# PLANNING FOR SUSTAINABLE SOUD WASTE MANAGEMENT IN JALINGO, TARABA STATE

**BY.**

**ANDEFIKI DANIEL IRAMAM.**

**PGD/07/0227.**

**DEPARTMENT OF URBAN AND REGIONAL PLANNING.**

**FEDERAL UNIVERSITY OF TECHNOLOGY VOLA,**

**ADAMAWA STATE.**

**SUPERVISOR**

**TPl A.A SAHABO**

**PROJECT TOPIC:**

**PLANNING FOR SUSTAINABLE SOLID WASTE**

**MANAGEMENT IN JALINGO, TARABA STATE**

**BY**

**ANDEFIKI DANIEL IRAMAM**

**PGD/07/0227**

**DEPARTMENT OF URBAN AND REGIONAL PLANNING.**

**FEDERAL UNIVERSITY OF TECHNOLOGY VOLA,**

**ADAMAWA STATE.**

**SUPERVISOR TPL A.A.**

**SAHABO**

DECLARATION

I declare that this work was carried out in its original form by

Andefiki Daniel Iramam of the Department of Urban and Regional Planning, Federal University of Technology Yola, Nigeria.

…… …….

Sign Date

November, 2009

## APPROVAL PAGE

This thesis Entitled Planning for Sustainable Solid Waste Management in Jalingo.

By Andefiki Daniel Iramam meets the regulations, governing the award of Post Graduate Diploma certificate in Urban and Regional Planning, Federal University of Technology Yola and is approved for its contribution to knowledge and literary presentation.

1. Name: A. A. Sahabo ……

Supervisor Date

2.Name: ……. ……

Internal Examiner Date

3.Name: ……. ……

External Examiner Date

Address: ……. .

4.Name: ……. ……

Head of Department Date

5.Name: ……. . ……

Dean of the School Date

6.Name: ……. . ……

Dean/School Post Graduate Studies Date

## DEDICATION

This project is dedicated to my parents Mr. Daniel Iramam and Mrs. Astira

Daniel and my dear wife Mrs. Tabitha Andefiki for their moral, prayers and financial support.

## ACKNOWLEDGEMENT

First and foremost, I am indeed grateful to God the Father, the Son and the

Holy Spirit.

I acknowledge with sincere gratitude and appreciation for the guidance and encouragement received from my project supervisor, TPL Sahabo, Abdul-Raham A. for the successful completion of this research work.

I am grateful to my pastor Rev. Haruna A. Amunde for prayers and encouragement. My profound gratitude also goes to the Headartment, Mal. M.M. Raji. I pray God to continue to bless you all. I owe appreciation to all the Academic Staff of this Department, Dr. F.A. IIIesarmi, Dr. M.A. Hussein, TPL B.D. Yarima, Mr. Ali Haruna, Mr. H. Ishaku, Mr. F.A. Ogwu for all their encouragements in many ways.

A heart full of gratitude to remember my class mates for cheering me up. My special thanks goes to Mr. Godwil N. Soken, my Director in the Ministry of Environment and Urban Development Jallnqo, Mrs. Hanatu Uriah my Sister and her husband Mr. Uriah Tutuwa.

My thanks also goes to Dan'asabe Musa, Mrs. Esther Solomon for cheering me up during my trouble waters. God bless you.

Andefiki Danial Iramam

November 2009

## ABSTRACT

In recent years many Developing Countries and Urban centers like

Jalingo the Headquarters of Taraba State Nigeria, dumps solid waste indiscriminately which created serious concern. It is unfortunate that waste management agencies in our cities find it difficult to arrest the pathetic situation.

The research seek to identified problem associated with poor stage of solid waste management and profiles solution or to avoid aesthically repulsive environment. The efforts to harmonize views and existing initiative is to achieve a lasting policy guidelines for strategic intervention in line with National Development objectives.

## TABLE OF CONTENT

Title Page: ..... ..... i

Declaration: ..... .....ll
Approval page: ..... ..... iii
Dedication: ..... .....iv
Acknowledgement: ..... .....v
Abstract: ..... .....vi
Table of Contents: ..... ..... vii-xii
List of Tables: .....' .... xii-xiv
List of Maps: . , ..... ..... 'XV
List of Plates: ..... .....xvi
List of Figures: ..... .....xvii

**CHAPTER ONE: INTRODUCTION**

1.0 Introduction: ..... ..... ..... 1
1.1 Background information: ..... ..... ..... 1
1.2 Statement of the problems: ..... ..... .....3
1.3 Aims and objectives: ..... ..... .....8
1.4 Scope and limitation: ..... ..... ..... 8
1.5 Limitation: ..... ..... 9

1.6 Study Area:.....9
1.7 Topography:.....13

1.8 Geology and soil formations:……13
1.9 Climate:……14

**CHAPTER TWO**

2.0 Literature review: .....16
2.1 Introduction: ..... 16
2.2 Literature Background: ..... 16
2.3 Conceptual clarification: ..... 17
2.4 Solid waste: .....18
2.5 Waste generation: ..... 19
2.6 Waste management: ..... 19
2.7 History of solid waste generation and management: ..... 20
2.8 Operational methods of waste disposal and pollution control:…… 23
2.9 Industrial waste management strategies: .....25
2.10 Measures for reducing industrial waste/toxicity: .....27
2.11 Trends in recycling in American: ..... 30
2.12 Solid waste management in Liberia: ..... .31
2.13 Lessons of experience: .....32
2.14 Urban waste management; a case study of Benin city: .....32

2.15 Waste management in university of Ibadan Nigeria: .....35

2.16 Recycling of waste: ..... 36

2.17 Problems of effecting solid waste disposal: .....38

2.18 Solutions to the problems: .....39

2.19 Solid waste management in Jalingo: ..... 41

2.20 Physical planning implication of the review of Jalingo solid waste management: .....46

2.21 Summary: .....47

CHAPTER THREE

3.0 Research methodology: .....48

3.1 Introduction: .....48

3.2 Types of data: ..... 48

3.3 Research design: .....49

3.4 Source of data: .....49

3.5 Sampling techniques and sampling size: .....SO

3.6 Sampling procedures: .....50

3.7 Field works procedures: .....52

3.8 Data analysis: ..... 52

CHAPTER FOUR

4.0 Data Presentation and analysis: ..... 53

4.1 Introduction: .....53

4.2 Total number of household interview: .....54

4.3 Existing Land use: ..... 57

4.4 Residential Land use: .....57

4.5 Commerce and Business:..... 58

4.6 Educational facility: ..... 59

4.7 Public and Semi public: ..... S9

4.8 Industry: .....60

4.9 Roads and Transportation: .....61

4.10 Green Areas: .....61

4.11 Specialized land uses: ..... 61

4.12 Jalingo air port: .....62

4.13 Location and distribution of solid waste containers: .....64

4.14 Quantity/amount of waste generated in kilogram in housed:.....65

4.15 Method of dumping/disposing solid waste: .....68

4.16 Distance of waste dumping from dumping sites: .....71

4.17 Frequency of waste disposal: ..... .....74

4.18 Willingness of respondents to pay for solid waste collecting

and disposal: ..... 76

4.19 Amount affordable for solid waste collection and disposal: .. 78

4.20 Government and its agency involvement in solid waste collection and disposal: .....79

4.21 Socio-Economic: .....82

4.22 Gender composition: ..... 83

4.23 Educational qualification: ..... 86

4.24 Monthly income level: .....87

4.25 Monthly expenditure: .....90

4.26 Level of awareness of solid waste management: .....91

4.27 Means of information on solid waste collection and disposal:…….94

4.28 Contribution of public private sector on solid waste management: 95

4.29 The role of Taraba State government in solid waste management in Jalingo:……97

4.30 Summary of finding: .....103

CHAPTER FIVE

5.0 Summary, Conclusion and Recommendation: ..... .. l0S

5.1 Introduction: ..... .105

5.2 Summary: ..... 105

5.3 Conclusion: ..... .106

5.4 Recommendations: ..... .1 07

Reference: .....

Appendix 1 .....

LIST OF TABLES

Table 1: Industrial waste source reduction measures: .....28-29

Table 2: Recyclable waste materials and use: .....37-38

Table 3: Population of wards in Jalingo: .....51

Table 4: Ages and Sex composition: ..... 56

Table 4b: Existing land use: .....60

Table 5: Location and distribution of solid waste containers: ....64

Table 6: Quantity of solid waste generated within household:.66

Table 7: Method dumping/disposing solid waste: ……68

Table 8: Distance of waste dumping sites from household: ... 71

Table 9: Frequency of waste disposal: ..... 7S

Table 10: Willingness of respondents to pay for solid waste collection and disposal:

76

Table 11: Amount affordable for solid waste collection and disposal……78

Table 12: Government and its Agency involvement in solid waste collection and disposal:……79

Table 13: Occupational Structure: ……..82

Table 14: Gender composition:……83

Table 15: Educational Qualification:……..86

Table 16: Monthly Income level: ..... 87

Table 17: Monthly Expenditure: ..... 90

Table 18: Level of awareness on solid waste management: 91

Table 19: Means of information on solid waste collection and disposal: ..... ., 94

Table 20: Contribution of public private sector on solid waste management: ....."" ....., 95

Table 21: Jalingo Local Government Solid waste management profile: 99

Table 22: Taraba State Ministry of Environment and Urban Development (Environmental Health Department) Profile ..... 100

Table 23: Recommendation and proposal for management Staff profile:……110

Table 24: General Proposal and/Recommendation and Implementation:……117

## LIST OF MAPS

Map 1: Existing Distribution and Location of Solid Waste Containers:……4

Map 2: Map of Nigeria showing Taraba State:……11

Map 3: Area of Study, Taraba State:……12

Map 4: Existing Land use:……63

Map5: Proposal:……106

## LIST OF PLATES

Plate 1: Indiscriminate dumping of solid waste at Road-block Jalingo-Yola road……..5

Plate 2: Dumping of solid on road Abuja phase 1 (Jalingo:..5

Plate 3: Poor disposal of solid waste into drainage along Magami road Jalingo……..6

Plate 4: Refuse collection points in Awoniyi quarters:……..6

Plate 5: Poor use of collection points at Kona ward Jalingo…7

Plate 6: Dumping of refuse on the road at Sintali ward Jalingo 7

Plate 7: Refuse in drainage and road at roadblock of kona road Jalingo……..70

Plate 8: Poor disposal of solid waste in drainage along Barade-Gada Boboji……..70

Plate 9: Refuse scatter on the road (Buba road, Magami)…..73

Plate 10: Solid waste on road behind prison yard Jalingo:……73

## LIST OF FIGURES

Figure 1: Quantity of waste generated within household (kg) ……67
Figure 2: Method of disposing waste:……67
Figure 3: Distance of waste dumping sites from household (m) ……72
Figure 4: Frequency of disposal of waste:……..72
Figure 5: Willingness respondents of pay solid waste……77
Figure 6: Amount affordable solid waste collection and Disposal……77
Figure 7: Government and its agency involvement in solid Waste……..81
Figure 8: Occupation:……..81
Figure 9: Occupation structure:……..85
Figure 10: General Composition:……..85
Figure 11: Educational Qualification:……..89
Figure 12: Monthly income:……..89
Figure 13: Monthly Expenditure:……..93
Figure 14: Level of awareness on solid waste management:..93

CHAPTER ONE

## 1.0 INTRODUCTION

This chapter introduces the research topic by defining and explaining key issues on solid waste. Also in the chapter are statement of the research problem, aim and objectives, significance of the research, scope and limitation. etc.

## 1.1 BACKGROUND OF THE STUDY

The current indiscriminate dumping of solid waste in urban centers like Jalingo the Headquarters of Taraba State is a matter of serious concern. It is equally unfortunate that waste Management Agencies in our cities dispose their refuse by open dumping. In fact, there is no proper sanitary landfill in operation. The indiscriminate dumping of refuse, therefore, constitutes serious health hazards, because of the danger of underground water contamination through leacheates. Other associated problems include smoke, gas emissions and offensive odour. So far there is no integrated and coordinated approach in dealing with issues of waste generation, storage, collection and disposal, indeed, there is no comprehensive plains as

at present arrangements are ad-hoc and un-coordinated (Zubairu 1998). As such "Mountain" and "Hill" of refuse has become common features' in cities like Jafingo, Onisha and Lagos. (Ogawa 2008).

The United State Nations Centre for Human Settlements (Habitat) estimated that over 80% of African cities do not process adequate and meaningful waste management (UNIOO & UNEP 1998). Out of this realization precipitate the idea! way of assessing management of solid waste, waste originating from domestic, commercial, hospitals and industrial source have reached an alarming proportion with negative impacts on the eco system/environment (Osi 1997). The scenario includes disease and health risks, water quality deterioration, and a dirty and aesthetically repulsive environment. Therefore, towns and cities are generating high volume of waste and their capability to manage them pose enormous health hazard, environment sanitation and protection. Hence, there is an increasing effort to harmonies views and existing initiatives to achieve a lasting policy guideline for strategic intervention in line with national development objective.

