FACTOR AFFECTING SOLID WASTE MANAGEMENT SYSTEM: A CASE OF ADDIS ABABA TANNERY SHARE COMPANY (ETHIOPIA)

BY: MEHARI MELESE MENGESHA

ADVISOR: CHALACHEW GETAHUN (PhD)

A Thesis Submitted to Department of Project planning and Management of St. Mary's University, in partial fulfilment of the requirement for the award of masters of Science degree in project planning and management

JUNE, 2021

ADDIS ABABA, ETHIOPIA

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Approval/Certificate

This is to certify that, the thesis worked by MehariMeleseMengesha, entitle: **"FACTOR AFFECTING SOLID WASTE MANAGEMENT SYSTEM: A CASE STUDY OF ADDIS ABABA TANNERY SHARE COMPANY (ETHIOPIA)"** *is carry out under strict supervision and has approve for submission to St, Mary's University School of Graduate Studies Program of Project Management in Partial Fulfilment of the Requirements for the Award of Master of Art in Project and Planning Management.*

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DECLARATION

I declare that the project entitled "**ASSSESSMENT OF PRACTICES AND CHALLENGES OF TANNERY SOLID WASTE HANDLING SYSTEM: A CASE STUDY OF ADDIS ABABA TANNERY SHARE COMPANY (ETHIOPIA)"**is my original work and has not been presented for any degree in this university or any other university or colleges, as well as all sources of material, used for the project have been duly acknowledged.

_____ _____

NameSignature

St. Mary's University **Addis Ababa July, 2021**

Endorsement

I confirm that this thesis entitled "**FACTOR AFFECTING SOLID WASTE MANAGEMENT SYSTEM: A CASE STUDY OF ADDIS ABABA TANNERY SHARE COMPANY (ETHIOPIA)"** has been advised by me and submitted for examination.

ChallachewGetahun(PhD) _____ _____

Advisor Name Signature Date

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MehariMelese

Contents

ACRONYMS /Abbreviations/

AATSC	Addis Ababa Tannery Share Company
AD	Anaerobic Digestion
BOD	Biological oxygen demand
COD	Chemical oxygen demand
CS	Chrome Shaving
CSW	Chrome Shaving Waste
ETP	Effluent Treatment Plant
FAO	Food and Agricultural Organization
IWM	Integrated Waste Management
LIDI	Leather Industry Development Institute
MSW	Municipal Solid Waste
NOx	Oxides of nitrogen
SLC	Standard Methods for Leather Chemical Analysis
SWM	Solid Waste Management
SWMS	Solid Waste Management System
SOx	Oxides of sulfur
SNCR	Selective Non-Catalytic Reduction
VOC	Volatile Organic Compound
TS	Total solids
TDS	Total dissolved solids

List of Figures

List of Tables

Abstract

This paper presents an overview of the current solid waste management situation in Addis Ababa tannery S.co and provides a brief discussion of the challenges. Tanning industry generates large quantities of solid wastes during leather manufacturing Process and subsequently during effluent treatment. From this point of view, in this study of tannery solid waste handling system that generated from tannery were made at Addis Ababa Tannery S.co. In addition, it deals with investigate of current case company solid waste management problems, opportunities and existing solid waste management practices. This results in generation of both solid, liquid and gaseous wastes. Solid waste disposal is increasingly becoming a huge challenge to tanners due to paucity of landfill sites and strict environmental legislations worldwide. Hence, finding a holistic solution to the tannery solid waste disposal problem is a challenge for researchers. In this context, use of solid waste for treatment of toxic pollutants in liquid waste is emerging as a new paradigm for solid waste generated from tanneries. This article presents an overview of the solid wastes emanating from tanneries and the various disposal methods practiced with special emphasis on the utilization of these wastes to treat toxic liquid pollutants.

*Key Words:****Tannery solid waste, Environmental regulation and standards, Disposal site.***

CHAPTER ONE: INTRODUCTION

1.1.Background of the Study

The company produced different kinds of leather products from rawhide and skins. During the conversation of rawhide and skin in to leather generates liquid, solid and gaseous waste, which has an impact on the environment. Therefore, the tanneries and other manufacturing sectors have a great challenge and pressure on environmental protection. The company generates up to 350 m^3 of wastewater during the processing of leathers and different types of solid waste. Addis Ababa tannery has a primary and secondary treatment plant for treating the liquid waste generated in order to fulfill the standard of EPA's discharge limit. The company produces different types of leather products for domestic and international market from rawhide and skin. Currently, the company produces and distributes the following products: -

- Sheep skin: sheep upper, garment, golf glove, dress glove & lining
- Hide cow upper, park leather (cow nappe), upholstery, bag leather & lining.

