Chapter 1.0 introduction to research study

Environment, Pollution

CHAPTER 1. 0 INTRODUCTION TO RESEARCH STUDY The city of Aba in Abia state is one of the most highly commercialised cities in Nigeria. The city generates large amount of waste as a result of industrialisation and dense population. The current waste management practice in the city which involves dumping of waste at dump sites, and by road sides for pick up by refuse collectors, thus damaging the environment, and making it aesthetically unpleasant too. This study explores the waste management practices in the city of Aba in Abia State, with the aim of using the knowledge derived from this study to make recommendations for a sustainable waste management practice rather than the indiscriminate dumping of waste at dump sites, and along the roads. 1. 1 BACKGROUND OF STUDY Human activities generate waste materials that are often discarded because they are considered useless. However, many of these materials can be reused, and thus they can become a resource for industrial production or energy generation, if managed properly (Tchobanoglous and Kreith, 2002). Third world countries face particular challenges in the management of solid waste, as in other aspects of environmental management. Some of the issues are very similar to those in the industrialised countries, but there are a number of fundamental differences that are shared by most countries of the developing world. It is essential to take cognisance of the wider economic, social and cultural context of the developing world in order that the challenge may be met (Thomas-Hope, 1998, pp 1- 2). The extent and nature of urbanisation in developing countries have major implications for solid waste management. Approximately 30 to 50 % of the population of developing countries is urban and generates a disproportionately high

volume of waste. The greater proportion, some 75 %, is domestic waste (Thomas-Hope, 1998, pp 1 - 2). According to Thomas-Hope, (1998), ‘ the social aspect of the challenge is further reflected in the population that derives a livelihood from scavenging at refuse collection points and dump sites. This is consistent with the high level of informal economic activity that occurs in developing countries, especially among the poor. The marginal socio-economic position of so many people in third world cities also makes it difficult for the authorities to achieve behaviour modifications through education and sensitisation programmes’. Furthermore, in tackling waste generation in developing countries, as in other aspects of environmental management, there is a general lack of a culture of cooperation that would produce a disposition for corporate effort. Besides, there are usually no well-developed enforcement mechanisms that would effectively coerce the mass of the population to comply with the stringent regulatory and legal frameworks required for effective management of waste (Thomas-Hope, 1998, pp 1 - 2). The current problems associated with solid waste lie not only in the increased quantities and greater urban concentrations of waste generated but also in waste varieties which have to be managed, and in transnational potential for contamination. This complex problem underlies the necessity for a comprehensive, multi-sectoral approach. The approach must incorporate a proactive dimension in order to reduce not only the amount of waste generated or discarded, but also to redirect the minds and behaviours of populations towards a new level of positive participation for maintenance of environment health, ecological protection and aesthetic satisfactory condition (Thomas-Hope, 1998, pp 1 - 2). The challenge lies in

finding an appropriate strategy that can combine acquisition of financial means of closing existing gaps between technological need and capability in various aspects of environmental management. The creation of local methods addresses problems within the particular economic and social-cultural constraints and opportunities of each country. The challenge also deals with the current existence of waste accumulation and inappropriate practices, at the same time planning a future comprehensive and sustainable management strategy (Thomas-Hope, 1998, pp 1 - 2). The increasing population and increasing waste generation rates are due to increased consumption of a range of products and its associated packaging, MSW heaps along major roads, stream channels, riverbanks and in open spaces are very common in Nigeria (Ogbonna et al., 2002). In recognition of the monumental challenges of MSW management, past Nigerian governments have attempted to tackle waste management issues through the “ task force" approach. This approach involves; designation of solid waste collection centres on major roads and public markets; and use of local contractors or agencies to evacuate generated waste. However, this approach has been found to be counter-productive in the long run as it has created more problems due to lack of coordination on the government’s part and inadequate solid waste management knowledge of responsible agencies. Solid waste dumped along roadsides are usually left over a long time to decompose naturally, eaten by animals, picked by scavengers or washed away by floods into the larger creeks and rivers thus affecting surface water quality (Nweke, 2000). In addition to the physical environment degradation, it impacts the natural environment aesthetically and health-

wise. They harbour flies, fleas, mosquitoes, rats and other disease vectors, which could cause several diseases such as Lassa fever and malaria (Ekugo, 1998). The constant presence of litter may be psychologically depressing to a city dweller and clearly stands in way of tourism development. Uncollected litters can also attract more litters perpetuating poor solid waste management practices. The unsustainable and wasteful utilisation of resources gives rise to polluted rivers and lakes. This result in extensive fish depletion and destruction of other forms of aquatic life due to increased organic load and concomitant depletion of dissolved oxygen in the water (Emongor et al., 2005). However, the lack of adequate data on solid waste has resulted in ineffective planning for solid waste management (PAI Associates, 1982; Onokerhoraye, 1985). This has greatly contributed to indiscriminate dumping of wastes on roads, stream channels, bush lands and open spaces (Ekere, 2003), thus defacing city landscapes and in turn causing flooding and the spread of vector borne diseases. Previous governments employed sanitary inspectors or public health workers to monitor waste generation and management. This method is no longer operational due to insufficient funds and governmental complacencies. The issue of sanitation in cities has been left to inexperienced contractors that rather see solid waste management simply as moving from one dump point to another. Though, it has been argued that the effectiveness of solid waste management in a city is one of the indices for assessing good governance (Whiteman et al., 2001). In recent years, the problem posed by solid waste mismanagement in this city appeared intractable. Through a combination of initiatives, the solid waste problem in the city is being tackled with a view to

