

ASSESSMENT OF MUNICIPAL SOLID WASTE MANAGEMENT PRACTICES IN ACCRA, GHANA

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ABSTRACT

There is a great deal of concern about the problems associated with the conventional approach to solid waste management in Accra, Ghana's capital city. This article traces the history of Accra's Municipal Solid Waste Management System, providing a detailed description and analysis of its practices and policies and suggests solutions to improve the efficiency of the city's Waste Management System.

BACKGROUND

The metropolis of Accra covers sixty-eight electoral districts grouped under the six sub-metropolitan districts of Ablekuma, Okaikwei, Ayawaso, Asiedu-Keteke, Osu Klottey, and Kphesie (see Figure 1). Accra grew out of a series of coastal fishing villages: James Town, Ussher Town, Osu, and Labadi, which was primarily a farming community. East of Labadi were the fishing villages of Teshie and Nungua. Initially, fishing was the main economic activity of these villages, but there was extensive trading in ivory, gold, and other merchandise, as well as slaves, between the settler communities and European traders living in Christianborg castle, Crevecour, Ussher, and James forts [1].

Urban land use in the metropolis is 70 percent residential, 20 percent industrial, 8 percent recreational/open space, and 2 percent commercial [2]. In the city, the old indigenous and settler areas of James Town, Sukura, Nima, Sabon Zongo, Chorkor, Maamobi, and Salaha are unplanned and characterized by overcrowding, inadequate sanitation and waste collection facilities, and substandard

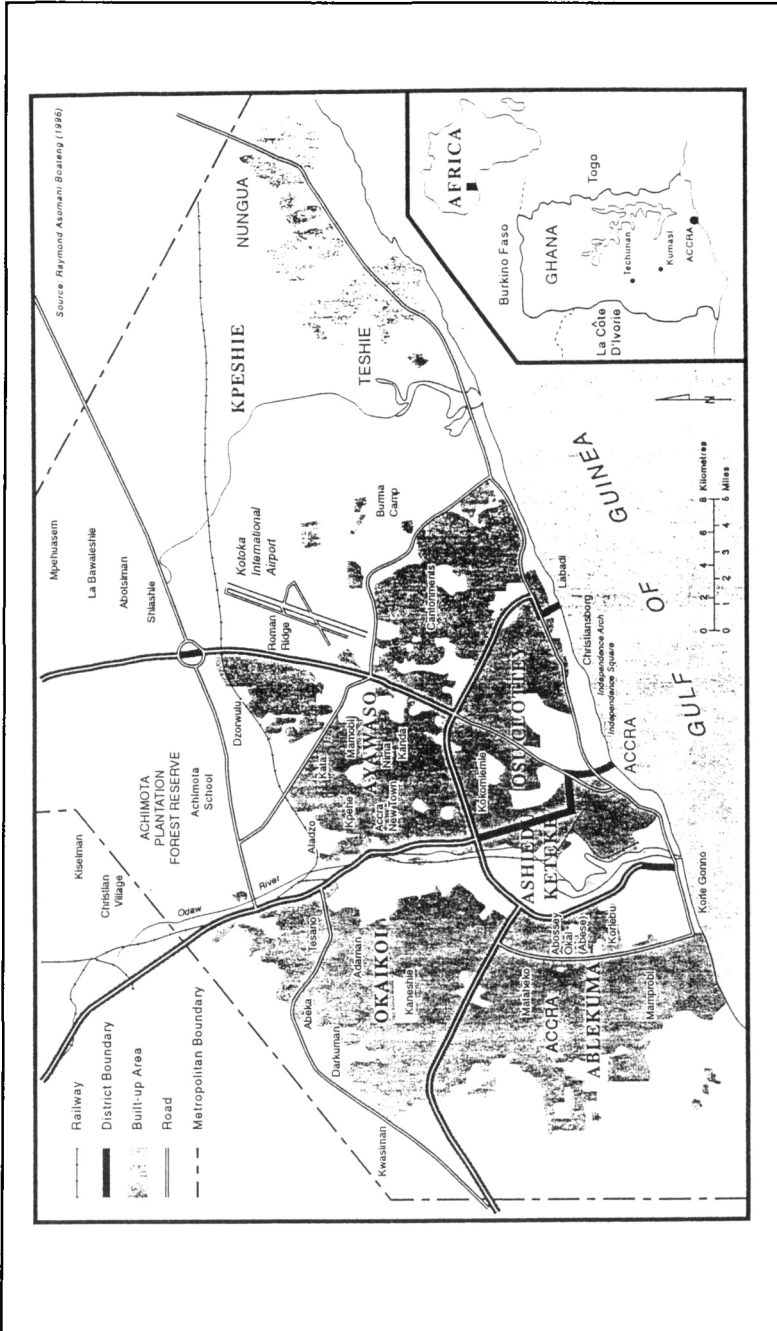


Figure 1. Accra metropolitan area.

