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Missing links in solid waste management in the Greater Accra Metropolitan Area in Ghana

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Abstract In recent years, solid waste management (SWM) policies and programmes have received lots of attention in the menu of most political leaders in developing countries. However, these concerns often focus on the efficiency criterion. Even that, efficiency is only narrowed down to the removal of waste from residential areas without much concern for either its safe disposal or its impact on the environment in case of improper waste disposal. There is little attention on reducing waste flows (through reuse, recycling and composting), or exploiting its economic value. The results of such blatant omission include threats to public health, environmental deterioration and lack of attention to waste as a resource. This study examines the key barriers to effective SWM practices in the Greater Accra Metropolitan Area and attests to the marginalization of waste treatment and disposal practices. It recommends that these missing links must be addressed through network service arrangements to ensure sustainable urban environment management.

Keywords Greater Accra Metropolitan Area · Integrated solid waste management · Sustainable urban environment management · Waste hierarchy · Waste minimization

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Introduction

In recent times, calls for integrated SWM have increased in international circles, academic literature and policy practice (Baud et al. 2001; Post 1999). This debate is occasioned by increased concerns for public health, environmental issues and investment tourism as well as many challenges emanating from the current SWM practices. Authorities in developing countries in particular tend to overlook the significance of waste minimization strategies, leading to situations where all "wastes" are sent to dumpsites for final disposal. This has made many cities lose sight of the economic value of waste and make them potential candidates for poor SWM. Authorities continue to struggle with SWM (Doan 1998) because they have failed to appreciate that sustainable SWM practice entails proper waste collection, transportation, treatment and eventual safe disposal of the residuals. Many reasons have been cited for the poor practices (Baud et al. 2001; Obirih-Opareh and Post 2002). What is clearly missing is the appreciation of the effect of ineffective waste minimization practices on the whole SWM process.

According to a publication in a leading Ghanaian newspaper, Daily Graphic of Monday, October 13, 2008, the world urban population generates between 14 and 20% of all world-wide waste of which between 57 and 85% is disposed of in landfills. Figure 1 shows waste minimization and disposal practices in Africa, indicating that only 3.9% of solid

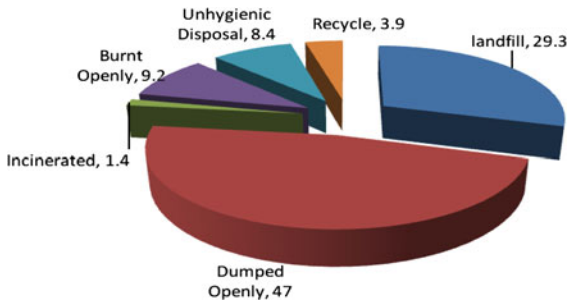

Fig. 1 Solid waste treatment and disposal in Africa. *Source*: Oteng-Ababio (2007)

waste generated is recycled. This partly explains why the continent is saddled with SWM problems. The truth is that indiscriminate dumping of solid waste raises several serious environmental concerns, including loss of renewable resources such as metals, plastic, and glass; loss of potential resources such as compost from organic waste, and energy from burnable waste.

Contributing to the debate on the potentials of waste as a resource, Furedy (1997) and Skinner (1995) noted that though waste must be disposed of, it is nonetheless a "would-be waste" due to its economic potentials through reuse, recycling or composting (Blore et al. 1999). There is thus the need to appreciate the role of waste reduction, reuse, recycling or composting which demands waste separation, sorting and processing. Failure to appreciate this vital interconnectivity creates a "missing link" in the SWM practices which then incapacitates any well-intended SWM process.

