



Sudan University of Science and Technology
College of Graduate Studies



Title:

**Impact of Waste on Environment in Ombada Locality, Khartoum
State, Sudan**

أثر النفايات على البيئة في محلية أمبدة ، ولاية الخرطوم,السودان

**A Thesis submitted for partial fulfillment of the requirement for the
degree of (M.Sc.) in Environmental Forestry**

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Dedication

- To the spirit of my father (God rest his soul) and the first teachers, teacher Bushra Hamed Jadallah,
- Dear to my heart to my mother, the teacher Samira Ibrahim Zayed
- To loved ones spirit brothers and sisters,
- To each of the morally encouraged me and stood beside me.

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ABSTRAT

In Ombada locality there accumulation of waste problems exist largely in several different places, such as in front of the houses, in front of the shops, in markets, in public and secondary roads, in the fields of football, inside the empty spaces of the houses, also accumulate waste inside the Lagoons, next to and inside the sewer drain rainwater. The research aims to determine the effect of the accumulation of waste on the surrounding environment such as vegetation cover, air, water and soil, and human health. The methodology of research is based on the following: The field visit, Measurement of vegetation, a questionnaire and visual observations, Previous research and related studies. Simple statistical analysis of the data obtained several results and the most important:74% of respondents said that there is a backlog of waste in the landfill and other places than the landfill, as follows: Within residential neighborhoods, main and branch roads , drilling and sewage discharge water fall, on the outskirts of residential neighborhoods, in markets in front of shops, workshops, and near creeks. 58% of respondents confirmed that waste affects the tree cover are: reduces growth process, hinders the photosynthesis process, affect the flowering and seed production process, The accumulation of waste affect on trees and affect the morphology of trees , this will lead also to fires and the destruction of various plants outbreak. .The study recommended that the household must sorting the waste even easier for workers waste transported to landfill final disposal properly and local authority is responsible for waste collection and disposal to intensify hygiene campaigns and the number of times the transfer of waste from residential neighborhoods and roads in the month.

المخلص

في محلية أمبدة تتراكم النفايات بصورة كبيرة أمام المنازل وأمام المحلات التجارية وداخل الأسواق وفي الطرق العامة والفرعية وداخل ميادين كرة القدم وداخل المساحات الخالية من المنازل داخل الأحياء وأيضاً تتراكم النفايات داخل الخيران وداخل مجاري تصريف مياه الأمطار . يهدف هذا البحث إلى معرفة تأثير النفايات على عوامل البيئة المحيطة بالإنسان من هواء وماء وتربة ونبات وعلى صحة الإنسان نفسه , وللحصول على النتائج النهائية استخدمت عدة طرق هي : الزيارات الحقلية،الدراسات السابقة،الملاحظات، قياس وحصر الغطاء النباتي والاستبيان . وبعد تحليل البيانات تحليل إحصائي بسيط تحصلت على عدة نتائج أهمها: 74% من المبحوثين أكدوا أن هناك نفايات متراكمة في أماكن أخرى غير منطقة المكب النهائي مثل الأحياء السكنية وفي المساحات الخالية من المنازل، الطرق الرئيسية والفرعية , مجاري تصريف مياه الأمطار وداخل الأسواق،بالقرب من الخيران وداخلها. 52% من المبحوثين ذكروا أن النفايات تؤثر على الغطاء الشجري بعدة طرق هي: تقليل عملية النمو ، تؤثر في عملية التمثيل الضوئي،تؤثر في عملية الإزهار وإنتاج البذور وتراكم النفايات يؤدي أيضا إلى دفن الأشجار واندلاع الحرائق وتدمير الغطاء النباتي. أوصت هذه الدراسة بأنه يجب على المواطنين فرز النفايات حتى يسهل لعمال النظافة نقلها إلى المكب النهائي وبصورة جيدة والسلطات المحلية هي المسؤولة عن جمع ونقل النفايات إلى الأماكن المخصصة لها وعن عدد مرات نقل النفايات من الأحياء السكنية والطرق الرئيسية خلال الشهر.

TABLE OF CONTENTS

No.	CONTENTS	page
	Dedication	I
	Acknowledgements	II
	Abstract	III
	Abstract in Arabic	V
	Table of Contents	IX
	List of Tables	XII
	List of Figures	XIV
CHAPTER ONE Introduction		
1.1	Background	1
1.2	Location of study area	2
1.3	Climatic conditions	3
1.4	The geographical expansion of Greater Khartoum	4
1.5	Location of landfill	4
1.6	Area and population	5
1.7	Vegetation	5
1.8	Research problem	5
1.9	Research objectives	7
CHAPTER TWO - Literature Review		
2.1	Scope of waste	8
2.2	Types of waste	8
2.3	Environmental impacts of waste	9
2.4	Recycling of waste	11
2.5	Benefits of recycling	12
2.6	Waste round the world	13
CHAPTER THREE. Materials and methods		
3.1	The field visit	26

3.2	Measurement of vegetation	26
3.3	A questionnaire	26
3.4	Interview the relevant actors	27
3.5	Visual observations	27
3.6	Previous research and related studies	27
3.7	Research Questions	27
3.8	Data analysis	28
CHAPTER FOUR . Results and Discussion		
4.1	Vegetation measurement on 2016	29
4.2	Socio-economic aspects	31
4.3	Types of accumulated waste	33
4.3	Reasons for the accumulation of waste	34
4.4	Situation of natural forests in the study area in the past/ present	37
4.5	Deportation of wastes	38
4.6	Types of trees, shrubs and grasses in the landfill area	38
4.7	Impact of wastes on the environment	40
4.8	Impact of wastes on vegetation	40
4.9	impact of the landfill on the soil	43
4.10	impact of the landfill on the water	45
4.11	The impact of the landfill on the air	46
4.12	impact of the landfill on human	48
4.13	The impact of the landfill on the animals	49
4.14	Impact of the landfill on the landscape	50
4.15	Role of environmental health in the waste disposal	51
4.16	Get rid of wastes in the future	52
4.17	Observations	53
CHAPTER FIVE. Conclusion and Recommendations		
5.1	Conclusion	59

5.2	Recommendations	60
5.3	References	61
5.4	Appendixes	63

LIST OF TABLES

No.	Tables	page
(1)	Type of trees in the landfill	29
(2)	Number of shrubs in the landfill	30
(3)	Type of grasses found in the landfill	30
(4)	Type of Respondents	31
(5)	Age of respondents	31
(6)	Profession of respondents	32
(7)	Educational level	32
(8)	Accumulation of waste in the landfill and other places	33
(9)	Means of waste collection is currently available	35
(10)	Times of deportation of wastes to the landfill month	36
(11)	Natural forest in the past	37
(12)	Natural forests at present	37
(13)	Deportation of wastes by lagoons from the landfill	38
(14)	Type of trees	38
(15)	The type of shrubs	39
(16)	The type of grasses	39
(17)	Impact of wastes on vegetation	40
(18)	Impact of the landfill on the soil	43
(19)	Impact of the landfill on the water	45
(20)	The impact of the landfill on the air	46
(21)	The impact of waste on human health	48

(22)	Impact of waste on animals	49
(23)	The impact of the landfill on the landscape	50
(24)	Role of environmental health on waste disposal	51

LIST OF PLATES

No.	Plates	page
1	Solid waste accumulated in the road nearby the population settlement (2016)	6
2	Solid waste accumulated in the stream carried by rainy water (2016).	6
3	Accumulation of waste covered the vegetation(2016),	41
4	Waste buried vegetation in landfill (2016).	42
5	Contamination of the ground surface by wastes in landfill area.	44
6	Remaining of ash after burning the waste,	47
7	Waste accumulated in the main roads in Ombada locality.	55
8	Accumulated waste next to homes	56
9	Accumulated waste within residential neighborhoods -	56
10	Waste near a small shop inside the neighborhood	58