Waste management is the" constitutional responsibility of the Local Government, However, this responsibility was not mutually exclusive. Even if it is, there is no Local Government in Nigeria including the poorest ones in the country how do you 'know? That can attord the huge financial, technical', distractive and human resources requirements to effectively carryout such constructional responsibility therefore the . State Government in solid waste management and disposal. There is also a need for Federal Government to give meaningful how? support. Unfortunately, there is a rack of coordinated jurisdiction on part 6fthe three (:3) 'tiers 6fGovernment, their agencies, the private sectors, waste generations and the general public.

1.2 STATEMENTOFPROBLEMS

The inability of both the Local and State Government in planning (Management) for solid waste in the area, poor distribution and location of refuse dumping containers, inadequate space for solid waste dumping, Improper management of environmental sanitation, insufficient sanitation/awareness campaign on importance and method of achieving dean environments and low level of public private participation in solid waste management; leading to spread of diseases and' health risk, water quality deterioration and dirty and aesthetically repulsive environment.

## 1.3 AIM AND OBJECTIVES

The aim of this research is to identify solid waste areas with a view to evolving physical planning solution for effective solid waste management.

The aim will be achieved through the following objectives:-

1. To identify solid waste prone areas.
2. To examine adequacy and distribution of refuse dumping containers.
3. To asses the socio-economic characteristics of the people of Jalingo.
4. To assess the contribution of public private sector in solid waste management.
5. To make proposals and recommends planning strategies that will enhance proper management of solid waste.

## 1.4 SCOPE AND LIMITATION

The study is focus on the planning for sustainable solid waste management in Jallngo town, Taraba State.

## 1.5 LIMITATION

The study is limited to Jalingo town due to inadequate time and

Finance. There may also be false view from respondents in order to

cover and justify their actionstactN1ties~.

## 1.6 STUDY AREA

### Historical Background

Jalingo. is located in the north-eastern part of Nigeria. It lies between latitude 8° and $9^0$ North of the equator and longitude $11^0$ and $12^0$ East, Qf the prime, meridian. Authentic information recorded from interviews held with elders/ traditional Council showed that the town, wasf'oundedJn.1892 by Mohammed Nya an Emir. Jalingo is an

old headquarters of Muri, and there are eleven districts in the whole

of the Emirate.

In 1892, the Fulanis conquered all the settlements within the

Emirate. It was during this period that *Nya* migrated into the town now called Jalingo, as more people migrated into the town in search of

shelter and, protection which was readily, available at Jalingo that

period. Presently, the whole of the Emirate is divided into four local

government areas as a result of the. 1976 local government reforms.

More so, creation of Taraba State in 1991 with its headquarters at Jalingo made it to 'be administrative and commercial town of Taraba State. Major tribes in Jalingo to day include the Fulanis, Mumuyes, Hausa, 'Jukuns, Kutebs,Wurkun,''Nyandang, Jenjo, lbos An 'Ybruba's.

The only Royal family in the town is Monammed Yari family. There are five king makers and they are responsible for the selection of the Emirs. The *Waziri* Is the adviser to the Emir. He is, in the absence of the Emir responsible for the ceremonial and traditional administration of the town. The Waziri is usually selected by the Emir

who, also. ensures that he is an educated man with integrity, considerable knowledge of town and people.

## 1.7 TOPOGRAPHY

Jalingo lies between 305rneters (1000ft) and 361 meters (2;000ft) above sea level it lies on gentry rolling slope that leads to the great plains of Muri. 'To the east of Jalingo, the land rises to a peak of about 914' meters (3,000ft). The peak forms a watershed for River lamurde and. other streams which drain into the river Benue. To the north of the town are heights ranging between 323 meters to 349 meters prominently among the hills are the Jalingo hills, However, Jalingo Hills Jauro Shadi hills for interesting features in the landscape of the town. The sloppy nature of the town makes it self-draining to river Lamurde.

## 1.8 GEOLOGY AND SOIL FORMATIONS

Around Jalingo, one finds the Yolde formation which veritable sequence of sandstones sandy mudstones shale and limestone which mark the' transition from marine to the continental sedimentation. In some areas, 'there are alternating' sequence of snale, sandy mudstone with subordinate sandstones. Jalingo falls within the undifferentiated basement complex, The structure of the area has been determined !largely by earth movements' of late cretaceous age

with the structural pattern being dominated by a series affords which are remarkable for their great length, narrowness and relatively simplicity the main period of which followed, folding, is of considerable importance and has affected all the rocks of the sequence.

The principal water bearing soil of the area around Jalingo are the sand stone. formation where the outcrops occur, ground water normally occur under water-table conditions. Sometimes they consist cheaply of fine grained sandstone, thin limestone and shale which do not normally form good aquifers.

1.9 CLIMATE

The micro-climate of Jalingo can be treated under three main headings namely:- Rainfall, Temperature, and relative humidity. These three climatic conditions interact to form the detailed weather situation in Jalingo at any point in time. Variations experience with regards to rainfall, temperature and relative humidity during the day and, wet, seasons often determine whether the inhabitants of the town find weather conditions smoothing or inconvenient, in general however, the micro-climate of Jalingo is some what arduous with

relatively wide and rapid changes in temperature and humidity.

During the dry season, that is November, to March, the dust laden Hermatten wind blows from the North-East straight off the sahara and sahel regions. On the arrival of the seasons that is around April and May the prevailing wind veers, to the south-west and continues in that direction from May to October. However, the rain stoma, which are often experiences her, come from the North-East Thus, it is from this direction, climatically speaking that the inhabitants of Jalingo need protection throughout terms of rainfall, Jalingo has some 195mm of rainfall during the wet seasons, that is from May to October. The rain rises to a peak from late July to early September.

AS mentioned earlier, however, considerable variations can take place both in monthly and annual totals. This is often due to the high intensity of many rainstorm and narrow from Which they sweep across Jalingo's country side. For instance, a rainstorm that can lead to flooding in Jalingo may leave an area of about 10km away from dry and dusty.

# CHAPTER TWO

## 1.0 LITERATURE REVIEW

## 2.1 INTRODUCTION

This chapter discusses extensively on different related literatures. The chapter deals basically with definition, clarification of some concepts associated with waste. It gives the concepts of waste, waste generation and management. The chapter also reviewed post experiences of other places i.e. relevant literatures to help produce a theoretical framework for this study.

## 2.2 LITERATURE BACKGROUND

Jalingo used to be a small urban until 1991 when it became the headquarters of Taraba State, although it was the provincial Capital of Muri province. On the creation of Taraba State, it became the center of employment and administration with over 1 million. The implication of flood plains and agricultural land into mortar and bricks as residential, commercial, administrative and industrial blocks.

The Lamurde River which in most cases used to have undisturbe4d flow under cooled vegetation has Since not only been

exposed but its course have always been blocked by construction and refuse from different land use.

## 2.3 CONCEPTUAL CLARIFICATION

Waste:

Waste can be defined as the used of materials or residues from production process, that is to be disposed of. A good number of authors have defined waste as "any unavoidable materials resulting from domestic activity or industrial operation for which there is no economic demand and which must be disposed for "Tchobanoglous et aI, 1977, Sridhar, 1996). Odocha (1994) defined or considered waste as materials which though many no longer be needed her may become feedstock or raw material else where. In fact, he defines waste as "those materials which are generated as a result of normal operations over which we have control in terms of their production, disposal or discharge". Wastes are generally categorized into solid and liquid waste, which are materials discharged in household dustbins; flush down toilets and chemical processing. Household waste include, bottles, vegetable trimmings, cans plastics and wastes from the toilets (sludge and sewage). Furthermore other wastes may

come from chemical and industrial processes. These include the chemical by-products from brewing, pharmaceuticals and electroplating etc.

Waste is also defined as materials of solid or semi-solid character that the possessor no longer considers of important valve to retain (Gilpin, 1976). Waste can be any garbage, sludge, and gaseous and other discharged materials resulting from various community activities. Waste consists therefore of discarded materials resulting from domestic and community activities and from industrial, commercial and agricultural operation.

## 2.4 SOLID WASTES

Solid waste is classified into garbage and rubbish. Garbage is putrefied waste from food such as meat, fish fruit and vegetable. While rubbish is non perishable waste that are either combustible or non-combustible such as paper, carton, wood, cloths, polythene, iron, glasses and ceramics. Solid waste are generated at every step in the process of rain materials and are converted to goods for consumption (Tchobanoglous et al, 1977).

## 2.5 WASTE GEN.ERATION

This is the process that brings about the waste, in short it deals with how wastes come to be. Order wards waste generation is the various methods that made waste of any kind to accumulate such as production activities which brings about bye products and bye product is the waste which has being generated from the production process.

## 2.6 WASTE MANAGEMENT

This is the collection, transportation, processing and disposal of waste materials, usually ones produced by human activity, man efforts to reduce their effect on human health, local aesthetics and amenity. A sub-focus in recent decades has been to reduce waste materials effect on the natural world and the environments and to recover resources from them.

Waste management, in all its ramifications, is a planned system of effectively controlling the production, storage, collection. transportation processing and disposal or utilization of wastes, in a sanitary aesthetically, acceptable and economical manner. It includes all administrative, financial, legal planning functions as well as the

physical aspects of waste handling (Gilpin 1976). Furthermore; waste management may be defined as that discipline associated with the generation, storage, collection, transfer, transportation, processing and disposal of solid or gaseous- wastes in a manner that is in accordance with the best principle of public health, economic engineering, conversion, aesthetics and other environmental considerations that is also responsible to public attitude (Tchobanoglous et ai, 1977).

## 2.7 HISTORICAL PERSPECTIVE OF SOLID WASTE GENERATION AND MANAGEMENT.

The composition of caveman's diet can still be deduced from analysis of bones, seeds and other rein rank retrieved from less accessible cave parts or dredged from moats ceramic fragment make it possible to follow the evolution of pottery mining residue and metallurgical slay testify of pre-historic or and metal working.

Fairly little is know about ancient ways of waste management but most probably these correspond to current practices in many less industrialized parts of the worlds.

People tend to discard waste out of their own immediate surrounding, i.e their house and yard, sweeping dust, dirt and evil

spirit out the hut is often the housekeepers' first morning activity. Household waste, depending on local culture and regulation, is discarded either casually or at assigned location, e.g in an enclosure, a pit or at a near by small dumpsite. Sometimes it is berried or burned. Most waste however, in those societies is put to good use, as animals folder, soil conditioned or as re-usable recyclable material. In numerous countries, dried animals dung is collected for used as fuel (Buekens 1990).

From the middle Ages onward, local codes in Europe have, stipulated that waste was to be deposited at specific location, from which it was handled. This was eventually delivered to peasants, which is a rent was paid for first clearing services were organized during the 19$^{th}$ centaury. It was a harsh job to the worker who does it manually but was made much higher with the development of standardized and wheeled countries. They allowed the use of dust free loading mechanism and the introduction of the disposable plastic or paper bags.

Until the late' sixties, waste management was an activities of public hygiene were the responsibility of local authorities. This either

provided collection and alleviation of refuse themselves, or employed private contractors for such services. The management of trade and industry from the trend of industrial waste require a more complex methods -of disposal.

Waste disposal, in principal was for a time not a problem since the quarrying of sand, gravel or day provided large pit volume than waste arising would fill (Buekena, 1990). It was later realized that a new method needed to be developed to take care of industrial waste and other waste that need special attention.

Industrial waste incineration began to be developed in the sixties, with the chemicals industry pioneering the development of rotary kiln incinerator plant in the seventies central authorities took a better grip on waste operation by various means such as.-

- The creation of National and Federal bodies environment responsible for comprehensive or waste related issues.
- The provision of extensive R&D fun for studies regarding the prevention, collection, recycling and disposal of waste.
- The promulgation of waste related law and relevant inspectorates;
- The central planning and handling of various aspects of waste management, eg land fill and treatment capacity, regarding, or .

even the arising of waste, by the banning or specification of certain packaging materials.

## 1.8 OPERATIONAL METHODS OF WASTE DISPOSAL AND POLLUTION CONTROL

Methods of Waste Disposal:

There are different methods of waste disposal which are common in Nigerian settlement, including Jalingo. These are open dumping sanitary, land filling, incineration, com positing, on site disposal and conversion into feeds:-

a. Open Dumping:- This is the most common and primitive method of solid waste disposal. This method is indiscriminately

located and waste are either allowed to pile or leveled at ties. These are some that are officially located within the urban countries in most methods disposal which is usually

unsatisfactory and has adverse effect on the environment, since it is mostly allowed to liter and pile up without ever

quitting if as often as it is required.

b. Sanitary Land Filling: In this method waste is deposited in valley or Borrow pits and covered immediately after compactions with thick stable materials. It is used to fill in low-

laying areas which many be natural used for reclamation of low laying waste land for useful purpose. It is know as controlled tipping and can also be used for flood control.

