9% of the respondents do not support it. About 73% of the total respondents agreed that the quantum of waste sent to landfill should be reduced or minimised whilst only 27% of the respondents thought otherwise.

The various stakeholders think the ways to minimize waste generated in the Metropolis include: banning the use of plastic bags; provision of adequate resource to the assembly

for waste collection, sorting, reuse and recycling of waste generated in the Metropolis by both generators and collectors; general public should be educated on how to segregate waste; introduction of waste pollution courts to deal with culprits; provision of standard dustbins to individual household to collect waste at their doorsteps; recruiting sanitation guards to control the littering of garbage; regular and routine sensitisation at all levels of the society. Polluter pays principle and public education; and regular dislodge of refuse containers by zoom lion.

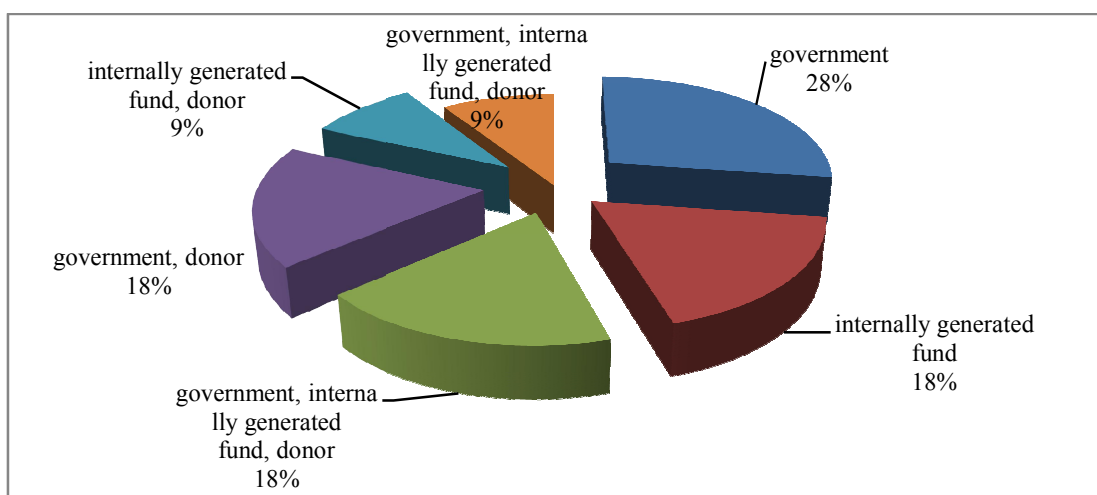


Fig. 1. Sources of funding for waste management in tamale metropolis

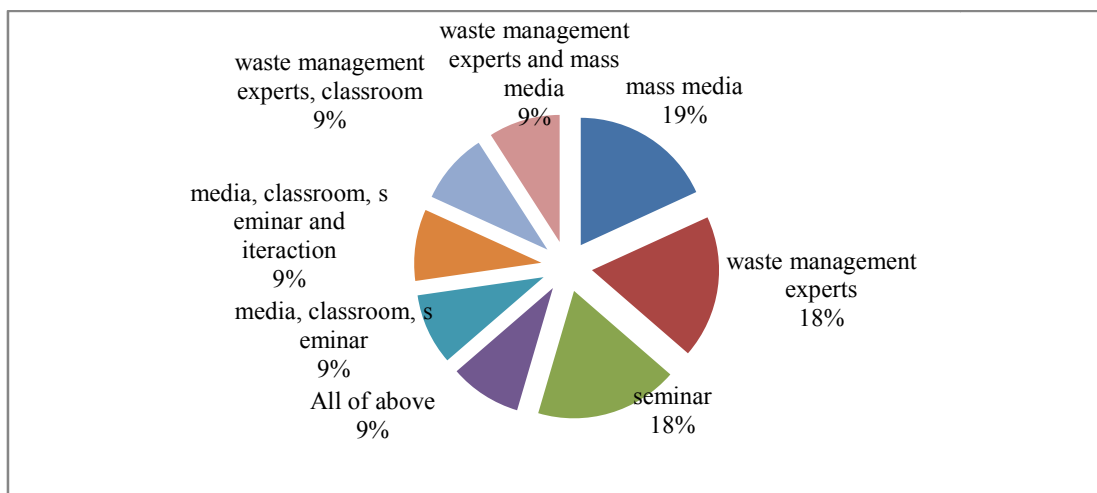


Fig. 2. Medium of stakeholder's awareness creation in the tamale metropolis

The study revealed the challenges that hinder minimisation of waste generated fall into technical, financial and social constraints. These challenges include poor financing of waste management activities, lack of management regimes at the land fill sites, inadequate education and poor attitude about the waste management, difficulties in handling on-biodegradable waste, lack of modern efficient equipment, lack of political will to enforce byelaws and, vehicles and other equipment to transport garbage and unwillingness of some of the people to comply with sanitation byelaws.

The study revealed that 100% of the respondents thought involving the various stakeholders in waste management programmes can help minimize or solve the waste management problems in the Metropolis. The respondents' contributions towards minimisation or solving the waste management include: contributing ideas in solving waste management problems and assisting in educating the public on waste management; education and enforcement of bylaws; and coordination of stakeholders and further provision of other needed support. They also contribute in organizing waste management meetings of stakeholders in the metro assembly and provide experts services, ready for networking and collaboration and strengthening awareness programmes on waste management.

**3.1.7 The role of the community sector and waste collection taxation**

Majority of the respondents (91%) think the community has a role to play in assisting the Metropolitan Assembly to manage waste whilst minority of 9% think otherwise. Probing the 91% of the respondents who believed the community has a role to play, revealed that they expect the community to adhere to waste management regulations/paying for proper disposal of waste; educating communities/organizing clean up exercise and communal labour/education of community members. The 91% majority of

