A REVIEW ON THE IMPLICATION OF ILLEGAL WASTE DUMPS ON SOIL AND CROPS

BY

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DECLARATION

I hereby declare that this dissertation A review on the implication of illegal waste dumps on soil and crops has been written by me and it is a report of my research work. It has not been presented in any previous publication for the award of post graduate diploma. All quotations are indicated and sources of information specifically acknowledged by means of references.

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CERTIFICATION

This dissertation **A review on the Implications of illegal waste dumps on soil and crops** meets the regulations governing the of post Graduate Diploma in Environmental Resources Management of the Post Graduate School of Nasarawa State University, Keffi and is approved for its contribution to knowledge.

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DEDICATION

This research work is dedicated to almighty Jehovah and also to my late father Mr. Johnson Bamidele Adewunmi.

ACKNOWLEDGMENT

My profound gratitude goes to my able and dedicated supervisor Dr. A.A. Kadafa. I thank her very much for her numerous assistance, the pain she took to read and scrutinize the work and her advice throughout the period of this project. I acknowledge your kindness to me; you are a very wonderful person.

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ABSTRACT

The disposal of waste is worldwide problems that continue to grow with industrial and technological revolutions, human practices and increase in human population. This research work titled A review on the implications of illegal waste dumps on soil and crops was carried out to bring to the light the potential danger associated with the refuse dumpsite on soil and crops and also to create awareness on the health implications. The aim of the study is to examine the health implications of illegal dumpsite. Secondary data was employed for these works which were obtained from relevant published articles like journals, seminal papers, government publications etc. Descriptive method of data analysis was used for this dissertation. Results indicated that illegal dumping is on the rise and is increasingly becoming a problem because it hinder the objective of keeping the environment clean and have serious impacts on soil and quality of plants produced. The study further show that indiscriminate dumping of waste around residential and commercial areas could pose health hazard to residents and other ecological sensitive areas such as soil, and streams. It is also recommended that indiscriminate disposal of waste on dumpsite should be discouraged through awareness campaign.

Keywords: **Indiscriminate, crops, soil, ecological, campaign.**

LIST OF TABLES

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LIST OF ABBREVIATIONS AND ACRONYMS

UNSD	
WHO	World Health Organization
FEPA	Federal Environmental Protection Agency
C02	Carbondioxide
VIP	Ventilated Improved Pit
NESREA	National Environmental Standards and Regulations Enforcement Agency
DPR	
OSHA	Occupational Safety and Health Administration
M2	Square Metre
UN	United Nation
UNEP	United Nation Environmental Programme
%	Percentage
DHHS	Department of Health and Human Services.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Waste is a substance or objects of the holder discards or intends or is required to discard. The United Nations statistical division also defines waste as material that are not prime products (the products produced for the market) for which the generator has no further use in terms of his/her own purposes of production, transformation and consumption and of which he/she wants to dispose (UNSD, 2009). Waste may be generated during the extraction of raw materials, the processing of raw material into intermediates and final products, the consumption of final products and other human activities. Residual recycled or reused at the lace of generation are excluded (UNSD, 2009). Once an object has become waste it will remain waste until it has been fully recovered and no longer possess a potential threat to the environment or the human health. Waste is also defined as any substance, solution, mixture or articles for which no directs use is ensured but is transported for processing dumping, elimination by incineration or other methods of disposal (Yakowitz, 1988).

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The word refuse and waste are interchangeably used. Refuse is also known as waste, rubbish, trash garbage, junk, liter or is unwanted or useless materials. (Hargerty, 1990) Defined rubbish as non perishable solid, glass and wood. Rubbish either decomposes or is non degradable. Garbage is waste or rejected food constituents which have been purchased during the preparation of cooking or storage of meat, fruit, vegetable etc (Hagerty et al, 1990). Refuse can be classified into two main types:

1. Public/Domestic refuse – which originates from houses, hotels, institutions, markets and street.
2. Industrial refuse – which are usually solid and liquid waste from working places and factories (Ibude, 1990).

With urbanization, industrialization, social developments and population increases, solid waste productions are growing rapidly making garbage a serious problem (Khupe, 1990). The levels of waste produced by local ecosystems biodegradative capacity, resulting in serious environmental pollution and epidemic outbreak of desease (Ronald, 1988). Accumulation of refuse in and around residential areas is the cause of most foul odour in some street due to the

fermenting garbage. These refuses are gathered from different homes, industries, food centers and offices with varying microbial contaminants.

Like chemical hazards, ecological agent might be dispersed in the environment through water and wind. Poisonous plants, insects, animals and indigenous pathogens are biological hazards that might encounter at the waste dump site soil (Khupe, 1996). Apart from the spread of micro-organisms from refuse dumps by insects, animals and indigenous pathogens are biological hazards that might encounter at the waste dump site soil (Khupe, 1996). Apart from the spread of micro-organisms from refuse dumps by insects and rodents also create fire and smoke hazards that pollute the environment (Hagerty et al, 1990).Urbanization and non-advanced patterns of consumption increases the amount of solid wastes has long been beyond the resources of most administrations in developing countries. Cilinskis and Zaloksnis 1996, Khupe, 1996). Refuse is seldom collected systematically outside prime residential area and are often dumped in peril urban areas in the inside of squatter settlement increasing exposure to health. Refuse for dump comes primarily from household and commercial areas (Obire and Aguda, 2002).