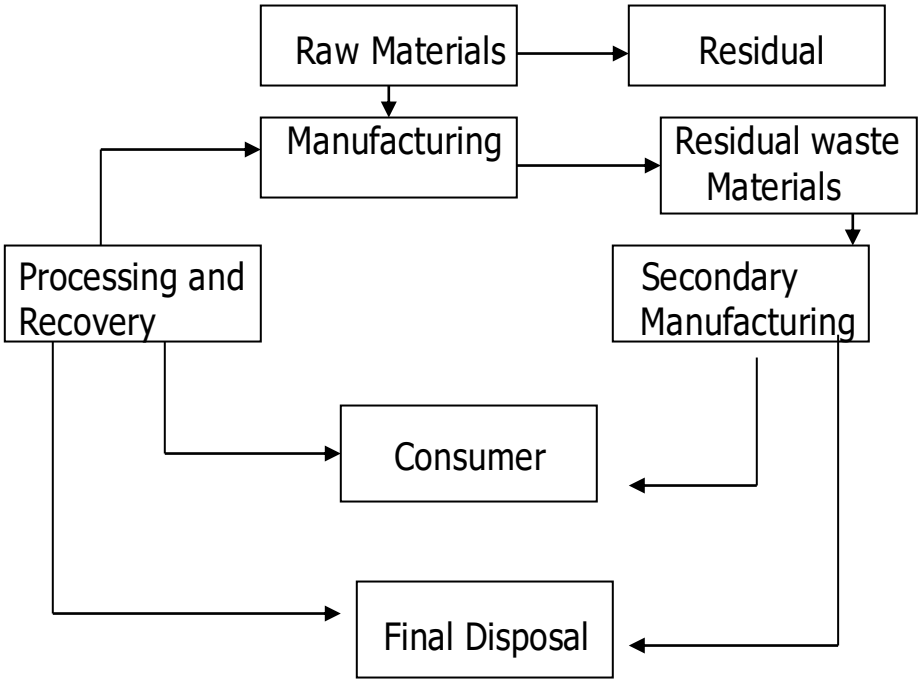
c. Incineration: This is process of reducing combustible waste to inert residue at a very high temperature. In short it is burning of all waste that can be burnt to ashes thereby reducing the bulk of the waste ashes and can be disposed off through control tipping or as manure in the farm.

d. Compositing:- This method involves the fermentation of refuse into a product compact, which supplies valuable humans for the soil. It is referred to as the aerobic hemophilic degradation of putrescibles material in the waste by microorganism. Composition is generally accomplished by moistening the heap and allowing it to ferment for some time. The heap requires turning over regularly to ensure complete fermentation (in every part of heap). It is also used for land reclamation project and other organic waste that is practicable.

Salvaging and Recycling:- This involve sorting (recovering) out useful material that can further be used for production like

and selling it to the buyers for production of other goods where I will be recycle ( reused) in to other goods back to the market and wastage in minimized.

**MATERIALS FLOW AND GENERAL OF SOLID WASTES**




Source (Adopted from solid waste Engineering principle and management issues by Tchobangeous et al, 1977)

2.9 INDUSTRIAL WASTE MANAGEMENT STRATEGIES

An important first step in the development of government waste management strategies is to obtain an understanding of the country is industrial structure and both the amount and types of waste generated by industry within different urban areas. While

industrial structure information is usually available from a national composition data usually is not, and must be collected by means of questionnaires surveys or by sampling and sorting waste at either disposal -sites, temporary dump sites or factory sites. Although industrial waste survey in developed countries according to same (Tay 1993, Wilson Balkau 1990) experience low responses rates and poor quality reporting of waste generation and composition data. They are at least expensive, appropriate way to collect such Information.

The remaining elements of an effective industrial waste management strategy includes.-

a. Planning for the construction of adequate non-hazardous waste disposal facilities.
b. The establishment of adequate treatment and disposal capacity for non-hazardous waste and definition of hazardous waste.
c. Creation of legislation covering water pollution, the storage and transportation of hazardous waste and definition of hazardous waste.
d. The enforcement of such legislations

e. Education and training programmes

f. Economic and technological assistant programmes.

g. The establishment of laboratory facilities for testing and monitoring of hazardous waste and waste water.

Most of the research conducted to date on hazardous waste management in developing countries includes that a phased approach to the implementation of a national waste management strategy is the best (Tay, 1993, Wilson and Balkau 1990).

## 2.10 MEASURES FOR REDUCING INDUSTRIAL WASTE/TOXICITY.

With respect to hazardous industrial solid waste, source, reduction can be refer not only to reduction of the volume or weight but also to reducing of toxicity. Many approaches have been identified in the literature for reducing industrial waste (Ghassemi 1989) Higgins *1989,* (Tay, 1993, Hunt 1990) the two main types of sources reduction are sources control and product changes.

As the name implies, product change refers to a change in the nature of the product so that it will produce less waste, or release fewer contaminant into the environment when it is used. It can

denote a change in the product that will intimately require less

packaging.

Most source reduction measures fall into the category of source control, this measure is associated with productions manufacture.

This includes the purification of raw material input and the

substitution of less toxic material.

Table1: INDUSTRIAL WASTE SOURCE REDUCTION

MEASURES

| Type of source<br><br>Reduction Measures | |
|---|---|
| Product Change | Reduce waste/toxic associate with product use. |
| Product Concentration | Concentration power, detergent, thus requiring less packaging |
| Product Substitution | Substitute water-base paints for solvent based points |
| Source Control | Reduce waste/toxicity of material used in a products manufacture |
| Input material changes | Reduces waste associated with product of manaufacture |
| Materials purification | Use a higher grode of crude oil during refining, thus reducing the amount of impurities that must be removed |
| Material substitution | Substitution water-based cleanses for |

| | |
|---|---|
| | solvent-based cleaners |
| Technology changes | Reduce waste thought process and equipment modification. |
| Process Change | Improve the efficiency of chemical reaction |
| Equipment changes | Use mechanical saraping system for cleaning rather than solvent |
| Process Automation | Automation can optimize product yields by automatically adjusting process parameters |
| Good housekeeping practices | Reduce by means of procedural and administrative measures |
| Management and personal practices | Offer employee education programs, bonuses and award to encourage employees to reduce waste |
| Waste stream segregation | Facilities recycling by preventing maxing of different waste types, particularly hazardous and non-hazardous waste. |
| Types of source reduction measures | Description/examples |
| Inventory control | Use input materials before expiring dates |
| Less prevention | Check for spills and fix leaks from equipment. |
| Cost accounting | Allocation waste treatment and disposal cost directly to the department or groups that generates the waster |

Source:- United State Environmental protection Agency (1988) (Ghassemi, 1989).

Most of these industrial source reduction measures not only does this practices, reduce waste, but it can also be cost effectives since purchasing qualities of materials at a slightly higher unit cost can be less expensive than buying in bulk and then having to dispose of the excess or expired materials (Virgina, 2006)

## 2.11 TRENDS IN RECYCLING IN AMERICAN

Poor communities recover every valuable items from waste: Asian recycler use rubbers from scrap tyres to make shoes, make their own recycling paper and flatter cans to made metal sheets for roofing. Annually 200 million tons of waste across O.E.CD borders route to reprocessing facilities, a business worth over US 200 million dollars. Waste paper level from North America to the far east, waste surplus glass is sent to south America, some of the west's waste plastics are slopped to China indeed recycling may not always be resources efficient when collecting and reprocessing involve long haul transport. Recycling is not keeping pace with waste increase in most

countries (Peter, 2006). But this may be due to the absence of recycling plant or facilities in some areas.

## 2.12 SOLID WASTE MANAGEMENT IN LIBERIA

The Liberian Emergency Employment programme (LEEP, ILO project component), which is an 18 month programme, maximums local employment for the short term. clean-up of markets within Monrovia, within which substantial volumes of waste had accommodated over the year. The organization did in essence cleanup market areas of Monrovia.

Liberian government also employ services of or involument of community based organization (CBOS) in providing solid waste management services from pre-collection to recycling and compositing. It is also encouraging to note that in spite of the difficult conditions existing in Monrovia for the establishment of private solid waste management sector there are some very promising developments. It is noteworthy that a small, but-significant, number of private contractors have started waste

management operations within Monrovia.

## 2.13 LESSONS OF EXPERIENCE

The lessons learn from Monrovia solid waste management is that it gives or allows participatory approaches to waste management.

## 2.14 URBAN WASTE MANAGEMENT; A CASE STUDY OF BENIN CITY

This case study is based on the work of Ogun (2000) who had done an empirical study covering 591 household's in Benin City. The study covered the slate of refuse disposal services between 1994-1995.

Background: This partnership was one involving the public sector (the city council) and the private sector operators of solid waste services and communities. The purpose of the partnership was to provide improved urban waste collection and disposal services in Benin, capital city of Edo State. The city authority comprised of the Oredo-city Council until 1998 when two more local authorities were created. Within the city council, managing refuse disposal services was the responsibility of the Environmental sanitation Unit (ESU).

Against a declining quality of municipal waste management service, market by poor funding and lack of equipment, the Edo State government set-up the Edo state environmental sanitation task force which was an ad-hoc body headed by a military, officer. The partnership was formed against a background of poor quality service, poor financing and inadequate institutional arrangements.

The partnership the municipal authorities engaged the private sector in providing urban waste management services. The first part of the city to be covered was the Government Reservation Areas where a house to house collection services was instituted with payment of service charge. Consultations were held between the councils official and communities on a service charges fee of NSO, per house the were to be collected by the traditional and community leaders, the services change was distributed on the basis of 6% to the services operators, 20% to the council to help fund the collection of waste from public places and 20% was to be kept for community and street head.

Partnership performance:

Ogun's assessment of the performance of the partnership was that it was not wholly successful". However, it had in its favour some element of community participation decentralization and community base service collection system.

Constraints and Problems:

(1) The determination of service charges by the city council was not based on a proper analysis of the economics of providing, thus charges could not keep pace with rising cost and could not sustain provision. The result was that some private operators withdraw their services.

(2) The consultative process was faulty. The city council officials had assumed that the views of the entire community.

(3) The programme suffered from successive administration, did not share the priority attention given to the use of private sectors.

(4) The professional input into the process of consultation reached has a possibility to influence by other interests.

## 2.15 WASTE MANAGEMENT IN UNIVERSITY OF IBADAN NIGERIA

Refuse management in our town and cities has over the years continue? to be a topic of great concern. As part of the efforts aimed at solving this problem the University of Ibadan now have the technology and experts for converting the compatible parts of refuse waste into organic fertilizer within 4-6weeks. This is referred as "Waste to Wealth and is worth advocating for handling of waste Osi (1997).

There is also after years of researchers, a substance for solving some of our perennial national problem. This is powdery substance especially produced from noxious aquatic weeds, water hyacinth and heavily impregnated with special isolates of micro-organisms for the purpose of waste management. The materials has been named OBD plus (i.e Oso Biodegrader plus) and it does the following:-

- Acts rapidly within a short period as six weeks and is used for agricultural purpose providing profit.
- Breaks down oil detoxifies organic matter and odour generation substance in sewage. It good for sewage treatment. It is very

cheap to maintain and never breakdown, is much more

efficient than many systems that are in operation.

- Break down and detoxifies industrial effluent pollutants making it very useful in treating industrial effluents.

- Biodegrades crude and refined oils, hence it is good agent for the bioremediation of oil polluted lands, particularly in the areas of operation of the oil companies.

This low-waste technology is in operation in combination with

trained water hyacinth to purity the brewery effluent of the Nigerian Breweries PLC, and is successfully going on (Osi, 1997).

## 2.16 RECYCLING Of WASTE

Water recycling comprises the recovering of recyclable waste, its processing into new materials or products, and the marketing of these new products. Recycling of waste brings lasting solution to problem of disposal (Oyinlola 1998). In fact utilization of solid was a raw materials for the manufactures of useful products which would not only reduce the amount of waste to be disposed but also to conserve national resource as well, help to reduce pollution. Some typical "Waste to wealth recycling methods" including the following:-

- Conversion of biodegradable waste components into solid and gases re-usable materials notably organic fertilizer and biogas known as "Methane" in a digester

- Convention of classic waste materials like plastic, glass and rubber in to bottles, drinking, glasses pails, basins and bowels and rubber in to slippers, convict pipes etc
- Conversion of woods/sawdust from fossil west materials into citing and pasteboard etc.

Other recyclable waste materials and their by products are presented in the table below.