LIST OF MAP

No	Map	Page
1	Location of study area (Ombada Locality)	4

LIST OF ACRONYMS

NO	ACRONYMS	Page
1	(MSW) .management of solid waste	1
2	(USAID) .Environmental Guidelines for Small-Scale Activities in Africa.	9
3	(PVCs) . Combustion of polyvinyl chlorides	10
4	(UEPA). United environmental protection agency	13
5	(EAA). Environmental Affairs Agency	16
6	(SWEEP-Net). the Regional Solid Waste Exchange of Information and Expertise Network	16
7	(METAP). Mediterranean Environmental Technical Assistance Program	17
8	(SPSS). Social Pakage of Scientific System	28

CHAPRER ONE

INTRODUCTION

1.1 Background

Improper management of solid waste (MSW) disposal causes all types of pollution: air, soil, and water. In discriminated dumping of wastes contaminates surface of the soil and ground water supplies. In urban areas, MSW clogs drains, creating stagnant water for insect breeding and floods during rainy seasons. Uncontrolled burning of MSW and improper incineration contributes significantly to urban air pollution. Greenhouse gases are generated from the decomposition of organic wastes in landfills, and untreated leach ate pollutes surrounding soil and water bodies. Health and safety issues also arise from improper MSW. Insects and rodents vectors are attracted to the waste and can spread diseases such as Cholera and Dengue fever. Using water polluted by MSW for bathing, food irrigation and drinking water can also expose individuals to disease organisms and other contaminants (Pervez and Kafeel, 2013). The United States Public Health Service identified 22 human diseases that are linked to improper MSW. Waste workers and pickers in developing countries are seldom protected from direct contact and injury, and the co-disposal of hazardous and medical wastes with MSW poses serious health threat. Exhaust fumes from waste collection vehicles, dust stemming from disposal practices and the open burning of waste also contribute to overall health problems (Pervez, and Kafeel ,2013). About 5000 tons of waste a day is generated in Khartoum State by six million people (Nagat, 2015).

But only 65% is collected by the authorities. most uncollected rubbish ends up being burned by people fed up with it accumulating in front of their houses. There is no recycling system in Sudan, except among some

food factories. Most people have cleaned houses but they doesn't care about the streets, and keeping their work places tidy. Accumulating waste and garbage in Khartoum State is estimated at 4200 tons per day, stressing that 60 percent of this accumulated waste is a result of misconduct. Collection of such huge waste is far beyond the financial and technical ability of the cleaning service department in Khartoum State (Nagat, 2015).

The uncontrolled burning of accumulated wastes creates smoke and other air pollutants which release toxic substances in the environment (Fangama, 2016). Bad waste management practices can result in land and air pollution and cause respiratory problems and other adverse health effects as contamination are absorbed from the lungs into other parts of the body (Fangama, 2016)

1.2 Location of study area

Greater Khartoum is located between Latitudes 15°26' and 5°45' N and Longitudes 32° 25 ' and 32° 40' E, an altitude of 405.6 meters above sea level. The terrain is generally flat or gently sloping, only interrupted by occasional hills of rocky outcrops while sand dunes provide a gently undulating topography. (Encyclopedia, 2016).

This flat landscape is also broken by the floors and terraces of the Nile valleys and wadis. The White Nile has a much lower gradient than the Blue Nile and consequently its terraces rise far more gently . The hydrological system, although dominated by the three Niles, possesses local drainage systems of ephemeral khors and wadis (dry riverbeds) which flow following the occasional rainstorms and which are more prominent west than east of the Niles. Some of those in the west manage to reach the Nile while in the east they are disorganised, little more than broad washes and most of them fail to reach the rivers because the terrain is more gently sloping and covered by sand formations. At the heart of

Greater Khartoum lies Tuti Island, formed of depositional silt, clay and sand (Galal Aldin ,2011).

The soil is shallow alluvial soil by the proportions of gravel, sand and stone in the western regions of South and West. The desert soil is dry it out a few of soil organic matter are found in the western parts of the locality (Encyclopedia, 2016).

1.3 Climatic conditions

The main climatic conditions of Greater Khartoum are conditioned by its location on the Southern fringes of the Sahara. The city experiences four climatic seasons The winter season extends from mid-November to March, with clear skies, cool and dry air from the North-east, a minimum temperature ranging between 8°C and 10°C which falls to 5°C during night, and maximum temperatures varying from 23°C to 25°C, and a relative humidity which may sometime be as low as 20 per cent. The hot, dry summer season is well in place by the end of March. The maximum temperatures may exceed to 45°C by the end of May. Weather instability is indicated by the recurrence of dust storms. The rainy season covers the period from July to September, with August being the rainiest month. Generally, annual rainfall ranges between 110 and 200 mm, but a minimum of only 4 mm was recorded in 1984 and an exceptional maximum of 420 mm in 1988. A short, hot (about 40° C) transitional season occurs between mid- September and the beginning of Winter. This change over season from South-westerly to North-easterly winds is accompanied by dust storms (Galal Aldin ,2011).

Prevail or desert climate in every month of the year is almost with the exception of the months of July and August / August which testify some rainfall. Ombada one of the localities most heat where the temperature exceeds 53 C° in the summer. The annual average high temperatures of

37C° with six months of the year no less than the monthly average temperature of the heat for 38 C° (Encyclopedia, 2016).

1.4 The geographical expansion of Greater Khartoum

The geographical expansion of Greater Khartoum has a generally inverse relationship with population density which was 14583 people / km² in 1955 and 22667 in 1970 but declined to 4815 in 1980 rising slightly to 6013 in 1998. This declining trend is indicative of the large areas progressively occupied, legally as a result of planning, replanning and resettlement programmes, and in an unauthorised way by new migrants and land speculators.



Map (1): Location of study area (Ombada Locality)(Encyclopedia, 2016).

1.5 Location of landfill

Ombada Locality located in North west part of Khartoum State, it is bordered by Omdurman Locality to the East and South, Northern Kordofan State to the West and River Nile State to the North (Dawria, etal, 2016).

1.6 Area and population

Ombada locality is the largest municipal area in Khartoum State, where estimated at around (20.695) square kilometers. This widening geographical space make it one of the most localities densely populated, making it tops the list of State localities in each census conducted. Recently, its population now is more than one million people (Encyclopedia, 2016).

1.7 Vegetation

Based on the division of Sudan into floral regions Omdurman within the desert regions and alum desert so limited natural plants that are perennial plants the cover often from trees *Acacia tortilis*, *Acacia tortilis* sub.sp. *tortilis*, *Ziziphus spini christi* and *Capparis decidua*... etc., in addition to herbs, greenery,.. etc, as well as shade and ornamental trees, upgrading and villages (Encyclopedia, 2016).

1.8 Research problem

In Ombada locality, waste accumulates significantly along the aspects of the main roads and within the streams of rain water draining and at the entrances to major key markets. For example, Libya Market and Baraka (Crore) and sub-markets Minor within neighborhoods and shops on main roads and in neighborhoods and in front of restaurants and cafeterias .Also piling up of waste in the fields of stadiums and in front of the houses too, in the west of the locality, accumulate livestock residues in the livestock markets also , in the North-west of this, piling up poultry farms and feed production waste, as well as medical waste from small medical centers and Ombada hospital. The random open burning of waste emits obnoxious smell, different gases which have impact on the

environment which in turn would affect human, animals and plant life. This effect in the environment of the area such as air, water, soil and sight pollution as well as the nasty smell affected the population (Plates 1 &2).



Plate1: Waste accumulated in the road nearby the population settlement (2016)



Plate2: Waste accumulated in the stream carried by rainy water (2016).

1.9 Research objectives

The main objective of research include the following:

-To know the impact of waste on the surrounding environment such as soil, surface and ground water, rainy water , vegetation and human health.

Sub-(Significance) objectives of research include the following:

- To know the sources and types of waste and the impact of each type on the surrounding environment.

- To know the effect of the accumulation waste on air, water and soil and its impact on human.

- To know the relationship between marginal professions and increase the accumulation of waste.

- To know the relationship between increased pollution by waste and migration to cities.

- To suggest suitable and proper means for collecting and get rid of the solid waste.

CHAPTER TWO

LITTERATURE REVIEW

2.1 Scope of waste

Waste is an unavoidable by-product of most human activity. Economic development and rising living standards in the Asian and Pacific Region have led to increases in the quantity and complexity of generated waste, whilst industrial diversification and the provision of expanded health-care facilities have added substantial quantities of industrial hazardous waste and biomedical waste into the waste stream with potentially severe environmental and human health consequences. (World Bank, 2010) .

