

**ASSESSMENT OF PRIVATE SECTOR PARTICIPATION IN DOMESTIC SOLID
WASTE MANAGEMENT IN KADUNA SOUTH LOCAL GOVERNMENT AREA,
KADUNA NIGERIA**

BY

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MAY, 2016

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KADUNA NIGERIA**

BY

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MSC/SCIE/24582/2012-2013
(ENVIRONMENTAL MANAGEMENT)**

**A DISSERTATION SUBMITTED TO THE SCHOOL OF POSTGRADUATE
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SCIENCE DEGREE IN ENVIRONMENTAL MANAGEMENT**

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MAY, 2016

DECLARATION

I declare that the work in this dissertation entitled“Assessment of Private Sector Participation in Domestic Solid Waste Management in Kaduna South Local Government Area, Kaduna Nigeria” has been carried out by me in the Department of Geography. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree or diploma at this or any other Institution.

Ebune OCHOLI
Name of Student

Signature

Date

CERTIFICATION

This dissertation titled “Assessment of Private Sector Participation in Domestic Solid Waste Management in Kaduna South Local Government area, Kaduna Nigeria” by Ebune OCHOLI meets the regulations governing the award of the degree of Master of Science (Environmental Management) of the Ahmadu Bello University, and is approved for its’ contribution to knowledge and literary presentation.

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DEDICATION

This work is dedicated to the living memory of my late father Mr. Sunday A. Oholi

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ABSTRACT

Domestic Solid waste management has become the greatest problem facing many urban and semi-urban areas in Nigeria. Despite the efforts by the state government to help to solve the problem its efforts are not enough and these brought about the involvement of the private sector to participate to help to solve the problem. The study assessed private participation in domestic solid waste management in Kaduna South Local Government, Kaduna State, Nigeria. The study area comprises of twelve (12) wards, the twelve wards was considered. Adopting the Yamene (1967) formula for sample size determination, the sample size for this study will be 381 and Bowley formula (1924) was used to determine the number of questionnaires to distribute in the twelve wards. The primary data used in this study was obtained by direct field observations, questionnaire administration, oral interviews, images and photos of the study area. The results of the major finding showed that plastics and polythene materials dominated the waste material generated with (33%) and metallic materials forms (9%) of the total waste generated. Generally waste generated was greater than waste disposed, the private sector played the greater role (57%) in the waste management than the government or public (43%), Waste disposals firms were faced with four (4) categories of challenges, first availability of dumpsite (42%), second, Inadequate of modern facilities (27%), third shortage of skilled personals (23%) and finally others (9%). The study thus recommended Public Enlightenment and Education on issues of waste management and a better public awareness strategy on the subject matter also The participation of private sector in the management of domestic solid waste should be encourage so as to help in the solution of domestic sold waste littering. The Kaduna State Ministry of Environment should review the existing laws and regulations guiding

environmental sanitation and health it should also be enforced with stiffer actions in order to make them more effective.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Waste is defined as any unwanted material that is due for discarding. But technically, waste is considered as a resource in the wrong place Abdullahi, (2011). Waste is something for which we have no further use and which we wish to get rid of. Solid wastes arise from unusable residues in raw materials, leftovers, rejects and scrap from process operations, used or scrap packaging materials and even the saleable products themselves when they are finally discarded.

Following the unrelenting urbanization and largely unimpressive performance of the public sector in the provision of infrastructure in many cities in low-income countries, the search for alternative strategies for urban environmental services became inevitable. One obvious consequence of rapid urbanization is the growing generation of solid wastes, and many city authorities face unprecedented challenges in managing these, including problems coping with their collection and disposal . Despite the importance of adequate solid waste management to the urban environment, the performance of many city authorities in this respect leaves much to be desired (Ogu2006).

According to the 1996 Global Report on Human Settlements, between one-third and one-half of the solid wastes generated within most cities in low and middle-income countries are not collected. They usually end up as illegal dumps on streets, open spaces and waste land. The proportion of solid wastes collected and disposed of is less than 25 per cent in Dares Salaam (Tanzania) and about 40 per cent and 60 per cent respectively for Karachi

(Pakistan) and Jakarta (Indonesia) (UNCHS 2000) It is believed that in the poorest communities (many of which are in sub Saharan Africa), 80 to 90m per cent of wastes generated are not collected for safe disposal. Even in countries where city authorities provide waste services, these are often spatially concentrated, leaving some parts of the city unserved.

In recent years, there has been a paradigm shift in urban infrastructure development and management from a dominance of the public sector to an emphasis on private sector provision of services. The World Bank's policy on the urban sector shifted from project-based lending in the 1970s to the current emphasis on institutional, regulatory and financial reforms by the public sector, enabling the private sector to play a major role in urban infrastructure development and provision (World Bank 2001).

Generally, private sector entrepreneurs or enterprises do not pay taxes, have no trading license and are not included in social welfare or government insurance schemes (Haan, Coad, &Lardinois, 1998).The private sector is that segment of the private sector that operates outside the official legal andinstitutional framework for solid waste management. One of the important characteristics directly related tothe informal sector solid waste management is that it is small-scale, labour-intensive, largely unregulated and unregistered and low technology manufacturing or provision of services (Wilson, Whiteman andTormin 2001).

Waste disposal, traffic flow and transportation, social security, and supply of basic utilities are top priorities in urban management. The efficiency of all these services determine the quality or otherwise of the entire urban set-up, be it in the developed or developing nations. Indeed, they are the threshold of measuring the performance of urban environmental

management. In spite of this creedal stand, the effectiveness or efficiency of these services are in most cases undermined in the developing nations in general and in most urban areas of Africa South of the Sahara in particular. To that effect, many urban centres in Africa South of the Sahara are sustaining serious problems of varying magnitudes. In Nigeria, for example, improper waste disposal has become a cancer in many of its urban centres. Kano metropolis is among the urban centres in Nigeria bedeviled with the problem of improper waste disposal. This has been attributed to poor waste management systems. Thus, in order to improve the efficiency of waste management system in Kano metropolis, private sectors are involved in municipal solid waste management (Ahmed 2014).

1.2 Statement of Research Problem

Modern waste management presents a high level of complexity that requires many aspects to be considered for a suitable solution that encapsulates both the current state of the environment as well as its potential to provide support for future generations (Jha and Murthy, 2002). Over the years, the problem associated with solid waste management is more acute in developing countries of the world than the developed world (Zerborck, 2003). Many Developing Countries are still struggling with solid waste collection and management (Wilson, Velis, & Cheeseman 2006), and Nigeria is no exception. Despite the private sector involvement in solid waste management in developing countries in the past two decades, there are still problems with solid waste management services. The problems in cities have become burdensome despite efforts being made by city authorities and governments (Onibokun and Kumuyi, 1999). The problems of solid waste such as inadequate service coverage, irregular waste collection, waste spill over from bins and

storage containers, and lax attitude of people towards indiscriminate disposal on unauthorized places and waste littering are common. All these requires due attention.

Much attention has been given to solid waste management in recent times by several research works for example, Joseph (2014), analyzed the involvement of public and private agents in refuse disposal services in urban towns in Delta state, Nigeria. The impact of the new entrant (private sector) into the wastedisposal industry against the conventional (public sector) in waste disposal as perceived by users as a means of advocating and promoting co-operative approach or a hand off of the weaker sector among the two was assessed. It was found that the private sector had advantaged score in all four variables of equipment, personnel, cost effectiveness and general overall effectiveness over the public sector. It was recommended among others that government/private participation should be encouraged and the private sector participation in refuse disposal would be a better means of keeping a sanitary environment.

Ahmed (2014) in a study onthe role of private sector participation in municipal solid waste in Kano metropolisassesses the role of private sector participation in solid waste management in Kano Metropolis, Nigeria. The method used include: direct field measurement, Focus Group Discussion, Inventory, Individual Interviews, Questionnaire Administration, and Case Study. The result shows that the total number of 50 inventories companies operating under franchise agreement in Kano metropolis are contributing greatly in terms of efficiency and effectiveness of refuse collection and disposal, creation of employment opportunities, economic development of Kano Metropolis through real capital investment, among others. It was concluded that the scope of operation of private

companies should be extended to cover the whole metropolis not only the current delineated planned areas.

Similarly Muhammad and Manu (2013) studied gender roles in informal solid waste management in Cities of northern Nigeria: a case study of Kaduna metropolis. The study relied on primary data collected through a household survey using structured questionnaires. A total of 120 households were visited and interviewed randomly in Kaduna metropolis to establish the role being played by women in waste management. These researchers paid a site visits to dumpsites and to Panteka market, a waste recycling market in the heart of Kaduna metropolis where a focus group discussion was held with women involved in the business of waste recycling. The result of the study showed that women are brought into the mainstream of waste recycling through a coordinated effort if poverty is to be tackled. Women and children are the most vulnerable segment of the society and most of women's earnings are spent on livelihoods and this entails that empowering women inevitable brings a sustainable empowerment of the family. Waste and women are closely related because of their daily contact with it and this placed them in a very significant position of waste collection, reuse and sell at the household level.

From all the literature reviewed, studies on assessment of private sector participation in solid waste management have not been carried out in the study Area. Thus, this study seeks to assess the sustainable involvement of private sector's in handling of Solid waste in the study area and will address the following questions;

- i. What are the types and volume of solid waste generated in the study area?
- ii. What agencies (public and private) are involved in solid waste management in the study area?

- iii. What is the level of participation of the private sector in solid waste management in the study area?
- iv. What are the prospects and challenges of the private sector participation in solid waste management in the study area?

1.3 Aim and Objectives

The aim of the study is to assess private sector participation in domestic solid waste management in Kaduna south Local Government Area, Kaduna State.

This would be achieved through the following objectives:

- i. To examine types and volume of waste generated in the study area;
- ii. To identify agencies involved in the management of solid waste in the study area;
- iii. To assess level of participation of private sectors in the management of solid waste in the study area; and
- iv. To examine prospects and challenges of private sector participation in solid waste management in the study area.

1.4 Hypothesis

H01: There is no significant relationship between the income level of respondents and the types of wastes generated in the study area

H02: There is no significant relationship between the income level of respondents and the volume of wastes generated in the study area

1.5 Scope of the Study

This study focuses on the assessment of the Private sector participation in domestic solid waste management in Kaduna south Local Government Area. The assessment

covered Rapid appraisal which involves the frequency of waste generation as well as waste collection and quality assessment of services rendered in relation to sustainable solid waste management strategies. The spatial coverage would be Kaduna South Local Government area. This cuts across the twelve (12) wards. The temporal scope is for one month (4 weeks) April 2016.

1.6 Justification of the study

The weak enforcement of by-laws for solid waste management has contribute to the lax attitude of the people towards indiscriminate disposal at unauthorized places, waste littering, and free riding. The enforcement of regulation by government officials appears to be weak and this may be due to lack of capacity, lack of resources and political will, and problems with the institutional set-up.

The findings from study will therefore provide the much needed information on the effectiveness of the private sector participation and provide decision making bodies on the required information to enable further planning on handling of solid waste in Kaduna South.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section deals with the various concepts and theoretical frameworks which were used to form the basis for this research work. Relevant literature were also reviewed which provides suitable information for this study.

2.2 Conceptual Frame Work

2.2.1 The concept of waste

The Federal Environmental Protection Act (1988) define “waste”, Waste as the term implies is any solid, liquid or gaseous substances or materials which being a scrap or being super flows, refuse or reject, is disposed of or required to be disposed as unwanted, this is Environmental law, the term assumes it’s ordinary literal meaning unlike in the real property Law, When waste” is used as a term of art, having meaning completely different from its ordinary meaning. One of the few statutes in Nigeria, which attempts to define waste is the Lagos State Environmental Edicts 1985, there in Section 32, waste is define as follows:

Waste includes:

- i.) Waste of all description.
- ii.) Any substance, which constitutes scrap materials or an effluent or other unwanted surplus substances arising from the application of any process.

The United Kingdom’s Environmental Protection Act 1990, re-enacting an earlier U.K statue, took this statutory definition a step further in section 75(2), it defines waste in these

terms: Waste includes:

- i.) Any substance which' constitutes a scrap material or an effluent or other unwanted surplus substance arising from the application of any process and
- ii.) Any substance or article, which requires to be disposed of as being broken, worn out, contaminated or otherwise spoiled.