**TABLE 2: RECYCLABLE WASTE MATERIALS AND USE**

| Waste | Recyclable Value or Use |
|---|---|
| Hair, Bristles wool feather | Brush, lanolin, fertilizer wigs, blankets carpets, fabric |
| Hoofs, Horns | Buttons, combs, hair pins, Novelties, washes, glues, gelatin |
| Bones | Buttons, cutlery, handles glue, bone |
| Hides, skins, feet | Horse whips, seats, belts, binding, shoes |
| Aluminum | Soft drink and bear cans cutlery |
| Paper | Newspaper, packaging material |
| Plastics (vanois types) | Bottle milk jugs, pipes, thin film |
| Glass | Various glass product, decorative |
| Ferrous metal | Tin cans, metal works |

| | |
|---|---|
| Non-ferrous metal | Aluminum, copper, lead etc various item |
| Yard waste organic waste | Compost |
| Construction waste | Filling materials |
| Tires | Road paving, building, shoe sales |
| Batteries | Recycling for lead and reuse |
| Waste oil | Reuse after refining |

Source:- Onibokon et al, 2000

## 2.17 PROBLEMS OF EFFECTING SOLD WASTE DISPOSAL

EFFECTIVE SOIL DISPOSAL: Is a tremendous environmental problems for Nigeria specially in the urban towns; Rural areas are better placed in that there are available bushes within the household areas, where refuse can be disposed of for farming purposes.

Causes of Poor Waste Disposal (Solid Waste) Ignorance and apathy:

Must people do what they do because they are not aware of the implications of their action, similarly many are apathetic to conditions are that prevails over them. These two factors. How great hindrances to the maintenance of a healthy environment in Nigeria Urban Areas. How often do we hear, "This is government work".

Plan-lessness on part of all.

The old urban towns were developed without adequate along term plan. There is always a rushed plan (except recently) with the result that provision are not made for solid waste disposal area' cemeteries and other essential necessities.

**Availability of Resources.**

Resources here include personnel equipment and finance. During the colonial era, we had sanitary inspectors but nowadays these people, are looked upon with disregard, there is absolute lack of supervision of refuse disposal. One or two refuse vans ply a whole urban town. Government on its own parts does not provide enough money to finance refuse disposal projects. There is also lack of skilled labour and when available they are not adequately recommended.

**2.18 SOLUTIONS TO THE PROBLEMS**

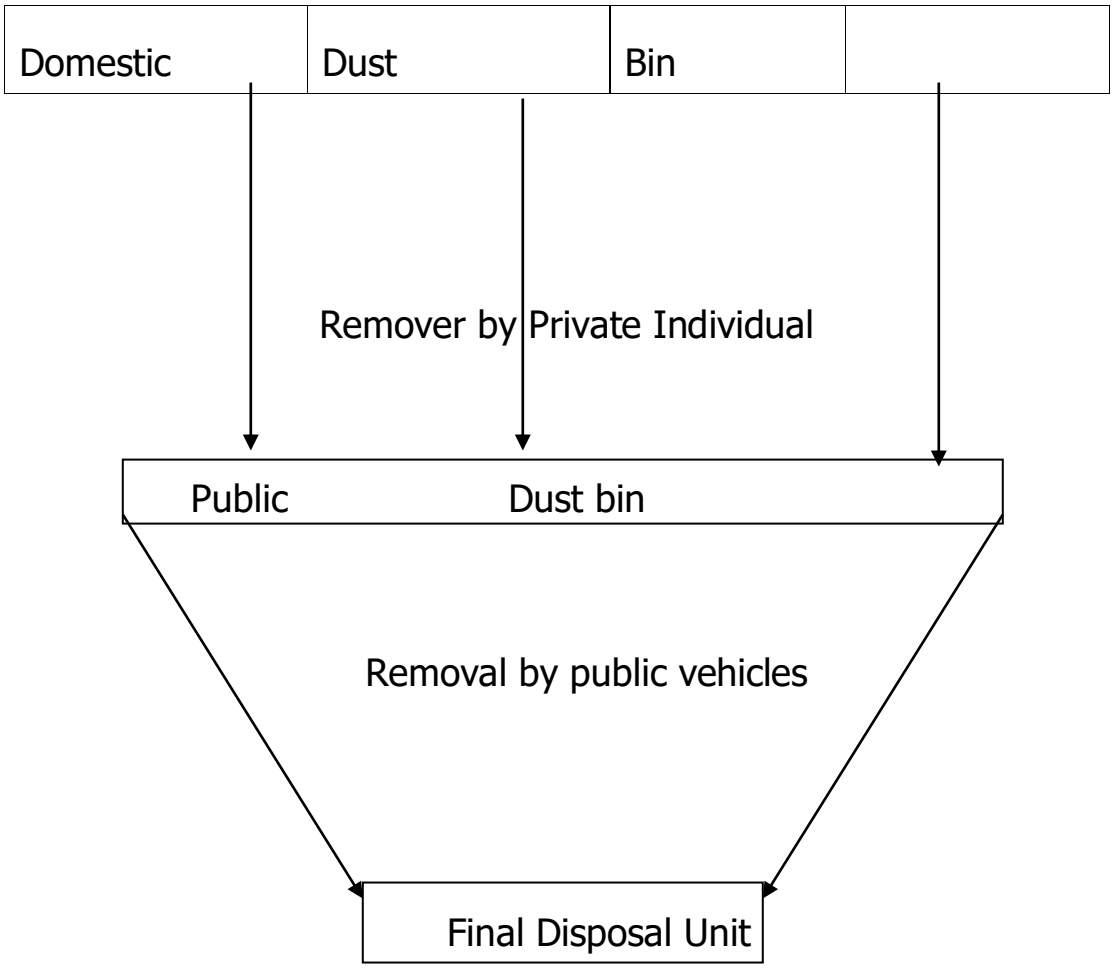
(i) Change of behaviour:- All effort should be made or sanitary measures achieved and therefore, it should be achieved by the cooperation of home school and the community.

(ii) Solid waste disposal as a private enterprise:- Solid waste disposal system should not be under any ministerial protocol. Illness and death do not wait for policy decision. If corporation, private enterprise or a kind of contract is offered for refuse waste disposal quick action may likely to be taken. Work done can be paid on pro data or as many be decided.

(iii) Refuse (waste) Disposal committees: This should be organized on local or constituency level and overseen by state committees. Unit committees will see to effective collection of solid waste and make sure that, adequate disposal is carried out by private enterprises or contract units responsible to state waste Disposal Board.

See (Refuse Disposal "Organic gram")

Refuse/Solid Waste Disposal System in Town (Typical)




Source: Igwe, (1996)

## 2.19 SOLID WASTE MANAGEMENT IN JALINGO.

Solid waste or refuse is generated by many human activities; principal source of solid waste comprise kitchen waste from food preparation and a wide variety of materials for which no further use can be found. Community centres, markets, motor parks, Schools, shops and small industries also generate solid waste.

Jalingo as headquarter of Taraba State was one of the 5 towns in the defunct Gongola State that enjoyed solid waste management facility through the World Bank Assisted Infrastructure Development Fund. (LD.F) project. There were about 40 containers located in different parts of town for the:-

- Dumping
- Collection; and
- Disposal

The facilities also Include solid waster management trucks and refuse collection transportation and disposal gangs who go round the town to effect the refuse collection system. However, the operations of the system had been hampered due to broken down equipments and absence of spare parts.

The present solid waste management system is an essential component of both public health and the aesthetic quality of the environment in which people live. The existing situations still create heaps of 'putrefvlnq waste which provide breading mediums for flies, homes for rats. If stagnant pools of water are created, there are usually mosquito problems must especially malaria fever.

Solid waste management differ from all other component of physical infrastructure in that it depends upon an established from the onset. The State Ministry of Environment and Urban Development-Jalingo are responsible for the solid waste management in Jalingo town, the major constraints that the ministry faces are.-

- Shortage of operational solid waste management equipment.
- Lack of spare parts for broken down trunks
- Lack of protective clothes for refuse collection gang.
- Lack of funds for repairs and maintenance of equipment.
- Lack of spatial arrangement for refuse dumps, especially in the older part of town

- Inadequate refuse collection services

- Inaccessibility to refuse dumped by the residents in the older part of the town.

- Insufficient collection points. The sanitary condition in the older part of Jalingo town form part of non aesthetic because of the town.

The operational system of the solid waste management as constituted presently is adequate but requires additional founding arrangement whereby funds can be obtained on regular basis for maintenance purposes. The absence of a mechanical workshop is a missing link within the operational setup of the present system.

The above flows from the fact that solid waste management usually receives scanty attention in must annual budgets but it may consume between 20 percent and 30 percent of municipal expenditures.

At present, the volume of refuse generated is anywhere between 0.4 and 10 litres per person per day (l/p/d) and vary from being largely inert, to containing a high proportion of vegetable matter which rapidly decomposes under the hot and humid conditions of Jalingo town.

The 40 containers place at different locations in the town have served useful purposes but a more regular evaluation of the containers are required. This is because in most communal storage evidences to suggest that collection and disposal votes are inadequate for teaming growth of Jalingo town.

The Role of NEPA in Controlling Industrial Waste.

The effect of UN managed waste in the environment could be epidemic, causing HI-health and death in a community. Considering the governments should of commitment in 198s, things are hopefully going to change.

The two environmental harmful Decrees) harmful waste special criminal provisions etc Decree No. 42 and the Federal Environmental Protection Agencies (FEPA) Decrees No. 58 promulgated by the Federal Ministry of Environment on the 25th November, 1988 and 30th December, 1988 respectively. The functions and activities of the Agencies are well stipulated in the Decree Establishing Agencies (II) (FEPA) 1990).

In brief FEPA is concerned with nations Environmental Problems.

The establishment and enforcement of Environmental standard as well as carry out periodic environmental monitoring activities is its major role. The Agency will also cooperate with the government councils, statutory bodies and research agencies on matters and facilities-relating to environmental protection.

This is aimed at achieving sustainable development in Nigeria as well as the following:-

a. Secure for all Nigeria a quality of environment and natural resources for their health and well being.
b. Conserve and use the environment and natural resource for the benefits of present and future generation's
c. Restore, maintain and enhance the ecosystem and ecological processes, essential for the functioning of biosphere to preserve biological diversity and the principle of optimum natural resources and ecosystem.
d. Raise public awareness and promote understanding of essential linkage between environment and development and to encourage individual and community participation in environmental improvement efforts, and cooperate in good faith with other countries, international organization/agencies, to achieve optional use of tran--boundary National resources and effective prevention or abatement of environmental pollution (17) PEPA, 1990).

With all this act and regulations, waste management in Jalingo is still an eye solve,

## 2.20 PHYSICAL PLANNING IMPLICATION OF THE REVIEW Of JAlINGO SOUD WASTE MANAGEMENTS.

Waste problems from household, industries, markets and other areas within the urban areas, as earlier discussed have routed in appropriate development patterns where developments have been allowed continue growing in isolation or without serious supervision by and from environmental issues, goals and actions. There is no evident that industrial policy has been directed specifically to address the issues of pollution in the site or general environmental impact of solid waste as a whole. This means that there is need for the intensification of how these solid waste are manage in the environment to avoid negative impact of west disposal and management on the environment and human life as well.

It is more serious when it comes to pollution from solid waste industrial waste since it is very rare to find any instrument for testing pollution level and its remedy. The study therefore intends to proposes suitable ways of solid waste management for Jalingo metropolis.

## 2.21. SUMMARY

This chapter has some definition related to the study topic for better direction. It has also researched on history of waste, generation and management which fed to the review of some countries waste management methods and techniques. Examples of such places are America, Liberia Benin city, University of Ibadan etc. It has also look at some waste management practices in Jalingo headquarters of Taraba State. The research went further in this chapter to look at the problems of refuse disposal, and its solutions, roles of Federal Environmental Protection Agency (FEPA) in solid waste management and the physical implications of reviewing Jalingo solid waste management.

From the literature review and the research findings there seem not to be any detailed research done on solid waste generation and management in Jalingo town. And with the existing problem on ground there is need to undertake a research to cover the gab in knowledge which this study seeks to find.

# CHAPTER THREE

## 3.0 RESEARCH METHODOLOGY:

## 3.1 INTRODUCTION

This chapter deals with the method and procedure employed in conducting the study. The method discusses in details the sources of data, sampling techniques as well as the collections instrument, procedure and analysis.

## 3.2 TYPES OF DATA

The following set of data is of interest in this study:

(a) Types of places:- Where waste are generated household, markets, school, mechanic and industries.

(b) Types of waste generated:- The solid, liquid, mixed. It could be in form of organic and inorganic waste.

(c) Method of waste disposal:- Open dump, pit incinerator, open burning land filling.

(d) Method of control:- FEPA monitoring inspectors by state gangs, fine, sanctions etc.

(e) Effectiveness of control frequency of inspection, collection and disposal and the use of machinery, use of trucks etc.