respondents thought the payment of waste collection tax by community could help in proper management of waste in the Metropolis whilst 9% of the respondents thought otherwise. All the respondents (100%) expressed the expectation of involving the community in waste management activities in the Metropolis. This supports the fact that communities have a role to play in waste management programme. The respondents were requested to indicate the forms of community sector involvement they would like to see and the responses are presented in Table 2.

Thirty percent (30%) of respondents want community involvement in waste management by collecting kitchen and garden waste for composting, and collecting recyclable materials, twenty percent (20%) want community involvement in collecting kitchen and garden for composting and collect all recyclable materials and 10% wants the community to be involved in collecting bulky waste for reuse and recycling and collection of kitchen waste and recyclable material and all waste management activities. The willingness of the respondents to pay for community sector waste management services were sought and it was revealed that 91% were ready to pay for the service whilst minority of 9% stated otherwise.

The Tamale Metropolitan Assembly collects some commercial waste but does not offer recycling of the waste. The Assembly does not have the capacity to provide recycling of the waste they collect but the private sector offer limited opportunities of this venture in Tamale. About 46% of respondents thought the Assembly should provide recycling of commercial waste and re-disburse into the commercial markets other than the private sector engaging in this activity, 45% thought the assembly should not be involved in the provision of recycling activities to commercial markets and only about 9% of respondents were indecisive about the issue of recycling of waste. Seventy-eight percent (78%)

**Table 2. Forms of community sector involvement**

<b>Response</b>	<b>Frequency</b>	<b>Percent</b>
Collect kitchen/garden waste for composting	3	30
Collect all recyclable materials	3	30
All of the above	1	10
Collect kitchen/garden waste for composting and collect all recyclable materials	2	20
Collect bulky water for reuse and recycling, collection of kitchen waste and recyclable material	1	10
Total	10	100

of the respondents thought the Metropolitan Assembly should manage waste in collaboration with local authorities whilst 22% of the respondents thought otherwise. One of the respondent who thought otherwise gave the reason as lack of interest in waste management by local authorities. Six of the respondents thought the Metropolitan Assembly should manage waste in collaboration with local authorities and gave the following reasons: local authorities are key stakeholders and since the assembly cannot always manage waste alone, there is the need for partnership; due to the large nature of the Metropolis coupled with limited funds for waste management, waste management can only be effective by involving local authorities; because local authorities have indigenous ideas and expertise that can help source for funds for waste management programmes; local authorities have also got powers to compliment that of the Assembly to enforce by-laws regarding sanitation and also; partnership and collaboration of other stakeholders would aid in proper waste collection in the Metropolis.

