

# SUSTAINABLE SOLID WASTE MANAGEMENT IN NIGERIAN URBAN CENTERS; CAUSES AND POSSIBLE SOLUTIONS

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## ABSTRACT

*This paper presents the concept of Integrated Sustainable Waste Management (ISWM), in the context of the selection of technologies and the design of systems for waste management ISWM differs from the conventional approach towards waste management by seeking stakeholder participation, covering waste prevention and resource recovery, including interactions with other systems and promoting an integration of different habitat scales (city, neighborhoods, household). It is emphasized that waste management is not a purely technical issue, but that other aspects need to be taken into account, while selecting a technology or designing a system, the political factor being the most important. Needs for future research to further develop the concept of ISWM are indicated, including identifying criteria for sustainability and defining weighting procedures.*

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## INTRODUCTION

Material that is discarded because it has served its purpose or is no longer useful is called solid waste. Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and outbreaks of vector-borne disease (that is, diseases spread by rodents and insects) (Adedibu, 1983a). As urbanization continues to take place, the management of solid waste is becoming a major public health and environmental concern in Nigeria urban centers. The concern is serious, particularly in the capital cities, which are often gateways to the countries for foreign diplomats, businessmen, and tourists. Poor visual appearance of these cities will have negative impacts on official and tourist visits and foreign investment. Recognizing its importance, a number of developing countries have requested collaboration of external support agencies, both bilateral and multilateral, in improving solid waste management in their cities in the last 20 years. Although some projects succeeded in providing lasting positive impacts on the management of solid waste in the recipient countries, many failed to continue activities after the external support agencies ceased their support. This unsustainability of collaborative projects is due to various technical, financial, institutional, economic, and social constraints faced by both the recipient countries/cities and external support agencies. Such constraints vary from country to country and from city to city, as developing countries and cities within them differ in solid waste management problems and they and external support agencies have different, and often limited, resources available to resolve the problems.

Health is wealth, but before health becomes wealth there is a need for proper management of the environment. (Adedibu, 1983b) Lack of planned environmental management has been known even in

developed countries to cause much illness in societies. Poor environmental management, for instance, led to various diseases in the O.K. and in the early days of the nation's development, many acts were implemented to improve the situation (Bruton, 1971). Similarly, the United States of America has created more Environmental Protection Agency to guide against ills imposed by poor environmental control (Boggs, 1969). There is no doubt; therefore, that for proper management of our environment there is need for adequate planning. This made Foley (1960, P. 89) state;

*"Planning's main task is to reconcile competing claims for the use of limited land so as to provide a consistent balanced and orderly arrangement of land use; that planning's central function is to provide a good (or better) physical environment-a physical environment of such good quality is essential for the promotion of a healthy civilized life and finally that planning as part of a broader social programmes is responsible for providing the physical basis for a better community".* Adequate planning is needed, of course, for proper environmental sanitation.

Adedibu (1983a), further maintained that Nigeria today, cannot boast of a good community life and still less of a quality environment. Many reasons can be advanced for this situation. In the first place, physical planning which is the foundation for healthy living was relegated in its importance as a social responsibility in the past development plans, and only recently, has the government seriously considered the conditions of the environment. Although the government is now anxious to improve the situation, the nation is currently in short supply of the adequate manpower to clean and improve the environment (Onibokun, 1981).

The rapid increase in population, massive expansion of the urban areas and the changing lifestyle has however, encouraged higher production

of solid waste which made the amount of waste generated on a daily per capital basis to rise considerably. The solid waste generated has more or less outweighed the technology available to cope with the disposal in most Nigerian cities. In view of the mounting problems associated with solid waste disposal, there is a clear need for serious geographical enquiry into the pattern of solid waste generation and its subsequent disposal. Such studies provide knowledge of the composition of the waste that is needed as a basis for the design of waste management strategies.

Problems associated with filth in urban areas of Nigeria are now at a crisis stage. All urban environments are littered with solid waste and heaps of wastes are even found on major roads and streets in the urban centers. Many times such heaps of garbage prevent the proper flow of traffic and may even block traffic entirely. The presence of wastes in and surrounding the urban centers does not only reduce the quality of the human environment but poses serious health hazards to the people living there.