providing lasting solution to it, and in so doing yield more immediate and tangible poverty reduction outcomes. Although Aba, like other Nigerian cities, lacks the formal — three tier approach programme for reuse, reduce and recycling. It therefore should be noted that increased waste generation creates more environmental problems in this area, as Aba is not able to manage wastes due to institutional, financial, technical, regulatory, knowledge, and public participation shortcomings. The consequence of inadequate waste disposal management leads to environmental degradation. Factors which influence and/or impact waste disposal comprises of the following: * the contamination of surface and groundwater through leachate; * soil contamination through direct waste contact or leachate; * air pollution through burning of wastes; * spreading of diseases by different vectors like birds, insects, and rodents; * odour in landfills, and * uncontrolled release of methane by anaerobic decomposition of waste Although past governments have formulated policies for environmental protection, these policies for one reason or other have not been implemented. Thus the magnitude and nuisance of the solid waste management problem in Aba has motivated this project’s choice. Like in many developing cities, Aba’s solid waste sector, which could be taken to generally represent the situation of Abia State, is largely characterised by low coverage of solid waste management services, pollution from uncontrolled waste dumping, inefficient public services, chaotic or unregulated private sector participation and lack of key solid waste management infrastructure. 1. 2 LOCATION OF STUDY Aba is one of the most commercialised cities in Nigeria. It was created in August 1991 by the federal military government, covering a landmass of 924 square

kilometres (www. nigeria. unfpa. org). It is the commercial nerve centre with a population of 494, 152 people (National Population Commission (NPC), 2001). The annual population growth rate is 2. 8 %, while total fertility rate (TFR) of 6. 5. Life expectancy is estimated at 55 years for men and 57 years for women. The main occupation includes agriculture, and petty-trading and civil service (www. nigeria. unfpa. org). Figure 1. Map of Nigeria showing Abia State Source: (www. nigeria. unfpa. org./unfpastates. htm) Figure 2. map of Abia State showing Aba and its Environs. Source: (www. nigeria. unfpa. org./unfpastates. htm) The Aba area comprises of Aba north, Aba south, Osisioma-Ngwa, Obioma-Ngwa, and Ugwunagbo local government areas. The two selected study areas for this research are Aba North and Aba South which lie at the same latitudinal and longitudinal setting and on latitude 5°20â€²N—5°50â€²N and longitude 7°26â€²E—8°03â€²E of the Greenwich Meridian. 1. 3 SCOPE OF STUDY The scope of this study covers Aba north and Aba south, and is limited to municipal solid waste. The focus will be on municipal solid waste management, as this study is intended to provide some insight into how Aba north and Aba south compares with other developed cities in term of progress towards achieving a more sustainable solid waste management. Considering the decision to concentrate on municipal waste generation, the definition of municipal waste varies, though the emphasis is on municipal waste, Tchobanoglous and Kreith, (2002), defines municipal waste as all waste generated from residential households and apartment buildings, commercial and business establishments, institutional facilities, construction and demolition activities, municipal services and treatment plant sites. Questionnaires were sent to area of study

and the method used in data collection includes: * Desk review of journal publications and records * Use of structured questionnaires to collect data from the respondents 1. 4 AIMS AND OBJECTIVES OF STUDY The overall aim of this research is to assess the attitude of waste workers towards waste management practices carried out in Abia State, and give recommendations for improvement. * By determining the (waste workers) attitude to a sustainable waste management using a questionnaire. * By reviewing the waste management practices applicable in the area. * Drawing on waste management in other countries to propose recommendations on the benefit of a sustainable municipal waste management system. CHAPTER 2. 0 LITERATURE REVIEW 2. 1 WASTE MANAGEMENT FROM A GLOBAL PERSPECTIVE Waste is generated by activities in all sectors of the economy and is generally regarded as an unavoidable by-product of the economy. The generation of waste reflects a loss of materials and energy. Today, solid waste management as cited in Chapter 1. 0 is problematic in almost all developing cities, though many Western cities have grappled with this problem in the past and some probably are still improving on their already existing advancements. Considering their legislations are being strictly followed, the current waste management principles in the 2008 directive EU recommends the support and promotion of actions enabling the EU to achieve continuous improvement of quality of life for current and future generations through the creation of sustainable communities capable of managing resources efficiently (Cited in Pires et al., 2010). These as speculated by Pires et al., (2010) will bring about a sense of urgency in SWM. The most recent legislation published by European Commission (EC) is the

Waste Framework Directive 2008/98/EC (EU, 2008), which reflects EU SDS and brings new challenges to SWM systems (Pires et al., 2010). This legislation buttresses the point about the advancements made by developed cities in the world, while on the part of the developing cities, distinct differences exist between them. United Nations Environmental Programme (UNEP), (2005), state that: ‘‘ As developing countries achieve economic growth coupled with population growth the environmental and economic burdens of solid waste management will increase’’ Cited in Pires et al., (2010). It is therefore needful for developing countries to be guided in taking the appropriate steps in developing sustainable waste management systems, as this is important because, the more environmental degradation in a particular region, the greater the effort required to restore its quality (UNEP, 2005), considering the fact that most developing cities are burdened by high influx rate of goods and personnel. Lessons can be drawn from experiences in developed countries to guide developing countries improve on existing MSWM systems, since waste management systems have evolved over the years in developed countries, and presently still is (Wilson, 2007). From past records, it seems certain that new difficulties with respect to physical, biological and social change, not currently widely anticipated, will arise sooner than later. This is because scientific knowledge of each of these systems is incomplete, the human population and its demands are increasing relentlessly and the possible human adjustments and adaptations, including technology, are multiplying (White, 1996). The price for that is a growing problem of how to handle all the generated wastes. Tchobanoglous and Kreith, (2002), defined Municipal Solid Waste (MSW) as any waste; i. e.

