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The Urban Solid Waste Management Conundrum in Ghana: Will It Ever End?

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Abstract Proper solid waste management (SWM) has become one critical environmental challenge faced by cities in Ghana due to its externalities. Notwithstanding the efforts by city authorities to remediate the problem, it still remains a monumental challenge and an elusive enterprise. This is evidenced from the uncollected garbage at public spaces and indiscriminate dumping at zones with fatal flaws. This article examines the current conventional solid waste management philosophies in urban Ghana, an African country whose development and growth is widely regarded as rapid and chaotic and points out some of the flaws in them. The fieldwork involved fifty key informant interviews with experts and six separate focus group discussions with some household heads. The paper argues that the current approaches to SWM, which are often imported from the Global north, have yielded little results because they are incompatible with local development trajectories. The paper concludes that the problem will persist unless the imported solutions are integrated with indigenously derived strategies.

Keywords Solid waste, Ghana, Human health, Conundrum, Efficiency

1. Introduction

"A good solid waste management (SWM) system is like good health: If you are lucky to have it, you don't notice it; it is just how things are and you take it for granted. However, if things go wrong, it is a big and urgent problem and everything else seems less important" **[1].**

The above quotation from UN-Habitat, seems to exemplify how solid waste generated through consumption and production activities has been handled over the years, becoming one of the most eye-catching signposts on most urban landscapes. Literature [2, 3] suggests that while developed countries seem to have abated the problem effectively and are now focusing on minimizing environmental pollution and maximizing resource recovery, countries in the the developing world, including Ghana, continue to struggle with basic collection and disposal, and its implicit cost.

Oteng-Ababio [4] observes that in an attempt to solve the problem, city managers in sub-Saharan African (SSA) have formed alliance with cities in the Global north in what is termed in Ghana as "sister city" initiatives. They share ideas on similar problems and try to fashion out common solutions with the impression that the historical forces and mechanisms that have driven the evolution of SWM in high-income countries can provide insight into how to move forward in developing country contexts [5]. While the sister city approach may be laudable, the initiative may be born out from a practical blankness. They tend to forget that the political, economic, social and cultural contexts are entirely different. What makes matters worse is that the managers from sub-Saharan African cities forget of their own geographical conditions and therefore technologies meant for Temperate climatic regions are imported to Tropical climatic regions, thus these technologies do not exhaust their lifespan. Eventually, the SSA countries become dumping grounds for technologies nearing their end-life in the form of technical assistance [6].

Another reason that accounts for the failures of the internationally developed policies is that proper waste management systems rests on proper waste audit to determine the quantity and quality, physical and chemical as well as other characteristics of the waste stream. This vital information is not adequately present in the developing world and therefore, the few private multinational companies who dare to help fail to recover long-run costs.

Municipal solid waste management (MSWM) in Accra and Kumasi, the two largest cities in Ghana has been very daunting. It is estimated that together, the two cities generate over 4200 tonnes of solid waste daily [7] with a collection rate of nearly 70%. Typically, most urban landscapes in Ghana are characterized by mountains of uncollected garbage, gutters choked with waste, open reservoirs that

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appear to be a little more than toxic pools of liquid waste and beaches strewn with plastic garbage [1]. As observed by [8], the ominous environmental, social and health impact of this neglect is greatest among those living in the low-income and peri-urban settlements where access to collection routes is a challenge. It is important to state from the outset that the problem is not the volume of waste produced but the viability of government and private firms to fashion out efficient management service that is environmentally friendly, economically viable and socially acceptable [9] is the source of worry.

The solid waste predicament in Ghana compares equally with what happens in other countries across the African continent: improper management under a cash stricken public sector leading to city-wide environmental health hazards; private sector participation under unclear policy and regulatory guidelines and importation of waste management technologies from developed countries that are unable to withstand the hash tropical weather conditions. In order to get out of this quagmire, past and current governments have introduced and are still considering other innovative options including new policies and technologies such as expanding the house-to-house waste collection to cover the middle income and some low income communities which were hitherto excluded, and also advancing the argument for waste recycling and composting programs. This will however mean that a lot of public education and stakeholder sensitization programs will have to be done if these innovations are to see a better day of light. It also remains to be seen how the viability of a smooth transition from communal collection container system used in low-income communities to house-to-house waste collection will be received in the already impoverish and underserved communities where keeping pace with livelihood survival has become a daily struggle.