housing. In contrast, newer neighborhoods such as North Labone, Airport Residential, Cantoments, and Dzorwulu are well planned with roads, good housing and access to municipal services [3].

The 1987 industrial census revealed that 32 percent of the country's manufacturing industries were situated in Accra. The city also sustains major financial institutions, government ministries, parastatals, multinational corporations, and other industries. The 1984 census indicated that 26 percent of the workforce is in the formal service sector, 24 percent in the wholesale and retail trade, 19 percent in manufacturing, and 3 percent in agriculture. In 1970, Accra's population was 636,667; it increased to 964,789 in 1984 and was estimated to be 1.1 million in 1992, with an annual growth rate of 5.5 percent [4].

OVERVIEW OF MUNICIPAL SOLID WASTE MANAGEMENT IN ACCRA

Municipal solid waste management in Ghanaian cities and towns in pre-colonial times was local, with each neighborhood looking after its own sector. Domestic waste handling and disposal was strictly carried out by female members of the household and the community at large, who saw to it that the neighborhood surroundings were clean. Women had the right to question and punish any member of the community, or an outsider, who dumped waste indiscriminately [5]. Municipal solid waste consisted mainly of household waste, a significant proportion of which, in the form of kitchen scraps, was fed to livestock; what was left, including street and compound sweepings, was recycled into food cultivation. Any waste that could not be reused was dumped, buried, or burned.

Municipal Solid Waste Management changed drastically during the period of colonization. Colonialism initiated changes in towns and cities; several cities were created as administrative centers for the colonial government, and, due to changes in the economy, migration increased. Towns and cities thereby increased in size and population. With such increases, the quantity and characteristics of the municipal solid waste produced also changed. As a consequence of the importation of manufactured goods, paper, plastics, glass, and metal became important components of the municipal solid waste stream even though the organic content was still dominant.

The expansion of cities called for new forms of waste management. Ghanaian cities, especially Accra, experienced the same unsanitary conditions that existed in European cities during the Industrial Revolution. The unsanitary conditions which existed in British cities led to the passage of the 1848 Health Act which sought to redress these problems. This Act emphasized the concept of the public sector provision of municipal services in the form of street cleaning, waste collection and disposal, sanitation, and water supply [6].

In African cities, a strong correlation between “dirt” and infectious diseases was established. Bruce claimed that “the filth track, the cholera track and the fever track were identical.” Hence, good health was seen to depend upon proper urban sanitation, which could only be achieved by the establishment of a centralized body to plan, provide, and manage adequate municipal services, including waste collection and disposal [7]. In Accra, Ghana, the introduction of municipal services dates back as far as in 1877 [8] with the establishment of the Accra Municipal Council, which was entrusted to provide essential urban services, specifically: refuse collection and disposal, sanitation, good drinking water, street lighting, and market and slaughterhouse facilities [9].

After independence in 1957, the provision of urban services in Accra continued to be the responsibility of the Accra city council and the management of urban solid waste was assigned to three departments of the Accra City Council, now the Accra Metropolitan Assembly (AMA). These were the Medical Officer of Health, the Mechanical Engineers Department, and the City Engineers Department. The Medical Officer of Health’s department was responsible for the collection and disposal of all solid and liquid waste by a team of laborers under the direct supervision of health inspectors. The Mechanical Engineers Department provided and maintained trucks and loading equipment. The City Engineers Department constructed and maintained civil works related to the storage and disposal of waste.

In 1985, with a loan of nine million Deutschmarks from the German government, the three departments were merged into the Waste Management Department (WMD) to manage municipal waste in the metropolis. Section 51(1) of the local Government Act of 1988 (Provisional National Defence Council Law 207) gives the WMD the sole responsibility of managing waste in Accra. The WMD operates as the sole agency of the AMA for the storage, collection, treatment, and disposal of solid and liquid waste. Other services performed by the WMD include weeding and sweeping public places, supervising the operation and servicing of public latrines, and street and drain cleaning.

