

**PHYSICAL PLANNING INDICES AND MEDIA AS PREDICTORS OF
COMPLIANCE WITH SOLID WASTE MANAGEMENT POLICY AMONG
REGISTERED AUTOMOBILE TECHNICIANS IN OYO STATE, NIGERIA**

BY

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CERTIFICATION

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DEDICATION

To

My late wife, KhadijatOluwatoyinSAFIU

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ABSTRACT

Solid waste management policy is formulated to ensure that citizens adopt friendly environmental habits and practices. Despite the enactment of legislations on solid waste disposal and management, many automobile technicians in Oyo State were not complying with the State regulations. Past studies focused on knowledge and attitude towards solid waste management practices, with little emphasis on compliance with the regulatory laws. This study was therefore carried out to examine physical planning indices (road accessibility, town planning regulations and location of solid waste management facilities) and media (electronic and print) as predictors of compliance with solid waste management policy among the registered automobile technicians(auto mechanic, auto panel, auto electrician and auto painter) in Oyo State, Nigeria.

Theory of Planned Behaviour provided the framework, while the descriptive survey design was adopted. The seven waste management zones in the State were enumerated, while proportionate to sample size technique was used to select 50% of Local Government Areas (LGAs) in each zone: Oyo (2), Ogbomoso (3), Oke-Ogun I (2), Oke-Ogun II (3), Ibarapa (2), Ibadan I (3) and Ibadan II (3). The total number of registered automobile technicians in each zones are: Oyo (97), Ogbomoso (443), Oke-Ogun I (236), Oke-Ogun II (336), Ibarapa (297), Ibadan I (789), Ibadan II (867); 60.0% of registered automobile technicians in the same workshop in each of the zones were randomly selected, making a total of 1 843. Solid Waste Management Practice ($r=0.93$), Awareness of Solid Waste Management Policy ($r=0.90$), Physical Planning Indices ($r=0.83$), Media ($r=0.76$) and Compliance with Solid Waste Management Policy ($r=0.76$) scales were used for data collection. These were complemented with six sessions of in-depth interviews with environmental health officers. Data were analysed using descriptive statistics, Pearson's product moment correlation and Multiple regression at 0.05 alpha level, while qualitative data were content analysed.

Participants' age was 41.6 ± 6.9 years and majority (67.7%) had Primary School Leaving Certificate. Most automobile technicians (78.4%) disposed solid waste indiscriminately. Road accessibility ($r=0.64$), town planning regulations ($r=0.61$), location of solid waste management facilities ($r=0.58$), electronic media ($r=0.57$) and print media ($r=0.55$) had positive significant correlations with compliance with solid waste management policy. There was a significant joint prediction of physical planning indices and media on compliance with solid waste management policy ($F_{(5,1816)}=293.27$, $adj.R^2=0.45$); accounting for 66.8% of its variation. Road accessibility ($\beta=0.34$), location of solid waste management facilities ($\beta=0.30$), electronic media ($\beta=0.14$), town planning regulations ($\beta=0.09$) and print media ($\beta=0.09$) contributed to compliance with solid waste management policy. Lack of road accessibility, improper location of solid waste management facilities and violation of town planning regulations hindered collection and transportation of solid waste, while low level of awareness accounted for non-compliance with solid waste management policy.

Poor road accessibility, strict town planning regulations, inadequate location of solid waste management facilities influenced compliance with solid waste management policy among automobile technicians in Oyo State. Stringent enforcement of waste disposal regulations, easy road accessibility and constant sensitization through the media will enhance compliance with solid waste management policy.

Keywords: Solid waste management, Road accessibility, Town planning regulations, Automobile technicians

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CHAPTER ONE

INTRODUCTION

Background to the Study

Solid waste is inevitably generated by a variety of human activities daily and its management is a serious intractable public health challenge in Nigeria. Its generation is not the problem, but how to effectively manage it at individual and community levels is the real problem. There exist a phenomenal increase in the volume and nature of solid waste generated largely because of population growth rate, rural-urban migration, the proliferation of slums/shanties, modernization and economic development.

Federal Ministry of Environment (2006) states that industrialization and rapid population growth in cities and towns, enhance wastes generation faster than they are collected, transported and disposed of. In many cities, notably Lagos, Ibadan, Port-Harcourt, Aba, Onitsha, Kano and Kaduna, the volume of solid waste has outweighed the capacity of urban administrations to plan for effective storage, collection, transfer, transportation and sanitary disposal involving solid waste. According to Fafioye and John-Dewole (2013), this situation occurs because most of the people at the city centres do not benefit from public disposal services and therefore have to bury or burn their waste or dispose of it haphazardly.

Waste ranges from garbage, sludge, gaseous and other discharged materials resulting from various community activities. Waste consists of discarded substances resulting from domestic, and community activities from industrial, commercial and agricultural operations. Wastes are generated at various phases of production of goods and services. These are important components of products that cause the emission of carbon dioxide by humans during the process of respiration. Waste is solid and semi-solid materials that the possessor no longer considers the valuable value to retain. Waste is also viewed as the material the holder intends to be discarded, and no longer has normal commercial cycle or chain of utility (Wokekoro, 2007). According to Oreyomi (2005), the issue of solid waste is as old as creation. Right from creation, man has always been faced with fundamental problems of how to effectively manage his waste products.

Igbinnomwanhia and Ideho (2014) assert that the growth of urbanization and population have caused a corresponding increase in solid wastes caused by man's domestic, social and industrial operations in towns and cities in Nigeria. Moronkola and Okanlawon (2003) stress that solid wastes constitute unwanted and discarded non-liquid materials emanating from activities of a man at home, school and workplace, which may be combustible. As long as human beings live, waste must be produced and it must take place within an environment. However, while taking decisions on how to deal with wastes, the environment is considered with a view to averting any danger that may arise from it.

Solid waste management is the collection, storage, transportation, treatment and its disposal in such a way to render it innocuous to human life, animal life, ecology and environment generally. Sridhar (2008) defines solid waste management as the discipline associated with the control of generation, storage, collection, transfer, transportation, processing and disposal in accordance with best practices of public health, economics, engineering, conservation and aesthetics. Wokekoro, (2007) states that waste management involves a planned system of controlling the production, storage, collection, transportation, processing and disposal of waste in a sanitary aesthetically acceptable and economical manner. This includes administrative, financial, legal and functional planning including the physical aspects of waste handling.

Proper solid waste management has not been successfully carried out in most states and local governments in Nigeria because of inadequate equipment, material and financial resources and ignorance on the part of the masses, leading to failure to appreciate the environment and to understand health hazards associated with improper solid waste disposal and management. Many people have wrong opinion, views or perspectives and incorrect knowledge about the use of the available waste disposal facilities. This leads to the wrong attitude towards solid waste management and uncooperative attitude of members of the community with government officials as well as private solid waste managers which have drastically inhibited the viability of these waste management programmes. Locations of the solid waste disposal facilities, road network and government policies have a diverse effect on effective utilization of waste disposal facilities (Wokekoro, 2007).

The problems facing most cities of Oyo State include indiscriminate dumping of waste. This is an intractable nuisance, resulting in open and wanton dumping of refuse, which include human and animal faeces. This, in turn, causes social embarrassment to the government and the populace (Omoleke, 2004). This condition characterizes the environmental culture in the most part of Oyo State. The problem of public health situation can put great excessive pressure on health budget, curtail productivity and worsen the urban condition of health. This ugly situation is persisted because of the high rate of illiteracy, ignorance, the culture of indiscriminate waste littering (that is throwing of waste on bare ground) and wanton population, slum condition, poor physical planning and violation of town planning regulation. It was established that there is the persistent wanton dumping of solid wastes in the Ibadan metropolis which is evident through the haphazard way of dumping refuse on roadways, walkways and drainages (Omoleke, 2004; Mudashiru, 2014). However, Adio-Moses (2007) claimed that health education has a strong influence in enhancing attitude towards solid waste management.

Personal exploration of the researcher revealed that several premises in the centre of cities and towns have no refuse storage facilities; hence, wastes are dumped inside streams, drainages and road island. Omoleke (2004) citing Adesiyani (2000) notes clearly a clustered configuration inhibits mechanized refuse collection due to high rate of solid wastes being dumped into drainages and stream channels, leading to flooding. The resultant effects of the on-going practices include street littering and aesthetic value depletion of the urban landscape.

Also, pollution is noticeable in most part of cities in Oyo State when refuse dump location and residential premises spontaneously catch fire. Equally, water pollution is evident in Ibadan city, in the rainy season when surface run-off or leachate flow into rivers. All these forms of environmental pollution reduce the property value of land close to dumping sites. Waste in dump sites is sources of air and water pollution, land contamination, health hazards and environmental degradation. The risks anticipated include foul odour, aesthetic nuisance, fire outbreak, water pollution, the proliferation of insects, flies, cockroaches, rats and other dangerous insects which can endanger public health through breeding of the pathogens of diseases like dysentery, cholera, diarrhoea,

yellow fever, lassa fever and filariasis. In view of this, it is pertinent to discuss physical planning and mass media indices with regard to the role they play in compliance with solid waste management policies.

Physical planning requires spatial expression of the desired form of social and economic development. Physical planning establishes and maintains framework which aligns the ongoing conversion of land using spatial development with long-term objectives for sustainable economic and social development. Urbanization is increasing at an alarming rate with pressure on municipal services especially the aspect of managing the ever-increasing amounts of waste. According to Danbuzu (2013), the problem of refuse disposal is basically a feature of rapid urbanization, collection centres are not well planned and this leads to the introduction of illegal collection points. Federal Ministry of Environment (2006) also states that solid waste management is poor across many urban centres because of poor town planning, making it virtually impossible for solid waste collection vehicles to have good access to some houses. These have resulted in heaps of solid waste clotting towns and cities and some low-density rural area.

Moreover, the violation of town planning regulations has created numerous incorrigible structural buildings leading to the creation of slum and ghettos in towns and cities. The problems confronting waste management include inaccessibility of buildings for collection and transportation of wastes. The memorable flood disaster of Friday, 26th August 2011 in Ibadan was largely attributed to poor urban and regional planning. (Agbola, Ajayi, Taiwo and Wahab, 2012) The National Health and Demographic Survey (NHDS) (2003) has also revealed that 87% of Nigerian populace use unsanitary methods for solid waste disposal. This encourages the breeding of mosquitoes, rodents, vermin and other pests of public health importance which has great potential for disease outbreaks. This is attributable to the low level of awareness among the populace.

The mass media refer to communication, whether print or electronic that reaches a large audience. The mass media include television, radio, advertising movies, the Internet, newspapers, and magazines. According to Ojenike (2012), mass media differ significantly from other knowledge institutions because they carry various kinds of knowledge, most times on behalf of other institutions. Media are used to shape people's values, beliefs

perceptions and behaviours. It contributes to socialization, such as when movies clearly teach people how to differentiate between the good and the bad. Adio-Moses (2007) avers that health education is important in changing and improving solid waste management practices.

The media is regarded as all technically organized means of communication that reach a large population effectively. The media is one of the most powerful institutional forces which helps in reinforcing health information thereby bringing government policies and programmes closer to the people. It is important to examine the media role in propagating health policies and government programmes on waste management.

The role of the mass media is to ensure adequate information and education of the populace on government policies and activities, particularly to ensure that people comply with the rules or laws of town planning, environmental sanitation laws. Publicity is an important tool for the public to get to know what one does and the importance of one's role in national development. However, solid waste management activities havenot been given adequate publicity. The importance of solid waste management programmes, are such that if blended with necessary desirable publicity in the print and electronic media, will make it and its practitioners the noticeable. In addition, mounting of environmental health education at all tiers of government on solid waste management is essential (Ogundele, 1997).

Solid waste management authorities have the duty to reduce litter and eliminating open dump sites, enhancing recycling of refuse and source reduction activities. Each of the activities requires some behavioural change on the part of the public. The basic means for achieving this change is through public awareness. Series of efforts have been made by the Oyo State Government in sensitizing the public on compliance with laws and regulations guiding waste management. Examples are production and airing of jingles on radio and television, erection of signposts on street light poles, production and distribution of educative leaflets and sponsorship of radio and television programmes. All these are aimed at creating awareness but with the present level of compliance seems not impressive.

The full compliance of implementation of environmental requirements needs to be met and the desired changes are achieved. The design of requirements affects the success of an environmental management programme, a well-designed environment promotes wellbeing. Conversely, if the requirements are poorly designed, then achieving compliance and the desired results will likely be difficult. Effective strategy and enforcement programme bring many benefits to society. First, it improves environmental quality and public health. Similarly, it reinforces the credibility of environmental programmes, which helps in ensuring fairness for those who willingly comply with environmental requirements. Therefore, the compliance brings economic benefits, to individual houses and society at large. In line with this, Adekola (2004) affirms that adequate management of solid waste can be achieved with effective compliance participation of the people from whose homes the problem of solid waste starts and ends.

Environmental laws need to be put in place to mitigate the threatening of environmental problems emanating from human activities in the quest for economic growth and development. Adelegan (2004) notes that environmental control arises because it brings improved health and better living conditions. In recognition of the need to take a holistic approach to environmental management in Nigeria, the Federal Government created the Federal Environmental Protection Agency in 1988, through the Federal Environmental Protection Agency Act (FEPA) 2007. States and local governments were directed to establish environmental commission and committee, respectively. The main solid waste management policies are formulated by the federal and state governments and its implementation is concentrated at the local government level.

According to Federal Ministry of Environment (2005), the National Environmental Sanitation Policy sets to achieve a clean and healthy environment for all Nigerians. In tackling the underlying problems of solid waste management, the policy guidelines recommend effective, efficient and sustainable waste management strategies. This includes waste minimization at source through re-use, recycling and energy recovery before final disposal. Due emphasis needs to be given to the use of locally available, appropriate and easily affordable technologies. The policy stipulates that the members of the public, including automobile technicians, are to imbibe the need for environment-

friendly habits and practices. This must be in compliance with existing legislation and policy guidelines on the solid waste management and paying for solid waste management services to ensure their sustainability.

Federal Government's efforts in combating environmental hazards, the state government agencies were established to complements. Oyo State Government enacted an edict establishing the Ibadan Waste Management Authority (Gazette No.8 Vol.22 of 16thMay 1997), which later transformed into Oyo State Solid Waste Management Authority in 2008 through a law passed by the Oyo State House of Assembly (Gazette, No.9, Vol.33 of 5th June 2008). The law delegates the functions of the 33 local government councils in the area of collection, transfer and their disposal. Hitherto it is being performed by local councils under the 1979 constitution to Oyo State Solid Waste Management Authority. The Ministry of Environment and Habitat Law 2012 and Environmental Sanitation and Wastes Control Regulation, 2013 were made (Gazette No.6 Vol.38 of 20thMarch 2013). Another complementary role played by the Oyo State Government is the introduction of weekly environmental sanitation exercise wherein the residents, including the automobile technicians, are expected to use the period between 7am and 10am on Thursdays to clean their environment and dispose of the refuse generated appropriately. Artisans and craftsmen by the nature of their jobs generate more solid wastes.

Artisans or craftsmen are skilled manual workers who make items of various types. These are strictly decorative in nature, including furniture, sculpture, clothing, jewellery, household items, tools and even machines. According to Mooko and Aina (2007), artisans are those who perform skilled works with their hands. They are equipped with vocational education acquired formally or informally. In most cases, they serve as apprentices before becoming expert in their vocations. They are involved in all kinds of occupations, especially those in construction and automobile industries. Example are carpenters, plumbers, bricklayers, welders, painters, panel beaters, electricians, and automobile technicians.

Many technological innovations of the 20th century have had a great impact on society. Examples are vehicles such as cars and trucks. However, the maintenance of

vehicles generates a number of wastes constituting a nuisance that are hazardous. This waste usually threatens workers' safety, degrade the environment, put an entire community at risk if not properly handled. Automotive wastes include oil filter, fuel filter, lead-acid batteries and scrap metal, tyres, asbestos, brake shoe and pads, used absorbent and rags, fluorescent bulbs and high-intensity discharge (HID) lamp and aerosol cans. All these, if not properly disposed may constitute a source of pollution to the environment. Meenamtabal, Uma and Murali (2005) argue that these hazardous wastes can result in serious illness, injury, or even death of the population exposed to them. They can also pose a serious threat to environmental quality when improperly stored, transported or disposed.

Many cases involve surface and groundwater contamination, including public water supplies. The role of automobile technicians is important in protecting the health of the public and the environment. Standard process of waste management practices are important for a number of reasons; they prevent waste of money by looking for ways to reduce and recycle automotive waste; they ensure adherence to local, state, and federal environmental regulations; these help to prevent high cost of penalties; they attract customers who prefer to deal with a workshop that can protect human and environmental health; they make use of such practices join from others who take pride in a befitting clean and healthy environment. Therefore, this study examined the physical planning indices and media contribution to compliance with solid waste management policy among registered automobile technicians in Oyo State.

Statement of the Problem

Good policies are put in place by the government but there is poor implementation of such policies. This affects enforcement and compliance, which is one of the problems confronting Nigeria in solid waste management. Oftentimes, when new policies are designed or existing ones are reviewed they are not given wide publicity. Owing to poor publicity, most people are ignorant of the consequences of their actions regarding indiscriminate dumping of refuse, infringement of town planning regulations and environmental sanitation laws of Oyo State. The report on the aftermath of the 2011 flood disaster in Oyo State attributed the disaster to improper waste disposal and management

practices, disruption of the existing physical planning structures, low level of awareness on government environmental regulations and non-compliance with solid waste management policy. (Agbola, Ajayi, Taiwo and Wahab 2012).

The automobile technicians by the nature of their operations, generate a large volume of wastes which are mostly non-biodegradable and hazardous in nature. If not properly managed these wastes can be a source of environmental pollution. Owing to the low level of awareness, some of them might not be well informed about the consequences of indiscriminate waste disposal practices. Some of them have considered it cheap to burn their solid wastes around the corner or open space. This constitutes serious and dangerous environmental pollution. This attitude is traceable to ignorance on the part of automobile technicians, poor physical planning in the area of accessible roads for waste transportation, inadequate provision of solid waste management facilities, the absence of a master plan for most of the cities and towns and impotency of sanitation laws. Lack of mass education and inadequate information may have been responsible for their non-compliance with solid waste management policy.

Previous studies have been done in other areas of solid waste management in relation to knowledge, attitude and practices as well as factors influencing solid waste management. However, the aspect of physical planning and media influence has not been given strong empirical attention, which makes it pertinent to conduct this research that examined physical planning indices and media as predictors of compliance with solid waste management policy among registered automobile technicians in Oyo State.

Objectives of the Study

The main objective of the study was to examine physical planning and media factors as predictors of compliance with solid waste management policy among the automobile technicians in Oyo State.

Specific Objectives

The specific objectives were to examine:

- (1) how automobile technicians in Oyo State dispose of their automotive solid waste.
- (2) if the automobile technicians are aware of the solid waste management policy of Oyo State;
- (3) the joint contribution of physical planning indices (road accessibility, town planning regulations and location of solid waste management facilities) in compliance with its policy among automobile technicians in Oyo State;
- (4) the relative contribution of physical planning indices (road accessibility, town planning regulations and location of solid waste management facilities) in compliance with the waste management policy among the automobile technicians in Oyo State;
- (5) the joint contribution of media (electronics and print media) to compliance with the solid waste management policy among the automobile technicians in Oyo State;
- (6) the relative contribution of media (print and electronic media) to compliance with the solid waste management policy among automobile technicians in Oyo State;
- (7) the joint contribution of physical planning indices and media on compliance with solid waste management policy among the automobile technicians in Oyo State.
- (8) the difference in compliance with the solid waste management policy among automobile technicians in Oyo State relative to years of work experience;
- (9) the difference in compliance with the solid waste management policy based on educational qualifications of automobile technicians in Oyo State.

Research Questions

This study provided answers to the following questions;

1. How do the automobile technicians dispose of generated automotive solid waste in Oyo State?
2. Are the automobile technicians aware of solid waste management policy in Oyo State?

Hypotheses

The following hypotheses were tested;

1. There will be no significant joint contribution of physical planning indices (road accessibility, town planning regulations, and the location of solid waste management facilities) to compliance with the solid waste management policy among automobile technicians in Oyo State.
2. There will be no significant relative contribution of physical planning indices (road accessibility, town planning regulations and the location of solid waste management facilities) to compliance with solid waste management policy among automobile technicians in Oyo State.
3. There will be no significant joint contribution of media (electronics and print media) to compliance with the solid waste management policy among automobile technicians in Oyo State.
4. There will be no significant relative contribution of media (electronic and print) to compliance with the solid waste management policy among automobile technicians in Oyo State.
5. There will be no significant joint contribution of physical planning indices (road accessibility, town planning regulation and location of solid waste management facilities) and media (electronic and print) to compliance with the solid waste management policy among automobile technicians in Oyo State.
6. There will be no significant difference in compliance with the solid waste management policy among automobile technicians in Oyo State based on years of work experience.
7. There will be no significant difference in compliance with the solid waste management policy among automobile technicians in Oyo State based on educational qualifications.

Delimitation of the Study

This study was delimited to the following;

1. The descriptive research design of correlation type
2. All registered automobile technicians in Oyo State as the study population
3. Seven zones of Oyo State including; Oyo, Ogbomoso, Oke-Ogun I, Oke-Ogun II, Ibarapa, Ibadan I and Ibadan II
4. Multi-stage sampling procedure, of proportionate, and simple random sampling techniques
5. A self-developed structured questionnaire as an instrument for data collection.
6. Independent variables of physical planning indices (road accessibility, town planning regulations, the location of solid waste management facilities) and media (electronic and print media).
7. The dependent variable of compliance with the solid waste management policy.
8. Descriptive statistics of frequency counts, percentages, and mean for demographic data and inferential statistics of ANOVA, and multiple regression for the hypotheses set at 0.05 level of significance.
9. Ten (10) trained research assistants.

Limitation of the study

Since the data collected is self reported, the accuracy and adequacy of the data cannot be ascertained. Also the researcher and research assistants interpreted the items of the questionnaires to the respondents who could not read it very well. Again, not all the questionnaire given out were able to be retrieved. However, a considerable number (1822-98.86%) was eventually used as the sample size.

The significance of the Study

This study has documented evidence on non-compliance with solid waste management policy among automobile technicians in Oyo State. This has bridged the gap in knowledge on compliance with solid waste management policy.

Also, the outcome of the study might help the government to review the implementation of the policy in order to bring about improvement in solid waste management in Oyo State. It might also assist health education specialists in planning or designing programmes on the importance of complying with the solid waste management policy and educating the public through the use of mass media.

This study might be of help to planners to understand the interactions between waste management and physical planning, promote planners contributions to sustainable waste management planning; and facilitate the integration of waste management into mainstream planning in order to promote urban sustainability. Similarly, the outcome of the study might help the policy-makers and other stakeholders in designing awareness programmes for the automobile technicians on their roles in environmental sustainability through positive solid waste management practices.

Finally, the study is an addition to the existing body of knowledge. It has provided further opportunities for researchers who might wish to carry out similar studies on the solid waste management policy.

The Operational Definition of Terms

Physical Planning: This is urban land use planning which allows easy accessibility of refuse trucks to collect and dispose of refuse.

Compliance: This means total obedience of the automobile technicians to the policy guiding solid waste management in Oyo State

Automobile Technicians: These are skilled manual workers that carry out repair on the automobile. They are also the categories of auto-mechanics, auto-electricians, auto-panel and auto-painters who are under the auspices of Nigerian Automobile Technicians Association (NATA) Oyo State Branch.

Automotive Wastes: These are solid wastes generated by automobile technicians in the course of repairing and servicing automobile. These wastes include oil filter, fuel filter, air filter, oil containers and paper, asbestos, brake shoes and pads, scrap metal, lead-acid batteries and so on.

Waste Management: Involves collecting, transporting and disposing of the generated automotive wastematerials so as to protect the environment, human life and health in accordance with the solid waste management policy by the automobile technicians

Media: This refers to the channel through which information or messages can be processed and disseminated to the intended audience. In this study, the media refers to electronic and print media through which automobile technicians have access to solid waste management policy information.

Electronics Media: This refers to radio, television and Internet channels through which information about the solid waste management policy is disseminated to the automobile technicians.

Print Media: This refers to all forms of printed materials through which information about the solid waste management policy is transmitted from one person to another. It includes posters, handbills, leaflets, billboards, newspapers, journals and magazines used for the enlightenment of the automobile technicians on the policy.

Solid Waste Management Policy: This refers to enabling laws and regulations made by both federal and for state governments which stipulate that the public including automobile technicians the need to provide storage facilities for waste generation and collection for transportation to the approved dumpsite.

CHAPTER TWO

LITERATURE REVIEW

The review of related literature is discussed under the following sub-headings:

1. A conceptual framework for the study

2. The theoretical framework for the study

- a. Theory of Reasoned Action and Theory of Planned Behaviour

3 Conceptual Review

- a. The concept of solid waste:
- b. Classification and sources of solid wastes:
 - i. Domestic/residential wastes generation
 - ii. Commercial wastes generation
 - iii. Construction and demolition wastes generation
 - iv. Municipal wastes generation
 - v. Automotive wastes generation
- c. Component of solid waste
- d. Solid waste characteristics
 - (i) Physical characteristics of solid waste
 - (ii) Chemical characteristics of solid waste
- e. Impact of solid waste on the environment
 - I. Environmental Impact:
 - i. Air pollution and release of gases
 - ii. Contribution to greenhouse gases
 - iii. Water pollution
 - II. Health risks of poor solid waste management on the public
 - i. Exposure to infection and biological contaminants.
 - ii. Injuries arising from exposure to solid waste
 - iii. Assessment of health impacts of automotive solid waste on the automobile technicians.
 - iv. Socio-economic impacts of solid waste management.
 - v. Health and environmental impacts of solid waste management
- f. Solid waste management policy in Oyo state.
 - i. History of solid waste management
 - ii. Goal and objectives of the solid waste management system
 - iii. The functional element of the solid waste management system.
 - iv. Components of the solid waste management system

v. Overview of the solid waste management policy

4. An empirical review of related literature

a. Physical planning and solid waste management policy

- (i) Road accessibility and compliance with the solid waste management policy in OyoState.
- (ii) Town planning regulations and compliance with the solid waste management policy in Oyo State
- (iii) Location of solid waste management facilities and policy compliance in Oyo State.

b. Mass media and solid waste management policy

- (i) Mass media and solid waste management in Oyo State
- (ii) Mass media and compliance with the solid waste management policy in OyoState

5. Appraisal of the Reviewed Literature

A conceptual framework for the study

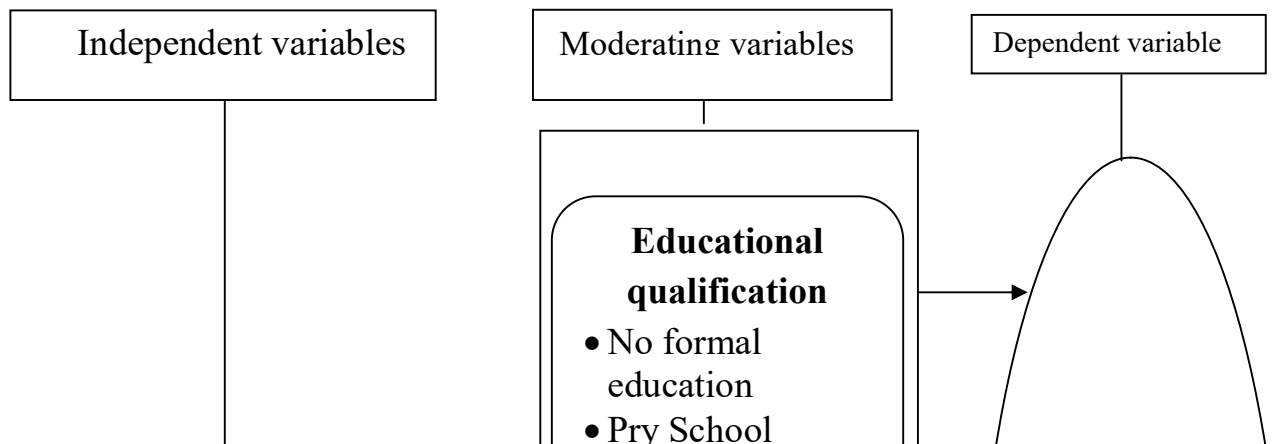


Fig. 2.1: Conceptual framework for the study

Source: Developed by the Researcher

The framework for the study is a self-developed concept which is structured in relation to how physical planning and mass media indices could influence or contribute to compliance with solid waste management policy among the artisans.