This paper has two objectives. First, it examines the current solid waste management practices in urban Ghana and points out some of the flaws in them. Second, it explores what can be the best practice for the nation in particular and its implications for other African countries in general. The significance of this study is the strong case it makes for recognition of the informal waste worker whose contributions are seldomly appreciated in the planning and implementation of solid waste management strategies in Ghana. The study reported in the rest of this paper is organized into six main sections. After the introductory expositions, the second section is devoted to the evolution of solid waste management services in Ghana while the third section discusses the policies and legal framework guiding solid waste management which is embodied in the Local Government Act (1994), Act 462 and the Environmental Sanitation Policy (ESP) of 1999. Section four summarizes the research methodologies while section five presents the overall results and offers a discussion of the results of the study. Section gives the concluding remarks makeas recommendations for the future.

2. Evolution of Solid Waste Management Services in Ghana

In Ghana, city authorities have historically been responsible for providing sanitation services to residents. The Accra City Council (ACC), for instance, was established in 1898 under the provisions of the Town Council Ordinance of 1894 and charged with the responsibility of refuse and sanitation management [10]. This, the council was able to do with the assistance of few community sanitary inspectors. Systematic waste collection and disposal services commenced during the period and by 1925, public dustbins emptied by two pushcarts and later, replaced with large carts drawn by mules were introduced. Incinerators were also introduced in 1929 [2]. However, increasing quantity of waste generation led to their breakdown by 1970, leading to crude dumping into quarry pits at Aborfu, Achimota and Abeka.

In the early 1990s, there was a policy shift towards private sector-led involvement. The World Bank in collaboration with the Ghana Government established the Urban Environmental and Sanitation Project (UESP) in 1999 which was implemented in five major cities in the country [11]. Under the project, the World Bank provided the funds as well as technical assistance for the privatization of refuse collection [12]. This was against the backdrop of the increasing financial burden on the local governments and the inefficiency of the public sector. The private sector was to overcome the government failures in public direct service delivery – too many workers, not enough supervisors, few incentives for better performance and limited finance ([13, 14, 15].

This led to contracting out and franchising the solid waste collection services to the private sector. This policy of private sector involvement in solid waste management is part of the extension of the market mechanisms of the New Public Management (NPM) and decentralization of local service delivery to the local governments. It has continued to date, [16]. The rationale for the private sector involvement (PSI) in solid waste collection, which is a World Bank policy initiative is to improve efficiency (reduce cost) and effectiveness of service delivery (service quality) through competition in the market – where private sector providers compete for a zonal monopoly to render service over a period of time – and to ensure that the environmental aspect of sustainable development is integrated into solid waste management [11]. The private sector is seen as endowed with qualities such as political independence, economic rationality, efficiency, dynamism and innovation, making it measure up favourably to public sector enterprise [17].

With this form of privatization, the companies were given a particular zone to manage. The total cost is not pushed to the beneficiaries, but rather the government subsidizes the cost, and allows the beneficiaries to pay some percentage of the total cost. The consumers pay between 10 and 20% of the total cost. The private companies individually bear the cost

of billing and collecting user charges. The choice of this form of privatization was based on the fact that the generators of waste should take part in the costs of its management (limited polluter pay principle). This, according to the experts, was to caution people to try as much as possible to reduce the volume of solid waste that they generate. It was also to help the government reduce the colossal amount of money that is expended on the management of solid waste. Though these salutary effects cannot be taken for granted, the empirical proof that privatization actually works is still rather weak and largely drawn from experiences in the Western world [18]. This re-shuffling of waste management operations, while necessary, has not yielded the expected encompassing benefits, with only 60-70% of waste generated in the cities being collected [19]. The issue is that rather than the numerous waste management companies working together cooperatively on behalf of the public. They work rather to protect their economic and administrative turf.

3. Waste Management Policy and Legal Framework in Ghana

The policies and legal framework guiding solid waste management in Ghana is embodied in the Local Government Act (1994), Act 462 and the Environmental Sanitation Policy (ESP) of 1999. After 10 years of implementation, the flaws in the policy became evident. It was therefore review in 2010 so that the policy-makers could adapt to changing conditions to prevent failure of their policies [20]. The revised policy reflected the changing context of national and international development priorities (the Ghana Poverty Reduction Strategy, the Millennium Development Goals, and the New Partnership for African Development –NEPAD).

Ghana established an Environmental Protection Agency (EPA) in 1994 under the auspices of the Ministry of Environment and Science and has developed some environmental legislation, principally the Environmental Protection Agency Act 490 and Environmental Assessment Regulation LI 1652. The main tool of control is the environmental assessment procedure. The policy stipulates, among other things, that the disposal of solid wastes must be in accordance with the standards and procedures prescribed by the EPA and any other regulatory agencies. While regulatory authority is vested in the EPA, general solid waste (domestic waste) management in Ghana is the responsibility of the Ministry of Local Government and Rural Development, which supervises the decentralized Metropolitan, Municipal and District Assemblies (MMDAs). The MMDAs are responsible for the collection and final disposal of solid waste through their Waste Management Departments (WMDs) and their Environmental Health and Sanitation Departments, figure 1.