A cow bought for slaughtering produces about 328.4km of waste in the form of dung, bones, bloods, horn and hoof. Sheep and rams produce about 0.9km head per day. The market generates a variety of waste, e.g. Corn cobs, vegetable waste, packaging materials etc, the house hold wastes also contain materials such as paper, glass, metals, plastics, and other non-easily biodegradable materials (Sridhar, 2007).Most municipal cities however do not have a sanitary land fill or solid waste management plant. Waste management in Nigeria is generally associated with mere dumping of collected waste at the final dump site. Improper disposal of untreated municipal waste is not only harmful to the environment but also to human health (Yaliang, 1996). Hence relevant of this research.

1.2 STATEMENT OF THE PROBLEM

Accumulation of waste produced by dense human and domestic animal populations often exceed the local ecosystem biodegradation capacity. This results in serious environmental pollution and sometimes outbreak of diseases (Ronald, 1996).Municipal wastes are not only harmful to health but also constitute a threat to ecological environment, including arable soils, rivers and streams (Yaliang, 1996). Several studies have revealed the incidence and distribution of pathogenic bacteria and heavy metals agents in the refuse dump site soil in

other parts of the country. There is a dearth of information on the implication of illegal dumpsite on fertility of soil and crops. Hence the researcher intends undertake the health implication of illegal dumpsite on soil, crops and vegetables.

1.3 RESEARCH QUESTION

The following are the research questions that would guide this study.

1. Is there any effects of dumpsite contaminants on soil?
2. What are the effects of waste dump on the quality of plants?
3. What are the ways of creating awareness on dangers and health implications of illegal refuse dumpsites?

1.4 AIM AND OBJECTIVE OF THE STUDY

The aim of the study is to examine the health implications of illegal dumpsite.

The objective of this study therefore is to:

1. To identify the effects of dumpsite contaminants on soil.
2. To identify the effects of waste dump on the quality of plants cultivated around Dump sites.
3. To build up awareness on dangers and health implications of illegal refuse dump sites.

1.5 SCOPE OF THE STUDY

The scope of this research work which is to examine the health implications of illegal refuse dump site.

1.6 SIGNIFICANCE OF THE STUDY

The study will attempt;

i. To build up awareness on the dangers and health implications of the illegal refuse dump site on soil and crops.
ii. To bring to glow the potential heavy metals associated with the refuse dump site.
iii. To provide a baseline for surveillance and control of infections agents arising from waste dumpsite top soils.
iv. To motivate the decision makers and relevant authorities (NASEPA, NUDB, and Federal environmental management agencies etc) to take appropriate measures towards evolving proper environmental management strategy.

CHAPTER TWO

CONCEPTUAL FRAMEWORK AND LITERATURE REVIEW

2.1 INTRODUCTION

The disposal of waste is a worldwide problem that continues to grow with industrial activities, human practices, and the growth of populations. Since the beginning of time, people have the need to find a way of disposing of their refuse. In 18th century, England and France, Carters were paid by individuals to waste and discard at the outskirts of town. Disposal in open pith became routine and Benjamin Franklin Initiated the first municipal cleaning program in Philadelphia in 175 AD. Since then, humans have developed types of waste that cannot simply be dumped into a whole (Opara et al, 2011).

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In most cities and towns in Nigeria and other African countries, waste are dumped indiscriminately on the streets or roads forming ugly refuse mountains, obstructing traffic and posing serious health risk to human (Opara et al, 2011). Thousands of lives are lost every year to environment related diseases such as cholera, diarrhea, malaria fever, typhoid fever, river blindness etc as majority of people in the developing countries live in filthy, cockroaches, rats and mosquitoes infected environment (Idowu, Adagunodo, Esimai and Olapade, 2012).

Olokor (2016) discovered that the problem of indiscriminate disposal of waste and unsanitary environment should be given urgent attention because of the risk factors on human health. Such risk-factors ranges from ill-health to severe health calamities, such as outbreak of epidemic diseases with adverse effects in some cases. Ekpu and Archibong (2007) discovered that the high rate of waste generation by people both in rural and urban areas is a direct reflection of the inefficient ways materials and energy resources are being used. Nearly every human activity creates waste, which may be difficult to get rid of especially with the careless attitude of many people to waste disposal. Lucas and Gilles (2014) asserted that indiscriminate habit of waste disposal has significantly affected environmental cleanliness and in turn bred environmental risk-factors affecting the health and well-being of people.

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Though there are available methods of waste disposal such as composting, handful, incineration, open dumping continues to be the only method in Nigeria. The nonchalant

attitude of the people on issues concerning waste management and environmental best practices has become a major source of worry. Waste are left in the streets, (open dumps) for days or weeks without proper sorting before they are disposed to the final dump site or relocated to the open lands (Mbata, 2008).

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2.2 ENVIRONMENTAL AND HEALTH IMPACTS OF WASTE DUMP SITE.

Dump sites are historically the most used method for waste disposal in the world. It has the longest history, the widest range of capabilities and in most instance, is the least expensive waste disposal method. Waste pose serious environmental and health problems, promote insect vectors like mosquitoes and flies, rats and mice, cause fire hazards, flooding of streams, development of aquatic weeds, small problems, nuisance etc. (Sridhar 2007). Some of these problems are related to their major constituents i.e. carbon, nitrogen, phosphorus and sulphur. Certain toxic and heavy metals like lead, mercury, cadmium, minerals and manmade synthetic chemicals present in wastes may contribute to environmental degredation that lead to poor health, disease or death (Sindhar, 2007).