The framework is in two levels with an illustration of boxes of variables and other elements showing the dependent variable of compliance with solid waste management policy. The two boxes with the independent variables show that they influence the

behaviour of people towards compliance with the policy. Furthermore, the framework shows the likely predictions of physical planning and media variables on the compliance level of the policy; which rested on the practice of proper disposal of solid waste. The interaction is revealed by the lines and arrows linking them together. Finally, the variable enclosed in the middleboxes illustrate the moderation of educational qualifications and years of work experience in compliance with the policy.

The theoretical framework for the study

Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB)

The theory of reasoned action (TRA) is one of the three models of persuasion which is also used in communication discourse as theory of understanding. Theory of reasoned action was developed by Martin Fishbein and Icek Azjen in 1967 and was derived from previous research that began as theory of attitude. The theory aims to explain the relationship between attitudes and behaviors within human action. (Gillmore and Archibald, 2002).

TRA posits that an individual's behaviour is driven by behavioural intentions, which are a function of an individual's attitude toward the behaviour and subjective norms surrounding the performance of the behaviour. The theory reveals that a person's behaviour is determined by his/her intention to perform the behaviour and that this intention is, in turn, a function of his or her attitude toward the behaviour and their subjective norm. The best predictor of behaviour is the intention. The intention is the cognitive representation of a person's readiness to perform a given behaviour, and it is considered to be the immediate antecedent of behaviour. The intention is determined by three things: attitude toward the specific behaviour, subjective norms, and perceived behavioural control.

The theory of planned behaviour (TPB) holds that only specific attitudes toward the behaviour in question can be expected to predict that behaviour. In addition to measuring attitudes toward the behaviour, it is important to measure people's subjective norms and their belief about how people they care about will view the behaviour in question. The TPB and TRA explore the relationship between behaviour and beliefs,

attitudes and intentions. Both TPB and TRA assume that behavioural intention is the most important determinant of behaviour. According to these models, behavioural intention is influenced by a person's attitude towards performing a behaviour, and my belief about whether individuals who are important to the person approve or disapprove of the behaviour (subjective norm).

The TPB and TRA assume all other factors (for example, culture, and environment) operate through the models' constructs and do not independently explain the likelihood that a person will behave in a certain way. The TPB differs from the TRA, in that it includes one additional construct perceived behavioural control. This construct has to do with people's beliefs that they can control a particular behaviour. Azjen and Driver (1991) state that behavioural control account for situations in which people's behaviour or behavioural intention is influenced by factors beyond control. They argued that people might try harder to perform a behaviour if they feel they have a high degree to control it. It has application beyond these limited situations. However, people's perceptions about controllability may have an important influence on behaviour.

According to the model, attitudes towards behaviour are shaped by beliefs about what performing the behaviour entails. The beliefs about social standards and motivation to comply with those norms affect subjective norms. The presence or lack of things that will make it easier or harder to perform the behaviour affects perceived behavioural control. Thus a causal chain of beliefs, attitudes and intentions drives behaviour. The TPB has been widely tested and successfully applied to the understanding of a variety of behaviour (Ajzen, 1991; Conner and Sparles 2005). For instance, in a meta-analysis of the TPB, Armitage and Conner (2001) reported that across 154 applications, attitude, subjective norms and perceived behavioural control accounted for 39% of the variance in intention, while intentions and PBC accounted for 27% of the variance in behaviour across 63 applications. Intentions emerged as the strongest predictions of behaviour, while attitudes were the strongest predictor of intentions.

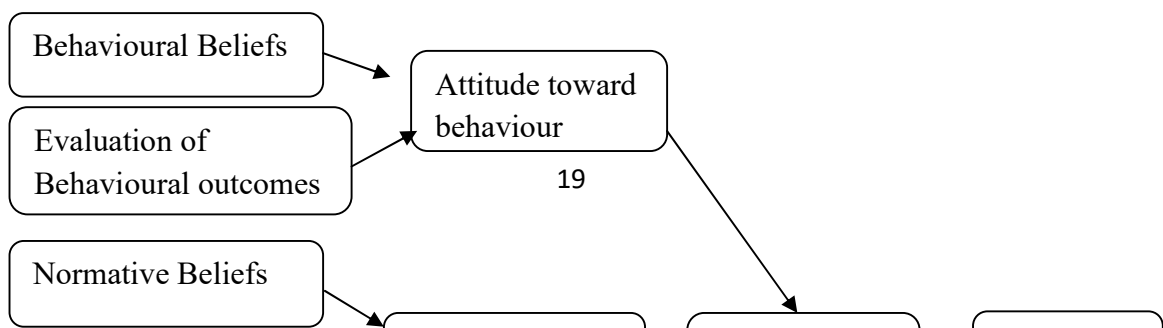


Figure 2.2: Theory of Planned Behavior

Source: National Institutes of Health, U.S. Department of Health and Human Services (2005)

The relevance of Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) to this study

Whenever an automobile technician perceives that performing a specific behaviour will be of help and beneficial to him or her, then he or she will demonstrate a positive attitude towards accomplishing such behaviour. For example, if an automobile technician knows that dumping of automotive wastes in an unauthorized place will cause health problems or he or she will be sanctioned by relevant authorities or agencies he or she will demonstrate a positive attitude towards compliance with the solid waste management policy. TRA and TBP are important to automobile technicians if they are knowledgeable about the importance of complying with the solid waste management policy. Such automobile technicians will be motivated in ensuring the provision for storage, collection and disposal of automotive waste generated in his/her workshop according to solid waste management policy.

With reference to the model, activities towards adherence to wastes policy are shaped by beliefs of automobile technicians about what is required in making provision for storage, collection and disposal of automotive waste. Also, the presence or lack of things such as road accessibility, the location of waste management facilities, and access to information on solid waste management policy makes it easier or harder to manage automotive waste in line with the policy of Oyo State. Therefore, a causal chain of beliefs, attitudes and intentions drive compliance with solid waste management policy among automobile technicians

Conceptual Review of the Literature

Concepts of solid wastes

Solid wastes in any form are an unavoidable part of human activity. They either come from man's production activities or as a by-product of materials consumed by man. A rising quality of life and high rates of resource consumption patterns have had an unintended and negative impact on the urban environment's generation of wastes far beyond the handling capacities of urban governments and agencies. According to Srinivas (2006), cities are now grappling with the problems of high volumes of waste, the costs involved, the disposal technologies and the impact on the local and global environments. Tsiboe and Marbell (2004) state that in 20th and the early 21st centuries indicate that waste has become a major consequence of modernization and economic development. Humanity's quest for Western-styled development was not backed up by the budget for the associated problems related to the management of waste.

Longman Dictionary of Contemporary English (1995) defines waste as an unwanted substance that is left after someone has used something, New Short Oxford Dictionary on Historical Principles views it as unusable material left over from a process of manufacture, or the useless by-product of a process. Davies According to Tchobanoglous, Theisen and Vigil (1993), solid waste arises from human and animal activities that are normally discarded as useless or unwanted.

Sanitation Connection (2002) also views solid waste as any substance that no longer has any value to the person who is responsible for it and is not to be discharged

through a pipe. It does not normally include excreta. It is generated by domestic, commercial, industrial, healthcare, agricultural and mineral extraction activities and accumulates in streets and public places. The words “garbage”, trash, refuse and rubbish are used to refer to some forms of solid waste. Solid waste is, therefore, any solid material generated through domestic, commercial, industrial, agricultural and demolition activities is regarded as unwanted by those who own it.

Classification and sources of solid waste

Solid waste is generated from various sources. The sources of generating solid waste are related to their communities. Chati (2012) classifies the sources of solid waste in a community into the following:

- i. **Domestic/Residential wastes generation:** They consist of combustible and non-combustible solid wastes from homes. They contain materials such as food waste (garbage) paper, corrugated cardboard, plastic, textiles, rubber, leather, wood and yard wastes. The non-combustible (inorganic) part consist; of items such as glass, crockery, tins, cans, aluminium, ferrous, metals and dirt. A portion of the residential waste is decay wastes which come from eating.
- ii. **Commercial wastes generation:** These relate to those from residential sources except for those involved in cooking and eating.
- iii. **Institutional wastes generation:** The generators of this source of wastes include government offices, school, hospitals, but medical wastes are handled separately from the rest of the solid wastestream.
- iv. **Construction and demolition wastes generation:** These are from demolition and construction activities. These result from the repair of individual residences, commercial buildings and other structures. They also include wastes from collapsed buildings broken-out streets, sidewalks and bridges.
- v. **Municipal wastes generation:** This is solid wastes from street sweepings, roadside litter, municipal litter containers, landscaping and tree trimmings, catch basin,

debris, dead animals and abandoned vehicles are categorized as wastes from municipal services.

- vi. **Automotive wastes generation:** This is solid waste generated in the process of servicing or repairing automobile vehicles. Automotive waste management depends on workshops owners, customers and employees working together to keep the work environment clean. The automotive wastes and their management are discussed as follows:

Oil filters

Oil filters filter out debris oil picks up as it circulates through the engine oil filters become saturated with trapped debris and ultimately must be changed to avoid loss of filtering capacity. Used oil filters normally contain some trapped oil along with other contaminants, such as heavy metals that are potentially hazardous. Oil filters exhibit hazardous characteristics of lead, other heavy metals and oil-based compounds. Therefore, used oil filters must either be managed as hazardous waste or in accordance with the requirements found in the regulations and laws.

Fuel filters

The fuel filter is a solid waste that contains some fuel. Therefore, precaution is required to prevent spillage. The main hazard associated with fuel filters is inflammability of fuel. Therefore, caution should be taken around flammable materials.

Air filters

Air filters are mostly made of paper, which is non-pollutant. Although when other systems fail such as the positive crankcase ventilation (PVC) system, a large amount of oil can soak into the paper element. If this occurs disposing of improperly could damage waterways. Air filters like papers can be disposed of in the regular trash collection system.

Oil containers

Motor oil is a large part of the automotive world and its containers must be handled properly. Oil left could find its way into waterways containers and cans of oils.

The solid waste can be disposed of via the traditional solid waste disposal methods. However, no free liquid should be left in a container.

Glass and paper

The home environment is the place where this waste stream is usually being managed correctly. The automobile workshop must also consider this waste stream in its pollution-prevention plan. The challenges of managing glass and paper are enormous because of their volume in landfills. However, the use of recycling methods is appropriate for managing glass and paper in an automobile workshop.

Asbestos

Asbestos is used in some brake and clutch linings and other products. Asbestos has a negative impact on humans if not properly managed. Auto technicians in workshops where brake and clutch works are done may be exposed to asbestos dust. Some brake dust is visible when a brake drum is removed from a car, truck or other equipment. Fine dust is invisible be seen with the naked eyes. These invisible particles may be asbestos and or other brake lining materials. Breathing these particles can damage the health of automobile technician (mechanics). It may cause shortness of breathing or cancer many years after inhalation. Wastes that contain brake dust must be carefully disposed off in line with the state and federal regulations. While, it must be placed in an especially marked heavy plastic bag double-tied and stored in leak-proof and air-tight containers in designated asbestos waste and, taken to the landfill approved for asbestos disposal.

Brake shoes and pad

The products contain many hazardous materials. Their improper disposal can have a significant impact on the environment. Brake pads can be disposed of in the solid waste stream. The best practice is to recycle them into scrap metal stream.

Scrap metal

Scrap metal refers to bits and pieces of metal parts (such as rods, bolts, wheel weights) or metal pieces that may be combined together with bolts or solder (for example, radiators, scrap automobiles), which when worn or no longer needed, can be recycled. Managing scrap will prevent contamination at the workshop.

Certain scrap parts contain lead, well-known toxic substances and potential pollutant.

Some automobile workshops have enough scrap metal to make it worthwhile to work with the haulier. Scrap metal is better managed through housekeeping practices and in a way that will not adversely impact the environment. Also, scrap items, such as radiators, that cannot be stored in a covered container should be stored in such a way that will prevent contact with rain, snow and stormwater. Other scrap metals such as copper wire, exhaust pipe, empty fuel tanks and other fittings can be collected in suitable containers.

Lead –acid batteries

These provide the basis for the electrical system of modern motor vehicles. They rely upon two components to store energy and produce electricity: lead and sulfuric acid. Batteries pose a real threat to human health and the environment if not properly disposed of. Lead acid batteries are a hazardous waste because of the lead (D008) and acid (D002) contents. Their batteries that are not reclaimable must be discarded in accordance with regulations. In other words, this needs to be disposed of at a permitted hazardous disposal facility.

Tyres

The management of scraped tyres is a serious concern. Used tyres are one of the difficult auto repair wastes to dispose of. The solution for many years is to stockpile old tyres in dumps. Tyres not properly disposed of constitute a potential fire hazard that could threaten natural resources by polluting air, soil, and water. Uncontrolled burning of tires releases toxins into the air, soil and even groundwater. State laws prohibit open burning of waste tyres. They burn very hot and are difficult to extinguish. They pose a hazard to fire personnel and others in the area. Also, discarded tyres are an excellent breeding ground for disease-carrying pests and rodents. Just one left outdoors can contain rainwater to

breed hundreds of thousands of mosquitoes, which have been known to transmit strains of encephalitis.

Absorbent and used rags

At automotive service stations, spills and leaks of used oil often occur when activities such as vehicle maintenance, machinery repair, and fluid servicing. Cleaning up these spills and leaks generates used rags and other absorbents. Rags are also used to apply cleaning solvents to parts and wipe parts clean of excess liquids, such as oils and solvents. Managing used rags and other absorbents, keep used absorbents that contain hazardous materials separate from those containing non-hazardous materials.

Fluorescent bulbs and high-intensity discharge (HID) lamps

Energy-efficient fluorescent lamps and high-intensity discharge (HID) lights have gained widespread usage over the years as compared to incandescent ones. Fluorescent lamps and HID lights are three to four times more efficient in converting electricity to visible light. Fluorescent and HID lamps contain mercury. Mercury is a heavy metal that accumulates in living tissue and causes illness or death in humans. When a lamp is broken or placed in a landfill or incinerator, the mercury can contaminate the air, surface water, and groundwater.

Aerosol cans

Quite a number of cleaners, paints and adhesives used in auto repair are packaged in aerosol spray cans. These cans are thin-walled steel pressure vessels pressurized with one of several hydrocarbon propellants, such as butane. When empty, the propellant and product are gone and the cans are not considered hazardous wastes. However, partially empty spray cans may be regarded as hazardous wastes because they contain ignitable or chlorinated solvents.

Managing aerosol containers can be grouped into two, that is managing empty aerosol containers and managing unused aerosol containers. Empty means the can that contains no product and no pressure. Empty containers are exempted from hazardous waste rules. They have no special storage labelling or disposal requirements. They may be recycled or sent to an incinerator that will recover the metal. But if the quantity is small, they can be mixed with other solid wastes. Non-empty aerosol containers can be returned and malfunctioning aerosols can be replaced. Malfunctioning aerosols returned to the

supplier or manufacturer are considered “product”, not “waste”. Therefore, hazardous waste rules do not apply. Full aerosol cans, even though they have been determined to be non-hazardous, have few disposal options. They generally cannot be sent to landfills or a solid waste incinerator. They will probably need to be managed by an agent specializing in the hazardous and problem-waste disposal.

As cited in (Wokekoro, 2007), Gobo and Ubong (2001) give a typically detailed classification of solid wastes as follows:

1. Garbage - putrescible waste from food, slaughterhouses, canning and freezing industrial etc.
2. Rubbish – non-putrescible wastes either combustible or non-combustible. Combustible wastes, either combustible or non-combustible, would include metals, glass, ceramics, stones, dirt masonry and some chemicals.
3. Ashes – residues (such as cinders and fly ash) of the combustion of solid fuels for heating and cooking or the incineration of solid waste by municipal industrial and apartment house incinerators.
4. Large waste – demolition and construction rubble, automobile home appliances, furniture, refrigerators and other home appliances, tyre, plastics etc.
5. Dead animals – household pets, birds, rodents, zoo animals, etc.
6. Hospital waste – anatomical and pathological wastes from hospitals
7. Sewage treatment process solids – screening settled solid, sludge
8. Industrial solid waste – chemicals, paints and explosives.
9. Mining waste – tailings slag heaps, Culm piles at coal mines
10. Agricultural wastes – farm, animal manure, crop residues and a host of others.

Table 2.1: Typical waste generation, activities and location associated with various solid wastes

Source	Typical Location	Types of Solid Waste
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Residential	Single-family and multi-family dwellings low-medium and high-rise apartments	Food waste, rubbish, ashes, special wastes
Commercial/Municipal	Stores, restaurants, markets, office buildings, hotels, motels, print shops, auto repair facilities and institutions	Food wastes, rubbish, ashes, demolition and construction wastes, special wastes, occasionally hazardous wastes
Industrial	Construction, fabrication light and heavy manufacturing refineries, chemical plants, lumbering, mining, demolition	Food wastes, rubbish, ashes, demolition and construction wastes, special wastes, occasionally hazardous wastes
Open areas	Streets, alleys parks, vacant plots, playgrounds, beaches, highway and recreational areas	Special wastes rubbish
Treatment plant sites	Water, wastewater and industrial treatment processes	Treatment plant wastes, principally composed of residual sludge

Source: Tchobanoglous et al. (1993: 52-53)

Tochobanoglous et al. (1993) further distinguish among food waste, rubbish, special waste and ashes and residue.

Food waste – These are wastes resulting from the handling, preparation, cooking and eating food. They are more generally referred to as garbage. These are highly putrescible and decompose rapidly, especially in warm weather, and give off very offensive odour. The putrescible nature of these wastes has a strong bearing on the design and operation of wastes collection services.

Rubbish – According to Puopiel (2010) rubbish consists of combustible and non-combustible solid wastes from household, commercial and institutional activities. It, however, excludes food waste and other highly putrescible materials. Combustible materials include textiles, rubber, cardboard, plastics, furniture and garden trimmings.

Special wastes – These include consumer electronics, batteries, oil and tyres.

Ashes and residue – These are remains of materials which have been burnt.

Components of solid waste

Developing countries have solid waste management problems compared with those found in developed countries. The composition of their waste is different from that of

developed nations. Third world countries have high food and yard wastes as compared to developed countries with a large fraction of paper and plastic contents that can be recycled (Dhussa and Varshney 2000)

Domestic waste streams also contain different components which are used to classify them into such types as organic or inorganic, and biodegradable or non-biodegradable; for example, plastic, paper, glass, ceramics, textiles, metal and inert wastes (Baabereyir, 2009). Baabereyir 2009 analyzed the composition of the solid waste stream in the country as containing paper/card, plastic film, dense plastic, textiles, miscellaneous, combustibles, glass, ferrous metal, garden waste and food waste (Baabereyir, 2009). The organic matter (paper, wood, food waste) is that aspect of the waste stream that is compostable. The inorganic matter, on the other hand, is non-compostable (rubber, leather, plastic, metal, glass, fabric and battery, among others).

The other classification is into bio-degradable and non-biodegradable type of waste, biodegradable wastes typically originate from plant or animal sources which may be broken down by another living organism. For example, green waste, food waste, paper waste, biodegradable plastics, human waste and sewage. Non-biodegradable wastes will not break down (or will not for many years). Examples are plastics, metal, and glass. Dangerous chemicals and toxins are also non-biodegradable. Styrofoam (polystyrene) and other similar materials have very organic content. Organic contents are reusable materials, such as glass, metal and hard plastics are retrieved and reused or recycled resulting in a final waste stream which has limited potential commercial value in the recovery of recyclable materials. There still may be sufficient quantities in a municipal solid waste of high density of organic content. If left alone, they constitute a major health and environmental hazard. Calorific values are reported as being low, making the waste streams typically unsuitable for energy recovery via incineration. However, it has the potential to be used as an organic fertilizer (Asomani Boateng and Haight, 1999). Countries with low-income generate a solid waste average of only 0.4 to 0.6kg/person/day as opposed to 0.7 to 1.8kg/person/day in fully industrialized countries. Cointream (1982) and others Arlosoroff (1992) Blight and Mbande (1996) note several common differences in the composition of solid waste in developing nations.

- Waste density 2-3 times greater than industrialized nations.
- Moisture content 2-3 times greater
- A large amount of organic waste (vegetable matter and so on)
- Large quantities of dust, street sweepings and a host of others.
- Smaller particle size on average than in industrialized nations.

Solid waste characteristics

There are a number of ways in which wastes produced in developing countries differ from those of industrialized countries. While the actual composition is not uniform in all developing regions in either of these categories, there are some general ways in which income influences both waste generation rates and waste composition. At a macro level, municipal solid wastegeneration increases with an increase in gross national product. At a household level, as income rises, the general trend is an increase in paper, metals and glass, a decrease in kitchen waste, accompanied by an increase in total weight and a decrease in density (Wright, 1997). The composition of waste in some African cities is shown in Table 2.2.

Table 2.2: Municipal solid wastes (MSW) composition in selected African cities

Composition (% by Weight)	Cities				
	Kumasi, Ghana	Accra, Ghana	Ibadan, Nigeria	Kampala, Uganda	Kigali, Rwanda
Organic	84.0	85.1	55.8	-	94.0
Plastic	-	3.4	6.3	-	-
Glass	-	1.9	1.8	-	-
Metal	-	2.6	-	-	-
Paper	-	4.9	12.9	-	-
Inert	-	-	-	-	-
Cloth	-	-	-	-	-

Source: Asomani-Boateng and Haight, 1999

Urban wastes can be subdivided into two major components - organic and inorganic. In general, the organic components of urban solid waste can be classified into three broad categories: putrescible, fermentable, and non-fermentable. Putrescible wastes

tend to decompose rapidly and, unless carefully controlled, decompose with the production of objectionable odours and visual unpleasantness. Fermentable wastes tend to decompose rapidly, but without the unpleasant accompaniments of putrefaction. Non-fermentable wastes tend to resist decomposition and, therefore, breakdown very slowly. A major source of putrescible waste is food preparation and consumption. As such, its nature varies with lifestyle, the standard of living, and seasonality of foods. Fermentable wastes are typified by crop and market debris (Diaz and Golueke, 1985).

Physical properties of solid wastes

The physical properties of solid wastes include composition, particle size, moisture content, density and the seasonal difference in the quantity and quality of the waste. The physical characteristics aid appropriate bin design and efficient operation of solid waste management (Peavy et al., 1985).

Density

The density rate is often needed in determining the total mass and volume of water that must be managed. The density of any solid waste stream will be determined by the composition and by the degree of shape alteration. The density of solid wastes varies markedly with geographic location, the season of the year, and length of time in storage (Tchobanoglous et al., 1993). The physical and chemical properties of solid waste are used to classify wastes and to determine equipment needs. They are essential tools that aid in the design of management plans with respect to source separation, energy recovery, collection and transfer into trucks and disposed off. This is only 1.5:1 in developing countries. Landfill compression technology, which averages volume reduction of up to 6:1 in industrial nations may only achieve 2:1 compaction with these increased waste densities application; when income level increases, the amount of post-consumer waste such as packaging, increases such technologies may be more appropriate.

The high moisture content and organic composition of wastes in the developing world may lead to problems of increased decomposition rates in areas with high average daily temperatures; high seasonal or year-round rainfall would only compound these problems, as it will produce more challenges with insect populations and conditions

conducive to disease. To mitigate these problems, the much more frequent collection is needed in hot, humid areas to remove organic wastes before they are able to decompose than would be needed in cooler, drier climates. The typical densities and moisture contents of components of municipal solid wastes are presented in Table 2.3.

Table 2.3: Characteristics of wastes by the level of industrialization

	Developing Countries	Middle-Income Countries	Industrialized Countries
Waste Generation (kg/cap/day)	0.4 to 0.6	0.5 to 0.9	0.7 to 1.8
Waste Densities (wet wt basis-kg/m ³)	250 to 500	170 to 330	100 to 170
Moisture Content (% wt at point generation)	40 to 80	40 to 60	20 to 30
Composition (% by wet weight)			
Paper	1 to 10	15 to 40	15 to 40
Glass, Ceramics	1 to 10	1 to 10	4 to 10
Metals	1 to 5	1 to 5	3 to 13
Plastics	1 to 5	2 to 6	2 to 10
Leather, Rubber	1 to 5	-	-
Wood, Bones, Straw	1 to 5	-	-
Textiles	1 to 5	2 to 10	2 to 10
Vegetables/Putrescible	40 to 85	20 to 65	20 to 50
Miscellaneous, Inserts	1 to 30	1 to 30	1 to 20

Source: Cointreau, 1982

The daily collection has proven unreliable or unworkable in many cities (Cointreau, 1982), perhaps a twice-weekly collection of organic material in conjunction with a municipal composting operation, would be sufficient to reduce decomposition. Knowledge of the density of waste is relevant for the design of all elements of the solid waste management system, namely community storage, transportation and disposal. For example, in high-income countries, considerable benefits are derived through the use of compaction vehicles on collection routes, because the waste is typical of low density. A reduction of the volume of 75% is frequently achieved with normal compaction equipment

so that an initial density of 100kg/m^3 will readily be increased to 400kg/m^3 . In other words, the vehicle would haul four times the weight of waste in the compacted state than when the waste is uncompacted. The situation in low-income countries is quite different: a high initial density of waste precludes the achievement of high compaction ratio. Consequently, compaction vehicles offer little or no advantage and are not cost-effective. Significant changes in density occur spontaneously as the waste moves from source to disposal, as a result of scavenging, handling, wetting and drying by the weather, vibration in the collection vehicles (Bhide and Sunderasan, 1983).

Table 2.4: Typical densities of municipal solid wastes as discarded uncompacted

MSW Component	Density, Kg/M^3		Moisture Content (%)	
	Range	Typical	Range	Typical
Food Wastes	128.2 – 480.6	288.3	50 – 80	70
Paper	32.0 – 128.2	81.7	4 – 10	6
Cardboard	32.0 – 80.1	52.4	4 – 8	5
Plastics	32.0 – 128.2	64.1	1 – 4	2
Textiles	32.1 – 96.1	64.1	6 – 15	10
Rubber	96.1 – 192.2	128.2	1 – 4	2
Leather	96.1 – 256.3	160.2	8 – 12	10
Garden Trimmings	64.1 – 224.3	104.1	30 – 80	60
Wood	128.2 – 320.4	240.3	15 – 40	20
Glass	160.2 – 480.6	193.8	1 – 4	2
Tin Cans	48.1 – 160.2	88.1	2 – 4	3
Nonferrous Metals	64.1 – 240.3	160.2	2 – 4	2
Ferrous Metals	128.2 – 1,121.3	320.4	2 – 6	3
Silt, Ash, Dirt, Brick etc.	320.4 – 961.14	480.6	6 – 12	8

Source: Tchobanoglous et al., 1993

Chemical characteristics of solid wastes

The data on the ultimate analysis of a typical municipal waste component is represented in the table above. Adequate information on the chemical composition of solid wastes is important in evaluating alternative processing and recovery options. For instance, if solid wastes are to be used as fuel properties like proximate analysis, fusing point of ash, ultimate analysis and heating value will be important (Tchobanoglous et al., 1993).

Generation rates of solid waste

The generation rate of solid waste is usually given in kilogramme per person per day (kpd). To assess the per capita generation of solid wastes, the methods used are Load count analysis; weight volume analysis; and material balance analysis. The weight volume analysis involves the use of detailed data obtained by weighing and measuring each load obtained. This is what is needed in terms of survey results (Tchobanoglous et al., 1993). Waste generation rates are affected by socioeconomic development, the degree of industrialization, and climate. Generally, the greater the economic prosperity and the higher percentage of urban population, the greater the amount of solid waste produced.

