Municipal Solid Waste Management in Greater Jos, Nigeria

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Abstract
In Nigeria, municipal solid waste management is an integral part of the waste management system. The current status of municipal solid waste management in Jos, a rapidly growing urban city in Nigeria has been reviewed through literature and other relevant documents. In addition, information from in-depth interviews conducted on senior government officials, industry stakeholders, participant observation and questionnaire survey on residential neighbourhoods have been used in this review of municipal solid waste management problem in Greater Jos. The problem is the existing municipal solid waste management system which is affected by unfavourable economic, financial, institutional, legislative, technical, operational and socio-cultural constraints. Despite recent improvements in the operations of the existing system through engagement of tasks force on environmental sanitation, municipal solid wastes are still dumped along roads, in culverts, drainage channels, underneath bridges and any available open spaces. A reliable municipal solid waste collection service that will be appropriate to local conditions is needed. Cooperation among the formal and informal sectors, communities, various stakeholders, good public awareness, attitudes and education is important. Markets for waste recyclable materials need to be encouraged. Small-scale composting plants could promote employment, income generation and poverty alleviation. Finally, recommendations for improvement include among others, policy and planning framework for municipal solid waste management, enforcing relevant clauses in development guidelines, accurate population data and funding for proper planning of waste management systems and infrastructure is necessary.

Key words: Greater Jos, Municipal solid waste, Planning, Stakeholder, Resource recovery, Nigeria

Introduction

Municipal solid waste has become an important issue in Nigeria. Piles of wastes are often found by roads, rivers and many other open spaces in cities, and this is causing significant planning and environmental problems. The urban population is growing at an alarming rate. While the Nigerian population is increasing by about 2.8% per annum, the rate of urban growth is as high as 5.5% per annum (NPC, 2008). This is increasing the difficulties associated with providing an effective solid waste management system. As cities grow, land use becomes increasingly complex and the wastes generated increase in volume and variety (Ogwueleka, 2009).

The dimensions and forms of municipal solid and hazardous wastes as a result of constant economic growth, development and industrialization, is undergoing a rapid rise in the whole world. According to World Bank report on solid waste management released in March, 2012, it is estimated that the total amount of municipal solid waste generated by urban residents globally reached 1.3billion tonnes per year with 1.2kg per person per year (Hoornweg and Bhada-Tata, 2012). The report (World Bank) further estimated that between 2012 and 2025, global generation of municipal solid waste will increase to 2.2billion tonnes with 1.4 kg/capita/day. Poorly managed waste has an enormous impact on public health, local and global environment, and economy (Hoornweg and Bhada-Tata, 2012). Improperly managed waste is more expensive than what it would have cost to manage waste properly in the first place (Hoornweg and Bhada-Tata, 2012).

The total nature of municipal solid waste includes: its contribution to greenhouse gas emissions; increasingly global linkages of products; urban practices; and the reprocessing industry. The significance of the issues is maybe best revealed in the level of devotion set to the situation in the United Nations Millennium Declaration-September, 2000. Three out of the eight Millennium Development Goals (MDGs) drawn in the declaration ensure waste or resource efficiency implications (UNO, 2007).

Solid waste management systems (waste storage, collection and transport, resource recovery and recycling, waste treatment and disposal) in Jos (see figure 1) the capital city of Plateau State in Nigeria have been assessed. Information was obtained from a variety of relevant government/private officials and organisations including the Federal, State, and Local Ministries, the Plateau Environmental Protection and Sanitation Agency (PEPSA), National Environmental Standard Regulation Enforcement Agency (NESREA), private sector companies, local residents and the informal waste sector. Problems associated with existing waste management systems and facilities have been identified. The legal, administrative and institutional framework and the role of informal recycling/ scavenging has been analysed, and ways of achieving more efficient and effective management recommended. The work reported in this paper was therefore aimed at identifying the problems that are basically of planning constraints in the waste management sector in Nigeria using Greater Jos municipality as a case study.