One thing to notice is that none of the above definitions of waste give "value" to the elements considered. There is no suggestion that the items, which constitute a waste, do not have value or is intrinsically useless. The word "unwanted" which appears in the definition although it introduces its own problem, does not necessarily, import a value element for a substance or material that may be unwanted notwithstanding that it has some value.

2.3 Classification and Nature of domestic Solid waste

Wastes can be classified into types including their sources, physical state, material composition and the level of risk associated with waste substances (Table 2.1) (World Bank, 1999). Such classification of waste provides a basis for the development of appropriate waste management practice.

Table 2.1 Classification of waste

| Criteria for classification | Example of waste type |
|----------------------------------|---|
| Sources or premise of generation | Residential, commercial, industrial, agricultural, municipal, services etc. |
| Physical state of waste material | Liquid, solid, gaseous, radioactive |
| Material composition of waste | Organic food, paper, plastic, glass, metal, textile waste |
| Level of risk | Hazardous , non-hazardous |

Source: World Bank 1999

2.3.1 Sources and types of municipal solid waste

Similarly, waste can be classified based on the source-classification, which is based on the fact that waste emanates from different sectors of society such as residential, commercial and industrial sources. A good example of the source classification was provided by the World Bank (1999) in a study in Asia which identified the sources of waste as residential, commercial, industrial, municipal services, construction and demolition, processing and agricultural sources (Table 2.2). Waste can also be classified based on their physical state which include liquid, solid, gaseous and radioactive waste. Waste can also be classified based on the level of risk, which is hazardous or non-hazardous.

Table 2.2: Sources and types of municipal solid waste

| Sources | Typical waste generator | Types of solid waste |
|-----------------------------|---|--|
| Residential | Single and multiple family dwellings | Food waste, papers, cardboard, plastic, textiles, glass, metals ashes, social waste (bulky items, consumer electronics, household hazardous waste etc. |
| Commercial | Stores, hotels, restaurants, markets, offices. | Food waste, papers, cardboard, plastic, glass, metals ashes, social waste (bulky items, consumer electronics), office hazardous waste etc. |
| Institutional | Schools, government centers, hospitals, prisons etc. | Papers, cardboard, plastic, glass, metals, ashes, special waste (bulky items, consumer electronics, office hazardous waste etc.). |
| Municipal sources | Street cleanings, landscaping, parks, beaches, recreational centers. | Street sweepings, landscape and tree trimmings, general waste from parks, beaches and other recreational centers |
| Construction and demolition | New construction sites, road repair, renovation sites, demolition of buildings | Wood, steel, concrete dirt. |
| Process (manufacturing) | Heavy and light manufacturing, refinery, chemical plants, power plant, mineral extraction and processing. | Industrial process water, scrap materials, clay, tailings |
| Agriculture | Crops, orchards, vineyards, diaries, feedlots, farms. | Spoilt food waste, agricultural waste, hazardous waste |

Source: World Bank/IBRD, 1999.

2.3.2 Material classification of waste type

The UK Environment Council (2000) also employed source classification to identify the major sources of waste as municipal sources, commerce and industry, agricultural sources, demolition and construction activities, dredged spoils, sewage sludge and mining and

quarrying operations. Classifying wastes by their sources is a useful way of determining the relative contributions of the different sectors of society to the waste stream and how to plan for their collection and disposal. Very often, the composition of the waste stream is also used to classify wastes into such types as organic waste, paper and cardboard, plastic, glass, ceramics, textiles metal and inert waste (Table 2.3). This type of waste classification based on material composition was conducted by the World Bank in 2002. An analysis of household waste streams in the county identified nine main types of materials: paper/card, plastic film, dense plastic, textiles, miscellaneous combustibles, glass, ferrous metal, garden waste and food waste.

Table 2.3: Examples of Material classification of waste type

| Waste type | Example |
|-------------------|---|
| Paper | Newspaper, Cardboards, Office waste paper, Magazine, Glossy |
| Plastics | Bottles, Expanded polystyrene, Film plastic, Other rigid plastics |
| Glass | Clear glass, Green glass, Amber glass, Non-recyclable glass |
| Metals | Steel cans, Aluminum can, Other Ferrous, Other aluminum |
| Organics | Yard waste-grass, Yard waste-other, wood, textiles, diapers, other organics |
| Inorganic | Electronics, carpets, drywall, other construction and demolition, other inorganic |

Source: World Bank 2002

2.3.3 Classification of waste based on physical state of waste substances

Using the physical state of waste substances, the materials in the waste stream can also be categorized into liquid, solid, gaseous and radioactive wastes. Examples of these types are shown in Table 2.4. The liquid waste include sewage sludge and waste water from bath house and kitchen while solid waste include food waste, paper, plastics, bottles, metals and debris. Waste could also be classified as gaseous which include smoke from factories, exhaust fumes and fumes from burning waste gas. Radioactive waste also includes uranium, radiation and plutonium.

Table 2.4 Classification of waste based on physical state of waste substances

| Waste type | Examples |
|-------------------|--|
| Liquid Waste | Sewage sludge, Waste water from bath house and kitchens |
| Solid Waste | Food waste paper, plastic, metal, debris |
| Gaseous Waste | Factory smoke, vehicle exhaust, smoke, fumes from burning waste gas, |
| Radioactive Waste | Radiation, uranium, plutonium, excess energy |

Source: US EPA, (2008).

2.4 Role of Agencies in Waste Management

Institutional arrangements for solid waste management(SWM) cover organizational structures and roles and responsibilities of agencies involved in various aspects of SWM, including interagency coordination, procedures and methods, capacity, and private sector involvement. Institutional arrangements also cover the laws, regulations, and policies implemented by concerned organizations to plan and manage their activities to fulfill their mandates on the management of solid waste. Ideally, institutional arrangements should be structured to promote effective, efficient, and sustainable SWM services to preserve environmental quality and protect public health. The core functions of SWM include (i) collection, (ii) transportation, (iii) disposal site operations, (iv) recycling operations, (v) public awareness, and (vi) monitoring and enforcement.

2.4.1 National Government

National government agencies, particularly departments responsible for environmental protection and health, are charged with setting environmental and public health standards for the storage, collection, disposal, and recycling of solid wastes, as well as for monitoring and enforcing these standards. In the FSM, which has a federal system of government, states are responsible for developing their own environmental and health laws. In some Pacific DMCs, particularly those with no municipal government, solid waste collection and disposal

services are provided by public works agencies (Schubeler2006).

2.4.2 Local Government

Where municipal councils exist, SWM is generally managed locally, with the councils given responsibility for providing solid waste collection and disposal services to residents. They are also mandated to enforce local bylaws to control littering and illegal dumping of wastes. Since municipal councils are responsible for providing a range of urban services, such as maintenance of public spaces, roads, and drainage, SWM can be planned as part of city- or town-wide strategies for integrated urban service delivery (Schubeler2006).

2.5 Informal Private Sector

Similar to many developing countries, the activities associated with informal waste management sector in Nigeria are scavenging of reusable and recyclable items from temporary and final disposal sites, and collection and transportation from households to communal dumps (Wilson *et al.*, 2006; Afon, 2007). Wilson *et al.* (2006) describes the sector as small-scale and labour-intensive, with low technology and pay; no documentation and largely unregulated and unregistered provision of waste management service. In addition, they do not pay taxes and are not licensed. The sector plays a significant but controversial role in the field of waste management (Elkan, 1988) as it is characterized with exploitation of participants, health and safety hazards while it serves a vital source of employment and income for the poor who have few alternatives for making a living (Nzeadibe, 2009). It is further driven by the market for recycled materials (Hayward and Gaskin, 2005; Nzeadibe, 2009). The venture is normally owned and operated by a single individual or a small group of individuals working in a loosely organized co-operative

(Abdullahiet *al.*, 2008; Wilson *et al.*, 2009).

2.5.1 Informal sector entrepreneurs

Waste management informal sector in Nigeria comprise of itinerant buyers, waste pickers/collectors, middlemen and recycling companies depending on where and how material recovery takes place (Wilson *et al.*, 2009).

2.5.1.1 Itinerant buyers

The itinerant buyers collect specific recyclable materials and/or organic wastes, door to door, from households and establishments, which they buy or barter with simple useable household items (Abdullahiet *al.*, 2008). They tend to specialise in one or two kinds of materials such as plastics and bottles with materials collected used directly, sold to middlemen and recycling industries (Wilson *et al.*, 2009). Their earnings per year is about N360, 000 (USD3058) (Wilson *et al.*, 2009), which is higher than the minimum wage of N114, 000 (USD968) per annum. Equipment's commonly used by itinerant buyers are push carts, wheel barrows and in a few cases motor vehicles (Imam *et al.*, 2008).

2.5.1.2 Scavengers

Scavengers are found among formal waste collection crew who recover materials from vehicles while transporting waste to disposal site(s) (Wilson *et al.*, 2009; Kofoworola, 2007). The most prominent ones however are those who scavenge for materials from bins, temporary and final dumpsites. Many of the informal waste collectors segregate the useful items from the waste and discard the residual waste at will. Generally, the materials collected are subjected to washing and drying and are used directly or sold for direct use while others are sold to middlemen and recycling industries for processing (Kofoworola, 2007). The venture is formed of a single individual or few individuals who earn

approximately N60, 000 (USD510) per annum (Wilson *et al.*, 2009).

2.5.1.3 Middlemen

Middlemen are usually waste dealers who buy recovered materials from scavengers at the dumpsites or in their small shops and make about N500, 000 (USD4248) per year from these proceedings (Wilson *et al.*, 2009; Kofoworola, 2007). The materials bought are further separated; sold directly to consumers or supplied to appropriate manufacturers (Kofoworola, 2007).

Policy makers and planners face a difficult dilemma due to widely differing opinions when dealing with the informal sector (Nwaka, 2005). Some stakeholders on one end of the spectrum believe the sector to be an obstacle to development of modern economy with its non-payment of tax and lack of respect for legal, social, health and quality standards (Nwaka, 2005). On the other end of the spectrum, the more realistic view adopted by more stakeholders is the sector remains a viable source of much needed income, and provides a significant service of waste collection for a significant percent of the populace and resource recovery that would otherwise be absent in the urban cities of Nigeria (Ogu, 2000; Nwaka, 2005; Nzeadibe, 2009).

The conflicting positions of stakeholder have resulted in ambivalence and hostility of waste management officials towards the sector (Nwaka, 2005) and their activities are at best ignored. A means of supporting and regulating this sector is therefore a challenge to the policy and managers (Nzeadibe, 2009).

2.5.1.4 Contractors

Typically, a private firm is awarded a contract for a specific period by the government for service delivery and is paid under terms of the contract (Cointreau-Levine, 1994). In

Kaduna presently, a number of private firms have been contracted to carry out these functions with the city zoned and allocated to each firm (Hussain, 2008).

2.5.1.5 Concession

This is usually a long-term contractual agreement where the private firm builds the facility for the service while utilizing government owned resource (such as land). Ownership of facility is transferred to the government in some cases after a specified period of private ownership and operation or remains with the private firm (Cointreau-Levine, 1994). Lagos state is in the process of finding out the viability of this type of private sector partnership for waste incineration with energy recovery with a private firm (Oresanya, 2010).

2.6 Private Sector Involvement in Solid Waste Collection

Private sector involvement in urban solid waste management was an integral part of Urban Environmental Sanitation Project (UESP) which was funded with World Bank loan. In the plans to involve the private sector, it was envisaged that in the short to medium term, LGs would provide about 60% of the basic services, with 40% being in the hands of the private sector. LGs were also required to set tariffs at realistic and economically viable levels, with due allowance for recurrent cost recovery and depreciation of capital investments, and to build private sector capacity through access to investment funds. The move from direct provision to contracting out implied that LGs had to completely re-organize, reorient their management and regulatory apparatus and strengthen their human capabilities (Awortwi, 2003), in order to facilitate, regulate, and monitor the private sector provision of solid waste management services.

2.6.1 Forms of private sector involvement in solid waste service

2.6.1.1 Emerging Private Sector Involvement and Public Private Partnership

Van Dijk (2008) defined Private Sector Involvement (PSI) as participation ranging from complete private provision of public services to complete public provision with minimal private sector activity. PSI is a generic term describing the relationship formed between the private sector and public bodies often with the aim of introducing private sector resources and/or expertise in order to help provide and deliver public sector assets and services (Schouten, 2009).