The unit generation rates are calculated thus:

$$\text{The unit generation rates} = \frac{\text{Total Quality of Wastes}}{\text{No. of Houses} \times \text{Residents per House} \times \text{Days}}$$

(Khan and Ahsan, 2003)

Table 2.5: Typical data on ultimate analysis of the combustible components in municipal solid waste

MSW Component	Percentage by Dry Weight
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	Carbon	Hydrogen	Oxygen	Nitrogen	Sulfur	Ash
Food Wastes	45 – 75	6 – 12	20 - 40	1 - 2	0.2 - 0.4	4 -5
Paper & Carbon	30 – 60	5 – 10	30 - 40	0 - 0.3	0.1 - 0.2	5 - 10
Plastics	50 – 80	8 – 10	15 - 20	<0.1	<0.1	6 - 10
Textiles	40 – 50	5 – 8	30 - 40	1 - 2	0.1 - 0.2	3 - 4
Rubber	60 – 70	8 – 10	-	-	1 – 2	15 - 20
Leather	50 – 60	6 – 8	10 - 12	8 - 10	0.2 - 0.4	8 - 10
Garden Trimmings	45 – 50	4 – 6	30 - 40	3 - 4	0.3 - 0.4	6 - 8
Wood	45 – 50	5 – 6	40 - 45	0.1 - 0.2	<0.1	0.5 - 1.5
Glass	0.5 - 0.6	0.1 - 0.2	0.2 - 0.4	<0.1	-	98 – 99
Metals	4.5	0.4 - 0.6	3 - 4	<0.1	-	90 – 95
Silt/Ash/Dirt	20 – 30	3 – 5	3 - 4	0.4 - 0.6	0.1 - 0.3	60 - 70

Source: Liu and Liptak (1996)

Impact of solid wastes

Poor management of solid wastes results in a bad odour created around the area, which makes the environment unpleasant. This also affects the economy of the area, as it decreases if the badly maintained waste is nearby. The means in which waste is produced and discarded give insight into how people live. Cleanliness of the city is a good reflector of knowledge and behaviour in terms of awareness and governance of the city. If a city is dirty, local administration may be considered ineffective or its residents may be accused of littering and illegal dumping. The quality of waste management services is a good indicator of the city's governance (Buso, Nakin, and Abraham, 2014).

In Nigeria, improper disposal of solid wastes and their effects on the environment are documented (Sridhar and Adoye, 2003, Ukem, 2008;) Sridhar (2008) asserts that

uncontrolled disposal of solid waste, which is the normal practice in many urban centres, causes hazard to the environment and affects the health of the communities. Some toxic and heavy metals, like lead, mercury, cadmium minerals and manmade synthetic chemicals present in wastes, may contribute to environmental degradation that leads to poor health, disease or death. Nwakwo (2004), indicates that improper disposal of solid waste constitutes a serious threat to human health and to the achievement of sound environmental sanitation. Furthermore, the World Health Organization (2004) claims that the average solid waste dumpsite contains 3 to 10 gallons of liquid that are hazardous to human health or the environment. Besides, improper solid waste disposal causes pollution, the spread of diseases usually by rodents, bugs, contamination of water and other public health risks (Leah, 2011).

Environmental impacts of solid waste

The environmental impacts of solid waste can be grouped into six categories; global warming, photochemical, oxidant creation, abiotic resources depletion, acidification, eutrophication and ecotoxicity on water (Seo, 2004). According to Alam and Ahamde (2013), decomposition of waste into constituent chemicals is a common source of local environmental pollution. This problem is especially acute in developing nations, very few existing landfills in the world's poorest countries would meet environmental standards accepted in industrialized nations, With limited budgets, there are likely to be few sites rigorously evaluated prior to use in the future. The problem is compounded by the issues associated with rapid urbanization. As land becomes scarce, human settlements encroach upon landfill space, and local governments, in some cases, encourage new development directly on top of operating or recently closed landfills.

Air pollution and release of gases

One major environmental concern is gas release by decomposing garbage. Methane is a by-product of the anaerobic respiration of bacteria. These bacteria thrive in

landfills with high amounts of moisture. Methane concentrations can reach up to 50% of the composition of landfill gas at maximum anaerobic decomposition (Cointreau-Levine, 1996). In well-designed and well-sited landfills there is the potential for methane recovery. Few landfills in the developing world are designed to capture and make use of methane. In all of Latin America and the Caribbean, only three such landfills were in operation, all in Chile (UNEP, 1996). Generally, the required capital for methane recovery installations is lacking, and the low price of commercially produced gas does not make methane flaring. The gas seeps into the porous soil surrounding the waste and eventually migrates into basements and homes, posing an explosion risk. Carbon dioxide is the second predominant gas emitted by landfills, Although it is less reactive, build up of the gas in nearby homes could be a cause of asphyxiation.

The contribution of greenhouse gases

Another issue with these gases is their contribution to the greenhouse gases (GHGs), which are blamed for global warming. Both gases are major constituents of the world's problem. However, while carbon dioxide is readily absorbed for use in photosynthesis, methane is less easily broken down and is considered 20 times more potent as a GHG (Johannessen, 1999). Hoornweg, Thomas and Otten (1999) state that, for every metric ton of unsorted municipal solid waste (containing 0.3 Mt carbon), 0.2 Mt are converted to landfill gases. Of these gases, carbon dioxide and methane each comprise 0.09 Mt. Since it is believed that landfill gases supply 50% of human-caused methane emissions and 2-4% of all worldwide greenhouse gases (Johannessen, 1999), this is clearly an area of concern in global environmental issues.

Water pollution

Liquid leachate management varies throughout the landfills of the developing world. Leachate poses a threat to local surface and groundwater systems and is carefully managed in developed nations. The use of dense clay deposits at the bottom of waste pits, coupled with plastic sheeting-type liners to prevent infiltration into the surrounding soil, is generally regarded as the optimum strategy to contain excess liquid. In this way, waste is encouraged to evaporate rather than infiltrate. The need for such measures depends largely

on climate conditions, as arid areas with high rates of evapotranspiration will not have nearly the potential for leachate problems as areas with high rainfall or snowmelt. Current practices in the developing world range from absolutely no leachate management (unofficial dumps or those operating continuously for years without “sanitary” specifications) to discharge into municipal sewer and sewage systems, direct discharge into surface water systems (rivers), multi-pond aeration and settlement systems, chemical treatment facilities, and recirculation systems (Johannssen, 1999).

Health risks of solid waste

Certain human health risks associated with solid waste handling and disposal in all countries to some degree exist. However, certain problems are more acute and widespread in developing nations. Cointreau (1982) has classified these into four main categories:

- (1) presence of human faecal matter,
- (2) presence of potentially hazardous industrial waste,
- (3) the decomposition of solids into constituent chemicals which contaminate air and water systems, and
- (4) the air pollution caused by consistently burning dumps and methane release.

Exposure to infection and biological contaminants

Human faeces are commonly found in municipal waste. Insect and rodent vectors are attracted to the waste and can spread diseases such as cholera and dengue fever. Using water polluted by solid waste for bathing, irrigation, and drinking can also expose individuals to disease organisms and other contaminants. The U.S. Public Health identified 22 human diseases that are linked to improper solid waste management (Hanks, 1967; cited in Tchobanoglous et al., 1993).

Among developing nations, the problem varies with the prevalence of inadequate sanitary disposal systems, such as municipal sewerage or on-site septic systems, outhouses, and many others. In areas where such facilities are lacking (especially shantytowns and over-crowded municipal districts), the amount of human faecal matter

present in the solid waste stream is likely to be higher. This presents a potential health problem not only to waste workers, but also to scavengers, other users of the same municipal drop-off points, and even small children who like to play in or around waste containers.

The usual disease pathways include placing contaminated hands in the mouth or eating food, through pest or vector insects, such as cockroaches or mosquitoes, or by directly inhaling airborne dust particles contaminated with pollutants. Survival time for pathogens varies with the requirements of the organism and the media in which they find themselves. A study conducted in Indian landfills showed that roundworms (*Ascaris spp.*) and whipworm (*Trichuris spp.*) were commonly found, especially in those landfills located near lower-income neighbourhoods and slums (Cointreau, 1982). Industrial waste can pose significant health risks for those involved in its collection and ultimate disposal.

Injuries arising from exposure to toxic chemicals

Toxic compounds in municipal solid waste are highly regulated in developed nations, where special procedures must be followed to ensure minimum environmental contamination and human exposure. Waste collectors in developing countries are seldom protected from direct contact and injury. The co-disposal of hazardous and medical wastes with municipal wastes poses a serious health threat. Exhaust fumes from waste collection vehicles, dust stemming from disposal practices, and open burning of waste also contribute to the overall health problems. People know that poor sanitation affects their health. This is more apparent in low-income countries than in other countries, and are most willing to pay for environmental improvements.

Assessment of health impacts of automotive solid waste on the automobile technicians

In assessing the impacts of municipal solid waste management needs consideration of a large number of components. Health impacts include exposure to toxic chemicals

through the air, water and soil media; exposure to infection and biological contaminants, stress-related to odour, noise, vermin and visual amenity; risk of fires, explosions, and subsidence; as well as spills, accidents and transport emissions (Dolk, 2002). Clear view of mechanics and others working in a garage where brake and clutch works are done may be exposed to asbestos dust. Brake dust is invisible; when a brake drum is removed from a car truck or other equipment. These invisible particles may be asbestos and/or other brake lining materials. Inhaling these particles can damage the health of automobile workers; there may be the incidence of shortness of breath, lung disease or cancer owing to many years of inhalation.

Also, automobile workers working on scrap metal may be exposed to the hazard of inhaling airborne lead that maybe released by heating lead scrap. Lead acid batteries pose a real threat to human health and the environment if improperly discarded. The corrosiveness and heavy metal (lead) content of lead acid batteries has may endanger human health and the environment. Acid spillage from such batteries may contaminate disposal sites with lead. Plates of lead-acid batteries are made of lead, a poisonous metal. Even a small amount of lead in the body causes damage to the central nervous system, blood, kidneys, digestive system and reproductive system. Lead is especially hazardous to children even minor concentration of lead in their blood impairs mental development. Sulphur is a threat because of its highly corrosive nature. The acid from old batteries may also contain lead compounds which pose an additional threat.

Discarded used tyres represent excellent breeding ground of diseases carrying pests and rodents. Just one left outdoors can retain enough rainwater to breed hundreds of thousands of mosquitoes which have been known to transmit malaria and encephalitis. Also, absorbents pick up liquids that need to be disposed of but do not change the chemical properties of these liquids. The absorbent still contains the chemical with its threat to health. HID lights contain small quantities of mercury cadmium and antimony. These materials are very hazardous and poisonous to the human nervous system. Cleaners, paints and adhesives used in auto repair are packaged in aerosol spray cans and also used as paints, solvents and pesticides are hazardous. Most aerosol cans pose a fire hazard because they contain highly inflammable propellants such as propane and butane.

Socio-economic impacts

The unsightly scene of illegal disposal sites, the reduced road space arising from wastes dumpsites and the possibility of fire outbreaks in nearby communities negatively impact the environment. The environments of illegal dumpsites are generally filthy and dirty. Besides, people scavenge on waste dumps for items which can either be reused or recycled. This constitutes a health hazard. Business transactions in commercial areas are often disrupted as a result of flooding and diseases (UNCHS/UNEP, 1997).

Health and environmental impacts of municipal solid waste management

Landfills

The use of landfills is associated with different health and social effects. The Health and social impacts include odour nuisance, ozone formation (from reaction of NO_x and non-methane organic compounds with sunlight) that can cause pulmonary and central nervous system damage, fire and explosion hazards from build-up of methane, an increase in the number of birds, rodents and insects which act as disease vectors, and ground air pollution from leachate and landfill gases (Neal and Schubel; 1987; USEPA, 1995a; El-Fadel 1997; Daskalopoulos 1998). Water contamination by leachate can transmit bacteria and disease to human beings.

Environmental impacts of landfills include ozone formation which can decrease crop yield and plant growth rate while methane is twenty times more effective at trapping heat than carbon dioxide (USEPA, 1995a). Leachate from the landfill can enter groundwater systems, leading to increases in nutrient levels that cause eutrophication (El-Fadel, 1997). Bioaccumulation of toxins and heavy metals can occur.

Incineration

Incineration impacts society by the production of odours and in the unsightliness of the facility (Garrod and Ken, 1998). There is also the potential for surface water pollution from wastewaters (used for quenching hot ashes before transport) (USEPA,

1995b). The most important health and environmental impact are from air emissions, which include particulates, CO, NO_x, acid gases (chlorides and sulphides), volatile acid rain (USEPA, 1995b, Daskalopoulos et al., 1998). Inhalation of particulate matter poses a health danger: smaller particles are more likely to carry heavy metals, which can be retained in lung tissue and enter the bloodstream (Neal and Schubel, 2001).

Recycling

Recycling has both health and environmental risks. Sorting facilities contain high concentrations of dust, bio-aerosols and metals. This commonly causes itching eyes, sore throats, and respiratory diseases (Gladding, 2002). Recycling uses a large number of energy resources (Daskalopoulos et al., 1998). Health and social side effects of recycling of waste have impacts on the environment in relation to municipal solid waste management.

Solid waste management

Solid waste management entails the collection, storage, transportation, treatment and disposal of wastes in such a way as to render them innocuous to human and chemical life, ecology and the environment generally. Management of solid waste is a major challenge in most cities in developing countries (Water Aid, 2008). It is believed that if the solid waste is properly managed, it can be a valuable resource, but if not effectively managed it can become a source of environmental and human hazards. Sanitation Connection (2002) opines that solid waste management involves activities that seek to minimize the health, environmental and aesthetic impacts of solid wastes.

Tchobanoglous et al., (1993) claims that solid waste management is that discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of solid wastes in a manner that is in accord with the best principles of public health economics, engineering, conservation aesthetics and other environmental considerations and that is also responsive to public attitudes. Inherent in this definition is the solid waste management process, which includes wastes generation, storage, collection, transport, processing and disposal of wastes. Also included is the way the wastes are handled until they are stored in storage containers.

History of solid waste management

The beginning of solid waste is traced to antiquity and the practice of recycling human wastes. One of the early attempts to manage human wastes in the United States took place at the turn of the century when New York City built a wooden-crib bulkhead around Rivers in the East River and filled in the area behind the marshes with ashes, rubbish and street sweeping. According to Olafimihan (2004), people used to collect waste from settlement by using primitive tools such as buffalo ribs to lift waste and shoulder baskets to carry it. The collected wastes were dumped in the nearby river or in open fields. In those days, the volume of water and the flow of rivers could absorb the dumped waste which was small in quantity.

Similarly, burning was also not uncommon in both the urban and rural areas of the United State. Solid wastes are also dumped in gutters and drainages channels, leading to flooding. That traditional practice cannot manage waste because of increasing population densities in urban areas and change solid waste composition. These practices are still in existence in modern times, when there should have been and sustainable ways of managing waste. In most towns and cities of Oyo State, these ways of managing solid waste in these way are clearly evident, as the inhabitants dumping waste indiscriminately.

Goals and objectives of solid waste management in Oyo State

Managing solid waste is not an end in itself but a means to achieve certain goals which are related to public health and aesthetics of the urban area. This was clearly communicated when Oyo State Government enacted the Oyo State Solid Waste Management Law 2004, which authorizes the Oyo State Solid Waste Management Authority to regulate waste disposal practices.

The ultimate goal of solid waste management is to promote health and prevent the occurrence of diseases. Therefore, the following objectives and goals of solid waste management as stipulated in the law are as follows;

1. to ensure that waste generated can be minimized and adequately stores,
2. to encourage and facilitate the regular collection of solid waste generated,

3. to guide the effective removal of solid waste generated from the storage points to disposal sites.,
4. to provide and maintain sanitary and adequate disposal facilities,
5. to educate the public on health implications of improper solid waste management,
6. to provide and maintain adequate waste management information system for effective planning and
7. to monitor the environment and prevent any form of ecological degradation emanating from ineffective waste management.

Baabereyin (2009) also notes that the goal of municipal solid waste management is to protect environmental health hazard, protect the quality of the environment, support the efficiency and productivity of the economy and creation of employment and income for the people. The principal goal of solid waste management is to collect waste and dispose of it in an environmentally-friendly and socially acceptable manner.

Henry, Yongsheng and Jun (2008) opine that the basic focus of municipal solid waste management is to protect the health of the population, promote environmental quality, develop sustainability and provide support to economic productivity. Sustainable solid waste management must be embraced fully by local authorities in collaboration with both the public and private sectors in order to meet these goals.

Functional element of waste management system

The problems associated with the management of solid wastes in today's society are complex because of the quantity and diverse nature of the waste, the development of urban areas, the funding limitations for public services in many large cities, the impacts of technology and resultant limitations in both energy and raw materials (Isirimah, 2002).

There are many operations involved in effective management system; each has a specific role to accomplish in the system. The knowledge and understanding of each of these procedures are required for effective management. Isirimah (2002) opines that the activities associated with management of solid wastes from point of generation to final disposal have been grouped into six functional elements, waste generation, waste handling

and separation, storage and processing, sorting, processing and transformation of solid wastes.

Table 2.6: Descriptive relationships of functional elements in a solid waste management system

Functional Element	Description
Waste Generation	Those activities in which materials are identified as no longer being of value and are either thrown away or gathered together for disposal
Handling, Separation, Storage, Processing at Sources	Waste handling: Management of waste until placed in storage containers for collection Separation: Based on a recycling plan (newspaper, cardboard, bottles, cans) Storage: onsite storage of waste awaiting collection) Processing at Source – e.g. compaction and yard waste composting
Collection	Those activities associated with the gathering of solid wastes from storage locations and the hauling of the wastes after collection to collection vehicle and then to material processing facility, a transfer station or landfill disposal site.
Transfer and Transport	Those activities with (1) the transfer of waste from the smaller collection vehicle to the larger transport equipment and (2) the subsequent transport of the wastes, usually over long distances to the disposal site
Processing and Recovery	Those techniques, equipment, and facilities used to improve the efficiency of the other functional elements and to recover usable materials, conversion products, or energy from wastes
Disposal	Those activities associated with ultimate disposal of solid waste including those wastes collected and transported directly to a landfill site, semisolid wastes (sludge) from wastewater treatment plant incinerator residue, compost, or any other substances from the various solid waste processing plants that are of no further use

Source: Peavy, Rowe, and Tchobanoglous et al, 1985

Components of solid waste management systems

Solid waste management systems involves a number of interrelated activities, including generation and storage of waste in household or communal containers, method of waste collection from storage frequency of collection, transfer from smaller containers

to larger ones, haulage of waste to a disposal site, collection and management of the waste to a disposal site, location and the management of the disposal site (Puopiel 2010).

Generation of solid waste

Generation of waste comprises those activities in which materials are identified as no longer being of any value by the owners/users and are either thrown away or gathered for disposal (Puopiel 2010). United Nations Environmental Programme (UNEP) (2009) argues that quantifying and qualifying the types of waste generated is the most fundamental step in solid waste management. Having necessary information the design of mitigating measures will be hampered. Similarly, UNEP (2009) cited by (Puopiel 2010), further states that in 2006 the amount of the municipal solid waste (MSW) generated globally reached 2.02 billion tonnes, making for a 7 percent annual increase since 2003. It was estimated that between 2007 and 2011, the generation of solid waste globally would rise by 37.3 percent, representing an 8 percent increase per year. As noted by Srinivas (2006), this indicates about 14 - 20 percent of all waste generated. Per capita waste generation varies, with 5.3kg/day for OECD in developing countries. Weak policies, changing lifestyles, lack of awareness among others will increase the rates over the next decade. Mensah and Larbi (2005) make similar assertions about the solid waste generation in the two largest cities of Ghana, Accra and Kumasi.

Handling of Solid Waste

Chati,(2012) views the handling of waste to comprise activities associated with managing wastes until they are placed in the containers used for storage, before collection or return to recycling centres. The specific activities associated with handling waste material at the source of generation will vary based on types of wastes material that are separated for reuse and the extent to which these materials are separated from the waste stream. Thus, handling of waste required movement of the loaded waste from collection centres to the final disposal sites; This, however, depends on the type of collection services available.

Storage of solid waste

Storage refers to the places where the generated solid waste is stored until it is collected, the upkeep of solid waste is affected by factors such as effects of storage on waste components, type of container, the container location and the contamination of waste components. These factors have a greater bearing on the storage of putrescible materials which decompose rapidly and so must be collected quickly (Tchobanoglous et al., 1993). According to Flintoff (1984), waste is usually stored within the household but may be transferred to a communal storage container prior to eventual collection and removal. Conditions that must be considered in the on-site storage of solid waste include (1) the type of container to be used, (2) container location, (3) public health and aesthetics and (4) the collection methods to be used.

The policy guidelines for efficient solid waste management stipulate that household sanitary dustbins or disposable refuse bags for collection and storage of household waste shall be promoted. The sanitary dustbins, either galvanized or plastic of about 20kg capacity, shall be fitted with two handles and a well-fitting cover to prevent fly infestation and odour nuisance. The bins shall be kept in a non-moist area to prevent corrosion. The dustbin shall be emptied into designated solid waste depot located within the area. Appropriate colour codes shall be adopted for segregation or sorting of domestic and hazardous waste (Federal Ministry of Environment, 2006). In commercial areas such as market, and automobile workshop, a large volume of collection bins shall be placed at strategic locations to accommodate the large volume of solid waste generated at the marketplace. And for industrial premises, dinosaur bins of about 1,500kg shall be placed at strategic locations within such premises to retain solid waste generated (Federal Ministry of Environment, 2006).

Collection of solid waste

The process of collection of solid waste requires the gathering of the waste materials for transport by vehicles after collection to the location where collection vehicles are emptied (Tchobanoglous et al., 1993). The collection is provided under various management, ranging from municipal services to franchised private services conducted under various forms of contract. Some collection methods identified include communal collection points, kerbside collection and drop-offs. The policy framework of guidelines

on solid waste management stated that authorities saddled with the responsibility of solid waste management should, among others:

- classify all settlements according to their level of urbanization, size function and economic base into urban semi-urban and rural
- review existing collection equipment method and frequencies, as well as the tradition and labour practices
- determine the most efficient system of waste collection for each settlement category, including;
 - (i) the method of the refuse pick,
 - (ii) manpower and equipment needs,
 - (iii) vehicle type and routing system
- Implement collection methods that take account of differences in residential districts of a city as indicated below;

Residential	Collection Method
Well planned, high income, low-density areas	House to House
Medium density residential layouts	Kerbside
High-density low income	Communal depot

Source: Federal Ministry of Environment (2006)

In the case of communal depots, adequate numbers shall be provided within 200 - 250 meters walking distance.

Separation, processing and transformation

This functional element of the solid waste management process, according to Chati(2012), entails the recovery and sorting of separated materials. The separation and

processing of solid waste components and the transformation of solid waste that occur primarily in locations away from the source of generation. The methods used for recovery of waste materials that have been separated at source include kerbside collection, drop-off and buy-back centres. The separation and processing of these wastes usually occur at recovery centres, transfer stations, combustion facilities, and disposal sites. The waste contents are often separated by size, using screens, manual separation of the waste components and size reduction by compaction and combustion.

The transformation processes are used to reduce the volume and weight of waste requiring disposal and to recover conversion products and energy. The organic fraction of municipal solid wastes can be transformed by a variety of chemical and biological processes. The most commonly used chemical transformation process is combustion, which is used in conjunction with the recovery of energy in the form of heat. Composting is the most commonly used biological process for solid waste transformation. Sorting processes will, however, depend on the waste management objectives achieved (Chati, 2012).

Transfer and Transport

Tchobanoglous et al. (1993) view the transfer and transport of solid wastes to comprise two principal steps:

1. the transfer of wastes from the smaller collection vehicle to larger transport equipment and
2. the subsequent transport of the wastes, usually over long distances, to a processing or disposal site.

Transporting of waste from households', factories and another generation site is a growing problem. The rapid urbanization of much of the developing world leaves little chance for adequate layout and planning. Many of the most rapidly growing parts of cities at the periphery of existing settlement garbage dumps, with their associated disease, odour and frequent fires (in some cases) would ideally be located on suitable land. These areas are becoming harder to find, As population urbanizes and municipal traffic increases, the

transport of waste becomes longer and more time-consuming and, therefore, more expensive and less efficient. Many cities employ neighbourhood-level collection points, where households are responsible for transport to the transfer point and the municipal or private enterprise transports the waste from there to ultimate disposal locations.

As observed by Chati (2012), transfer of waste usually takes place at a transfer station. Although motor vehicle transport is most common, transport by rail and barges is also available. At the transfer station, the waste is unloaded from collection vehicles into large tractor-trailer trucks.

Disposal

The last phase element in the solid waste management process is disposal. Eventually, something must be done with the solid wastes that are collected and are of no further use as well as with the residual matter after solid wastes have been processed and the recovery of conversion products and or energy have been accomplished. Factors to consider are availability and suitability of disposal facilities, safety standards, nature of waste, public perception of hazards posed by such waste disposal site, and cost considerations (Shess and Hnismans 1983, Parks 2006).

Chati (2012), citing Tehobanoglous (1993) argue for the landfilling or land spreading process as the final destination of all solid wastes, whether they are residential wastes collected and transported directly to a landfill site, residual wastes from recovery facilities, and residue from the combustion of solid wastes, compost or other materials. The good sanitary landfill is not a “dump” but an engineered facility used for disposing of solid wastes on land or within the earth’s mantle without creating nuisances to public health or safety such as breeding of rodents and insects and contamination of groundwater. The table below summaries the different waste disposal methods;

Table 2.7: Summary of waste disposal methods

Disposal Type	Description	Comment
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Uncontrolled Dumping	Waste is dumped at a designated site without any environmental control measures	This is not a 'disposal' option; it has high risks, causes serious environmental problems and is mentioned only because it is so frequently occurring
Sanitary Landfilling	Controlled application of waste on land	Low cost and low technology solution when land is available; the most common and effective method of disposal for most developed countries, although it presents some risks in certain circumstances
Composting	Biological decomposition of organic matter in waste under controlled conditions	Not a complete disposal system; needs the correct proportion of bio-degradable materials in the waste. By-products have value as compost but need to be disposed or used. Not appropriate if there is no market for compost. Largely centralized schemes have not been successful
Incineration	Waste is burned under controlled conditions in purpose-built furnaces (incinerators)	Success depends on how much combustible material there is in the waste. An expensive high technology solution. Residues need to be disposed of; there is some environmental concern over the nature of the gases emitted

Source: Flintoff, 1984

World Health Organisation (WHO) principles on waste management

According to Elemile (2009), citing Wyes (1997), WHO collaborated with national government agencies, local organizations and industries to provide principles aimed at ensuring preventive waste management worldwide to combat the enormous problems associated with waste management

These principles include;

- i. segregating of non-hazardous waste from harmful waste - producing processes to avoid monotonous fractions from being contaminated by hazardous components;
- ii. auditing existing operations and production methods to minimize the volume of waste produces;
- iii. routine maintenance and process;
- iv. storing harmful waste materials away from the workplace and nearby residential areas.
- v. storing waste in covered containers to avoid leakage of liquid components into the environment;
- vi. labeling waste contents in each storage container and ensuring that staff are well trained in chemical safety procedures;
- vii. ensuring that individual operators and municipalities work together to develop sanitary landfills;
- viii. covering up existing open dumps with low permeability liner to reduce leachate generation; and
- ix. pre-treating hazardous waste to minimize the volume requiring disposal and its toxicity prior to disposal.

Overview of solid waste management policy

Nigeria exemplifies chronic solid waste management problems in an addition to her population growth. It is the most populous country in Africa, with over 120 million residents (World Bank, 1996), and over the past 50 years has the third largest urban growth rate in the world at 5.51% annually (UNWUP, 1999). It is estimated that nearly ten percent of the population (21 million people) live below the national poverty line (World Bank, 1996).