Figure 1: Map of Nigeria showing the strategic position of Greater Jos

Source: Google images, June 2013

Overview of Greater Jos municipality

Jos was created by the colonial administration having its growth tied to the history of tin mining activities on Jos-Plateau in Nigeria. The population grow in 1930 from not more than 10,000 to more than 600,000 in 1991 (Dung-Gwom, 2008). The current population of the municipality (see table 1) stands at over 1million people (NPC, 2008). Greater Jos is currently the capital and administrative/political headquarters of Plateau State. It covers Jos North, Jos South, and part of Jos East, Barkin-Ladi, Bassa and Riyom local government areas. These local governments were known to be one until in 1999 when they were separated as individuals' local government councils. Jos landscape is changing as a result of urban sprawl due to urbanization. The present and the past Master Plan development of Jos is merging with close rural areas surrounding the municipality.

Table 1: Greater Jos population

S/No	Local council	Population			
		Male	Female	Population	Population (percent)
1	Bassa	92,649	94,210	186,859	14.21
2	Jos North	217,160	212,160	429,300	32.64
3	Jos East	43,249	42,353	85,602	6.51
4	Jos South	155,262	151,454	306,716	23.32
5	Riyom	71,984	59,573	131,557	10.00
6	Barkin-Ladi	88,478	86,789	175,267	13.33
	Total	**668,782**	**646,619**	**1,315,301**	**100.00**

Source**:** National Population Commission (NPC) 2008, Nigeria

Greater Jos the capital of Plateau State in Nigeria was initially developed according to a Master Plan devised in 1976. This apportioned 2.0% of the Greater Jos area for government activity/usage, 49.0% for residential development, and 32.5% as open/green/recreational areas to add to the aesthetics of the city, with the remaining land (16.5%) being used for ancillary services, light industries, other infrastructure

and commercial activities. The Greater Jos master plan was designed to accommodate growth and provide an opportunity to avoid many of the problems associated with unplanned growth associated with other cities in Nigeria.

Plateau State Government establishments relocated to Greater Jos during the 1980s, and all federal and state government ministries and parastatals' headquarters with many national and multinational corporations and many national newspapers are now in Jos. This rapid expansion far exceeded what had been anticipated in the Master Plan of 1976 which expires in 2000. The population of Jos now exceeds the original design capacity. In 1991 the population of the Greater Jos was less than 1million, and this had increased to 1,315,301 by 2006. Projected population figures for the Greater Jos region predict massive growth with 2.6 million people expected by 2025 (Fola Konsult, 2008).

The planning implication of the estimated population figure indicated above is that even with the conservative growth rate of 5%, the population would have doubled itself within a period of 17 years between 2007 and 2025. The urban infrastructure will be stressed considerably in relation to the required waste management services and facilities, unless appropriate steps are taken to accommodate projected increase in population. Unfortunately, the opportunity to develop infrastructure (including that for waste management), in phase with city growth and in line with a pre-agreed Master Plan, was lost, and Jos now shares many of the same problems as other Nigerian cities.

The landmark Federal legislation on environmental protection in Nigeria was the decree Number 58 of 1988, which established the Federal Environmental Protection Agency (FEPA). The specific role of FEPA with respect to solid waste management is to (Onibokun, 1999): Study the most reliable systems that are appropriate for local, domestic and industrial wastes; Specify waste disposal and treatment methods that take into consideration the geological and environmental setting and encourage recycling; Specify waste disposal sites that guarantee the safety of surface and underground water systems; Set up and enforce standards for adequate sanitary facilities for the disposal of human and other solid wastes in dwellings, housing estates and public facilities in both urban and rural areas; Establish monitoring programmes including periodic surveillance of approved waste disposal sites and their surroundings and waste water systems; Establish monitoring stations for the control of the disposal of leachate from dumpsites into surface water and groundwater systems.

FEPA enacted a number of laws and regulations. These have included: The National Protection Management of Solid and Hazardous Wastes Regulations of 1991; The Pollution Abatement in Industries and Facilities Generating Waste Regulation of 1991; The General Guidelines for Pollution Abatement in Industries 1991.