The EPA Act 490, is the enabling legislation and, with regard to solid waste management, it enables the Minister to make regulations concerning the type, quality or conditions or concentration of substances that may be released into the environment; and the collection, storage, recovery, recycling or disposal of substances which may be hazardous to the environment. The research reveals that to date, three relevant guideline documents have been developed: Ghana Landfill Guidelines; Guidelines for the Management of Healthcare and Veterinary Waste in Ghana; and Manual for the Preparation of District Waste Management Plans in Ghana. The policies guiding solid waste management are inadequate or out-dated cookie-cutter plans that become even more out-dated every year. It is important to recognize that obsolete solid waste management plans are dangerous because it may fool people into believing that it is protecting them when in effect, it may rather be exposing them.

The Ghana Landfill Guidelines published by the EPA is an attempt to promote and help upgrade landfills, initially by improving site selection, waste compaction and drainage resulting in 'High Density Aerobic Landfills and culminating in achieving operation of 'Sanitary Landfills' by 2020. However slow this process might be, there is evidence to show that progress is being made to achieve these targets [12].

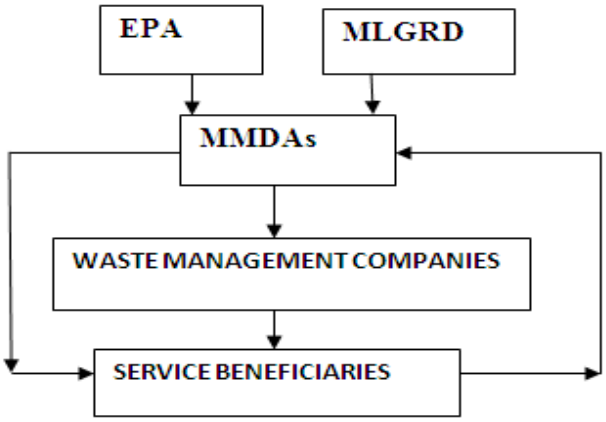

Figure 1. Institutional Arrangements for Solid Waste Management

4. Methodology

4.1. Geography of Ghana, Growth and Environmental Conditions

Ghana is centrally located on the West African coast. It is bordered by Togo to the east, Cote D'Ivoire to the west and Burkina Faso to the north with a total land area of some 239,460 km^2. The land generally consists of low plains with a dissected plateau in the south-central area and scattered areas of high relief. Lying just above the equator, Ghana has a tropical climate with mean annual temperatures ranging between 26℃ and 29℃ but temperatures are generally higher in the north than in the south [21]. As the three regions of northern Ghana battles with climate change and other severe weather conditions (drought which frequently leads to crop failure and food shortage), cities in southern Ghana are grappling with how to effectively and efficiently manage the quantity of solid waste generated from the high population growth and the improvements in economic development. The Ghana statistical service puts the population of Ghana at 24,658,823 [22]. The figure represents an increase of 30.4 percent over the 2000 census population of 18,912,079. The data further indicate that the most populous region is Ashanti, with a population of 4,780,280, representing 19.4 percent of the country's total population followed by Greater Accra, with a population of 4,010,054 (16.3%). The least populous regions are Upper West with 702,110 persons constituting 2.8% of the total population and Upper East with 1,046,545 persons or 4.2% of Ghana's population [22]. The Economic Reform Program (ERP) which began in the 1980s under IMF guidance and governance reforms which started in 1991 has resulted in siginificant economic growth, culminating in the increase in the quantity of solid waste being generated, whose management continues to be a challenge for the national government.

4.2. Data Collection

To achieve the set goals, the study adopted multiple data collection methods including key informant interviews, participant observation and a comprehensive review of official and other documents to generate empirical data. The fieldwork involves qualitative data collection that took place between June, 2013 and December, 2014). we conducted 50 key informant interviews with community opinion leaders including Assembly members and leaders of two prominent informal waste workers group in Accra and Kumasi. Some public officials from the Waste Management Departments; Community Water and Sanitation Agency and private waste management companies were also interviewed. Specifically, the key informants were interrogated on the challenges of managing waste and the way forward. To assess the modus operandi of the informal waste workers, participant observation was employed to learn at first-hand, how they engage with their client. Lastly, two separate FGDs were held with household heads to explore issues on efficiency and affordability of the solid waste management services they receive. Each focus group had seven participants made four women and three men. Women were biasly recruited because the management of solid waste at the domestic level in Accra and Kumasi is mostly their responsibility.