The Federal Environmental Protection Agency (FEPA) was established in 1988 to control the growing problems of waste management, The main goal was a target 80 percent effective management of municipal solid waste generated at all levels and ensure environmentally sound management vision 2010 (Committee, 2003). Strategies to achieve this goal include education and awareness programmes, developing collaborative approaches to integrative local management of municipal solid waste (MSW), strengthening existing laws and ensuring compliance, and encouraging local and private sector participation. Although this is a positive, though somewhat undefined, approach to solid waste management, the reality and government corruption have prevented its effective implementation. There is little to hold the government or the public accountable to the regulations developed by FEPA and Vision 2010 (Bankole, 2004)

In Nigeria, it seems as though no organization is willing to take responsibility, for regulation of waste management has changed hand several times since the late 1980's (Onibokun and Kumuyi, 2003). Since state resources are often extremely limited, private companies are often becontracted for waste disposal. Also in 2005, the Federal Ministry of Environment developed Policy Guidelines on solid waste management with the aim of improving and safeguarding health and welfare of the public through efficient and sanitary solid waste management that is economical, as well as sustainable and guarantee sound environmental quality. Accordingly, the Federal Ministry of Environment (FME) (2005) stated the objectives of the policy guidelines to include:

- i. to develop policy guidelines for effective and sustainable solid waste management system in Nigeria;
- ii. to promote a healthy environment by ensuring sanitary solid waste management;
- iii. to minimize waste generation and promote sorting at source reuse, recycling and energy recovery;
- iv. to ensure safe and nuisance-free disposal of (urban and rural) domestic medical and industrial wastes in order to adequately protect public health during and after collection, transportation treatment and final disposal;
- v. to promote effective stakeholders participation in solid waste;

- vi. to develop and maintain an indigenous waste management system based on a physical and socio-cultural characteristic of communities; and
- vii. to maintain adequate and regular waste management services at an affordable cost.

The justifications for developing the policy guidelines on solid waste management as given by FME (2005) are as follows;

- The alarming rate at which heaps of solid waste occupy most of our cities, coupled with the fact that 87% of Nigerians use methods adjudged as in sanitary, has not only constituted visual blight and odour nuisances, but also encouraged the breeding of rodents, mosquitoes and other pests of public health importance with their attendant disease with risk.
- Markets and motor parks used by many of Nigerians daily are seldom provided with facilities used for solid waste collection and disposal. As a result of this, men and women in markets and motor parks often dispose of solid waste into public drains around street corners etc.
- Flooding of our major roads is due largely to silt and solid waste blocking the drains serves as breeding sites for mosquitoes.
- The high incidence of improper waste management related diseases e.g. cholera, typhoid, diarrhoea, malaria etc. have become a source of embarrassment to Government. It is a known fact that a dirt environment with its attendant health consequences that prevails in most cities could scare away tourist and investors.
- The World Health Organization (WHO) is also concerned about poor sanitation in member countries. In a resolution, the Regional Committee for Africa during the forty-third session stated in its document AFR/RC43/R2 of 7th September, 1993 that it is expedient to affirm that proper sanitation and sound waste management are crucial for the promotion and protection of human health and of the environment, both of which are necessary for sustainable development.

Among the strategies stipulated for adequate implementation of the policy guidelines on solid waste management as stated by FME (2005), are:

1. promoting waste minimization at household and community levels through reduction at source, reuse, recycling and resource recovery,
2. establishing regulations, sanctions and enforcement mechanisms for solid waste management from the source of generation to the point of disposal,
3. evolving realistic and sustainable funding mechanisms,
4. cooperate with other stakeholders to ensure sustainable solid waste management,
5. patronizing recycled goods and biodegradable packages,
6. undertaking sorting of recyclable components at the source and dispose of waste at designated sites,
7. segregating hazardous wastes and ensure hygienic and safe disposal,
8. maintaining sanitary dustbins in homes,
9. adopting the technology of covering local waste into energy generation, including biogas,
10. adopting the use of soil conditioner,
11. paying for solid waste management services to ensure sustainability, again the policy stipulated the sanctions and enforcement mechanisms such as:
 - a) enacting of bye-law regarding solid waste management stipulating service standards and operations as well as citizens obligations,
 - b) disseminating the bye-laws to all communities for better understanding and compliance,
 - c) establishing of local mobile courts for the prosecute on offenders and impose sanctions to supplement federal government effort to combat the issues involved in solid waste management.

Similarly, the policy guidelines stipulated the roles of an institution such as the federal, state and local government as well as civil society organization and the public.

The public shall:

- i. adopt environment-friendly habits and practices;
- ii. comply with existing legislation on solid waste management,
- iii. comply with the provision of the policy guidelines,

- iv. cooperate with other stakeholders to ensure sustainable solid waste management systems,
- v. patronize recycled goods and biodegradable packages,
- vi. undertake to sort of recyclable components at the source and dispose of residue designated sites,
- vii. segregate hazardous waste and ensure hygienic and safe disposal,
- viii. maintain sanitary dustbins in homes,
- ix. adopt the use of compost as a soil conditioner,
- x. pay for solid waste management services to ensure its sustainability,

To complement the policy, the Oyo State Government enacted an edict establishing the Ibadan Waste Management Authority Gazette No.8, Vol.22 of 16 May 1997, which later metamorphosed into Oyo State Solid Waste Management Authority in 2008. The 33 local government councils in Oyo State shall collect, transfer and dispose of solid waste.

In other words, the functions hitherto performed by the Local Council under 1979. Constitution has been delegated to the Authority through the Oyo State Solid Waste Management Authority Law 2004 (Gazette No.9 Vol. 33 of 5th June 2008). Also, the Ministry of Environment Sanitation and Wastes Control 2012 was created (Gazette No.6 Vol. 28 of 20th March 2013).

The Oyo State Solid Wastes Offences Fines/Sanctions/Regulation stipulates that; “Any person who is a landlord, agent of a landlord or tenant and who neglects, fails or refuses to provide and maintain a dustbin or make provision for waste disposal in his premises shall be liable upon conviction to a fine of two thousand, five hundred naira only or to two months imprisonment”.

Empirical literature review

Physical planning and compliance with solid waste management policy

Town planning regulations and compliance with solid waste management policy in Oyo State

Oyo State is in the wet, rainforest southern part of Nigeria. The state lacks adequate physical planning. The traditional areas grew from settlements with footpaths linking the houses. However, the new area well laid out with adequate physical planning. Planning generally refers to taking a conscious decision about the future and is concerned with deliberately achieving some objectives. It proceeds by assembling actions or events into some orderly sequence which will achieve a pre-set goal. Obateru (2004) defines planning as the coordination of goals and the resources to achieve them.

Physical planning is the preparation of a set of decisions to guide the use of physical space and environment (Onu, Suresh, Trevor,2014). Physical development is the putting into effect of such decisions,” Physical (land use) planning (coordination of goals and objectives to achieve them) is concerned with the spatial arrangement of urban and rural land uses, for the purpose of creating orderly, economical, functionally efficient and aesthetically pleasing physical environment for living working recreation and circulation (Obateru 2004). It is the deliberate spatial organization of human activities to achieve the highest possible sustainable, social and economic benefits, convenience and aesthetics in the light of available resources of manpower, finance, technology, time and of course land among others. This could be national, regional or local level”.

The need for a sound administrative framework for refuse collection and disposal cannot be undermined in Nigeria (Bello-Imam, 1986). Transformation of many Nigerians from a rural setting to urban setting has been largely only physical. It has not been accompanied by cultural, planning and technological transformation, resulting in the transfer of habits and culture accordingly. These problems are really more social and organisational rather than technological and require the ability to devise and or strengthen relevant institutions.

Most parts of Oyo State, particularly Ibadan, has a poor waste management system. There are two major collection systems practised in Ibadan, namely house-to-house collection and collection from neighbourhood depots. Obviously, the collection and

transportation of solid waste to the final disposal point is more difficult in the traditional areas in Ibadan and other town and cities, than in new laid out areas owing to poor vehicular access resulting from inadequate physical planning. During environmental sanitation exercises on Saturdays, and recently on Thursdays, the residents in traditional areas are forced to drop their wastes on road islands along major roads. This is because of lack of vehicular access to their different houses. Danbuzu (2011) asserts that careless and illegal dumping of solid waste has led to the problem of polluting the land.

According to Nabegu (2010), evolving problems that contribute to solid waste accumulation have been identified in Ibadan metropolis. The core or tradition settlement of the city is characterized by slum, inaccessibility, and poor condition of the environment which is evidence of poor town planning in the previous years. This culminated in the placing of public containers in places far away from the majority of users. As a result of this, most residents have to walk a long distance before getting to where they can dump waste. Many of them indiscriminately dump their waste in nearby open spaces, drains and streams, causing environmental hazard within the neighbourhood. A study carried out by Fafioye and John-Dewole (2013) reported significant relationships that exist between waste management and physical and town planning.

Road accessibility and compliance with solid waste management policy in Oyo State

Wastecollection and disposal are most problematic at a certain state of a country's development. The experience of Britain in environmental sanitation is a good example in this regard. Although Britain has to a large extent, brought her to refuse disposal under control, her experience in the nineteenth century is related to what Nigeria cities and villages are experiencing today.

Regarding physical layout for solid waste management in Ibadan have observed that the lack of motorable roads and streets hampers garbage collection and evacuation by municipal authorities in traditional core areas. This problem is noticed in all towns and cities in Oyo State because the building of houses does not allow the disposal of vehicles to move freely in those areas. According to Danbuzu (2009), most collection centres are not well planned. This leads to the introduction of illegal collection points. This can be

attributed to lack of coordination in building houses and non-compliance with the physical planning policy. Even the government does not have planning for dump sites. Also, it occurs in higher institutions, marketplaces and industrial estates.

Furthermore, a house needs the immediate environment together with the related community services and facilities. Housing, according to WHO (1960), as cited by Danbuzu (2009), is the physical structure which human beings use in providing shelter and the environment of the structure should include all necessary facilities, equipment and devices (mechanical and electrical) for the physical, mental health and practical well-being of the family and individual. Thus has become a part of the concept of human settlement, which is defined as places in which a group of people reside and pursue their life goals. Re-planning of the city of Ibadan has always been a herculean task for successive governments because of political consideration in doing so (Omoleke 2004). As at today most of the cities in Oyo State, especially Ibadan does not have a master plan.

Location of solid waste management facilities and compliance with the solid waste management policy in Oyo State

According to Sanni and Ipingbemi (2008), urbanization and environmental health issues are the major challenges facing planners, city managers and various professional stakeholders in the environment sector. It is hard to find an urban area where facilities are planned to function with the aim of protecting public health. In most cases, consideration is given to maximizing the use of available land space in place of provision of facilities to prevent environmental pollution. In heavily built-up areas, it is often difficult to provide access for solid waste removal. Such a situation still exists in most of the urban areas to date. Within Ibadan South West Local Government in the inner core of the city centre is a massive expanse of the built-up area known as “Foko” Ring Road in the Eastern part and Mokola in the West. The same situation exists in Lagos Island, from Tinubu Square to Berger Bridge bordering the inner Marina, in what is popularly known as “Isale Eko”. In areas like these, human traffic and vehicular movement are extremely difficult hence, solid waste evacuation is almost impossible. Since places like these exist without planning, several activities go on, which expose the inhabitants to adverse health consequence.

Obviously, land, air and water pollution exist everywhere. Social disorientation exists in urban noise pollution in most of the city centres. Aledare (2008) points out that, when solid waste is not promptly removed from human habitation, it often becomes a source of pollution, leading to the transmission of diseases like typhoid fever, cholera, dysentery, and Lassa fever, Moses (2005) identifies indoor air pollution as one of the problems associated with poor housing and poor environmental planning.

Solid waste management constitutes a challenge in unplanned urban areas. When a community is not adequately planned with consideration for environmental health services, collection, storage, transportation and final disposal of solid waste become a major problem. Sanni and Ipingbemi (2008) view the challenge of urbanization and environmental health as major challenges facing planners and other professional stakeholders. According to Adegoke (1990) notes that one of the spheres of life in which Nigeria has virtually made non-start is in the area of waste management. These account for heaps of uncollected solid waste that dot the entire landscape. There is no systematic approach to waste collection in most urban cities and where collection exists disposal was often in open dump sites with virtually no environmental safeguards. This situation will continue to be so since as at today, there is no urban plan with an efficient solid waste management system in many parts of Nigeria.

Adegoke (1990) observes that effective waste management is essential for sustainable development. Aledare (2008) claims that the major function of urban governance is to ensure that cities are livable. Such a fundamental role is only possible when there is a well-planned layout with adequate provision for solid waste management. According to Nabegu (2010), solid waste in the Kano metropolis, northern Nigeria is to be dumped by the public in designated collection areas which are made up of irons that are easily loaded on to trucks mechanically or made of blocks. Even where these are available, is the waste thrown in a more or less uncontrolled manner and the file of waste does not allow free access to locate points and often produce unpleasant and hazardous smoke from slow-burning fires. The present disposal situation is expected to deteriorate given more rapid urbanization, as settlements and housing continue to encircle the existing dump and the environmental degradation associated with these dumps directly affect the

population. About 70% of the Ibadan residents do not have an authorized dumping site for their waste. This confirms a nationwide survey by the Federal Office of Statistics (1978), which found that 52% of urban households in Nigeria do not have access to an authorized dumping ground.

Mass media and solid waste management in Oyo State

Ojenike (2012) states that mass media has been identified as an important tool in health promotion intervention programmes. Community intervention programmes are devoid of one or combination of the following mass media channels and strategies, television, radio, newspaper, magazines, outdoor advertising, transit advertising, direct mail, telemarketing and other special promotion events. The application of mass communication techniques is second only to the activation of community participation through community organization and coalition building as a critical element in community intervention.

Authorities involved in waste management have the task of reducing litter and open dumping and promoting recycling, reuse and source-reduction activities. Each of these activities requires some behavioural change. The procedure for achieving this change is public awareness education. According to Federal Ministry of Housing and Environment (1982) the problems of solid waste management include lack of meaningful waste management strategy, lack of public awareness concerning waste recycling practices economic value of wastes and the effect of improper disposal of waste both on the people and the physical environment. In a study carried out in Abeokuta, the findings of Babayemi and Dauda (2009) indicate that awareness of waste collection service was highest among the groups with age greater than 30; followed by those between 20 and 30; while it was least among those less than 20 years old. The same pattern was observed for awareness of waste management regulations. The percentage of those who used other indiscriminate waste disposal options was highest among those who were less than 20 years of age.

Akpala (2006) states that poor attitude towards the keeping and maintenance of hygienic environment also stemmed from the inadequate knowledge of the inhabitants on

safe and hygienic waste handling and management. Continuous indiscriminate disposal of municipal solid waste is accelerating and is linked to poverty, poor governance, urbanization, population growth, poor standards of living and low level of environmental awareness (Adewuyi, Komine, Yasuhara and Murakami, 2009 and Ogu, 2000).

Mass media and compliance with solid waste management policy in Oyo State

Billboard advertisement and compliance with solid waste management policy

Environmental challenges facing developing countries, like Nigeria, include unhealthy disposal of solid waste. Poor attitude towards waste management has been shown to be a major cause of solid waste problems in Nigeria cities. There are many ways to enlighten people on how to manage waste. Billboard advertising is one of the most effective outdoor advertising that has the features to catch one's attention because of the striking colours, magnificent images and giant sizes. According to Osang (2012), the billboard is also the most visible medium carrying advertising messages that can cut across literacy barriers, which makes it easily understood by both the literate and illiterate. It is free, as viewers do not pay to gain access to it. Billboard advertisements or hoardings are designed to catch a person's attention and create a memorable impression very quickly, leaving the reader thinking about the advertisement after they have driven past it. They are only a few words, in large print and a humorous or arresting image in brilliant colour. Olaghere (1997) argues that of all forms of outdoor advertisement, billboards have in common the purpose of catching the eyes of passerby and impressing on them a concise but powerful sales message at the time they are passing by. This implies that as Benson Eluwa (2005) puts it, billboards' advertising gives extra attention as a result of its size and location or site, colour advantages, lighted signs and mass appeal. This means that billboards are the most effective public means of advertising. Billboards, advertising is a valuable medium of communication to drivers and pedestrians because the posters stand alone and make their presence felt in a different way from any other form of advertising. In Nigeria, billboards advertising are used to convey different messages on health/pharmaceuticals, beverages and foods, beauty and cosmetics, soft drinks, telecommunication services and all sorts of information including political advertising. One area that may not have appeared on billboards advertising is solid waste management.

Studies by Idiagbe (2012), Chijide (2012) and Ladipo (2012) reveal that billboards as outdoor advertising contributes to economic growth. Chijide (2012) argues that billboard has become a key positive influence in the Nigerian marketing environment. Billboard remains the second biggest contributor to objective-driven media engagement worldwide, and it is the most enduring and effective among advertising media options. Invariably, it is the vehicle of advertising that is active at all times, because it is ubiquitous and it reinforces brand availability. Correct application of marketing principles and techniques promote a socially just cause, idea or behaviour has been effectively used in many areas such as health, cigarette smoking infant and maternal mortality and so on. Billboard strategy, as Conchita (2006) observes, has been found to significantly contribute to the attainment of specific programme objectives and goals.

Rolfe (2012) identified solid waste reduction through billboards advertising. He found that billboards advertising on solid waste helped to instil environmental health awareness and action in the citizens and ensure the protection of public health and the environment. But this has not been the case in Nigeria. While the Federal or State Ministry of Health and pharmaceutical companies have billboards on related issues perhaps, the Ministry of Environment at the state level does not have billboards advertisement on solid waste management (SWM) within the south geopolitical zone of Nigeria. This is rather serious, particularly in the capital cities, which are gateways to the country for foreign diplomats, businessmen, and tourists. Ogawa (2008) asserts that poor visual appearance affect official and tourist visits and foreign investment. The solid waste management system in Nigeria displays an array of problems, including low collection services, crude open dumping and burning without air and water pollution control, breeding of flies and vermin. Thus, challenges arising from solid waste management are caused by human factors which constrain it as expected.

Public enlightenment and information dissemination are key to successful implementation of a given policy decision particularly when support is needed for public and behavioural change from constituencies. Furthermore, public awareness campaigns were designed with the objectives of drawing the public's attention to a certain issue that can bring about behaviour and social changes.

When introducing a new public concept, issue, policy or project, it is crucial that the main audience that will be affected accepts the messages. Therefore, it is important to understand the needs and desires of the target audience as well as their perceptions of the proposed changes. This kind of understanding is part of what is referred to as social marketing, which seeks to influence social behaviours in order to benefit the target audience and society at large. When policymakers introduce new services that they want the citizen to accept and abide by, they must plan and implement communication programmes with intended objectives and mechanisms in harmony with the new system, what is required of them and how they will benefit from it (Ezeah and Robert, 2012).

A policy like privatization of solid waste management is a project that requires a complete understanding of the citizenry to changes in view with the objectives and processes of the new system, this need to relate to what is required of them and how they will benefit from it. Obviously, every human being appreciates a well-planned society. A planned environment will provide for orderly development of society, promote good health and enhance social, as well as spiritual and psychological well-being of the populace. To achieve this, every member of the community must be involved in urban planning and management policy thrust as well as effective legislation and enforcement.

Techniques for creating awareness on environmental issues as listed by Ajibade (2000) and Moses (2004) include;

legislation

training programmes

drama music and dance

discussions

jingles and advertisement on radio and television

print media campaign advertorials and features

public consultation

instituting of environment-related clubs and association

incorporating environmental education (EE) into school curricula.

Moses (2004) laments the negative consequences of non-involvement of community members in the planning, implementation and evaluation of environmental programmes. Most community members are not involved in the planning and implementation of programmes as basic as solid waste management which ought to be community-driven. Despite the obvious benefits of such participation, planners still adopt the top-bottom, know-it-all approach to planning issues and in planning activities.

Furthermore, Ajibade (2000) asserts that proper enforcement of any law begins from the level of public understanding of the issues involved, how much input they made into its enactment the level of public awareness of its existence, the level of public awareness to participate and cooperate with its implementation as well as the professionals to implement its provisions. A good law should not only aim at sanctioning of offenders but should also educate and encourage compliance.

Appraisal of reviewed literature

The study examined the physical planning and media indices that predict compliance with the solid waste management policy among the automobile technicians of Oyo State, Nigeria. In order to have a direction to the study, a conceptual framework was developed to explain the relationship of the two major independent variables - physical planning indices and media and link each to compliance with solid waste management policy. The reasoned action and planned behaviour were adopted as the theoretical framework for the study (Ajzen and Driver, 1991).

The conceptual review focused on areas such as the concept of solid waste and management. Sanitation Connection (2002) described solid wastes as materials which are no longer have value to the person responsible for them and are not to be discharged through a pipe. Solid waste is generated from various sources such as domestic, industrial related construction, municipal treatment plant and agriculture wastes (Chatti, 2012). It also entails the collection, storage, transportation treatment and disposal of wastes in such away as to render them innocuous to human and chemical life ecology and the environment generally (Sanitation Connection, 2002; Baabereyin, 2009; Henry Yongsheng and Jun 2008).

The Federal Ministry of Environment developed policy guidelines in solid waste management in the year 2005 with the aim of improving and safeguarding people's health and welfare through efficient sanitary, solid waste management methods that will be economical as well as sustainable and guarantee sound environmental quality (FME, 2005). There are various factors that are militating against the achievement of the goal of the policy. Among them are poor physical planning and low level of awareness among the populace. Poor motorable roads and streets hamper garbage collection and evacuation by municipal authorities in traditional core areas. Most collection centres are not well planned, leading to the introduction of illegal collection points (Dambuzu, 2013).

Various studies on awareness of the public on solid waste management revealed that lack of environmental education among the populace contributed to indiscriminate disposal of solid waste (Akpala 2006; Adewuyi Komine, Yaswhare and Murakami 2009). Therefore, strong awareness and campaign are cardinal to the adequate implementation of any policy decision, particularly when it requires the support of the public and behavioural change from constituencies. Ezeah and Robert (2012) state that introducing new public concept issue or project policy is crucial to effective and standard enough to impact on the populace. It is necessary to understand the needs of the target audience and their perceptions of proposed changes in view.

CHAPTER THREE

METHODOLOGY

The methods deal with the following sub-headings:

1. Research design
2. Population
3. Sample and sampling technique
4. Research instrument
5. The validity of the research instrument
6. Reliability of the research instrument
7. Fieldtesting of the research instrument
8. Ethical consideration
9. Procedure for data collection
10. Procedure for data analysis

Research design

The descriptive research design of correlation type was used for this study. The design is considered appropriate as it does not involve the manipulation or control of the dependent variable but only enables the researcher to investigate, describe and give the relationship between variables as they naturally occurred. According to Thomas and Nelson (2001), descriptive research design explains and interprets current issues and existing conditions identifies problems and practices, make comparison and evaluation for the factual collection of information.

Population

The population comprised all automobile technicians in Oyo State.

Sample and Sampling Techniques

The sample for the study was one thousand, eight hundred and forty-three (1,843) respondents drawn from the existing seven geographical zones as specified in the Oyo State Solid Waste Management Authority Law, 2004 otherwise known as the Oyo State waste management zones. They are; Oyo, Ogbomoso, Oke-Ogun I, Oke-Ogun II, Ibarapa, Ibadan I and Ibadan II zones,

The multi-stage sampling procedure was used for this study. This involved proportionate, and simple random sampling techniques and the stages are as follows:

Stage one:Proportionate to samplesize technique was used to determine 50% of the local governments in each of the seven zones of the state. That is in Oyo zone, 2 out of 4 LGAs; Ogbomoso Zone, 3 out 5 LGAs; Oke-Ogun Zone I, 2 out of 4; Oke-Ogun Zone II, 3 out 6 LGAs, Ibarapa Zone, 2 of 3 LGAs; Ibadan Zone I, 3 out 6 LGAs; and Ibadan Zone II, 3 out of 5 LGAs.

Stage two:Simple random sampling technique offishbowl without replacement was used to select the actual 50% of the local government areas from the existing zones.

Stage three:Proportionate to samplesize technique was adopted to determine 60% of the respondents for the study in each of the local governments.

Stage four: Simple random sampling technique was used to select the respondents by given them equal chance of being picked.

Table 3.1: Zones and local government areas

S/N	ZONE	NAME OF LGAs IN EACH ZONE	NUMBER OF LGAs	NUMBER OF LGAs SELECTED
1	Oyo	Oyo West, Oyo East, Atiba and Afijo Local Governments	4	2
2	Ogbomoso	Ogbomoso South, Ogbomoso North, Oriire, Surulere and Ogo-Oluwa Local Governments	5	3
3	Oke-Ogun I	Iseyin, Itesiwaju, Iwajowa and Kajola Local Governments	4	2
4	Oke-Ogun II	Saki West, Saki East, Atisbo, Olorunsogo, Irepo and Orelope Local Governments	5	3
5	Ibarapa	Ibarapa North, Ibarapa Central and Ibarapa East Local Governments	3	2
6	Ibadan I	Ibadan North-East, Ibadan North, Akinyele, Lagelu, Egbeda and Ona Ara Local Government	6	3
7	Ibadan II	Ibadan South-West, Ibadan North-West, Ibadan South-East, Oluyole and Ido Local Governments	5	3
	TOTAL		33	18

Table 3.2: The number of automobile technicians in each LGA of Oyo State

S/N	Name of Zone	Name of existing LGA	No of registered auto-technicians in each LGA
1.	Ibadan 1	Ibadan North-East Ibadan North Akinyele Lagelu Egbeda Ona Ara	250 475 64 157 206 366
2	Ibadan 2	Ibadan South-West Ibadan North-West Ibadan South-East Oluyole Ido	279 288 320 300 270
3	Ibarapa	Ibarapa North Ibarapa Central Ibarapa East	120 144 153
4	Oyo	Oyo West Oyo East Atiba Afijio	117 67 30 32
5	Ogbomoso	Ogbomoso South Ogbomoso North Oriire Surulere Ogo-Oluwa	186 134 30 120 123
6	Oke-Ogun 1	Iseyin Itesiwaju Iwajowa Kajola	126 34 38 110
7	Oke-Ogun 2	Saki West Saki East Atisbo Olorunsogo Irepo Orelope	140 147 158 34 38 42
	Total		5,348

**Source: Nigerian Automobile Technicians Association (NATA) Oyo State
Chapter Office, Ibadan (2016)**

Table 3.3: The numbers of automobile technicians selected in each local governments and zones

S/N	Name of Zones	Name of existing LGA	No of LGA to be selected	Selected LGAs.	No of registered automobile technicians in each of the selected LGAs.	60% of the number of automobile technicians to be selected in each of the LGAs
1.	Ibadan 1	Ibadan North-East Ibadan North Akinyele Lagelu Egbeda and Ona Ara	3	Ibadan North East Ibadan- North Akinyele	250 475 64	150 285 39
Sub Total					789	474
2	Ibadan 2	Ibadan South-West Ibadan North-West Ibadan South-East Oluyole Ido	3	Ibadan South-west Ibadan- North-west Oluyole	279 288 300	168 172 180
Sub Total					867	520
3	Ibarapa	Ibarapa Central Ibarapa East Ibarapa North	2	Ibarapa East Ibarapa Central	153 144	92 87
Sub Total					297	179

4	Oyo	Oyo West,	2	Oyo East	67	41
		Oyo East, Atiba Afijio		Atiba	30	18
Sub Total					97	59
5	Ogbomoso	Ogbomoso	3	Ogbomoso	186	112
		South		South	134	81
		Ogbomoso		Ogbomoso	123	74
		North Oriire Surulere Ogo-Oluwa		North Ogo Oluwa		
Sub Total					443	267
6	Oke- Ogun 1	Iseyin	2	Iseyin	126	76
		Itesiwaju			110	66
		Iwajowa Kajola		Kajola		
Sub Total					236	142
7	Oke- Ogun 2	Saki West	3	Saki West	140	84
		Saki East		Atisbo	158	95
		Atisbo		Irepo	38	23
		Olorunsogo Irepo and Orelope				
Sub Total					336	202
Total					3065	1843

Research Instruments

In order to examine physical planning indices and media as predictors of compliance with the solid waste management policy among automobile technicians in Oyo State. A self-developed questionnaire of five (5) sub-sets and In-depth Interview Guide were used.

Physical Planning Indices and Media Predicting Compliance with Solid Waste Management Policy Questionnaire (PPIPCSWMPQ)

The instrument consisted of Physical Planning Indices Scale (PPIS), Media Scale (MS), Compliance with Solid Waste Management Policy Scale (CSWMPS), Solid Waste Management Practices Scale (SWMPS) and Awareness of Solid Waste Management Policy Scale (ASWMPS). The instrument was divided into six sections. Section A elicited information on personal characteristics of the respondents, while sections B, C, D, E and F were used to elicit information in line with the tested variables in the hypotheses and research questions. The items in the questionnaire were developed in line with the review of concepts and empirical information on solid waste management policy.