Illicit open of dumping of solid wastes comes with grave health consequences due to the fact that dumpsites provide substrate for breeding, feeding and habitation of pathogenic organisms and vectors of public health importance. Oyekan and Sulyman (2015), reported that insects and vectors that transmits major diseases of public health are usually formed in dumpsites. These vectors include but not limited to flies, mosquitoes and rodents (Onibiokan – 2000). For instance, the breeding of flies is decomposing of organic waste, while mosquitoes are encouraged by piles of refuse like-car tyres, empty cans etc, these vectors play vital roles in the transmission of disease of public health importance like plague, amoebic dysentery, rat bite fever, Lassa fever etc. (Barina, 2003, Adamu et al; 2014). Vegetation grown in contaminated soil have the ability to bio-accumulate toxic heavy metals, in their tissues which pose potential health risks as they could bio-magnify in the consumer's tissue which pose potential health risks as they could bio-magnify in the consumer's tissue.

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The waste produced in Ibadan may move on and end up in Sokoto, Maiduguri Abeokuta or Ghana due to movement within and outside the generation site. There is a need to treat such waste and bring them back into the cycle of life so that ecological harmony is maintained (Sridhar, 2007).

The primary goal of any solid waste management system as to safeguard the health of the citizens and protects the environment. This is achieved by ensuring proper collation, transportation, treatment and finally, safe disposal of waste. However, the last step is missing in most solid waste management systems implemented in the country.

(Adeputu 1985) reported that toxic liquid (leachate) from waste dump sites seep into surface and groundwater and contaminates them causing water pollution. Toxins the leachate also seep into the food chain through fruits and vegetables grown in the area (soil pollution) (Adeputu 1985) also reported that when waste decomposed, inflammable methane is released which can result in explosion (Dump fires), the smoke released is also highly toxic for inhalation and contributes to global warming.

Dump sites are sources of diseases as they breed flies, rodents and pests, which spread diseases. Other impacts are foul smell, visual ugliness and bind menace which can be a hazard to airplanes. Studies have revealed that incident and distribution of many pathogenic intestine parasites and heavy metals agents which infect both man and animals (Okoronkwo and Onwuliri 1997; Adeputu, 1985; Strans and Blumenth's 1990). The most commonly formed bacterial against include gram negative enteric heavy metals like pseudomonas species, Eschericha Coli, Aeromonas Species and some gram-positive organisms (Smeltzer et al, 1994). Similarly, intestinal parasites are found in many communities and are of such a major international health concern. It has been shown that refuse dumps are significant sources of transmission for intestinal parasitic infections in Kampala, Uganda and Jos, Nigeria. Okonkwo and Owuliri, 1998). Ayeba and Akinbo (2002) reported that protozoan cysts, helminthes eggs, flagellates ascaris lubricoides, entamoeaba histolytic, hookworm and schistosomes were isolated from waste dump site soil in Ibadan. Wachukwu et al (2009) reported that fire (5) genera of pathogenic heavy metals were associated salmonella species (the causative agent of typhoid fever), Escherichia coli (urinary tract infection and diarrhea in children) staphylococcus) bureaus (urinary tract infection, boils etc) pseudomonas aeruginosa and bacillus.

Heavy metals cause diseases in both plants and animals. Studies have shown that heavy metals cause 100,000 diseases in plants. This number includes about 70 percent of diseases of major crops many heavy metals produce bioactive compounds called mycotxin such as alkaloids and polyketides that are toxic to humans another animals. Loses of crops due to heavy metal diseases (e.g rice) blast disease) or food spoilage can have a large impact on human food supplies and local economics.

Heavy metals can also cause deterioration of textile and food substances stored under damped conditions.

Diseases of man caused by metals are called mycoses. Heavy metals called candida albicans is unique in the sense that it is required in a small amount in the body of man, however, when it reaches a particular level, it becomes a nuisance and could harm the body especially in individuals with low immunity.

2.2.1. **ENVIRONMENTAL POLLUTION**

Pollution appears to be the most serious of all the environmental problems in Nigeria. Other major environmental problem are ultimate change, global warming and the loss of biodiversity through the extinction of many species which are partly cause by Pollution refers to the introduction by man into the environment harmful substances or energy waste that cause hazards to natural resources and ecological systems damage to structures or amenity or interference with legitimate uses of the environment (Holgate 1979).

Municipal solid waste comprise of water from domestic houses and offices. The disposal of these is the cause of a great deal of environmental pollution in the country. The pollutants involved comes from a wide range of sources including human excreta, household and offices waste, polythene bags etc. It is a common site to see tall heaps of refuse in major cities in the country. The inappropriate disposal of polythene bags, which are not biodegradable products is causing some concerns of late. These together with other waste substances block drainage channels resulting in flooding. Leachate which consists of decomposed organic and inorganic matter are subsequently mixed with water to product effluents.

The composition of leachate is highly variable in nature depending on numerous environmental factors and the characteristic of the refuse (Chem et al, 1974). The wide variation in the composition of Leachate even in the same general area could be explained from the standpoint of differences in the action of micro-organization in their formation. Waste disposal poses threat to both man animals and soil. Like chemical hazards, etiologic agents might be dispersed in the environment through water and wind. Poisonous plants insects etc are encountered at the waste site (khupe 1996). With industrialization, social development and population increases, solid waste production are growing rapidly making garbage pollution serious problem (Yaliang, 1996).