5. Results and Discussions

5.1. The SWM Conundrum in Ghana

Notwithstanding the efforts of city authorities in managing solid waste, it still remains a monumental challenge and an elusive enterprise. This is mainly due to high population growth [23]; weak operational capacities of the municipal authorities; limited financial resources due to unreliable revenue sources [22]; implementation of imported policies without recourse to local conditions (Ali, 2010) and limited community participation in strategic plans and projects; poorly designed collection systems and the need to give equal attention to other development priorities . This has led [24] to the practice of uncontrolled and crude dumping of solid waste in open spaces which constantly block both primary and secondary drainage networks [1].

The lack of defined solid waste collection routes and inaccessible road networks in the low income communities has introduced additional difficulties to the existing problems [15]. Ironically, these underserved communities have become the host communities for open dumps because of their inability to bargain with the city authorities for their rights; in any case, most of them are migrants who have settled on "empty" lands without any proper tenancy agreements. The common characteristics in these communities are choked drains and pools of stagnant water, which breeds mosquitoes and other disease causing organisms. It is therefore not uncommon to see that these socioeconomically disadvantaged populations are more strongly affected by various environmental health problems such as malaria, acute respiratory infections, skin infections and the most severe forms of asthma [25, 26], scourging mainly children, women and the elderly.

It is argued that consumption of basic services such as sanitation and solid waste (SSW), has elements of externality, excludability and non-rivalry problems (public good characteristics) and thus should not be left to individual decisions [27]. And because one of the roles of the state is to ensure the welfare of its citizens, services that depict public good characteristics should be financed by the state. In line with this argument, statistics from the Kumasi indicates that city managers spend over $491,730 a month on waste collection and disposal [16], while city authorities in Accra spend US$307,340 a month on waste haulage alone with an extra US$163,910 on maintaining dump sites, an amount that could have been channelled to other important sectors of the city [2].

UN-HABITAT [1] explains that lack of political will-awareness and dedication among national and local government to effectively address the challenge, is often cited as a prominent factor. While there is ample evidence

that this is true, there may be other factors at play. In Ghana, the problem is compounded by limited accurate data on the characteristics of solid waste generation to aide efficient waste management planning. Accurate data is a *sine qua non* for any effective SWM system. Yet, various studies give contradictory figures. Tsiboe and Marbell [28] quote the total daily waste generation in AMA as 1,800 tons while the regional administration quotes 2,200 tons or 0.6 kg per person [12]. The MLGRD gives daily rate as 0.51 kg per person while the World Resource Institute quotes 0.41 kg. In Kumasi solid waste statistics from the waste management department of the Kumasi Metropolitan Assembly provides conflicting figures depending on which institution or individual is accessing the data and the purpose for which it is going to be used. For instance while the Ghana Statistical service, the official data bank for Ghana indicates that Kumasi generates between 1200 and 1500 tons of solid waste per day and that less than 50% is properly collected and disposed off, the waste managemwent department sources show that Kumasi generates between 1800 and 2200 tons of solid waste a day and that the collection and disposal rate is over 70% [16]. Such discrepancy has the tendency of obscuring the reality of current waste stream.

Apart from collection difficulties, one other segment of solid waste management in Ghana that has attracted limited attention, is the acquisition (or lack) of safe waste disposal sites and in some cases, the conflicts associated with such acquisitions [29]. Ghana currently has four engineered landfill sites: Tamale, Takoradi, Tema and Kumasi. A fifth one in Accra, where the largest quantity of solid waste is generated is yet to start. The Kumasi project which is regarded as the most well managed among the four is located at Dompoase, about 13 km south-west from the Kumasi city center. It covers an area of 100 hectares of prime farmland. It is an open landfill, where the waste is deposited, spread out, levelled by a bulldozer and then compacted by a steel studded wheeled compactor to reduce the volume. The landfill is expected to be operational till 2018. A situation that places additional burden on authorities to look for 'free land' for the construction of another landfill.

5.2. Current Modes of Solid Waste Management

Our research revealed that two modes of waste collection-House to House (HH) Collection Mode and the Communal Container Collection (CCC) Mode are being practiced in Ghana.

5.2.1. House to House (HH) Collection Mode

The house to house (HH) collection is commonly practiced in higher income and some middle income communities as well as some public institutions. Our study revealed that under the HH system, each house owner and/or landlord, office building, business, and street-vending kiosk are required to register with a contractor and pay a fee, which is tiered according to income status. Upon registration, the dwelling is entitled to a free refuse bin which is provided by the municipality or the contractor. The contractors collect the solid waste weekly at a fee between GH ₵12.00 and GH ₵15.00 (about $3) per month in Kumasi while contractors in Accra collect between GH ₵20.00 and 25.00 ($ 4) per month.