Integrated solid waste management

Developing an appropriate SWM approach is becoming a more complex issue for various reasons. First, the number of actors involved in SWM including private companies and citizens are increasing while co-operation between municipal authorities is also on the ascendancy (Ljunggren 2000). Again, 'waste' is no longer regarded as something 'to get rid of (Furedy 1997) but as of both economic and environmental potential value while new or modified treatment technologies are emerging. There is also a growing environmental concern and a conscious demand for cost-efficient SWM solutions. In the circumstances, many municipalities are struggling to achieve acceptable quality and coverage of services due to budget constraints, lack of cooperation among solid waste generators, difficulty of managing transport fleets as well as identifying and managing disposal sites.

In the meantime, integrated solid waste management (ISWM) is generally seen as the most widely accepted and practiced concept for SWM (Zia and Devadas 2008) and this according to Tchobanoglous et al. (1993), entails the selection and application of suitable techniques, technologies and management program to achieve specific goals and objectives including environmental and health regulations, economic reliability and social acceptability. It takes into account local conditions and the selection of proper mix of alternatives and technologies to meet changing local challenges without compromising on legislative demands. The decision making process and the eventual mix for ISWM process is informed by environmental, economic, social and institutional considerations and the trade-off thereafter can take place at different levels (Lardinios and Van de Klundert 1997).

One key feature of the ISWM system is the waste hierarchy approach which involves the collection, storage, transportation, processing, treatment, recycling and final disposal of waste (Cheeseman et al. 2000). It entails a simple, affordable and sustainable system (socio-economically and environmentally) and guarantees equitable provision of services to both the poor and the rich thus ensuring improved environment and providing health and economic benefits as well as providing safe, dignified and secure employment. Undoubtedly, a formal house-to-house waste collection has been in-use in the developed countries. However, in developing ones like Ghana, waste generators, their house-helps or waste pickers are mostly involved in primary collection by carrying waste to transfer stations (Post 1999). Local authorities then collect the waste (secondary collection) from these transfer points to final disposal sites, which vary in standards based on resources and knowledge. Further, recyclables may be extracted from the waste stream from the points of generation, transfer or disposal (Oteng-Ababio 2007).

The waste hierarchy approach is criticised for being an 'open system' instead of "a closed-loop", or "ZERO-WASTE" which aims at eliminating rather

than "managing" waste, and adopts a system approach that aims at 'no waste' and encourages waste diversion through recycling and resource recovery. It is a guiding design philosophy for eliminating waste at source and at all points down the supply chain (ACT Government 1996) and that has been the focus of most developed countries, hence, ISWM. However, Ghana like most developing countries has yet to adopt the ISWM approach. Attempts to pursue the tenets prescribed under the waste hierarchy system have even been saddled with challenges (Post 1999), including lack of the requisite municipal human and financial capital as well as political commitment. These thus give enough reasons and motivation for this paper.

Meanwhile, the literature is replete with several socio-economic and environmental values associated with proper SWM practices. Economically, it helps in employment creation and income generation (Baud and Schenk 1994; Halla and Majani 1999; Baud 2004). In Greater Accra Metropolitan Area (GAMA), it is a common sight to see truck pushers and other itinerant waste buyers, carting recovered items for resale to recycle companies. However, because of some social stigma associated with the industry, social groups seemingly least respected are most prevalent in that economy like people of the Northern extraction in Ghana, the 'Kru' in Liberia, the 'Zabbaleens' in Egypt and the 'Untouchable' community in India.

Objective of the study

This paper seeks to explore the current SWM practices in GAMA and examines some of the missing links that have perpetually challenged both past and current managers. Specifically, this paper aims:

- To review the historical and current SWM practices in Ghana;
- To examine the main characteristics of the mode of waste disposal;
- To identify the missing links in the current SWM practices, and,
- To offer recommendations on how SWM can be more effective and sustainable.

The study argues that by concentrating on waste collection alone to the exclusion of other waste minimization processes like reuse, recycling and compositing has invariably created 'a missing link', and that has accounted for the demise of both past and present SWM programmes.