generated wastes from residential households and apartment buildings, commercial and business establishments, institutional facilities, construction and demolition activities, municipal services and treatment plant sites. On the part of recycling in the waste hierarchy (Reduce, Reuse, Recycle, Recovery and Disposal) (Waite, 1995, p 3), in the western world could be reached through several measures. Though, some analysts claim that 50-80 % of the western world's natural resource could be recycled or reused by the year 2012, and some measures to achieve this also taken. These measures include enacting a national bottle bill into law, banning disposable plastic items, requiring labels on products made with recyclable materials and the percentages used, using education and advertisements to discourage the " throwaway" mentality, requiring households to separate wastes for recycling (or offering financial incentives for doing so), decreasing subsidies for virgin-material industries, and providing subsidies for secondary-material industries and waste reduction programs (Tyler, 1990). Improving on existing legislations, with simplification and modernisation effects on waste definition, end-of-waste criteria, recycling, recovery and disposal activities is one of the guidelines which is crucial to a sustainable waste management system globally. Most developing countries, including Nigeria, do not have formal government-driven or private industry-driven extended producer responsibility (EPR) programmes for waste management. This is worsened by the governments’ attitude toward indiscriminate waste dumping and the prevailing low-end “ crude" recycling activities. Governments and their officials in most developing countries appear to be far removed from the environmental implications of municipal waste in their countries (Osibanjo

and Nnorom, 2007). There is therefore an urgent need for the introduction of both government-driven (mandated) and industry-driven (voluntary) EPR programs in the developing countries to check environmental contamination, otherwise called Private and Public sector Participation (PPP). The mass of waste produced in the world has been growing considerably for many decades especially in affluent countries' (World Bank, 1992; OECD, 2008). Though data on waste arising is often incomplete and in some cases unreliable, recent estimates suggest that the municipal solid waste alone generated globally exceeded 2 billion tonnes per year at the turn of the millennium (Key Note, 2007). As less developed countries such as China and India industrialise and their populations urbanise, huge amounts of municipal waste are disposed of, though the production per capita (less than 0. 5 kg/day/capita in India and less than 0. 9 kg/day/capita in China) is still relatively small compared to the production in most individual OECD counties (up to 2. 1 kg/day/capita in the USA). However, this masks the fact that a large proportion of the MSW is produced in urban centres. In 2002, more than 1 billion tonnes of industrial waste (about five times the amount of MSW) was produced in China, mostly mine tailings, coal ash, and slag, and by 2030 China is expected to generate approximately twice as much municipal waste as the USA, while India will overtake the USA (EASUR, 2005). These figures clearly demonstrates the fact that the developed economies generate more waste than the developing, little wonder when in the near future what the world would be without a sustainable global waste management system, as less developed countries industrialise and their populations urbanise, and huge amounts of municipal waste are disposed off.

A waste management hierarchy based on the most environmentally sound criteria favours waste reuse, wastes reduce, recycling, and composting. In many countries, a large percentage of waste cannot presently be re-used, re-cycled or composted and the main disposal methods are land-filling and incineration (Giusti, 2009). Overall, recycling is increasing in Western Europe, though a lack of data makes it difficult to identify trends for Eastern Europe (Giusti, 2009). Despite important technological advancements, improved legislation and regulatory systems in the field of waste management, and more sophisticated health surveillance, the public acceptance of the location of new waste disposal and treatments facilities is still very low due to concern about adverse effects on the environment and human health. Health issues are associated with every step of the handling, treatment and disposal of waste, both directly (via recovery and recycling activities or other occupations in the waste management industry, by exposure to hazardous substances in the waste or to emissions from incinerators and landfill sites, vermin, odours and noise) or indirectly (e. g. via ingestion of contaminated water, soil and food). In the past, the performance of a large number of landfills and incinerators has been quite poor, including landfills that were built with a containment barrier (a clay liners or a synthetic membrane (Giusti, 2009). 2. 2 WASTE MANAGEMENT OVERVIEW IN THE DEVELOPING NATIONS Municipal solid waste in developing countries has been characterised by operational inefficiencies of services, limited utilisation of recycling activities, inadequate non -industrial hazardous waste management landfill disposal, and service coverage (ZurbrÃ¼gg and Schertenleib, 1998). It is becoming widely recognised that an integrated

approach to waste management leads to the sustainability of the waste management system. The concept of integrated waste management (IWM) according to McDougall et al., (2001) takes an overall approach and manages waste in an environmentally effective, economically affordable and socially acceptable way. It involves usage of a range of treatment options at a local level and considers the entire solid waste stream. The importance of establishing a regulated waste management framework has been widely recognised but progress with regard to legislation, collecting system and construction of formal recycling facilities is slow especially in developing countries (Liu et al., 2006). Until recently, municipal wastes have rarely been high on the political agenda in developing countries. Nevertheless, the risks to human health and environment from uncontrolled disposal of a country's municipal wastes may be considerable. The challenges of MSWM sector are growing continuously with rapid urbanisation; a trend in the developing world. The world’s urban population is expected to double to over five billion in the next 35 years, with 90 % of this growth taking place in developing countries (World Resources Institute, 1997). A World bank report estimates that solid waste in urban areas of East Asia alone will increase from 760, 000 tonnes/day to 1. 8 million tonnes/day within 25 years, while waste management costs will almost double from US$ 25 billion to US$ 47 billion by 2025 (Urban Age, 1999). It is clear that SWM in future will expand in scope and complexity. It will also consume a considerable proportion of city budgets. The SWM sector, therefore, deserves careful attention for striking a balance between quality of service and cost effectiveness. This challenge is particularly significant for developing countries, where resources are limited

but urbanisation is occurring rapidly. Developing countries often experience great difficulty in controlling their wastes. Their available resources must be concentrated on the most urgent problems. Interim solutions may be required to bring such problems under immediate control whilst more permanent facilities are developed. Even in the long term, there will be further need for compatible solutions with limited resources available. Public and private sectors are active in handling SWM in developing countries. Actors from each sector are presented in view of their particular advantages and constraints. Public sector agencies in SWM generally mean municipalities or city corporations operate under certain inherent limitations. For instance, rigidity of laws, compounds the difficulty in bringing about operational changes. Moreover, the public sector employs workers e. g. street sweepers, waste loaders and drainage cleaners. Consequently, labour unions often wield considerable influence over the whole organisation. However, the sector suffers from low staff productivity, inadequate supervision and unsatisfactory equipment (Salahuddin and Shamim, 1992). Furthermore, vibrant ‘ informal’ private sectors exist in almost all cities in the developing world which plays a significant role in SWM. People not engaged by the public sector livelihoods’ solely or partially depending on solid waste may be grouped as the private sector. Most of the private operators are ‘ informal’ workers. The term ‘ informal’ sector is used in reference to economic activities possessing the following characteristics: non-permanence and casualness, outside the scope of existing company law or government regulations, carried on in small-scale by less capitalised establishments mostly relying on household labour (Salahuddin and Shamim,