2.2 Types of waste

1- Municipal solid waste:

Municipal solid waste (MSW) is generated from households, offices, hotels, shops, schools and other institutions. The major components are food waste paper, plastic, rags, metal and glass, although demolition and construction debris is often include in collected waste, as are small quantities of hazardous waste, such as electric light bulbs, batteries automotive parts and discarded medicines and chemicals. (World Bank, 2010) .

2- Industrial solid waste :

Encompasses a wide range of materials of varying environmental toxicity. Typically this range would include paper, packaging materials waste from food processing, oils, solvents, resins paints and sludges, glass, ceramics, stones, metals plastics, rubber, leather, wood, cloth,

straw, abrasives etc. As with municipal solid waste, the absence of a regularly up-dated and systematic database on industrial solid waste ensures that the exact rates of generation are largely unknown . (World Bank, 2010) .

3- Agricultural Waste and Residues:

Expanding agricultural production has naturally resulted in increased quantities of livestock waste, agricultural crop residues and agro-industrial by-products. (World Bank, 2010) .

4- Hazardous Waste:

With rapid development in agriculture industry, commerce, hospital and health-is consuming significant quantities of toxic chemicals and producing a large amount of hazardous waste. (World Bank, 2010) .

2.3 Environmental impacts of waste

- Increase disease transmission or otherwise threaten public health: Rotting organic materials pose great public health risks, including, serving as breeding grounds for disease vectors. Waste handlers and waste pickers are especially vulnerable and may also become vectors, contracting and transmitting diseases when human or animal excreta or medical wastes are in the waste stream .Risks of poisoning, cancer, birth defects, and other ailments are also high (USAID,2009).

1- Contaminate ground and surface water:

Municipal solid waste streams can bleed toxic materials and pathogenic organisms into the leachate of dumps and landfills. (Leachate is the liquid discharge of dumps and landfills; it is composed of rotted organic waste, liquid wastes, infiltrated rainwater and extracts of soluble material.) If the

landfill is unlined, this runoff can contaminate ground or surface water, depending on the drainage system and the composition of the underlying soils (USAID, 2009).

2- Create greenhouse gas emissions and other air pollutants:

When organic wastes are disposed of in deep dumps or landfills, they undergo anaerobic degradation and become significant sources of methane, a gas with 21 times the effect of carbon dioxide in trapping heat in the atmosphere. Garbage is often burned in residential areas and in landfills to reduce volume and uncover metals. Burning creates thick smoke that contains carbon monoxide, soot and nitrogen oxides, all of which are hazardous to human health and degrade urban air quality. Combustion of polyvinyl chlorides (PVCs) generates highly carcinogenic dioxins (USAID,2009).

3- Damage ecosystems:

When solid waste is dumped into rivers or streams it can alter aquatic habitats and harm native plants and animals. The high nutrient content in organic wastes can deplete dissolved oxygen in water bodies, denying oxygen to fish and other aquatic life form. Solids can cause sedimentation and change stream flow and bottom habitat. Sitting dumps or landfills in sensitive ecosystems may destroy or significantly damage these valuable natural resources and the services they provide (USAID, 2009).

4- Injure people and property :

In locations where shantytowns or slums exist near open dumps or near badly designed or operated landfills, landslides or fires can destroy homes and injure or kill residents. The accumulation of waste along streets may

present physical hazards, clog drains and cause localized flooding (USAID,2009).

5- Discourages tourism and other business:

The unpleasant odor and unattractive appearance of piles of uncollected solid waste along streets and in fields, forests and other natural areas can discourage tourism and the establishment and/or maintenance of businesses (USAID, 2009).

2.4 Recycling of waste:

Recycling is the process of converting waste materials into new materials and objects. It is an alternative to "conventional" waste disposal that can save material and help lower greenhouse gas emissions (compared to plastic production, for example). Recycling can prevent the waste of potentially useful materials and reduce the consumption of fresh raw materials, thereby reducing: energy usage, air pollution (from incineration), and water pollution (from landfilling). Encyclopedia (2016). Recycling is a key component of modern waste reduction and is the third component of the "Reduce, Reuse, and Recycle" waste hierarchy. Recyclable materials include many kinds of glass, paper, and cardboard, metal, plastic, tires, textiles, and electronics. The composting or other reuse of biodegradable waste such as food or garden waste is also considered recycling. Materials to be recycled are either brought to a collection centre or picked up from the curbside, then sorted, cleaned, and reprocessed into new materials destined for manufacturing. Encyclopedia (2016).

2.5 Benefits of recycling:

1- Recycling saves raw materials:

Recycling reduces the need for raw materials such as metals, forests and oil and so reduces our impact on the environment. .(Friends of the Earth.2008)

2- Recycling reduces our impact on climate change:

Although recycling uses energy, overall it reduces climate emissions, as recycling a material generally uses far less energy than manufacturing from virgin materials.(Friends of the Earth.2008)

3- Recycling costs less:

The costs of different waste management techniques are subject to many variables making it difficult to distinguish between them in purely economic terms . However, when comparing landfill, incineration and recycling, recycling has considerable economic merit.(Friends of the Earth.2008)

4- Recycling generates cash:

After collection, recyclables are separated and baled at materials recycling facilities and sent to re processors such as paper mills, glass works or plastic reprocessing plants where the waste is processed for use in new products. Although it costs local authorities money to collect recycling, the materials generate income when recycled and sold. This money can be fed back into the waste collection budget.(Friends of the Earth.2008)

5- Recycling creates jobs:

The process of recycling and composting, from kerbside collection to the sorting and reprocessing of recyclables, creates more jobs than incineration and landfill. There is still a huge potential for growth in the reprocessing sector, particularly in areas with strong manufacturing industry.(Friends of the Earth.2008)

6- Recycling helps us toward sustainable living:

For householders, recycling is one of the easiest ways they can reduce their impact on the environment and it is often the first such action they take. It introduces a “green” consciousness to daily life. Making people think about the impact of their consumption and production of waste can help to encourage us to make lifestyle decisions to reduce the waste we create and our impact on the environment. Recycling also creates a cyclic way of living rather than the current linear model, and this change is essential for reducing our impact on the environment as a whole, and will help us develop sustainably.(Friends of the Earth.2008).

2.6 Waste round the world

Waste in America:

Over the last few decades, the generation, recycling, composting and disposal of MSW changed substantially. Solid waste generation per person per day peaked in 2000. The 4.4 pounds per person per day in 2013 is about the same as in 2012, and is one of the lowest rates since 1980. The recycling rate has increased from less than 10 percent of generated MSW in 1980 to over 34 percent in 2013. Disposal of generated waste in landfills decreased from 89 percent in 1980 to under 53 percent in 2013 (UEPA, 2013).The sources of MSW include residential waste (including waste from apartment houses) and waste from commercial and institutional locations, such as businesses.

Analyzing of MSW:

EPA analyzes waste by material, such as plastics, or paper and paperboard, as well as by major product categories, which include durable goods (such as furniture), nondurable goods (such as paper or clothing), containers and packaging (such as milk cartons and plastic

clothing), Total MSW generation in 2013 was 254.1 million tons. Organic materials such as paper and paperboard, yard trimmings and food continue to be the largest component of MSW (UEPA, 2013).

Paper and paperboard account for 27 percent, and yard trimmings and food account for another 28.1 percent. Plastics comprise about 13 percent of MSW; metals make up 9 percent; and rubber, leather and textiles account for another 9 percent. Wood follows at over 6 percent and glass at almost 5 percent. Other miscellaneous wastes make up approximately 3 percent of the MSW generated in 2013. Total MSW recovery in 2013 was over 87 million tons. In 2013, paper and paperboard accounted for about 50 percent, and yard trimmings accounted for over 23 percent, while food accounted for another 2 percent. Metals comprised 9 percent, glass about 4 percent and plastic and wood about 3 percent each. Other miscellaneous materials made up about 6 percent of MSW recovery. After MSW recovery through recycling and composting, Americans discarded almost 167 million tons of MSW in Food was the largest component of discards at 21 percent. (UEPA, 2013).