The study area

Most cities in GAMA did not have the advantage of being wholly planned since physical planning was introduced after they had developed spontaneously. In terms of density, the average national population rose from 28 people per km^2 in 1984 to 77 persons per km^2 in 2000 while that of the Greater Accra Region escalated from 441 persons per km^2 to 897 persons, an increase of more than 103.3% within the same time frame (GSS 2000). These figures illustrate the enormous changes taking place in Accra and with such high density, the volume of generated waste is expected to be enormous (Smith 1997).

Figure 2 above depicts GAMA which includes the Accra Metropolitan Assembly (AMA), Tema Municipal Assembly (TMA) and Ga District Assembly (GDA). These 3 districts form the largest urban agglomeration in Ghana and are located along the Gulf of Guinea, stretching from Gbegbeyese in the west to Ada in the east. It had a combined population of 450,000 in 1960, reaching 2,715,805 in 2000, with an average population growth rate of 4.6% as against the regional and national averages of 4.4 and 2.7%, respectively.

Research methodology

Both primary and secondary data sources were used in this study, which builds on an earlier work that has already been published (Oteng-Ababio 2010). Using stratified multi-staged sampling technique, residential areas were chosen to represent low, middle and high-income areas while random sampling was employed to interview a number of households within each category. The population density of an area informed the choice of the number of respondents for interview. Some aspects of SWM practices were physically observed and this helped to determine how each of the stakeholders cooperate in the process. Also, selected focus group discussions were conducted with the main stakeholders and to examine the impact of

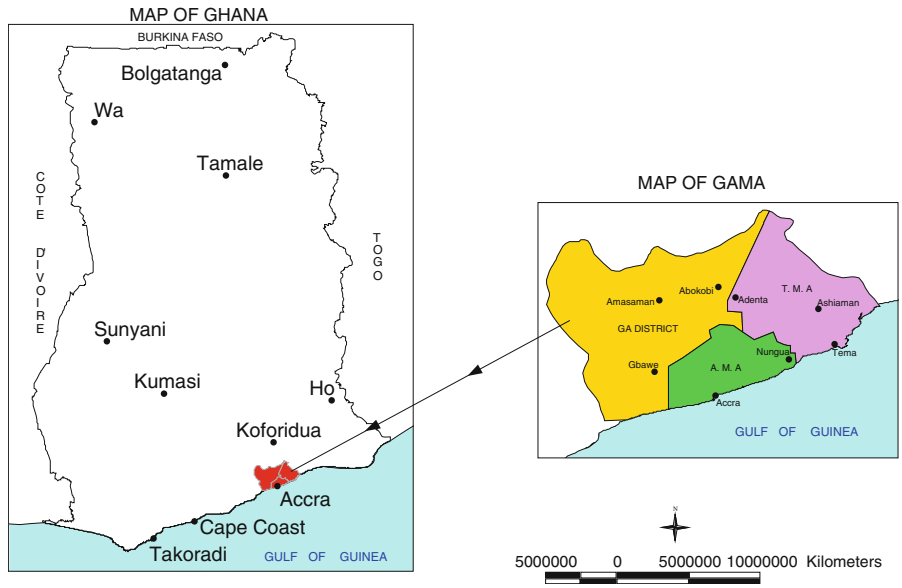

Fig. 2 Map of Ghana and GAMA showing the three Metropolitan Areas. *Source*: Oteng-Ababio with the assistance of CERSGIS-2010

selected independent variables on a particular dependent, variable, cross-tabulation using Chi-square (x^2) test of significance was employed.

Results and discussion

The historical development of SWM in GAMA

The growth of GAMA dates back as far as the late nineteenth century when Accra consisted of 3 towns: Usher, James Town and Korle Wonko. Organized SWM commenced in 1898, when the Accra City Council (ACC) was established and charged with that responsibility. This, it was able to do with the assistance of few health inspectors and sanitary labourers. In 1925, public dustbins were introduced and were emptied by means of two pushcarts managed by workers. This labour intensive method was later replaced with large carts drawn by mules (Oteng-Ababio 2007). Incinerators were introduced in 1929 with the increase in population and improvement in technology. However, by 1948, the only incinerator which had a maximum capacity of 100 tonnes per day could hardly cope with the collected refuse, hence its total breakdown by 1970. This marked the beginning of crude dumping into quarry pits at Aborfu, Achimota, and Abeka, all within AMA.