1992). Informal sector activities are not regulated or controlled by government agencies-they exist and operate because of market forces or other socio-economic factors (Ali, 1999). The above definition very well describes the activities carried out by multitude of people who depend on solid waste to earn or supplement their income in developing countries. In low-income countries, the size of informal sector is significant due to poverty, unemployment or underemployment. There are also comparatively formal entities active in the sector. These are community-based organisations and small business enterprises. The private sector, should work alongside public sector as in many developed countries. The extent of private sector participation depends on a number factors including demand for service, ability to pay, poverty and regulations. When it comes to privatisation, governments generally only consider full privatisation without considering partnerships with all levels of the private sector (Ali, 1999). According to Ahmed and Ali, (2004), public—private partnerships are considered as alternatives to full privatisation, in which government and private companies assume co-responsibility and co-ownership for the delivery of city services. Through these partnerships, the advantages of the private sector–dynamism, access to finance, knowledge of technologies, managerial efficiency, and entrepreneurial spirit–are combined with social responsibility, environmental awareness, local knowledge and job generation concerns of the public sector. Under mutually favourable circumstances it is advantageous to have public and private sectors playing active roles, thus capitalising on each sector’s strengths. PPPs could offer the best of both sectors, and one may believe that such alliances are naturally inclined to

form. In reality, partnership between the two sectors is not easy to achieve. Certain enabling environment is necessary to foster trust and working relationship. PPP is more than the public sector merely offering co-operation to the private sector to facilitate the profitability of local firms. It is far more than occasional meetings between the city council and local business organisations. Partnerships are shared commitments to pursue common goals (Kolzow, 1994). Although, Onibokun and Kumuyi, (1999) suggest that policy frameworks and implementation strategies must be accompanied by new forms of governance to increase efficiency and effectiveness, and maximise popular participation in service provision. An increasing interest in public—private community partnerships is evident. However, this is often related to technical or financial issues, rather than political, sociological and environmental relationships. Onibokun and Kumuyi, (1999) commented further that techno-financial approaches have failed to develop an institutional set-up necessary to empower citizens to participate effectively. Some health impacts have also been identified considering the attitude of waste managers in the developing countries, where open landfill is predominant; as Fatta et al., (1999) has acknowledged it as one of the major threats to groundwater resources, Guisti, (2009); has identified congenital malformations as the strongest association with human health. Sever, (1997), made emphasis on the increased risk of birth defects and some cancers for populations living near landfill sites, as Guisti, (2009); recognizes the main pathways of exposure as; inhalation from landfills, and consumption of water (contamination of water supplies by landfill leachate). At last, attitude is a supposed construct, that being inaccessible to direct

observation, must be inferred from measurable responses, In other words, it reflects whether the developing nations perceives that a significant number of people endorse/disapprove the behaviour of interest as it regards to waste management. For instance, if an individual believes they have little control because of lack of necessary resources to undertake the behaviour, then their behavioural intentions may be negatively influenced, despite positive attitudes and/or subjective norms (Ajzen et al., 1992). Overall, the more favourable the attitude and subjective norm of an individual or a people, the greater the willingness (intention) to perform that activity (Ajzen, 1991). 2. 3 WASTE MANAGEMENT OVERVIEW IN DEVELOPED NATIONS Municipal solid waste management is an integral part of urban environmental planning, which is evident in developed cities in recent times. According to Zhang et al., (2010), to promote a sustainable development, waste management has evolved into material flow management in many developed countries, and includes careful handling of raw materials and reduction of emissions as well as climate/environment protection. Using the European cities as instances, after the commitments made at the Earth Summit in Rio de Janeiro, (1992), the European Council in 2001 adopted the first EU Sustainable Development Strategy. The overall aim of the renewed EUSDS was to support and promote actions enabling the EU to achieve continuous improvement of quality of life for both current and future generations. This is expected to be achieved through the creation of sustainable communities capable of managing resources efficiently, tapping the innovation potential of the economy, ensuring prosperity, environmental protection and social cohesion. The most recent legislation published by European Commission is the Waste

framework Directive 2008/98/EC (EU, 2008), it reflects EU SDS and brings new challenges to SWM systems. New definitions for waste, by-products' and end-of-waste, result in the need for choosing appropriate technologies that aim at improving the protection of human health and environment, promoting reuse and recycling, enhancing waste prevention programs via bio waste separate collection, and implementing extended producer responsibility collectively. Sustainable consumption and production, related to waste prevention programs have received wide attention in the nexus of resources conservation, recovery, and reuse. Social factors, including population growth and migration, become essential for the accurate forecasting of waste generation and estimation of the proper capacity of the SWM facilities. Public health which used to be considered by Life Cycle Assessment (LCA) impact categories must be included through the application of a quality assurance system (QAS) for product control. All of them compound the structure of current SWM systems and deepen the need for systems analysis within the EU member states. EIONET, (2007a), has observed From a life-cycle view point, that an all-encompassing MSW management system includes fundamental operational units from collection, transporting, treatment, recycling, and to disposal, however the existing European regulations still promotes the hierarchy of waste management inevitably to involve a wealth of waste management Practices tied to policies, institutional settings, financial mechanisms, technology selection, and stakeholder participation, and that Some of the EU member states have applied economic instruments including Pay-As-You-Throw (PAYT) and an organic waste tax to create economic incentives for residents to divert BMW