(f) Environmental effect data diseases, pestilence, mosquitoes, stench, noise and smoke, (Environmental degradation).

## 3.3 RESEARCH DESIGN

This is survey design the study using schedule observation, questionnaires, key information, and focus group discussion for data collection. The design also involve a sample selection from the target research population of the identified stakeholders in solid waste generation disposal and control processes.

## 3.4 SOURCE OF DATA

The sources of data for the study will (are) from primary and secondary sources:- The primary source, which include the use of questionnaire, interview and reconnaissance survey. The interview are with communities from mechanic workshop, market officials, works, and some government officials in the ministries of Environment trade, and industry, land and survey. The secondary source comes from relevant interactive, like journals, magazines, internet and other authorities available with relevant information on the subject matter.

## 3.5 SAMPLING TECHNIQUES AND SAMPLING SIZE.

Sampling is the scientific selection of a group of a group out of a total population from which information is sought, which will be a representative of the population.

A sample size of 20% of the total population of the area will be systematically selected to serve as the study sample, and it will be at random.

## 3.6 SAMPLING PROCEDURES

A systematic sampling will selected from the study area. The study area will be divided into eleven (11) wards and a total of 271 structural questionnaires will be administered in all.

The population of each ward was obtained from the independent National Electoral Commission, Jalingo (INEC), which consists of adults of voting age e9 18 years and above which form the total population of respondents.

An equal change of 0.3% of the population of each ward was calculated to obtain the number of respondents per ward.

TABLE 3: POPULATION OF WARDS IN JALINGO

| S/N | WARDS | POPULATION | % RESPONDEDNTS |
|---|---|---|---|
| 1 | Magami | 9,104 | 27 |
| 2 | Nukkai | 7,025 | 21 |
| 3 | Sabon-gari | 9,604 | 27 |
| 4 | Mafindi | 6,200 | 19 |
| 5 | Mallam Gabdo | 6,448 | 19 |
| 6 | Lamurde | 5,700 | 17 |
| 7 | Karofi | 6,607 | 20 |
| 8 | Gol | 5,575 | 17 |
| 9 | Yandang | 12,487 | 37 |
| 10 | Barade | 12,581 | 38 |
| 10 | Majindadi | 9,695 | 29 |
| Total | 11 | | |

Source:- Independent National Electoral Commission, (INEC). Jalingo Headquarter 2001.

How to calculate the number of respondent using 0.3% of the total population of each ward is given in the example below.

To calculate for Majidadi ward is 0.3/100 x 9,10411=27 respondents.

## 3.7 FIELD WORKS PROCEDURES

The field work procedure will involve the administration of the 271 structural questionnaires to household heads, as earlier mentioned. It will also involve administration of questionnaires to market officials, ministry of environments and urban developments; filed observation taking note of prone area of solid waste, generation, collection, disposal, drainage etc.

## 3.8 DATA ANALYSIS TECHNIQUES

A simple and logical analysis will be adopted, using descriptive statistical technique such as frequency tables, graphs and charts. Similarly, regression analysis will be used to analyze the relationship between the dependent variables.

xi .....xn

y = f (xl., .....xn)

y = dependent variables e.g solid waste

xi. ..... xn independent variables e.g .....(xl., ..... xn).

# CHAPTER FOUR

## 4.0 DATA PRESENTATION AND ANALYSIS

### 4.1 INTRODUCTION

This chapter deals with presentation of the information or the result of the finding of the research work in form of analysed data. This result is presented on tables, plates and charts. The chapter sum up socio-economic characteristics of the study area, location and distribution of solid waste container, quantity of solid waste generated in kilogram in household, method of dumping/disposing solid waste, Distance of waste dumping site from household, and willingness of respondents to pay for solid waste collection and disposal. The chapter also unfold the role of Taraba State government in solid waste management in Jalingo and the ministry of environment and Urban Development Environmental Health Department) Profile.

In achieving the aim and objectives of the study; it is necessary to conduct surveys which will serve as a guide in identifying some problems and potentials of the study.

The type of survey conducted or carried out is random sampling, where communities, wards and their leader's stakeholders were all interviewed. The relevant of the survey is that it will give a general view of the existing solid waste management equipment; poor stage of refuse collection and disposal by using small percentage of population. This method usually gives accurate information.

**Socio-economic Characteristic of People**

The study of this kind involves preliminary state whereby the socio-economic set-up of the people is thoroughly taken into consideration.

This will go along way to finding out the type of people living in the study area, income level, and economic activities; This help a lot in understanding and identifying their problems, high rate of solid waste generation.

4.2 TOTAL NUMBER OF HOUSEHOLD INTERVIEW 271

Total numbers of household = 2250

Average number of person per household = 4

Total numbers of household multiply by average numbers of person 2250 x 4 = 9,120

15-59 years

Male: Population age is 15-59 years =3776

represents 41.4%

Female: Population aged 15-59 = 3,183 which represents 34.9% with total of 6959.

0-14 years

Male: Population aged 0-14 years

= 1031 which represent 11.3%

Female Population aged 0-14 years

= 857 which represents 9.4%

with total of 1,888 (20.7%) 60-65

years and above

Male: Population aged 60 years and above =

109 (1.2%)

Female Population aged 60 years and above

= 164 (1.8%)with total of 273 which represent (30/0).

The population of labour force within the study area is ?????? the aged 60 years and above age 0-4 years 2,1605 ratio 3.1

Male - Female ration 6:5

Population stories represent the studying points for planning at all scale. Ratchiffe, 1979) providing guideline for deciding total land requirements and sources as a basis for locating land between various competing uses, population dictates the policy for most employment, education, health services and so on.

The knowledge of today's population helps in planning for futures.

**TABLE 4: AGES AND SEX COMPOSITION**

| Group | Male | female | Female | Female | Total |
|---|---|---|---|---|---|
| 0-4 | 347 | 3.8 | 283 | 630 | 3.1 |
| 5-9 | 301 | 5.3 | 246 | 547 | 2.7 |
| 10-14 | 383 | 4.2 | 328 | 711 | 3.6 |
| 15-19 | 474 | 5.2 | 392 | 866 | 4.3 |
| 20-24 | 538 | 5.9 | 447 | 1985 | 4.9 |
| 25-29 | 620 | 6.8 | 484 | 1104 | 5.3 |
| 30-34 | 593 | 6.5 | 465 | 1058 | 5.3 |
| 35-39 | 492 | 5.4 | 401 | 893 | 4.4 |
| 40-44 | 429 | 4.7 | 374 | 803 | 4.1 |
| 45-49 | 374 | 4.1 | 310 | 684 | 3.4 |
| 50-54 | 137 | 1.5 | 173 | 310 | 1.9 |
| 55-59 | 119 | 1.3 | 137 | 256 | 1.5 |
| 60-64 | 82 | 0.9 | 100 | 182 | 1.1 |
| 65+ | 27 | 0.3 | 64 | 91 | 07 |
| Total | 4,916 | 539 | 4,2001 | 9,120 | 44.419 |

Sources: Survey, 2009

The figure above show that age groups of 20-39 years male most affected by people on solid waste management.

The planning implication shows that these age groups are the most economic productivity.

## 4.3. EXISTING LAND USE

The 'need for orderly development of land is one of the basic concerns of Urban Planning which can be achieved through details study and analysis of existing land use of the area for which development is prepared. Know about the existing land use is of paramount importance as regards future development.

The existing land use for urban area of about 4,351.36 ha.

## 4.4. Residential land use

Residential land use areas are generally comprised of dwelling residual land within each plot and access road. Over 63% of urban area is devoted to residential use, most which devoted to the "Old core" areas where the spatial pattern is organic, densities high and the housing topology is mainly traditional compound type. To the east of the town are low density residential area, principally in the historical GRA, recent medium density development are taking place in the northern fringe of the town these are more of government sponsor housing estates or layout for civil servant.

## 4.5. COMMERCE AND BUSINESS

This category comprises three sub-types:-

i.e - Mixed retail and residential

- Business and entertainment

- Wholesale/Commercial land uses.

In recent times, Jalinqo has witness the rapid development in business and commercial development; majority of these developments take place in the form of change of uses from purely residential to mixed commercial cum residential. The greatest concentration of these uses are in Palace way (Kasuwan Yelwaj Turaki/Sintali/Hausa ward. The main market located on Palace road forms the central point for retails trade and commercial activities in the town. The major mixed retail/residential activities are found along Palace way, Barde way, Hamman-ruwa way, Manga road and Hospital road.

During the field survey over 15 financial institution located along Hamman-ruwa way and Barde way. Other uses include insurance companies and professional offices as well as places of

worship, health and medical services centre. It also include services industries such as hotels and places of entertainment.

## 4.6. EDUCATIONAL FACILITIES

This- category describes all educational institutions, both western and Arabic. Educational facilities account for about $14^0/0$ of the built area.

## 4.1. PUBLIC AND SEMI PUBLIC

This category include establishment such as Federal and State Ministries, corporations, Departments, Authorities and Boards; as well as Law Enforcement Agencies and Local Government Offices.

The status of Jalingo as the capital of Taraba State has attracted the development of the new administrative buildings, conversion of residential uses to administrative land use. The State Secretary building the Judiciary and the House of Assembly buildings are located away from the centre of commerce, business, and service; but located in harmony with existing and proposed residential area for the high-medium income earners.

Table 4: EXISTING LAND USE

| LAND USE CATEGORY | AREA HA. | 0/0 OF VARIOUS LAND USES |
|---|---|---|
| Residential | 1,288 | 1,288 |
| Commercial /industrial | 1,308 | 29.60 |
| Educational | 1,272 | 30.06 |
| Health | 20 | 29.23 |
| Governmental | 228 | 0.46 |
| Places of worship | 25 | 5.24 |
| Recreation/Public open space | 104 | 0.57 |
| Road | 106.36 | 2.39 |
| Total | 106.36 | 100 |

Source: Field Survey, 2009. Catech, 2000

## 4.8. INDUSTRY

Industrial land in this context refers to formal premises engaged in manufacturing both heavy, medium and small-scale level. The latter include mainly informal, traditional and craft industries located largely within the residential compounds. There were no large to medium scale or formal manufacturing industry in Jalingo except Taraba Gas. Majority of industrial concerns are within the informal

sector and are mainly bakery, carpentry, timber works, cement block molding, furniture making and dress making.

## 4.9 ROADS AND TRANSPORTATION

Land use types included under this category are such activities as petrol filling station, fuel deports, motor parks, bus stops and other road hierarchy.

These uses occupy about 9.0% of the total land use.

## 4.10 GREEN AREAS

Green areas as used covers such uses as recreation, gardens, forest reserves, cemeteries and major bands of road side land scalping. The open spaces so defined occupy about 7% of the total land use.

The principal green areas that contribute to climate and psychological benefit/gardens and dense areas of planting, only constitute about 2% of the total land use.

## 4.11 SPECIALIZED LAND USES

This category include those unique singular types of institutional demand that typically consume large areas of land. In Jalingo such land uses are the stadium complex site located along

Jalingo Yola road and Taraba Television complex along Jalinqo-Ball road.

## 4.12. JALINGO AIR PORT

The-forma! air strip is locate inside the existing town i.e within the built up area around the motor park and stadium facility. The air strip has been relocated to Jauro Yinu, along Jalingo Wukari road within 16km radius.

## 4.13 LOCATION AND DISTRIBUTION OF SOLID WASTE CONTAINERS (EQUIPMENTS)

Location and distribution of solid waste equipment serves as a means whereby urban areas have access to its full usage as a result of its spread and relationship with others around. The table below shows the location of solid waste equipment/ containers.

TABLE 5: LOCATION AND DISTRIBUTION Of SOLID WASTE CONTAINERS (EQUIPMENTS)

| Existing Equipment/Containers | Quality | location | Remarks |
|---|---|---|---|
| IDF Container | 7 | Sintali A | Concentrated |
| IDF Container | 4 | Barade | Average |
| | 5 | Maji dadi | Average |
| | 7 | Sintali B | Concentrated |
| | 4 | Turaki B | Average |
| | 2 | S/Dawaki | Average |
| | 2 | Abuja ward | No serve |
| | 30 | | |

Source:- Field survey, 2009.

The table, shown above depict that solid waste containers (IDF) available are distributed within the heart of Jalingo at expense

of others location. The inadequate equipments are found concentrated within the heart of Jalingo town.

The table above shows that the location and distribution of solid waste disposal containers are closed to one another, as compared to space standards.

The distribution of the waste containers equipment in the map reveals that containers are concentrated within the heart of the town at expense of the surrounding areas.

As a result of the concentration of solid waste management containers and equipments within Sintali ward, Barade, Turaki 'A' ward. Other wards or communities at peripheral will not gain advantage of full utilization (collection and disposal). This will serves as a means of future proposal for disadvantages area. This tend to explain why solid wastes are dump cause environmental repulsive.