The central element in a PSI is the (often formal) arrangement or partnership that the actors conclude with one another. In a PSI the relation between the private provider and the public buyer is central, and in many cases such relationship or arrangement is shaped in the form of a contract (Van Dijk, 2008).

Public Private Partnership (PPP) can be described as a contractual relationship between public sector agency and private sector where resources and risk are shared for the purpose of delivering a public service or providing infrastructure. PPP in developing countries has been slow especially in the Sub-Saharan Africa countries, although there is increasing private sector involvement (PSI) uptake in French-Speaking Africa (Li and Akintoye, 2003). PSI can vary from the provision a service to outright ownership of facilities depending on government control and private economic scale. Li and Akintoye (2003) drawn from analysis that there are five forms of PSI: service contract, leasing, joint venture, concession and privatization.

The simplest form of PSI is service contract, and in this form of PSI, the public sector retains control over policy decisions. The strongest form is joint venture where co-responsibility, co-ownership for service delivery, shared resources and shared returns are the core of the partnership. Grant(1996) points out that the core of partnership in PSI involves shared authority and responsibility, joint investment, sharing of liability/risk taking, and mutual benefit. PPP is characterised by five features: (1) involves two or more partners, (2) each partners is principal, but in situation of power relation some partners are agent, (3) involves enduring and stable relationship among partners, (4) involves transfer of resources (money, authority, expertise) and risk, and (5) mutual sharing of responsibility for outcomes or activities and benefits (Li and Akintoye, 2003).

2.7 Rationale for Private Sector Involvement in Public Services

Economic theory suggests that when services are organized through market, competition requires numerous buyers and sellers such that no single entity can dominate. Local Governments can influence competition through regulatory, facilitative and monitoring roles. It is expected that PSIs will provide opportunities for users to participate not only in paying for the cost of service delivery, but also in decisions regarding the kind of systems, technology, and the standard and quality of services that will be delivered to them.

In theory, the involvement of the private sector in public services is to improve the performance of public services and to attract private capital for major investments (Rothenberger, Frei and Brugger, 2005). The PSI is expected to foster high efficiency, minimize cost and provide better service delivery. The rationale for introducing different inter-organizational arrangements for delivering solid waste services was to reduce cost of services. It is argued in the literature that contracting out leads to cost savings and better

value for money by removing the production of such services from inefficient public bureaucracies that are more intent on satisfying the wishes of producer groups than of consumers (Awortwi, 2004). Contracting out reduces costs in three principal ways. First, private companies are free from Civil Service requirements, they use an incentive pay system and have greater freedom to hire and fire workers and they employ part-time workers, have less absenteeism and therefore are more flexible than the public sector in reducing costs. Second, they pay lower wages than government agencies. Finally, private companies tend to pay their workers substantially lower fringe benefits (Helmsing, 2003).

There are four arguments that if services are provided by the private sector, governments will be able to: reduce subsidies and cost; reduce public borrowing by encouraging the private financing of capital expenditure on infrastructure; increase tax revenue from private operators; and reduce the public debt by selling assets (Rakodi, 2003). Furthermore, it is suggested that private provision will result in improved equity, since charging everyone for services will generate sufficient revenue to expand services to unserved residents and areas. The purpose of private sector involvement in solid waste service was to improve efficiency and effectiveness in order to protect public health. However, in developing countries, there are problems with arrangements for working towards public interest, policy objectives, transparency and coordination of public services, and how to achieve greater efficiency of PSI by contracting, monitoring and regulating. In public-private relationships, the danger is that the efficiency gains from contracting the private sector may be outweighed by the additional transaction costs of doing business between multiple actors – setting policy frameworks, coordinating, contracting and monitoring are done at a cost.

2.8 Private Sector Involvement in Solid Waste Market

The delivery of public services has traditionally been carried out by the public sector. The increasing financial burden on the local governments and the inefficiency of the public sector (government failure) in developing countries necessitate the use of markets for public service delivery. However, markets where there is perfect competition with willing buyers and sellers do not work for public services that have externalities and information asymmetry. Solid waste collection service as a public good has externalities (negative environmental impacts) if people are excluded from the service. Solid waste collection cannot be provided through the market without regulation (legislation and incentives). The private sector is involved in solid waste collection due to market and government failures. There is also non-governmental organization failure, due to the over reliance on donor support to cover investment, operation, and maintenance costs. This means that the private sector failure (inefficiency) under performance and inability to deliver the expected service quality – could occur if the needed policies, legislation, incentives, and government support are not given to it.

The extension of the market mechanisms of the New Public Management (NPM) to private sector involvement in solid waste collection services is still an emerging issue, especially in developing countries. Contracting out solid waste services to the private sector and charging for services rendered by the private sector are still faced with difficulties. Public services delivery such as water supply, sanitation and solid waste services have been failing in developing countries for a long time despite the NPM and decentralization of local service delivery to the local governments. The expected improvements in service delivery

have often not been achieved (van Dijk, 2006). Obviously, decentralization alone was not enough to bring about improvements in service delivery, and therefore private sector involvement in public service delivery was introduced. The paradigm shift from public sector delivery of public services (solid waste service delivery) in developing countries to private sector provision began in the past two decades. Governments vigorously began to promote the private sector as a provider of services to improve service efficiency¹ and effectiveness² (Roth, 1987; Cointreau-Levine and Coad, 2000; Batley and Larbi, 2004), but the needed private finance and expertise to bring about the improvement are still issues, especially in developing countries.

In developing countries, different forms of Private Sector Involvement (PSI) have been suggested for achieving greater efficiency and effectiveness, to overcome the government failures in public direct service delivery – too many workers, not enough supervisors, few incentives for better performance and limited finance (Cointreau-Levine, 2004; Cointreau-Levine and Coad, 2000; Post et al., 2003). Private Sector Involvement (PSI) in solid waste collection in developed countries emerged in the 1970s, and since then there has been increasing private sector involvement in solid waste collection service in many parts of the world (Eggerth, 2005). By 1994, there were more than 10,000 private firms engaged in urban solid waste collection service in the United States, where more than 80 percent of solid waste was collected by the private firms (Cointreau, 2004). There is now PSI in all the elements of integrated solid waste management from collection, sanitary landfilling, recycling to resource recovery in the developed countries.

Private Sector Involvement in all sectors in developing countries has been slow especially in the Sub-Saharan Africa countries, although there is increasing private sector involvement (PSI) uptake in French-Speaking Africa (Li and Akintoye, 2003). By 1989, there was private sector involvement in solid waste collection in Latin American cities (Santiago, Buenos Aires, Sao Paulo and Caracas) with populations of 3.6 to 12 million (Bar-tone, 1991). The companies in these cities operated under service contract arrangements with the municipalities. The involvement of private sector in solid waste collection in most developing countries started gaining momentum in the 1990s. The World Bank advocated Private Sector Involvement in the 1994 World Development Report.

2.9 The Prospects of Private Sector Participation in Waste Management

Solid waste management (SWM) is one of the obligatory functions of the urban local bodies in the country. The local bodies are, therefore, required to provide adequate services for the collection, transportation and disposal of waste. SWM service is highly labour intensive and on account of increased wage structure of the Government and municipal employees, this service is becoming more and more expensive. Besides, the efficiency of the labour force employed in the urban local bodies is far from satisfactory. High wage structure and inefficiency of the work force results into steep rise in the cost of service and yet the people at large are not satisfied with the level of service being provided by the urban local bodies. It is, therefore, necessary that the local bodies may seriously consider private sector participation in solid waste management. (Pongracz, Philips, and Keiski, 2004).

2.9.1 Area where privatisation can be attempted

According to (Pongracz, Philips, and Keiski, 2004) Private sector participation may be considered in newly developed areas, underserved areas and particularly in the areas where local bodies have not been providing service through their own labour force. Some of the examples of the areas where private sector participation can be considered are as under:

Door to door collection of domestic waste, door to door collection of commercial waste, door to door collection of hospital waste, hotel waste, construction waste, market waste, setting up and operation and maintenance of waste disposal facility, setting up and operation and maintenance of waste treatment plants, supplying vehicles on rent, supplying vehicles on lease, repairs and maintenance of vehicles at a private garage, transportation of waste on contractual basis, etc.

The contracts should carry a provision of penalty for failure to perform the contractual obligation. The local body while giving a contract to a private sector, voluntary organization/Non-Governmental Organisation (NGO) should make an enabling provision in the contract to inspect the performance of the private contractor from time to time and as a matter of rule should inspect the performance of the private contractors to maintain the quality of services, prevent corrupt practices and take remedial measures,. The formats should be prescribed for such inspections and results of inspections should be reported to the higher authorities at regular intervals

2.9.1.1 Waste as Wealth

It must be called to mind from initial definition of waste that wastes do not mean useless or altogether worthless substances, as waste here may become a feedstock or raw materials elsewhere.

2.9.1.2 Job Creation/Food creation

In his pursuit for agriculture, solid-economic welfare and general physical development on land space, man has so much altered nature and natural resources Odiette (1993). Vehicles for achievement of sustainable development include among others, the conservation and preservation of natural resources, effective solid waste and water (sewage) treatment and disposal, effective handling of toxic waste, forestation, landscaping, air, land, water and noise pollution control.

Recycling of scrap metals, conversion of rice husks to briquettes, and redesigns of gas burners, production of organic fertilizers through urine and faeces, with a resultant effect on food yields. Drawing experience from situation where farmers are using urine as source of manure, Sridhar called for a new philosophy of moving waste to the next level as waste prevention, collection, separation and removal. Fulani (2007), noted that Nigerians must follow strictly on what she termed the three Rs: Reuse, Recycle and reduce, for the nation to have a cleaner environment.

According to Anyaegbudike (2009), the vision we are looking for is to render a world-class waste management service, and this mission statement can be achieved through increased community participation, through motivated staff and through higher standard of service delivery for ourselves. To be able to achieve this vision, wastes should be separated into their various components right from the generation stage.

2.10 Incentives to Private Sector

(Pongracz, Philips, and Keiski, 2004) stated recorded that Solid waste management is one such an area where private sector has still not found much interest. Private sector has,

therefore, to be given some incentives by way of long term contracts, assured supply of garbage at site, lease of land at nominal lease rent, etc., for entering this field.

- Contracts may be given for doorstep collection of waste from households, shops and establishments, hotels, hospitals, for a period not less than 3 years so that the contractor may be in a position to invest money for buying equipment. The contractors will have no interest in short-term contract, as investment made may become redundant if the contract is not subsequently renewed.
- Private sector may be offered waste land at a nominal rent for not less than 15 years for setting up treatment plants such as compost plant, biomethanation plant, energy generation plant, etc. The terms for getting royalties from the private sector can be worked out by local bodies through mutual negotiations.
- If vehicles etc. are to be taken on rent or workshop facilities are to be taken from private sector, the term of contract can be for 3 to 5 years so as to enable the private sector to invest money in the procurement of vehicles and machinery.
- However, private sector participation may be encouraged in such a way that it does not affect the interest of the existing labour, it does not violate the provisions of the above law, does not exploit the private labour and yet reduce the burden of the urban local body of new establishment. This will substantially help in improving the quality of service of the urban local bodies, effect economy in expenditure and would also give a scope to private sector entering in waste management market.
- An arrangement of BOO (Build, Own and Operate), BOOT (Build, Own, Operate and Transfer) or any other arrangement which may be transparent and beneficial to local body may be made keeping in view above observations.

- There may be situations where urban local bodies may not have adequate lands for waste treatment and/or disposal or local bodies find it difficult to manage the same departmentally. In such situations they may consider private sector providing waste treatment and disposal facilities on its own land or on municipal land and local body may pay tipping fees for the treatment and disposal of their garbage by private entrepreneur. However, cost benefit analysis should be carefully carried out by the local body while agreeing to such an agreement.