As a result, the problems associated with refuse collection; disposal and environmental sanitation in Nigeria cities have attracted the attention of Federal, State and Local governments. Various conference and workshops have been organized by all levels of government, and Research Institutes within the country with a view to finding

lasting solutions to the problems of solid waste problems. All efforts made have proved abortive, instead the problems of solid waste continuous unabated. The paper seeks to study by highlighting the causes of solid waste management practices in Nigeria urban centers and this is with a view to propose an effective and sustainable solid management solutions.

**METHODOLOGY**

Information for this paper was collected from review of series of journals, articles, books, unpublished dissertations etc. Features of solid waste are tabulated and organgram in this article was studied and synthesized from some solid waste publications. This was used as a basis in the explanation of the above subject matter. The study is limited to management of urban solid waste in Nigeria urban centers.

**WASTE CATEGORIES AND CHARACTERISTICS**

Generally speaking, waste is categorized partly according to its source, means of disposal, and its characteristics. Urban refuse, for example, contains several categories, which are collected and treated in the same way, whereas hazardous waste characteristically has dangerous properties irrespective of its sources. Nigeria urban solid waste is commonly categorized as follows

**Table 1: Characteristics of Solid Waste Generation in Urban Centers**

Kind	Composition	Sources
Garbage	Wastes from preparation cooking, and serving of food; market wastes; wastes from handling, storage, and sale of produce	Household's restaurant institutions store markets.
Rubbish	Combustible: paper, cartons, boxes, barrels, wood, excelsior, tree branches, yard trimmings, wood furniture, beddings, damage Non-combustible: metals, tin, cans, metal furniture, dirt, glass cookery, minerals.	
Ashes	Residence from fires used for cooking and heating and from on-site incineration.	
Street refuse	Sweepings dirt, leaves, catch basin dirt, contents of litter receptacles.	Streets, sidewalks valleys vacant lots.
Dead animals	Cats, dogs horses, cow	
Abandoned vehicle	Unwanted cars and trucks left on public property	Factories, power plant
Industries wastes	Food processing wastes, boiler, house cinders, lumber scraps, metal scraps, sharing	
Demolition waste	Lumber, pipes, brick, masonry and other construction materials from rased buildings and other structures	Demolition sites to be used for new building, renewal projects express way.
Construction waste	Scrap, humbler, pipe, other construction materials.	New construction, re-modeling
Special waste	Hazardous solid and liquid explosives, pathological wastes, radioactive materials	Households hotels hospitals, institution, stores industry.
Sewage treatment residue	Solids from coarse screening and from chambers; septic tank sludge.	Sewage treatment plant; septic tanks

Source: Adopted and compiled from Adedibu 1983a&b; Olapade B. T 2000, Coffey, M. (1996).

All these features from table 1 are common phenomenon in Nigeria urban centers with no adequate solutions to take care of present and future solid waste management practices.

**THE CONCEPT OF INTEGRATED SUSTAINABLE WASTE MANAGEMENT (ISWM)**

Before elaborating upon the concept of ISWM, it is necessary to explain the terms 'sustainable' and 'integrated'. Sustainable is a system that is; appropriate to the local conditions in which it operates, from a technical, social, economic, financial, institutional, and environmental perspective, and; capable to maintain itself over time without reducing the resources it needs. Integrated is a system that: uses a range of inter-related collection

and treatment options, at different habitat scales (household, neighbourhood, city) involves all stakeholders, be they governmental or non-governmental, formal or informal, profit- or non-profit oriented takes into account interactions between the waste management system and other urban systems. The different habitat scales that need to be integrated are the premise, neighborhoods and city level. Table 2 shows the solid waste management activities that can be carried out at each of these levels.