## 4.14 QUANTITY/AMOUNT Of WASTE GENERATED IN KILOGRAM IN HOUSEHOLD

As moisture transfer takes place during the solid waste disposal process, leading to change in weight of various fraction. Solid waste composition is therefore expressed in terms of "as generated" or as "disposed". When living standards rise, people consume more and

waste increases. This tend to explain why amount of waste generated within household increases.

TABLE 6: QUANTITY OF SOLID WASTE GENERATED WITHIN HOUSEHOLD (KG)

| Quantity of Waste Generated within household (kg) | Number | Percentage |
|---|---|---|
| 1-5 | 271 | 10% |
| 6-10 | 54 | 20% |
| 11-15 | 68 | 25% |
| 16-20 | 95 | 35% |
| 21-25 | 271 | 10% |
| Total | 271 | 100% |

Source: Filed survey, 2009

The data collected from the sample survey shown that above 16-20 kg of waste were generated within household about 16-20kg of waste generated constitutes 35 percent of the total sample of household, 6-10kg of waste generated within household account for 35 percent of the total sample population. This reveal, that the highest waste generated were from household.

## 4.15 METHOD OF DUMPING/DISPOSING SOLID WASTE

Solid waste disposal is seen as the final lapses of waste-management. The effective waste management depends on how effective the stages are carried out or method used. Different methods of waste disposal are use, open dumping, dumping on road, dumping in organized dumping sites.

TABLE 7: METHOD OF DUMPING/DISPOSING SCUD WASTE

| Method of Disposing Waste | Number | Percentage |
|---|---|---|
| Open dumping and burning | 80 | 30% |
| Indiscriminate dumping | 95 | 35% |
| Duping on road | 41 | 15% |
| Duping on river | 33 | 12% |
| Dumping in organized duping sites | 22 | 8% |
| Total | 271 | 100% |

Source: Field survey 2009

From the study conducted, it was found that those who (respondents) dump their waste in open place and burning accounts . for 30 percent. Those who dump their waste indiscriminately account for $35^0/0$, dumping on road account $15^{\%}$, duping on river account for

12% and dumping in unorganized dumping sites account for 8%. It therefore depict that the highest method of disposing waste is indiscriminate dumping.

The planning implication of the method of disposing waste is that it will determine the appropriate methods of waste disposing within Jalingo town. Also gives rooms for sanitized aesthetic environment. It is a source of a number of public health and safety problems such as diseases air, water pollution and fire it is not recommended.

## 4.16 DISTANCE Of WAST,\E DUMP FROM DUMPING SITES

This implies the behaviours or attitude of people towards distance from household to disposal sites.

TABLE 8: DISTANCE OF WASTE DUMPING SITES FROM HOUSEHOLDS

| Distance of Waste Dumping Sites from Household (m) | Frequency | Percentage |
|---|---|---|
| 5-9m | 14 | 5% |
| 10-50 | 10 | 4% |
| 60-100 | 15 | 6% |
| 110-150 | 18 | 7% |
| 160-200 | 25 | 9% |
| 210=250 | 45 | 16% |
| 260-300 | 50 | 18% |
| 360 and above | 94 | 35% |
| Total | 271 | 100% |

Source: Field survey 2009

The data collected from the sample survey shows that the majority of the sample population move for more than 300 metres from their household to dumping sites, which account for $35^0$/0, 260

300 metres account for 18%, distance of 210-250m accounted for 16%. And 160-200m distance of respondents from dumping sites account for 90%, lOO-150m accounts for 6 percent, lO-50m account for 40/0 and distance of respondent of 5-9m of households to dumping sites account for 5%.

The inform above depicts that majority of household move for a distance of about 310 and above metres from their residence to duping sites, therefore could not dump appropriately because of distance from their households to dumping site.

The planning implication of this distance from dumping site is that its aids every distribution and location of dump site (disposal and collection containers) for residents usage.

4.11 FREQUENCY OF WASTE DISPOSAL

This explain the rate at which households within Jalingo dispose their waste. Some dispose their waste everyday, once a week, once in two weeks and once month respectively.

TABLE 9: FREQUENCY (TIME) OF WASTE DISPOSAL

| Number of Days | Frequency | Percentage . |
|---|---|---|
| Every day | 33 | 12% |
| Once a week | 49 | 18% |
| Once in two weeks | 108. | 400/0 |
| Once a month | 81 | 30$^{0}$/0 |
| Total | 27 | 100% |

Source: Field survey, 2009

From the sample survey conducted, shows that those respondent that dispose their waste or refuse every day account for 12$^{0}$/0, once a week account for 18% once in two weeks (180) accounts for 400/0 and once in a month (81) account for 30%.

The data depict that those respondents that dispose their waste once in a week account, the highest of the sample populations. The planning implication of this is that delays in waste disposal may cause repulsive environment. This tend to explain why solid wastes are scatters, littering the environment in Jalingo.

## 4.18 WILLINGNESS OF RESPONDENTS TO PAY FOR SOLID WASTE COLLECTION AND DISPOSAL

Willingness is a key to development as it indicate participation effort. For the purpose of this study, the people's willingness to pay for solid waste collection for sustainable solid waste management.

TABLE 10: WILLINGNESS OF RESPONDENTS TO PAY FOR SOLID WASTER COLLECTION AND DISPOSAL

| **Willingness of Respondents to Pay for Solid Waste** | **Frequency** | **Percentage.** |
|---|---|---|
| Yes | 122 | 45% |
| No | 149 | 55% |
| Total | 271 | 100% |

Source: Field survey, 2009.

The above table shows that those who willingness to pay for $45^0/0$ and those respondents that did not indicates their interest constitute $55^0/0$ of the total sample population. This depict that majority of the sample population show willingness to pay for the solid waste collection and disposal.

## 4.19 AMOUNT AFFORDABLE FOR SOLID WASTE COLLECTION AND DISPOSAL.

Generally, it is believed that the lower the income the lower the expenditure. The survey conducted reveals that about 65 percent can afford NSO for solid waste collection and disposal, Nl00 = (41) respondents account for 15 percent of the total respondents. About 12 percent of respondents can afford N200 == for the collection and disposal of solid waste and 8 percent of respondents affords N300 = 00 for the collection and disposal of solid wastes.

TABLE 11: AMOUNT AFFORDABLE FOR SOLID WASTE COLLECTION AND DISPOSAL

| Amount affordable for solid waste collection and disposal. | Number | Percentage |
|---|---|---|
| N50.00 | 76 | 65% |
| N100.00 | 41 | 15% |
| N200.00 | 33 | 12% |
| N300.00 | 22 | 8% |
| Total | 271 | 100% |

Source: Field survey, 2009

The table above shows that majority of sample population can afford N50.00 only. This depicts level of poverty associated with

communities as to their affordability towards collection and disposal of waste.

## 4.20 GOVERNMENT AND ITS AGENCY INVOLVEMENT IN SOLID WASTE COLLECTION AND DISPOSAL

Traditionally, government and its agency involvement in solid waste management (collection and disposal) is very important since it is the sale responsibility of the government in waste management (Aled 2002). Government participation in solid waste management may be assess effective, fairly, effective and not effective.

TABLE 12: GOVERNMENT AND ITS AGENCY INVOLVEMENT IN SOLID WASTE COLLECTION AND DISPOSAL

| Government and its Agency Involvement in Solid Waste | Number | Percentage |
|---|---|---|
| Effective | 68 | 25% |
| Fairly effective | 81 | 30% |
| Not effective | 122 | 45% |
| Total | 271 | 100% |

Source: Field survey, 2009

The above table reveals that government and its agency effectively participation accounts for 25 percent, fairly effective participation of government and its agency account for 30 percent of total respondents, while not effective of government participation account for NS percent.

This shows that not effective of government participation in solid waste collection and disposal for the highest percentage of which depicts poor maintenance, monitoring and execution of the solid waste management in Jalingo, which call for private public participation in solid waste collection and disposal.

## 4.21 SOCIO-ECONOMIC

### occupational Structure

This shows that various economic activities in which occupants of an area are engaged in order to earn the live-hood. This will also help in planning with regard to their potentialities within a giving society.

TABLE 13: OCCUPATIONAL STRUCTURE

| Occupation | Number | Percentage |
|---|---|---|
| Trading | 109 | 40% |
| Farming | 81 | 30% |
| Civil Service | 54 | 20% |
| Artisan | 16 | 6% |
| Others | 11 | 4% |
| Total | 271 | 100% |

Source: Field survey, 2009

The table above shows that 40 percent of the respondents engage in trading, farming accounts for 30 percent, civil serves, account for 20 percent, Artisan account for 6 percent and other occupation account for 4 percent respectively. The diversification of

people's activities shows that Jalingo has a potential of socioeconomic and physical development in an urban characteristics.

The information above shows how relative their contribution to the spatial development through solid waste collection and disposal; which added aesthetic to urban form.

4.22 GENDER COMPOSITION

This brings about the total sample population in the study are. The sex composition is very important to planners because it determined the sex that contributes towards physical and economic development.

TABLE 14: GENDER COMPOSITION

| **Gender** | **Number** | **Percentage** |
|---|---|---|
| Females | 141 | 52% |
| Males | 130 | 48% |
| Total | 271 | 100% |

Source: Field survey, 2009.

The data above shows that females accounts fore 52 percent, while males accounts 48 percent of respondents. The data shows that females carried highest percentages of sample population. This

means that there will be low level of participation in term developmental issues collection and disposal of solid waste. Also as female contributes heavily in developments then there will be tendencies of male having burden of caring for female.

## 4.23 EDUCATIONAL QUALIFICATION

This information is very important because education attainment is an indicator of one's earning power as well as use in determine the supply of future man power of an area.

TABLE 15: EDUCATIONAL QUALIFICATION

| Qualification | Number | Percentage |
|---|---|---|
| FSC | 81 | 30% |
| SSCE | 95 | 35% |
| OND/NCE | 54 | 20% |
| HND/Degree | 41 | 15% |
| Total | 271 | 100% |

Source: Field Survey, 2009

From the survey conducted, shows that those attended first school leaving certificate account 30 percent of sample population, 35 percent account for senior school certificate of education (SSCE) and 20 percent of account for National Diploma and National certificate of Education (NCE) and Higher National Diploma/Degree accounts for 15 percent.

This shows that there is less awareness of importance of educational level as the highest population sample is with Senor School Certificate of Education (SSCE). However, the need for communities to be enlighten on the importance of education.

4.24 MONTHLY INCOME LEVEL

This information is important as it ascertain the type of facilities to be recommended for the community(ies) base on their economic afford ability. The range of the monthly income level are shown below.

TABLE 16: MONTHLY INCOME LEVEL

| Income | Number | Percentage |
|---|---|---|
| Under N10,000 | 21 | 8% |
| Nl1,OOO-N30,OOO | 122 | 45% |
| N31,OOO-N50,OOO | 95 | 35% |
| N51,OOO and above | 33 | 12% |
| Total | 271 | 100% |

Source: Filed survey, 2009

The above data on monthly income level reveals that 21 of respondents are within the monthly earning income level of under N10,OOO, 45% earn N11,OOO-N30,OOO monthly, 35% earn N30,000 –

N50,OOO and above 12% of total sample earn monthly income level N51,OOO and above.

This shows that majority of people (respondents) in Jalingo are traders and farmers earn fall within average income earner (Nl1,OOO-N30,OOO monthly).

However, the relevance of this information is that saving capacity of people will be determine as regard to the proportion to the earning ability of the people for any needed social service (facilities). This will gives room for type the type of facilities and services to be proposed for the people (settlement).

## 4.25 MONTHLY EXPENDITURE

Generally, it is believed that lower the income, the lower the expenditure. The survey revealed that 10% of respondent have monthly expenditure of less than N10,OOO, 44% have their monthly expenditure of Nl0,OOO-N30,OOO, 37% have between N31,OOO-N50,OOO. The remaining 9% of total respondents expended N50,OOO- and above; depending on individual.

TABLE 17: MONTHLY EXPENDITURE

| Monthly Expenditure | Number | Percentage |
|---|---|---|
| Less than N10,000 | 27 | 10% |
| N11,000-N30,000 | 119 | 44% |
| N31,000-N50,000 | 100 | 37% |
| N51,000 and above | 24 | 9% |
| Total | 271 | 100% |

Source: Field Survey, 2009.

The information on monthly income of respondent is an expression of disposable income of population and how and what they expended.

From the survey, conducted it was apparent that they spend most of their income on food, transport, shelter, health care and provision of social services. The importance of this information depicts the basis for determining the ability of people within their ward, or locality to pay for or sustain solid waste management in Jalingo town.

4.26 LEVEL OF AWARENESS OF SOLID WASTE MANAGEMENT

This has attained great importance in physical development. It is through in physical development. It is through communication that aims and objectives of any programmes are to be widely disseminated to the communities (wards on how to ensure success of the sustainable waste management initiatives.

