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Country Report

Solid waste management in Abuja, Nigeria

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Abstract

The new city of Abuja provided an opportunity to avoid some of the environmental problems associated with other major cities in Africa. The current status of solid waste management in Abuja has been reviewed and recommendations for improvements are made. The existing solid waste management system is affected by unfavourable economic, institutional, legislative, technical and operational constraints. A reliable waste collection service is needed and waste collection vehicles need to be appropriate to local conditions. More vehicles are required to cope with increasing waste generation. Wastes need to be sorted at source as much as possible, to reduce the amount requiring disposal. Co-operation among communities, the informal sector, the formal waste collectors and the authorities is necessary if recycling rates are to increase. Markets for recycled materials need to be encouraged. Despite recent improvements in the operation of the existing dumpsite, a properly sited engineered landfill should be constructed with operation contracted to the private sector. Wastes dumped along roads, underneath bridges, in culverts and in drainage channels need to be cleared. Small-scale waste composting plants could promote employment, income generation and poverty alleviation. Enforcement of waste management legislation and a proper policy and planning framework for waste management are required. Unauthorized use of land must be controlled by enforcing relevant clauses in development guidelines. Accurate population data is necessary so that waste management systems and infrastructure can be properly planned. Funding and affordability remain major constraints and challenges.

1. Introduction

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 health 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 (UDBN, 1998). 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 (Omuta, 1987).

Solid waste management systems (waste storage, collection and transport, resource recovery and recycling, waste treatment and disposal) in Abuja, the capital city of Nigeria, have been assessed. Information was obtained from a variety of relevant groups and organisations including the Federal Environmental Protection Agency, the Abuja Environmental Protection Board, 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 solid waste management are proposed.

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2. Abuja

Abuja was established in 1976. It is the capital of Nigeria and is part of the Federal Capital Territory (FCT). It was initially developed according to a Master Plan devised in 1979. This apportioned 2.0% of the FCT 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 Abuja master plan was designed to stimulate growth and provide an opportunity to avoid many of the problems associated with unplanned growth associated with other cities in Nigeria.

Federal Government establishments relocated to Abuja during the 1990s, and all embassies, the headquarters of many national and multinational corporations and many national newspapers are now in Abuja. This rapid expansion far exceeded what had been anticipated in the Master Plan, and the population of Abuja now exceeds the original design capacity. In 1991 the population of the FCT was 378,671, and this had increased to 1,724,205 by 2001. Projected population figures for the Abuja region predict massive growth with 5.8 million people expected by 2026 (Federal Ministry of Environment Report, 2004). 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 Abuja now shares many of the same problems as other Nigerian cities.

3. Waste management in Abuja

3.1. Role of Federal government agencies

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 Abuja Environmental Protection Board (AEPB) is responsible for solid waste management in Abuja. 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 the FCT.
- 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.

3.2. Current situation in Abuja

3.2.1. Amount of 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 Abuja is 0.55–0.58 kg per person per day (Solid Waste Audit Report, 2004). This is influenced by the

Table 1
Household waste composition data for different districts in Abuja

Waste type (%)	District name and characteristics					
	Garki	Wuse	Maitama	Asokoro	Gwarimpa	Apo
Paper	13	12	13	13.6	6.9	10.1
Metal	5.6	3.3	5.3	6.7	5.4	4.9
Glass	5.5	4.4	5.32	4.1	4.1	–
Plastic	16.2	17.3	20	15.1	21.3	18.7
Food remnant	52	54.3	54.8	53	61.2	65.3
Textile	2.2	4.7	0.1	3.1	–	–
Rubber	3.4	1.5	0.19	0.7	–	0.9
Others[a]	1.8	2.4	0.6	2.8	1.1	–
Persons/ Household	8	8	6	6	13	6

Source: Federal Ministry of Environment (2004).
[a] Includes wood, sanitary pads, diapers, etc.

time of year, local culture, traditions and personal income.

3.2.2. Waste composition

Table 1 provides composition data for solid wastes produced in six districts of Abuja. 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.

3.2.3. Waste storage

A key aspect of effective waste management is proper waste storage on the premises where the waste is generated (Oluwande, 1984). The AEPB is responsible for collecting waste from municipalities, and they have made containers (120-L and 240-L plastic bins, and 1.1 m^3 metal bins) available to every household.

3.2.4. Waste collection and transport

Collection and transportation are a major cost in the waste management process. There are 12 private companies currently operating that collect waste. Private firms collect house-to-house, typically between one and three times a week, depending on the availability and condition of their vehicles. Collection of kerbside deposited waste tends to be quite irregular. Informal sector collection workers also 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 districts, 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 (UDBN, 1998; Oluwande, 1984).

Traffic conditions often interfere with waste collection and transport in Abuja. Collecting and transporting waste at night has been tested by the AEPB, although this proved to be problematic because of security implications for householders.

A shortage of waste collection vehicles in Abuja 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 Abuja, as summarised in Table 2.

The waste composition in Abuja, 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 2, about half of the AEPB vehicles are compactors, but only 30% of these are operational. In contrast, only 15% of private sector vehicles are compactors.

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.

3.2.5. Resource recovery and recycling

The average recyclable content of waste in Nigeria is estimated at 28% (UDBN, 1998); the composition data for Abuja in Table 1 would suggest a rather higher figure, perhaps greater than 40%. The only recycling in Abuja 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

Table 2
Summary of waste collection, transportation and disposal vehicles operating in Abuja

Type	Owned by AEPB			Owned by private sector		
	Existing units	Operational		Existing units	Operational	
		No.	%		No.	%
Lorries	4	4	100	12	10	83
Tippers	8	2	25	48	32	67
Roll-on roll-off skip vehicles	2	2	100	1	1	100
Tractors	3	2	67	1	1	100
Automated compactor truck	17	5	29	9	8	89
Side loader truck	2	2	100	–	–	–
Total	36	17	47	71	52	73

Source: Federal Ministry of Environment (2004).

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.

3.2.6. Waste treatment and disposal

Despite the good intentions of the Master Plan, there are no sanitary landfills in the FCT for waste disposal. Solid waste from the formal collection system in the various districts of Abuja is transported to a single dumpsite at Mpape. Problems associated with odours and air pollution from burning wastes at the site have been significantly reduced recently due to the introduction of relatively simple on-site improvements in the management of wastes.

Illegal disposal is also common in Abuja. 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'.

3.2.7. Public awareness and attitudes to waste

Public awareness and attitudes to waste can affect all stages in the 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 Abuja 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 Abuja 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.

3.2.8. Private sector participation

There are now 12 private waste management collection companies operating in Abuja and these require significant technical backup, especially in the area of capacity building. 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 AEPB, and a system is required that ensures and encourages sustainable private sector participation (Cointreau and Coad, 2000; METAP, 2004; Coad, 2005).

4. Recommendations for improvements

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

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 be 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 Abuja 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). Recommendations 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. A small charge should be payable to the informal sector

for providing recycling and waste collection services. Markets for recycled materials need to be encouraged both in Abuja and nationally.

A properly sited engineered landfill should be constructed as recommended in the 1979 Master Plan (Rushbrook and Pugh, 1999). Operation of this site should be contracted to the private sector. All wastes dumped along roads, underneath bridges, in culverts and in drainage channels in Abuja need to be cleared as a matter of urgency.

Unlike most developed and some developing countries, there is no clear policy in Nigeria on composting (Dulac, 2001). 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 Abuja.

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.

5. Conclusions

The new city of Abuja 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 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 and institutional, legislative, technical and operational constraints. More 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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