The Plateau Environmental Protection and Sanitation Agency (PEPSA) is responsible for solid waste management in Plateau State. It has responsibility to: Remove, transport and dispose of domestic, commercial and industrial waste; Clear and maintain public drainage facilities, street cleaning and clearing of abandoned vehicles; Register private waste collection companies; Prepare and periodically up-date the master plan of waste collection and disposal in the city; Approve and monitor all disposal systems in the city; Assess recycling as a waste management option for

industries and government agencies; Establish and recommend the basic standard requirements for solid, liquid, gaseous or toxic waste management provided they do not conflict with, but complement the standards of the FEPA; Establish and recommend acceptable safe methods of collection and disposal of hazardous and toxic waste products in Plateau State; Educate the general public on the various disposal methods acceptable for domestic and industrial waste products; Initiate environmental protection legislation and keep existing legislations under constant review to reflect the latest discoveries and observations on the subject; Organise and mobilise the public to participate actively in regular clean-up exercises and beautification of their environments.

Methods and Approach

This study exploits a mix of qualitative and quantitative investigation methodologies, in a three phase procedure, covering pre-fieldwork, fieldwork and post-fieldwork stages (see figure 2).

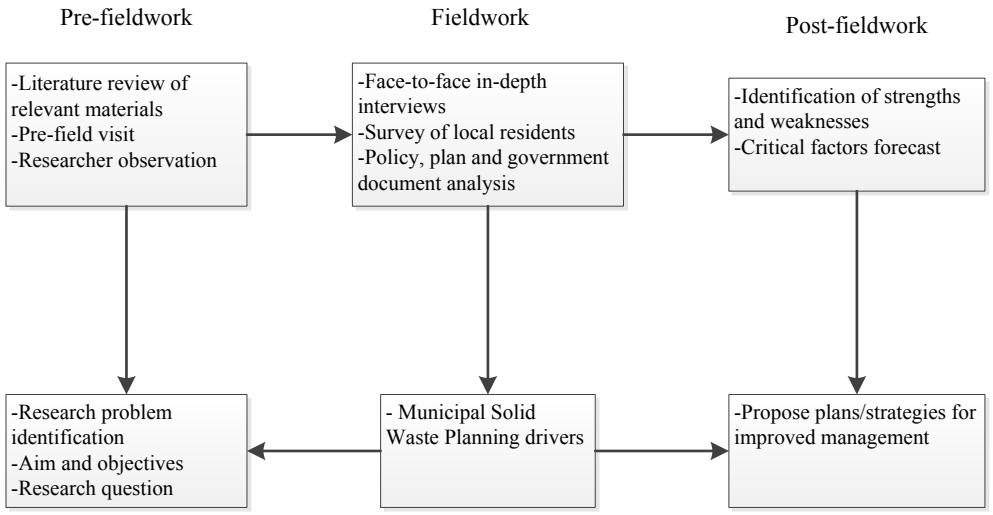

Figure 2: Outline of research process

Figure 1 is a summary of the three phase methodologies implemented for this study. The pre-fieldwork (primary) phase involved literature review on municipal solid waste management issues in developed and developing countries, and first hand pre-field visit to municipal solid waste planning and management authorities in the study area-Greater Jos (see figure 1). Following this, at the data collection stage, Jos North and Jos South local government areas were selected. Apart from being the former Benue and Plateau States capital city, both local government areas are main administrative and commercial foci respectively, especially for the middle-belt region of Nigeria. Using numerous strategic tools such as key informant interviews, researcher observation and household survey, primary data on municipal solid waste management in Greater Jos municipality was collected between 2011 and 2013.

Municipal solid waste challenges in Greater Jos

Greater Jos (the study area), with a population of over one million people became the capital of Benue-Plateau State of Nigeria, a West African sub-region in 1976. Over

thirty-five years now, the city has been experiencing a rapid population growth; as a result, there is a continuous increase in residential, commercial, industrial, and institutional land uses leading to urban expansion. This has a direct effect on the increase in municipal solid waste generation leading to diverse and multiple environmental issues. As a result, it is becoming very difficult for municipal authorities to organize, manage effectively and efficiently municipal solid waste (Egbere et al., 2001; World Bank, 2004).

A cursory observation within the study area shows visible aspects of problem manifesting in accumulation of garbage, waste-clogged drains and water bodies, street litter and stinking gutters. In spite of the concerns frequently raised by concerned groups, institution and individuals, the municipal solid waste situation continues to worsen thereby posing serious threats to public health and environment. Besides, the planning issues associated with the worsening municipal solid waste situation appears to fall more heavily on the residents even though wastes management are supposed to be publicly funded and regulated. The problem in Greater Jos can be enumerated as follows: Problems caused by the urbanization process with irregular and unplanned urban growth is generating more wastes arisings in Greater Jos without any framework for management in the Plateau State of Nigeria; The existence of a multiplicity of organizations, agencies and ministries responsible for environmental management with no or inadequate funding for municipal solid waste management development; Greater Jos' master plans, past and the present lacked sustainable solid waste management strategies/ plans for implementation in line with best practices of sustainable development. The problems affecting municipal solid waste in Nigeria is summarized in figure 3.