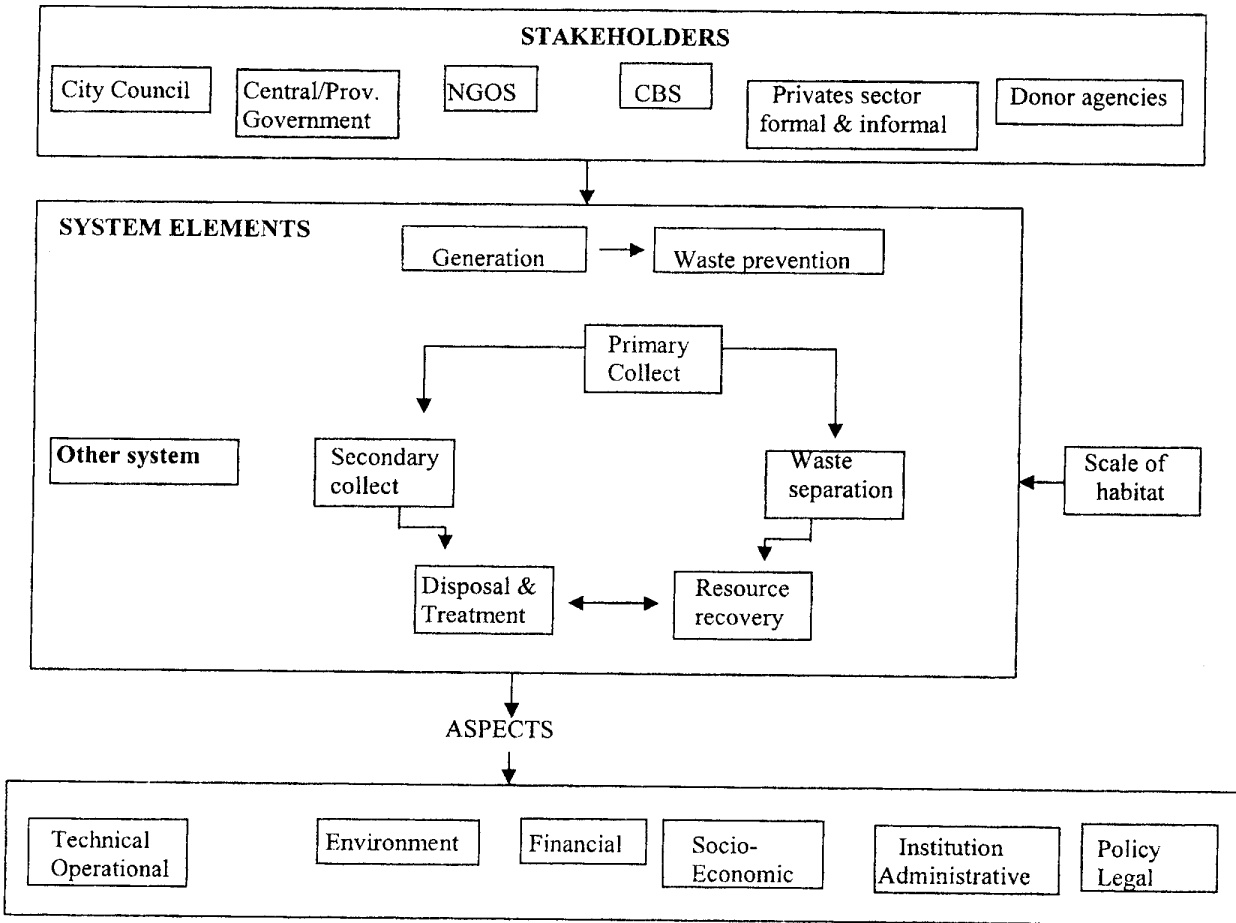
**Table 2: Habitat scales and activities in an Integrated Sustainable Waste Management system Habitat scaollection and disposal systemesource recovery sy**

Habitat scale	Collection and Disposal system	Resources Recovery system
Premise level	Storage at source	Prevention Separation at source Reuse at source
Neighborhoods level	Primary collection Temporary storage	Primary collection Sorting and Pre-treatment Reuse Recycling Composting
City level	Secondary collection Transfer storage Tertiary collection Final disposal and treatment	Sorting and pre-treatment Secondary collection Reuse Recycling Composting