from regular waste streams normally being collected by municipalities to specific collection avenues as Cited in Pires et al., (2010). This is observed in the BMW system and Landfill Allowance Trading System (LATS) in the United Kingdom (UK), and was launched to provide local authorities with the flexibility to manage waste streams more effectively. The LATS system, which is made to revolve around transferable allowances, will enable the greatest amount of waste diversion to occur in areas where it is cheapest, and most practicable to do so. The “ EPR system" and the “ deposit-refund system" are practical waste management systems that have been set to ensure the maximum reuse and recycling of waste, and the most well-known EPR system is the packaging waste Duales System Deutschland (DSD) (or Green Dot system) that was firstly applied in Germany in the 1990s and later on all over Europe (Buclet, 2002). MSW management is normally seen as a major decision making issue with respect to sustainable development in all EU local communities and other developed nations, as seen in building plans, etc. (Pires et al., 2010). In western nations, proposed strategies for waste management are subject to public opinion, as can be seen in the document ‘ road map to maximise waste diversion in London’ (City of London, 2007) that the citizen’s views are sought and utilised in implementing waste management plans for the nations. The citizen is at the centre of waste management in the city and it ensures that citizens and city authorities hold themselves accountable to waste management strategy adopted, which makes the system sustainable. . Developed countries possess heavily industrialized recycling activities that are more or less removed from the daily life of a citizen (e. g., sophisticated curbside recycling programs).

Therefore, research on waste recycling in the developed world focuses on technical applications such as models and tools (Daskalopoulos et al., 1998) The significant strides made in achieving the current success level in the developed nations waste management system is broadly due to the belief that sustainable waste management system is based on sound guiding principles, strong service delivery values with as many locally based solutions as possible and moving at a fiscally responsive pace (Asase et al., 2009). 2. 4 WASTE MANAGEMENT IN OTHER NIGERIAN CITIES AS COMPARED WITH THAT IN THE COMMERCIAL CITY OF ABA Many households, industries, and institutions have effective arrangements for disposal of their wastes: either by emptying wastes into trash receptacles which are kept in front of the house, collected by local government disposal agents, and sent to landfills, or by arranging to send the wastes directly to landfills. The latter is true mainly of some industries and institutions (Adelman and Morris, 1971). However, in Nigeria in particular, there seems to be an over-estimation of (Friedmann, 1986) and an over-response to (Adepoju, 1975), the productive superiority of the cities. According to Abumere, (1983) it would therefore be reasonable to expect variations in the spatial distribution and management of solid waste within cities. The industrial and institutional zones generate the smallest volumes. This is not only because there are relatively few industrial and institutional entities in Nigerian cities at this stage of Nigeria's development, but also because such bodies are most likely to have private arrangements for disposing off or managing their wastes effectively without allowing accumulation within and around their premises (Omuta, 1987). In Nigeria, there are two broad systems of SWM — public and private; the

former being the more conventional and traditional. In the public SWM system, the “ waste disposal unit" seems to have been the most common arrangement, varieties of which have at different times been established in Ibadan (Onokerhoraye, 1977), Benin City (Omuta, 1985), Enugu, Onitsha, Warri and Kaduna (FMHE, 1983) among other urban centres. Usually the waste disposal unit is established at the local council level, as an operational section of the Health Department, and is headed almost invariably by health superintendents. Operationally, the unit is responsible for locating public garbage collection depots in different parts of the city where residents deposit their domestic solid wastes. The disposal unit also ensures that collected wastes are disposed off. However, this arrangement has either been completely broken down or where it still exists, non-functional due to lack of staff, institutional relations, city’s structure, infrastructure and equipment. However, since the efficiency of management is a function of relationship between the rates of generation and disposal, the number of personnel alone cannot determine environmental quality. A lot also depend on the quantity and quality of the equipment at the disposal of staff (Sada, 1984). On the contrary, should staff and equipment function adequately, urban structure poses a real constraint on SWM. It is generally argued that urbanisation is a 20th-century phenomenon in Third World countries; however, Nigeria is known to have a good number of pre-colonial cities. For the most parts, these traditional cities are characterised by uncontrolled development and grossly deficient physical layout. The most relevant element of this process for SWM is the lack or difficulty of physical access. To appreciate the seriousness of associated problems with urban structure, it

has to be appreciated that the core areas of the traditional city are occupied predominantly by poor segments of the population who generate more voluminous, biodegradable and odoriferous organic refuse, as reported by (Adedibu, 1983) using Ilorin and Offa as case studies. More emphasis has been addressed in relating physical layout to SWM in Ibadan (Onokerhoraye, 1976). Egunjobi, (1983) reported the lack of good road and street infrastructure hamper garbage collection and evacuation in the traditional core areas. Similar problems have been reported in Benin City (Akpovi, 1981). In such situations, where waste bins are necessarily located at accessible points for easy collection, two inter-related negative scenarios arise. First and foremost, the walking distance to reach refuse depots tends to discourage residents usage. Also, Omagbemi, (1983) commented that many traditional residential neighbourhoods are not provided with depots as they are inaccessible. Another structural problem of SWM is its lack of satisfactory (formal) provision for final disposal sites. The removal of refuse from depots or private homes, however flags up some environmental concerns should it result in non-sanitary disposition. In this regard, what most urban authorities appear to have implemented is to relocate potential solid waste problems from built-up areas to urban fringe. Okafor, (1983) makes note of this fact that routes to cities have almost always been characterised by unsightly hills of refuse. Designated disposal solid waste sites have also been problematic e. g. in Sokoto, a disposal site 3. 21 Km from Gidan Kwano village has polluted its wells. Perhaps one important institutional problem facing urban solid waste management in Nigeria is finance. This problem may be regarded as an imposed problem because the