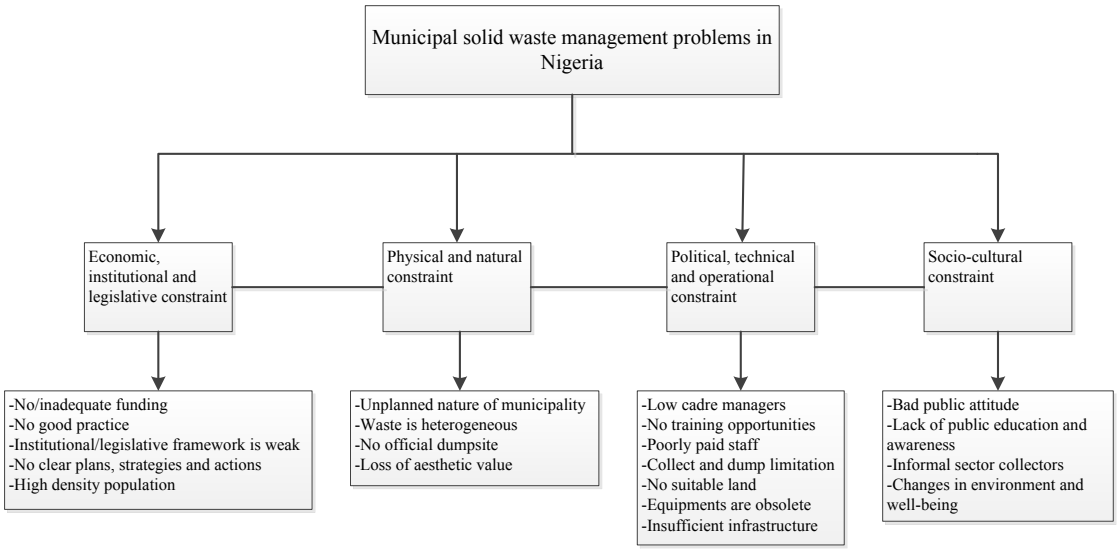

Figure 3: Problems affecting municipal solid waste management in Greater Jos, Nigeria.

Quantity of municipal solid waste generated

The amount of waste generated has increased in both quantity and diversity without adequate investment in collection, transport, treatment and disposal facilities. These problems are further complicated by political, economic and social factors. The average waste generation rate in Jos is 0.55–0.58 kg per person per day (PEPSA,

2013). This is influenced by the time of year, local culture, traditions and personal income.

Municipal solid waste composition

Table 2 provides composition data for municipal solid wastes produced in municipal councils of Greater Jos. The main components are food residues, plastics, paper, glass bottles and metals. The waste has a heterogeneous composition comprising of both degradable and non-degradable materials, and it is collected without sorting. The bulk of the non-degradable waste is potentially recyclable materials, while the degradable materials could be composted. Plastics mainly come from water and fruit juice bags and containers.

Municipal solid waste storage

A key aspect of effective waste management is proper waste storage on the premises where the waste is generated (Oluwande, 1984). The PEPSA is responsible for collecting waste from municipalities, and they have made containers (120-L and 240-L plastic bins, and 1.1 m3 metal bins) available to very few household.

Municipal solid waste collection and transport

Collection and transportation are a major cost in the waste management process. There are no private companies operating that collect waste. Collection of kerbside deposited waste tends to be quite irregular. Informal sector collection workers operate house-to-house collection services; they often separate out recyclable materials and dump unwanted degradable waste around the area. As a result, such informal collectors are officially banned from certain areas, and their carts are regularly impounded by the authorities. Collection and transportation of waste is both labour and capital intensive. It has been estimated that waste transportation, including labour and machinery, accounts for between 70% and 80% of the total cost of solid waste management in Nigeria (FME, 2004; Oluwande, 1984).