CHAPTER THREE

STUDY AREA AND METHODOLOGY

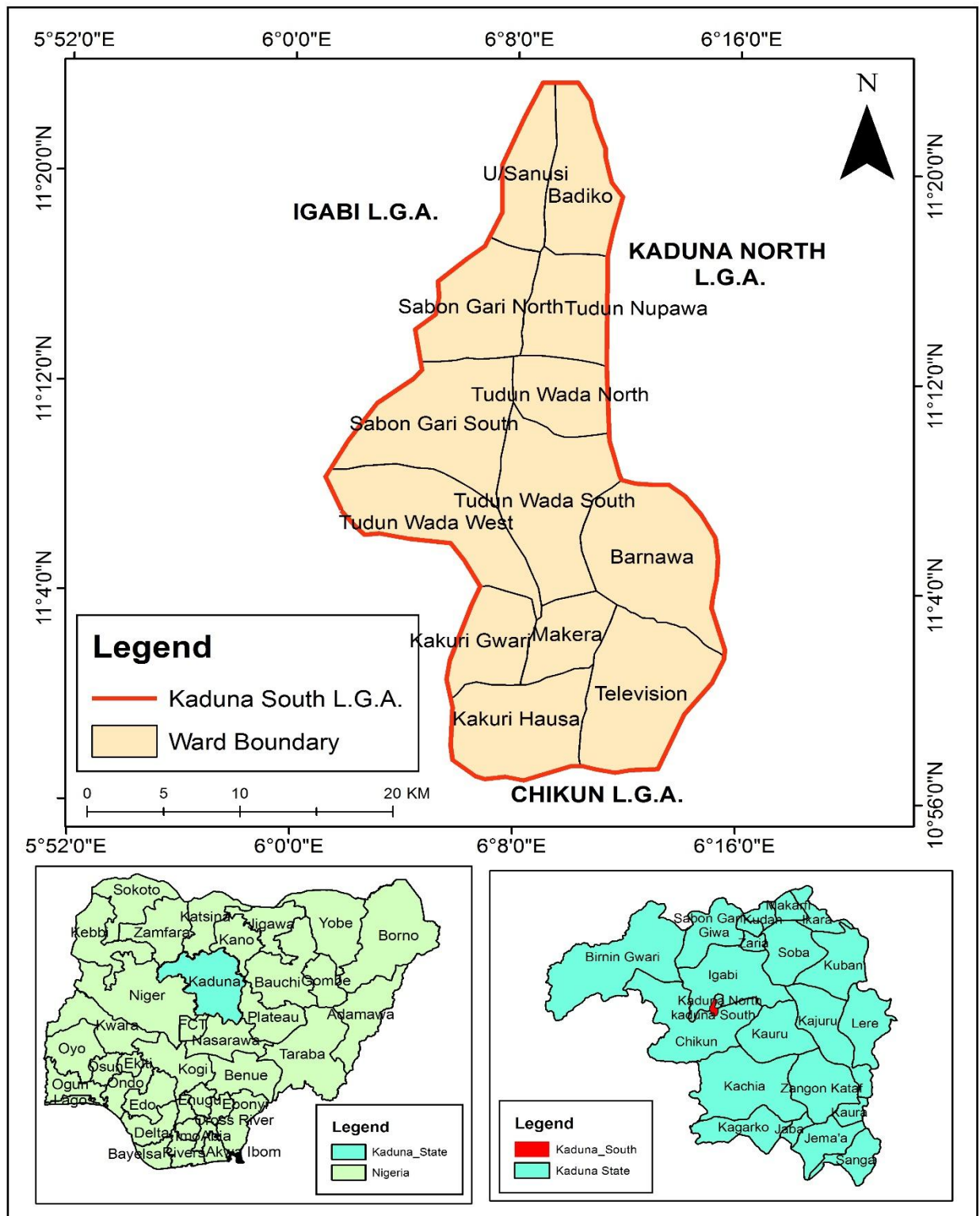
3.1 Introduction

This section provides the background information of the study area to facilitate discussion of results and these include; the location, climate, geology and drainage, soils and vegetation, people and occupation. In addition, the methodology employed to answer the research questions of this study in the study area such as reconnaissance survey, the type and sources of data, sampling design and sampling techniques, instruments of data collection, validity and reliability of the instruments and data analysis in Kaduna South Local Government Area, Kaduna State were discussed.

3.2 Location

Kaduna South Local Government Area (LGA) is one of the 23 LGA's of Kaduna state. It is surrounded by Kaduna North LGA to the north, Igabi LGA to the west and ChikunLGA to the south and east. It is located approximately between lat $10^{\circ}34' 0''\text{N}$ - $10^{\circ}26' 0''\text{N}$ and long $7^{\circ} 24' 40''\text{E}$ - $7^{\circ} 30' 0''\text{E}$.as shown in Fig.3. 2. Kaduna. South is about 912 Km from Lagos, about 390 Km from Nigeria's northern border and 180 Km from Abuja the country's capital city. It covers roughly over 35Km. the study area comprises of Barnawa, Kakuri, Television, TudunNupawa, UngSanusi,Badikko, SabonGari, Makera, and Tudun Wada area found in Kaduna south LGA of Kaduna state.

Fig. 3.1 Nigeria showing Kaduna state and Kaduna State showing study area



Source: Administrative Map

3.3Physical Setting

3.3.1 Climate

The climate of Kaduna metropolis is the same as obtained in the whole Kaduna state. The dry season last from November to March (5 Months). The cold-dry season accompany with dust laden harmattan wind blows from the north-east during this period. The rainy season lasts from April to October, (about 7 months) with the peak in July/August. The average annual rainfall is about 60.0mm. NEST, 1991 in Ali (2004).

The rainy season is much longer in Kaduna as much longer in Kaduna as compared to the extreme northern states due to their nearness to Saharan desert neighboring countries. Temperatures are high throughout the year with the highest in March/April (about 38:60C) the lowest temperature is in January (about 20.20C). Relative humidity in the dry season is below 10% in the afternoon and 30% at dawn. During the rainy season, the relative humidity can be over 70% in midday and 95% at dawn NEST, 1991 in Ali (2004).

3.3.2 Vegetation

The vegetation is of the guinea savanna type with tall grass, scattered trees and gallery forests along river courses. Example of trees found in shea butter *Butyrapenniuparkii*, tamarind, *tamarindusindica* (Ali, 2004) activities of man have greatly affected the vegetation of Kaduna city. These activities include bush burning, cultivation, grazing fuel, wood cutting, urbanization and industrial activities. Vegetation communities are associated with distinct ecological sites with particular regard to the nature of the soils.

3.3.3 Geology and Relief

Kaduna lies within the northern Nigeria Basement complex rocks which were ‘emplaced’ during the ‘Erbuniun to Pan African Orogenic cycle about 1900 +250-550 years’. The rock is constituted of granite, gneiss, migmatite gneiss complex, schists are also sound (Geological survey, 1988, in Ali, 2004).

The Kaduna rocks are made up of granite referred to as older granites. Quartz and dolerite are further classified under igneous rocks while migmatite gneiss complex are grouped under metamorphic rocks. The quartz occurs as veins while dolerite occurs as dikes trending in a north-south fashion (Geological survey, 1988 in Ali, 2004).

Sedimentary rocks occur as loose sediments or superficial deposits of clay, laterite and alluvium restricted within flood plains or stream courses. These units of formation were deposited in recent times as a result the decomposition of the parent rock material.

Furthermore, these units are widespread within Kaduna metropolis especially laterite and it forms the top soil useful for agricultural purposes (Federal Geological Survey, 1988 in Ali, 2004).

The structures sound associated with these rocks are faults, lineation, foliation and numerous structures left as relics of metamorphism. The faults were observed to follow a NE-SSW trend as well as lineation. These suggest that the fault plane may be ascribed to the weak failed arm of the ‘RRR – triple junction rifting of the cretaceous times’ (Federal Geological Survey, 1988 in Ali, 2004). The southern parts of Kaduna metropolis is occupied by much of the ferruginous soils. These soils are deeply weathered and are usually reddish in color. They contain a lot of stones. The soil of southern parts of Kaduna

metropolis falls into the following Categories for the USDA soils taxonomy classification system of Kaduna state: (i) Afisols (ii) Utisols (iii) Entisoliv and (iv)Inceptols (Keay, 1959 in Ali, 2004)

3.3.4 Drainage

The entire Kaduna metropolis is drain by River Kaduna with its source from the highlands of Jos Plateau. The River Kaduna takes the form of the NNE-SSW trend of the major fault plan, while numerous subsequent streams takes the form of the basement fractures. It is thus believed that the river may be associated with one of the tectonic episodes (Federal Geological Survey, 1988, in Ali 2004). Other river that flows into River Kaduna in the study area are River Barnawa-Narayi, River Kakuri, River Makeraand River RafinMallam. (Ali, 2004).

3.4 Human Setting

3.4.1 People and culture

The Kaduna south local government area comprises of 12 wards. These include TudunNupawa, Tudun Wada North, Tudun Wada South, SabonGari North, SabonGariSouth, SabonGari West, Barnawa, Kakuri, Gwari, Kakuri Hausa, Television, UngwanSanusi, Badiko.

The Kaduna south Local government area with its headquartering at Makera has the advantage of not being inhabited by any of the major ethnic groups. Available evidence shows that, the town is inhabited by over 200 different ethnic groups, the inhabitants are a mix grill with Hausa, Yoruba, Igbo, Fulani, Gwari, Ikulu, Kadara, Bajju, Jaba, Iibio, Ijaw, Angas, Baron, Tiv, Idoma, Igala, and host other ethnic groups.

All settled as a result of administrative, industrial and extensive trading activities. Virtually, all ethnic groups in Nigeria can be found here. Christianity and Islam are the major religious groups in the town. The third important group is the traditional religion. This group has however, continued to suffer a major depletion in the number of its adherents since the advent of Christianity. Hausa language is the dominant indigenous medium of communication after English which is official lingua franca of the country.

According to 2006 census, the Kaduna South local government area has a total population of about 402,390. This is attributable to a relatively high and stable birth rate combined with a steady decreasing death rate. In addition, rural-urban migration is, increasingly playing a significant part in the overall growth of the population. There is a continuous influx of young school leavers into the town to look for jobs. The concentration of federal and state institutions in Kaduna has created government employment opportunities in Kaduna which act as magnets attracting people from far and near. As people move in many located near their next of kin giving leverage for its growth and continued prominence (Mamman, 1992 in Ali, 2004).

Trading in items such as leather products, wood carvings, kitchen utensils, household electronics hand woven cloths, ceramics, foodstuffs, vegetables and fruits to high quality textile materials became their occupation. Others who were professionals such as tailors, carpenters, bricklayers and barbers also came to offer their services to the people. They came from all tribes and tongues and they include the Ibos, Yoruba's, Nupes and Hausas who took advantages of the market provided by the large government staff, railway workers, military men and commercial staff of the trading companies. In the early years, government also gave numerous incentives to encourage immigrants into Kaduna in

attempt to secure enough labour to clear the surrounding bush and thereby free it from mosquitoes, tsetse fly and other dangerous creeping reptiles (Maman, 1992 in Ali 2004).

Two types of families can be distinguished in Kaduna south. These are the nuclear and the extended families. The nuclear family is based on the husband-wife or wives and their children. The extended family, in contrast, consists of two or more nuclear families joined through an extension of the parent-child relationship rather than the husband-wife relationship. An example of such married sons, their wives and the children of the later.

These three generations live under the same roof or in a cluster of adjacent buildings. Marriage is very prevalent among Nigerian adults of all ethnic groups. These types of marriages exist in the Southern part of Kaduna metropolis just as in other towns in Nigeria. The religious (Christian/Muslim) marriages which normally take place in the church or mosques civil marriages and traditional marriages. In this society, marriage is generally universal (Ali, 2004).

3.4.2 Economy of Kaduna South LGA

The activities in the Kaduna South Local Government Area reflect the commercial, service, administrative, industrial transport and professional needs of the state and northern Nigeria. The 1956 capital territory law created the limits of the present day city of Kaduna and set in motion, the rapid and dynamic physical, economic and social transformation of the town. This led to the establishment of modern infrastructural facilities such as electric power supply, pipe borne water, good roads, several banks telephone services and an international airport. These modern infrastructure were the backbone of the establishment of at least seven textiles mills, breweries, bottling companies, flour mills and a motor assembly plant

just, to mention a few. Motor assembly plant just, to mention a few. These are attracting many, especially the youth, to seek employment and share in the economic development of the town (Ali, 2004).

The Kaduna south local government area has achieved development; acquired more structures particularly manufacturing and industrial complexes that have today dominated the large industrial estates of Kakuri, Makera, Nasarawa, Ungwan Romi, and more recently Kudenda. These actions have encouraged the constant transformation of the existing levels of commerce and trade, social services, utilities and facilities and brought about the mixing that followed the choice of residential area. The combination of these gave some kind of initial impetus of status, class religion, ethnicity and development status of the town (Ali, 2004).