*Source: Adopted from Arnold van de Klunert et al 1999*

Any ISWM system should distinguish between the habitat scales and integrate them as much as possible. Sustainable and integrated are, in a sense, two sides of the same coin. For example using different collection and treatment options, at different habitat scales, can form the basis of a system that is adapted to local (physical, social, economic, etc.) conditions. Involvement of stakeholders is one of the pillars of sustainability of a system, leading to a feeling of responsibility for the success of the system, at least if their political and economic interests are served with the system, and a willingness to keep it going on the part of stakeholders. If waste management systems are integrated with other systems, this could enhance

sustainability as well. For instance compost made from urban organic waste and applied in urban agriculture, parks etc. can lead to a closed-cycle system within the city, thereby reducing import of raw materials and goods from outside and concurrent burdens on the environment from transportation, manufacturing of chemical fertilizers, etc. The concept of ISWM is visualized in a diagram (Figure 1) below. It shows in a highly schematic way all dimensions of ISWM: a range of stakeholders, different system elements and their interactions with other systems and habitat scales, and six different aspects of integrated sustainable waste management.



Source: Adopted from Beukering et al. (1999).

**Fig. 1: Dimension of Integrated Sustainable Waste Management**

ISWM is not supposed to be used as a blueprint. However, it can provide a framework for the selection of appropriate technologies for waste management and for the development of sustainable waste management systems in general, for both liquid (human) and solid waste. It can induce policy and institutional reform to promote sustainability in waste management. In addition, it can provide the basis for analysis of existing waste management systems to assess their sustainability. The concept has already been used as a guideline for the analysis of the solid waste management system in Bangalore, India .

**CAUSES OF WASTE MANAGEMENT PRACTICES**

The highlights are some of the causes of waste management practices in urban centers of developing nations:

- Lack of meaningful waste management strategy;
- Too many (illegal) refuse dumps resulting in mis-use of land;
- Wrongly sited and unhygienic dumps;

- Dumping together of all kinds of wastes in available sites;
- Lack of reliable data on waste composition, rate of generation as well as waste generators;
- Absence of waste sorting culture;
- Inadequate safe landfill sites;
- Inefficient waste collection by public agency;
- Irregular collection and unhygienic disposal of wastes by private and public sectors in waste management;
- Transportation of wastes is done mostly by children (through head portage) who can only cover a short distance;
- Inadequate equipments for safe disposal at dump sites;
- Lack of coordination and good working relationship between the private and public sectors in waste management;
- Poor attitude of urban residents to pay for waste management services;
- Lack of public awareness on waste recycling practices;

- Non-provision of properly designated and well-managed refuse dumps by local governments;
- Poor storage facilities/system especially for agricultural product;
- Inadequate community awareness of the economic value of waste which has kept the volume of wastes on the increase;
- Inadequate public awareness of the danger of improper waste disposal both to people and the physical environment;
- Lack of cooperation among waste generators for an organized and collaborative framework for waste collection and disposal poverty;

#### **REQUIREMENTS FOR THE PREPARATION OF AN INTEGRATED AND SUSTAINABLE WASTE MANAGEMENT STRATEGY**

For any integrated waste management strategy, the four fundamental methods of managing municipal solid waste must be incorporated: source reduction, recycling, incineration and land filling.

In order to have an effective and sustainable waste management strategy, it is important to consider the following points at the preparation stage.

- Full participation and active involvement of all relevant stakeholders
- Each strategy should have a performance indicator (capable of evaluation).
- Sustainable cost-recovery and management mechanism must be established.
- The cost of implementing the strategy must be worked out and funding sources identified.
- There must be consensus among the stakeholder on each strategy on their representative.
- Each strategy must lead to an action plan to be jointly prepared by, negotiated with, and consented by all identified factors.
- Relevant actors or implementers must be identified for each strategy.
- Strategy must be capable of review.

The cost of implementing the strategy must be worked out and funding sources identified.

#### **HOW TO MAKE SOLID WASTE MANAGEMENT SUSTAINABLE**

##### **Strategic Planning and Policy Analyses**

There is a need for government to provides technical, analytic, and research assistance to local, regional, and state agencies in all stages of the strategic planning process. Recent and ongoing projects in some developing countries Nigeria inclusive address major recycling, composting, and waste minimization trends; procedures for analyzing the effectiveness of waste reduction programmes; long term integrated solid waste management plans for local and regional agencies; the waste diversion

and economic impacts of different pricing schemes; and best management practices and program assessments relative to waste diversion goals.