This mode has its own challenges. Respondents complained about the comparatively exorbitant fees that did not commensurate with the services they receive. The researchers' observations revealed that the containers were not collected regularly as agreed upon in the performance contract. The containers very often become the feasting grounds for domestic animals and create unsightly scenes. The mess, the nauseating stench and the flies hovering over the heaps was a grave source of worry to residents. For these reasons, tension and conflicts between the beneficiaries and service providers were a common occurrence. For instance, expressing outrage at the situation, Maame Yaa, a resident of Old Tafo in Kumasi, indicated:

"my container has not been lifted for the past two weeks. This is not acceptable because the contractor promised to lift the container at least once a week," she stated.

She continued that the situation had changed from bad to worse and it was no longer possible to determine when her filled-up litter bin would be lifted. Similarly, Prosper Ayoo, who lives at Darkuman in Accra, expressed similar sentiments and suggested that it was time the government prioritized sanitation management, as it was the most basic service to residents.

While city authorities constantly blamed solid waste contractors for not leaving up to the terms and conditions agreed upon, the waste contractors also put the blame at the doorstep of the government. For instance, in an interview with a director of a prominent private solid waste management company, he opined:

"How do you (government) expect us to deliver when our capital is locked up? They owe us over GH¢4.315 million ($1.115 million at January, 2014 exchange rate)". He continued; ***"some of my colleagues (contractors) are currently not operating at their peak, as some of their trucks had broken down", adding that "without adequate funds to repair them, some have remained in the shops for months".***

These concerns raised by the contractors were confirmed by a director of waste management in Kumasi but he explained further;

"according to the contractual agreement, they work on credit basis and therefore it was a 'normal' practice", he concluded.

The research further revealed that the delay in funds release by the government was due to excessive bureaucracy and limited budgetary allocation. In a situation where solid waste management is regarded as a public good, it is important that the government always acts with dispatch in order to forestall any disaster the may arise from such (in) actions.

One other challenge, though less apparent, was the frequent container theft. It strains credulity that waste containers are regularly stolen by unscrupulous individuals

for their personal gains. Not even the company identification marks are able to deter such nation wreckers from engaging in this dastardly act.

5.2.2. Communal Container Collection (CCC) Mode

The communal container collection (CCC) mode is of two forms; the pay as you dump, which is common in the low income, high density populated communities and the free dumping mode, which has been fashioned for public places such as markets, educational institutions and public hospitals among others. In Kumasi for example, there are over 150 communal collection centers where households discharge their waste. With the pay-as-you dump, households discharge their waste into Skips at transfer stations or designated locations for collection vehicles to pick at frequent intervals. In an interview with the public relations officer of the AMA, he intimated that this policy was introduced as a result of high indebtedness by the government to private solid waste companies that were contracted to manage solid waste in the metropolis. As of the time of the study, an amount of GH ₵1.00 ($0.3) was charged for a bucket-full of solid waste. The rate is not fixed. The more you dump, the more you pay.

There are major problems with the communal collection system as well. The first major difficulty is that the containers are often too high for the public to accurately dump the waste and therefore in the event, the waste is dropped on the immediate surroundings. Another problem with the communal container system is that sometimes, it takes the operators many days before emptying is done. This creates unsightly scenes with bad odour. A third major problem relates to the distances residents have to travel to access the communal container sites. Literature on distance decay theory [29, 24, 6] have established that there are maximum travel thresholds within which households will voluntarily access the central containers and once this is exceeded, utilization tends to fall off considerably. Indeed, these leading scholars on distance studies had established that the longest distance residents have to travel to access a container should not exceed 200meters and that distance beyond 200meters most cases, serves as a deterrent for households to look for alternative dumping sites, which invariably are very close to their living places.

5.2.3. Final Disposal

Analysis of secondary documents from the MLGRD shows that Ghana follows the "end-of-pipe approach" to SWM where generated solid waste is collected and disposed of in open dumpsites, which by far, remains one of the most reliable and economically viable methods of managing MSW [30, 31].

Poor solid waste management has not just become a local public health issue, it has been recognized as a global environmental problem, because of the significant contribution of waste-related emissions to climate change (UNEP, 2011; UNFCCC, 2005). Indeed, waste-related greenhouse gas (GHG) emissions are estimated to be 5% of the total GHG emissions and are expected to increase to 9% in 2020 (Singh, et al., 2014). This has therefore brought excessive pressure on national governments to adopt an environmentally sound approach to SWM that must go beyond the technical guidance on the development, operation and monitoring of solid waste disposal sites as provided through the Government's Minimum Requirements [4].