The items of the questionnaire were developed based on the initial exploratory discussion with people that shared similar characteristics with the actual study population. In the first stage, ninety-four (94) items were generated based on the exploratory survey discussion after which the questionnaire was presented to professional health educators and an expert in psychometrics. The items were later reduced to fifty (50). The instrument was validated through expert and peer review. This helped to remove ambiguity and item construction problems. This instrument was subjected to exploratory factor analysis. A Kaiser-Meyer-Olkin (KMO) of 0.66, 0.65, 0.62, 0.61 and 0.62 were obtained for PPIS, MS, CSWMPS, SWMPS and ASWMPS respectively; which was above the benchmark of 0.60. This indicates that the sample size of each of the scales is adequate for the conduct of factor analysis. The test of sphericity of each of the scales was statistically significant which supported the factorability of the correlation matrix as the p-value stood at 0.000.

Section A: This was used to obtain information on the socio-demographic characteristics of the respondents. Seven question-items were generated and responded to by the

respondents. The items included sex, age, educational background, workshop street/location, occupation, local government area and years of work of experience in the location.

Section B: Physical Planning Indices Scale (PPIS)

The scale was used to elicit information from the respondents on road accessibility, the location of solid waste management facilities and town planning regulations. Fifteen (15) items were generated and reacted to by the respondents during the pre-testing of the instrument. The data generated were then subjected to factor analysis of 0.60 as a criterion for retention of items. The result of the analysis showed that twelve (12) items met 0.60 criterion, thus, such the items were retained, while the items that did not meet with the criterion were expunged. Every response was scored on a 4-point modified Likert format of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD), with an allotment of points in the following order; SA = 4, A=3, D=2, SD =1. A Cronbach alpha method was used to test the internal consistency of PPIS and it yielded a reliability of 0.83.

Section C: Media Scale (MS)

Media Scale was used to obtain information from the respondents on electronic and print media. Twelve (12) question items were generated and reacted to by the respondents during the pre-testing of the instrument. The data generated were then subjected to factor analysis, with 0.60 as the criterion for retention of items. The result of the analysis showed that eight (8) items met 0.60 criterion, hence, the items were retained, while the items that did not meet with the criterion were expunged. Every response were scored on a 3-point format of Yes, No and I don't know with an allotment of points in the following order; Yes = 3, No=2, I don't know=1, A Cronbach alpha method was used to test the internal consistency of MS and it yielded a reliability of 0.76.

Section D: Compliance with Solid Waste Management Policy Scale (CSWMPS)

Compliance with Solid Waste Management Policy Scale elicited information from the respondents on how the respondents were complying with solid waste

management policy. Initially, eight (8) questions were generated and reacted to by the respondents during the pre-testing of the instrument. The result of the analysis showed that six (6) items met the 0.60 criterion; hence, questions that did not meet the with 0.60 criterion were expunged. Every response was scored on a 4-point modified Likert format of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) with an allotment of points in the following order; SA = 4, A=3, D=2, SD =1. A Cronbach alpha method was used to test the internal consistency of CSWMPS and it yielded a reliability of 0.76.

Section E: Solid Waste Disposal Practices Scale (Checklist) (SWDPS)

Solid Waste Disposal Practices Scale (Checklist) elicited information from the respondents on solid waste disposal practices among the respondents. Five (5) question-items were generated and reacted to by the respondents during the pre-testing of the instrument. The result of the analysis showed that all the five (5) items met the 0.60 criterion. Cronbach alpha method was used to test the internal consistency of SWMPS and it yielded a reliability of 0.93.

Section F: Awareness of Solid Waste Management Policy Scale (ASWMPS)

Awareness of Solid Waste Management Policy Scale was employed to elicit information on what awareness of the respondents would be in relation to Solid Waste Management Policy. Eleven (11) question-items were generated and responded to by the respondents during the pre-testing of the instrument. The data generated were then subjected to factor analysis, with 0.60 as the criterion for retention of items. The result of the analysis showed that all the eleven (11) question-items met 0.60 criterion; hence, the items were retained. Every response was scored on a 2-point format of Yes and No allotment of points in the following order; Yes = 2, No=1. A Cronbach alpha method was used to test the internal consistency of ASWMPS and yielded a reliability of 0.90.

In all, fifty-one (51) items were generated in the questionnaire (PPMIPCSWMPQ). Cronbach alpha method was also used to test the internal consistency of the four scales (PPIS, MS, CSWMPS, SWDPS and ASWMPS), yielded a reliability of 0.81. The questionnaire met criterion of 0.70, which is expected for psychometric measures.

2 In-depth Interview Guide

The In-depth Interview Guide (qualitative research instrument) contained five (5) questions with a series of probes on most of the items. The instrument was used to elicit further information in line with the variables tested. The five generated items with probes were reacted to by the respondents that are Environmental Health Officers. Triangulation method was used to establish the consistency of the responses of the respondents through the use of multiple perspectives in interpreting a single set of information.

The method was executed by interviewing three (3) groups of respondents based on their years of experience (less than 10 years, 11-20 years, 21 and above years). The data generated through transcribing were then subjected to thematic content analysis, the research errand read and analyzed the transcript and later compared the notes.

The validity of the Instrument

To ensure the validity of the research instrument, a draft copy of the questionnaire was presented to the researcher's supervisor and experts in the Department of Human Kinetics and Health Education, University of Ibadan, experts from Department of Environmental Health, Faculty of Public Health, College of Medicine, University College Hospital, Ibadan and Department of Urban and Regional Planning, Faculty of the Social Sciences, University of Ibadan for constructive criticisms. Necessary corrections were effected before administration of the instruments in order to improve face and content validity.

Reliability of the Instrument

To determine the reliability of the instrument, the validated version of the sets of a questionnaire administered to twenty (20) automobile technicians in Iwo Local Government Area of Osun State. The automobile technicians that were outside the coverage of the study were used. But shared the same characteristics with the population for the study. The data collected were thereafter subjected to Cronbach alpha to determine the reliability coefficient. Solid Waste Disposal Practices Scale (SWDPS) had 0.93; Awareness on Solid Waste Management Policy Scale (ASWMPS) has 0.90; Physical

Planning Indices Scale (PPIS) has 0.83; Media Scale (MS) had 0.76; while Compliance with Solid Waste Management Policy Scale (CSWMPS) had 0.76.

Field testing of the instrument

The field-testing of the questionnaire was carried out using twenty automobile technicians in IwoLocal Government ofOsun State. These automobile technicians were not within the coverage of the study but sharedsimilar characteristics with the population of the study, while nine (9) respondents were used for the field-testing of in-depth interview guide (qualitative research instrument). This acquainted the researcher with the problems that might be encountered during the actual study

Ethical consideration

Ethical approval was obtained from the Chairman Ethical Review Committee of the University of Ibadan, in conjunction with the Collaborative Institutional Training Initiative (CITI PROGRAM). The researcher presented copies of the research proposal, letter of introduction and some other information. The documents were reviewed and the researcher was directed to make some corrections. After submitting the corrected copy a full approval was given with reference number UI/SSHEC/20I6/0011. (See Appendix IV).The technicians were informed about the purpose of the investigation while informed consent forms were filled. Adequate confidentiality of their responses to questions was assured before the administration of the questionnaire.

Procedure for data collection

The researcher collected a letter of introduction from the Head, Department of Human Kinetics and Health Education, the University of Ibadan, which was presented to the leaders of Nigerian Automobile Technicians Association (NATA) for identification purpose. The instrument was administered personally, with the help of ten (10) trained research assistants in the selected local governments. The interpretation was made for those with non-formal or low formal education. These were complemented with six sessions of in-depth interviews with selected environmental health officers. The self-

administration was to ensure a high rate of return and also enable the respondents to ask questions and obtain clarification on issues that are not clear to them.

Procedure for Data Analysis

The completed copies of the questionnaire were collated, coded and analyzed using both descriptive and inferential statistics. The descriptive statistics of frequency counts, percentages, bar chart and histogram constituted the demographic information of the respondents; while mean and standard deviation were used for research questions 1 and 2; regression was used to test hypotheses 1-5, and Analysis of Variance(ANOVA) was used to test hypotheses 6 and 7. All the hypotheses were tested at 0.05 level of significance. The Scheffe Post-hoc analysis was also employed to ascertain the source of difference from the sample means revealed by ANOVA.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF FINDINGS

This chapter focuses on the analysis of the data with respect to the research questions and hypotheses earlier stated. The discussion follows the analysis

Socio-demographic characteristics of the respondents:

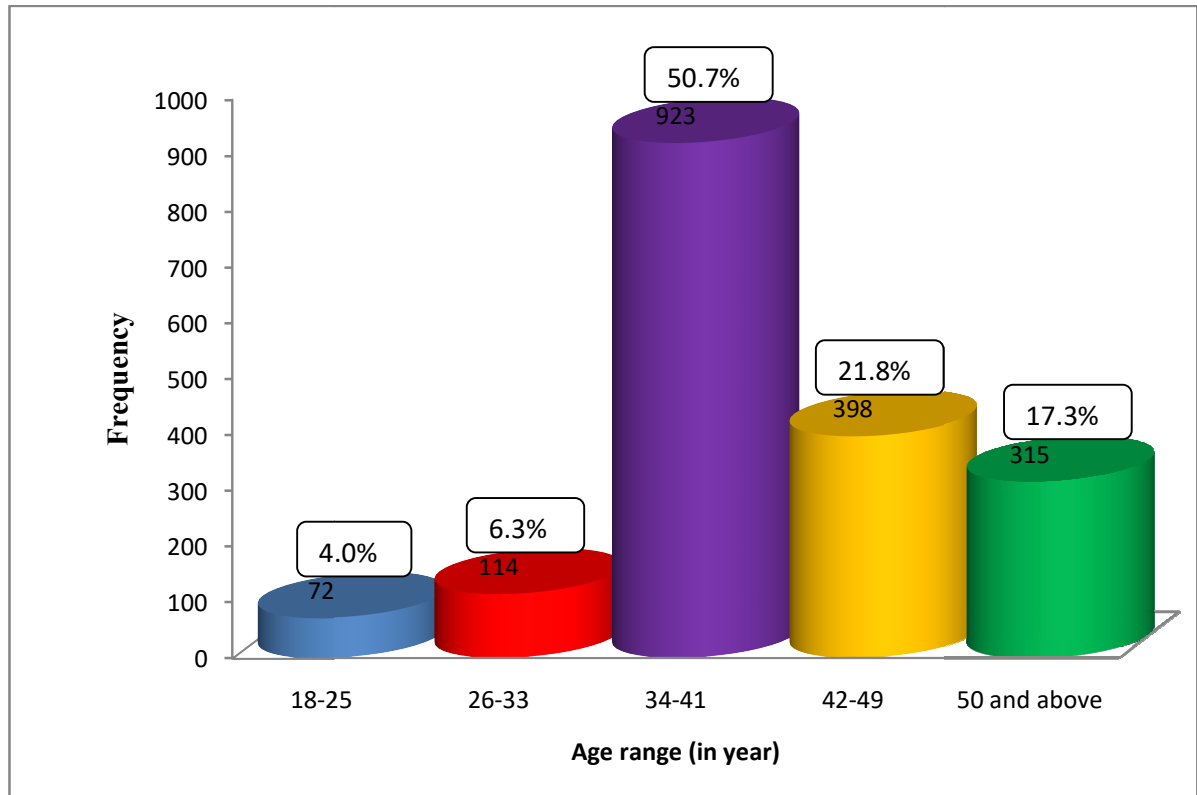


Figure 4.1: Histogram illustrating respondents by age

Figure 4.1 showed that 72 (3.95%) respondents ages ranged 18-25 years; 114 (6.25%) were in the range of 26-33 years, 923 (50.7%) were in the age range of 34-41 years; 398 (21.8%) were 42-48 years old; while 315 (17.3%) of them was above 50 years. This implies that most of the respondents were in the age range of 34-41 years.

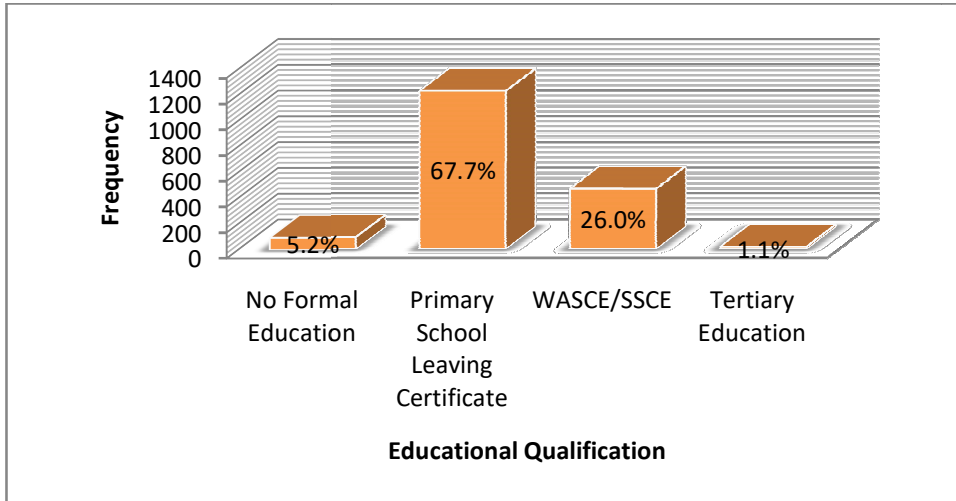


Figure 4.2: Bar chart illustrating respondents' educational qualification

Figure 4.2 reveals that 95 (5.2%) of the respondents had no formal education; 1,234(67.7%) obtained Primary School Leaving Certificate;473 (26.0%) possessed WASCE/SSCE; while 20 (1.1%) had post-secondary school qualifications. The implication is that the majority of the respondents had a Primary School Leaving Certificate.

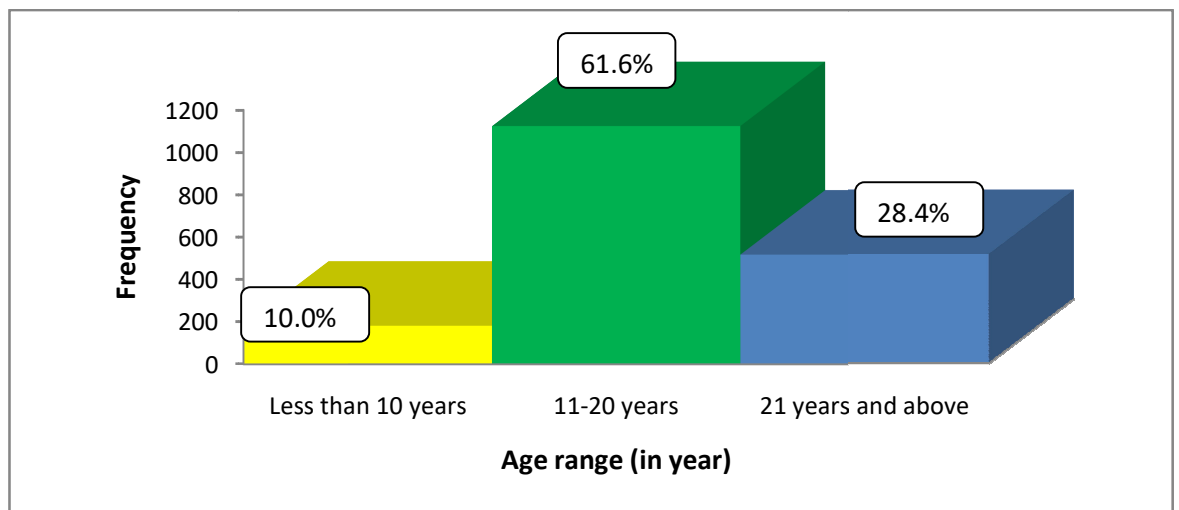


Figure 4.3: Histogram illustrating respondents years of work experience

Figure 4.3 indicates that 182 (10.0%) respondents had less than 10 years; work experience; 1,123(61.6%) had spent 11-20 years; while 517 (28.4%) had over 20

years' work experience. This implies that most of the respondents had 11-20 years' work experience.

Research Questions:

The study provided answers to the following questions:

Research Question 1: How do the automobile technicians dispose of their generated automotive waste in Oyo State?

Table 4.1: Analysis of how automobile technicians dispose of automotive wastes in Oyo State

S/n	Items	Frequency	Percent (100%)
1.	Which of the following periods do you adopt to dispose of your automotive solid waste?		
i.	Everyday	69	3.8
ii.	Every other day	260	14.3
iii.	Every week	269	14.8
iv.	At convenient time	1224	67.1
Total		1822	100.0
2	Which of the following serves as the means of storing your automotive solid waste before disposal?		
i.	Refuse bin	30	1.64
ii.	On the ground outside	1663	91.3
iii.	Inside waste bag	75	4.1
iv.	Anywhere	54	2.96
Total		1822	100.0
3	Which of the following times of the day you normally dispose of your automotivesolid waste?		
i.	Early in the morning before daybreak	77	4.2
ii.	In the afternoon	53	2.9
iii.	At night	1576	86.5%
iv.	At convenient time	116	6.4
Total		1822	100.0
4.	Which of the following methods of solid waste disposal do you adopt?		
i.	Burning	226	12.4
ii.	Open dumping	1271	69.8
iii.	Dumping into the stream or river	249	13.7
iv.	Use of private waste collector	55	3.0
v.	Burial	21	1.1
Total		1822	100.0

As shown in Table 1, 69 (3.8%) respondents affirmed that they disposed of their automotive waste every day; 260 (14.3%) disposed of the automotive waste every other day, 269 (14.8%) disposed of the automotive waste every week, while 1224 (67.1%) respondents disposed of their solid wastes at convenient time. This implies that most of the respondents disposed of their automotive wastes at a convenient time. In addition, 30 (1.64%) respondents used refuse bin as a means of storing their automotive waste before disposal; 1,663 (91.0%) stored it on the ground outside; 75 (4.1%) stored it inside waste bags, while 54 (2.96%) respondents stored their automotive wastes anywhere before disposal. The implication is that most of the respondents stored their automotive wastes on the ground outside.

The table further showed that 77 (4.2%) respondents normally disposed of their automotive wastes early in the morning before daybreak; 53 (2.9%) disposed of the automotive wastes in the afternoon; 1,576 (86.5%) at night, while 116 (6.4%) respondents normally disposed their automotive wastes at convenient time. It implies that most of the respondents normally disposed of their automotive wastes at night. Similarly, 226 (12.4%) respondents acknowledged that they adopted burning as a method of solid waste disposal; 1271 (69.8%) respondents adopted open dumping; 249 (13.7%) adopted dumping into the stream or river; 55 (3.0%) dumped their automotive wastes by using private waste collectors; 21 (1.1%) adopted burial means of solid waste to dispose. The implication is that most of the respondents adopted the open dumping method of solid waste disposal. Based on the reactions of the respondents, it could be inferred that the automobile technicians disposed of their automotive wastes at a convenient time, stored the solid wastes on the ground outside, dispose of the wastes at night and normally dispose of the wastes at night. The finding on solid wastes disposal revealed that most of the respondents disposed their solid wastes indiscriminately. Hence, it could be deduced that the automobile technicians in Oyo State disposed of their automotive wastes indiscriminately.

Research Question 2: Are the automobile technicians aware of the solid waste management policy in Oyo State?

Table 4.2: Analysis of awareness of automobile technicians about the solid waste management policy in Oyo State

S/n	Items	Yes	No	Mean	Std. Dev.
1	Are you aware of any solid waste management policy?	1542 (84.6%)	280 (15.4%)	1.1537	.36074
2	Are you aware of the government policy guidelines on solid waste storage?	1539 (84.5%)	283 (15.5%)	1.1553	.36231
3	Are you aware of the government policy guidelines on solid waste collection policy?	1552 (85.2%)	270 (14.8%)	1.1482	.35538
4	Are you aware of the government policy guidelines on solid waste on transportation?	1639 (90.0%)	183 (10.0%)	1.1004	.30067
5	Are you aware of the government policy guidelines on solid waste disposal?	1568 (86.1%)	254 (13.9%)	1.1394	.34647
6	Are you aware of the government policy guidelines on solid waste on enforcement and sanctions mechanism?	1450 (79.6%)	372 (20.4%)	1.2042	.40321
7	Is the use of waste bin a means of storing automotive waste on workshop premises before final disposal?	1426 (78.3%)	396 (21.7%)	1.2173	.41255
8	Could dumping of automotive waste on an undeveloped plot of land be regarded as an appropriate way of solid waste management?	141 (7.7%)	1681 (92.3%)	1.9226	.26728
9	Could dumping of automotive waste in nearby stream/river/gutter be regarded as an appropriate way of solid waste management?	152 (8.3%)	1670 (91.7%)	1.9166	.27660
10	Could engagement of waste collector for disposal of automotive waste be regarded as appropriate means of solid waste management?	1255 (68.9%)	567 (31.0%)	1.3112	.46311
11	Are you aware that under the solid management policy, there is a penalty for dumping of automotive waste in drainage during the rainy season?	1724 (94.6%)	98 (5.4%)	1.0538	.22566
Total				Weighted Mean= 1.30 Criterion= 1.5	

As indicated in Table 4.2, 84.6% of the respondents affirmed that they were aware of any solid waste management policy; while 15.4% did not. In addition, 84.5% of the respondents were aware of the government policy guidelines on solid waste storage; while 15.5% responded negatively. Moreover, 85.2% admitted that they were aware of the government policy guidelines on solid waste collection policy; while 14.8% responded contrary to that. Furthermore, 90.0% of the respondents responded that they were aware of the government policy guidelines on solid waste concerning transportation; while 10.0% did not. Also, 86.1% of the respondents affirmed that they were aware of the government policy guidelines on solid waste disposal; while 13.9% did not. It was also shown that 79.6% of the respondents reacted that they were aware of the government policy guidelines on solid waste concerning enforcement and sanctions mechanism; while 20.4% did not. Based on the reactions of the respondents, the majority of them were strongly aware of policy and government policy guidelines on solid waste, collection, storage, transportation as well as disposal.

It was further shown in Table 4.2 that 78.3% of the respondents affirmed that the use of waste bin is a means of storing automotive waste in workshop premises before final disposal; while 21.7% reacted negatively. In addition, 7.7% of the respondents reacted that dumping of automotive waste on an undeveloped plot of land could be regarded as an appropriate way of solid waste management; while 92.3% did not. In the same vein, 8.3% of the respondents affirmed that dumping of automotive waste in nearby stream/river/gutter could be regarded as an appropriate way of solid waste management, while 91.7% reacted negatively. Moreover, 68.9% of the respondents reacted that engagement of waste collector for disposal of automotive wastes could be regarded as an appropriate means of solid waste management; while 31.0% responded otherwise. Also, 94.6% responded positively under the solid management policy, there is a penalty for dumping of automotive wastes in drainage during raining season, while 5.4% did not. In relation to the reactions of the respondents, the majority of them were strongly aware of storing automotive waste in waste bin before final disposal, dumping of automotive waste on an undeveloped plot of land, dumping of automotive wastes in nearby stream/river/gutter, engagement of waste collector for disposal of automotive wastes as well as penalty for dumping of automotive wastes in drainage during the rainy season.

This finding on awareness, therefore, revealed that the weighted mean value of 1.30 was lower than the criterion of 1.50. Hence, it could be deduced that the awareness of the solid waste management policy among automotive wastes in Oyo State was low.

The following hypotheses were tested;

Hypothesis 1: There will be no significant joint contribution of physical planning indices (road accessibility, town planning regulations, the location of solid waste management facilities) to compliance with the solid waste management policy among automobile technicians in Oyo State.

Table 4.3: Regression analysis on the joint contribution of physical planning indices to compliance with solid waste management policy

R=.642 R ² =.412 Adj. R ² =.411						
Model	Sum of Squares	DF	Mean Square	F	Sig. (p value)	Remark
Regression	11992.999	3	3997.666	424.984	.000	Sig.
Residual	17101.261	1818	9.407			
Total	29094.260	1821				

Table 4.3 revealed that there was a significant joint contribution of physical planning indices (road accessibility, town planning regulations and location of solid waste management facilities) to compliance with the solid waste management policy among automobile technicians in Oyo State ($F_{(3,1818)}=424.984$; $p<.05$); with 41.2% of the variation accounted for by the independent variables of physical planning indices, therefore, the null hypothesis was rejected. This implies that physical planning indices of road accessibility, town planning regulations and location of solid waste management facilities jointly contributed to compliance with the solid waste management policy by the automobile technicians in Oyo State.

Hypothesis 2: There will be no significant relative contribution of physical planning indices (road accessibility, town planning regulations and location of solid waste

management facilities) to compliance with the solid waste management policy among automobile technicians in Oyo State.

Table 4.4: Regression analysis of the relative contribution of physical planning indices to compliance with the solid waste management policy

Variables	Unstandardized coefficients		standardized coefficients	t	Sig.	Remark
	B	Std. Error	Beta (β)			
(Constant)	2.385	.364		6.548	.000	
1.Road accessibility	.455	.002	.392	20.300	.000	Sig.
2.Town planning regulations	.541	.040	.352	13.552	.000	Sig.
3.Location of solid waste management facilities	.090	.042	.053	2.128	.033	Sig.

Table 4.4 showed the independent variables, the standard regression weight (B), the standard error of estimate, the t- ratio and the level at which the t-ratio was significant. As revealed in the table, the ratios associated with all variables (1, 2 and 3) were significant at the 0.05 level.

Regarding which independent variables contributed to the prediction, the value of the t-ratio associated with the respective variables, as observed in Table 4.4, indicated that all the variables (road accessibility, town planning regulations and location of solid waste management facilities) significantly contributed to the prediction of compliance with the solid waste management policy of automobile technicians in Oyo State. Standard regression weight (B) with these variables (see Table 4.4) showed that variable 1 (road accessibility) was the most potent contributor to the prediction, followed by variable 2 (town planning regulations) while variable 3 (location of solid waste management facilities) was last.

The results revealed that all the variables significantly contributed to the non-compliance with the solid waste management policy. Therefore, the null hypothesis, which states that there will be no significant relative contribution of physical planning indices (road accessibility, town planning regulations and location of solid waste

management policy) to compliance with the solid waste management policy among the automobile technicians in Oyo State was rejected.

Hypothesis 3: There will be no significant joint contribution of media (electronic and print) to compliance with the solid waste management policy among automobile technicians in Oyo State.

Table 4.5 Regression analysis of the joint contribution of media to compliance with the solid waste management policy

R=.378 R ² =.143 Adj. R ² =.142						
Model	Sum of Squares	DF	Mean Square	F	Sig. (p value)	Remark
Regression	4159.329	2	2079.664	151.711	.000	Sig.
Residual	24934.931	1819	13.708			
Total	29094.260	1821				

Table 4.5 revealed that there was a significant joint contribution of media (electronic and print) to compliance with solid waste management policy among automobile technicians in Oyo State ($F_{(2,1819)}=151.711$; $p<.05$); with about 14.3% of the variation accounted for by the independent variables of media, the null hypothesis was rejected. This implies that media of electronic and print jointly contributed to compliance with the solid waste management policy by the automobile technicians in Oyo State.

Hypothesis 4: There will be no significant relative contribution of media (electronic and print) to compliance with the solid waste management policy among automobile technicians in Oyo State.

Table 4.6: Regression analysis of the relative contribution of media to compliance with the solid waste management policy

Variables	Unstandardized coefficients		Standardized coefficients	t	Sig. (p-value)	Remark
	B	Std. Error	Beta (β)			
(Constant)	8.079	.337		23.947	.000	
1.Electronic media	.663	.071	.237	9.410	.000	Sig.
2.Print media	.336	.043	.198	7.852	.000	Sig.

Table 4.6 captures for each independent variable the standard regression weight (B), the standard error of estimate, the t-ratio and the level at which t-ratio was significant. The t-ratio associated with all the variables were significant at 0.05 level.

The extent of which two independent variables contributed to the prediction, the value of t-ratio associated with the respective variables, as observed in Table 4.6, indicated that all the variables (electronic and print media) significantly contributed to the prediction of compliance with solid waste management policy among automobile technicians in Oyo State. The standard regression value weights (B) was associated with these variables (see Table 4.6) showed that variable 1 (electronic media) contributed most to the prediction, followed by variable 2 (print media).