Table 2: Municipal waste generation data for different categories of settlement in Jos

WASTE COMPONENT	HIGH DENSITY (RESIDENTIAL) %	LOW DENSITY (RESIDENTIAL) %
Fabric	3.38	0.97
Plastic	3.14	0.97
Polythene	5.79	2.41
Organic	28.97	8.69
Metals/tin	1.45	0.97
Paper	3.14	1.21
Leather	1.26	0.72
Debris	19.56	13.76
Dead dry cells	0.97	0.24
Bottles/glasses	1.21	1.21

Source: PEPSA, June 2013

Traffic conditions often interfere with waste collection and transport in Jos. Collecting and transporting waste at night has been tested by the PEPSA, although this proved to be problematic because of security implications for householders. A shortage of waste collection vehicles in Greater Jos is due to lack of funding and inadequate maintenance. Efficient collection depends on proper selection of vehicles; this needs to take account of road conditions, traffic density, availability of spare parts, servicing requirements and haulage distances. A variety of motorised and manual vehicles are used for waste collection and transport in Greater Jos, as summarised in Table 3.

The waste composition in Greater Jos, as in many other cities in developing countries, has a high organic content, so that compaction vehicles offer little advantage in terms of increasing waste density. As shown in Table 3, about half of the PEPSA vehicles are compactors, but only 30% of these are operational. Manual collection equipment used by informal sector waste collectors includes push carts, wheel barrows and pedal tricycles. Other basic implements used by the informal sector (for waste sorting) include hand-rakes, shovels and iron sorting rods.

Table 3: Summary of municipal waste collection, transportation and disposal vehicles owned by government operating in Jos

S/N	TYPE	EXISTING UNIT	NUMBER FUNCTIONAL	%
1	Tippers	4	3	75%
2	Roll-On Roll-Off Skip Vehicles	4	3	75%
3	Tractors	2	1	50%
4	Automatic Compactor Trucks	4	1	25%
5	Side Loader Trucks	2	2	100 %
6	Pail Loader	1	-	0%
7	Back Hoe/Bucket Loader	1	1	100 %

Source: PEPSA, June 2013

Resource recovery and recycling

The average recyclable content of waste in Nigeria is estimated at 28% (FME, 2004); the composition data for Greater Jos in Table 1 would suggest a rather higher figure, perhaps greater than 40%. The only recycling in Greater Jos is carried out by the informal sector. Limited amounts of cans, plastics, bottles and newspapers are stored in homes and sold to itinerant buyers, and house-to-house collection of these materials has significant potential for expansion.

Most recycling appears to be carried out by segregation from mixed waste. Such sorting is undertaken by the informal sector collectors from their carts; by the collection crew from waste vehicles; and by scavengers, both from street bins and at the dumpsite. Scavengers normally have no formal education, vocational training or access to appropriate equipment and do not normally have alternative employment opportunities in the formal sector. The scavengers and other informal sector recyclers

generally sell their recovered materials to middlemen, who in turn sell to small and large scale processing and manufacturing industries. For example, collected glass is processed and recycled locally as cullet for use in the glass industry; whole bottles are cleaned and reused as syrup, drinks and juice containers; the bases of broken bottles are sold to small scale industries that cut and polish the glass to manufacture items such as ash trays and candle holders.

A recent review has examined in detail the role of the informal sector in waste management in developing country cities (Wilson et al., 2006), although relatively little data are available on the effectiveness and overall contribution of informal sector recycling.

Municipal solid waste treatment and disposal

Despite the good intentions of the Master Plan, there are no sanitary landfills in the Greater Jos for waste disposal. Solid waste from the formal collection system in the various settlements of Jos is transported to a single dumpsite at Dong, a suburb. Problems associated with odours and air pollution from burning wastes at the site have been significantly increased recently due to dumping of waste from almost all parts of Jos to this area.

Illegal disposal is also common in Jos. Piles of solid wastes are often found along roads, underneath bridges, in culverts and drainage channels and in other open spaces. One source is the informal collection workers, but there are many others involved in such 'fly-tipping'.