By early 1970s, the ACC had introduced 2 systems of waste collection; the house-to-house (HH) for a fee in the then high-income areas, whilst residents in low-income areas dumped refuse at central points which were later collected into side loaders by labourers at no cost. The ACC established the Waste Management Department (WMD) in 1985 and a privatization policy was also conceived as a means to extend coverage to un-serviced areas. However, waste treatment and disposal remained the responsibility of the local authority.

Major characteristics of current mode of waste disposal in GAMA

The current SWM practice in GAMA is clearly biased towards achieving 100% waste collection and its subsequent disposal, with very partial or no treatment or processing. Yet, to achieve the objectives of sustainable development, there is a need for paradigm shift to help reduce the depletion of the natural resources, reduce environmental stress and promote public health, as well as avoid economic losses through loss of man hours through ill-health. Two (2) main official arrangements for solid waste disposal were identified: the communal container collection (CCC) operational in the low-income areas and house-to-house (HH) in the middle and high-income areas. In both instances, all wastes were

lumped together and eventually sent for final disposal. No formal arrangement for waste separation at source or elsewhere is in place. The findings tend to suggest that most residents in GAMA adhered exclusively to the formal arrangements for waste disposal, where the CCC is predominant in the low-income, high-density areas, characterised by narrow, badly maintained or steep grading roads (poor planning, accessibility and participation), while the HH dominates the middle and high income areas which have had the advantage of physical planning and better infrastructure.

From Table 1, about 85% of respondents in the low-income areas of AMA, saddled with very poor infrastructure, used the CCC services. Alternatively, almost 50 and 74% of respondents from the middle and high-income areas respectively used the HH services. A chi-square test, conducted on the mode waste disposal and the residential location gave a value of 224.460 and a df of 6, which by inference means that there is a high systematic relationship between mode of waste disposal and residential areas; in other words, the mode of waste disposal is influenced by residential areas and by extension, the wealth of the area under review (i.e. high, medium and low). Similar patterns were observed in TMA and GDA.

Another observation is the use of the services of 'Kaya Bola'. The study revealed that in the middle-income areas of Abossey Okai, Adabraka and Kaneshie of AMA, 22.5, 22.5 and 25% of the respondents respectively used the services of 'Kaya Bola'. Interestingly, these areas form part of the commercial hub of Accra and presumably, contain some modestly rich residents. Thus, because of their commercial interests and wealth, they could afford these services as a trade-off for the apparent inefficiency of the formal CCC arrangements. This tends to give a general indication of people's growing environmental awareness with increasing wealth.

Table 1 Method of waste disposal by residential areas in AMA (in percentage)

Classification	Kaya Bola[a]	CCC	HH	Others	Total
Low class	7.14	84.76	7.62	0.48	100
Middle class	16.19	22.38	50.48	6.19	100
High class	10	12.27	74.44	3.33	100
AMA total	11.6	47.7	37.8	3.4	100

Note: Chi-square value 224. 460. Asyump. Sig. (2-Sided) .000 a.1 cells (8.3%) have expected count less than 5. The minimum expected count is 3.06

Source: Field Data (2006)

[a] Kaya bolas is private porter who carries solid waste from residences, offices, markets, etc. to a container or dumpsite for a fee

Distance-decay in solid waste disposal in GAMA

The study revealed that residents, especially in the low-income areas, who have to travel longer distances to a waste container site to dispose of waste have the tendency of finding alternative place, which is normally very close to their places of abode. Figure 3 revealed that, 50% of respondents in the low income areas are willing to access waste containers within the 50 m radius while only 5% are prepared to travel about 200 m for the same purpose. The study further noted that the long distances, coupled with the fact that these containers are always over-flowing, serve as enough deterrent to residents who then look for alternative dumping sites.