TABLE 11.8: LEVEL OF AWARENESS ON SOLID WASTE MANAGEMENT

| Level of Awareness | Number | Percentage |
|---|---|---|
| Yes | 122 | 45% |
| No | 149 | 55% |
| Total | 271 | 100% |

Source: Field Survey, 2009

The survey conducted determine the opinion of communities (respondents) on awareness of solid waste management the table above shows that 45 percent of respondents are aware of solid waste collection and disposal, while those respondent that were not aware account for 55 percent.

This form the basis for proper disseminated of information on relevance of waste collection and disposal.

## 4.27 MEANS OF INFORMATION ON SOLID WASTE

### COLLECTION AND DISPOSAL

Information per 'se' is important to any given. Therefore, the purpose of this study; it serve as a base through which people avoid repulsive environment through proper management of solid waste.

Means of information

TABLE 19: MEANS OF INFORMATION ON SOLID WASTE

COLLECTION AND DISPOSAL

| Means of Information | Number | Percentage |
|---|---|---|
| Audio-visual | 38 | 14% |
| Town crier | 135 | 50% |
| Community leaders | 98 | 36% |
| Total | 271 | 100% |

Source: Field Survey, 2009.

The table above shows that the means of information is important were through Audio-visual, town crier and community leaders. The table show 14% of sample population for audio-visual means of information on solid waste management. Town crier respondent and community leaders account for 30% respectively.

The highest percentage of means of information is the town crier which term to be the crude way of information disseminating information.

However, with the rate of awareness on issues of solid waste collection for modern means of information such as Audio-visual. This will help to make communities known of current situation and need of waste collection and disposal.

## 4.28 CONTRIBUTION Of PUBLIC PRIVATE SECTOR ON SOLID WASTE MANAGEMENT

Public private sector participation is very important as it involved people, citizen, government and private individual. They participation are in different form such as finance, advice labour and materials (equipments).

However, for the purpose of this study financial aspect is considered.

TABLE 20: CONTRIBUTION OF PUBLIC"'PRIVATE SECTOR ON SOLID WASTE MANAGEMENT

| S/N | Type of Project | Location | Estimated Cost (N) | Year Started | Public Contr. | Private Contr. | Public Private | Year Rem. |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | Door to door container | | 480,000 | | 4,000 | 280,000 | | un |
| 2 | Acquisition of dumpsite | | 3,000,000 | | 2,000,000 | 1,000,00 | | un |
| 3 | Hiring of Grader | | 2,000,000 | | 1,200,000 | 800,000 | | cl |
| 4 | Pickup truck Hiring | | 1,500,000 | | 1,200,000 | 300,000 | | cl |
| 5 | Gangs | | 9,000,000 | | 500,000 | 400,000 | | cl |
| 6 | Leader | | 700,000 | | 300,000 | 400,000 | | um |

Source: Filed survey/ 2009 (M.E.U.D Jalingo).

Note: UN= Uncompleted

CL= Completed project.

This table above shows that public private participation in solid waste management is very poor, which call for privatization of solid waste management for effective and sustainability.

Private sector participation in solid waste management (collection and disposal) services will also a way of reducing financial

burden of the government. It can also draw not only investment finance from private companies for solid waste management managerial expertise and technical skills.

## 4.29 THE ROLE OF TARABA STATE GOVERNMENT IN SOLID WASTE MANAGEMENT IN JALINGO.

Solid waste means the handling process of solid waste materials from generation at source to its disposal in most economized way consistent with protection of public health and environment, and In accordance with the wishes of those served by the system.

Solid waste management is the top priority of many government f the world due to its associated problems. In the 1999 constitution of the Federal Republic of Nigeria, under fourth schedule, section 71(h) I, the provision and maintenance of public convenience.

Sewage and refuse disposal is the main responsibilities of the respective municipal in their localities.

In Jalingo, it is therefore the responsibility of Jalingo Local Government Council; to enable municipal carried out her

constitutional obligation in waste management. The Taraba State Government has enacted some laws while old ones were repealed.

Some of the laws or Taraba State Edict No7 of 1998, which led to establishment of Taraba State Ministry of Environment and urban development. The above edict, charge the agency with the responsibility of establishing environmental criteria, guideline, specification of standard, for protection of water, air and land thereof. In the policy guideline of edict No7 of 1998, part (iii) No8 (2), g; the Agency is to monitor the treatment and disposal of domestic and industrial waste.

In part (vi) It is responsible for regulating and prescribing standards on waste disposal, safe and efficient collection, treatment and disposal of waste, storing refuse and dump sites from where refuse can be collected.

Furthermore, to make sure that waste management process is enhanced. Edict No.8 was enacted in the same year and was Title Taraba State Environmental protection Agency Edict.

This contains a detailed policy implementation guideline on waste management. In part of No.16 (1) and No. 16 (14) of Edict No.7 the respective municipal government is to organized the

handling and disposal of waste generally and to ensure that the policy of "The polluter pay principle" is implemented in each respective localities. The same Edict, No.7 (9) prescribe the fund of five hundred naira only (N500.00) or one month imprisonment to any offender. Apart from these, last Saturday of every month (7am-10am) is set aside for environmental sanitation, while media talk on negative impacts, of indiscriminate dumping of refuse on environment to health.

The above measures taken by the state government are encouraging. In assessing the Jalingo Local Government's solid waste management profile.

Table 21: Jalingo Local Government Solid Waste Management profile.

| **Characteristic** | **Number** |
|---|---|
| Staff with ordinary National Diploma | 4 |
| Staff with FSLC | 6 |
| Total Staff strength | 10 |

| **Total Number of Waste** | |
|---|---|
| Collection/disposal vehicles | 4 |
| Total number of waste functional machine | 1 |
| Total number of front machine | 1 |
| Evacuation site | No. specific routine |

Source: field survey, 2009

TABLE 22: TARABA STATE MINISTRY OF ENVIRONMENT AND URBAN DEVELOPMENT. (ENVIRONMENTAL HEALTH DEPARTMENT) PROFILE.

| **Characteristic** | **Number** |
|---|---|
| Staff with Degree | 1 |
| Staff with HND | 22 |
| Staff with SSCE | 27 |
| Staff with FSLC | 40 |
| Total number of personnel | 80 |
| Total number of waste collection/disposal vehicle | 8 |
| Total number of functional disposal vehicle | |

Source: Field survey, 2009 MEUD Jalingo

For the Jalingo solid waste managements profile, she has only four (4) solid waste collection (disposal vehicles out of which only one is functional. The number of the front loader machine is one, total stuff strength site out of which four are technical *staff* with National Diploma as highest qualification. The rest (unskilled staff) are primary school certificate holders.

The council does not have proper record as well as analysis of solid waste generated in respective areas.

With the 'profile' the municipality is unable to keep face with the growing volume of waste generated in Jalingo.

Information from field survey revealed that Taraba state ministry of Environment and urban Development is assisting the Jalingo Local Government by embarking, on releasing tipper vehicles for collection/disposal and now about 30 containers has been distributed within Jalingo metropolis.

Upon these," field investigation revealed that at time the vehicles are available but no fuel to power them. Occasionally the front machine got broken. All these resulted into unspecific routine

waste evacuation.

In addition to waste management problem at local level, the agency, the Taraba state Ministry of Environment and Urban Development charge with responsibility of overseeing waste management activities of respective only boast municipal. The ministry can only boast of 23 technical staff with highest qualification being degree. There were twenty seven (27) Secondary school certificate holders, while those with primary school certificate are. 40 making a total of 80 staff.

Consequently, the state as a whole does not have a well designed standard dump sites. Data concerning waste generation and composition is lacking. If seems government attitude towards waste management is one sided (le) favoured regulation formulation) because the survey revealed that 37 percent of household in the study site do not have standard waste collection bin, they either use plastic containers, basket containers or dumping or burnt their refuse daily; and no body charge defaulters to court.

In an interaction with government officials revealed that the state government was considering privatizing waste management in the state, while some elected political office holders seem to be

against the idea because it may affect their chances of being voted back into office if people are lay on their solid waste. This may cause one to think that politicians are using waste problems in the society to win election or public are not really aware about these show insincerity and seriousness on the part of government in managing the growing waste problem.

This agreed with UNICE, (1994) reports estimating that 80 percent of the cities of developing countries do not poses and adequate and meaningful refuse management system.

## 4.30 SUMMARY OF FINDINGS

From the date analyzed, it is found that the following were the summary of the planning for sustainable solid waste management in Jalingo.

To percent of solid waste collection and disposal containers are concentrated within the heart of jalingo.

35 percent of sample population attended SSCE (Formal education).

45 percentage of the respondents earned N1l, 000 = - N30, 000 = monthly and 44 percent spend within the range N11,OOO - N30,OOO = monthly. (Low income earners) .

55 percent of sample populations are not aware of solid waste management system.

14 percent of the respondents get information through print media, newspapers, and television.

37 percent of the respondent used dustbin as method of collecting and disposing waste; and 35 percent dump their waste indiscriminately.

Poor level of private, public participation in solid waste management.

Jalingo local government council with poor management profile in waste collection and disposal; with total of 10 staff strength.

The state Ministry of Environmental and Urban Development (Environmental Health Department) with total of 80 staff strength with a graduate as director.

However, the identified finding (problems) through analysis can serve as a basis for proposal of planning for sustainable solid waste management in Jalingo.

# CHAPTER FIVE

# 5.0 SUMMARY, CONCLUSION AND RECOMMENDATION.

## 5.1 INTRODUCTION

In order to solve the outlined existing planning problems of solid waste management in Jalingo, which include poor distribution and location of refuse waste dumping container, insufficient sanitization awareness campaign achieving clean aesthetic environment and low level of public private participation in solid waste management. In this regards, the chapter presents proposal conclusion and recommendations to meet both contemporary and future needs of the projected population. In this regard, projections of existing as well as refuse containers and refuse points are made for the purpose of recommendations.

## 5.2 SUMMARY

This study seeks to evaluate solid waste management in Jalingo, headquarters of Taraba State, especially the impact of the objectives such waste on its immediate environment. The objective is to identify solid waste prone area, examine adequacy and distribution of refuse dumping containers, assess the contribution of public-private

sector in solid waste management and recommends planning strategies that will enhance proper/sustainable solid waste management.

The researcher make some examination/assessment of waste that are being generated (collection and disposal). The result proved ineffectively of the solid waste collections and disposal. It is on this ground that a workable recommendation is being made to arrest the situation of indiscriminate dumping of solid waste. This, therefore necessitated the research and hence recommendations are reached (outlined).

## 5.3 CONCLUSION.

The problem of solid waste management has been world wide issues that have alerted the attention of many countries, and even the whole world. Jalingo as headquarters of Taraba state in Nigeria is not exceptional. Having highlighted enormity of the possible strategies to tackle them, as shown above, will doubt save as an eye opener and or as an encouragement/reminder to gear attention towards solid waste collection and disposal.

## 5.4 RECOMMENDATION

a. DISTRIBUTION AND LOCATION OF SOLID WASTE MANAGEMENT CONTAINERS.

In 'proposal, solid waste management committee should be set up and be headed by physical planner for effective changes of activities especially in the distribution and location of solid waste collection and disposal containers.

The following criteria are taken into consideration for proposed location and distribution of solid waste containers.

i. Areas lacking refuse containers

ii. Relationship of existing solid waste containers with other 50m space standards.

In location and distribution of refuse collection and disposal containers, the new 12.0 containers are hereby proposed to disadvantage areas. This will no doubt reduce heap of solid waste in Jalingo.

b. PUBLIC-PRIVATE PARTICIPATION IN SOLID WASTE MANAGEMENT

In order to encourage planning and sustainable solid waste services "in Jalingo town, adequate and active public and private participation in the preparation and execution of solid waste Management system Is very necessary to solve the existing problems of public private low participation.

Also public-private sector participation in solid waste management (collection and disposal services) is also a way to reduce financial burden of government. It can draw not only finance from private companies for solid waste management equipment and facilities, but also. Managerial expertise and technical skills.

Experiences in developing countries which are reported elsewhere indicate that privately operated services are generally more cost effective than public sector services. Therefore, the use of private sector resources through contractual arrangement provides a potential alternative towards self-financing solid waste management.

Effective application of economic incentive measures and private sector resources in solid waste management requires human

resources development in technical aspects, of solid waste management, human resources development in finance planning and management is necessary and a key to development of more self - financing schemes in solid waste management.

c. AWARENESS CAMPAIGN ON IMPORTANCE OF SOLID WASTE MANAGEMENT

To conduct an education campaign on waste management and related health issues in school (best Sanitary practices) market place, safe guiding of human and household domestic waste.

- To organized UN-sponsored public events such as "Waste management Day" with street threat shows, information meeting and for discussion and distribution of flyers.
- To set up a course on waste management at the faculty of environmental sciences of Nigerian University.
- To provide extra-professional technical training to the staff organized and operating waste management systems from public authorities, FEPA, Ministry of Health etc.