SOLID WASTE GENERATION AND CHARACTERISTICS

The population of Accra generates approximately 750 tons of refuse per day and the per capita generation is 0.5 kg a day [10]. The daily generation of solid waste in the metropolis is expected to increase by 3.7 percent annually. The wastes generated consist of: organic wastes (63%), inert (22%), plastics (3.4%), paper (4.9%), glass (1.9%), metals (2.6%), others (2.3%) [10]. The main sources of solid waste are residential, commercial (markets, shops, restaurants, and hotels), industrial, and institutional (hospitals and schools). Restaurants and markets in the city generate 60,000 m³ of organic waste each year [11]. By weight, domestic solid waste constitutes 85 percent of the municipal waste

stream; the remaining 15 percent is accounted for by commercial, industrial, and institutional sectors.

MANAGEMENT PRACTICES

The city's municipal solid waste management practices involve storage, collection, transportation, and final disposal.

WASTE STORAGE

Household Waste

An assortment of containers, such as wooden crates, plastic pails, metal buckets, cardboard boxes, and raffia baskets, are used for the storage of household solid waste on premises in poor and high density areas of the city. Containers are kept in backyards, kitchens, and courtyards prior to being emptied into a neighborhood container or disposed of at a community dump. Durable containers are kept inside homes to avoid being stolen by thieves. Because these containers are usually uncovered they attract flies and domestic animals. High income residential sectors such as Airport, Ridge, and Cantoments, which are serviced by house-to-house collection, use 120 and 240 liter bins for the storage of domestic solid waste.

Street sweepings and market wastes are also taken to temporary storage sites consisting of movable metal containers and four-sided masonry structures. These structures, constructed in the mid 1950s, have door openings and remain virtually unused now, except as hideouts and operating points for thieves and drug dealers, and as abodes for the homeless.

Commercial and Institutional

Restaurants, hotels, banks, educational institutions, markets, and other commercial establishments store their refuse in non-standardized containers, the contents of which are emptied into containers provided by the Waste Management Department for final disposal.

Hospital and Industrial

Major health institutions in the city, including Korle Bu, Ridge, and Mamaprobi and Adrabaka polyclinic, which have registered with the WMD, are provided with containers for waste storage. Private clinics, health centers, and dental and veterinary clinics spread throughout the city store their refuse in non-standardized containers and finally dispose of the contents at open dumps, communal bins, and open spaces. Similarly, industries which are covered by the industrial waste service of the WMD store their waste in containers provided by

the department. Those not covered, especially informal small scale industries, store their waste in an assortment of containers and dispose of their contents in open spaces, drainage channels, and at open dumps.

TRANSPORT

Equipment for solid waste management in Accra consists of large capacity motorized vehicles which are very expensive to maintain. The WMD transports solid waste from its central containers and houses, using multi-lift and compaction trucks, to the city's main disposal sites. When the department was created in 1985, it had thirty multi-lift trucks, nine cesspit emptiers, four compaction trucks, and two pay loaders. In 1993, nineteen multi-lift trucks, eight cesspit emptiers, four compaction trucks, and two pay loaders were still functioning; the rest had broken down, and the lack of foreign exchange to import spare parts to fix them has led to their abandonment.

SOLID WASTE COLLECTION

Collection of waste in the city is discussed under residential, commercial, hospital, and industrial.

Residential

This involves three types of services: house-to-house collection involving the use of compaction trucks, collection by donkey-drawn carts, and central container services. WMD operates a small fleet of vehicles for its house-to-house service. There are about 7,000 house-to-house collections, in addition to commercial and government premises. House-to-house collection is restricted to high-income and some middle-income residential areas. Each house pays a direct fee of 2400 Cedis or 3000 Cedis per month, for 120 liter or 240 liter bins respectively (1US\$ = 1000 Cedis, 1994 exchange rate). Donkey-drawn cart service covers North Tesano, parts of Ablekpe, Dzorwulu, and Roman Ridge. Refuse bins are emptied into donkey-drawn carts for transfer to central containers, where the waste is eventually disposed of at a final disposal site.