It can thus be deduced that there is a maximum travel threshold (in this case, a 50 m radius) within which residents will voluntarily access the CCC. Once this is exceeded, utilization tends to fall off considerably. This negative relationship observed is empirically reinforced by the little littering in areas serviced by HH operators (e.g. Airport, Kanda, and Community 6) where wastes are virtually collected at the doorsteps of residents as against the filthy CCC dominated areas (e.g. Nima. Ashiaman), where residents have to travel longer distances to container sites.

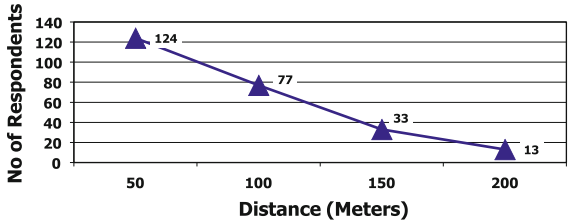

Fig. 3 Distance-decay in solid waste disposal. *Source*: Field Data (2005)

Evaluating the current solid waste treatment and disposal practices in GAMA

The study revealed that to date, treatment, processing and safe disposal of waste have not attracted much attention. Currently, while most recycling and reuse activities remain private, waste disposal remain haphazardly within the domain of local authorities. These missing links (discussed below) have long been identified as contributing to the woes of SWM in most cities (Furedy 1997; Skinner 1995).

Composting: Teshie-Nungua compost plant (AMA)

The only compost plant within GAMA is the Teshie-Nungua Compost Plant (TNCP), set up in 1979 to process manure for agriculture and help reduce the amount of waste sent to the final dumpsite. However, since its inception the plant has operated not more than 10% of its installed capacity of 3,800 tonnes annually. Figure 4 gives a summary of annual production levels (as a percentage of the plant annual installed capacity) from 1994 to 2004. Reasons cited for this abysmal performance include lack of electricity, water and old age of the plant; hence the site has virtually become a dumpsite.

Reuse and recycling of materials

As already indicated, besides the Teshie plant which is now almost defunct (see Fig. 5), GAMA lacks any formal programme for resource recovery, reuse and recycling, and hence source separation of waste is non-existent. The fact is that the country's environmental policy remains silent on waste minimisation practices.

In the circumstances, that vacuum is being bridged by the activities of the informal recycling sector, which are privately owned and carried out by scavengers who work on the dumpsite (see Fig. 6) and along the beaches. In the poorer communities also, it is a common practice to use organic waste (food leftovers) to feed domestic livestock, and some people even sell organic waste to livestock owners. This study could not establish the quantities of recycled waste because those involved do not keep records. However, it was established that recyclables have a large market in TMA, yet to be tapped into. One such private market is the Blow Plast Industry Limited, engaged in plastic waste recycling, with a total capacity of 24 metric tonnes a day but currently processing only seven tonnes per day.

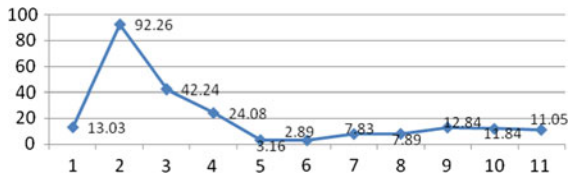

Fig. 4 Percentage production (of total capacity) at TNCP (1994–2004). *Source*: AMA/WMD (2005)

From all indications, a state intervention is required to enhance opportunities of recycling and the reuse of waste material. The environmental rationale of such action is to reduce the amount of waste meant for final disposal and to preserve the finite natural resources. This can also serve as an incentive to stimulate privatised refuse collection, making the overall service less dependent on user charges and/or the local treasury. In many Asian cities, both organic and inorganic waste is exploited as an economic resource by many poor people, farms and industries (Furedy 1992). Unfortunately, the private sector in GAMA hardly seems to recognise this potential, hence the urgent need to investigate the economic potential of domestic, industrial and commercial waste in the specific context of GAMA as well as the attitudes of various stakeholders towards recycling and reuse (Post 1999).