The assessmentthat the types of tannery solid wastes are de-dusted salt, raw skin trimmings, hair, fleshing, splitting waste, pickle trimmings, chrome shaving, crust trimmings, finished leather trimmings and sludge. Determination of the solid waste generation rates using material balance analysis techniques shows that in processing 5,000 ton of cattle hide and sheepskins per year, the tannery generates a total of 3000 ton of solid waste from beam house, tanning, re-tanning, finishing processes and effluent treatment plant. It was found that 859kg of solid waste is generated during processing one ton of wet salted hide. Similarly, 262kg of solid waste is generated during processing amount of sheepskins. It was observed that beam house operations have more than 60% contributions in generating the solid wastes.

1.1.1 Brief description of the industry (leather manufacturing)

Ethiopia is being one of the countries with large and diverse livestock population in the world. Ethiopia has estimated livestock population of 54 million cattle, 25.5 million sheep, and 24 million goats based of the offtake rate of 7.0 %, 33.0 % and 35.0 %. For cattle, sheep and goat respectively, journal of Biology, Agriculture & healthcare (2016). Based on the above figure the country is expecting to produce 3.1 million hides, 7.8 million sheepskins and 8.2 million goatskins annually, Gebre-michael researcher (2013). Hides and skins are the basic raw material inputs for the leather industry. Hides, and skins, leather and leather products are supply to domestic and export markets and providing foreign exchange earnings, which contribute significantly to the Ethiopian economy. This earning is a small portion of the potential income on view of in which the huge animal resources

available. The main constraints to increase utilization of hide and skins are low quality of rawhide and skin due to poor husbandry system and lack of awareness of flaying and handling until reaching to factory in the supply chain. This indicates that the quality of leather produced and goods have low quality or low grade for export market. The potential supply of hide and skins depends on the scale of meat production.

The leather industry in Ethiopia has tremendous potential for domestic and foreign market, especially, the Ethiopian highland sheepskin and bread has dense and compact fiber structure, which makes it for glove production and other products.

1.2. Statement of the Problem

Solid wastes generated from leather production industries, is highly polluting industrial wastes. Some of the solid wastes generated from the industry contain chromium (Cr) which is one of the toxic heavy metals and known for contaminating ground water, soil, plants and causing carcinogenic effect on human health. This anthropogenic interference might harm the community as the chromium and other heavy metals are potentially toxic to crops, animals and humans when contaminated soils are used for crop production.

The study revealed that the reasons for low performance of SWM in the case company includes: lack of properly designed collection route system and time schedule, inadequate and malfunctioning operation equipment, poor condition of the final dump site, littering of the corner around the skips which encouraged illegal dumping are the technical problem identified. Insufficient funds as well as lack of promotion on waste reduction: recycling, absence of cost recovery, practice of energy option, waste separation and composting are among the financial challenge. Social problems encountered include lack of awareness, illegal dumping, poor condition of waste workers and lack of private sector. Incompetence of organizations in terms of equipment required for operation and man power/staff qualifications, training and human resource developments/and unreliable service are the institutional challenge that the city encountered in the sector.

The waste produce from the conversion of raw hides and skins into finished leather and the impact of that leather at the end of the product life is a direct result of the raw materials and chemical used and the technology applied. Most waste is generated during the early stage of processing, soaking, liming and tanning operation. The current method of the company is used one way of disposing way. They used municipality service. The company located in Addis Ababa city and the municipality service are collected, transported and disposed with municipal solid waste in open dump area. In addition to this, since the collection frequency of the municipality service is too low the solid wastes generated from the tanning industries stay in the factory compound for a long period of time that lets the wastes

creates unfavorable environmental condition for the community working in the industry. In addition, it should be managed in an environmentally with negative impact. Therefore, a proper tannery solid waste management system has to be proposed.

1.3. Research questions

The basic research questions that are expected to be answered by this research are the following.

1. What is the nature and magnitude of wastes and the problem face in the organization?
2. What are the practice and challenges, socio-cultural as well as economic factors that constrain the effectiveness of participation of company's solid waste management in case company?
3. What should be done for effective solid waste management system in case company?