Wastes in the Arab Countries:

Population increase, economic progress, expansion in urban areas, rapid industrial development, and rising standard of living have all contributed to a sharp rise in solid waste generation in most Arab countries. It is estimated that the municipal solid waste generation rates in Arab Gulf states have increased from 4.5 million tons per year in 1970 to a staggering 25 million tons in 1995 (Farag, 2005).

The annual rate of municipal solid waste increase is about 3.3 percent, which is on average equivalent to that of population increase. These figures, however, can be underestimated indeed, since there are no

reliable statistics on actual amount of waste produced in many countries of the region. A quick prediction of the amounts of municipal solid wastes generated in the Arab Region in the year 2020 shows that this figure can simply exceed 200 million tons per year (Farag, 2005).

One can notice that 80 percent of the total municipal solid wastes in the Arab Region are decomposable and recyclable, and the remaining is inert matter. On average in the region, approximately 50 to 60% of municipal solid wastes are organic, and about 10% paper, 7% plastic, 4% glass, 4% metals, and 4% textiles. In many countries up to 50 percent of the waste generated may be left uncollected. Primitive methods of disposal are still practiced in the region, including open dumping and burning in open air, as well as mixing of municipal with medical and industrial wastes when disposed off. Often hazardous wastes may intermingle with municipal wastes during with handling and disposal. (Farag,2005). Problems related to old landfill site contamination residential areas intrusions, and sequential remediation and rehabilitation efforts are rising in several countries. The integrated waste management strategy (i.e., from cradle-to-grave) with its universal hierarchy has been introduced recently in several countries as well. Modern collection, treatment and disposal systems have started to be employed in the region, such as vehicle collection and sorting, composting, incineration of medical wastes, and sanitary landfilling. (Farag,2005).

Recycling, reuse and recovery are still at infancy stages, nonetheless are gaining popularity . Due to poverty, scavenging still exists in some areas, providing recycling and unintended environmental benefits among economic earnings. In the Arabian Gulf sub-region, waste collection and disposal are highly efficient, and, sanitary landfills are widely used. The high content of organic matters in municipal waste triggered the interest

in composting, thus several composting plants have been established and are already in operation producing compost -fertilizing materials and soil conditioners .(Farag, 2005).

The municipality manages for instance in Doha-Qatar, a large composting plant since the eighties. Some fractions of the waste, e.g., aluminum, paper, glass and plastics are collected and recycled in small recycling plants scattered in the region, that are mainly operated by the private sector (Farag, 2005).

Wastes in Egypt:

MSW Generation in Egypt:

Environmental Affairs Agency (EAA) estimated the generation of Egyptian MSW with 0.3 to 0.8 kg/day/capita, with an annual growth of 3.4%. In addition, there is 6.2 million tons/year industrial waste including 0.2 million ton of hazardous waste and 23 million ton/year of agricultural waste. The country report on the solid waste management in July 2010, which has been prepared for the Regional Solid Waste Exchange of Information and Expertise Network in Mashreq and Maghreb Countries (SWEEP-Net), stated that Egypt is the second most populous country in Africa, with 78.2 million inhabitants (May 2010), with the majority of them residing along the Nile Valley and Delta. The urban population comprises 43% of the total population. According to the country report of 2010, the total annual MSW generation in Egypt has increased more than 36% since 2000, to the current level (2010) of 20.5 million tonnes per year. (Mohamed, 2015).

The estimated breakdown of MSW generation at the different regions is as follows: Upper Egypt 10%, Canal & Sinai 5%, Delta 31%, Greater Cairo 47%, Alexandria & Matruh 7%. (Mohamed, 2015).

MSW Performance in Egypt:

A study that has been done through Mediterranean Environmental Technical Assistance Program (METAP) in Egypt resulted that MSW collection covers 0–35% in rural areas and 40–95% in urban areas. Out of 8 landfills, there are only 5 in operation and 3 are under construction. There is one unit for treating hazardous industrial waste. One ton of MSW costs from collection till disposal approximately 100 to 110 LE in Cairo and Alexandria, and less than 60 LE in the other govern rates. The average cost recovery is around 70 LE/tonne and the total cost recovery is about 200 million LE/year. The selling price per ton of sorted waste depends on the waste type. (Mohamed, 2015).

Some of the organic fraction is generally used to feed the household's feedstock in the rural areas. The non-usable fraction is dumped in empty land, along roads, irrigation and water course. A few municipalities in some villages use trucks and tractors to collect municipal solid waste, which is dumped in open dump sites, where it is burned to reduce its volume, or left to be rotten naturally . MSW Final destination is 9% composted, 2.5% recycled, 5% land filled and 83.5% open dumped. Country report of 2010 included that MSW in Egypt contains about 85% easy recyclable materials such as organics, glass, metals and paper and the rest of 15% (others) must be specified in order to be able treating them in a proper way. Paper, glass, metals are collected and separated from the source and sent to factories for recycling. The main portion of the Egyptian MSW here is the organic waste which forms about 56% of the total MSW (12.88×10^6 tonnes). (Mohamed, 2015).

Recycled organic waste does not exceed 20%, so there is an urgent need to manage the rest of organic waste otherwise this will serious

environmental and public health problems. In fact, the improper disposal of solid waste in opened dump sites, waterways and drains has led to the contamination of water supplies which hinders Egypt's natural resources, heritage, and the health and welfare of its people. The waste generation is projected to exceed 30 million tons annually by 2025. The performance of recycled organic waste does not exceed 20% despite of the large number of 66 composting plants. Egyptian MSW is characterized by its high organic content of about 56%, paper of 10%, plastics of 13%, glass of 4%, metals of 2% and other materials of approximately 15%. Although the Egyptian government commenced several initiatives to develop the waste management sector with the start of the new millennium, their efforts resulted in little improvement. Less than 65% of that waste is managed by some form of public or private sector collection, disposal or recycling operation. The remainder accumulates on city streets and at illegal dumping sites. Physical and chemical characteristics are determined according to the waste and the place of generation such as paper, textiles, plastic, glass, food residues, rubber, metal, etc. Moreover, the management of this waste remains, for the most part, both inefficient and inadequate. (Mohamed, 2015) .

Problems of disposal of solid waste in Ethiopia:

The major problems associated with the disposal site are:

- The site is getting full.
- Surrounded by housing areas and institutions.
- Nuisance and health hazard for people living nearby.
- More than 200 - 300 waste pickers per day, work continuously and obviously living nearby the site and interfering the operation of the work

for collection of salvageable materials such as wood, scrap metals and discarded food.

- No daily cover with soil.
- No leachate containment or treatment.
- No rainwater drain-off.
- No odor or vector control.
- No fence.
- No weigh bridge, inaccurate weighing of waste.
- Community participation Sanitation activities-Campaigns Supply of dust bins Willingness to pay Associations- Addis Ababa Clean initiative.
- Developing transfer stations and new sanitary landfill (Matthew, 2010).

Collection of solid waste in Ethiopia

The Municipality Spends large proportion of its budget on collection, transport, and disposal of solid waste. Solid waste collection services divided in to two sub-systems:

primary and secondary collection . Primary collection is done by micro and small. Enterprises . Payment is Volume based rate (30 birr Per m³) Residents are divided in two Zones. One Zone constitutes 800-1000 residents. In each zone one MSE is assigned to work. The city is divided into 549 zones each zone comprising 800-1000 households. The number of enterprises organized to work on solid waste collection is 520 with a total number of 5815 operators. Most residents are willing to cooperate with the government in financing SWM (Matthew, 2010).

Separation, reuse and recycling

Sorting of waste takes place at various levels in the waste management process:

- The first level of source separation is at household plastic materials, glass, bottles, are considered as valuable and usually sorted out for reuse
- Several collectors represent the second stage: Street boys, private sector enterprises, scavengers at municipal landfill, and the korales
- Recyclable materials include: metal, wood, tyres electricity products, old shoes and plastic.
- The municipality role in recycling is absent and mainly focus on collection, storage transportation and disposal of solid waste.
- Most of the collection of recyclable wastes in the city is performed by the informal sector
- Recyclable materials are used by local plastic shoe, and metal factories. (Matthew, 2010).