Solid degradable waste in synergy with environmental factors and bio-degraders or both comes with environmental impacts that limit the quality of air soil as well as both surface and ground water. For instance under anaerobic condition methanogens (bacteria) can aid the release of methane gas (Amuda et al; 2014) as well as 0_2 or both, which degrade air quality and also aid the incidence of global warming. Besides this other anthropogenic pollutants associated with wastes pollutants including greenhouse gases such as carbon dioxide, methane oxides of sulphide nitrogen as well as heavy metals which include but not limited to cadmium (Cd), Copper (Cu) Iron (Fe), Lead (Pb) Zinc (Zn) Aluminum) (Al) are transported as leachate through the soil to underground water or as runoff from one ecosystem to the other during precipitation which could be biomagnified along the food chain by aquatic and terrestrial biota thereby resulting to pollution that induce adverse effect. In a developing country like Nigeria, high waste stream are generated with corresponding inadequate management strategies (Angaye et al; 2015) largely due to financial constrains or weak legislation thus resulting to the practice of open air in-site burning which have attendant greenhouse effect that results to global warming (Ayuba et al; 2013; Amuda et al; 2014)

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2.3 **WASTE MANAGEMENT**

Solid waste management is the discipline associated with the control of generation, storage collection transfer and transport processing and disposal of solid waste in a manner that is in accord with the best principle of public health, economics, engineering, conservation, aesthetics and other environmental considerations (Sridhar, 2007). Reported the objectives of environmental management to include among others preventing adverse effects on human beings animals, plants and their environment; conserving raw materials and energy reserves reducing or eliminating pollution of water resources in natural area and improving planning and management of dump sites, other objectives include reducing the harmful health and environmental impact of waste promoting biological recovery of waste and recycling of materials and converting of waste to wealth.

2.3.1 **MUNICIPAL SOLID WASTE MANAGEMENT PRACTICES AND CONSTRAINTS**

Waste management in developing countries is usually equated with disposal of waste on land or discharge of waste into bodies of water (Cilinskis and Zaloksnis, 1996). This method of waste management is unscientific and constitutes a nuisance to the public and result in pollution and associated health hazards.

In Nigeria, liquid wastes are managed in a indiscriminate manner. There are no sewage treatment plants, sewage gets into drains and flow into rivers and streams. Human excreta are managed separately through ventilated improved pit (VIP) toilet, or septic tanks (Sridhar, 2007).

In the waste management strategies, a variety of methods are in vogue depending on the type of waste to be deposed of the level of economic development of the country and the commitment of the government. Solid waste management methods include waste minimization (or reduce) reuse recycling and disposal. The various technologies available are: waste management hierarchy (, recycle controlled landfill, sanitary landfill composting and incineration Reuse), (Sridhar, 2007).

Waste management is at once a technical cultural and financial problem. In waste management practices, waste management involves collection, transportation and hygiene disposal. These steps should operate in harmony with the environment but governance of waste is a serious problem in Nigeria. There has been shifting of responsibilities among agencies and the various tiers of government and between these and the private sector, thus constituting a setback. Limited involvement of civil society is also a problem (representation in policy formulation and executive bodies), the citizen participation in operation and maintenance and the limited involvement of small contractors in the execution of project.

Households have no influence on solid waste management systems.

2.4 **BIODEGRADATION OF SOLID WASTE**

Degradation of organic waste is a biological process in which organic matter is reduced to humus by heavy metals and actinomycetes; all of which are widely distributed in nature or may be contained in the waste (Riley et al, 1977).

The biological degradation of organic compound results in the generation of gases, aliphatic acids and other liquids (Riley et al, 1977). Soil micro-organism including bacteria and fungi reality colonies the waste dump on the land (soil) carrying out degradation and transformation of the degradable (organic) material in the waste (Stainer et al,) these organism use the waste constitutes as nutrients and this detoxifying the materials as they break down complex organic compounds into simpler less toxic molecules (Paroni et al, 1975).

Biodegradation is an important process that aids solid waste degradation and recycling of nutrients; thereby reducing their pollution capacity in the environment.

BELOW ARE SOME PRODUCT AND TIME TO BIODEGRADE

Table 2.1

S/N	PRODUCT	TOME TO BIODEGRADE
1.	Vegetables	5 days – 1 month
2.	Orange peels	6 months
3.	General papers	2-5 months
4.	Paper towel	2-4 weeks
5.	Cardboard paper	2 months
6.	Cotton t-shorts	6 months
7.	Tree leaves	1 year
8.	Wood socks	1-5 years
9.	Plastics coated milk carton	5 years
10.	Leather shoes	24-40 years
11.	Nylon fabric	30 – 40 years
12.	Tin can	80 – 100 years
13.	Aluminum can	80 – 100 years
14.	Glass bottle	1 million years
15.	Styrofoam cups	500 years – forever

Source: Saidu Adamu Gaji, Nov., 2016

Table 2.2: Results of plants analysis within the dumpsite (Experimental).

Parameter	Cowpea	Spinach	Potatoes
PH	4.8	5.7	4.9
Salinity	0	0.2	0.3
Mercury (Mg/l)	0.047	0.89	0.97
Copper (Mg/l)	0.096	0.0203	0.098
Silver (Mg/l)	0.03	0.0096	0.03
Iron (Mg/l)	0.9	0.017	0.36
Zinc (Mg/l)	0.5	0.0286	0.45
Cadmium (Mg/l)	4.94	0.045	5.45

Source: Magaji J.Y.2012

Table 2.2 show that the PH value is 4.8 in Cowpea, 4.9 in potatoes and 5.7 in spinach; this implies that the crops are slightly acidic. Salinity is very low rising from 0 in Cowpea, 0.2 in spinach and 0.3 in potatoes. Mercury was found to be 0.047 in cowpea, o.89 mg/l in spinach, and 0.97mg/l in potatoes, the highest concentration occurs in copper which was 0.098 mg/l followed by 0.096mg/l in Cowpea and the leaf value of 0.0203mg/l was recorded in spinach silver was found to be 0.03mg/l in cowpea and potatoes, while 0.0096mg/l was recorded in spinach. Iron was found to be 0.9mg/l in cowpea, 0.39mg/l in potatoes and 0.017mg/l in

spinach. Zinc was 5mg/l, 0.045mg/l and 0.0286mg/l in potatoes, cowpea and spinach respectively. Cadmium was 5.45mg/l in potatoes, 4.94mg/l in cowpea, and 0.045mg/l in spinach.