Waste disposal practices

Efficient disposal of unwanted waste poses the biggest challenge to the authorities in GAMA as they appear to have endorsed illegal dumping by some contractors who, for lack of official dumpsites, are creating their open dumpsites with no prior treatment of waste. This creates a real nuisance to nearby residents in terms of litter, foul odours, smoke and fire hazards, and becomes a potential source of social unrest (see Table 2).

Ironically, the study revealed that both TMA and AMA have since early 2000, been earmarked for separate Engineered Landfill Project, for which the necessary feasibility studies and finances had been secured. In 2004 for example, the World Bank approved an International Development Association

Fig. 5 Sections of the Teshie-Nungua Buhler-System compost plant. *Source*: Oteng-Ababio (2007)

Fig. 6 Scavengers at the Oblogo dumpsite and during waste collection. *Source*: Field Data (2005)

Table 2 Status of dumpsites in GAMA-2008

Classification	TMA	AMA	GDA
Open dumpsite (crude dumping)	Kpone	Christian Village, *T-N compost plant	Achiaman, Tantra Hill, Oyoko
		Kwashibu	
		Sarba (Weija)	
Controlled dumpsite		Oblojo (closed)	
Planned sanitary landfill	Kpone (stalled)	Kwabenya (stalled)	

*T-N refers to Teshie-Nungua

Source: WMDs (TMA; AMA; GDA); 2008

credit of US$62 million for an engineered Landfill Project in AMA at Kwabenya (MLGRD 2004) yet, the project has since remained stalled and the site is now within a 'fast growing city' which from all indication, cannot be sacrificed in the name of a landfill.

SWM in GAMA—some missing links

The review of the current SWM practices vis-à-vis the known best practices drawn from literature revealed some missing links which must be addressed to prevent the current practice exhibiting its 'ecological footprint' on the environment. Based on a rating criteria adapted from National Health Service (NHS) Environmental Assessment Tool (NEAT) as depicted in Table 3, most respondents within the study area especially those in the low-income neighborhoods scored every facet of the current SWM practices well below 40 (i.e. bad), and thus called for a review of the current management practices.

The study identified at least, two major missing links in the current SWM practices which have

Table 3 Rating criteria for assessing current waste management practices

%	Rating
Less than 40	Bad
More than 40	Good
More than 55	Very good
More than 70	Excellent

Source: Adapted from NEAT (NHS Estates 2001)

virtually condemned the 'region' into perpetual SWM problems. These are:

Lack of appropriate waste minimisation act

The National Environmental Sanitation Policy of 1999, which is the blueprint for SWM policy in Ghana, had as its objective to develop and maintain a clean, safe and pleasant physical environment in all human settlements and promote social, economic and physical well-being of all sections of the population (MLGRD 1999). The policy outlined the principal components of environmental sanitation to include the collection and sanitary disposal of waste, but painfully neglects the indispensable role of waste minimization processes towards sustainable SWM. Accordingly, the system of household solid waste collection in GAMA does not encourage source separation of waste in order to reduce waste flows going to the dumpsite. All current arrangements are based on collection of mixed wastes for final disposal. The occasional waste separation at source is largely confined to items that people can either use or give to neighbours and this is purely voluntarily (Obirih-Opareh and Post 2002). Hence, the need for a waste minimization act to help ginger the local authorities to action.

Generally, a waste minimisation act is regarded as a key national driver for waste minimisation. It allows a local authority to "do or arrange for the doing of, anything which in its opinion is necessary or expedient for the purpose of minimising the quantities of controlled waste, or controlled waste of any description, generated in its area" (Waste Minimisation Team 2007). The lack of such an act in Ghana has literally made waste minimisation an 'optional' activity. Indeed, waste reduction in general as a policy appears 'alien' in GAMA. Efforts to reduce the amount of waste sent for disposal have been concentrated on the few privately operated recycling and recovery outlets.