task of SWM has been assigned to a level of government, which, although rightly closer to the source of generation, is the most fiscally incapacitated. The other important institutional constraint is the jurisdictional arrangement for solid waste management, and non implementation of legislations. In many cases, the city as a whole is regarded as one unit for the purpose of solid waste management (Onokerhoraye, 1977). Though, in the central government, the landmark Federal legislation on environmental protection in Nigeria was established by the Federal government (cited in section 2. 3. 4). Its role also include, establishing monitoring stations for controlling leachate disposal from dumpsites into surface water and groundwater systems (Onibokun, 1999). The Abuja Environmental Protection Board (AEPB) is responsible for SWM in the central government and its responsibility comprises of the following: * Disposal of domestic, commercial and industrial waste. * Maintenance of public drainage facilities, street cleaning and confiscation of untaxed and non-road worthy vehicles. * Registering of private waste collection companies. * Preparation and periodically up-dating the master plan of waste collection and disposal. * Approval and monitoring of all disposal systems. * Implementation recycling as a waste management option for industries and government agencies. * Recommendation of basic standard requirements for solid, liquid, gaseous or toxic waste management which do not conflict with standards of the Federal Environmental Protection Agency (FEPA). * Recommendation of acceptable safe methods of collection and disposal of hazardous and toxic waste products in the Federal Capital Territory (FCT) * Education of the general public on various disposal methods acceptable for domestic and industrial waste products. * Initiation of

environmental protection legislation and existing legislations to be constantly reviewed to reflect latest SWM discoveries and observations. * Organisation and mobilisation of public active participation in regular clean-up exercises and beautification of their environments (Imam et al., 2008). From the current situation in Abuja: 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 time of year, local culture, traditions and personal income. The main components of waste in Abuja are food residues, plastics, paper, glass bottles and metals (Federal Ministry of Environment, 2004). At present there are 12 private companies currently in waste collection. 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- 80 % of the total cost of SWM in Nigeria (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. 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 (Solid Waste Audit Report, 2004). In terms of Resource recovery and recycling the average recyclable content of waste in Nigeria is estimated at 28 % (Solid Waste Audit Report, 2004). 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, 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 (Imam et al., 2008). Looking at 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 formal collection system in various Abuja districts is transported to a single dump site at Mpape. Problems associated with odours and air pollution from burning wastes at the site has been significantly reduced recently due to introduction of relatively simple on-site improvements in management of wastes. Illegal disposal is also common. 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’ (Imam et al., 2008). In general, Abuja residents 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. Efforts have been made by governmental and private sector to increase awareness of SWM issues e. g. televised discussions on waste management. However, most people still do not appreciate environmental quality and delegate it as governmental responsibility (Imam et al., 2008). Abia state Environmental protection Agency (ASEPA) is also responsible for waste management, but due to the lack of amenities and infrastructure as

stated earlier, demonstrates institutionalised waste management in Aba as compared with other Nigerian cities have fallen short of its responsibilities. However, the grassroots must be effectively educated and mobilised in order for the leadership of ASEPA and the present government to produce results. 2. 4. 1 WASTE MANAGEMENT AND URBANISATION IN NIGERIA Urbanisation in the third world has resulted in expansion of “ slum areas" and creation of new ones. The international institute for environment and development (IIED), 2002), reported that the process of globalisation has reinforced problems of rapid urbanisation in Nigeria and other areas of the developing world. Globalisation is seen as a process of geographical realignment of networks of production and consumption and sites of power (Beall, 2002). The urban Nigerians have acquired much scientific technology and capacity and can consume over ten times more materials and gadgets than their rural counterparts. In an attempt to continue this consumerist bent by demanding ever-greater quantity of material goods from ever declining rural resources they have grossly polluted, disorganised and blighted the environment. The social linkage between public uncalculated costs and privately anticipated benefits is steadily increasing. In the long run, preservation of urban Nigerian and preservation planning concern for the environment are indistinguishable (Uyanga, 1985). The forces behind unprecedented urban growth in Nigeria are many. Rural-urban migrations, natural population increase, engulfing of peripheral rural settlements by urban expansion and in some cases, conflicts have as root cause. The push factors from rural areas have been declining agricultural productivity or low prices, lack of employment opportunities, basic physical and social infrastructure. Also, better employment

opportunities and lifestyles in cities are alluring (Harsch, 2001). Globalisation and urbanisation have come to stay. They have benefits as well as a many irking problems. Problem solving solutions associated with urbanisation and globalisation brings about positive prospective alternatives. The ability to deal with this new situation requires effective capacity building for cities and communities toward participatory and good governance (Achankeng, 2003).

2. 4. 2 WASTE MANAGEMENT AND NIGERIA'S POPULATION CHANGE

Population has always affected waste generation, collection and invariably disposal due to rapid urbanisation and higher standards of living. Using Lagos State as an instance, the population rose from 1, 443, 569 (1963) to 5, 685, 981 (1991) and to 6, 947, 191 in December 1996. This has impacted negatively on both the environment and waste generation in the State. Lagos is the most densely populated state in Nigeria due to its commercial activities. The quality of waste generated is proportional to population size; as population increases, waste generated also increases. Like many other cities in the urban developing world, cities in Nigeria are faced with the twin problems of population increases and rapid expansion. These phenomena have no doubt brought increasing strain on urban infrastructural facilities such as in waste management. The existing system appears to be incapable of coping with the mountain load of waste generated and heaped on the surface (Taiwo, 2009). Many state governments spend a good percentage of their funds on domestic waste management. For example Lagos State Government spends between 20 — 25 % of its funds on waste management and a projected population that runs into millions. it is estimated that the average individual generates an average of 0. 115 kg of waste daily. The