Areas of the city not covered by the house-to-house collection rely on the central container service of the WMD. The department has 183 container locations and 100 official communal dumps; the number of illegal dumps in the city is unknown (see Figure 2). The containers have 7, 10, and 16 cubic meter capacities to serve an estimated 45,000 houses in the city. Size 7 and 10 containers are placed in residential areas, where each container serves a threshold population of 3000 residents. Size 16 containers are placed in markets. The inadequate number of containers, as well as delays in collecting and emptying them when full, are cause enough for some residents indiscriminately to dump their waste into drains,

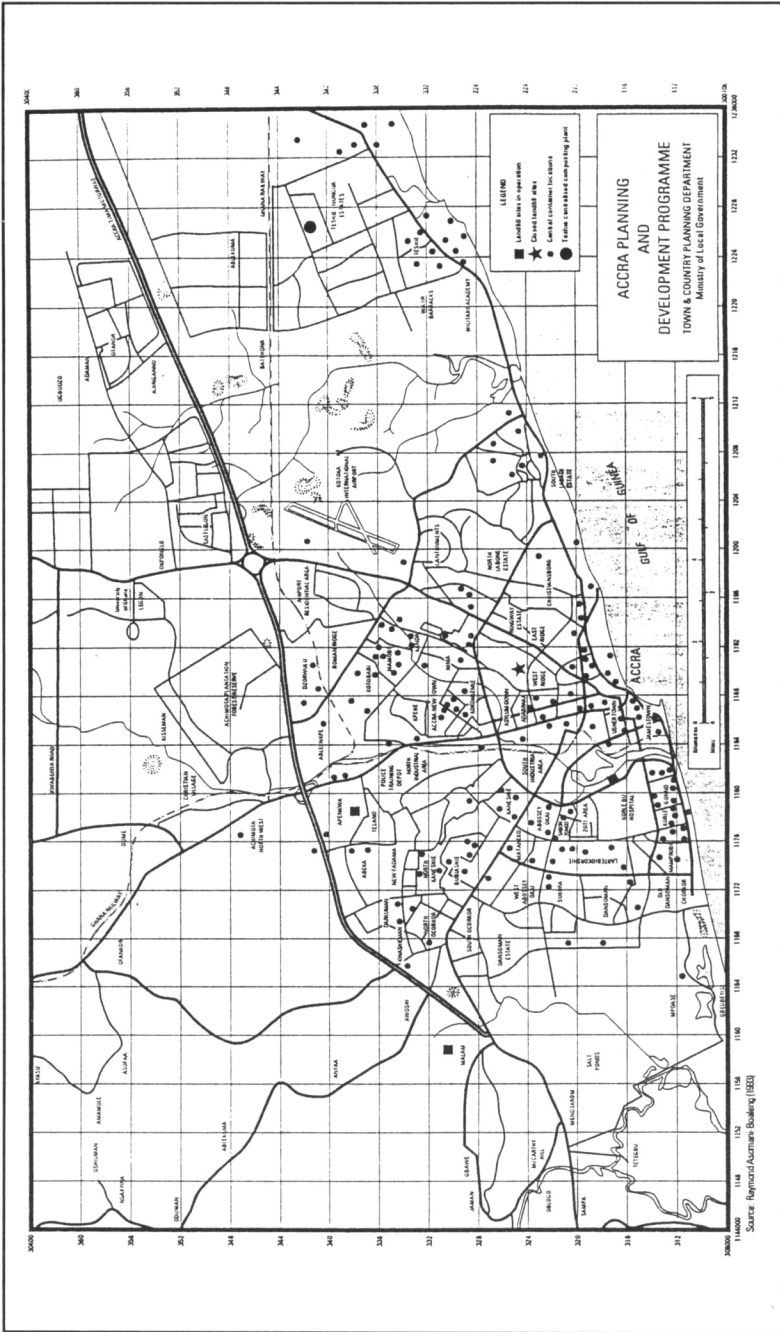


Figure 2. Location of central containers and landfill sites in Accra.

open spaces, and creeks. The height of the containers, the great distances of the containers from the nearest houses, and their open nature discourage their usage by residents. The sides of the containers measure 2 to 3 meters high, which makes it extremely difficult for residents to empty their refuse into them—especially since children have the traditional role of disposing of household refuse. There is a risk of children falling into the containers. Consequently, most children dump refuse elsewhere. Also, since the containers are not covered, they are scavenged by waste pickers and domestic animals who scatter the wastes. Finally, residents who must cross busy streets to dump their waste into containers run the risk of being struck by a vehicle. In Nima, a high-density residential community in the city, five children lost their lives between 1991 and 1993 as a result of crossing the busy Nima highway to dump household waste into containers located on the other side [12].