Transport and disposal

- Municipality transports from garbage containers (Secondary collection) to the final dumping site.
- The highest level in the transportation system is represented by municipality.
- The role of private sector on transportation of solid waste is highly limited (Matthew, 2010).

waste in certain areas in the Sudan

In the best third world countries, the responsible authorities cannot remove more than a third or a quarter of the daily quantity generated

because of the work force and economic cost. Solid waste is considered in Sudan as a major concern and that the lack of an effective and clear system for the disposal of solid and hazardous waste in a safe manner as not to cause any pollution to the surrounding environment as there is no system to benefit from the re-use of some waste such as organic waste, plastic, iron, paper and others. Estimated solid waste generated at the country level, including more than 5. 282 million tons per year, only 10% of this waste is being transported, and even this small percentage that are taken are not subject to the safe handling. So, it has become a big concern and the damage it caused, the state has recently focused on that and there are signs of good in all of Khartoum state and some other states(like Gedaref), some prospects here and there in the state capitals in regard to the allocation of budgets and opening the door for investment.

In Almatama locality, it's not much different from the waste accumulation in the cities and that solid waste management is one of the challenges facing local officials. The locality departments practice conventional methods for a long time in solid waste management, in which the lack of scientific methodology is prevailing (Nagat,2015).

Dumping of waste hazardous in the Sudan:

The disposal of medicinal waste represents a major environmental threat to urban communities in the country as adequate facilities to handle such waste is lacking in most urban centers. (Abdella and Donald ,2009).

Solid wastes:

Until recently the country has had no experience in solid waste management. In 2002 Khartoum State established the Khartoum Cleaning

Project, a solid waste-management programme. House-to-house domestic refuse collection and commercial and industrial waste-container collection has been introduced. Use is made of press-pack refuse compactors, dump trucks and hook-lift trucks to transport refuse and waste to a dump site or to transfer stations from where it is taken by long semi-trailers to a landfill site (Abdella and Donald ,2009).

Waste in Khartoum state

Khartoum is one of the densely populated cities as a population is now about 6 millions. So, the domestic solid waste management has become one of the challenges facing localities officials. These localities, since mid last century and until the end of it, performed the domestic solid waste management by traditional methods with a lack of resources and lack of scientific methodology till a 2001 decision of the governor of the state of Khartoum to form the State-level higher committee to develop a plan for the management of domestic solid waste, as a result, the project of Khartoum State sanitation came being. There is an effort exerted by the different sectors (Administrative divisions that it`s established by Cleaning Project) in Greater Khartoum to collect and transport wastes to final disposal through landfill. Reports from various sectors in greater Khartoum showed that the daily production of solid waste is equivalent to 50. 550 ton that wholly collected and transported in quantities without being sorted for use by recycling for the production of organic fertilizer, and there are also some negative environmental and health phenomena that occur from time to time, such as reproduction of flies and the incidence of watery diarrhea and overstock of domestic waste in certain areas,)some main streets and streets and markets and some service and demographic complexes etc.). (Nagat,2015).

This poses a question about the effectiveness of domestic solid waste carried out by the various sectors since the establishment of the project in 2001 until the beginning of 2007 in terms of the combination 91 deportation and the treatment and final secure disposal of domestic solid waste in accordance with environmental requirement of the project in 2001 until the beginning of 2007 in terms of the combination, 91 deportation and the treatment and final secure disposal of domestic solid waste in accordance with environmental requirements. (Nagat,2015).

waste In Port Sudan:

The case of Port Sudan illustrates the solid waste management problems that exist throughout the country. The city has several uncontrolled waste disposal sites on its fringes. The largest by far is located along the banks of a broad *wadi*, approximately six kilometers from the city center. The boundaries of the site are difficult to determine, as open dumping takes place along the access routes and in vacant and common land. In total it is estimated not less than 5Km² are covered with a layer of mixed waste ranging from 0.1 to 1m in thickness. The site is virtually uncontrolled and presents obvious health and environmental hazards. Waste is burned or sorted by resident group of waste scavengers who live in terrible conditions on sites. Animal observed feeding on the waste including dogs, goat and camels. The types of waste dumped on site include clinical waste (syringes, catheters, blood packs, drugs and bandages), plastic and papers, drums and other metal scraps, abattoirs, and food wastes, and septic tanks solid and liquids. (PERSGA) Coastal Zone .June – 2010.)

Landfill and Waste Dumps in port Sudan:

For the purposes of the toolkit, landfill is a controlled engineered waste storage site where as a dump is a largely dump site contains mixed waste that was disposed of without any pollution prevention devices.

In all cities at Red Sea State disposal sites are unmanaged and can be classified as open disposal sites. Most are close to the residential areas. The passage of water in rainy season through waste cause leachate escaping in uncontrolled manner. (PERSGA) Coastal Zone .June – 2010).

main problems of waste management in port Sudan:

1- Municipal Solid Waste Incineration

No Municipal Solid Waste Incinerators exist in Sudanese Red Sea Coast at present time. Solid wastes are often treated by open burning. (PERSGA) Coastal Zone .June – 2010

2 -Hazardous Waste Incineration

Since there is no hazardous waste management and classification in Sudan Red Sea Costal Area, their management by incineration or any special mean do not exist. (PERSGA) Coastal Zone .June – 2010

3 - Light-Fraction Shredder Waste Incineration

This activity is not practiced in Sudanese Red Sea Coast. Separation of e.g. waste car and refrigerators are usually done manually by hand and the materials are then sold as scrap. (PERSGA) Coastal Zone .June – 2010).

4- Sewage Sludge Incineration

This activity is not practiced in Sudanese Red Sea Coast. In fact there is no sewage system existed in all towns at the coastline. (PERSGA) Coastal Zone .June – 2010

5 -Waste Wood and Waste Biomass Incineration

This activity is not practiced in Sudanese Red Sea Coast. The woods generated from industries mainly furniture are used for cooking.

Wood from construction or demolitions is usually separated and used for cooking or disposed off with municipal solid wastes. (PERSGA) Coastal Zone .June – 2010

6- Animal Carcasses Burning

Animal carcasses rejected from slaughterhouses for health reasons and the remains separated during sloughing process are collected and disposed off with municipal waste. (PERSGA) Coastal Zone .June – 2010

7 - Medical Waste Incineration

The problem of medical waste is well known and of high concern to the local authorities. In Port Sudan there are two main hospitals with capacity of 754 beds and six private hospitals with capacity of 371 beds.

All wastes of these hospitals are disposed off together with domestic wastes. There are no incinerators of any kind exist in these hospitals for medical waste treatment. The Ministry of Health contracted a company to collect medical waste from hospitals and private clinics but finally is mixed with municipal solid waste for disposal. (PERSGA) Coastal Zone .June – 2010).

CHAPTER THREE

MATERIALS AND METHODS

The methodology of research is based on the following:

3.1 The field visit

Field visits conducted on public streets, markets, hospitals, residential neighborhoods and landfill to see the accumulated waste, types of waste present. And the effects that resulted from the accumulation such as gestation disturbance, soil contamination or lock streams of rain water or breeding insects and any attempts by officials or citizens to resolve this issue

3.2 Measurement of vegetation

Measured an area of 100×100 meters (estimated at about one hectare) and then an inventory of plant species within this space, and repeated this way three times in different areas within the landfill and then analyzed the data.

3.3 A questionnaire

Design a questionnaire with several questions directed to the citizens within the study area to answer several questions such as follows:

- What are the types of accumulated waste?
- Are there any accumulated waste inside the home front?
- What are the main reasons that led to the accumulation of waste?
- What are the damages resulting from the accumulation of waste?

- What are the appropriate solutions to solve the problem of waste accumulation definitively?

3.4 Interview the relevant actors

The relevant authorities such as the York and the Department of Environmental Health interview and discuss with them the follows:

- What are the main reasons that led accumulation of waste on public roads and streams of rain water, markets and hospitals?
- What are the necessary measures that need to be made to address this problem?
- What are the problems faced accumulation of waste and environmental sanitation?