funds available or at least earmarked for domestic waste management is grossly inadequate to fund public agencies and other Private Sector Participants (PSP), population growth goes hand in hand with increased pollution and environmental decay (Taiwo, 2009). 2. 4. 3 Standard of living in Nigeria vis-Ã -vis waste management Standard of living is generally measured by variables such as income per person and poverty rate. Other measures such as access and quality of health care, income growth inequality and educational standards are also used. Examples are access to certain goods or measures of health such as life expectancy. It is the ease by which people living in a time or place are able to satisfy their needs and/or wants. Most third world cities lack resources to meet the demand for such services as water, sanitation and SWM. The insufficient services results in a deterioration of urban environments (air, water and land pollution) that poses risks to human health and environment (Medina, 1997). In Nigeria employee productivity is low due to certain factors such as sociological, felt in manifested lack of a sense of belonging in an organisation, and tendency by employees to perceive a job as another’s business. This negative attribute to work has impacted on waste management efforts of the state. Poor attitude to work, poor coordination and inadequate communication among workers and institution saddled with SWM responsibilities due to bureaucratic impediment and administrative hitches have resulted in chaos, confusion and ineffectiveness in delivering many urban public services. Ignorance coupled with poverty may also be adduced to the habit of most people especially in densely populated areas. It is dis-heartening to find humans defecating in broad daylight on the side of Highways or urinating on

the sidewalk or gutter in full glare of the public or indiscriminate discharge of garbage into drains and at times on the highways (Taiwo, 2009). The standard of living has led to scavenging. Scavenging is a ubiquitous occurrence throughout the developing world, and is very prominent in Nigeria. The World Bank has estimated that up to 2 % of the population in third world countries survives by recovering materials from waste. Scavengers salvage materials to sell for recycling, as well as repairable and reusable items that can sell or use themselves (Medina, 1997). The concept of standard of living has in recent decades increasingly approached economists' idea of a utility function in which wellbeing depends on a wide variety of pecuniary and non-pecuniary circumstances. Whiteman et al., (2001) argued that the effectiveness of solid waste management in a city is one of the indices for assessing good governance''. The standard of living in Nigeria needs not be over emphasised as it is evident from the way waste is generated, and clearly evident by the rate at which waste is managed in third world cities which is clearly a mirror image of their standard of living in Nigeria for instance. 2. 4. 4 EXISTING LEGAL AND INSTITUTIONAL FRAMEWORK FOR MUNICIPAL WASTE MANAGEMENT IN NIGERIA The instrumental basis for implementing strategic plan comprises of a legal and regulatory framework which is elaborated in the form of bylaws, ordinances and regulations concerning SWM, and includes corresponding inspection and enforcement responsibilities and procedures at national, state, and local levels. This legal or regulatory framework, if consciously implemented can bring about a sustainable waste management system (SchÃ¼beler et al., 1996). FEPA was established by Decree No. 58 of 1988 and charged with the

responsibility for environmental protection. Following the upgrading of the agency to a Federal Ministry of Environment (FMEnv) in 1999, the Ministry was mandated to coordinate environmental protection and natural resources conservation for sustainable development. Table 1 SHOWING THE EXISTING NATIONAL ENVIRONMENTAL PROTECTION REGULATIONS S/N | Regulations | Year | Provision | 1 | National Environmental Protection (Effluent Limitation) Regulations | 1991 | The Regulation makes it mandatory for industrial facilities to install anti-pollution equipment's, makes provision for effluent treatment and prescribes a maximum limit of effluent parameters allowed. | 2 | National Environmental Protection (Pollution and Abatement in Industries in facilities producing Waste) Regulations. | 1991 | Imposes restriction on release of toxic substances, and stipulates requirements for monitoring of pollution. It also makes it mandatory for existing industries and facilities to conduct periodic environmental audits. | 3 | National Environmental Protection (Management of Solid and hazardous Waste) Regulations. | 1988 | Regulates the collection, treatments and disposal of solid and hazardous waste from municipal and industrial sources. | 4 | Harmful Waste (Special Criminal Provisions, etc.) Decree No: 2. | 1992 | Provides legal framework for effective control of the disposal of hazardous waste into any environment within the confines of Nigeria. | 5 | Environmental Impact Assessment Act (Decree No: 86). | 1991 | The decree makes it mandatory for an EIA to be carried out prior to any industrial project development | 6 | National Guideline and standard for Environmental Pollution Control | 1987 | The regulations provide guidelines for management of pollution control measures. | 7 | Workmen Compensation Act | 1992 | Occupational health and

safety. | 8 | Urban and Regional Planning Decree No: 88 | | Planned development of urban areas (To include and manage waste sites). | 9 | Environmental Sanitation Edicts', Laws and enforcement Agencies | | General environmental health and sanitation. Enforcing necessary laws. | 10 | State Waste Management Agencies | | Ensure proper disposal and clearing of wastes. | 11 | Public Health Laws | | Covering public health matters. | Source: Federal Republic of Nigeria Medical Waste Management Final Report 2007 Federal Ministry of Environment (FMEnv): has responsibility to administer and enforce environmental laws in Nigeria. The specific responsibilities of the ministry include: 1. Monitoring and enforcing environmental protection. 2. Enforcing international laws, conventions, protocols and treaties on the environment. 3. Prescribing standards for and making regulations on air quality, water quality pollution and effluent limitations, atmosphere and ozone protection, control of toxic and hazardous substances; and 4. Promoting cooperation with similar bodies in other countries and international agencies connected with environmental protection. State Environmental Protection Agency (SEPA): Each state within Nigeria is empowered to make laws for the protection of its own environment, within its jurisdiction. SEPAs are responsible for the assessment of all public or private projects activities within the states. The roles of SEPAs in this project include; 1. Conducting public enlightenment on environmental sanitation and management; 2. Co-operating with the Federal and Local Governments, Statutory bodies and Research Agencies on matters relating to the project; 3. Pollution control and environmental health in the states; Collaborating with FMEnv and other agencies to achieve effective prevention of abatement