Commercial

Commercial and institutional waste collection is provided for approximately seventy customers, primarily stores, hotels, restaurants, banks, educational institutions, and markets. Containers of variable sizes (3.2 m³, 7 m³, 10 m³, and 16 m³ as well as 250, 600, and 1,100 liters) are deposited at these locations by the WMD. These containers are emptied twice a week by using multi-lift trucks. Compaction trucks are utilized for the 240, 600, and 1,100 liter containers. The eighteen markets in the city which are managed by the AMA are provided with 16 cubic meter containers. On average, approximately four hundred trips in total are made each month to empty these containers.

Hospital

Hospital wastes from the city's main hospitals and clinics are collected and disposed of by the WMD. These wastes are stored in 240 and 1,100 liter standard receptacles provided by the department. There is no differentiation between infectious and non-infectious, or hospital-specific and domestic waste. All such wastes, including hypodermic needles, are dumped into the same container and trucked to the city's disposal sites. Private medical practitioners who operate health posts, dental, and veterinary clinics dispose of their waste into community containers, and at illegal community dumps.

Industrial

The industrial waste service of the WMD covers only a few companies in the city's industrial areas which have registered with the department. These registered industries are provided with containers which are picked up twice a week; the waste is disposed of in the city's poorly managed landfill sites. Owing to inadequate technology, waste collected from industries is limited only to that

which has characteristics similar to domestic waste. Industries not registered with the department are serviced under the house-to-house collection or central container services. This means that hazardous industrial wastes enter the municipal waste stream.

SOLID WASTE DISPOSAL

The main methods for municipal waste disposal in the city are controlled landfill, open, and indiscriminate dumping. Ring Road West and Mallam are the two landfills in operation in the city (see Figure 2).

Ring Road West Landfill

This site, which used to be a marsh bordering the Korle Lagoon, became operational in 1988 and was supposed to operate for three years; in 1993 it was still in operation. As of 1993, 500,000 cubic meters of solid waste had been dumped at the site. This landfill receives the largest quantity of collected waste in the metropolis. Municipal solid waste, including toxic hazardous wastes from hospitals and industries, are disposed of at this site. Surface runoff and leachate is not controlled and drains into the nearby Korle lagoon, causing pollution. Offensive odors from decomposing refuse can always be detected. The practice of setting the dump on fire to reduce waste volume produces a lot of smoke which engulfs neighboring residential areas. Because methane generated from the heap is not tapped, the fire burns all the time, creating life-threatening situations for waste pickers and waste collection crews, as evidenced by the deaths of two children trapped in the burning refuse while picking waste at the site in 1991 [12].

Mallam Landfill

This site was opened in 1991 and is planned to last until 1999. It was an unused laterite burrowing pit that was converted into a landfill site. There is no permanent compaction or covering of fresh waste, nor is there treatment of leachate or contaminated surface run off. Flies, windblown litter, dust, and offensive odors are some of the problems at the site.

Open Dumping

The WMD operates 100 open dumps in the city, where the bulk of the municipal solid waste not disposed at the two landfills are dumped. Uncontrolled burning, which takes place at these dumps to reduce waste volume, is a major source of air pollution. They are also sources of offensive odors, flies, and rodents, all of which degrade the urban environment. With inadequate excreta disposal facilities in poor and high density neighborhoods, these open dumps

serve as places of convenience for a majority of residents in these areas and serve as hideouts and operating points for thieves and people who deal in marijuana and cocaine.

Indiscriminate Disposal

Indiscriminate disposal of solid waste in Accra is widespread, as evidenced by the familiar sight of solid waste in drains, along roads, in creeks and dry valleys. Household and commercial waste deposited in drains often clogs them, resulting in flooding, especially during the rainy season.

RECYCLING AND REUSE

Recycling and reuse of waste materials is practiced extensively in Accra. Materials recovered include glass bottles, paper, cardboard boxes, plastic products including cooking oil containers, bottles for liquid soaps and shampoos, plastic bags, metal scraps, and food waste, especially cassava and plantain peelings. Waste pickers going from house to house in wealthy or middle income areas buy or retrieve reusable and recyclable waste materials in the form of paper, bottles, and plastic items. These items are later reassembled and sorted out for reuse or sold to waste merchants. Timber market, located in the heart of the city, is a well-known area where waste materials are sold.