The final disposal sites in Ghana are often located in an ecological and/or a hydrological sensitive and challenging neighbourhoods including abandoned valleys without proper leachate or gas recovery systems. Their maintainance therefore fall short of the legally set standards required for safeguarding public health and environmental quality. These sites tend to be disturbingly degraded but typically, 'environmental pollution' becomes a veritable buzzword, adapted inadequately, or adopted uncritically to mask actions or inactions of the city authorities who ought to have done better. Such a situation risks embedding unsustainable structures, processes and outcomes and therefore, there is the need to shift emphasis towards understanding these socio-ecological transformations and dynamics within the fundamental Ghanaian context.

Residents living in the environs of the disposal sites, have on countless occasions threatened to forcefully close down the facilities because of the overpowering stench, mosquitoes and insects emanating from the dumpsites. This has created a situation where public acceptance of such noxious facilities is fast diminishing, with some adopting a 'build absolutely nothing anywhere near anything' attitude. The Oblojo waste dumpsite in Accra and the Dompoase landfill in Kumasi present a microcosm of such causalities of public disenchantment [32]. As a trade-off for using the area as a dumpsite, the Accra and Kumasi Metropolitan Assemblies promised to provide infrastructure services but failed to follow through. Residents support their actions with statistics from the Ghana Health Service which indicate that about 80% of all cholera and diarrhea cases come from communities where waste management is a challenge [33].

The increasing rate of urbanization coupled with competing demands for poverty alleviation, means much more focus has had to be placed on appropriate but cost-effective methods of managing household waste, which is growing at an average rate of 3% annually [22]. The magnitude of the problem manifests more clearly when viewed against the Ghana's land area of 238,000 km^2, with 24 million people and 47,800 settlements, including 6 metropolitan, 49 municipal, and 161 district capitals [34]. This situation, by implication means that open spaces are becoming less available, thus making the practice of open disposal unsustainable.

5.3. Solving the Solid Waste Conundrum

Awareness is gradually improving with NGOs and civil society groups assisting community-based organizations in educating their residents on sound household waste handling, while demanding better service from the city authorities [35].

Nevertheless, the urgency of this matter remains unabated, given that low-income, high-density settlements may absorb up to 70% of these cities' populations [36]. At this point, the paper discusses some of the options that are already known which should be intensified and fortified to help meet the solid waste management challenge. Other stakeholder activities that are also involved in managing solid waste, but are often lost from the radar will also be unskirted. All in all, the hope is that all the options will be used in an integrated manner to achieve sustainability in solid waste management, recognizing that no single solution is enough. As a first step, the paper proposes that solid waste management system in Ghana should rely on a more integrated approach, whereby the stakeholder base is broadened to capture both formal and informal players. It is for this reason that the contribution of the informal sector becomes very critical.

5.3.1. The Role of the Informal Sector

Literature on waste management at the household levels demonstrates the heavy reliance on informal initiatives in low-income neighborhoods [37, 6, 4]. The services of the informal sector is critical because of its multiple contributions towards the realization of Millennium Development Goals One and Seven; creating employment for low-income citizens; improving public health and reducing the environmental footprint [38, 39, 40, 41]. The informal waste management sector refers to the indigenous, unregulated and unregistered activities of people and households with respect to waste collection, disposal and recycling. One such informal initiative that is fast becoming popular is the professional waste pickers – locally called 'Kaya bola' in Ghana. They use carts drawn by horses, donkeys, bicycles, or tri-motors [42, 43, 44]. to convey the solid waste they have collected from the communities to the final disposal sites, at a fee that meets the pocket of the poor resident. The salience of their work is that they are able to meander their way through the nook and cranny of the communities where vehicular access is limited. Unfortunately, in the development discourse concerning appropriate MSWM practices and its related handicaps, very little attention or appreciation is given to the traditional skills, endurance and resourcefulness of these people, who for years have been the 'unnoticed' backbone of MSWM at least in the low-income areas [37] (see figure 3).

A 2011 survey conducted at Moshie Zongo[1], show that approximately 80% of the surveyed households utilize Kaya bola services, making them very significant in the waste management system [19]. Despite the considerable economic and social benefit they produce, they are also seriously threatened by disease organisms, sharp objects and other hazards in the waste as they generally lacked protective equipment. The problem is even made worse as hospital waste from the various private hospitals; liquid waste from baby diapers as well as other hazardous substances from the light industrial areas are all picked together, thus increasing the risk of infections.