3.5 Visual observations

Visual observations were made by considering, in all the places within the study area and to monitor places of waste accumulation within the study area.

3.6 Previous research and related studies

A review of all previous studies conducted in the (accumulation of waste) and its impact on the environment and health in general.

3.7 Research questions

The idea of this research arises from the following:

- Is the waste affect the surrounding environment?.
- What are the expected effects?.
- What are the appropriate solutions for each impact?.

3.8 Data analysis

The data analyzed statistically by using Social Package of Scientific System (SPSS).

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Vegetation measurement on 2016

Vegetation in the landfill area was measured in order to find out the vegetation types, frequency and density. Three samples were chosen for measurement. The area of each sample is one hectare. The results are in the following tables.

4.1.1 Types, frequency and density of trees in the landfill

Table (1): Types, frequency and density of trees in the landfill

Species	Frequency	Percentage%
<i>Ziziphus spini-christi</i>	11	50.00
<i>Balanites aegyptiaca</i>	5	22.70
<i>Acacia tortilis</i>	3	13.60
<i>Acacia tortilis spp tortilis</i>	3	13.60
Total	22	100
Average density/ha	7	

In table (1), the result shows that the frequency of *Ziziphus spini-christi* is very high which is equals to 50% of the total tree species in the area measured. The least frequency is *Acacia tortilis* and *Acacia tortilis spp tortilis* trees in spite of this region is the ecology of the two species. On the other when divided the total trees by three (22/3) equals to about seven trees. Then the density of trees is equals to seven trees per hectare. This indicated that the seedlings and trees are buried by waste or burned before.

4.1.2 Types, frequency and density of shrubs in the landfill

Table (2): Types, frequency and density of shrubs in the landfill

Species	Frequency	Percentage %
<i>Prosopis juliflora</i>	18	47.4
<i>Acacia nubica</i>	5	13.2
<i>Calotropis Procera</i>	15	39.4
Total	38	100
Average/ha	12	

The frequency of *Prosopis juliflora* is equals to 47.4% of the total shrubs in the area. While *Calotropis procera* and *Acacia nubica* have a percentage of 39.4% and 13.2% respectively. The density is equals to 12 shrubs/ha (Table 2).

4.1.3 Types, frequency and density of grasses in the landfill

Table (3): Types, frequency and density of grasses in the landfill

Species	Frequency	Percentage %
<i>Cassia angustifolia</i>	15	37.5
<i>Cyperus spp</i>	15	37.5
<i>Citrullus colocynthis</i>	10	25
Total	40	100
Average/ha	13	

Also after the measurements to determine the types of grasses in the landfill area, the frequency for both *Cassia angustifolia* and *Cyperus spp* are 37.5% of the total grasses in the landfill. The density of grasses is equals to 13/grasses/ha. Those grasses scattered in places not reached by waste (Table 3).

4.2 Socio-economic aspects

4.2.1 General information

Table (4): Type of respondents

Description	Frequency	Percentage %
Males	29	58
Females	21	42
Total	50	100

In table (4) 58% of the respondents are males. While the females are equal to 42 % of the total respondents in the study area.

Table (5): Ages of respondents

Description	Frequency	Percentage %
20-30	15	30
30-40	20	40
40-50	10	20
50-60	3	6
Over 60	2	4
Total	50	100

In the table above 40% of the respondents their ages ranging between 30-40 years, and the least percentage is among the age groups over 60 years.

Table (6): Profession of respondents

Description	Frequency	Percentage %
Labours	25	50
House wife	14	28
Student	4	8
Employee	2	4
Livestock breeders	1	2
Dealer	1	2
No answer	3	6
Total	50	100

50% of respondents hold a job labors , 28% of them are housewives and 8% of the total respondents are students .This results explained that the majority of the population in the study area know little about the impact of the waste on themselves (Table 6).

Table (7): Educational level

Description	Frequency	Percentage %
Uneducated	2	4

Educated Quran	4	8
Basic school	7	14
Secondary school	11	22
University	24	48
No answer	2	4
Total	50	100

Table (7) shows that 48% of the respondents their education levels are a university, 22% secondary school and 14% of them are basic school. This result explained that the people in the study area are wished to educate their children.

Table (8): Accumulation of waste in the landfill and other places

Description	Frequency	Percentage %
Yes,	37	74
No.	9	18
Declined to answer	4	8
Total	50	100

Table (8) explained that 74% of respondents said that, there is a backlog of waste in the landfill and places other than the landfill, such as residential neighborhoods, areas in front of empty spaces of homes, inside the abandoned houses, main and branch roads, drilling and sewage discharge water fall, on the outskirts of residential neighborhoods, in markets such as Al Baraka Market and Libya, in front of shops, workshops, and near creek.

4.2.2 Types of accumulated waste

The respondents said that the types of accumulated wastes consist of the following: bags, Plastic bottles, leftovers, leaves and tree branches, wastewater + water restaurants, glass, construction waste, metal pieces, remnants of the workshops and tires.

4.2.3 Reasons for the accumulation of waste

The respondents answered that, the reasons for the accumulation of waste are as follows:

- Lack of interest in citizen health aspect and the importance of hygiene,
- The Locality not interest to clean and transport the waste to the allocated places.
- The Locality focuses only on the billing of the citizen,
- Lack of a clear system to lead his work in organizing clean ups,
- Unavailability designed to transport waste carts,
- Lack of commitment by the citizens to pay the bills to the competent authorities the transfer of waste,
- The lack of drums to save the waste until the vehicle comes to move them, and lack of control and lack of cleaners.

Table (9): Means of waste collection is currently available

Description	Frequency	Percentage %
There is no way for the transfer of waste	21	42
Cart and dismissed from service	1	2.0
Phones and large plastic bags	9	18
Caro popular effort carts	1	2.0
Waste transport vehicles	12	24
No specific methods	1	2.0
No answer	5	10
Total	50	100

In table (9), 42% of respondents confirmed that, there are no ways currently to collect and transfer the accumulated waste to the final landfill. 24% of them confirmed that, there are vehicles to transport the waste, and 18% said there were bags and mobiles large plastic waste

collection , and 2% said that there was no specific methods for the collection waste, while 10% of the total respondents were declined to express any opinion in this regard.

Table (10): Times of deportation the wastes to the landfill / month

Description	Frequency	Percentage %
Once a month	11	22
Twice a month	4	8.0
Three times a month	1	2.0
Four times a month	2	4.0
Eight times a month	1	2.0
Deportation take some months	23	46
Leave for several months	1	2.0
No regularity in the deportation	2	4.0
No answer	5	10

Total	50	100
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In table (10), 46% of the respondents confirmed that, the transportation took some months, and 22% said there was deported only once a month, while 10% of them declined to give any opinion. Accumulation of huge amount of waste remaining for long time ,it is secure place for hidden rats, insects breeding and emission of nasty odors.

4.2.5 Situation of natural forests in the study area in the past/ present

Table (11): Natural forest in the past

Description	Frequency	Percentage %
Thick	5	10
Moderate	26	52
Thin	10	20
No forest	2	4.0

No answer	7	14
Total	50	100

Table (12): Natural forests at present

Description	Frequency	Percentage %
Thick	4	8.0
Moderate	9	18
Thin	28	56
No forest	1	2.0
No answer	8	16
Total	50	100

In the above tables 11 and 12, 52% of respondents stated that, the state of forests in Ombada Locality in the past were moderate. On the other hand 56% of respondents said that, the state of the natural forests in Ombada Locality in the present was thin. This means, the forest were crowded by trees in the past, then gradually declined by cutting down trees for firewood and settlement.

4.2.6 Deportation of wastes

Table (13): Deportation of wastes by lagoons from the landfill

Description	Frequency	Percentage %
Yes	33	66
No	12	24
Unknown	1	2.0
No answer	4	8.0

Total	50	100
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In table (13) 66% of respondents said that, the wastes cover landfill area, 24% said there was no covers ,2% said he did not know anything in this regard, and 8% declined to express any opinion to this topic.

Also the respondents mentioned that the lagoons transported the wastes during rainy season into residential neighborhoods and sewer drain rainwater.