At the dumps, adults and children recover recyclable materials for resale. Domestic animals such as goats, sheep, and pigs are often seen rummaging for food on the dumps, often side by side with waste pickers searching for recyclable materials.

At the city's two landfill sites, waste pickers and laborers of the WMD recover materials that they will sell to waste merchants and artisans. At these sites some artisans have established workshops where they turn scrap metals retrieved from the landfill into cooking stoves, dustbins, and buckets. The Accra Metropolitan Assembly (AMA) has established a large-scale centralized composting plant at Teshie, one of the city's neighborhoods, to compost organic solid waste from the city's waste stream. The facility is designed to produce 200 tons of compost a day, but due to constant breakdowns, the lack of equipment, and the high cost of operation the plant is unable to produce at full capacity [12]; hence, this approach has proved ineffective as a waste management strategy.

STREET AND DRAIN CLEANING

Some 850 workers keep the streets of Accra clean through daily sweeping and cleaning of drains. Refuse from these services is collected into containers provided by the WMD and the contents finally disposed of at the city's main dumps. As streets are often used as dumping grounds, street refuse contains a

mixture of waste from several sources. In poorly serviced areas where sanitation facilities are lacking, street refuse contains substantial amounts of human fecal matter.

PRIVATIZATION OF SOLID WASTE COLLECTION

Between 1985 and 1995 the Accra City Council, in an effort to improve solid waste collection services in the city, initiated a policy of privatization. With this policy, the city would draw up contracts with private companies for refuse collection and make it the sole responsibility of the city council both to monitor the activities of these companies and to ensure that the contractors discharge their duties to the satisfaction of the city council, in accordance with the contract terms. Subsequently, pilot projects were implemented by contracting out waste collection in low and medium income residential neighborhoods which were not covered by the city's waste collection services. It is the intention of the city to privatize solid waste collection in the whole of the metropolis by the year 2000.

In low-income, high-density residential areas, privatization has not been successful due to the fact that residents in these areas cannot afford the fees charged. The inability of the city's WMD to provide adequate containers at communal storage points for the dumping of waste collected from individual homes, as well as trucks to haul away these containers when full to final disposal sites, has resulted in these communal storage sites remaining unsightly with uncollected heaps of refuse. Regarding medium and high-income areas, private contractors with the experience and equipment to manage these areas are not available. Contractors who bid for solid waste collection in these areas are required to possess highly sophisticated vehicles such as rear-loading compaction trucks, multi-lift container vehicles, and tipper trucks. Since local private contractors do not have the equipment, the contracts are not won.

SPECIFIC PROBLEMS

The previous discussion demonstrates that Accra's conventional waste management system is ineffective and inefficient. Specific problems resulting from the city's waste management practices are examined below.

Coverage

Waste collection and disposal coverage is grossly inadequate. Residents in poor and high density residential neighborhoods do not have access to the city's waste collection and disposal services. The WMD estimated in 1992 that 35,000 houses in low and medium income residential areas of Accra did not have access to waste collection and only 60 percent of the 750 tons of solid waste generated daily in the metropolis was being collected and disposed of [13]. As a result, the dumping

of waste into drains and open spaces is common in these areas. Even the portion that is collected is not disposed of in a sanitary and safe manner as portrayed above.

Final Disposal

The co-collection and co-disposal of hospital, industrial, and household wastes causes serious health and environmental problems. Hazardous industrial waste and pathogenic waste generated by hospitals, primary health care centers, dental, and veterinary clinics enters the municipal waste stream because there are no appropriate measures for their collection and disposal. This poses a serious health risk to the public, due to increased potential exposure to such diseases as AIDS. The city's two "landfill sites," which receive about 90 percent of waste collected by the WMD, are poorly managed. The location of these landfills within the city's built area, without any proper management procedures to manage leachate, surface runoff, odors, landfill gas, and the practice of setting these landfills on fire for the purpose of reducing waste volumes, results in the pollution of the urban environment and constitutes a potential health risk to the city's residents.