of trans-boundary movement of waste; (Federal Republic of Nigeria, 2007). Presently, it’s been observed that Nigeria is experimenting with the privatisation of the waste sector, as states like Lagos state have established municipal solid waste management policies to encompass private sector participation in waste collection and transfer to designated landfill sites (Ogwueleka, 2009). 2. 4. 5 Existing Waste Management Capabilities in Nigeria There are a number of companies in Nigeria collecting and transporting MSW. Their capabilities are rudimentary for collection and transportation. Waste management treatment and disposal infrastructure is currently underdeveloped in Nigeria; for example landfills are still at the stage of municipal dumps rather than sanitary or ‘ engineered’ landfills. This is the situation mostly in almost every parts of the country. In Abuja the federal capital territory for instance, 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. The average recyclable content of waste in Nigeria is estimated at 28 % (Urban Development Bank of Nigeria (UDBN), 1998). The only recycling in Abuja is carried out by the informal sector. Scavengers generally, 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 (Imam et al., 2008). In Enugu city, the capital of Enugu State of Nigeria developed with discovery and mining of coal in the 1920s (Okoye, 1975), waste recovery, exchange and recycling activities are concentrated at specific points in the urban space of Enugu. Scavenging is not a recent occupation in this city, as women have been known to pick up used up bottles to hawk water, and all kinds of drinks (Agunwamba, 2003). According to Salahuddin and Shamim, (1992), over 20, 000 women work as paper pickers in Ahmedabad city, it appears to have intensified with the development and operation of the Ugwuaji landfill facility. There is a concentration of recoverable and recyclable materials at the landfill site as the landfill is currently the only designated waste disposal site in the entire city, and all PSPs tip waste they collect. In addition, waste pickers have unrestricted access to the site. Waste paper, cardboard and polyethylene packaging materials are usually not recovered because there are currently no market outlets. As a result, pickers have no incentive to salvage them. Recovered materials such as bottles and plastics are transported with pick-up vans and sometimes push-carts, from landfills to bottle and plastic banks, scrap metal dealers, artisan shops and small-scale manufacturers located at various locations in the state. These shops collect, sort, and carry out some pre-processing. Some of these materials are also processed along the access road leading to landfills or sold — usually without processing — onsite to scrap buyers then transport the wares to various destinations (Nzeadibe and Eziuzor, 2006). It has been observed that regardless of the informal sector

waste workers un education they possess skills both directly related to waste recovery and recycling as well as for locating markets and potential customers (Nzeadibe, 2008). Registration and licensing of scavengers or even employment of scavengers could be considered as an avenue to retain and possibly improve their skills while also providing more sustainable livelihoods to recyclers. These guarantees a certain level of economic security, and also encourage the present capability while also ensuring that the maximum amount of materials is recovered from the landfill for a sustainable waste management practice in the country (Nzeadibe, 2008). 2. 4. 6 THE ABOUNDING EMPLOYMENT OPPORTUNITIES IN WASTE MANAGEMENT IN NIGERIA Waste management as an Informal sector, its activities are not regulated or controlled by government agencies–they exist and operate because of market forces or other socio-economic factors (Ali, 1999). This definition very well describes the activities carried out by the multitude of people who depend on solid waste to earn or supplement their income. In low-income countries the size of the informal sector is significant because of poverty, unemployment or underemployment (Ahmed and Ali, 2004). Recently, Nigeria’s urban waste management — especially the work of the informal sector — has increasingly attracted the attention of researchers and policy makers. Studies of waste management in Nigerian cities are paying more attention to the linkages between waste management and urban governance on one hand (Onibokun and Kumuyi, 1999) and economic, environmental, socio-political and spatial aspects of informal waste management on the other (Imam et al., 2008). In all these investigations, however, the developmental capacity of the informal sector

for improved SWM and need to support the activities of the sector have been largely ignored (Nzeadibe, 2008). Little thought has been given to encourage graduates to make a career in the informal waste management sector in spite of the development contributions made by the sector. However, Nzeadibe, (2008), observed that the economic impact of the informal sector in Enugu State South Eastern Nigeria has been found to be significant, as the average waste picker earned more than the minimum wage in Enugu State. It has been estimated that up to 150, 000 waste pickers are active in Municipal Corporation of Delhi area (Chaturvedi, 1998). ‘‘ Small-scale recyclers, as seen in the case of Enugu’’ according to Okoye, (1975), purchase items like glass, metal cans and plastics. Using these wastes as raw materials, they manufacture saleable products. However, a young population, high unemployment, low incomes and increasing solid waste indicate that sustainable waste management system could provide much needed jobs if the government and private sectors attach more importance to it rather than sole reliance on oil sector as a major source of employment. 2. 5 PROCEDURAL APPROACH TO WASTE MANAGEMENT A procedural approach to waste management will have to take into account community and regional-specific issues and needs to formulate an integrated and appropriate set of solutions unique to each context. This can also be most complimented by people’s attitude towards waste, otherwise would be an effort in futility (Van de Klundert et al., 2001). As with any issue in developing nations, solutions which work for some countries or areas will be inappropriate for others. Specific environmental conditions will dictate the appropriateness of various technologies, and the level of industrialisation

and technical knowledge present in various countries and cities will constrain solutions. Studies on MSW issues however repeatedly discuss certain approaches as being at least adaptable to many developing nation scenarios. These approaches emphasise waste reduction (creation of less waste and increased material recovery) and appropriate disposal options as part of an integrated evaluation of needs and conditions. However, when considering a procedural approach to waste management, the " waste hierarchy" concept set out in the government's waste strategy should be a useful tool. This procedure relates to generation, handling, keeping, safe storage, transport, collection and disposal of all