4.2.7 Types of trees, shrubs and grasses in the landfill area

Table (14): Types of trees

Description	Frequency	Percentage %
Yes	5	10
No	43	86
No answer	2	4.0
Total	50	100

In table (14), 10% of the respondents confirmed that there are trees in the landfill area, while 86% of them answered that there were no trees in the area of the landfill. The types of trees are: *Prosopis juliflora*, *Blanites aegyptiaca*, *Ziziphus spini-christi*, *Acacia tortilis*, *Acacia tortilis spp tortilis*, *Acacia nubica* and *Azadirachta indica*. This is similar result found in the ground survey in 2016.

Table (15): The types of shrubs

Description	Frequency	Percentage %
Yes	5.0	10

No	43	86
No answer	2.0	4.0
Total	50	100

86% of the respondents said that the types of shrub present in the landfill are *Prosopis juliflora* and *Calotropis procera* (Table 15).

Table (16): Types of grasses

Description	Frequency	Percentage %
Yes	5	10
No	43	86
No answer	2	4.0
Total	50	100

Table (16) shows that the types of grass are *Puncture vine*, *Cassia angustifolia*, *Citrullus colocynthis* and *Cyperus spp* which are growing seasonally in Autumn.

4.3 Impact of wastes on the environment

4.3.1 Impact of wastes on vegetation

Table (17) : Impact of wastes on vegetation

Description	Frequency	Percentage %
Yes	29	58

No	8	16
Nourishes trees	1	2
No answer	12	24
Total	50	100

table (17) explained that 58% of respondents confirmed that, the waste affects the vegetation cover as follows: Reduces growth process, hinders the process of photosynthesis, affect the flowering and seed production process. The accumulation of waste burying vegetation, affect the morphology, lead to fires and the destruction of various plants. This as a results is the same as reported by USAID (2009), “. Sitting dumps or landfills in sensitive ecosystems may destroy or significantly damage these valuable natural resources and the services they provide” plates (3 &4).



Plate (3): Accumulation of waste covered most of vegetation in landfill, South of Ombada locality (2016)



Plate (4) : Waste buried vegetation in landfill South of Ombada locality
(2016).

4.3.2 Impact of the landfill on the soil

Table (18): Impact of the landfill on the soil

Description	Frequency	Percentage %
Yes	32	64
No	10	20
No answer	8.0	16
Total	50	100

From table (18) 64% of respondents answered that the impact of waste on the soil as follows: Leveling the soil surface by drilling landfill and there by become invalid armed building, the presence of waste reduces the fertility of the soil and makes it unsuitable for cultivation, lead to contaminate groundwater , reduces growth plants on the soil surface, chemicals + sewage lead to soil contamination and lack of suitability for cultivation in the future, change the nature of the soil and the installation of components, breeding insects and pests in the soil, adding the remnants of edible oils into the soil reduces fertility. These results are similar as report by (USAID, 2009). If the landfill is unlined, the runoff can contaminate ground or surface water, depending on the drainage system and the composition of the underlying soils. Also plate (5) revealed the scattered of waste in the landfill (2016).



plate (5): Contamination of the ground surface by wastes in landfill area
South of Ombada locality (2016) .

4.3.3 Impact of the landfill on the water

Table (19): Impact of the landfill on the water

Description	Frequency	Percentage%
Yes	31	62
N0	10	20
No answer	9.0	18
Total	50	100

IN table (19), 62% of respondents said that the impact of waste on the water as follows: Contamination of drinking water with bacteria and disease-causing germs, breeding of flies and insects inside the water, leading to the spread of diseases, contamination of surface and groundwater sources of toxic substances and chemicals, turning the smell of drinking water to the foul smell like the smell of the echo, The taste of the water turned into a salty taste. These results are agreed with (USAID ,2009), They mentioned that “ Municipal solid waste streams can bleed toxic materials and pathogenic organisms into the leachate of dumps and landfills. Solids can cause sedimentation and change stream flow and bottom habitat.”

4.3.4 The impact of the waste on the air

Table (20): The impact of the landfill on the air

Description	Frequency	Percentage %
Yes	42	84
No	4.0	8.0
No answer	4.0	8.0
Total	50	100

In table (20), 84% of respondents confirmed that waste affect air due to: The spread of dust in the atmosphere in large quantities, the spread of odors emitted from the food scraps, dead animals and sewage. Breeding insects such as mosquitoes and flies spread in the air. Air pollution, toxic gases, such as methane and carbon dioxide. Burning waste within the landfill lead to the spread of smoke in the air. The proliferation of plastic bags in the air and attached to wires electricity. These results are agreed with (USAID ,2009), reported that, “when the organic wastes are disposed of in deep dumps or landfills, they undergo anaerobic degradation and become significant sources of methane, a gas with 21 times the effect of carbon dioxide in trapping heat in the atmosphere. Garbage is often burned in residential areas and in landfills to reduce volume and uncover metals. Burning creates thick smoke that contains carbon monoxide, soot and nitrogen oxides, all of which are hazardous to human health and degrade urban air quality”. Plate (6) explains the remains of burning the waste in the landfill.



Plate (6): Remaining of ash after burning the waste, South of Ombada locality (2016) .

4.3.5 Impact of the landfill on human

Table (21): The impact of waste on human health

Description	Frequency	Percentage
Yes	44	88
No	2.0	4.0
No answer	4.0	8.0
Total	50	100

In table (21), 88% of respondents confirmed that waste affect the people on the followings: Water and air pollution leads to the spread of chest diseases such as asthma, allergies and crises. The spread of malaria and typhoid fever diseases as a result of pollution. The spread of kidney failure due to water pollution. Visual pollution as a result of the accumulation of waste. Deterioration of human health in general as a result of contamination of the surrounding environment. Breeding flies leads to the spread of diarrheal diseases. This is similar report of (USAID,2009)” In locations where shantytowns or slums exist near open dumps or near badly designed or operated landfills, landslides or fires can destroy homes and injure or kill residents. The accumulation of waste along streets may present physical hazards, clog drains and cause localized flooding.”

4.3.6 Impact of waste on animals

Table (22): Impact of waste on animals

Description	Frequency	Percentage %
Yes	34	68
No	9.0	18
No answer	7.0	14
Total	50	100

The table above showed that, 68% of respondents confirmed that the waste have an effect on the animals due to: when animals eat plastic bags that lead to them to die. when eat leftovers fermented lead to disease and weak health, such as diarrhea. Air, water and soil pollution affects the health of the animal such as the man. This result agreed with (USAID, 2009). “The waste impact on animals in case of “When solid waste is dumped into rivers or streams it can alter aquatic habitats and harm native plants and animals. The high nutrient content in organic wastes can deplete dissolved oxygen in water bodies, denying oxygen to fish and other aquatic life form.”

4.2.7 Impact of waste on landscape

Table (23): The impact of the landfill on the landscape

Description	frequency	Percentage
Yes	40	80
No	4.0	8.0
No answer	6.0	12
Total	50	100

In table (23) 80% of respondents confirmed that waste have an effect on the landscape due to: Waste accumulated lead to visual pollution. Accumulation of waste side uncivilized reveals and demonstrates the failure of society. The accumulation of waste distorts the overall appearance of cities and aesthetic appearance. The accumulation of plastic bags and hanging on the trees leads to deformation of the landscape, these lead to a distortion of the entrances to the city and disturbing the public mood. These results are the same as reported by (USAID, 2009). “Sitting dumps or landfills in sensitive ecosystems may destroy or significantly damage these valuable natural resources and the services they provide”. Also added “The unpleasant odor and unattractive appearance of piles of uncollected solid waste along streets and in fields, forests and other natural areas can discourage tourism and the establishment and/or maintenance of businesses”.

4.3.8 Role of environmental health on the waste disposal

Table (24): Role of environmental health on waste disposal

Description	frequency	Percentage%
Yes	13	26
No	28	56
No answer	9.0	18
Total	50	100

In table (24) 56% of respondents confirmed that there is no role for the environmental health in waste disposal ,while 26% of them confirmed that there is a role for the health of the environment in the waste disposal. This mean that there are not awareness about the, transfer of waste to the designated areas and dispose of them, instruct citizens of the importance of hygiene and environmental protection, the provision of waste transport vehicles and periodic monitoring of streets and driveways.