Figure 3. Informal waste workers carting collected waste

In an unstructured interview with some informal waste pickers, they confessed to the negative impact of the business on their health, albeit at different degrees and in varying dimensions. The commonly perceived health problems mentioned included eye irritation, respiratory diseases with coughing and sneezing, skin diseases, especially scabies, minor injuries from stepping on broken bottles or sharp objects in the refuse, headaches from working in the sun and backaches from excessive bending of the body with frequent intensity.

Additionally, the informal waste collectors usually operate in hostile and life threatening environments [45]. They are sometimes regarded by city authorities as nuisances, embarrassments, and criminals, even though they cannot be completely exonerated from some criminality and acts of violence as records from police show. They are also not recognized by the formal rules as important stakeholders in the solid waste management system. Regardless of other interventions, if they are incorporated into the SWM process, the convenience, reliability, and the cost of Kaya bola services will undoubtedly help in sustaining solid waste management in Ghana.

An area of opportunity would be to provide these informal waste workers with improved working conditions to ensure their health and safety. If the government can provide and maintain good health and safety standards, it may provide some incentive for the informal waste workers to incorporate themselves into the formal sector in exchange for health services and better working conditions. This will not only contribute to reducing the amount of money the government has to pay to private waste contractors for the inefficient service, it will also lead to the total improvement in the waste management service.

5.3.2. Recycling and Composting

As observed by [46] society's increasing demand for raw materials has become challenging and economically unsustainable and this has compelled many local authorities to rethink and embrace the concept of recycling as a sound approach to solid waste management. While there is

1 A low income, high density community in Kumasi

evidence that one of the efficient ways of managing waste is to encourage recycling at all levels (household, institutional and national), state participation in this endeavour has been piecemeal. The mandated government institutions in charge of managing solid for instance do not play a direct role in solid waste recycling and that they mainly focus on collection, storage, transportation, and disposal of solid waste [32]. Recycling in Kumasi and Accra is done voluntarily, at lower levels and without institutional backing, meanwhile formal recycling programs are necessary for effective and sustainable waste management. The research revealed that the benefits of waste recycling can be enamours: plastic waste recycling, for instance contributes significantly towards tax revenue and foreign exchange generation for the state. In the words of the director of the KMAs waste management department;

"Ghana gains a substantial amount of dollars from the export of recycled plastic to neighbouring countries such as the Ivory Coast, Togo and Nigeria".

Again, the country saves a substantial amount of foreign exchange that could have been used to import raw materials for the plastic industry.

The recycled plastic waste serves as a resource for the production of sign and information boards, garden furniture, litter bins, garden fence, and toys among others; hitherto, these items were imported. In an interview with the registrar general of companies in the Ashanti Region, he mentioned that many companies have applied to recycle plastic waste in the Region and that when they start their operations, the employment base of the country will increase significantly. By implication, plastic waste recycling could constitute a single largest source of informal employment and revenue in the country despite the negative environmental impact.

Similarly, e-waste recycling has become a 'market niche' for the informal recyclers in Agbogbloshie, an indigenous community in Accra, where thousands of refurbishers repair and sell used electronics [47, 48]. Their studies show that the current recycling pathways are economically driven, fuelled by the urbanization of poverty and lax environmental laws. The research further revealed that on a good day, a waste recycler earns on average 3.50 USD per day, a figure above the minimum daily wage from formal employment [19]. Giving the importance of recycling in managing solid waste, it is important that formal rules and regulations are put in place and fortified as part of the waste management strategies.

Another way of ending the solid waste management conundrum is to practice composting, which seeks to transform refuse into a valuable commodity. This approach will also reduce the quantity of solid waste that goes to the landfill. In a country where organic waste is estimated to be about 65% of the waste stream, composting becomes essential as solid waste management strategy. Compost has high agronomical value and could be used to improve crop yield in the country. The research however revealed that composting was a very complex and expensive activity that goes beyond the capabilities of individual households. Composting in Ghana has little success stories to tell.

The case of the Teshie Compost Plant may shed light on the problems confronting this technology. A large-scale composting plant was constructed in Teshie, a suburb of Accra, in the late 1970's. The plant was initially established to produce compost fertilizer from household organic waste [49]. However, the plant did not have the managerial capacity to source separate the feedstock and composted mixed waste, resulting in the production of compost of insufficient quality to be utilized as fertilizer by vegetable growers. The plant was never able to operate at full capacity and the technology was strained by frequent breakdowns [49]. The Teshie compost plant today is little more than an additional landfill site.