Table 2.3 Results of analysis of the concentration of heavy metals in plants from the control site

Parameter	**Cowpea**	**Spinach**	**Potatoes**
PH	7.3	6.8	6.9
Salinity	0	0	0
Mercury (Mg/l)	0.013	0.006	0.005
Copper (Mg/l)	0.011	0.0075	0.014
Silver (Mg/l)	0.006	0.00034	0.005
Iron (Mg/l)	0.25	0.26	0.27
Zinc (Mg/l)	0.06	0.003	0.044
Cadmium (Mg/l)	4.004	0.002	0.0312

Source: Magaji J.Y 2012

Table 2.3 shows that the PH value in the control plants samples was 7.3 in cowpea, 6.9 in potatoes is almost neutral. Salinity is 0 in all the plants samples. Mercury is 0.013mg/l in cowpea, 0.006mg/l in spinach, and 0.005mg/l in potatoes. Copper was found to be 0.011mg/l in cowpea, followed by 0.014mg/l in potatoes and the least value of 0.0075mg/l was recorded in spinach. Silver was 0.006mg/l in cowpea and 0.005mg/l in potatoes, while 0.003mg/l was recorded in spinach. Iron was found to be 0.25mg/l in cowpea; 0.26mg/l in spinach and 0.27mg/l in potatoes. Zinc was 0.06mg/l, 0.003mgl and 0.044mg/l, in cowpea, spinach and potatoes respectively. Cadmium was 0.031mg/l in potatoes, 0.004mg/l in cowpea, and 0.002mg/l in spinach.

Table 2.4 Comparative analysis of the concentration of heavy metals in plants of the control and dumpsite samples.

Parameter	**Cowpea dumpsite**	**Control**	**Spinach dumpsite**	**Control**	**Potatoes dumpsite**	**Control**
PH	4.8	7.3	5.7	6.8	4.9	6.9
Salinity	0	0	0.2	0	0.3	0

Mercury (Mg/l)	0.047	0.013	0.89	0.006	0.97	0.005
Copper (Mg/l)	0.096	0.011	0.0203	0.0075	0.098	0.014
Silver (Mg/l)	0.03	0.006	0.0096	0.0003	0.03	0.005
Iron (Mg/l)	0.9	0.25	0.017	0.26	0.036	0.27
Zinc (Mg/l)	0.5	0.06	0.0286	0.003	0.45	0.044
Cadmium (Mg/l)	4.94	0.004	0.045	0.002	5.45	0.031

Source: Magaji J.Y. 2012

The results of the analysis of heavy metals in plants cultivated within the dumpsite and those from the control site. The PH value of the three samples is higher than those of the dumpsite, implying that the corps planted far from the dumpsite are slightly acidic. Salinity is zero except in spinach and potatoes that is 0.2 and 0.3 respectively away from the dumpsite. The concentration of the heavy metals in all the samples cultivated around the dumpsite is higher than those from the control site. This is a clear indication that the waste dump has affected the quality of the crops grown around the area.

Table 2.5 comparative analysis of heavy metals concentration for the dumpsite samples with those of FEPA Standard.

Parameter	**Cowpea**	**Spinach**	**Potatoes**	**FEPA Limit**	**Remarks**
PH	4.5	5.9	4.5	6.5-8	Above the limited
Salinity	0.3	0	0.2	NM	
Mercury	0.84	0.017	0.87	0.001	Above the limit
Copper	0.086	0.0103	0.088	0.01	Above the limit
Silver	0.03	0.0096	0.03	NM	
Iron	0.7	0.007	0.3	0.03	Above the limit except in spinach
Zinc	0.4	0.0086	0.4	0.03	Above the limit except in spinach
Cadmium	4.04	0.035	5.24	0.0005	Above the limit

Source: Magaji J.Y. 2012

Safety limit for salinity and silver were not mentioned. Table 4 indicates that the concentrations of mercury, copper and cadmium in plants of the dumpsite are above FEPA limit, except spinach that contains iron and zinc values within the safety limit.

SOIL ANALYSIS

The result of the analysis of the surrounding soil is shown in table 5.

Table 2.6 and 2.7 shown the concentration of heavy metals in dumps and surroundings soil during wet and dry seasons.

Table 2.6 WET SEASON

S/N	DISTANCE	CD	CU	FE	MN	PB	ZN	NI	CR
1	Center of dumps	10.03	1.34	1998.80	91.03	8.80	148.0	11.63	4.20
2	20m North	1.60	0.25	1946.00	55.50	4.00	60.33	3.10	1.60
3	20m West	1.80	0.52	1797.60	49.45	5.30	137.0	2.50	1.72
4	20 South	6.73	0.82	1845.00	62.80	6.90	50.90	7.50	2.90
5	20 East	1.61	0.23	1865.00	44.27	6.35	70.05	2.00	1.74

Source: Suleiman M.B. Maigari A.U. and Saidu Danladi 2016

Table 2.7: DRY SEASON

S/N	Distance	Cd	Cu	Fe	Mn	Pb	Zn	Ni	Cr
1	Center of dumps	12.22	2.15	2440.00	92.05	8.78	151.0	11.8	4.55
2	20m North	1.75	0.25	1989.50	61.75	4.10	66.55	3.75	1.65
3	20m West	1.92	0.68	1814.00	54.50	5.63	147.0	2.85	1.7
4	20 South	6.60	1.34	1865.00	81.20	7.63	61.57	9.55	3.25
5	20 East	1.70	0.83	1899.50	46.60	6.90	72.25	2.50	1.95