4.2.9 Get rid of wastes in the future

Some official's staff mentioned that can get rid of wastes in the future, through the following:

- Provision of vehicles
- Cleanliness campaigns within neighborhoods,
- Citizens cooperate with the officials in the collection of waste.

4.3 Observations

4.3.1 The landfill

The land fill is located South of Omdurman, West of Salha and Omdurman Islamic University buildings and neighboring lanes from Ombada Locality. The total area of the landfill is approximately seven feddans (3.2 ha). On the other hand there is scattered vegetation in the study area.

4.3.2 Vegetation

Most of vegetation buried by wastes unless some of *Balanites aegyptiaca*, *Prosopis chelensis*, *Ziziphus spini christi*, *Calotrobis procera*, *Senna senna* , *Tribulus tristris* , *Ipoma Spp.* and *Aerva juavinaca*.

4.3.3 The scenery of the landfill

Jebel Toria is the oldest landfill always receives collective waste of Omdurman especially Ombada Locality.

-The landfill causes the diminishing of the importance of the neighboring scenery of the area.

- The cars drivers usually transport the waste and unloaded out of the landfill near the settlement area.

- Also the landfill used by the authorities to exterminate corrupt goods, medicines and poisons after subjecting them to initial treatments.

- It observed that the piles of ash were indicated that there are large amounts of smoke and dust emitted from there as such of the presence of brick factories.

- In addition to the nasty odor emitted from waste and smoke from burning of tires covered the sky.

4.3.4 waste in the streets of Ombada locality

Waste accumulates heavily on the main streets in the Ombada locality, which in turn led to other problems such as the breeding of flies, mosquitoes and other disease-carrying insects, and also led to the blockage of sewer storm water on the main roads, and this leads in turn to cause floods in the Autumn and could lead to the collapse of houses and small facilities and bridges. The accumulated waste piles in the streets made up of the following: leftovers, plastic bags and plastic bottles, the glass, iron cut and bathwater (as most types of bathrooms in Ombada locality are pools municipality so we find citizens dispose of wash water on roads and key, creating pits and grooves in these waters accumulate, leading to the breeding of flies, mosquitoes and disease-carrying insects).plate ,7.



Plate (7): Waste accumulated in the main roads in Ombada locality.(2016).

4.3.4 Waste in front of the houses and shops

Also in Ombada locality accumulate waste for long periods in front of houses, mostly made up of leftovers, which leads to the emission of unpleasant odors and breeding of flies in very large quantities and reproduction of stray cats and dogs, which in turn may transmit diseases to people, and the situation is exacerbated in the autumn, where mixed waste rainwater and create an environment very suitable for the breeding of insects and pathogenic microbes with the spread of odors for very long distances. Plate 8,9 &10.



Plate (8): Accumulated waste next homes.(2016).



Plate (9): Accumulated waste next homes.(2016).



Plat (10): Waste near a small shop inside the neighborhood

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The results indicated that, the presence of accumulated waste inside residential neighborhoods, in front of houses, public roads and branch, inside the empty spaces of the houses, in front of shops and in the markets, and within the landfill area. This waste consists of food scraps, plastic bags, glass, metal pieces, construction waste, dust, smoke, leaves, twigs and leaves of trees, remnants of animals, dead animals, sewage, water restaurants. These wastes have negative impact on the surrounding environment to human beings, the air, water, soil and animal and vegetation and human health. The burning of the waste pollutes the air and the spreads nasty odors in the atmosphere, buries vegetation, pollutes the surface water, fresh water, causes many diseases to humans, such as gastrointestinal and respiratory diseases and distort the general appearance of the city and visual pollution and disturb the mood of the citizen.

5.2 Recommendations

The study comes up of the following:

1. The household must sorting the waste even easier for workers waste transported to landfill final disposal properly.
2. Local authority is responsible for waste collection and disposal to intensify hygiene campaigns and the number of times the transfer of waste from residential neighborhoods and roads in the month.
3. Innovation of new scientific systems and processes to collect the waste and disposal..
4. Attention to workers waste and improve their financial situation even do their duty to the fullest
5. Strictly laws should be hold to penalty all those who work on the scattering of waste indiscriminately in not intended places.
6. Development of an independent supervisory body to monitor the officials for the transfer of waste to the landfill final

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Appendixes:

Appendixes (1): Questionnaire

بسم الله الرحمن الرحيم

جامعة السودان للعلوم والتكنولوجيا

كلية الدراسات العليا

استبيان لجمع معلومات، بغرض بحث الماجستير في الغابات البيئية

العنوان: أثر النفايات على البيئة بمحلية أمبدة

الرقم:.....

القسم الأول: المعلومات العامة

1. النوع: ذكر أنثي.....

2. العمر:سنة .

3. المهنة: مزارع ، مربي مواشي ، تاجر ، عامل ،

4. المستوي التعليمي: أمي ، خلوة ، أساس ، ثانوي ، جامعي

القسم الثاني: معلومات عن المكب

1. أين يقع مكب النفايات بمحلية أمبدة؟.....

مساحته:.....بعده من السكان.....

2. هل توجد نفايات متراكمة في محلية أمبدة غير المكب؟.....

إذا كانت الإجابة بنعم أذكرها؟.....

3. ما هي أسباب تراكم النفايات في رأيك؟.....

4. ما هي أنواع النفايات المتراكمة؟.....

5. ما هي وسائل جمع النفايات المتوفرة حالياً؟.....

6. كم مرة في الشهر ترحل النفايات من أماكن تراكمها على المكب؟.....

7. ما هي المشاكل التي تواجه المسؤولين في جمع النفايات؟.....

القسم الثالث: حالة الغابات الطبيعية في محلية أمبدة ماضياً وحاضراً

1. ما هي حالة الغابات في محلية أمبدة الماضي؟ كثيفة ، متوسطة ، خفيفة

2. ما هي حالة الغابات في محلية أمبدة في الحاضر؟ كثيفة ، متوسطة ، خفيفة

القسم الرابع: أثر النفايات على البيئة

1. هل توجد خيران بساحة المكب؟ نعم..... لا.....

2. إذا كانت الإجابة بنعم، هل الخيران تحمل النفايات لمناطق أخرى، حددها.....

.....
.....
2. ما هي أنواع الأشجار والشجيرات والأعشاب الموجودة بمنطقة المكب؟

الأشجار

هي:.....
.....
.....

الشجيرات

هي:.....
.....
.....

الأعشاب

هي:.....
.....
.....

4. ما هو تأثير المكب على الأشجار والشجيرات والأعشاب؟

التأثير على لأشجار:.....

التأثير على الشجيرات:.....

التأثير على الأعشاب:.....

5. هل هناك تأثير للمكب على التربة؟.....

إذا الإجابة بنعم كيف يتم

ذلك؟.....
.....
.....

6. هل هناك تأثير للمكب على الماء؟.....

إذا كانت الإجابة بنعم كيف يتم

ذلك؟

.....
.....
.....

7.. هل هناك تأثير للمكب على الهواء؟.....

إذا كانت الإجابة بنعم وضح

ذلك؟

.....
.....
.....

8.. هل هناك تأثير للمكب على الإنسان؟.....

إذا كانت الإجابة بنعم كيف يتم

ذلك؟

.....
.....
.....

9.. هل هناك تأثير للمكب على الحيوان؟.....

إذا كانت الإجابة بنعم كيف يتم

ذلك؟

.....
.....
.....

10. هل هناك تأثير للمكب على المنظر الطبيعي؟.....

إذا كانت الإجابة بنعم وضح

ذلك؟

.....
.....
.....

11. ما هو دور صحة البيئة في التخلص من النفايات؟.....

.....
.....
.....

12. هل هناك إرشاد بيئي للمواطن للتعامل مع النفايات؟.....

إذا كانت الإجابة بنعم وضح

ذلك؟.....

.....

.....

13. ما هو رأيك في كيفية التخلص من النفايات في المستقبل؟.....

.....

.....

.....