As a result of its position (industrial) and fast rate of economic growth, Kaduna South local government area became attractive to both national and international business men and industrialists. The area witnessed a boom in population and commercial activities leading to the creation of new wards such as Kakuri Kansa, Kakuri Makera, Kakuri Gwari, Sabongari north, Sabongari south, Tudun Wada north and Tudun Wada south. The railway serves as a vehicle for economic and commercial tool. The railway lines from the East and West meet here. Hence, the name Kaduna Junction, the railway became most important as the surrounding rural population could not produce the food required to sustain the increase in influx. Therefore, the railway became an important mode of transporting food, industrial and agricultural products both into and out of Kaduna to the coast (Ali, 2004).

3.4.3 Land use Pattern in Kaduna South LGA

Residential land uses occupy the largest amount of space (4,036.6 hectares) of land. This consists of 1,392.4, 579.4 and 1353.0 of low, medium and high residential density neighborhoods respectively. The residential areas in the Kaduna South Local Government Area have a unique and distinct spatial neighborhood pattern. The neighborhoods are broadly recognized as Sabon Gari, Government Residential Area (GRA), Tudun Nupawa, Tudunwada, Kabala, Barnawa, Narayi, Ungwan Sunday, television, Kakuri and Nasarawa neighborhoods. The GRA is a low 2-5 houses per hectare neighborhoods which was formerly exclusively reserved for the Europeans, the neighborhoods of Sabon Gari, Barnawa and Tudun Wada Manifest patterns of carefully planned and developed neighborhoods without any traditional village core. The other neighborhoods manifest a traditional village high, density house structure. The roads and agricultural land uses cut across all categories of slopes.

However, agricultural use is least in the southern part of Kaduna metropolis because the area is designed for industries and its associated road linkages. Gullies pose the greatest threat to the survival of the building and currently, the most active in the areas where ground has been severely seared.

3.5 Methodology

3.5.1 Design of the Study

3.5.2 Reconnaissance Survey

A reconnaissance survey was carried out to enable the researcher get acquainted with the study area and to help in the determination of appropriate sampling technique.

3.5.3 Types of Data

The types of data required for this research include:

- i. Socio-economic characteristics of the respondents such as sex, age, marital status, household size, level of education, income and occupation.
- ii. Types of domestic solid wastes generated in the study area.
- iii. Frequency of waste collection by private Managers.
- iv. Waste management methods and frequency of disposal in the study area.
- v. Domestic solid waste management strategies available in the study area.

3.5.4 Sources of Data

The two principal sources of data was adopted for this work are primary and secondary sources of data.

3.5.4.1 Primary Sources

These include questionnaire administration to both the residents and the firms involved in the management of waste in the study area. The questionnaire was structured such that it can capture such details as the conventional method of waste management which includes: collection, transportation, processing, treatment, recycling or disposal of waste materials to reduce their adverse effect on humans' health or amenities(Mary and Barbara, 2005). In addition, the head of the various private firms was interviewed to affirm the responses from their employee.

3.5.4.2 Secondary sources

This include data from existing literatures, published and unpublished works, generated from materials, internet based documents, journals, text books and articles. Others include thesis and dissertations.

3.5.5 Sample Size and Sample Techniques

According to data gotten from Nigerian National Population Commission NPC 1991 the population of the study area amounted to 391,575 but when the population is projected using Population Projection Formula which is $P_0 = P_1 (1 + r)^n$

Where P_0 = Projected population; P_1 = Initial Population, r = Growth rate at (3.5%)

$$P_0 = 391575 (1 + 3.5\%)^{24}$$

$$P_0 = 391575 (1 + \underline{3.5})^{24}$$

100

$$P_0 = 391575 (1 + 0.035)^{24}$$

$$P_0 = 391575 (1.035)^{24}$$

$$P_0 = 391575 (1.3629)$$

$$P_0 = 894,083 \text{ projected to 2015}$$

Based on the projected population of 2015 which amounted to 894,083, Krejcie and Morgan's (1970) table for determining sample size for a given population was used since the projected population amounted to about 894,083 people. The appropriate total sample size of 381 and Purposive sampling technique was adopted for the purpose of this study. The study area comprises of twelve (12) wards under the local Government Area which is shown in the Table 3.1

Table 3.1:Twelve (12) wards in Kaduna South Local Government are of Kaduna State

| S/no | Wards | NPC 1991 | Projected to 2015 |
|-------------|-----------------|-----------------|--------------------------|
| i. | Ungwansanusi | 21265 | 48555 |
| ii. | Badikko | 28971 | 66150 |
| iii. | TudunNupawa | 22311 | 50943 |
| iv. | SabonGari North | 20135 | 45975 |
| v. | SabonGari South | 39921 | 91153 |
| vi. | SabonGari West | 26984 | 61613 |
| vii. | Tudunwada North | 24540 | 56033 |
| viii. | Tudunwada South | 54188 | 123732 |
| ix. | KakuriGwari | 23685 | 54081 |
| x. | Kakuri Hausa | 49323 | 112621 |
| xi. | Barnawa | 42113 | 96158 |
| xii. | Television | 38139 | 87084 |
| | Total | 391575 | 894094 |

Source: Adapted From National Population Commission 1991

The sample size of the study area according to wards would be determine using Bowley (1924) formula which is $\frac{nh}{N} = ni$

Where N= population; n= sample size; h= group population and ni= individual Wards

The sample size of the wards can be shown in the table below:

Table 3.2:Sample Size of Population of the twelve Wards In Kaduna South Local Government

| s/no | Wards | Sample size |
|--------------|-----------------|--------------------|
| i. | Ungwansanusi | 21 |
| ii. | Badikko | 28 |
| iii. | Tudunnupawa | 22 |
| iv. | SabonGari North | 20 |
| v. | SabonGari South | 39 |
| vi. | SabonGari West | 26 |
| vii. | Tudunwada North | 24 |
| viii. | Tudunwada South | 53 |
| ix. | KakuriGwari | 23 |
| x. | Kakuri Hausa | 48 |
| xi. | Barnawa | 41 |
| xii. | Television | 37 |
| | Total | 381 |

Source: Adapted National Population Commission 1991

3.5.6 Method of Data Analysis

The data obtained from the respondents were analyzed to achieve the stated objectives which are to;

- i. *examine the characteristics and volume of waste generated in the study area:* According to (Chandrappa and Das, 2012) .Compilation and comparison of solid waste generation in cities of various countries showed that waste is generated at an average rate of 0.4-0.6 kg/cap/day in low income countries, as compared to 1.1-5.0 kg/cap/day in high income countries . In order to achieve this objective, demographic and socio-economic Characteristics of the Respondents such as income were used to establish the volume of waste generated in the study area. Results obtained were presented and explained using a bar graph and a frequency table.
- ii. *evaluate the agencies involved in the management of solid waste in the study area:* In order to achieve this objective, the data to achieve this objective are gotten through personal interviews and the administration of questionnaires to heads of households while the results obtained are presented and explained using a bar graph and a frequency Table.
- iii. *examine the level of involvement of private sectors in the management of solid waste in the study area:* According to Khajuria, Yamatoto and Morioka (2010), the private sector helps with investment, technology and Vehicles in the collection of waste in cities. In order to achieve this objective, data based on Khauriaetal.(2000).Systematic random sampling technique was used to select the private firms. The private firms are arranged alphabetical as shown in the Table 3.3 and the first was picked and the second missed.

Table 3.3 Private Firms Existing in the Study Area.

| S/N0 | Name of Private Sector | Area of coverage |
|-------------|-------------------------------|---|
| 1 | A.U Abdulahi& sons | KurminMashi/ New extension |
| 2 | AJNU Ventures | Major road (Nigerian Teachers Institute to Command Junction Ali Akilu Rd) |
| 3 | BeedeeMultilinks Ltd | Kudenda Settlement and Industrial area |
| 4 | Epitome Int'l Nig. Ltd | Narayi village Bayan Dutse settlement and Narayi High Cost |
| 5 | F & J Envir. Nig. Ltd | UngwanSanusi, Badikko Govt. House area |
| 6 | Finix- Nuh Ventures | Barnawa High Density GRA |
| 7 | Global Green Eni. | Tudumn Wada II |
| 8 | Guda Vision & Associates Ltd | BakinRuwa Junction to Kabala west |
| 9 | Kuhiya Nig. Ltd | Television, Ung. Kadra, and UngKaje |
| 10 | Lemo Global Enterprise | Panteka road and all streets on both sides around TudunNupawa |
| 11 | M.G Nig. Ltd | UngwanRomi GRA and SuramiOhinoyi Sultan Road settlement |
| 12 | Magna Engr. Ltd | Nassarawa and Trikaniya settlement |
| 13 | Mamia Nig. Ltd | UngRomi, Ung. Kudu settlement |
| 14 | Musfat Int'l Service | Tudunwada I, Tudunnupawa |
| 15 | NCHAS Nig. Ltd | Makera,Kakuri settlement and Kakuri GRA |
| 16 | Shas Guard Nig. Ltd | Federal Government Collegge Area from Danisa clinic |
| 17 | Sleeve Logistics | UngwanRomi settlement, Romi New Extn. Gbagyi Village settlement |
| 18 | Syalengr Ltd | Kabala west and UngwanMuazu settlement |
| 19 | West- Track Global | Shehulaminu from Independence way junctn. To UngwanRimi Total including Mafara Estate |

Source: Adapted from Kaduna Environmental Protection Agencies (KEPA)

When this was done the private firms to be sampled are:

Table 3.4: Sampled Private Firm

| S/No | Name of private Firm | Area of coverage by Private Firms |
|-------------|-----------------------------|--|
| 1 | A.U Abdulahi& sons | Kurminmashi/ New extension |
| 2 | BeedeeMultilinks Ltd | Kudenda Settlement and Industrial area |
| 3 | F & J Envir. Nig. Ltd | UngwanSanusi, Badikko Govt. House area |
| 4 | Global Green Eni. | Tudun Wada II settlement |
| 5 | Kuhiya Nig. Ltd | Television, Ung. Kadra, and Ung.Kaje |
| 6 | M.G Nig. Ltd | UngwanRomi GRA and SuramiOhinoyi Sultan Road settlement |
| 7 | Mamia Nig. Ltd | UngwanRomi, Ungwan Kudu settlement |
| 8 | NCHAS Nig. Ltd | Makera,Kakuri settlement and Kakuri GRA |
| 9 | Sleeve Logistics | UngwanRomi settlement, Romi New Extn. Gbagyi Village settlement |
| 10 | West- Track Global | Shehulaminu from Independence way junction. To UngwaRimi Total including Mafara Estate |

Source: Adapted from Kaduna Environmental Protection Agencies (KEPA)

A well-structured questionnaire, subjected to analysis, was administered to the head of the firm and another to the workers making it two (2) questionnaireper firm and a total of 20 wereadministered. The results are presented in bar graphs and frequency table.

- iv. *examine the prospects and challenges of private sector involvement in solid waste management in the study area* : Questionnaire administration was carried out to operators and household to establish the prospects, as well as the challenges been experienced in the management of waste. Data obtained were will be analyzed using descriptive statistics and frequency table.

Test of hypothesis

SPSS was used; Spearman’s correlationstatistics was used to test both H01 and H02

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This section provides a summary of the results obtained from the administration of questionnaires in order to analyze the domestic solid waste management strategies in the study area. It includes a summary of the demographic and socio economic characteristics of the respondents, types of domestic solid wastes generated in the study area, domestic solid waste management strategies employed in the study area, and what private companies that participate in domestic solid waste management in the study area.

4.2 Demographic and Socio Economic Characteristics of Respondents

4.2.1 Sex Distribution of the respondents

The data obtained from the field shows that 55% of the respondents are male and 45% female as shown in Table 4.1 This pattern could be traced in part to the social and religious factor as a result of less dominant role performed by women especially in Northern Nigeria which coincides with the study Area of this research work. According to Jiggins (1994) women's perspectives and values for the environment are somewhat different than men's. Women give greater priority to protection of and improving the capacity of nature.