1.4. Objectives

1.4.1. General Objective

The general objective of this study is to know the type of the solid wastes generated by Addis Ababa Tannery Industry and figure out to propose suitable solid waste handling system.

1.4.2 Specific Objectives

The specific objectives of this study include:

- Investigating and identifying the nature and magnitude of SWM in the case company.
- Assessing the practice of solid waste disposing mechanism of current system.
- To assess the challenges of reduce waste management practices in the case company
- Indicate the solid waste management system such as reuse and recycling rates of products.
- To assess factors for effective solid waste management in Addis Ababa Tannery.

1.5 Hypothesis of the study

It is the hypothesized that there are descriptive factors that are affect the implementation of the Solid waste management system in the selected company. The hypothesis of this research is listed as follows:

H_10: There is no positive relationship between Employee Awareness and effective implementation of SWMS.

H_1A: There is positive relationship between Employee Awareness and effective implementation of SWMS.

H_20: There is no positive relationship between Surrounding environment and effective implementation of SWMS.

H_2A: There is positive relationship between Surrounding environment and effective implementation of SWMS.

H_30: There is no positive relationship between disposal mechanism in the company and effective implementation of SWMS.

H_3A: There is positive relationship between disposal mechanism in the company and effective implementation of SWMS.

H_40: There is no positive relationship between Cost for SW and effective implementation of SWMS.

H_4A: There is positive relationship between Cost for SW and effective implementation of SWMS.

H_50: There is no positive relationship between distance of dumpsite and effective implementation of SWMS.

H_5A: There is positive relationship between distance of dumpsite and effective implementation of SWMS.

1.6. Significance of the research

Ethiopian's leather industry is one of the priority sectors for earning foreign currency. However; the value that obtained in the sector is still less so that tanneries are not competent in global market due to quality of products. This is become tanneries have low quality management practice and technological innovativeness acquisition capabilities. This study helps to point out the Managing the Solid waste that generate in organization that practices for identifying and analyzing practice and challenge the Solid waste management in the case company.Thus, this study provides information for the importance of assessment of practice and challenge tannery solid waste for distribution by realizing the tangible and intangible results and outcome of the company. Moreover, the study is also indicating the way of managing operational performance and its benefits in all perspective.

1.7. Scope and Limitation of the research

This study analyses the actual processes performed in Addis Ababa tannery S.co in order to investigate tannery solid waste handling system within the case company. Therefore, it will be essential to determinate the amount of the solid waste generated, to sample and analyzed these solid waste management systems. The main aim of this study consists in gathering accurate and useful data of the nature and amount of solid waste generated during leather making operation from raw hides and skins input to finished leather. This necessary data is used to assess solid waste management system.

The limitation of the study is not good enough to see the solid waste management system only this company in need to do more company. Because they might be follow the same way for managing the solid waste but the can use different kinds of practice and approach to handle it. In addition, time and cost is limitation of the research. Then the solid waste management system is poor in case company in terms of facilitation and data organization.

CHAPTER TWO: LITERATURE REVIEW

2.1. Conceptual review on solid waste management

2. 1.2 Definition

Solid waste means anything that is neither liquid nor gas and is discard as unwanted (Solid Waste Management Proclamation No. 513/2007). In the modern age of development, the increasing quantity of solid waste is one of the growing environmental problem in both developed and developing countries. The solid waste generated from industrial sources contains a large number of chemicals, some of which are toxic. The waste is considering toxic, if the concentration of the ingredients exceeds a specified value (Kamble J.R *et al* 2009*)*.

Production of leather from raw hides and skins has been one of the most important industrial processes since ancient times. For centuries, leather was one of few available materials for the production of high durability garments and footwear. The principal aim of the leather industry, which plays a significant role in today's global economy, is to transform animal hides/skins into physically and chemically stable material by subjecting them to chemical and mechanical sequential processes, and therefore to obtain products for meeting various needs of people (H. Ozgunay, *et al*. olish J. of Environ.Stud. (2007)). Leather industry has been categorized as one of highly polluting industries and it has adverse impact on environment because of the generation of huge amount of liquid, solid and gaseous wastes. The simplified inflow and out flow of tanning industry is shown in Figure 2.1 below.