The findings of the study revealed that all the variables (electronic and print media) significantly contributed to the compliance of automobile technicians in Oyo State to the solid waste management policy. Therefore, the hypothesis, which states that there will be no significant relative contribution of media (electronic and print media) to compliance with the solid waste management policy was rejected.

Hypothesis 5: There will be no significant joint contribution of physical planning indices (road accessibility, town planning regulations, the location of solid waste management facilities) and media (electronic and print) to compliance with solid waste management policy among automobile technicians in Oyo State.

Table 4.7: Regression analysis on the joint contribution of physical planning indices and media to compliance with the solid waste management policy

R=.668 R ² =.447 Adj. R ² =.445						
Model	Sum of Squares	DF	Mean Square	F	Sig. (p value)	Remark
Regression	12997.487	5	2599.497	293.269	.000	Sig.
Residual	16096.773	1816	8.864			
Total	29094.260	1821				

Table 4.7 indicated that there was a significant joint contribution of physical planning indices (road accessibility, town planning regulations, location of solid waste management facilities) and media (electronic and print) to compliance with the solid waste management policy among automobile technicians in Oyo State ($F_{(5, 1816)} = 293.269$; $p < .05$); with about 44.7% of the variation accounted for by the independent variables of physical planning indices and media. Therefore, the null hypothesis was rejected. This implies that physical planning indices of road accessibility, town planning regulations, the location of solid waste management facilities media of electronic and print jointly contributed to compliance with solid waste management policy by the automobile technicians in Oyo State.

Hypothesis 6: There will be no significant difference in compliance with the solid waste management policy among automobile technicians in Oyo State based on years of work experience.

Table 4.8.1: Analysis of Variance (ANOVA) on the difference in compliance with solid waste management policy based on years of work experience

Source	Sum of square	DF	Mean square	F	Sig.	Remark
Between Groups	1262.941	2	631.471			
Within groups	27831.318	1819	15.300	41.272	.000	Sig.
Total	29094.260	1821				

Table 4.8.1 revealed that a significant difference in compliance with solid waste management policy among automobile technicians in Oyo State based on years of work experience ($F_{(2,1819)}=41.272, p<.05$). That is, there was a significant difference between the automobile technicians group means in relation to their years of experience, hence, the null hypothesis was rejected. This denotes that there was variation in compliance with the solid waste management policy based on years of work experience among the automobile technicians in Oyo State.

Table 4.8.2: Descriptive analysis of the difference in compliance with solid waste management policy based on years of work experience

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Less than 10 years	182	13.9176	4.90223	.36338	13.2006	14.6346	6.00	24.00
11-20 years	1123	13.1460	3.37655	.10076	12.9483	13.3437	6.00	24.00
21 years and above	517	15.0309	4.55149	.20017	14.6377	15.4242	6.00	24.00
Total	1822	13.7580	3.99713	.09364	13.5743	13.9416	6.00	24.00

Table 4.8.2 showed that the respondents with over 21 years; experience had the highest mean ($\bar{x} = 15.0309$); those with less than 10 years had a considerable mean of 13.9176; while the respondents with 11-20 years had the least mean ($\bar{x} = 13.1460$). The implication of compliance level with the solid waste management policy was lower among the respondents with 11-20 years and less than 10 years' experience compared to those with over 21 years. That is, the respondents with over 21 years; experience had better compliance with the solid waste management policy than other groups.

Table 4.8.3: Scheffe post hoc multiple comparisons analysis on the difference in compliance with solid waste management policy based on years of work experience

(I) Years of work experience	(J) Years of work experience	Mean \bar{x} Difference (I-j)	Std. Error	Sig.	95% confidence interval	
					Lower Bound	Upper Bound
Less than 10 years	11-20 years	.77155*	.31256	.048	.0059	1.5372
	21 years and above	1.11337*	.33714	.004	1.9393	.2875
11-20 years	Less than 10 years	.77155*	.31256	.048	1.5372	.0059
	21 years and above	1.88491*	.20789	.000	2.3942	1.3756
21 years and above	Less than 10 years	1.11337*	.33714	.004	.2875	1.9393
	11-20 years	1.88491*	.20789	.000	1.3756	2.3942

The result of the post-hoc test in Table 4.8.3 showed that there was a significant difference in compliance with the solid waste management policy between the group that had less than 10 years of work experience and those with 11-20 years' work experience ($p=0.048$). Besides, there was a significant difference in compliance with the solid waste management policy between the automobile technicians group that had less than 10 years of work experience and those with 21 years and above ($p=0.004$). Also, there was a significant difference in compliance with the solid waste management policy between the automobile technicians group, with 11-20 years and those group with 21-years and above ($p=0.000$).

Hypothesis 7: There will be no significant difference in compliance with the solid waste management policy among automobile technicians in Oyo State based on educational qualifications.

Table 4.9.1: Analysis of Variance (ANOVA) on the difference in compliance with the solid waste management policy based on educational qualifications

Source	Sum of square	DF	Mean square	F	Sig.	Remark
Between Groups	279.446	3	93.149			
Within groups	28814.814	1818	15.850	5.877	.001	Sig.
Total	29094.260	1821				

Table 4.9.1 revealed that there was a significant difference in compliance with the solid waste management policy among automobile technicians in Oyo State based on educational qualifications ($F_{(3,1818)}=5.877, p<.05$). That is, there was a significant difference between the automobile technicians group means in relation to their educational qualification, the null hypothesis was rejected. This shows that there was variation in compliance with the solid waste management policy based on educational qualifications among the automobile technicians in Oyo State.

Table 4.9.2: Descriptive analysis of the difference in compliance with the solid waste management policy based on educational qualifications

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
No formal education	95	14.4842	5.19587	.53309	13.4258	15.5427	6.00	24.00
Primary School Leaving Certificate	1234	13.9465	3.82997	.10903	13.7326	14.1604	6.00	24.00
WASC/SSCE	473	13.1374	4.08077	.18763	12.7687	13.5061	6.00	24.00
Tertiary Education	20	13.3500	4.17102	.93267	11.3979	15.3021	9.00	22.00
Total	1822	13.7580	3.99713	.09364	13.5743	13.9416	6.00	24.00

Table 4.9.2 showed that the respondents with no formal education had the highest mean ($\bar{x} = 14.4842$), followed by those with Primary School Leaving Certificate ($\bar{x} = 13.9465$) and those with tertiary education ($\bar{x} = 13.3500$); while those with WASC/SSCE had the least mean ($\bar{x} = 13.1374$). The implication of compliance level with the solid waste management policy was lower among the respondents with WASC/SSCE, tertiary education, Primary School Certificate Leaving Certificate than those with no formal education. That is, the respondents with no formal education had better compliance with the solid waste management policy than other groups.

Table 4.9.3: Scheffe post hoc multiple comparisons analysis on the difference in compliance with solid waste management policy based on the level of education

(I) Educational background	(J) Educational background	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
No formal education	Primary School Leaving Certificate	.53770	.42389	.657	-.6484	1.7238
	WASC/SSCE	1.34679*	.44760	.029	.0944	2.5992
	Tertiary Education	1.13421	.97945	.719	-1.6064	3.8748
Primary School Leaving Certificate	No formal education	-.53770	.42389	.657	-1.7238	.6484
	WASC/SSCE	.80909*	.21530	.003	.2067	1.4115
	Tertiary Education	.59652	.89740	.931	-1.9145	3.1075
WASC/SSCE	No formal education	-1.34679*	.44760	.029	-2.5992	-.0944
	Primary School Leaving Certificate	-.80909*	.21530	.003	-1.4115	-.2067
	Tertiary Education	-.21258	.90884	.997	-2.7556	2.3305
Tertiary Education	No formal education	-1.13421	.97945	.719	-3.8748	1.6064
	Primary School Leaving Certificate	-.59652	.89740	.931	-3.1075	1.9145
	WASC/SSCE	.21258	.90884	.997	-2.3305	2.7556

The result of post-hoc test (Table 4.9.3) showed that there was a significant difference in compliance with solid waste management policy between the group that had no formal education and those with WASC/SSCE ($p=0.029$). In addition, there was a significant difference in compliance with the solid waste management policy between the automobile technicians group that had Primary School Leaving Certificate and those with WASC/SSCE ($p=0.003$); there were no differences between the other compared groups with diverse educational qualifications.

Qualitative presentation of thematic content analysis on physical planning indices and media as predictors of compliance with the solid waste management policy among automobile technicians in Oyo State, Nigeria

This aspect presents the thematic content analysis of physical planning indices and media in relation to solid waste management. The responses of the environmental health officers (interviewees) in relation to the in-depth interview are also explained below:

A. Physical Planning Indices:

i. Road accessibility:

The result of thematic content analysis revealed that interviewees affirmed the fact that road accessibility hinder the collection and transportation of solid waste. In the same vein, the interviewees observed that most of the automobile technicians were affected. The respondents also reacted that automotive wastes were being stored on the ground or anywhere before being disposed of. In addition, it was observed that majority of automobile technicians resulted in the burning method of waste disposal owing to road accessibility factor.

A respondent noted:

Poor road accessibility has served as a serious hindrance to the collection and transportation of solid wastes among automobile technicians.

Another respondent reacted:

Due to inaccessibility to the road, the government could not provide public waste bins for the benefit of automobile technicians. Hence, most of them keep their wastes in the bag or burn them.

ii. Location of solid wastes management facilities:

Few of the respondents could testify to the fact that solid wastes management facilities were located in automobile technicians areas of operation. These few respondents noted that the facilities were not so near to automobile workshop; hence, they were not convenient for them to dispose of automotive wastes.

A respondent stated thus;

We appreciate the government for providing waste bins in many areas of operation; however, there are a lot of places where such facilities are far from automobile workshop or not even in existence

Another respondent asserted that;

Most of the automobile technicians are not finding it convenient to dispose of their automotive wastes due to the far location of the solid wastes management facilities

iii. Town planning regulations:

In relation to town planning regulations, most of the respondents agreed that violation of town planning regulations can lead to the problem of transportation of solid wastes from their area. An appreciable number of the respondents noted that the violation affected the automobile technicians in managing their automotive wastes. They further argued that the failure of some inhabitants of the area to observe setback while erecting their houses is making it difficult for them to collect and transport their wastes even through the engagement of services of the private waste collectors. In addition, most of the respondents claimed that they are supposed to have refuse storage facilities located in their area, but they could not benefit from that owing to violation of town planning regulations.

A respondent asserted thus:

I strongly believe that violation of town planning regulations can lead to the problem of transportation of automotive wastes.

Another respondent argued thus:

The indiscriminate erection of structures without following the town planning regulations has constituted a burden to the transportation of automotive wastes.

B. Media:

Most of the interviewees affirmed the fact that the mass media played a role in compliance with the solid waste management policy. The interviewees further noted that electronic media was the most effective source of disseminating information about solid waste management. In the same vein, most of the respondents responded that automobile technicians did not comply with the provisions of solid waste management policy.

A respondent stated thus:

In my own candid opinion, mass media played a good role in compliance with solid waste management policy

Another respondent said:

Besides, radio and television are adjudged the most effective sources of information about solid waste management policy

Discussion of Findings:

With respect to how the automobile technicians disposed of their generated automotive wastes, it was revealed that most of the respondents disposed of their automotive wastes indiscriminately, which is in contrast to the solid waste management policy. This manifested in the form of waste being thrown on roadways and dumped into drainages. This wastes obstructs the free flow of drainages, thereby creating conditions for mosquitoes to breed. The problem becomes more compounded during the rainy season when the content of drainages are usually emptied on the highways. Many of them bury or

burn their wastes in open space or disposed of them indiscriminately by the side of the roads or into the stream. The result is in line with finding of Mudasiru (2014), that there is the persistent wanton dumping of solid wastes in the Ibadan metropolis which is evident through the haphazard way of dumping refuse on roadways, walkways and drainages.

Also, concerning the awareness of automobile technicians to solid waste management policy, the result revealed that the awareness of the respondents about the guidelines on the solid wastes collection, storage, transportation and disposal was low. This might be a result of inadequate information from the government agencies in educating the members of the public in compliance with the solid waste management policy for a clean and healthy environment. This is in contrast with the finding of Babayemi and Dauda (2009) in the study carried out in Abeokuta which revealed an awareness of waste collection service was highest among the groups with age greater than 30 years and least among was 20 years of age. The finding further revealed that the same pattern could be observed for awareness of waste management regulations. However, it is in line with the finding of Akpala (2006) that the poor attitude towards keeping and maintenance of hygienic environment also stems from the inadequate knowledge of inhabitants on safe and hygienic wastes handling and management.

On the relationship between physical planning indices and compliance revealed that physical planning indices of road accessibility, town planning regulations and location of solid waste management facilities were connected to non-compliance with the solid waste management policy by the automobile technicians in Oyo State. This might be responsible for the practice of indiscriminate disposal of automotive wastes among the automobile technicians which was caused by deplorable roads, unplanned settlement and inadequate waste collection facilities. This finding is in agreement with that of Onu, Suresh and Trevor (2014), which established the knowledge of the problem of municipal solid waste management in the Niger Delta region. It also corroborates the finding of Nabegu (2010), which revealed that some problems, such as poor nature of roads and unplanned settlement contributed to solid wastes accumulation have been identified in Ibadan metropolis. The core or traditional area of the city is characterized by slum, inaccessibility, and poor condition of the environment, which is evidence of poor town

planning in the previous years. This culminated in the placing of public containers into places far away from users. As a result of this, most residents have to walk far distance before getting to where they can dump wastes. Many of them have to indiscriminately dump their wastes in nearby open spaces, drains and streams causing environmental hazard within the neighbourhood. Fafioye and John-Dewole (2013) study revealed a significant relationship existed between waste management and physical and town planning.

Furthermore, the result revealed that road accessibility, town planning regulations and the location of solid waste management facilities independently contributed to non-compliance with the solid waste management policy by the automobile technicians in Oyo State. However, road accessibility contributed most, while the location of solid waste management facilities factor was the least contributor. This means that the variables of road accessibility and town planning regulations have strong relationship with compliance with solid waste management policy.

This outcome of this study is in line with the finding of Danbuzu (2009) that, most collection centres are not well planned and this leads to the introduction of illegal collection points which can be attributed to lack of coordination in building houses and non-compliance with the physical planning policy. The outcome of the study also tallies with the finding of Nabegu (2008), that, generally, with the exception of Government Reservation Areas (GRAs), almost all parts of Kano city are poorly planned. There are no access roads; some residential areas are not accessible to cars or trucks in the ancient part of Kano called the city. This has made it difficult to evacuate or dispose of solid waste deposited in such areas. This study also buttresses the outcome of a study carried out by Buso, Nakin and Abraham (2014), that management of waste information system, collection methods, road network, collection time frame, and collection vehicles remain the most important elements contributing to the conditions of waste management in O.R. Tambo District Municipality.

The result indicated that media of electronic and print jointly contributed to non-compliance with the solid waste management policy by the automobile technicians in Oyo State. Further investigation revealed that electronic media contributed most. This might be

as a result of its wider coverage in terms of information dissemination because it can reach both literate and illiterate and larger audience at the same time unlike the print media, whose coverage is limited. The findings are also in tandem with Ojenike (2012), who claims impossibility to find a community intervention programme devoid of one or a combination of the mass media channels and strategies such as television, radio, newspaper, magazine, outdoor advertising, transit advertising, direct mail telemarketing and other special promotion events. Application of mass media technique is second only to activation of community organization and coalition building as a critical element in community intervention. Solid Waste Management Authorities have the task of reducing litter and open dumping and promoting recycling, reuse and source reduction activities. Each of these activities requires some behavioural change mechanisms.

In addition, the result of the study established that the physical planning indices of road accessibility, town planning regulations and location of solid waste management facilities and media of electronic and print were connected to non-compliance with the solid waste management policy by automobile technicians in Oyo State. This evidently shows that the combination of physical planning indices and media has a direct relationship with compliance with the solid waste management policy among the automobile technicians in Oyo State. This is in line with the findings of Sanni and Ipingbemi (2008), that urbanization and environmental health issues were major challenges facing planners, city managers and various professional stakeholders in the environmental sector. The result also tallies with the finding of Buso, Nakin and Abraham (2014), that there was a positive correlation between bin distribution and illegal dumping.

Again, the result is in consonance with the findings of Onu, Suresh and Trevor (2014), who show that indiscriminate waste disposal in Niger Delta Region of Nigeria was due to the existence of slums and unplanned settlements, with 21% of the respondents concurring to this claim. Other factors identified in the research were room for good road networks in the region, the absence of waste management facilities and infrastructure.

Furthermore, the result corroborates the submission of Adewuyi, Komine, Yaswhare and Murakemi (2009), that lack of environmental education among the populace sampled contributed to indiscriminate dumping of solid waste. This is also in

line with the view of Adio-Moses (2007) that health education is important in changing and improving solid wastes management practices.

The result equally revealed that there was variation in non-compliance to solid waste management policy based on work experience among the automobile technicians in Oyo State. The respondents with over 21 years of work experience had better compliance with the solid waste management policy than other groups. This might be as a result of their long-standing exposure to environmental education and their years of experience on the job, which made them have an advantage over other groups of automobile technicians.

Finally, the study found out that there was variation in non-compliance with the solid waste management policy based on educational qualifications among the automobile technicians in Oyo State. The result specifically revealed that those with no formal education had better compliance with solid waste management policy than other groups that had formal education. This can be attributed to the poor attitude of the eliteto government policies which is responsible. However, the outcome of the study is in contrast with the finding of Babayemi and Dauda (2009), that the awareness of waste management regulations remained highest among those who had tertiary education and least among those who had primary education. It is not also in line with the finding of Igbinomanhia and Ideho (2014), which revealed that the residents of Benin-citymetropolis lacked adequate awareness on the policies for waste management and proper disposal methods, including waste sorting at source, which can be attributed to the poor educational background of the residents, the study indicated that most of the sampled population had no formal education. Fafioye and John-Dewole (2013) also found a significant relationship between waste management problems and respondents' educational qualification.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

This chapter presents the summary, conclusion and recommendations made based on the findings of the study. The contributions to knowledge as well as suggestions for further studies are also captured in the chapter.

Summary

The study examined the physical planning indices and media as predictors of compliance with the solid waste management policy among registered automobile technicians in Oyo State. The variables selected for this study were independent variables of physical planning indices and media; moderating variables of educational qualifications and years of work experience as well as the dependent variable of compliance with solid waste management policy.

Also, a conceptual framework was developed. The theory of planned behaviour was adopted as a theoretical model for the study. In addition, relevant literature was consulted in line with the conceptual review on solid waste and the empirical review on physical planning indices and media and compliance with solid waste management policy under various sub-heading. The reviewed literature was also appraised.

Descriptive design of correlation type was used for the study. The population for the study comprised automobile technicians in Oyo State Nigeria. Multistage sampling procedures that involved proportionate sample size and simple random techniques was used to select one thousand, eight hundred and forty-three (1843) respondents from eighteen (18) local governments across the seven zones of the state in accordance with Oyo State Solid Waste Management Laws of 2004. Self-developed questionnaire and in-depth interview guide were used as instruments. The questionnaire was subjected to validation and reliability; copies of it were administered to the one thousand eight hundred and forty-three respondents. Approval was obtained from the Ethical Review Committee of the University of Ibadan, with the Collaborative Institutional Training Initiative (CITI PROGRAM). Descriptive statistics of frequency counts, percentages and mean, as well as

inferential statistics of regression and Analysis of Variance (ANOVA), were used to test the hypotheses at 0.05 level and content analysis was carried out on qualitative data.

The study provided answers to two research questions and tested seven hypotheses. The results indicated that the respondents' awareness about solid waste management policy was low and also their solid waste disposal practices were against the policy, and all the seven hypotheses tested were significant. The independent variables of physical planning indices and media contributed to non-compliance with solid waste management policy independently and taken together. There were relative contributions of town planning regulations, road accessibility and location of waste facilities and its compliance with the solid waste management policy and likewise the media. The result also showed that there was a significant difference in compliance with the solid waste management policy based on educational qualification and years of work experience.

Conclusion

The following conclusions were drawn. It was concluded that most of the respondents (automobile technicians) disposed of their solid wastes indiscriminately which was against the provision of waste management policy. Majority of them did not have enough awareness of the policy. Also, the physical planning indices of road accessibility, town planning regulations and location of solid wastes management facilities and the media of electronic and print had a joint significant prediction on compliance with the solid waste management policy among the automobile technicians in Oyo State.

Furthermore, road accessibility, town planning regulations and location of solid wastes management facilities, electronic and print media had relative contributions to compliance with the solid waste management policy among the automobile technicians in Oyo state. Finally, a significant difference existed in compliance with solid waste management policy among the automobile technicians in Oyo State based on years of work experience and educational qualification respectively.

Recommendations

Based on the findings of the study, the following recommendations are given.

1. The provision and location of solid waste management facilities should be done in such a way that they are very close to the generators of solid waste to prevent indiscriminate dumping of automotive wastes at unauthorized places, such as road median, drainages, open spaces and abandoned properties.
2. Town planning regulations should be enforced to ensure easy movement of refuse collection trucks in all places so as to facilitate compliance with the solid waste management policy among the automobile technicians.
3. The government should develop and implement master plans for cities and towns in Oyo State whereby provision would be made for mechanic villages that will be provided with facilities for compliance with solid waste management policy.
4. The government should employ an urban renewal strategy in the core areas so as to implement an effective environmental policy in the area. An urban renewal strategy will pave the way for the accessibility of refuse disposal trucks or vehicles to the core areas and also allow the public container to be placed in areas accessible to the public.
5. The government should also ensure good maintenance of existing roads to facilitate easy accessibility of refuse collection vehicles in all cities and towns of Oyo State, particularly mechanic villages.
6. Good road networks should be built in all the cities and suburbs linking all automobile workshops in the state.
7. An alternative strategy should be available to cater for adequate solid waste management challenges of the automobile technicians in the state that have no access to good road network to improve waste management facilities.
8. The government should also sponsor enlightenment programmes on radio and television to educate the automobile technicians on the need to embrace the government policy on the clean environment in the area of proper solid waste management.

9. Media organizations should make it part of the corporate social responsibility to embark on the reorientation of the automobile technicians on the need of the individual to synergise with the policythe guidelines on the solid waste management policy to ensure safe and healthy environment.
10. The government should produce and distribute posters, leaflets and handbills to educate people on the details about the waste management policy. It is also important that the message is illustrated with examples and diagrams where appropriate, and is made as entertaining and attractive as possible.
11. The government should adopt the use of billboards as a strategy for disseminating information to the automobile technicians about the solid waste management policy.
12. The government should adopt effective dissemination of information through social media platforms such as Facebook, Twitter and other to disseminate messages to the automobile technicians about the solid waste management policy.
13. The health educators should adopt various channel of communication such as use of interpersonal communication, mass media (electronic, print and social media) to sensitize the automobile technicians about the need to comply with solid waste management policy.

Contributions to knowledge

The study contributed to knowledge in the following ways

1. The study established that road accessibility is a strong factor in compliance with the waste management policy in Oyo State.
2. It was confirmed in the study that town planning regulations are an effective factor in compliance with the waste management policy in Oyo State.
3. The study demonstrated that the location of solid waste management facilities is a strong factor in compliance with solid waste management policy in Oyo State.

4. It was established in the study that electronic media is a potent factor in compliance with the solid waste management policy in Oyo State.
5. The study established that print media as a strong factor to the populace enhance in compliance with the solid waste management policy in Oyo State.
6. The study demonstrated that the interaction of physical planning and media variables are potent factors in compliance with the solid waste management policy in Oyo State.
7. Finally, the study established the need for health educators, policy makers and stakeholders to mount sensitization programme on attitudinal change towards waste management by automobile technicians.

Suggestions for further studies

Based on the outcome and the limitations of the study, the following suggestions are made:

1. The study is delimited to Oyo State. Therefore it could be replicated in other states in Nigeria to determine the differences associated with physical planning indices and media on adherence to the solid waste management policy.
2. Multi-disciplinary and inter-disciplinary collaborations on adherence to the solid waste management policy should be carried out.
3. Experimental research that will improve knowledge and better attitude of automobile technicians towards adherence to the solid waste management policy can also be looked into.
4. Comparative analysis of compliance with solid waste management practice among different artisans group can be investigated.
5. Lastly, comparisons of compliance with solid waste management policy between rural and urban centres can also be examined.

REFERENCES

- Agbola, B.S; Ajayi, O; Taiwo, O.J. and Wahab, B.W. 2012. The August 2011 flood in Ibadan, Nigeria: anthropogenic causes and consequences. *International Journal of Disaster Risk Science*.3,4:207-217 Retrieved July 24, 2014, from <http://doi.org/10.1007/s13753-12-0021-3>
- Adegoke, O.S. 1990. Waste management within the context of sustainable development. E.O.A. Aina and N. O. Adedipe Eds *The Environment and Sustainable Development in Nigeria*. Abuja; FEPA. 103-107
- Adejuwon, G. A. and Aina, W. J. 2014. Emergency preparedness and response to Ibadan Flood Disaster 2011: implications for well-being. *The Mediterranean Journal of Social Sciences*.58: 2039-2117.
- Adekola, G. 2004. Analysis of selected demographic and social-cultural factors influencing participation of urban dwellers in solid waste management in Ibadan, Nigeria. PhD Thesis. Department of Adult Education, University of Ibadan.
- Adelegan, J.A. 2004. The history of environmental policy and pollution of water sources in Nigeria (1960-2004): the way forward. Retrieved Feb. 25, 2015 from <http://www.userpage.fu-berlin.de/fluakkumen-bu2004/>
- Adewole, A. T. 2009. Waste management towards sustainable development in Nigeria: A case study of Lagos State: *Internal NGO Journal* 4.40: 173-179.
- Adewuyi, R., Komine, H. Yasuhara, K. and Murakami, S. 2009. "Municipal solid waste problems in developed developing countries –Japan and Nigeria as case studies. Retrieved Nov. 13, 2012, from <http://www.geo.civil.ibaraki.ac.jp/comine/my paper/JGS>.
- Adio-Moses, R. O. 2007. Effect of health education programme on market traders knowledge, attitude and practices towards solid waste management in Ibadan metropolis, Nigeria. *African Journal of Educational Management*. 14.1:157-176.

- Alam, P. and Ahamde, K. 2013. Impact of solid waste on health and the environment. *International Journal of Sustainable Development and Green Economics(IJSDGE)* 2. 1-1, 2.2315-47121.
- Aledare, K.D. 2008. Issues in urban planning and management Ibadan: *Metroplan Associates*. Retrieved Aug .22,2015,from<http://www.nou.edu.ng>.
- Ajibade, L.T. 2000. A technique of creating environmental awareness in Nigeria.H.I. Jimoh and I.P. Ifabiyi Eds.*Contemporary Issues in Environmental Studies*. Ilorin: Haytee Press Pub Coy Ltd. 277- 286.
- Akpala, C.O. 2006. Health implications of poor urban planning in South Eastern in Nigeria, *Journal of Environmental Research and Management*. 4:46-51.
- Armitage, C.J. and Conner, M. 2001. Efficacy of theory of planned behaviour a meta-analytic review.*British Journal of Social Psychology*.40:471-499.
- Azjen, I.1991. The theory of planned behaviour, organizational behaviour and human decision. *Dec-Proc* 50: 179-211
- Azjen, I. and Driver, B.L. 1991 Prediction of leisure participation from behavioural normative and control beliefs: An application theory of planned behaviour. *Leisure Science* 13:185-204
- Baabereyir, A. 2009.Urban environmental problems in Ghana:A case study of social and environmental injustice in solid waste management in Accra and Sekondi – Takoradi. *Researchgate*. Retrieved Oct. 20, 2018 from <https://www.researchgate.net>
- Babayemi, J.O. and Dauda, K.T. 2009. Evaluation of solid waste generation, categories and disposal options in developing countries: A case study of Nigeria. *Journal of Applied Sciences and Environmental Management* 13. 3: 83-88.