4.2.1 Sex Distribution of the respondents

Table 4.1 Sex Distribution of the respondents

| Area | Ugwan Sanusi | Badiko | TudunNupawa | SabonGari North | Sabongari South | SabonGari West | Tudunwada north | Tudunwada South | KakuriGwari | Kakuri Hausa | Barnawa | Tel |
|---------------|-----------------|--------|-------------|--------------------|--------------------|-------------------|--------------------|--------------------|-------------|-----------------|---------|-----|
| Male | 15 | 21 | 19 | 16 | 20 | 17 | 19 | 35 | 20 | 33 | 31 | |
| Female | 6 | 7 | 3 | 4 | 19 | 9 | 5 | 18 | 3 | 15 | 10 | |
| Total | 21 | 28 | 22 | 20 | 39 | 26 | 24 | 53 | 23 | 48 | 41 | |

Source: Field Survey, 2016.

In addition, Akwa (2009) noted that women are generally responsible for human waste disposal of children and cleanliness of latrines and other facilities. Men, on the other hand, tend only to handle waste when they are paid for it, or when it is specific to their activities

Yakubu, Okafor and Abu (1999)

4.2.2 Marital status

Table 4.2.2 shows the marital status of the respondents 32% are single, 48%, 7%, 10%, 3% are married, widows, divorced and separated respectively as seen in the table below:

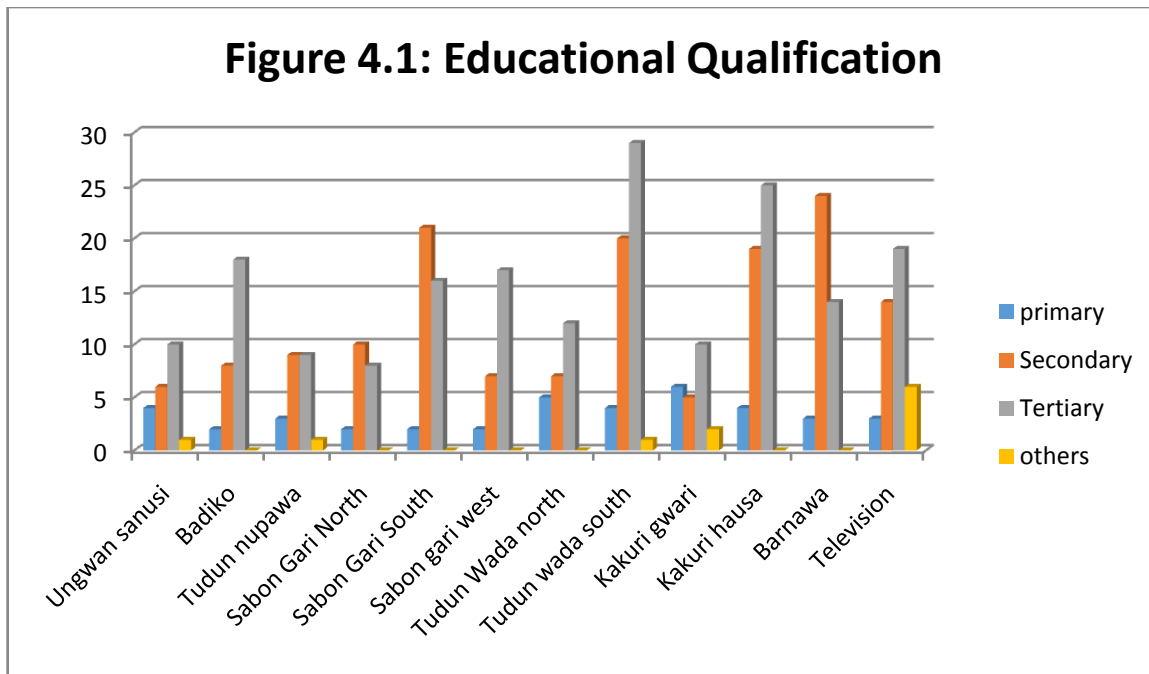
Table 4.2 Marital Status of Respondents

| Area | Single | Married | Widows | Divorced | Separated | Total |
|---------------------|--------|---------|--------|----------|-----------|-------|
| UngwanSanu si | 6 | 9 | 3 | 2 | 1 | 21 |
| Badikko | 8 | 11 | 6 | 3 | 0 | 28 |
| TudunNupa wa | 9 | 6 | 4 | 2 | 1 | 22 |
| SabonGari North | 6 | 7 | 0 | 3 | 1 | 20 |
| SabonGari South | 13 | 18 | 6 | 2 | 0 | 39 |
| SabonGari West | 9 | 15 | 1 | 3 | 1 | 26 |
| Tudun Wada North | 7 | 13 | 1 | 2 | 1 | 24 |
| TudunWada South | 13 | 33 | 0 | 5 | 3 | 53 |
| KakuriGwari | 7 | 10 | 2 | 3 | 1 | 23 |
| KakuriHausa | 17 | 24 | 2 | 5 | 0 | 48 |
| Barnawa | 15 | 18 | 3 | 3 | 2 | 41 |
| Television | 10 | 17 | 0 | 2 | 0 | 37 |
| Total | 121 | 181 | 28 | 39 | 12 | 381 |
| Percentage (%) | 32 | 48 | 7 | 10 | 3 | 100 |

Source: Field survey 2016

4.2.3 Educational qualification

The data on the educational qualification as presented in table 4.2.3 shows that the respondents who have attained primary education constitute 10% while the respondents who attained secondary education are 39% and tertiary education constitute 49%.while others constitute 2% that is Quaranic education.



Source: Field survey 2016.

From the information above 49% of the respondent tertiary education, 39% went to a secondary education and 10% primary education. This shows that the level of literacy in the study area is high, due to the concentration of institutions and the migration of educated people in search of employment opportunities and this could have a positive impact on their perception of waste and its management.

4.2.4 Occupational Distribution of the Respondents

Table 4.3 Occupational Distribution

| Area | Trading | Artesian | c/servant | Businessmen | Farmers | Total |
|--------------|---------|----------|-----------|-------------|---------|-------|
| UngwanSanusi | 4 | 2 | 9 | 5 | 1 | 21 |
| Badikko | 2 | 1 | 11 | 6 | 8 | 28 |
| TudunNupawa | 3 | 0 | 14 | 3 | 2 | 22 |
| SabonGari | 4 | 0 | 9 | 3 | 4 | 20 |
| North | | | | | | |
| SabonGari | 3 | 0 | 19 | 10 | 7 | 39 |
| South | | | | | | |
| SabonGari | 2 | 1 | 9 | 7 | 6 | 26 |
| West | | | | | | |
| Tudun Wada | 3 | 1 | 9 | 7 | 4 | 24 |
| North | | | | | | |
| Tudun Wada | 6 | 4 | 25 | 10 | 8 | 53 |
| South | | | | | | |
| KakuriGwari | 3 | 2 | 10 | 5 | 3 | 23 |
| Kakuri Hausa | 2 | 3 | 18 | 9 | 16 | 48 |
| Barnawa | 4 | 5 | 20 | 7 | 5 | 41 |
| Television | 2 | 0 | 15 | 12 | 8 | 37 |
| Total | 38 | 20 | 168 | 84 | 72 | 381 |
| Percentage | 10 | 5 | 44 | 22 | 19 | 100 |
| (%) | | | | | | |

Source: Field survey 2016.

The Table 4.2.2, about 10% of the respondents are Traders, 5%, 44%,22% and 19% of the respondents are artesian, civil servants, business men and farmers respectively This shows that majority of the respondents are civil servants with 44% and artesian as the least with 10%.This shows that they are engaged in one form of activity or the other that could generate waste.

4.2.5 Income Level of the Respondents

The level of income an individual earns could greatly influence the amount of waste generated. Thus, the information on the respondent's monthly income showed that about 16% of the respondents earn less than ₦10,000, 24% earn about ₦ 11,000 – ₦ 30,000 while 47% earn about ₦ 31,000 – ₦ 50,000 and 13% earn ₦ 50,000. The income level shows that the highest respondent is 47% which is ₦31,000 – ₦50,000 and therefore have the capacity

to generate domestic solid waste this is also in agreement with the work of Adedibu and Okekunle (1989) personal income influences waste generation due to its impact on individual consumption pattern. In addition, the rate of solid waste generation per capital increase as the standards of living improves (UNCHS, 1992).

Table 4.4 Income Level of the Respondents

| Area | □ ₦10000 | ₦11000-₦30000 | ₦31000-₦50000 | □ ₦50000 | Total |
|------------------|----------|---------------|---------------|----------|-------|
| UngwanSanusi | 5 | 4 | 10 | 2 | 21 |
| Badikko | 7 | 7 | 13 | 1 | 28 |
| TudunNupawa | 8 | 5 | 9 | 0 | 22 |
| SabonGari North | 6 | 4 | 8 | 2 | 20 |
| SabonGari South | 2 | 13 | 15 | 9 | 39 |
| SabonGari West | 3 | 8 | 10 | 5 | 26 |
| Tudun Wada North | 8 | 5 | 9 | 2 | 24 |
| Tudun Wada South | 6 | 8 | 35 | 4 | 53 |
| KakuriGwari | 6 | 2 | 13 | 2 | 23 |
| Kakuri Hausa | 4 | 15 | 19 | 10 | 48 |
| Barnawa | 3 | 11 | 21 | 6 | 41 |
| Television | 3 | 9 | 19 | 6 | 37 |
| Total | 61 | 91 | 181 | 49 | 381 |
| Percentage (%) | 16 | 24 | 47 | 13 | 100 |

Source: Field Survey (2016).

4.3 Characteristics and Volume of Domestic Waste Generated

In order to achieve the first objective of the study, the responses of the respondents on the Characteristics and volume of domestic solid waste generated in the study area was used

and presented in the Table 4.6, 33% of the domestic solid waste generated in the study are plastic while 25%, 14%, 9% and 19% are paper, Organic, Metal and Textile respectively, which shows that the waste is mostly no-biodegradable waste.

Table 4.5 Types of Waste Generated in the Study Area

| Area | Paper | Organic | Plastic | Metal | Textile | Total |
|------------------|-------|---------|---------|-------|---------|-------|
| UngwanSanusi | 6 | 3 | 6 | 2 | 4 | 21 |
| Badikko | 7 | 5 | 7 | 3 | 6 | 28 |
| TudunNupawa | 8 | 3 | 5 | 3 | 3 | 22 |
| SabonGari North | 5 | 4 | 6 | 2 | 3 | 20 |
| SabonGari South | 7 | 6 | 14 | 3 | 9 | 39 |
| SabonGari West | 5 | 5 | 9 | 2 | 5 | 26 |
| Tudun Wada North | 6 | 4 | 7 | 3 | 4 | 24 |
| Tudun Wada South | 13 | 5 | 22 | 5 | 8 | 53 |
| KakuriGwari | 6 | 3 | 8 | 2 | 4 | 23 |
| Kakuri Hausa | 11 | 6 | 17 | 4 | 10 | 48 |
| Barnawa | 12 | 4 | 13 | 3 | 9 | 41 |
| Television | 10 | 5 | 13 | 2 | 7 | 37 |
| Total | 96 | 52 | 127 | 34 | 72 | 381 |
| Percentage % | 25 | 14 | 33 | 9 | 19 | 100 |

Source: Field Survey, 2016.

Afangideh, Kinuagbeye and Atu (2012), in the same vein reported that majority of the wastes generated in Calabar are biodegradable waste compared to non-biodegradable waste which when decomposed can be harmful to human health. Ramachandra and Bachanda (2007) also reported that typically because of the low income in developing countries the waste is usually characterized by no-biodegradable waste mainly from households.

4.3.2 Frequency of Waste Generation and Disposal in the Study Area.

Table 4.7 shows that 70% of the respondents generate waste daily, while 11% of the respondents dispose their wastes daily; about 21% of the respondents generate their wastes twice a week, while about 30% of the respondents dispose their wastes twice a week; about

about 62% of the respondents generate their wastes once a week and 13% dispose their wastes once a week. This implies that the rate of waste generation is greater than the rate of waste disposal. It also shows that the residents of the study area are faced with the challenges of domestic solid waste management.

This affirms the claim of Filani and Abumere, (1986) and Faniran, (1994). reputed that the search for the appropriate management techniques has not been easily adopted like the shifting of the managing authority from the state to the local government, to independent management boards and then back to the state (Odewumi, 2002). This further buttresses the claim of Akinsulire (2005) who observed that recent events in major cities in African countries have shown that the problems of waste management have become a monster that has thwarted most efforts made by international, federal and state governments, as well as city authorities and professionals alike.