Public awareness and attitudes to waste

Public awareness and attitudes to waste can affect all stages in the municipal solid waste management process. This has an impact on household waste storage, waste segregation, recycling, collection frequency, littering and fly-tipping, willingness to pay for waste management services, and the level and type of opposition to waste treatment and disposal facilities. In general, people in Jos have a poor attitude towards waste management (Agunwamba, 2003). People who handle waste are regarded as dirty, poor and inferior, and carrying household waste to bins is often regarded as a duty for children. Efforts have been made by both the government and the private sector in Greater Jos to increase public awareness of solid waste management issues, and there have been televised discussions on waste management. The side effects of improper waste disposal have been well publicised. However, most people still do not appreciate that environmental quality is not just the responsibility of the government and that the individual also has an important role.

Private sector participation

There are now no private waste management collection companies operating in Greater Jos. An important factor in the success of the private sector is the ability of the state government to support, enforce and sustain written contracts. These describe the services required, and state penalties and other sanctions that will be applied in the case of failure to deliver. The award of contracts and the monitoring and enforcement of the contracts are the responsibility of the PEPSA, and a system is required that

ensures and encourages sustainable private sector participation (Cointreau and Coad, 2000; METAP, 2004; Coad, 2005).

Economic constraint

The survey revealed that an average of about 54.56% of the sampled households earn less than or equal to about $150, as monthly income (see table 4). Considering the economic requirement of the family, a monthly income of less than or equal to $300cannot meet the economic demand of the family hence as they can do without the service of a solid waste disposal agent they engage in crude open dumping of solid waste in drainages, around the streets and open market places, any peace of unused land, Open air burning without air pollution control. In addition economic constraints also make them to patronize cart pushers who are not able to get to the approved designated dump sites where the municipal solid waste are expected to be managed properly.

Table 4: Income range in Greater Jos

S/N	Range (Naira per month)	Frequency	Percentage (%)
1	18,000 – 20,000	4	22.2
2	20,000 – 30,000	1	5.6
3	30,000 – 60,000	5	27.8
4	60,000 above	3	16.7
5	Business	3	16.7
6	No indication	2	11.1
	Total	18	100

Source: Author's survey, 2013

Financial constraint

Municipal solid waste management is given very low priority in the budget due to limited finances (PEPSA, 2013). As a result very limited funds are provided to the solid waste management sector by the governments, and the levels of services required for protection of public health and the environment are not attained (see table 5).

Table 5: Amount spent on waste disposal in Greater Jos

S/N	Range (Naira per month)	Frequency	Percentage (%)
1	< 500	4	22.2
2	500 – 1000	1	5.6
3	1000 – 5000	4	22.2
4	> 5000	0	0
5	Varies	9	50.0
	Total	18	100

Source: Author's survey, 2013

Technical constraint

This study revealed that there is lack of human resources at both the state and local government level and the private sector with technical expertise necessary for municipal solid waste management planning and implementation. Many officers in charge of solid waste management, particularly at the State waste management agency and ministries handling the issues of municipal waste, have little or no technical background or training in planning or management. In fact all the problems that the municipal solid waste management system is faced with are exacerbated by the lack of trained personnel. This study also revealed that there is ineffective municipal solid waste collection and unreliable solid waste collection service. Aged vehicle fleet and poor road access were also observed.

Institutional constraint

Several agencies have been created at the state level that is involved at least partially in solid waste management (Onibokun, 1999). Such agencies at the state level include – Plateau Environmental Protection and Sanitation Agency (PEPSA), special environmental task force etc. However, there are often no clear roles/functions of the various state and local government agencies defined in relation to municipal solid waste management and also no single agency or committee designated to coordinate their projects and activities. The local government environmental department has the responsibility of picking up and transportation of solid waste from public place to dumpsites (PEPSA, 2013). The PEPSA also has the mandate to pick up and transport solid waste to the dumpsite. However there is no body coordinating these activities. The lack of coordination among the relevant ministries and agencies often results in duplication of efforts, wastage of resources, and un-sustainability of overall municipal solid waste management programs. The lack of effective legislation for municipal solid waste management is partially responsible for the roles/functions of the relevant federal, state and local government agencies not being clearly defined and the lack of coordination among them.

Operational constraint

This study revealed that the social status of solid municipal waste management workers is generally low (Agunwamba, 1998). This is due to the negative perception of the society regarding the work which involves the handling of solid waste. Such societal perception leads to low regards for the work, low self-esteem for the workers especially the garbage men and in turn produces low working ethics and poor quality of their work. Where the society allows only a certain social class or group to deal with solid waste, the availability of work force for solid waste collection and disposal becomes constrained by this rule.