- Bankole, P.O.2004. Nigeria environmental United NationsEnvironmentalprofile:*National Environmental Outlook, Program*.RetrievedFeb.28,2013from<https://www.unep.net/profile/mdex.cfm>.
- Benson-Eluwa, V. 2005.Advertising principles and practice.Enugu: Virgin Creation. 5
- Blide, A.D. and Sunderasan, B.B.1985. Solid waste management in developing countries. Retrieved Feb. 30, 2015 from <https://journals:sagepub.com>
- Blight, G.E. and Mbande, C.M. 1996.Some problems with waste management in developing countries.*Journal of Solid Waste Technology and Management*7: 2 170 – 173.
- Buso, S; Nakin, M.D.V. and Abraham, A. 2014. Assessing the physical planning and management of waste. In O.R. Tambo Ed. District Municipality: Implications for management. *WIT Transaction on Ecology and The Environment*. 180: 125-134.
- Butu, A.W. and Mshelia, S.S. 2004. Municipal solid waste disposal and environment issues in Kano metropolis Nigeria.*British Journal of Environmental Sciences*. 2.2:10-26.
- Chati, T.J. 2012. Solid waste management in Ghanaian towns:A case of Saboba, Northern region. A B.Sc Thesis.University of Science and Technology College of Architectureand Planning, Department of Planning.Retrieved May. 28, 2015 fromwww.jsaer.com.
- Cointreau-Levine,S. 1996.Sanitary landfill siting and criteria.Washington DC World Bank*InfrastructureNotes*.Urban12,32.RetrievedFeb.15,2012fromOrg/htm/fpd/urban//solid-wmtechpaper5pdf
- Cointreau, S.J. 1982 Environmental management of urban solid wastes in developing countries: a project guide urban development department; World Bank. 26-32. Retrieved Feb.15,2012, from <http://www.worldbank.Org/htmlfpd/urban//solid-wm/techpaper5pdf>.

- Conner, M. and Sparks, P. 2005. The theory of planned behaviour and healthy behaviour. *Health Psychology* 21:194-201
- Danbuzu, L.A.S. 2013. Spatial distribution of solid waste collections points in Urban Kastina, Northern Nigeria. M.Sc Thesis. Department of Geography, Bayero University, Kano. Retrieved Dec. 31, 2015 from <http://danbuzu.wordpress.com/2012/12/25/spatial-distribution-of-solid-waste-collection-points-in-kat-2/>.
- Daskalopoulos, E. 1998. Municipal solid waste: A prediction methodology for the generation rate and composition in the European Union countries and United State of America. *Resources Conversation and Recycling*. Retrieved Jan. 25, 2016, from <https://www.researchgate.net>
- Dolk, H. 2002. Chromosomal congenital anomalies and resident near hazardous waste landfill sites. London School of Hygiene and Tropical Medicine. *Journal of Environmental and Health Impact of Solid Waste Management Activities*. 195-201
- Elemile, O.O. 2009. Effect of training and provision of collection bin on source-separation of solid wastes among workers of the University of Ibadan, Nigeria. MPH Dissertation. Department of Epidemiology, Medical Statistics and Environmental Health, University of Ibadan, Nigeria.
- El-Fadel, M., 1997. Environmental impacts of solid waste landfills. *Journal of Environmental Management* 50: 1-2.
- Ezeah, C. and Roberts, C.L. 2012. "Analysis of barriers and success factors affecting the adoption of sustainable management of municipal solid waste in Nigeria. *Journal of Environmental Management*, 103: 9-14.
- Fafioye, O. O. and John-Dewole, O.O. 2013. A critical assessment of waste management problems in Ibadan South –West Local Government Area, Ibadan, Nigeria. *Greener Journal of Environmental Management and Public Safety*. 2.2: 060-064

- Federal Ministry of Environment. 2006. National training manual on environmental sanitation for environmental health practitioners. Federal Ministry of Environment. 20-25
- Flintoff, F. 1984. *Management of solid wastes in developing countries South East Asia series 1.1*ed. New Delhi. World Health Organization Regional Publication.175-185.
- Garrod, G. and Ken, W. 1998. Estimating lost amenity due to landfilling waste disposal. *Resources, Conservation and Recycling*. 22: 83-95.
- Gillmore, R, and Archibald, M. 2002. “Ten sexual behavior: Applicability of the “Theory of Reasoned Action” *Journal of Marriage and Family*. 64, 64: 885-897. Retrieved May 10, 2015, from <http://doi:10.1111/j.1741-3737.2002.00885x>
- Gladding, T., 2002. Health risks of materials recycling facilities. In R.E.Hester and R.M. Harrison eds. Environmental and health impact of solid waste management activities. Issues in environmental science and technology. Cambridge, U.K. Royal Society of Chemistry.53-72.
- Gobo, A. E. and Ubong, I.U. 2001. Fundamentals of environmental chemistry and meteorology. Tom and Hary Publications Ltd. Port Harcourt, Nigeria. 233-241
- Hanks, T.G. 1967. Solid waste disease relationships. A literature survey. Retrieved March, 28, 2015 from <https://eric.ed.gov>
- Henry, R.K; Yongsheng, Z; and Jun, D. 2006. Municipal solid waste management challenges in developing countries –Kenya case study. *Waste Management*. 26. 1, 92-100. Retrieved Feb. 25, 2016, from <http://dx.doi.org/10.1016/j.wasman.2005.03.007>
- Hoornweg, D. Thomas, L. and Otten, L. 1999. Composting and applicability in developing countries. *Urban waste management working papers*, Series 8 Washington, DC: World Bank.16

- Igbinomanhia, D. I. and Ideho, B. A. 2014. A study of the constraint to formulation and implementation of waste management policies in Benin metropolis, Nigeria. *Journal of Applied Science of Environmental Management*. 18.2: 197-202
- Isirimah, N.O. 2002. Understanding the natural properties and sources of water quality environment. Port Harcourt. Tom and Harry Publications. 19 – 25.
- Johannessen, L.M. and Boyer, G. 1999. Observations of solid waste landfill in developing countries: Africa, Asia and Latin America. Bank. *Urban and Local Government Working Paper Series 3*, Washington. DC. World Bank. Retrieved Dec. 20 , 2015 from <http://books.google.com.ng/books?id=145>
- Khan, I.H and Ahsan, N. 2003. Textbook of solid waste management. 1st ed. New Delhi: CPS Publishers. 22.
- Leach, M. 2011. Home healthy living green. Effects of improper solid waste disposal. Retrieved Dec. 15, 2015 from <http://www.eHow.co.uk>.
- Liv, D.H.F and Liptak, B.G. 1996. Environmental engineers handbook. New York: Laws Publishers. 25.
- Longman Dictionary of Contemporary English (1995p.1612)
- Meenambal, T. Uma, R.N. and Mural, K. 2005. The principle of environmental science and engineering. New Delhi: S. Chand and Company Ltd. 84.
- Mooko, N. and Aina, L. O. 2007. Information environment of artisans in Botswana. *Libri*. 57: 27-33.
- Moronkola, O.A. and Okanlawon, F.A. 2003. Fundamentals of public and community health education. Ibadan: Royal People (Nigeria) Ltd. 63-81
- Moses, A.J. 2004. Strengthening public participation in solid waste management in Nigeria: an education viewpoint. *Journal of Environmental Health* 1.2: 83- 97.
- Mudasiru, M. 2014. Space, population and waste management in Ibadan. *The Journal of Pan African Studies* 7.4: 175-194.

- Nabegu, A. B. 2008. Municipal solid waste characteristics in three residential zones of Kano metropolis. Maiduguri. *Journal of Arts and Social Sciences* 6: 199-210.
- Nabegu, A. B. 2010. Analysis of municipal solid waste in Kano Metropolis, Nigeria. *Journal of Human Ecology*. 31.2: 111-119.
- Neal, H.A., and Schubel, J.R, 2001. Solid waste management and the environment. New Jersey: Prentice-Hall. Inc. 32
- Nwakwo, B. O. 2004. The environment in sanitation and health. Owerri: Colon Concepts.
- Obateru, R.I. 2004. The genesis and future of Abuja. Ibadan. Penthouse Publications (Nig). Retrieved May 27, 2015, from <https://www.worldcat.org>
- Ogu, V.I. 2000. Private sector participation and municipal waste management in Benin City, Nigeria. *Environmental and urbanization*, 12. 2: 103 – 117.
- Ogundele, B.O. 1997. Managing solid wastes in Nigeria: methods, problems and solutions. *Nigerian School Health Journal* 9. 1&2:58-65.
- Ohaka, A. R; Ozor, P. E; and Ohaka, C.C. 2013. Household waste disposal practices in Owerri Municipal Council of Imo State. *Nigerian Journal of Agriculture, Food and Environment*. 9.2:32-36
- Ojenike, B. 2012. The Nigerian press: Historical and contemporary issues in focus. Ibadan: Akacom publications limited 66-67.
- Okpala, D.C. 1998. Institutional problems in the management of Nigerian. *Urban Environmental*. NISER Monograph Series. 3-7.
- Olafimihan, H.O. 2004. Solid waste management in B.O. Ogundele Ed. *Problems in Health Education*. Ibadan. Codat Publications 159 – 173.
- Omoleke I.I. 2004. Management of environmental pollution in Ibadan an African city. The challenges of health hazard facing the government and people. *Journal of Human Ecology* 15.4: 265 – 274

- Onibokun A.G. and Kumuyi, A.J. 2003. Science for humanity. International Development Research Centre: Ibadan, Nigeria.
- Onkore-horaye A.G. 1976. "Urban decay and environmental pollution in Nigerian cities implication for social welfare" A paper presented at the seminar on Environmental pollution in Nigeria NISER Ibadan 8 – 15.
- Onu, B., Suresh S. S. and Trevor, P. 2014. Impact of inadequate urban planning on municipal solid waste management in Niger Delta Region of Nigeria. *Journal of Sustainable Development*. 7.6: 27-45.
- Oreyomi, M.K. 2005. Ecological sanitation of water and environmental conservation technology option: The case of slums in Oyo State, Nigeria. *J. African Environmental Issues* 3: 12-15
- Oyo State Government Edict No 9 Vol. 33 of 5 June 2008, Ministry of Information, Community Development, Sport and Culture, Ibadan.
- Peavey, S.H., Rowe, D.R. and Tchobanoglous, G., 1985. Environmental engineering USA. McGraw-Hill Book Company, 573-652
- Pfeffer, J.T. 1992. Solid waste management engineering. *Prentice Hall International Series*. 35-47
- Sanitation connection 2002. Introduction of solid waste management. SKAT Retrieved. 25th May 2011 from <https://www.who.int/sanconnect>.
- Sanni, L. and Ipiingbemi O. 2008. Urbanization, environmental health and planning. Ibadan. Department of Urban and Regional Planning. University of Ibadan . Retrieved 30th Feb. 2012 from <http://ir.library.ui.edu.ng/handle/123456789/976>
- Seo, S. 2004 Environmental impact of solid waste treatment methods in Korea. *Journal of Environmental Engineering*. 130.1: 81-89.
- Sirdhar, M.K.C. and Adeoye, G.O. 2003. Organo-mineral fertilizer from urban waste development in Nigeria. *The Nigerian Field* 68:91-111.

- Sirdhar, M.K.C and Ojediran, J.O. 1983. The problems and prospects of refuse disposal in Ibadan city, Nigeria. *Journal of Environmental Health* 1: 571-575.
- Sridhar, M.K.C. 2008 Solid waste disposal lecture note for module mandatory continuous education programme. Abuja Environmental Health Officers Registration Council of Nigeria (EHORECON).38-39.
- Srinivas, H.2006. Solid waste management, Retrieved on May20,2011, from <http://www.gdre.Org/eum/waste>.
- Tchrobanoflous. G; Theisen, H. and Vigil, S. 1993. Integrated solid waste: engineering principles and management issues. The USA. McGraw-Hill Publishing Company,
- Thomas, J.R. and Nelson, J.K. 2001. A research method in physical activity .4th ed. Champaign. IL. Human Kinetic
- Tsiboe, A.I; and Marbel, E. 2004. A look at solid waste problems in Accra, Ghana. Masters Thesis, Roskilde University. Retrieved on 20th Oct. 2011, from <http://www.modernghana.com/newsp>.
- United Nations World Urbanization Prospectus UNWUP 1999. Retrieved Feb. 15, 2012, from <http://www.Un.org/esa/populations/WUP2001report.htm>.
- United State Environmental Protection Agency (USEPA) (1995) Air emissions from municipal solid waste landfills. Background Information for Final Standards and Guidelines. Retrieved Feb. 15, 2012, from <http://www.epa.gov/ttn/atw/landfill/bidf1.pdf>.
- UNCHS (Habitat)/UNEP, 1997. City experiences and international support..2: 67-70
- UNEP, 1996. International source book on environmentally sound technologies for municipal solid waste management. UNEP Technical Publication

- Wokekoro, E. 2007. Solid waste management in the construction industry (A case study of Port Harcourt Metropolis) International Conference on Waste Management, Environmental Geotechnology, and Global Sustainable Development (ICWMEGGSD07-Gz07) ID020 Ljubljana, SLOVENIA, August 28-30; 2007. Retrieved Nov. 13, 2015, from <https://www.researchgate.net>
- World Bank 1996. Restoring urban infrastructure and services in Nigeria. Retrieved Feb. 2013. from http://www.worldbank.org/afr/findings/English/find_62.htm.
- Wright, A. 1997. Exploring possible directions for improving solid waste management in developing countries: the case of Yogyakarta Indonesia. The University of Waterloo. 17-21.

APPENDIX I

DEPARTMENT OF HUMAN KINETICS AND HEALTH EDUCATION,

UNIVERSITY OF IBADAN, IBADAN

**QUESTIONNAIRE ON PHYSICAL PLANNING INDICES AND MEDIA
AS PREDICTORS OF COMPLIANCE WITH SOLID WASTE
MANAGEMENT POLICY AMONG AUTOMOBILE TECHNICIANS IN
OYO STATE, NIGERIA**

Dear Respondent,

The researcher is a doctoral student in the above-named department. I am conducting a study on physical planning indices and media as predictors of compliance with solid waste management policy among automobile technicians in Oyo State.

The outcome of this study would be of help in developing programmes that would improve compliance with solid waste management policy in Oyo State.

Consequently, the researcher, therefore, solicits your cooperation by responding objectively to this questionnaire. Your responses are to be treated with confidentiality.

Thank you for your anticipated cooperation.

Yours sincerely,

Safiu T. G.

Researcher

SECTION A

Demographic information

Instruction: Please tick (√) in the column as it apply to you in each of the following items:

1. Sex: (a) Male (b) Female

2. Age (a) 18 – 25 (b) 26 – 33 34 – 41(d) 49 (e) 50 and above
3. Educational qualification (a) No formal education (b) Primary School Leaving Certificate (c) WASC/SSCE Tertiary education
4. Workshop Street/ Location
5. Occupation Trade
6. Local Government Area
7. Years of work experience: (a) less than 10 years (b) 11-20 years
(c) 21 years and above

SECTION B

Physical Planning Indices Scale (PPIS)

Please tick (√) in the appropriate column to indicate the extent you agree or disagree with the statement below: Strongly Agree (SA) Agree (A) Disagree (D) and Strongly Disagree (SD)

S/N	ITEMS	SA	A	D	SD
	Road Accessibility				
1	The road to my workshop has a footpath with a thick bush, so I find it easy/convenient to dump my automotive waste along the bushy path.				
2	The road to my workshop is not motorable, therefore, it is difficult to make use of the waste collector for disposal of my automotive waste.				
3	Due to lack of access road to my workshop, the automotive waste generated are often transported to the road through the use of handcart push.				
4	The unplanned nature of my area hinders waste collection by refuse truck and non-compliance with solid waste management policy				

5	Lack of motorable road hinders the provision of the public waste bin near my workshop.				
	Location of solid waste management facilities				
6	I do make use of public waste bins in my area for disposal of automotive wastes				
7	I don't dump my automotive wastes in the public waste bins provided by the government because it is located far from my workshop.				
8	Despite the availability of public waste bins in my locality, I don't make use of it due to personal reasons.				
9	Provision of solid waste management facilities to assist in compliance with automotive wastes management policy				
	Town Planning Regulations				
11	Building houses without following the town planning regulations constitute a hindrance to proper solid waste management in my area because most houses were built without providing space for the access road.				
12	Inadequate enforcement of town planning regulations is a major cause of lack of vehicular accessibility in my area thereby leading to indiscriminate dumping of automotive wastes.				
13	Lack of space in my workshop prevented me to provide solid waste storage facility.				
14	Failure to observe set back while building houses in my area has led to lack of vehicular accessibility, therefore, I find it difficult to engage the services of a waste collector.				

SECTION C

Media Scale (MS)

Please tick (✓) in the appropriate column to indicate the extent to which you agree or disagree with the statement below:

S/N	ITEMS	YES	NO	I DON'T KNOW
	Electronic Media			
1	Radio programmes have been a source of information through which I learnt about policy on solid waste management.			
2	Current information through radio programmes has improved my level of education/awareness on solid waste management policy.			
3	Current information through television programmes has improved my level of awareness about solid waste management policy.			
4	I learnt about solid waste management policy through social media such as Facebook, Twitter and so on			
	Print Media			
5	Current information through Newspaper/Magazine/Journals has improved my level of education/awareness on solid waste management policy.			
6	Billboard placed at strategic locations are a source of information about solid waste management policy.			
7	Some information about solid waste management policy is learnt through reading from textbooks.			
8	Handbills, poster and leaflets are sources of information through which I learnt about solid waste management policy.			

SECTION D

Compliance with Solid Waste Management Policy Scale (CSWMPS)

Please tick (✓) in the appropriate column to indicate your responses in the statement

S/N	ITEMS	SA	A	D	SD
1	I have never had access to a copy of solid waste management policy, hence I do encounter challenges in the process of managing solid waste.				
2	I am aware of solid waste management policy but I hardly make use of any of the provision of the policy.				
3	Due to challenges of road accessibility to my workshop, I found it difficult to comply with some of the provisions of solid waste management policy.				
4	As a result of the nonavailability of solid waste management facilities in my area, I find it difficult to comply with the provision of solid waste management policy.				
5	I do not know my role in the implementation of solid waste management policy because there is not enough information about it.				
6	Holding educational meetings with stakeholders in solid waste management will facilitate compliance with the solid waste management policy.				

below:

SECTION E

Solid Waste Management Practice Scale (Checklist)

Please tick (✓) in the appropriate column to indicate your responses in the statement below

1. Which of the following normally form the major components of your solid waste?

i. Organic materials

ii. Metal scraps

iii. Plastic and Nylon

iv. Glass

v. Dust and ashes

vi. Rags

vii. Rubber

viii. Used tyres

ix. Paper/empty cartoons

2. Which of the following periods do you adopt to dispose your solid waste?

i. Everyday

ii. Every other day

iii. Every week

iv. At convenient time

3. Which of the following serve as the means of storing your solid waste before disposal?

i. Refuse Bin

ii. On the ground outside

iii. Inside waste bag

iv. Anywhere

4. Which of the following time of the day did you normally dispose of your solid waste?

i. Early in the morning before daybreak

ii. In the afternoon

iii. At night

iv. At convenient time

5. Which of the following method of solid waste disposal did you adopt?

i. Burning

ii. Open dumping

iii. Dumping into the stream or river

iv. Use of private waste collector

v. Burial

SECTION F

Awareness on Solid Waste Management Policy Scale (ASWMPS)

S/N	ITEM	YES	NO
1	Are you aware of any solid waste management policy?		
2	Are you aware of the government policy guidelines on solid waste storage?		
3	Are you aware of the government policy guidelines on solid waste collection policy?		
4	Are you aware of the government policy guidelines on solid waste on transportation?		
5	Are you aware of the government policy guidelines on solid waste disposal?		

6	Are you aware of the government policy guidelines on solid waste on enforcement and sanctions mechanisms?		
7	Is the use of waste bin a means of storing automotive wastes in workshop premises before final disposal?		
8	Could dumping of automotive wastes on an undeveloped plot of land be regarded as an appropriate way of solid waste management?		
9	Could dumping of automotive wastes in nearby stream/river/gutter be regarded as an appropriate way of solid waste management?		
10	Could engagement of waste collector for disposal of automotive wastes be regarded as appropriate means of solid waste management?		
11	Are you aware that under solid waste management policy there is a penalty for dumping of automotive wastes in a drainage during the raining season?		

Please tick (√) in the appropriate column to indicate your responses in the statement below:

Thank you.

APPENDIX II

DEPARTMENT OF HUMAN KINETICS AND HEALTH EDUCATION

UNIVERSITY OF IBADAN, NIGERIA

**IN-DEPTH INTERVIEW GUIDE ON PHYSICAL PLANNING INDICES AND
MEDIA AS PREDICTORS OF COMPLIANCE WITH SOLID WASTE
MANAGEMENT POLICY AMONG AUTOMOBILE TECHNICIANS IN OYO
STATE NIGERIA.**

Dear Respondent, (interviewee)

This interview guide is designed to obtain in-depth information on physical planning indices and media as predictors of compliance with solid waste management policy among automobile technicians in Oyo State, Nigeria. Through an in-depth conversation on the roles physical planning (road accessibility, town planning regulations, and location of solid waste management facilities) and media (electronic and print). Your responses to the interview will be treated confidentially.

Thank you.

Researcher: Safiu T.G.

A. Physical Planning Indices.

(i) Road accessibility.

Do you think that lack of road accessibility can hinder collection and transportation of automotive waste?

- a) Probe: Do you think this can affect method of managing automotive waste by automobile technicians.
- b) Probe: If so, can you explain from your experience on how automobile technicians have been managing their automotive waste?

(ii) Location of solid waste management facilities.

Is there any solid waste management facility located in automobile technicians' area of operation?

- a) Probe: is it far or near their workshop?
- b) If it is far, is it convenient for them?

(iii) Town Planning Regulations

i. Do you think that violation of town planning regulations can lead to the problem of transportation of automotive wastes from their workshop?

- a) Probe: If so, how does this affect automobile technicians in managing their automotive waste?
- b) Do automobile technicians have space for placement of refuse storage facilities?

B. Media.

1. Do you think that mass media (electronic and print) can play a role in compliance with solid waste management policy?

Probe (a) If so which of them is the means of disseminating information about solid waste management.

(b) Which of the two (electronic and print) is the most effective?

APPENDIX III

INFORMED CONSENT FORM

UI/SSHEC Approval Number: UI/SSHEC/2016/0011

This approval will elapse on 27/09/2017

I, (Please write full names), voluntarily give my consent to serve as a participant in the study entitled:

PHYSICAL PLANNING AND INDICES MEDIA AS PREDICTORS OF COMPLIANCE WITHSOLID WASTE MANAGEMENT POLICY AMONG AUTOMOBILE TECHNICIANS IN OYO STATE IN NIGERIA

I have received a satisfactory explanation of the general purpose and process of this study as well as description of what I will be asked to do and the conditions that I will be exposed to. It is my understanding that my participation in this study is voluntary and I will receive no remuneration for my participation.

It is further my understanding that I may terminate my participation in this study at any time and that any data obtained will be held confidential. I am aware that the researchers have to report to his supervisor and that all data collected will be accessible to the supervisor as well.

Signature of participant:

Date:

APPENDIX IV



SOCIAL SCIENCES AND HUMANITIES RESEARCH ETHICS COMMITTEE (SSHEC) UNIVERSITY OF IBADAN

Chairman: A. S. Prof. Jegede, B.Sc, M.Sc (Ife), MHSc (Toronto), Ph.d (Ibadan)
Tel: +234-8055282418
E-mail: sayjegede@yahoo.com
sayjegede@gmail.com
as.jegede@mail.ui.edu.ng

NOTICE OF FULL APPROVAL AFTER FULL COMMITTEE REVIEW

**RE: PHYSICAL PLANNING AND MEDIA INDICES AS PREDICTORS OF COMPLIANCE
WITH SOLID WASTE MANAGEMENT POLICY AMONG ARTISANS IN OYO STATE
IN NIGERIA.**

UI/Social Sciences Ethics Committee assigned number: UI/SSHEC/2016/0011

Name of Principal Investigator: Tajudeen Gbolagade SAFIU
Address of Principal Investigator: Human Kinetics & Health Education,
Faculty of Education,
University of Ibadan.

Date of receipt of valid application: **21/03/2016**

Date of meeting when final determination on ethical approval was made: **28th September, 2016**

This is to inform you that the research described in the submitted protocol, the consent forms, and other participant information materials have been reviewed and given full approval by the SSHE Committee.

This approval dates from **28/09/2016 to 27/09/2017**. If there is delay in starting the research, please inform the SSHE Committee so that the dates of approval can be adjusted accordingly. Note that no participant accrual or activity related to this research may be conducted outside of these dates. All informed consent forms used in this study must carry the SSHE Committee assigned number and duration of SSHE Committee approval of the study. It is expected that you submit your annual report as well as an annual request for the project renewal to the SSHE Committee early in order to obtain renewal of your approval to avoid disruption of your research.

Note: the National code for health research ethics requires you to comply with all institutional guidelines, rules and regulations and with the tenets of the Code including ensuring that all adverse events are reported promptly to the SSHEC. No changes are permitted in the research without prior approval by the SSHEC except in circumstances outlined in the Code. The SSHEC reserves the right to conduct compliance visit to your research site without previous notification.

A handwritten signature in blue ink, appearing to read 'A. S. Jegede', written over a horizontal dashed line.

Prof. A.S. Jegede
Chairman, SSH Ethics Committee

APPENDIX V

UNIVERSITY OF IBADAN, IBADAN, NIGERIA
DEPARTMENT OF HUMAN KINETICS AND HEALTH EDUCATION

Head of Department
Professor Michael Adeniyi Ajayi
NCE (Ife), B.Ed. (Benin), M.Ed., Ph.D. (Ibadan)
Sports Psychology & Leisure Studies.



E-mail: michaelajayi952@ymail.com
michaelajayi604@gmail.com
Tel.: 08023424905

Our Ref: _____

Date 26th Oct. 2016

Your Ref: _____

*The President
Nigerian Automobile Technicians Association
Oyo State Chapter
Ibadan.*

Dear Sir,

Permission to collect data/information/carry experiment

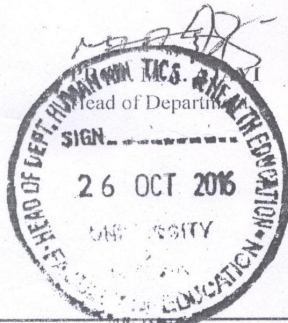
The bearer *Mr. T. G. Safiu* with Matric. No. *62990* is a
Ph.D student in the Department of Human Kinetics and Health Education,
University of Ibadan, Ibadan.

He/She needs to collect data/information/carry out experiment in your Department/Unit for
his/her/ Project/Course work.

Kindly allow him/her all necessary assistance required.

Thank you.

*Original copy received
by me *Adedokun*
28/10/16.*



OTHER PROFESSORS

1. Prof. B. O. Ogundele (Health Education/Promotion)
2. Prof. O. A. Moronkola (Health Education/Promotion & Curriculum Studies)
3. Prof. B. O. Asagba (Organization & Administration of Sports)
4. Prof. E. O. Morakinyo (Organization & Administration of Sports)
5. Prof. J. F. Babalola (Exercise Physiology)
6. Prof. A. O. Abass (Exercise Physiology)
7. Prof. O. A. Adegbesan (Sports Psychology)
8. Prof. A. O. Fadoju (Sports Psychology)

READERS

1. Dr. Francisca Anyanwu (Health Education)
2. Dr. K. O. Omolawon (Organisation & Administration of Sports)

APPENDIX VI



FEDERAL REPUBLIC OF NIGERIA

**POLICY GUIDELINES ON
SOLID WASTE MANAGEMENT**

DEVELOPED BY

**FEDERAL MINISTRY OF ENVIRONMENT
ABUJA**

JANUARY 2005

Policy Guidelines On Solid Waste Management

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PREFACE

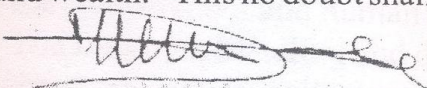
Solid Waste Management remains one of the most daunting Environmental Sanitation challenges facing the country today and it has continually remained at its lowest ebb despite huge investments in the sector. Currently, as a result of industrialisation and rapid population growth in many cities and towns, wastes are generated faster than they are collected, transported and disposed.