Table 4.6 Frequency of Waste Generation and Disposal

| Area | Daily | | Twice a week | | Weekly | | Once in two weeks | |
|--------------|------------|----------|--------------|----------|------------|----------|-------------------|----------|
| | Generation | Disposal | Generation | Disposal | Generation | Disposal | Generation | Disposal |
| UngwanSanusi | 18 | 3 | 5 | 8 | 19 | 3 | 0 | 0 |
| Badikko | 25 | 4 | 6 | 6 | 22 | 2 | 0 | 0 |

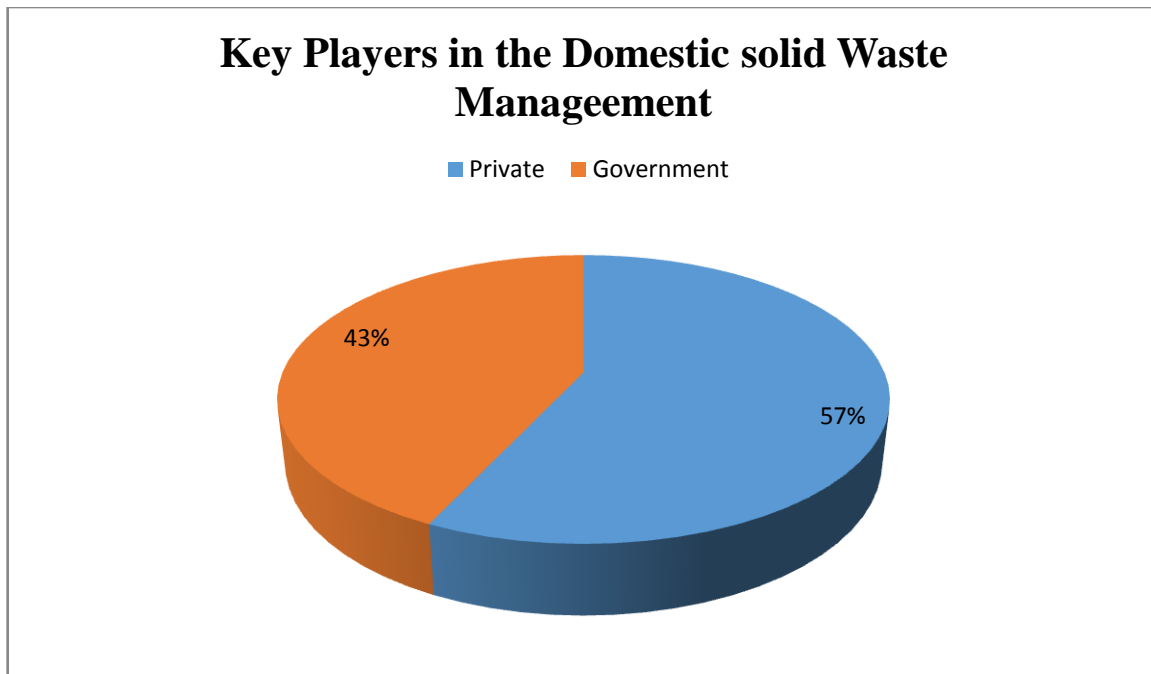
| | | | | | | | | |
|------------------|-----|----|----|-----|-----|----|---|---|
| TudunNupawa | 16 | 3 | 7 | 9 | 15 | 4 | 1 | 0 |
| SabonGari North | 15 | 4 | 5 | 8 | 16 | 2 | 0 | 1 |
| SabonGari South | 23 | 13 | 6 | 6 | 19 | 5 | 0 | 0 |
| SabonGari West | 19 | 4 | 7 | 8 | 18 | 3 | 0 | 0 |
| Tudun Wada North | 14 | 4 | 5 | 9 | 15 | 7 | 2 | 0 |
| Tudun Wada South | 40 | 5 | 10 | 10 | 33 | 3 | 0 | 0 |
| KakuriGwari | 15 | 3 | 6 | 9 | 16 | 4 | 0 | 0 |
| Kakuri Hausa | 19 | 4 | 7 | 11 | 22 | 6 | 1 | 0 |
| Barnawa | 26 | 3 | 9 | 10 | 23 | 6 | 1 | 0 |
| Television | 22 | 4 | 6 | 9 | 19 | 5 | 0 | 1 |
| Total | 252 | 42 | 80 | 103 | 237 | 50 | 5 | 2 |
| Percentage (%) | 70 | 11 | 21 | 30 | 62 | 13 | 1 | 0 |

Source: Field Survey, 2016.

4.4 Assessment of the Agencies Involved in the Management of Domestic Solid Waste

The responses obtained from the assessment of the agencies involved in the management of domestic solid waste in the study area are tabulated as shown in figure 4.8 About, 57% of the respondents agreed that private firms are the major players in the management of domestic waste in the study area, 43% of the respondents were of the opinion that different levels of government the key players in the management of domestic solid waste.

Figure 4.2: Key Players in the Domestic Solid Waste Management.



4.4.2 Effectiveness of domestic solid waste in the management

Figure 4.2 shows the evaluation of the domestic solid waste management in the study area indicated that 54% of the respondents claimed that waste management is not effectively tackled in the study area, 36% of the respondents agreed otherwise that domestic waste is being properly handled while only 10% are of the opinion that the domestic waste are handled very effective. This evaluation shows that a sharp decline is being experienced in the proper handling of domestic waste in the study area, this claim corresponds with the findings of Omran *et al*, (2007), Efe (2010) and Mudiare (2015), which shows that much attention has not been given to the management of waste in Nigerian cities.

Table 4.7 Effectiveness in Tackling Domestic Solid waste in the study Area

| Area | Very Effective | Not Effective | Effective |
|------|----------------|---------------|-----------|
|------|----------------|---------------|-----------|

| | Freque ncy | Percent age (%) | Frequen cy | Percent age (%) | Freque ncy | Percent age (%) |
|---------------------|-----------------------|----------------------------|-----------------------|----------------------------|-----------------------|----------------------------|
| UngwanSanusi | 2 | 0.5 | 10 | 3 | 8 | 2 |
| Badikko | 3 | 0.8 | 14 | 4 | 10 | 3 |
| TudunNupawa | 3 | 0.8 | 12 | 3 | 7 | 2 |
| SabonGari North | 2 | 0.5 | 8 | 2 | 5 | 1 |
| SabonGari South | 3 | 0.8 | 23 | 6 | 15 | 4 |
| SabonGari West | 4 | 1.0 | 19 | 5 | 14 | 4 |
| Tudun Wada North | 3 | 0.8 | 10 | 3 | 9 | 3 |
| Tudun Wada South | 6 | 1.6 | 34 | 9 | 21 | 5 |
| KakuriGwari | 3 | 0.8 | 10 | 3 | 14 | 4 |
| Kakuri Hausa | 3 | 0.8 | 19 | 5 | 12 | 3 |
| Barnawa | 2 | 0.5 | 26 | 7 | 10 | 3 |
| Television | 4 | 1.0 | 21 | 6 | 13 | 3 |
| Total | 38 | 10 | 206 | 54 | 138 | 36 |

Source: Field survey 2016

4.5 The Level of Participation of the Private Sectors in the Management of Solid Waste

The information in Table 4.10 shows the level of involvement of private sector in the management of domestic solid waste in the study area.

Table 4.8: The Level of Involvement of Private Firms

| Private firms | Level of Involvement |
|----------------------|-----------------------------|
|----------------------|-----------------------------|

| | Collection | Transportation | Disposal |
|-----------------------|-------------------|-----------------------|-----------------|
| A.U Abdulahi& sons | Nil | ✓ | ✓ |
| BeedeeMultilinks | ✓ | ✓ | ✓ |
| F & J Envir. Nig. Ltd | Nil | ✓ | ✓ |
| Global Green Eni. | ✓ | ✓ | Nil |
| Kuhiya Nig. Ltd | Nil | ✓ | ✓ |
| M.G Nig. Ltd | ✓ | ✓ | ✓ |
| Mamia Nig. Ltd | ✓ | ✓ | ✓ |
| NCHAS Nig. Ltd | ✓ | ✓ | ✓ |
| Sleeve Logistics | ✓ | ✓ | Nil |
| West- Track Global | Nil | ✓ | ✓ |

Source: Field Survey 2016

According to Table 4.10 about four (4) private firms were found to adopt the proper definition of waste management which means the collection, transferring, processing, treatment and disposing domestic waste, these firms are Abdulahi& sons (A.U), Mamia Nig. Ltd, M.G Nig. Ltd, NCHAS Nig. Ltd respectively. others like A.U , J Envir. Nig. Ltd, Kuhiya Nig. Ltd sand West- Track Global Transport and dispose domestic solid waste generated in the study area only, Global Green Eni.and Sleeve Logistics collect and transport domestic solid waste generated in the study area.

4.6 The Prospects And Challenges Of Private Sector Involvement In Solid Waste Management

To achieve the fourth objective the information gotten from Table 4.11 shows that the major challenges been experienced by the private operators includes dumpsite which about 42% of the respondents in the study area attested to, others are lack of modern facilities with 27%, shortage of personnel 23%, and others 9%. This includes inappropriate enforcement machinery, Illegal service providers and delay in the payment of service fees.

Table 4.9 Challenges Encountered by Private Firms.

| Challenges | Areas | | | | | | | | | | | |
|-------------------------------------|---------------|--------|-------------|----------------|----------------|---------------|-----------------|-----------------|-------------|--------------|---------|------------|
| | Ungwan Sanusi | Badiko | Tudunnupawa | Sabogari North | Sabogari South | Sabogari West | Tudunwada North | Tudunwada south | KakuriGwari | Kakuri Hausa | Barnawa | Television |
| Dumpsite | 9 | 12 | 10 | 14 | 12 | 13 | 7 | 24 | 10 | 19 | 16 | 13 |
| Inadequate modern facilities | 6 | 7 | 5 | 6 | 9 | 7 | 6 | 14 | 7 | 12 | 11 | 10 |
| Not enough personnels | 4 | 5 | 4 | 0 | 11 | 3 | 6 | 9 | 4 | 15 | 14 | 12 |
| Others | 2 | 3 | 3 | 0 | 7 | 3 | 5 | 6 | 2 | 2 | 0 | 1 |
| Total | 21 | 28 | 22 | 20 | 39 | 26 | 24 | 53 | 23 | 48 | 41 | 37 |

Source: Field Survey 2016

Efe (2010) in the same vein reported that there were no authorized dumpsites in Ughelli and the major methods of waste disposal are open dumping, land filling and dig and bury.



Source: Field Survey, (2016).

Fig 4.3: Dumpsite Site along the road in Barnawa



Source: Field Survey, (2016).

Fig 4.4: Dumpsite in SabonGari North



Source: Field Survey,(2016).

Fig 4.5:Dumpsite in an uncompleted building in Tudunwada

4.6.2 Frequency of how long has the Private Sectors being Collecting Waste?

According to the Table 4.12, 30% of the respondents have being in the waste management business for 7-8 years, 25% have being in the waste management business for 3-4 years, and 15% and 10% of the respondents private companies have being in the waste management business for 1-2and 9-10 respectively.

Table 4.10: Frequency of how long has the Private Sectors Being Collecting waste?

| No of Years | Frequency | Percentage (%) |
|-------------|-----------|----------------|
| 1-2 | 3 | 15 |
| 3-4 | 5 | 25 |
| 5-6 | 4 | 20 |
| 7-8 | 6 | 30 |
| 9-10 | 2 | 10 |
| 10> | 0 | 0 |
| Total | 20 | 100 |

Source: Field Survey 2016

4.6.3 Frequency of collection of waste in the study area

The table shows that 40% of the respondents usually collect the waste weekly, 30% collect waste twice a week, 10% collect the waste daily and 20% collect waste monthly.

Table 4.11 Frequency of Collection of Waste in the study area

| Time | Frequency | Percentage (%) |
|--------------|-----------|----------------|
| Daily | 2 | 10 |
| Weekly | 8 | 40 |
| Twice a Week | 6 | 30 |
| Monthly | 4 | 20 |
| Total | 20 | 100 |

Source: Field Survey 2016

This conforms with the work of Eggerth(2005), Post *et al*(2003) the private firms do not collect the waste regularly.