However, in view of the growing urban population and the scarcity of potential disposal sites, there is a need to reduce waste generation in the first place. This will offset the costs and environmental impacts of waste generation, collection, treatment and disposal. A Waste Minimisation Team in London (2007) revealed that disposable nappies make up nearly 3% of all household waste in Southwalk. Admittedly, introducing waste minimization practices in GAMA will take time as new systems will have to be implemented, and campaigns run to encourage residents to make permanent behavioural changes, yet that adventure is worthwhile in view of the current realities.

Lack of proper disposal sites

Clearly, the proper disposal of solid wastes is one of the most important challenges faced by authorities. Presently, there is no engineered sanitary landfill; hence the huge wastes generated in GAMA (i.e. about 1,800 tonnes a day in AMA alone) are managed in unprotected and uncontrolled dumps with serious negative implications. Undoubtedly, such developments among other things:

- constitute a danger to public health;
- affect the quality of the environment by risking the pollution of groundwater, surface water, the air and soil;
- jeopardize residential development in the vicinity of these sites as well as the regional planning, and;
- waste renewable resources.

Conclusion and recommendations

By and large, lessons from cities where proper SWM approach has been adopted confirm a number of advantages. In Germany, the Waste Avoidance and Recycling Act was enacted in 1996 against a background of increasing scarcity of disposal sites. After a decade of its application, the recycling rate for plastics reached about 90% compared to 7% in the United Kingdom (Bleischwitz and Hennicke 2004). Similarly in Copenhagen, after a comprehensive

urban SWM programme was developed in 1991, the number of landfills reduced from 30 to 3 (Oteng-Ababio 2007).

The study has shown that GAMA's population keeps on growing suggesting that poor SWM will persist unless conscious efforts are made to change the status quo. AMA currently spends about $600,000 monthly to maintain refuse sites and about $240,000 on landfill sites. It indeed spends 65% of its internally generated resources on sanitation-related issues alone (AMA/WMD 2008). Notwithstanding such huge financial expenditure, the assembly was recently warned of an imminent explosion at the Oblojo dumpsite if it did not take steps to degas the site, epitomizing the un-sustainability of the current practices notwithstanding the obviously high financial outlays (Daily Graphic 2008).

The study attests to the fact that any sustainable SWM practice demands proper treatment and final disposal sites, with the necessary attainable threshold and operational linkages. The study finds this to be a major missing link in the SWM drive in GAMA. The current open dumpsites are a violation of existing sanitary laws, yet these are tolerated due to lack of proper treatment and landfills sites within GAMA. The study advocates for the 3 assemblies (GDA, TMA and AMA), to network, collaborate, coordinate and develop common waste treatment and disposal infrastructure such as incinerators, landfills and recycling plants, possibly under the umbrella of the Regional Coordinating Council. This approach will not only cut down cost but also make possible, the judicious use of scarce resources. Perhaps, with the Kwabenya Landfill Project "permanently stalled", the assemblies need to see to the commencement of the Kpone Landfill Project, which is without protestation.

Government should necessarily take steps to educate the citizenry on waste reduction and separation as a matter of national policy. Probably, the government will have to enact the appropriate waste minimization legislation as a first step. The current attempts by some private SWM companies including ZoomLion Company to encourage some form of waste separation at source (residential level) have so far failed. This is because apart from the lack of any legal backing, not much education has been given to the populace on where to put particular waste except with the yellow and green colouring on the waste containers, which, to an informed person, would seem suggestive but meaningless to an uninformed. Ultimately, there is much to be gained by addressing the missing links through the implementation of network service arrangements across GAMA with considerable potentials to improve SWM outcomes, achieve better value for money and promote peaceful co-existence within the ecosystem.

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