When waste is not collected, unsanitary conditions develop which are linked to the prevalence of parasites, tetanus, malaria, hookworm, cholera, and diarrhea [14]. Songsore and McGranahan revealed that malaria, diarrhea, intestinal worms, and upper respiratory tract infections were among the most common health problems reported at out-patient facilities in the Greater Accra Region [15]. Generally, in the city of Accra the major health problems are diseases attributed to poor environmental sanitation and exacerbated by ignorance and poverty [16]. Statistics show that over 50 percent of the most frequently reported diseases in the city in 1995 were environmentally related [17].

Waste dumped into storm drainage channels, creeks, lagoons, and other water impoundment points creates serious environmental problems which can develop into disastrous situations. The recent floods in the city which caused the death of twenty residents and destroyed property worth millions of dollars were attributed partly to refuse which had blocked the city's drainage channels and silted water impoundment points [18]. The disposal of waste into Accra's Korle Lagoon has destroyed the lagoon's ecosystem and now threatens the health of nearby residents. According to ecologist Theo Anderson:

If you fall in there you will be dead in minutes. The Korle Lagoon is one of the most polluted places on earth. It is a natural depression that serves as a cesspool for most of the city's industrial, hospital, human and household waste—it is an environmental nightmare. Owing to the pollution, no living thing, animal or plant has been able to grow in it for years. Even boaters steer clear of its thick black nauseating syrup. Its stench wafts back to envelope the adjoining shanty towns that are home to hundreds of families who because they have no sanitation facilities have turned the shores of the lagoon into a giant latrine [19].

CAUSES OF INEFFECTIVENESS

Poor planning, lack of financial resources, and the adoption of inappropriate and expensive technologies are major factors contributing to the failure and ineffectiveness of the city's waste management system.

Municipal Solid Waste Management planning, as shown in our earlier discussion, is centralized and informed by the "Rational" planning model, which emphasizes a top-down approach to municipal waste management. It emphasizes a formal body of techniques, rules, and practices for the planning and organization of solid waste. This emphasis on formal, technical, and scientific elements restricts the involvement of the majority of actors who can play a meaningful role in the planning, managing, and providing of solid waste management services.

Reliance on expensive mechanized systems in the face of limited resources means that investment in new systems, along with the successful operation and maintenance of these systems to respond to increasing quantities of solid waste generated by the Accra's expanding population, is lacking. Financing the city's solid waste management operations requires about one-third of the total municipal budget [12], and the present municipal solid waste management operations is being sustained by funds from the German government. The challenge, then, is: can the city's waste management system be improved to be environmentally, economically, and socially sustainable now and in the future, when there is no more foreign aid?

CONCLUSION

Given our discussion so far, municipal solid waste management is a serious concern in Accra. Management practices and policies modeled on that of developed countries have not been as effective as expected. It is also apparent that neither the government nor the private sector can handle Accra's solid waste management problems, and since there is a need for adequate and effective provision of waste collection and disposal services, strategies to achieve this goal must be found.

- There is a need for an integrated approach to solid waste management in the city which will allow for greater participation from various actors, at different levels: city, private sector, community/neighborhood, etc. Within this framework, emphasis should be placed on waste minimization through source reduction and recycling. The organic fraction of the city's waste stream could be recycled into compost and used by the city's urban cultivators, who are in need of soil conditioner. As a waste management, income generating, and job-creating strategy, poor and high-density residential sectors of the city, where waste collection and disposal is problematic, should be involved in organic solid waste composting. Community-based organizations within

these neighborhoods must be given the responsibility of organizing and implementing community-based composting projects. Industrial, commercial, and institutional sectors must be encouraged to minimize their waste through source reduction and recycling.

- There is a need to rely on simple, cheap, and easy to operate technologies which can be obtained locally for solid waste collection. Regarding the treatment and management of hazardous waste, where technology does not exist locally it could be obtained through foreign assistance. Foreign assistance is not an unlimited resource, and should be drawn on only in cases where no local solution is available.
- Health education should form an important component of the school curricula at all levels, and continuous public health education campaigns to instill awareness about the negative impacts of inappropriate waste disposal practices should be a necessary component of the city's waste management system. In this regard, various organizations and actors involved in the management of solid waste, and the media must be involved.
- Currently there is no specific legislation, regulations, or guidelines for the management of hazardous waste in Ghana. A legislated code of practice should be promulgated for the handling and safe disposal of hazardous waste from hospitals, clinics, and industries.

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