4.7 TEST OF HYPOTHESIS

4.7.1 Incomes of household heads and the type of domestic waste generated

The hypothesis on the relationship between household's income and type of domestic waste generated was subjected to a statistical test using the spearman's correlation statistics. The result of the test shows that there is a positive but weak statistical significant relationship between income level of household heads and the type of domestic waste generated in the study area at 0.01 level of significance, given a correlation coefficient of 0.182*, and a significant level of 0.02. This implies that income level of household influence the type of waste generated by the household.

Table 4.12: Test of Hypothesis 1

| | | Correlations | |
|----------------|--------------------------|--------------------------|------------------------|
| | | Income of household head | Type of domestic waste |
| Spearman's rho | Correlation Coefficient | 1.000 | .182* |
| | Income of household head | . | .02 |
| | N | 381 | 381 |
| | Correlation Coefficient | .182* | 1.000 |
| | Type of domestic waste | .02 | . |
| | N | 381 | 381 |

** . Correlation is significant at the 0.01 level (2-tailed).

4.7.2 Incomes of household heads and the volume of domestic waste generated

The hypothesis on the relationship between household's income and volume of domestic waste generated was subjected to a statistical test using the spearman's correlation statistics. The result of the test shows that there is a strong positive statistical significant relationship between income level of household heads and the volume of domestic waste generated in

the study area at both 0.01 and 0.05 level of significance, given a correlation coefficient of 0.711**, and a significant level of 0.01. This implies that the higher the income of a household, the higher the volume of waste generated by that household.

Table 4.12: Test of Hypothesis 2

| | | Income of household head | Volume of waste generated |
|----------------|---------------------------|--------------------------|---------------------------|
| Spearman's rho | Correlation Coefficient | 1.000 | .711** |
| | Income of household head | | |
| | Sig. (2-tailed) | . | .01 |
| | N | 381 | 381 |
| | Correlation Coefficient | .711** | 1.000 |
| | Volume of waste generated | | |
| | Sig. (2-tailed) | .01 | . |
| | N | 381 | 381 |

** . Correlation is significant at the 0.01 level (2-tailed).

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This section gives a summary of the study carried out by the researcher, the conclusions based on the findings from the study, as well as the recommendations from the study for further research and policy development for sustainable environmental management.

5.2 Summary of Findings

- I. The results gotten from the field show that the types of domestic waste are majorly paper, plastic, Organic, textile and metal. Plastic or polythene materials dominated the types of waste generated (33%) while metallic materials forms only (9%) of the total waste generated.
- II. Generally the waste generated was greater than the waste disposed.
- III. The private sector played greater role (57%) in the waste management than the government with (43%).
- IV. The level of involvement of the private sector in the management of domestic solid waste in the study area was done in three major ways collection, transportation and disposal. It was found out that 50% of the respondents were involved in the three (collection, transportation and disposal), 30% of the respondents were involved in transportation and disposal, 20% involved in collection and disposal.
- V. Waste disposal firms were faced with four categories of challenges. First, availability of modern dumpsites (42%), secondly, Inadequacies of modern facilities

(27%). Third, shortage of skilled personnel (23%) and final, other problems (9%) such as illegal service provider, delay in prompt payment of fees etc.

- VI. It was also found out that only four of the firms were involved in real waste management that is collection, transportation treatment disposal and recycling.
- VII. All the firms were generally young in the business the oldest one are still less than ten years in existence.

5.3 Conclusion

Despite various efforts, it is becoming clear that present system of waste management have not been able to satisfy community needs for an acceptable clearing level as well as in reducing the general health and environmental impacts of waste. Moreover, national and state efforts have not been able to improve the general aesthetic appearance of city landscape. Evidence of increasing frustration is the indiscriminate and open waste dumping with its attendant high environmental and health risks, and persistent waste accumulation that is evidence in various locations of the main urban centers of the state. These locations are consistently liable to various vectors (rodents and insects) and foci to severe environmental pollution, repulsive and very bad smells and disgusting appearance. When burnt on dump locations, these accumulations have negative environmental and health impacts and implications. Effort were made by the past administrators in the state, in launching war against indiscriminate dumping of waste and giving priority to solid waste management. Adequate funds and logistics were made available.

However problem of waste began when the regime elapsed, which result to non-funding of the appropriate organization. This resulted to indiscriminate dumping wastes in every nook and crannies of the area.

From this study, private sector participation in the management of domestic solid waste in the study area was found to be more than that of the government participation. The strategies used in the management of the domestic solid waste was found to be ineffective. The findings conform to that of Oluwole (2006) who reported that in Lagos despite the participation of the private sector in the management of domestic solid waste the situation still remains the same i.e. not effective in tackling waste. Also Kassim(2009), reported on the sustainability of the private sector in Domestic solid waste collection and found out that sustainability of private sector participation in urban service delivery in developing countries should be encouraged.

5.4 Recommendations

Based on the findings of this study the following recommendations have been put forward:

- i. The first thing that needs urgent attention is in the area of public enlightenment and environmental and health education. Without grassroots environmental education and enlightenment, enforcement of environmental sanitation and waste disposal laws has a very little prospect of success. The public needs to be enlightened on proper waste generation and disposal practices including sorting of wastes. This can be achieved through enlightens campaign on TV, radio and postal to educate the citizen on it (WHO 2006). There is also a need to introduce solid waste management in the primary school curriculum so that they could be informed on the need to maintain a clean and healthy environment.
- ii. The Kaduna State Ministry of Environment should review the existing laws and regulations guiding environmental sanitation and health it should also be enforced with stiffer actions in order to make them more effective. Providing legal procedures that impose restrictions on waste disposal in unauthorized places and designated land fill sites should be should be provided (Ezeah, 2006).

- iii. Over billing of the Tenements by the Billing Company should be discouraged.
- iv. Public participation in drafting of Solid Waste Policy is essential for the acceptance by the populace
- v. The participation of private sector in the management of domestic solid waste should be encourage so as to help in the solution of domestic sold waste littering.

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APPENDICES

Appendix I

QUESTIONNAIRE I- FOR WASTE GENERATORS

Dear Sir/Ma,

I am a post-graduate student of Geography department in Ahmadu Bello University, Zaria carrying out a research on “**Assessment of Private sector participation in domestic Solid Waste in Kaduna south Local Government Area**” Please kindly answer the questions below as all Information supplied would be used mainly for academic purposes and shall be treated as highly confidential. Thank you.

Section A

1. Gender (a). Male [] (b). Female []
2. Marital Status (a) [] (b). Married [] (c).widow [] (d). Divorced [](e). Separated []
3. Educational qualification: (a).Primary school education [] (b). Secondary school education [](c).Tertiary education [] (d). others (specify) []
4. Occupation: (a). Trading [] (b).Artesian [] (c).Civil servant [] (d).Business man [](e). others (Specify) [].
5. What is your income per month? (a). below ₦10,000 [] (b). ~~₦~~11,000- ~~₦~~30,000 [] (c). ~~₦~~ 31,000- ~~₦~~50,000 [] (d). above 51,000 []

Section B

Please tick (✓) where appropriate SD = Strongly disagree, D = Disagree, N = Neither agree or disagree, A = Agree, SA Strongly agree.

| No. | Question | SD | D | N | SA | A |
|-----|---|----|---|---|----|---|
| 6. | I mostly generate Residential waste | | | | | |
| 7. | I mostly generate paper waste | | | | | |
| 8. | I mostly generate Metal waste | | | | | |
| 9. | I mostly generate Organic waste | | | | | |
| 10. | I mostly generate Plastic waste | | | | | |
| 11. | I mostly generate Textile waste | | | | | |
| 12. | I dispose my waste in authorized dumpsite | | | | | |
| 13. | The dumpsite is far away from my vicinity | | | | | |
| 14 | I mostly generate bottle waste | | | | | |

| | | | | | | |
|----|------------------------------------|--|--|--|--|--|
| 15 | I mostly generate commercial waste | | | | | |
| 16 | I mostly generate industrial waste | | | | | |

Section C

Please tick (√) where appropriate Yes, No

| No. | | Yes | No |
|-----|---|-----|----|
| 17. | Do you have any government or private agency or institution responsible for the collection and disposal of domestic solid waste in your area. | | |
| 18. | Do you encounter any challenges in disposing your waste | | |
| 19. | Are the institutions managing the domestic waste effective | | |
| 20. | Are they effectively tackling the issue of domestic solid waste management in your area | | |

21. If yes in question 14 above, what is the name of the agency?

22. How do they collect this waste? (a) Wheel barrow (b) Trucks (c) Others

23. How do they dispose these wastes? (a) Incineration (b) Burying (c) Open dumping (d) others specify

24. How effective are the private companies (a) Very effective (b) effective (c) not effective.

| No. | | Daily | Twice a week | Weekly |
|-----|---|-------|--------------|--------|
| 25. | How often do you generate domestic solid waste? | | | |
| 26. | How often do you dispose the domestic solid waste? | | | |
| 27. | How often do these private companies come to collect and dispose these domestic solid wastes? | | | |

Section D

28. do you encounter any challenges in disposing your waste (a) yes (b) No

29. If yes what type (a) Dumpsite (b) Lack of modern facilities (c) not enough Personnels
(d) others Specify

30. In what ways can solid waste collection and disposal be improved in your area
.....
.....
.....
.....
.....

Appendix II

QUESTIONNAIRE II- FOR THE PRIVATE FIRMS

Dear Sir/Ma,

I am a post-graduate student of Geography department in Ahmadu Bello University, Zaria carrying out a research on “**Assessment of Private sector participation in domestic Solid Waste in Kaduna South Local Government Area**” Please kindly answer the questions below as all Information supplied would be used mainly for academic purposes and shall be treated as highly confidential. Thank you.

SECTION A: AGENCIES INVOLMENT IN WASTE MANAGEMENT

What is the name of your agency

What is your spatial coverage

How long have you being collecting waste? (i) 1-2 years [] (ii) 3-4 years[] (iii) 5-6 [] (iv)7-8 years [] (v) 10 years and above []

What type of waste do you collect (i) Residential waste [] (ii) Industrial waste [] (iii) Commercial waste [] (iv) Health waste (v) others specify

How do you collect the waste generated in the area? (i) Trucks [] (ii) Wheel barrows [] (iii) others specify

How do you dispose these waste generated? (i) incinerators [] (ii) Designated Dump site [] (iii) Burying (iv) Land fill [] (v) Burning []

How often do you collect waste generated? (i) Daily [] (ii) once a week [] (iii) twice a week [] (iv) weekly [] (v) Once a monthly []

What is your staff strength both skilled and unskilled (please specify the number of the skilled and unskilled).

SECTION B: INVOLVEMENT OF THE AGENCY IN THE MANAGEMENT OF WASTE

How does your agency participate in the management of the waste? (i) Financially [] (ii) Collecting of the waste from the house holds [] (iii) Transportation of the waste generated only [] (iv)Helping in Processing of the waste only [] others specify

SECTION C: PROSPECTS AND CHALLENGES

What type of problem do you encounter in your area of jurisdiction when you collect waste?

.....

What prospects do you see in the management of waste in your assigned area

.....

Appendix III

Table 4.13: Test of Hypothesis One

Correlations

| | | Income of household head | Type of domestic waste |
|----------------|--------------------------|--------------------------|------------------------|
| Spearman's rho | Correlation Coefficient | 1.000 | .182* |
| | Income of household head | | |
| | Sig. (2-tailed) | . | .02 |
| | N | 381 | 381 |
| | Correlation Coefficient | .182* | 1.000 |
| | Type of domestic waste | | |
| | Sig. (2-tailed) | .02 | . |
| | N | 381 | 381 |

** . Correlation is significant at the 0.01 level (2-tailed).

Table 4.13: Test of Hypothesis Two

Correlations

| | | Income of household head | Type of domestic waste |
|----------------|--------------------------|--------------------------|------------------------|
| Spearman's rho | Correlation Coefficient | 1.000 | .182* |
| | Income of household head | | |
| | Sig. (2-tailed) | . | .02 |
| | N | 381 | 381 |
| | Correlation Coefficient | .182* | 1.000 |
| | Type of domestic waste | | |
| | Sig. (2-tailed) | .02 | . |
| | N | 381 | 381 |

** . Correlation is significant at the 0.01 level (2-tailed).