##### **Waste Plan**

There is a need for integrated waste management modeling tool, Waste Plan, is a widely used and sophisticated Windows-based software system for solid waste planning and analysis. In more than ten years since Waste Plan was first developed, solid waste managers throughout the world have used it for development of cost-effective integrated solid waste management strategies, analysis of user fees, and other purposes. Waste Plan was fully updated in year 2002 with improved user interface and reporting policies.

##### **Full-Cost Accounting**

Increasing complexity of local integrated solid waste management systems has made it difficult for public managers to accurately capture the full costs of local hauling, processing, and disposal options. There is the need for government and non-governmental parastatal to work with solid waste management agencies with developed countries and this would aid to implementing locally specific full-cost accounting (FCA) systems in developing nations.

##### **Resource Conservation Benefits**

The global resource conservation benefits associated with local source reduction and recycling efforts are generally not recognized. To account for these benefits reduced resource extraction and processing, energy savings, avoided air and water pollution, and increased local employment, there is the need to create "benefits multipliers", this is made up of a basic spreadsheet model that can be applied to local source reduction and recycling information under a range of assumptions about future practices of solid waste.

##### **Source Reduction Measurement**

Accurate measurement and evaluation of waste prevention is a major impediment to widespread implementation and adoption. There is a need for all the three tiers of government that is local, state, federal and international agencies to develop and implement new techniques for quantifying source reduction progress and potential, as well as statistical procedures to help local governments identify and overcome barriers to increased participation in recycling programs.

#### **RECOMMENDATIONS**

The following suggestions are being put forward as part of the recommendations to the current problems of waste management problems.

- (i) There is need to have a well known disposal method in the city, by so doing, the city authority will be able to control the

- collection, transportation and disposal of refuse;
- (ii) Legislation on solid-waste disposal must be enforced, in order to have a clean environment;
  - (iii) To have effective and clean environment, more equipment needs to be purchased and more people have to be trained as environmental sanitary officers;
  - (iv) The condition of service for people working in the environment sanitation area should be different from the general civil service condition of service, and more incentives should be given to them.
  - (v) Most of the citizens are ignorant of the importance of clean environment; therefore, there should be enlightenment campaigns on TV, Radio, and Postal, to educate the citizens on this. By so doing, the people will be aware and use the facilities provided to them.
  - (vi) Instead of making some local government departments responsible for cleaning the refuse, the work should be given to a Board who will be held responsible for all the inadequacies in the disposal and management of wastes. The same Board should be asked to keep records of the wastes produced for future planning purpose. At present, there is little information relating to the composition of the waste and method of disposal apart from the one secured from the survey on which this article is based.
  - (vii) As solid waste management involves a lot of money, there must be a way to collect fees from the population. In this regard, one would like to suggest that a fix amount of money be charged yearly. This can be effected as the city has a good method of collecting taxes. During the time of tax collection, the people in the indigenous area of the city could be charged to pay the tax, while the people under the Pay-As-You-Earn (PAYE) get the money deducted from their salary as it is done in the civil service.
  - (viii) Most of the indigenous areas of the urban centers have rough roads passing through them. The local governments should purchase light refuse vans that can ply these rough roads to collect the refuse and deposit the same in an area where is being marked for solid waste disposition for Ogbomoso. Upon all, the sanitary inspectors of the olden days in Nigeria should be re-introduced in Ogbomoso. It is mainly through these people that our environment can be made clean. This is because they will be able to go from house to house to monitor and see the total environmental sanitation, be it water, refuse and air. It is

being suggested here that government should adopt these recommendations.

Above all, for a faster and clean environment the federal through the state local governments should embark on Kenyan approach of waste management practices. In which case, government of Kenyan purchase wastes from the public at reasonable price. This has led to a faster and dynamic approach of making environment of Kenyan very clean.

## CONCLUSIONS

The traditional hierarchy should not be emphasized for the management of urban solid waste under low-economic conditions; the implication of privatization of solid waste services on the hierarchy should be considered; the management of industrial wastes should include cleaner production; scavengers or informal waste pickers should be incorporated into the formal sector and be provided with sanitary working conditions; and in the event that waste reduction and recycling activities are implemented, they should be promptly rewarded.

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