In 2012, Zoomlion Ghana Limited constructed a $40 million material-recovery facility at Adjen-Kotoku in Accra for sorting and composting of solid waste. Documentary evidence show that the facility has the capacity to process 300 tonnes of waste in an eight-hour shift and pelletise recovered plastics to be sold to end-users for the manufacture of plastic items such as plastic chairs, carpets, bowls and many others. It is also purposed to produce compost or organic fertiliser to feed local farmers to support the production of food for human consumption.

However, few years after its inauguration amidst pomp and peagentry by politicians, chiefs and some waste management groups, the facility has suffered three closures with the last one occurring on May 19, 2014 [50]. Three reasons have always been at the core for the frequent suspension of operations-lack of funding from the central government (the main client), frequent power outage resulting from Ghana's energy crises and high cost of operations due to the fact that the waste is not source segregated. In an interview, the public relations officer of the company opined;

"our outfit has not received any mony from the Local Government Ministry (government agency responsible for waste management) for managing waste in Accra, it has become difficult in operating the plant since operational cost are finance with loans. What makes the situation precarious is that the government has not shown any signs that payment is in sight", he concluded in fraustration.

Commenting on the other difficulties, a managing director of the company lamented;

..... "further complicating our operations is the current energy crises facing the nation. As a result, most of the operational capacities that rely on power such as the electronic weighing machine has not been functioning as it is supposed to. Using power generators also add to our already high cost of operations".

These narrations provides a tiny snapshot of how other external factors have affected the smooth operation of a waste management facility that has the ability to reduce the filt that accumulates in the city.

Unlike Accra, composting as a waste management strategy is not an option for Kumasi within the short and medium term plans. In an interview with the director of the

Kumasi waste management department, he explained that as of the time of carrying this research, all composting plant in the KMA had been decommissioned; this according to him was due to high operating costs and the mixed municipal solid waste, without source separation. He however stated that composting as an option for solid waste management was being considered as the city authorities were monitoring a similar project in Accra, the nation's capital (as alluded to earlier). It should be noted here that the success of composting will depend on whether market for compost exists; the sale of compost could help support the local economy as well as provide a pesticide-free fertilizer and soil amendment for local farmers. Composting can also provide a means of employment for the youth, and eventually, will encourage a more participatory approach to waste management services, a condition needed for effective and sustainable solid waste management.

6. Concluding Remarks: The Formal-Informal Nexus

Formalizing informality in solid waste management as used in this context refers to complementing and/or integrating the activities of the informal waste management sector and the formal waste management sector in a mutually beneficial relationship in order to ensure environmental sustainability and poverty alleviation [51, 52]. Evidence abound [53-56] with regards to the critical role that the informal waste sector plays in filling the vacuum created by the operation of the public sector in the delievery of SWM services. They collect waste from difficult to reach neighboughoods and deposit them at designated communal sites for onward collection by waste management skips that are owned by the formal sector.

This situation portrays a symbiotic relationship which eventually impacts positively on solid waste management in the short, medium and long term. The services of the informal sector is not only cost-effective but saves energy and protects scarce natural resources. At the same time, local authorities save significant expenses, which they would have otherwise paid to private waste collection contractors. Notwithstanding the foregoing argument, an increasing shift of cities to the adoption of a 'modernised' waste management systems, presents a likely high chance of rifts between the already existing arrangements between the two sectors regarding the ownership of waste [5]. To avoid such situations it is important to create a balanced system.

This study has shown that since the establishment of the waste management departments in Ghana, several policies have been adopted to address the problem of poor SWM. These policies have not shifted focus from draconian rhetoric and personal responsibility, to one of investment in urban infrastructure. Ghana has often taken an outward-oriented view by acceding to a so called attractive proposal from the IMF and the World Bank, which aims at market reforms. Central to this, is the goal of encouraging deregulation of various aspects of the economy including waste management and other environmental services. The waste management services endorsed by the Britton Woods institutions aims at shifting the burden of the cost of waste management to the private sector, who in turn, shifts that burden to the already troubled citizens.

Attractive as the World Bank policies may be, they fail fundamentally, because the policies fail to acknowledge the presence of some important local actors such as the 'Kaya Bola' and informal waste recyclers whose contributions to the entire solid waste management system are crucial. Additionally, community participation in the planning and implementation of such programmes are minimal or nonexistent at best, thus virtually consigning the concept of local participation to its grave at birth. Whilst we acknowledge that community participation and active involvement of informal waste worker should complement the neo-liberal policies already in place, how they should be incorporated is also an important factor. As a way of recommendation, we posit that there should be a substantial rethinking and a renewed role of the informal sector in order to develop a new paradigm for efficient and sustainable solid waste management in Ghana.

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