Nine percent (9%) of the respondents suggested the following as ways to tackle the waste problems: allowing private sector participation in waste management; adequate funding to aid in waste management and sensitisation of citizens in payment for waste management services; educating and creating more awareness on waste management issues; encouraging more experts in waste management and provision of more waste management equipment and facilities; enforcing the by-laws and punishing sanitation offenders; and encouraging waste sorting before disposal. Collaboration of stakeholders, periodic meeting to discuss waste management issues, arranging for alternative funding for waste management was also suggested.

**3.1.8 Stakeholders' collaboration, consultation and partnership in waste management in tamale metropolis**

Out of the 11 respondents, 91% of the respondents thought there were consultation and collaboration among all stakeholders in the management of waste whilst only 9% do not see any consultation / collaboration among stakeholders in the Metropolis. The respondents who believed collaboration can help improve or bring innovations in waste management practices suggested the following: looking for

alternative funding of waste; adding value to waste by turning them into fertilizers; and house to house collection of waste and provision of recycling facility. This can help generate income for the Assembly and also promote agriculture in the Metropolis.

All the respondents thought partnership among stakeholders can help improve waste management in the Metropolis. About 82% of the respondents thought there is an information flow among the various stakeholders in waste management. Mbeng et al. [21] identified information as critical for the success of 3Rs, composting, waste prevention and waste minimisation in urban councils since most communities lack vital knowledge for effective implementation of this method of waste management. About 36.4% of the respondents thought waste recycling should be given a topmost priority in dealing with waste in the Metropolis is indicated in Table 3. This was followed by waste collection, waste disposal and waste recycling and waste collection with 18% each.

**Table 3. Stakeholders' topmost priority when dealing with waste in the metropolis**

Response	Frequency	Percentage
waste collection	2	18.2
waste disposal	1	9.1
waste recycling	4	36.4
waste collection, waste disposal and waste recycling	2	18.2
waste generation and waste disposal	1	9.1
all the above list	1	9.1
Total	11	100

**4. CONCLUSION**

The study revealed that the various stakeholders were aware of the current waste management problems faced by the Metropolis. It is therefore very eminent that the fastest growing city in West Africa in recent years is gradually becoming a slum despite being adjudged the cleanest city in Ghana on three occasions. The most considered waste management problem by the stakeholders was improper disposal or indiscriminate dumping of waste by individuals. The study revealed that 46% of the stakeholder organizations in the Metropolis receive support to assist in waste management activities whilst 54% of them do not received any support. It is clear from the study