Therefore evidently to be successful such public awareness campaign

and capacity building would require an enabling (sustainable) policy and administrative environment.

d. MANAGEMENT PROFILE

In other to actualize, solid waste collection and disposal, the following are hereby proposed and recommended.

Directors or head. To be headed by town planners or Environmental health officer with minimum qualification Master's Degree.

TABLE 23: RECOMMENDATION AND PROPOSAL MANAGEMENT STAFF PROFILE

| Characteristics of Proposal | Number |
|---|---|
| Recommendation and proposal<br>Management staff profile | |
| Head (Director)<br>Supporting staff officers Technical officers<br>Staff with SSCE<br>Gangster<br>Total number of vehicles<br>Collection & Disposal (50H-roll) | 1<br>30<br>40<br>50<br>120<br>15 |

NB All collection points spaced at approximately 50 meters intervals.

The main features of the proposed collection and disposal system are:

- Continue use of IDF types of refuse container and new areas as receptors.
- Oil drums should be placed along all roads, lane (and alley ways in the

  built up areas of the town).

Drums along lanes and passage ways in accessible to motorized collection vehicles should be serviced by hand carts which would then be transferred to the nearest collection points on a motorable road.

- Collection points on Access ways should normally be serviced by tippers.
- The containers procured via the IDF. Project, (broken down should be repaired and used in the accessible collection points. These be unusable) they should be replaced by a similar make (new one).

e. STREET CLEANING

In must cities and towns in Nigeria today, one sees street sweepers in early morning cleaning and sweeping the streets, open spaces and public places.

An efficient street cleaning system is an essential component of solid waste management. Basically street cleaning/sweeping arise due to:

- Waste dumped by householders in the street and road side drains.
- Waste blown around from communal dumps or collection points.
- Sand and silt on paved roads an in open drains.
- Leaves and vegetation.
- Animal dung especially in Jalingo town where cattle and goats roam freely.

The responsible authority Ministry of Environmental and Urban development (environmental health department). For the solid waste management of Jalingo town may employ 300 gangsters (sweepers) for her roads. The work can be achieved using: -

- Long - handled brooms having stiff bristles for paved surface and soft bristles for unpaved surface.
- Flat front shovels
- Flat boards for picking up and transferring waste.
- Hand carts
- Hand gloves

With this, old and densely populated part of the town would require frequent cleaning and the market and its surrounding should be swept at least daily.

f. GENERAL PROPOSAL/IMPLEMENTATION

Having evolved a number of detailed planning proposals for sustainable solid waste management, it has become imperative at this stage to suggest how these proposals are to be implemented. The implementation policies will consider among other things, the source of financial and bodies that will be responsible for the implementation.

g. SOURCE OF FINANCE

Generally, the implementation cannot be actualized without strong financial backing.

The main burden of financing will therefore be on community development body(ies) public, individual, institutions. Example, African Development Bank, Mortgage Banks.

h. IMPLEMENTATION AGENCY (IES)

Community bodies (ies) are also responsible for implementation with government. The Taraba State Ministry of environment and

Urban development, through Environmental Health division, mechanical division and Local Government Environmental Health officers, acquisition of site for refuse dump, at appropriate site and maintenance of broken down machines for collection and disposal of waste.

i. PUBLIC PARTICIPATION

Plan are for planned, the public should be involved at the stage of plan preparation and implementation in order to ensure acceptability and appreciation of proposal by those planning the programme and communities being plan for. The public should be mobilized full and Integrated adequately in the course of implementation.

j. COSTING

This is the monitory value of both considered and material to be use in the Implementation process of the project, in which a market survey reflects the current cost of materials.

Table 23: GENERAL PROPOSAL/RECOMMENDATION AND IMPLEMENTATION

| S/N | Proposal | No. Unit | Area (hect) | Unit cost ₦ | Total cost ₦ | Agency for implementation | Phasing I 2009-2014 | Phasing II 2014-2019 |
|---|---|---|---|---|---|---|---|---|
| 1 | Sanitization workshop | 2 | | 22,000 | 440,000 | Local Govt., MEUD, Private-Public Participation | → | |
| 2 | Collection & disposal container | 20 | | 700,000 | 84,0000.00 | | → | → |
| 3 | Bins/dustbin | 150 | | 3,500 | 525,000 | | → | |
| 4 | Roll-roll vehicle | 15 | | 3,000,000 | 45,000.00 | | → | |
| 5 | Tipper | 8 | | 3,000,000 | 24,000.00 | | → | → |
| 6 | Staff (Professional) | 240 | | 8,000,000 | 8,000.00 | | → | |
| 7 | Gangster | | | | | | → | |
| 8 | Repairs & Maintenance | 6 | | 1.200.000 | 7,200,000 | | → | |
| 9 | Long handle brooms | 400 | | 1,200 | 480,000 | | → | |
| 10 | Flat board for picking waste | 200 | | 4,000 | 600,000 | | → | |
| 11 | Flat front shovels | 500 | | 1,500 | 750,000 | | → | |
| 12 | Hang gloves | 2000pt | | 200 | 400,000 | | → | → |
| 13 | Treatment Chemical | 40cart. | | 35,000 | 140,000 | | → | → |
| 14 | Acquisition of dump site | 2 | | 1,5000,000 | 3,000.00 | | → | → |
| 15 | Treatment plant (Construct of incinerator | 2 | | 10,000000 | 20,000.00 | | → | → |
| | Total cost | | | | 19359000 | | | |

## PHASING

Phasing is a useful tool for implementation it is segmentation of a scheme into parts (phases); intended to be executed successively. Thus It ensure efficiency in the implementation exercise.

However, phasing is the final stage of propose schemes, for the purpose of this study which last for ten years the schemes is divided in to MO phases during which every project is expected to be completed.

### Phase I (2009-2014)

During this phase, priority should be given to the following for its successful execution, sanitization workshops, dustbin, (bins), Tipper for evacuation of solid waste, long handled brooms, flat front shovels, flat board of picking, hand gloves, treatment chemical.

### Phase II (2014-2019)

In phase II the following projects will be done through the period specified.

Provision of solid waste containers, Roll-roll vehicles, employment professional staff and gangster, acquisition of dump sites and treatment plant for solid waste.

## REFERENCE


(1) Buekens, A and Choeter J . (1988) History of Waste Management. Vrije University, Brussel,

(2) Cateech Consult (2000) Master Plan for Jalingo, Taraba State.

(3) Encarta Premium Suit, (2004) Micro - Soft Encarta, Computer System:

(4) Essaghah, A. (1997) Amfitop Series in Urban and Regional Planning:
Urban Planning Concept, Standards and Symbols, published in Nigeria by Amfitop Books, First Edition (1997) P.49-50.

(4) Ghassemi, I (1989) "Waste Reduction" An Overviews. the Environmental Professional (100 - 116 ).

(5) . Hisashi Ogawa (2008) Sustainable Solid Waste Management in Developing Countries.
WHO Western Specific Regional Environmental Health Centre (EHC) Kuala Lompur, Malaysia.

(6) Mba H. C. and Ogbazi, J. (1991) Urban Planning: Perspective and Emerging Concepts. The Principles and Practice of Urban and Regional Planning in Nigeria, Akwa, Mekslink Publishers.

(7) Osi, B.A (1997) Paper Presented at the National Training Workshop on (Rural and Urban Refuge Management) held at the National Women Development Centre, Abuja, 11th August, 1997.

(8) Sridhar, M K. ·C. (1996) "Women in Waste Management. A Seminar Paper Sponsored. by LHWP and British Council for the Seminar on Educating women for sustainable Environmental management, Oweri, Nigeria, March 5-7.

(9) Smart N. Uchegbu, (2002) Environmental Management and Protection Spotlite Publishers, 11 lbobo Street Achara Layout, Enugu, Nigeria

(10) Tehbanoglous George, et, al. (1997) Solid Waste, Engineering. Principles and Management Issues. New York Mcgraw Hill Book Co.

(11) Uloko C. E. and Agbonoga J. E. (2005) "An Essential Handbook for Physical Planners" Kaduna Polytechnic Published in Nigeria by Alex Publications AK 23 Wushishi Road, Kaduna,

(12) UNEP (2007) Assessment of Solid Waste Management in Liberia. United National Environment Programme, Post-Conflict and Disaster Management Branch in Collaboration with Environmental Potential Agency in Liberia.

(13) Wikipedia, (2006)" Waste Management, the Free Encyclopedia. Environmental Science (Environmental Technology/the Company Waste Management Inc. FLLE:/D:/INDUSTEIAL%20waste%20 Concept. Retrieved "lHp:/len.Wikiipedia.Org./wiki. waste management. Htm. (last modified 13: 21, 10 May. 2006).

Appendix 1

Department of Urban and Regional
Planning, School of Environmental Science
Federal university of Technology Yola,
Adamawa State
17th July, 2009.

SURVEY ON PLANNING FOR SUSTAINABLE SOLID WASTE MANAGEMENT IN JAlINGO.

QUESTIONNAIRE

Dear Sir/Madam.

This study is intended to obtain information on Sustainable Solid Waste Management in Jalingo to help suggest an effective way of waste management. Your views will be treated in confidence as this research is primarily for academic purposes.

Thank you for the anticipated corporation.

Yours faithfully,

Andefiki Daniel Iramam

SECTION A

(Please just tick in space provided **or** fin in were necessary)

1. Occupation

(a) civil servant (b) self employed (c) business or private employed

(d) farmer

2. Gender of respondent:- (a) Male (b) Female

3. Marital status:- (a) Single (b) Married.

4. Educational Qualification:- (a)FSC (b) SSCE (c) OND/NCE

(d) HND/Degree and above (e) none.

5. Names of ward you are residing: .....

6. Household Size:- (a) 0-5 (b) 6-10 (c) 11 and above.

7. How are income earners in your household? (a) 1 (b) 2 (c) 3

(d) 4 (e) 5.

SECTION 2

WASTE GENERAL AND DISPOSAL

1. What is the quantity or amount of waste generated in kilograms (kg) in your household?

(a) 1-5 (b) 6-10 (c) 11-15 (d) 16-20 (e) 21-25 (f) 26-30 (g) 31 and above.

2. What method do you use in disposing waste? (Please specify

   a. Open dumping and burning
   b. Indiscriminate dumping
   c. Dumping on road
   d. Dumping on river
   e. Dumping in organized dumping site.

3. How far is the dumping site from your house?

   (a) 5-9m (b) 10-50m (c) 60-100m (d) 100-150m (e) 160-200m (f) 210-2S0m (g)260-300 (h) 310 and above

4. How often do your dispose your waste?

   (a) Everyday (b) Once a week (c) Once in two weeks (d) Once a month (e) Others please specify ....., .....

5. Are you willing to pay for collection and disposal of your waste? Yes ( ) No ( )

5b If yes what amount can you afford? (a) N50 (b) Nl00 (c) N200 (d) N300

6. How effective is the State Government or its agency in terms of waste collection? (Rate as $0\text{-}100^0/0$) or

   (a) Effective (b) Fairly effective (c) Not effective

7. Are there other bodies or group involved in waste disposal in your ward?
   Yes ( ) No ( )
8. Do you believe that your cultural values and taboo affect the collection and disposal of refuse?
   Yes () No ( )
9. How effective is the local government council In waste collection?
   (a) Effective (b) Very Effective (c) Not Effective.
10a. Area you aware of the potential health hazard associated with solid waste accumulation?
   Yes () No ( )
b.If yes list some of the dangers are known to you .....
.....

11. Are you satisfied with the general cleanliness of Jalingo town?
   (a) Yes ( ) (b) No ( )
12. Do your support that waste collection and disposal should be privatized?
   (a) Yes ( ) (a) No ( )
13. Suggest other step/ways on how waste collection and disposal can be improved.

## STAKE HOLDERS

## MINISTRY Of ENVIRONMENT AND URBAN DEVELOPMENT JALINGO

Interview Questions

1. What is the role of your ministry in solid waste management in Jalingo?

a.

b.

c.

2. Do you have any schedule or procedure structure for solid waste management?

b.If yes, List them please .....

3. Are the equipment for waste management adequate? if yes, how adequate?
4. How many Staff in the ministry on the waste management team.

5.Are the staffs in the solid waste management team adequate? 6. How effective is the waste management team in your ministry? (a) Very effective (b) Effectively (c) Not effectives

7. What are the problems faced by the waste management team?
    a. Poor allocation fund
    b. Inadequate Staff
    c. Inadequate equipment and broken down machinery for solid waste collection and disposal.
8. What are the possible solutions to these problems?
    a. Provision of capital
    b. Employment of experts in solid waste
    C. Provision of adequate equipment and maintenance of machining
9. Does the ministry experience storage of operational solid waste management equipment?