Source: Suleiman M.B. Maigari A.U. and Saidu Danladi 2016

The highest mean concentration of Cadmium (12.22mg kg)lead copper (2.15 mg /kg), manganese (92.05mg/kg), iron (244.00 mg/kg), lead (88 mg/kg), Zinc (151.0 mg /kg), Nickel (11.85mg/kg) and Chromium (4.55 mg/kg) were recorded in the soil from dumpsite in both seasons. Low concentration of cadmium was recorded from soil sample 20m north of the dumpsite (4.55 mg/kg) during the wet season, while the lowest concentration of copper (0.25 mg/kg) was recorded from the soil samples 20m east outside the dumpsite. The high iron concentrations in all soil samples may not be from the waste.

It has been reported that natural soli contains significant concentration of iron which suggest that the pollution of the environment by iron cannot be completely linked to a waste materials

alone but other natural sources of iron must be taken into consideration. Besides, iron has earlier been reported to be the most abundant element in Nigeria Soil.

The lower content of iron was recorded from the soil sample zone west while low Zinc Context was recorded from the soil sample 20m North. There is increase in zinc content in soil sample from west, this may be due to surface run off from the dumpsite. The increase in heavy metal levels of soil sample from the dumpsite and 20m south of the dumpsite reflects the composition of waste is slop could have contributed to the appreciable levels of most of the metals in the location compared to the other locations due to surface run off from the dumpsite. The general trend for the heavy metals in the soil samples is Fe > Zn >Mn > Pb> Ni> Cd > Cr > Cu. The mean metal concentrations (Cu, Mn, Fe, Pb, Zn, Ui, Ni, Cr) in all the soil samples were lower than the limit set by FEPA and WHO. However the mean cd content in all the soil samples from dumpsite 20m north, south, east and west of the dump were above 3mg/kg limit set by FEPA. Similar trend of metal levels above the DPR limit has been reported in soils ground at dumpsite in Uyo, Nigeria cadmium is mostly released from anthropogenic sources. Cadmium is mainly used as an anticorrosion coating in electroplating, as an alloying metal in solders as a stabilizer in plastics as a pigment, and as a component of Nikel cadmium batteries and phosphate fertilizers.

The cadmium level in this study was higher than 9.05mg/kg in dumpsite soil from Uyo Nigeria and also higher than 0.73mg/kg reported in dumpsite soil in Ghana. However, the Pb levels in this study were lower than 9.90mg/kg and 41.82 mg/kg reported in dumpsite soils in Uyo and Ghana respectively. Most of the other metals like Mn, Fe, Zu and Cr levels in this study were higher than values earlier reported. It was observed that in the rainy season the metal concentrations decreased. This could be attributed to heavy rainfall, dilution and run off during the rainy season metals from the soil in the various sites may have been washed out to some extent.

Table 2.8 Implication on Soil/Health Effect.

S/N	AUTHOR/ YEAR	LOCATION	SOILTYPE	CONTAINMENT	IMPLICATIONS ON SOIL/HEALTH EFFECTS
1.	Suleiman M.B & Maigari A.U. Oct. 2016	Gombe	Loamy soil	Leachate from the dump site	Polluted soil affects human through direct contact and the consumption of the garden vegetables grown on dumpsites.
2.	Onifade A.D. Nwabotu F.A. Sept, 2014	Ilorin south local govt. area kwara state	Loamy clay soil	It is found that the cadmium (Cd)is mostly released from anthropogenic sources. Cd content in the soil sample from dumpsite were above 3mg 1kg limit set by FEPA and WHO standard	Such toxic chemicals are serious environment problem facing the country because of its consequent effects on the pollution of soil water and air. Heavy metal toxicity can result in damaged or reduced mental and central nervous function, lower energy level and damage to blood composition, lungs, kidney, liver and other neurological organs among others
3.	Saidu Danladi oct. 2016	Jigawa state	Loamy	It is found that chromium (Cr) in the water (soil) sample exceeded the WHO permissible the WHO permissible limit the amounts of metal increased with haphazard disposal of municipal waste in soil. Toxicity from biodegradable properties	Chromium Vi causes skin raches, stomach upset and ulcers, respiratory problems, weakened immune system, kidney and liver damages, alteration of genetic materials and lung cancer.

				and accumulative behavior	
4.	Arekwe A. & Chime Rezie 2012	Port Harcourt metropolis	Loamy	Leachate from the dumpsite	Serious health implication on the garden vegetables grown on abandoned dumpsites or around active dumpsites.

Source: Onifade O.A. 2014

Table 2.9 Implication on plants/health effects

S/N	AUTHOR/ YEAR	LOCATION	SOILTYPE	CONTAINMENT	IMPLICATIONS ON SOIL/HEALTH EFFECTS
1.	Magaji J.Y 2012	Mpape dumpsite FCT Abuja	Cowpea, spinach and potatoes	Concentration of mercury, copper and cadmium in these plants of the dumpsite are above the PEPA Limit.	Eating food with high level of cadmium increases salivation severely irritates the stomach, leading to vomiting and diarrhea.
2.	Owoeye I.O & Okojie O.H. 2013	Niger delta region	Vegetables	Contaminated vegetable exposures to high levels of metallic inorganic or organic mercury	This can permanently damage the brain kidney and developing Festus. Occupational safety and health administration (OSHA) research has shown that exposure to methyl mercury is worse for young children brains.
3.	Osinowo F.D. 2015	Lagos	Vegetable	Zinc level is highly contaminated	Too much zinc is harmful

Source: Owoeye I.O. and Okojie O.H. 2013

CHAPTER 3
RESEARCH METHODOLOGY

3.0 INTRODUCTION

This chapter explains the research procedure and methodology adopted. The analysis of secondary data also constitute the methodology framework of the study.