The National Environmental Sanitation Policy sets out to achieve a clean and healthy environment for all Nigerians. In tackling the underlying problems of solid waste management, this Policy Guidelines has recommended effective, efficient and sustainable waste management strategies. Such strategies include, waste minimisation at source through re-use, recycle and energy recovery before final disposal. Due emphasis has also been given to the use of locally available, appropriate and easily affordable technologies. Criteria for standardisation of the technologies have also been put in place.

Furthermore, since the type and volume of waste generated vary with location and season of the year, the preferred waste management options also vary from place to place and season to season. Thus, the methods of solid waste management have been hinged on the diverse socio-cultural, religious and topographical considerations that exist in the country.

The roles expected of all Stakeholders are clearly spelt out in the Policy Guidelines with special emphasis on the role of the private sector for their full participation. A clear call for adequate funding of the various strategies has been made to all Stakeholders. Sanctions and enforcement mechanisms shall be strengthened and decentralised for better efficiency while rewards for best practices shall be institutionalised.

The ultimate aim of the Policy Guidelines is to ensure that solid waste management is private sector driven with a potential to create employment and wealth. This no doubt shall enhance sustainability.



Col. Bala Mande (rtd.)
Honourable Minister of Environment.
January 2005

1.4 Effective and efficient Solid Waste Management is based on a hierarchy of management options: the reduction of waste, its reuse wherever possible, recycling, composting and energy recovery, and final disposal. However, there will always be certain wastes for which incineration is the most reasonable environmental and economic option. The Government policy shall seek to choose the best options for waste management that will minimise the risk of environmental pollution and harm to human health.

2.0 AIM

To improve and safeguard public health and welfare through efficient sanitary Solid Waste Management methods that will be economical, sustainable and guarantee sound environmental quality.

3.0 OBJECTIVES

- 3.1 To develop Policy Guidelines for efficient and sustainable Solid Waste Management in Nigeria;
- 3.2 To promote a healthy environment by ensuring sanitary Solid Waste Management;
- 3.3 To minimize waste generation and promote sorting at source, reuse, recycling and energy recovery;
- 3.4 To ensure safe and nuisance-free disposal of (urban and rural) domestic, medical, and industrial wastes in order to adequately protect public health during and after collection, transportation, treatment and final disposal;
- 3.5 To promote effective Stakeholders participation in Solid Waste Management;

- 3.6 To generate employment opportunities, improve the standard of living and thus reduce poverty;
- 3.7 To optimize labour and equipment in waste management to enhance increased productivity;
- 3.8 To facilitate cost recovery in waste management investment and ensure project replication and sustainability;
- 3.9 To build an institutional framework capable of ensuring an efficient waste management system;
- 3.10 To evolve and maintain an indigenous waste management system based on the physical and socio-cultural characteristics of communities;
- 3.11 To maintain adequate and regular waste management services at affordable cost.

4.0 JUSTIFICATION

- 4.1 The alarming rate at which heaps of solid wastes occupy most of our cities, coupled with the fact that 87% of Nigerians use methods adjudged as insanitary, has not only constituted visual blight and odour nuisance, but also encouraged the breeding of rodents, mosquitoes and other pests of public health importance with their attendant disease outbreaks.
- 4.2 It is common knowledge that markets and motor parks used by hundreds of Nigerians daily are seldom provided with facilities used for solid waste collection and disposal. As a result of this, men and women in markets and motor parks often dispose of the solid waste into public drains, around street corners, etc.

- 4.3 Flooding on our major roads is due largely to silt and solid waste blocking the drains and other outlets provided. The stagnant water in the blocked drains serves as breeding sites for mosquitoes.
- 4.4 The high incidence of improper waste management related diseases, e.g cholera, typhoid, diarrhoea, malaria etc, have become a source of embarrassment to Government. It is a known fact that a dirty environment with its attendant health consequences that prevails in most of our cities could scare away tourists and investors.
- 4.5 The World Health Organization (WHO) is also concerned about poor sanitation in member countries. In a resolution by the Regional Committee for Africa during the Forty-third session stated in its document AFR/RC43/R2 of 7th September 1993, that it is expedient to affirm that proper sanitation and sound waste management are crucial in the promotion and protection of human health and of the environment, both of which are necessary for sustainable development.

5.0 STRATEGIES

- 5.1 Promote waste minimization at household and community levels, through reduction at source, reuse, recycling and resource recovery;
- 5.2 Evolve and promote appropriate technologies for recycling of waste components such as bottles, glass, metals, paper, plastic and organic matter;
- 5.3 Foster the establishment of small-scale waste recycling plants at household and community levels, to source for and convert recyclable waste;
- 5.4 Develop technical capacity of public and private sector Agencies in Solid Waste Management;

- 5.5 Conduct research to determine per capita waste generation and build a database on Solid Waste Management;
- 5.6 Establish regulations, sanctions and enforcement mechanisms for Solid Waste Management from source of generation to the point of disposal;
- 5.7 Develop a Solid Waste Master Plan as a national blue print for effective Solid Waste Management;
- 5.8 Evolve realistic and sustainable funding mechanisms;
- 5.9 Create public awareness and sensitisation on efficient municipal Solid Waste Management practices;
- 5.10 Ensure effective monitoring and evaluation of municipal Solid Waste Management practices;
- 5.11 Set health criteria for manual sorting of wastes at household and community levels.

6.0 INSTITUTIONAL ROLES

- 6.1 **The Federal Government shall:**
 - 6.1.1 Develop, periodically review and update the Policy Guidelines on Solid Waste Management;
 - 6.1.2 Develop and circulate set standards for equipment procurement and maintenance in Solid Waste Management;
 - 6.1.3 Develop and circulate set standards on private sector participation in Solid Waste Management services;
 - 6.1.4 Prepare a Solid Waste Master Plan as a national blue print for effective Solid Waste Management and ensure its implementation at the appropriate levels of Government;
 - 6.1.5 Enact appropriate Legislation that will foster successful implementation of the Policy Guidelines and Master Plan;

- 6.1.6 Source for funds for programme development, specialized studies and capacity building on Solid Waste Management;
- 6.1.7 Provide technical assistance to States and LGAs in Solid Waste Management;
- 6.1.8 Initiate relevant programmes for improved Solid Waste Management practices;
- 6.1.9 Establish a national data bank on Solid Waste Management for planning and development;
- 6.1.10 Provide environmental education and awareness on sound Solid Waste Management;
- 6.1.11 Collaborate with relevant Stakeholders and ESAs on Solid Waste Management;
- 6.1.12 Register Solid Waste Management facilities that require EIA certification.

6.2 The State Governments shall:

- 6.2.1 Support and ensure the implementation of the Policy Guidelines on Solid Waste Management;
- 6.2.2 Facilitate the implementation of the National Solid Waste Master Plan;
- 6.2.3 Enact relevant State Legislation;
- 6.2.4 Make adequate annual budgetary provisions for Solid Waste Management;
- 6.2.5 Provide technical support to the LGAs through training and manpower development programmes for capacity building and institutional strengthening;
- 6.2.6 Support the provision of logistics including financial instruments to facilitate private sector participation in Solid Waste Management;
- 6.2.7 Conduct public education and enlightenment on sound Solid Waste Management;
- 6.2.8 Conduct research into local options for Solid Waste Management to guide LGAs;
- 6.2.9 Establish data bank on Solid Waste Management;
- 6.2.10 Provide land for siting waste management facilities.

6.3 Local Governments shall:

- 6.3.1 Implement the Policy Guidelines on Solid Waste Management as a statutory obligation;
- 6.3.2 Implement the National Solid Waste Master Plan;
- 6.3.3 Enact appropriate legislative instruments and establish necessary sanctions and enforcement mechanisms for efficient service delivery;
- 6.3.4 Enlist the services of the private sector and other Stakeholders in Solid Waste Management;
- 6.3.5 Register and license all operators of waste management facilities and services;
- 6.3.6 Make adequate annual budgetary provisions for Solid Waste Management;
- 6.3.7 Recruit, train and retrain staff for efficient service delivery;
- 6.3.8 Establish a consultative forum with members of the public to build consensus on appropriate strategies for waste management;
- 6.3.9 Develop IEC materials on solid waste handling techniques at household level;
- 6.3.10 Promote private sector participation in the delivery of waste management options.

6.4 The Private Sector shall:

- 6.4.1 Comply with the provisions of the National Policy Guidelines and Master Plan on Solid Waste Management;
- 6.4.2 Participate in Solid Waste Management on cost recovery basis;
- 6.4.3 Undertake waste recycling activities in an environmentally sound manner;
- 6.4.4 Engage in partnership with Local Governments for better service delivery;
- 6.4.5 Undertake research, specialized studies and product development in Solid Waste Management;
- 6.4.6 Promote public enlightenment campaigns.

6.5 **Civil Society Organisations shall:**

- 6.5.1 Undertake grassroots mobilization to support appropriate waste management options;
- 6.5.2 Promote the adoption of waste separation and resource recovery at household level;
- 6.5.3 Promote public enlightenment campaigns on appropriate strategies for waste storage, collection and disposal.

6.6 **The Public shall:**

- 6.6.1 Adopt environment friendly habits and practices;
- 6.6.2 Comply with existing Legislation on Solid Waste Management;
- 6.6.3 Comply with the provisions of the Policy Guidelines;
- 6.6.4 Cooperate with other Stakeholders to ensure sustainable Solid Waste Management systems;
- 6.6.5 Patronise recycled goods and biodegradable packages;
- 6.6.6 Undertake sorting of recyclable components at source and dispose residue at designated sites;
- 6.6.7 Segregate hazardous wastes and ensure hygienic and safe disposal;
- 6.6.8 Maintain sanitary dustbins in homes;
- 6.6.9 Adopt the technology of converting local waste into energy generation including biogas;
- 6.6.10 Adopt the use of compost as soil conditioner;
- 6.6.11 Pay for Solid Waste Management services to ensure its sustainability.

7.0 **GUIDELINES FOR EFFICIENT SOLID WASTE MANAGEMENT SERVICE DELIVERY AT THE LOCAL GOVERNMENT LEVEL**

The strategies adopted for waste management at the Local Government level shall relate to the culture, land use types, economic base, climatic conditions, level of urbanization and the existing institutional arrangement. However, some guidelines are provided as a broad statement to make for strategic

interventions in Solid Waste Management in Nigeria.

7.1 WASTE STORAGE

- 7.1.1 Household sanitary dustbins or disposable refuse bags for collection and storage of household wastes shall be promoted. The sanitary dustbins either galvanized or plastic of about 20kg capacity shall be fitted with two handles and a well fitting cover to prevent fly infestation and odour nuisance. The bins shall be kept out of reach of domestic animals, to prevent spillage of refuse. The galvanized dustbin shall be kept in a non-moist area to prevent corrosion. The dustbins shall be emptied into designated solid waste depot located within the area. Appropriate colour codes shall be adopted for segregation or sorting of domestic and hazardous wastes.
- 7.1.2 For commercial areas e.g. market, etc, mammoth bins shall be placed at strategic locations to accommodate the large volume of solid waste generated at the market place.
- 7.1.3 For industrial premises, dinosaur bins of about 1,500kg shall be placed at strategic locations within such premises to retain the solid wastes generated.

7.2 WASTE COLLECTION

The Local Governments shall:

- 7.2.1 Conduct studies and classify all settlements according to their level of urbanization, size, function and economic base into urban, semi-urban and rural.
- 7.2.2 Review existing collection equipment, method, and frequencies, as well as the tradition and labour practices.
- 7.2.3 Determine the most efficient system of waste collection for each settlement category and:
- i. Set out the method of refuse pick;
 - ii. Determine manpower and equipment needs;
 - iii. Determine vehicle type and routing system.

- 7.2.4 Integrate as much as possible, the various waste collection methods adopted for the different levels of settlements.
- 7.2.5 Introduce standardized waste storage bins, but where this is not immediately possible, existing storage bins shall be made functional and safe.
- 7.2.6 Implement collection methods that take into account differences in residential districts of a city as indicated below:

Residential Area	Collection Method
Well planned, high income, low density areas	House to house
Medium density residential layouts	Kerb side
High density low income districts	Communal depots

In case of communal depots, adequate numbers shall be provided within 200 to 250 meters walking distance to residence.

- 7.2.7 Set up an efficient system for sanctioning and enforcement.
- 7.2.8 Monitor, evaluate and re-plan at regular intervals

7.3 COLLECTION EQUIPMENT

- 7.3.1 In the choice of waste collection vehicles and equipment, emphasis shall be on optimizing vehicle and labour for improved productivity. The following guidelines are offered for vehicle choice:
 - i. A variety of non-motorised vehicles, which are human or animal powered are the most appropriate to be used as primary refuse collection vehicles in areas inaccessible to motor vehicles, such as in high density areas with poor road access; or when haul distance is short. Examples of such vehicles include:
 - a) Handcarts with container capacity of about 200kg have economic radius of operation of about 1 km;
 - b) Pedal tricycles with container capacity up to 500kg, have economic operation radius of about 2-3 km;

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 - b) Pedal tricycles with container capacity up to 500kg, have economic operation radius of about 2-3 km;

c) Animal drawn carts have limited capacity of about 2 cubic meter, with an economic radius of operation of about 3km.

ii. In densely populated areas, heavy motorized vehicles often create problems. In such circumstances and particularly where haul distance is long, the collected intra settlement wastes can be transferred from a small vehicle to a large one at the periphery of settlements or at an appropriate location created as transfer station.

iii. The compactor truck is uneconomical and inappropriate in most areas because non-compaction vehicles can adequately collect our type of waste.

7.3.2 The choice of solid waste handling machine and equipment shall comply with the set guidelines of the Federal Government.

7.3.3 The programme of equipment procurement shall be accompanied by maintenance agreement.

7.4 TRANSFER STATIONS

7.4.1 The need for transfer stations has been recognized particularly for some large metropolitan centers. Transfer stations shall be established where any of the following conditions subsist:

i. Where disposal sites cannot be located near the sources of solid waste generation;

ii. Where the responsibilities for waste management are separated and in the hands of different Agencies;

iii. Where labour and transportation costs are high, particularly for haulage business.

7.4.2 Transfer station shall be built where public objection to its construction is limited and transport cost is optimized.

7.5 WASTE TRANSPORTATION

Intra-city and inter-city transportation of solid waste shall comply with the following guidelines:

7.5.1 Choice of vehicles shall comply with set guidelines on equipment procurement.

7.5.2 Transport vehicles shall be covered to prevent unhealthy spread and dispersal of waste.

7.5.3 Transport itinerary shall be planned and properly routed in a manner that will not encumber intra-city mobility.

7.6 WASTE MANAGEMENT METHODS

7.6.1 Sanitary landfill remains the most cost-effective means of Solid Waste Management. Local Governments shall identify suitable landfill sites. The management of the site shall be public or private but the LGA shall monitor and supervise the sites to ensure compliance with standards.

7.6.2 The biological decomposition of organic wastes to produce biogas and/or compost shall be encouraged.

7.6.3 The large potential for recycling that has been found for municipal waste in Nigeria shall be tapped.

7.6.4 Incineration as a method of waste treatment shall be employed only where the local environment permits and for selected wastes.

7.7 MANAGEMENT OPTIONS

7.7.1 Four (4) management options are recommended:

- i. By Local Government/Municipal Agencies;
- ii. By Private Companies on contract with the LGA/Municipality;
- iii. By Private Companies on contract with Home Owners;
- iv. By public/private partnership.

7.7.2 Direct operations of waste management by LGA/Municipal Agencies may be embarked upon where the private initiative is low. This practice is often bedeviled with frequent personnel turnover and the use of incompetent or untrained officials. Although money may be saved, it may be at the expense of satisfactory performance.

7.7.3 Contracting out waste collection to private contractors by the LGA/ Municipal Agency has its advantages. First, waste collection is conducted as a business venture without political considerations. Similarly, the burden of expenditure for

equipment and capital outlay is placed on private companies where collection is effective. However, it may sometimes be counter-productive, as profit is the object of service. Also, contractual obligations are fixed and inflexible to changing conditions, as alterations in collection practices will require review in terms of contract. Furthermore, there are dual risks. One occurs in case of non-renewal of contract in spite of high capital outlay by the private contractor. The other is the risk to Government in case the private contractor fails.

- 7.4 Contract with individual house-owners is a frequent occurrence in sub-urban or rural areas where the LGA/Municipality does not usually render waste collection services. The practice has been found to be highly competitive and often uneconomic. There is usually price cutting by operators, which leads to low service standard. However, if properly organized and well monitored by the LGA, the service can be very effective in ridding the urban fringes of waste.
- 5 Public private partnership which is the latest practice the world over, shall be encouraged as this service will without doubt, complement the efforts of the Government at getting rid of solid waste heaps in the city. Apart from the fact that the system will create more employment and alleviate poverty of the operators, the revenue base of the LGA will be significantly increased through the registration and licensing of such operators. However, the Government on its part shall promote and organize this sector through creation of appropriate enabling environment.

PRIVATE SECTOR PARTICIPATION

Private sector participation shall be hinged on the principle of fair play and transparency that is devoid of political undertones. The selection of private sector participants in Solid Waste Management shall be organised as follows:

Franchised area shall be planned and mapped;

- 8.2 Criteria for company qualification and selection shall be clearly stated;
- 8.3 Indicators for franchised performance shall be specified;
- 8.4 Terms of Reference and Conditions of Engagement of the private sector participant shall be well defined;
- 8.5 Monitoring and evaluation procedures shall be outlined;
- 8.6 Entire operations shall be backed by Legislation.

9.0 SANCTIONS AND ENFORCEMENT MECHANISMS

Mobile Sanitation Courts have become necessary to encourage public compliance with set rules and regulations, enforce standards and ensure positive attitudinal changes. In this regard, the following shall be put in place;

- 9.1 Bye-laws on Solid Waste Management stipulating service standards and operations as well as citizen's obligations shall be enacted;
- 9.2 The Bye-laws shall be adequately disseminated to all communities;
- 9.3 Local and mobile courts shall be established, where they do not exist, to try offenders and impose sanctions;
- 9.4 Sanctions shall be strictly enforced.

10.0 REWARD FOR BEST PRACTICES

- 10.1 Each tier of Government shall identify best practices based on set criteria for exposition and reward;
- 10.2 Replication of best practices shall be encouraged.

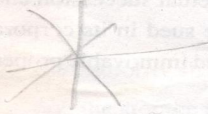
APPENDIX VII

A 1

Supplement to Oyo State of Nigeria Gazette, No. 9, Vol. 33, of 5th June, 2008--Part A

ASSENTED to by me this 28th this day of January, 2008

Otunba (Dr) Christopher Adebayo Alao-Akala
Governor



OYO STATE OF NIGERIA

No. 1

2008

**A LAW TO MAKE PROVISION FOR THE ESTABLISHMENT,
FUNCTIONS AND POWERS OF THE OYO STATE SOLID WASTE
MANAGEMENT AUTHORITY AND OTHER THINGS CONNECTED
THEREWITH**

() Date of Com-

mencement

ENACTED by the Legislature of Oyo State of Nigeria as follows:-

Enactment

1. This may be cited as the Oyo State Solid Waste Management Authority Law, 2004
2. In this Law unless otherwise requires "the Authority" means the body established under section 3 of this law;
 "Chairman" means Chairman in charge of the Authority;
 "Oyo State" means the areas within the jurisdiction of all the local Government areas in Oyo State.
 "Local Government" means the Local Government Council and includes, as a context of the circumstances may require, an Composition of the Authority administrator or a Committee of Management for a Local Government;
 "Solid Wastes" means, but it is not limited to garbage, refuse and other discarded solid materials resulting from domestic, industrial, commercial and agricultural from community
 "Solid Waste Management System" means all components of a system including Land, vehicles, building, structure, plants and equipment used in connection with the collection, transfer and disposal of solid Wastes;

Short Title

Operations and activities

THE SCHEDULE

Zone	Head Office	Area of Jurisdiction
Oyo	Oyo West	Oyo West, Oyo East, Atiba and Afijio Local Governments
Ogbomoso	Ogbomoso South	Ogbomoso South, Ogbomoso North, Oriire, Surulere and Ogo-Oluwa Local Governments
Oke Ogun I	Iseyin	Iseyin, Itesiwaju, Iwajowa and Kajola Local Governments
Oke Ogun II	Saki West	Saki West, Saki East, Atisbo, Olorunsogo, Irepo and Oorelope Local Governments
Ibarapa	Ibarapa North	Ibarapa North, Ibarapa Central and Ibarapa East Local Governments
Ibadan I	Ibadan North-East	Ibadan North-East, Ibadan South, Akinyele, Lagelu, Egbeda, Ona-Ara Local Governments.
Ibadan II	Ibadan South-West	Ibadan South-West, Ibadan North-West, Ibadan South-East, Oluyole and Ido Local Governments.



SUBSIDIARY LEGISLATION
LIST OF SUBSIDIARY LEGISLATION
OYO STATE SOLID WASTES MANAGEMENT OFFENCES
(FINES/SANCTIONS) REGULATION)

1. These Regulations may be cited as the Oyo State Solid Wastes Offences (Fines/Sanctions) Regulations.
2. Any person who:
 - (i) being a landlord, agent of a landlord or tenant and who neglects fails or refuses to provide and maintain a dustbin or make provision for waste disposal in his premises shall be guilty of an offence and shall be liable on conviction to a fine of two thousand five hundred naira only or to two months imprisonment; or
 - (ii) fails, neglects or refuses to pay the prescribed fee on his dustbin to the registered waste collector or contractor in his area, shall be guilty of an offence and shall be liable on conviction to a fine of two thousand five hundred naira only or to two months imprisonment; or
 - (iii) being a registered waste-collector or contractor who fails to collect the wastes which he has undertaken to collect, shall be guilty of an offence and may apart from being liable to a fine of not less than ten thousand naira only on each occasion, have his registration revoked; or
 - (iv) being a registered waste-collector or contractor fails, neglects or refuses to cover the tipper lorry or any vehicle used to collect refuse with tarpaulin while passing through the city shall be guilty of an offence and shall be liable to a fine of not less than five thousand naira only; or
 - (v) being a driver of a tipper lorry carrying sand or gravel fails, neglects or refuses to cover the tipper lorry with tarpaulin while passing through the city shall be guilty of an offence and shall be liable to a fine of not less than five thousand naira or.

- (vi) deposit or causes to be deposited laterite sand or building material or equipment on the road or road side shall be guilty of an offence and shall be liable to a fine of five thousand naira; or
- (vii) being a registered waste-collector or contractor fails, neglects or refuses to pay the prescribed fee towards the maintenance of public disposal facilities which he has to use may have his registration revoked; or
- (viii) being an unregistered person or persons who carry out the work of a waste collector or contractor, dumps waste in any unauthorized place, shall be guilty of an offence and be liable to a fine of ten thousand naira only; or
- (ix) burns or causes to be burnt, the contents of any dustbin belonging to the board or committee, shall be guilty of an offence and shall be liable to a fine of five thousand naira; or
- (x) stores or causes to be stored or agreed to be stored on his premises any industrial or commercial waste, shall be guilty of an offence and shall be liable on conviction to a fine of twenty-five thousand naira or two years imprisonment; or
- (xi) throws or dumps or counsels or procures any person to throw or dump, or causes to be thrown or dumped any waste on any road or a public place shall be guilty of an offence and shall be liable on conviction to a fine of two thousand and five hundred naira or to imprisonment for two months; or
- (xii) abandons or parks a motor-vehicle or any scrap thereof on any road or in any unauthorized public place shall be guilty of an offence and shall be liable on conviction to a fine of twenty-five thousand naira per trailer, ten thousand naira per lorry, five thousand naira per other vehicles and two thousand five hundred naira per motor cycle or two months imprisonment; or
- (xiii) stores in any receptacle in any place in a manner likely to hold water and breed mosquitoes shall be guilty of an offence and shall be liable on conviction to a fine of five thousand naira or to imprisonment for two months' or

- (xiv) constructs any structure or display for sale any wares, articles or things on any roadside or on public drains or pedestrian ways shall be guilty of an offence and shall be liable on conviction to a fine of two thousand five hundred naira or to imprisonment for two months; or
- (xv) allows waste-water to drain from his premises into the road in a manner likely to be injurious to health or public property shall be guilty of an offence and shall be liable on conviction to a fine of two thousand five hundred naira or to imprisonment for four months; or
- (xvi) allows any bird or animal under his control to stray on any road or public place, shall be guilty of an offence and shall be liable on conviction to a fine of two thousand five hundred naira or to imprisonment for four months and the seized animal or bird shall be forfeited to the State in case of default in payment in fine; or
- (xvii) being the owner of any premises without toilet facilities and who fails to provide such facilities, shall be guilty of an offence and shall be liable on conviction to a fine of five thousand naira or to imprisonment for twelve months; or
- (xviii) defecates or urinates in any public place shall be guilty of an offence and shall be liable on conviction to a fine of five hundred naira or to imprisonment for two months; or
- (xix) being the owner of any premises with overgrown weeds likely to harbour vermis or reptiles shall be guilty of an offence and shall be liable on conviction to a fine of two thousand five hundred naira or to imprisonment for two months; or
- (xx) being the owner of any place, premises or structure which is likely to constitute a danger to the public, shall be guilty of an offence and be liable on conviction to a fine of ten thousand naira or to imprisonment for twelve months' or
- (xxi) being the owner of premises whose surroundings are dirty or weedy or whose gutter is used as a dump shall be guilty of an offence and shall be liable on

- conviction of a fine of two thousand five hundred naira or to imprisonment for two months or summary closure of the premises for three to seven days by an authorized officer; or
- (xxii) being a registered waste-contractor, organization or individual who dumps waste on any unapproved place or site, shall be guilty of an offence and shall be liable on first conviction to a fine of twenty thousand naira and in the case of a second offender to a cancellation of its operating licence in addition to the payment of a fine of twenty thousand naira; or
- (xxiii) as a driver of passenger vehicle (bus or "danfo") fails to maintain a waste paper basket in his vehicle shall be liable on conviction to a fine of two thousand five hundred naira or imprisonment for three months; or
- (xxiv) as a food or meat vendor fails to display his food or meat items in approved model boxes shall be liable on conviction to a fine of two thousand and five hundred naira or imprisonment for three months; or
- (xxv) knowingly fouls or pollutes sources of water supply shall be liable on conviction to a fine of ten thousand naira or imprisonment for twelve months; or
- (xxvi) being the owner of petrol station or any premises licensed for the sale of petroleum products fails to provide toilet facilities for the use of customers shall be guilty of an offence and shall be liable on conviction of a fine of ten thousand naira or to imprisonment of six months; or
- (xxvii) does an act or omits to do any act or counsels, procures, aids or abets any person to do any act or omit to do any act in contravention of any of the provision of this law but for which no penalty is otherwise provided shall be guilty of an offence and shall be liable on conviction to a fine of five thousand naira or to imprisonment for six months; or
- (xxviii) being a person group of persons organization makes or emits noise by natural mechanical electronic or any other means shall be liable on conviction to a fine of

two thousand five hundred naira each person and ten thousand naira for group of persons or organizations; or

(xxix) wanders or moves about during the period of a sanitation exercise without lawful reason shall on conviction be liable to a fine of two thousand five hundred naira or four months imprisonment or

(xxx) After having a ceremony party or any other function in any open place within Oyo State fails or neglects to remove or clear all the debris or any other resultant waste within twelve hours after the said ceremony party or functions shall be liable on conviction to a fine of five thousand Naira or to imprisonment of three months or both.

APPENDIXVIII



The Oyo State Secretariat of Nigerian Automobile Technicians Association (N.A.T.A) Olomi Ibadan



The researcher and some members of the State executives of N.A.T.A



An automobile workshop



Evidence of poor automotive solid waste management in a typical automobile workshop



Evidence of poor automotive solid waste management in a typical automobile workshop



Evidence of poor automotive solid waste management in a typical automobile workshop



Evidence of poor automotive solid waste management in a typical automobile workshop



Some of the participants used for the study



Research assistants and some of the participants used for the study



The research assistants and some executive members of N.A.T.A of a Local Government in Oyo State



The researcher and some of the participants used for the study