Socio-cultural constraint

In the course of this study, materials such as dead animals, food items and used clothes were observed at the road junctions and by the road side. The practice of dumping material for sacrifices such as animal parts or full dead bodies of animal at road junctions and by the road side is a cultural norm acceptable in some cultures.

Such norms affect designs and implementation of sustainable municipal solid waste management systems.

Conclusions and recommendations

The new city of Greater Jos provided an opportunity to avoid some of the environmental problems associated with many other major cities in Africa. Unfortunately, accelerated population growth in the 1990s far outstripped the provisions made in the old Master Plan, and this is presenting the authorities with major problems concerned with the management of solid wastes. There is a general lack of public awareness or concern regarding waste issues, and wastes are currently taken to a single poorly engineered land disposal site. The existing system suffers from unfavourable economics, financial, institutional, legislative, technical operational and socio-cultural constraints.

A number of recommendations are made here, aimed at the development of an integrated and sustainable system for municipal solid waste management in Greater Jos.

To minimise costs, an improved waste storage and collection system is required. Each household should use standard 120-L or 240-L waste bins that are placed outside for ease of collection. In areas where this is not appropriate, centrally located waste collection points should be established that are shared by a number of households. The capacity of the private sector to provide reliable waste collection services and of the public sector to supervise them should be strengthened.

Vehicles need to appropriate to the local conditions. Vehicles specifically designed for carrying wastes should be used wherever possible to avoid material being lost during transportation. A programme of regular vehicle maintenance is required and appropriate vehicles should be used (Wilson et al., 2001). Training needs to be provided, particularly for drivers operating waste tipping equipment, and more vehicles will be needed to cope with increasing waste generation.

There needs to be a continuing programme of public awareness concerning waste management that is particularly aimed at younger Jos residents. Wastes need to be increasingly sorted at the source, to separate materials that can be recycled and to reduce the amount of wastes requiring collection and disposal.

Co-operation is required among communities, the informal sector, the formal waste collectors and the authorities if recycling rates are going to increase (which would in turn reduce the quantities of residual waste for collection and disposal, and thus the costs of the formal waste management system). These include increased involvement and integration of the informal sector so the collectors can collect separated materials for recycling from households. Informal waste collectors could also provide an ‘official’ door-to-door collection service in areas that are inaccessible to larger vehicles. This would need to be integrated with formal collection services via waste transfer stations; the collectors should be provided with space at the transfer station to sort recyclable materials, to avoid the current problem of illegal dumping after separating the saleable items. Markets for recycled materials need to be encouraged both in Greater Jos and nationally.

A properly sited engineered landfill should be constructed as recommended in the 1976 Master Plan for developing countries (Rushbrook and Pugh, 1999). Unlike most developed and some developing countries, there is no clear policy in Nigeria on composting. Sorting would be required to exclude hazardous and non-degradable components like plastics, metals and glass from the waste and this is where co-operation from householders is needed to separate degradable waste at source. The removal of subsidies on fertilizers in Nigeria has created a demand for alternatives, and a market for compost exists. Small-scale composting plants could enhance the development of low-capital and labour intensive industries that promote employment, income generation and poverty alleviation in Greater Jos.

Enforcement of waste management legislation is required, as are a proper policy and planning framework for waste management. The government must control unauthorized use of land, and this should be achieved by enforcing relevant clauses in the development guidelines. There is also a need for accurate population data so that waste management systems and infrastructure can be properly planned. The Master Plan should be updated (or revived) in terms of its provisions for waste management infrastructure.

Funding and affordability remain among the major constraints and challenges. An element of specific user charging will be needed to supplement municipal and national taxes. A system for making micro-credit available to the informal sector would aid its development as part of an integrated and sustainable waste management system. Addressing the problems in an integrated way (as outlined above) would also increase the likelihood of multilateral donor funding for major investments, such as in the landfill site, transfer stations or new vehicles.

Effective involvement of the private sector and greater integration of the informal sector are recommended. Composting of biodegradable wastes and increased waste recycling and resource recovery are identified as areas for further development.

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