3.2. RESEARCH DESIGN

Descriptive research method was used for the study. The method is used to describe systematically a situation or area of interest factually and accurately. They further stated that the design could be public opinion survey facts finding surveys status studies and so on. Hence in a more specific way pure descriptive surveys used. Pure descriptive survey as a design in which the features or variable being studied for any samples are never compared for various strata of the samples which in most cases are the dependent variable for the study. Survey design is the one in which a group of items were studied by collecting analysis and interpreting data from a few peoples considered to be representative of the study population.

3.3. SOURCE OF DATA COLLECTION

Secondary data was employed for this research work which are obtained from relearn published articles like journals inaugural lectures, seminar paper, textbooks government publications and these were obtained from internet. Secondary data is the data that have been already collected and readily available from other sources since the study is trying to review existing research work but not conduct a new investigation on the assessment of the of illegal waste dumping on soil and crops.

3.4 RELIABILITY OF THE INSTRUMENT

Reliability refers to the consistency stability or dependability of the data . The reliability of an instrument implies that the instrument must consistently measure what it is supposed to measure and also indicates how much confidence one can place on the result of the test. A reliable measurement is one that if repeated a second times will give the same result as it did the first time.

3.5. VALIDITY OF THE INSTRUMENT

Validity refers to data that are not reliable but also true and accurate .Validity of an instrument determine the extent an instrument is able to collect the expected data. It connotes the trustworthiness of an instrument and the instrument must be passed to experts or specialists for validation validity is determined by the degree of provision of correct response from sample objects by the degree of provision of correct response from sample on object by the relevant research design or research instrument. The structure and language of the findings were modified in the light of the corrections. The instrument was structured in such a way as to minimize the effect of errors like inconsistency and ambiguity

CHAPTER FOUR

4.1 INTRODUCTION:

This trend of illegal dumping is on the rise and is increasingly becoming a problem because it hinder the objective of keeping the environment clean and can have serious impacts on soil and quality of plants produced. Waste generation and disposal is one environmental problem that has been of great concert to local inhabitants, local state and federal government as well as the world in general (Ishoka, 2008; Babayemi & Dauda, 2009).

In developing nations, a great proportion of illegal waste dumped are either in controlled landfills or pen dumps which constitute sources of health risks to surrounding residents. The use of sanitary landfills is not feasible for many waste management authorities of most countries due to cost constraints.

The cities of third world counties are growing at very rapid rates compared to this in the developed nations. For example, a UN-habitat report observed that Africa is the fattest urbanizing continent having cities like Cairo, Lagos, Nairobi Kinshasa among others growing at fast rates that would make them triple current sizes by the year 2050. The increasing growth of cities, therefore, has implication for municipal waste management among other social services required in the urban communities. Data from many of the cities shows inadequacy in urban social services like shelter, provision of safe drinking water and efficient management of waste. The cities are therefore littered with "mountains" of rubbish in landfills and open (in most cases illegal) waste dumps which are covered with flies and thus serve as breeding grounds for rodents and mosquitoes which are carries of diseases.

4.2 RESULT FOR IDENTIFICATION OF EFFECTS OF DUMPSITE CONTAMINANT ON SOIL

Illegal dumped materials contain toxic substances, sharp objects, white goods nappies, contaminated medical waste asbestos and tires just to mention a few. Illicit open of dumping of waste comes with great health consequences due to the fact that dumpsites provide substrate for breeding feeding and habitation of pathogenic organisms and vectors of public health importance. Oyekan and Salmon (2015) reported that insects and vectors that transmit major diseases of public health are usually found in dumpsites. These vectors include but not in limited to flies, mosquitoes, and rodents Onibiokan. H.(2000).

For instance, the breeding of this is decomposing of organic waste, while mosquitoes are encouraged by piles of refuse like car tyres, empty cans etc. these vectors play vital role in

the transmission diseases of public health importance like plague, amoebic dysentery rate bite fever, lass fever etc (Barina 2003, Adamu et al 2014).

Vegetation grown in contaminated soil have the ability to bio accumulate toxic heavy metals in their tissues which pose potential health risks as they could bio-magnify in the consumer's tissue.

Airborne pollutants and noxious gases produced from refuse dumps contribute to the increase in pulmonary diseases among the population near dumpsite (Ayotamuno & Gobo 2004) A critical review of the north America literature indicated that headaches wheezing sleepiness narcotic symptom and mood disorders occur among residents hiring proximal to a landfill Croen, (1998).

According to Yakowitz.H.(1998), illness often associated with living near dumpsites typically include a wide range of health problems such as respiratory symptoms irritation of skin, nose, and eyes, gastrointestinal problems; fatigues, headaches psychological disorders and allergies

TABLE 4.1. RESULTS FOR IDENTIFICATION OF EFFECTS OF DUMPSITE CONTAMINANTS ON SOIL

S/N	AUTHOR YEAR	LOCATION	EFFECT FOUND
1.	Magaji J.Y 2012	Gombe	Bio-magnification cattle due to Absorption via grazing
2.	Owoeye I.O & Okojie O.H 2013	Niger Delta Region	Lower soil fertility manifestation as lower crop yield
3.	Onifade A.O & Nwabotu F.A. Sept. 2014	Ilorin South Local Govt. Area Kwara State	Soil contamination with heavy metals and eventual run off & contamination of river

4.3 RESULTS FOR IDENTIFICATION OF EFFECTS OF DUMPSITE CONTAMINANT ON PLANT

This study shows that the concentration of heavy metals in all the samples cultivated around the dumpsite are higher than those from the control site and they are also above the FEPA limit except Iron and Zinc in spinach that is within the limit. Salinity and silver limits were not mentioned. Though the differences is not much, but it should be noted that heavy metals

in the body are bio-cumulative and become toxic when they are not metabolized by the body and accumulate in the soft tissues gradually over time.