that waste management activities are poorly financed and stakeholder organizations do not coordinate funds for waste management in the Metropolis. Out of the 11 respondents, 91% of them thought there were consultation and collaboration among all stakeholders in the management of waste in the Metropolis whilst 9% do not see that consultation/ collaboration among stakeholders. The study also revealed that the Metropolis waste management challenges fall into technical, financial, institutional and social constraints.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Bartone CR. Strategies for improving municipal solid waste management: lessons from a decade of World Bank lending. Regional Conference Partnership in Municipal Solid Waste Management, Cairo. World Bank, Washington DC, USA; 2000.
2. United Nations Environmental Programme (UNEP), Developing Integrated Solid Waste Management Plan Training Manual, Volume 2: Assessment of Current Waste Management Systems and Gaps Therein. Osaka/Shiga, Japan; 2009.
3. Liyala CM. Modernising Solid Waste Management at Municipal Level, Institutional arrangements in urban centres of East Africa. PhD thesis, Environmental Policy Series, Wageningen University, Netherland; 2011.
4. Awuyo-Vitor D, Ishak S, Jasaw JS. Urban Households' Willingness to Pay for Improved Solid Waste Disposal Services in Kumasi Metropolis, Ghana. *Urban Studies Research*. 2013;8.
5. Carlton C, Thompson H. Product stewardship - is there a role for better collaboration? *Outlooks on Pest Management*. 2009;20(3):126-127.
6. Goven JE, Langer L. The potential of public engagement in sustainable waste management: Designing the future for bio-solids in New Zealand. *Journal of Environmental Management*. 2009;90: 921-930.
7. Ahmed SA, Ali SM. People as partners: Facilitating people's participation in public-private partnerships for solid waste management. *Habitat International*. 2006; 30:781-796.
8. Rael, Brown P. Managing the intractable: Communicative structures for management of hexachlorobenzene and other scheduled wastes. *Journal of Environmental Management*. 2009;90: 1583-1592.
9. Sujauddin M, Huda SMS, Hoque ATMR. Household solid waste characteristics and management in Chittagong, Bangladesh. *Waste Management*. 2008;28:1688-1695.
10. Oberlin AS. The Role of Households in Solid Waste Management in East Africa Capital Cities. PhD Thesis, Environmental Policy Series, Wageningen University, Netherland; 2011.
11. Tukahirwa JT. Civil Society in Urban sanitation and Solid waste Management." PhD Thesis, Wageningen University, Netherlands; 2011.
12. Mbuligwe SE, Kaseva ME. Pollution and self-cleansing of an Urban River in a developing Country: A case study in Dar es Salaam, Tanzania; 2005.
13. Rotich HK, Yongsheng Z, Jun D. Solid waste management challenges in developing countries: Kenyan case study. *Waste Management*. 2006;26(1):92-100.
14. Abankwa V, Grimard A, Somer K, Kuria F. United Nations Human Settlements Programme (UNHABITAT), 2009. Available:[www.unhabitat.org/pmss/getElectronicVersion.aspx?nr=2929](http://www.unhabitat.org/pmss/getElectronicVersion.aspx?nr=2929)[Oct. 29, 2013]
15. Puopiel F. Solid Waste Management in Ghana: The Case of Tamale Metropolitan Area. MSc. thesis, Department of Planning, Kwame Nkrumah University of Science and Technology, Ghana; 2010.
16. Okot-Okumu J, Nyenje R. Municipal solid waste management under decentralisation in Uganda. *Habitat International*. 2011;35: 537-543.
17. Adelaide A. Waste Management and Sanitation at James Town and Accra Central. MSc. thesis, University of Ghana, Legon; 1995.

18. Benneh G, Songsore J, Nabila JS, Amuzu AT, Tutu KA, Yangyuru Y, McGranahan G. Environmental problems and the urban household in the Greater Accra Metropolitan Area (GAMA) – Ghana. Stockholm, Stockholm Environment Institute; 1993.
19. Ogawa H. Sustainable Solid Waste Management in Developing Countries. 2005. Available: [www.gdrc.org](http://www.gdrc.org). [Oct. 30, 2013].
20. Zaini S, Gerrard S, Jones AP, Kadaruddin A. Policy, challenges and future prospect of solid waste management in Malaysia. Proceeding on International Sustainable Development Research Conference. University of Manchester; 2002.
21. Mbeng IO, Phillips PS, Fairweather R. Developing sustainable waste management practice: Application of Q Methodology to construct new Strategy Component in Limbe-Cameroon. The Open Waste Management Journal. 2009; 2:27-36.
22. Hashim KSM, Abdul H, Mohammed SR, Haneesa Z. Developing conceptual waste minimisation awareness model through community based movement: A case study of Green Team, International Islamic University Malaysia. In: Persidangan Kebangsaan Masyarakat, Ruangdan Alam Sekitar (MATRA 2011); 2011. Pulau Pinang.

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