Eating food with very high levels of cadmium increases salivation severely irritates the Stomach leading to vomiting and diarrhea. Long term exposure to lower levels of cadmium in food leads to a buildup of cadmium in the kidneys and possible kidney disease. Other potential long term effects are lung damage and fragile bones, abdominal pain, choking and tenseness'.

Animals given cadmium in food show high blood pressure, iron –poor blood, liver disease and nerve or brain damage. The department of health and human services (DHHS) has determined that cadmium and cadmium compounds may reasonably be antic pated to be carcinogens.

Zinc is an essential element in our diet. Too little zinc can cause health problems but too much zinc is also harmful. Result revealed that zinc level exceed the safety level it implies that adequate measures have to be put in place.

Exposures to high levels of metallic inorganic or organic mercury can permanently damage the brain, kidneys and developing fetus effects on brain functioning result in irritability shyness, tremors, changes in vision or hearing, and memory problems. Research has shown by occupational safety and health administration (OSHA), that exposure to methyl mercury is worse for young children than for adults because more of it passes into children's brains where it interferes with normal development.

Table 4.2 Results for identification of effects of dumpsite contaminant on plant

S/N	AUTHOR YEAR	LOCATION	EFFECT FOUND
1	Owoeye I.O. & Okojie O.H. 2013	Niger Delta Region	Contaminated vegetables exposures to high levels of metallic inorganic or organic mercury.
2	Onifade O.A(2014)	Lagos	Zinc level is highly contaminated and too much zinc is harmful

4.4 AWARENESS ON DANGERS AND HEALTH IMPLICATIONS OF ILLEGAL REFUSE DUMP SITES.

Illegal waste dump damage the environment and ultimately to the human body system. It has both direct and indirect effects. The direct health effects arise from excessive breeding of vermin and agents of disease such as rats, flies and mosquitoes. Rat are known to transmit

diseases such as leptospirosis, lassa fever and some other hemorrhaging fevers, salmonellosis, and plague. Flies are implicated in transmission of diarrhea diseases such as shigellosis while mosquitoes are well known for transmission of malaria.

Apart from infections diseases, illegal disposal of refuse will also result to leachate and contamination of groundwater and this can result in poisoning of boreholes. Leachate is the liquid that forms as water tricks through contaminated areas. It is a very harmful mixture of chemicals that may result to hazardous substances entering surface water, groundwater or soil. It can cause injuries e.g from broken bottles, rusted metal objects etc resulting in cut, slippery constituents resulting in fall. Refuse also generates methane gas which is highly inflammable and is therefore a fire hazard. Waste that ends up in water bodies negatively change the chemical composition of the water. Technically, this is water pollution. This will affect all ecosystems existing in the water. Hazardous chemicals that get into the soil(contaminants) can harm plants when they take up the contamination through their roots. If humans eat plants and animals that have been in contact with such polluted soil, there can be negative impact on their health which as a result can cause diseases or even death

The bottom line is that bad waste management practice can result in land and air pollution and can cause respiratory problems and other adverse health effects as contaminants are absorbed from the lungs into other parts of the body. Food waste can be unsightly, unsanitary and smell, it can lead to diseases and epidemic if not disposed off properly. Skin diseases, eye problems, diarrhea, typhoid, scabies, cholera, intestinal parasites are only some health risk that are created by the unsanitary disposal of waste.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

The present investigation revealed the presence of various heavy metals known to be associated with waste dumpsite soil. It was also discovered that illegal dumping of refuse in the society has several implications on individuals and the society. These implications ranges from its negative effects on individuals health, environment and also on economical status of the society.

Illegal dumping of refuse cause infections disease among people, contamination of food water, air pollution, and chemicals illegally disposed this causing harm to people. It also serves as breeding sight for diseases vectors illegal dumping of refuse causes environmental degradation soil pollution creates harmful soil that is bad for crops production environmental mess and poor environmental hygiene.

This study has further show that health hazard that indiscriminate dumping of waste around residential and commercial areas could pose residents and other ecological sensitive areas such as soil, rivers and streams.

The soil around dumpsites serves as reservoirs of pathogens consequently, it can be interested from these findings that pathogenic microbes in these soil can be lurched to contaminate ground, vegetables and crops meant for human and animal consumption.

5.2. RECOMMENDATIONS

Based on the findings from this study the following recommendations are made.

- Indiscriminate disposal of waste on dumpsite should be discouraged through awareness campaign. It is essential that the farmers be educated and encouraged to reduce such contamination by controlled use of pesticides waste not using waste water and cultivating in a field far away from waste dump areas.
- The use natural manure and compost should be encouraged among the farmers because they are harmless.,
- It is suggested that regular monitoring regarding the heavy metal contamination should be encouraged as vegetables are the main sources of food in Nigerian urban area to avoid possible consumption of contaminated vegetables food stuffs.
- The government agencies responsible for the enforcement of laws should redouble their efforts towards control of indiscriminate dumping.

- Private sector participation should be encouraged to compliment government effort. This could be achieved by sensitizing the general public to pay for the services rendered.
- Waste should be sorted and treated before disposal to minimized the health hazards associated with dumping of waste.

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