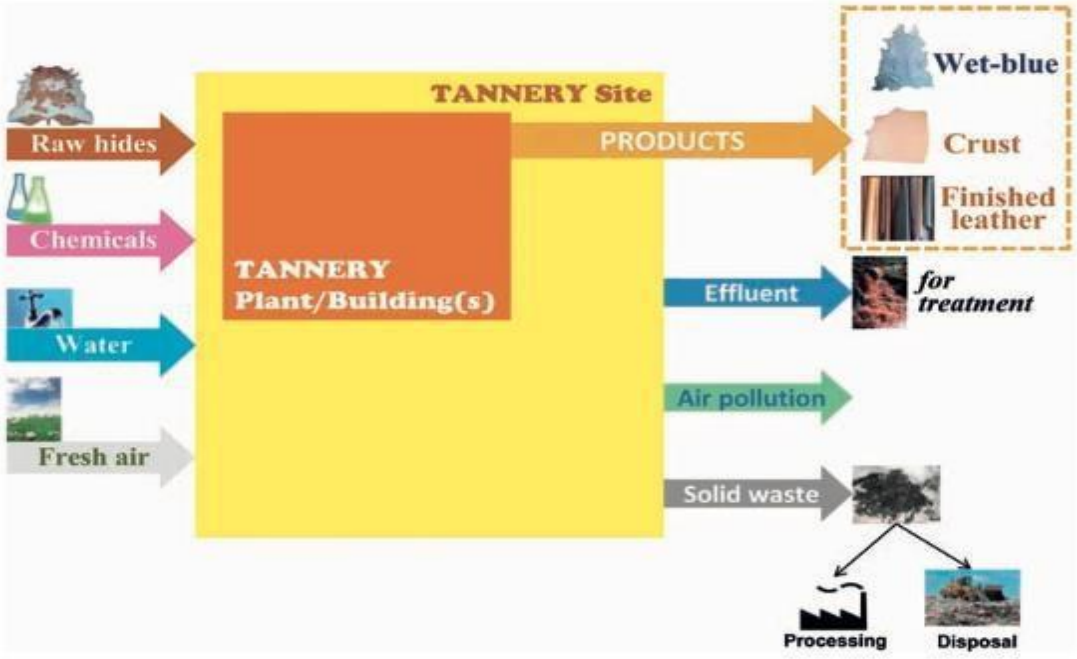


Figure 2.1: Simplified inflow and outflow of Tanning Industry (UNIDO Vienna, 2011)

2.2. Leather Manufacturing Processes

The leather processing stages can be categorized in to four main stages as follows (H. Ozgunay, *et al*, *2007*):

A) Beam House Processes
B) Tanning processes
C) Re-tanning Processes
D) Finishing processes

A)Beam house processes

Generally, the conventional conversion process of hides/skins to leather involves 'do–undo' operations. The conserved skins/hides are first subjected to a trimming process for removing the unwanted parts called skin/hide trimmings.

I.Soaking Process

Two effects have to be achieved in soaking of cured hides: cleaning up of the surface of the hide and rehydration of the interior of the hides. Manure, urine and blood generally contaminate the typical hide. Animal skins are naturally contaminated with soil, dust and sand from normal activities of the animals during grazing and on the feedlot. This is called **soaking** process. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013,)

II. Hide and Skin Unharing and Liming

The process of un hiring is the first major step in leather making. After soaking process, the skins/hides are subjected to **liming/un-hiring** process which is treating the materials in alkaline (pH ranging from 12 to 13) solution of lime ($Ca(OH)_2$) and sodium sulphide (Na_2S) to remove hair and swell up the skin/hide. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013,)

III.Splitting

After liming/un-hiring process, a mechanical process called fleshing process removes the flesh and fat adhering to the hide/skin. Another mechanical operation called **splitting** after fleshing process is applied most of the time to cattle hides to split into two or three layers or to remove some unwanted layers of the hide. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013,)

IV.De-liming

Itis chemical process performed to decrease the pH to 8.0 to 9.0 so that to remove the lime added during liming process and to make the hide/skin more receptive to the chemicals that will be used in

further stages.(Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

V. Bating

After de-liming process, hides/skins are exposed to an enzymatic effect for both opening up the structures of hides/skins, and the removal of unwanted proteins by a process called **bating**.(Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

VI. Degreasing

Following the bating process, a **degreasing** process is applied for removing the excess natural fat using aqueous emulsification with detergents, or solvent extraction. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

VII. Pickling

After degreasing process, the hides/skins are treated in a solution composed of salt and acids in acidic solution at an average pH of 2.5 to obtain a homogeneous distribution of tanning material that will be applied in the tanning process. This process is called **pickling** process and the product at this stage is named as pickle.**(**Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013**)**

B)Tanning Processes

After the hides/skins are conditioned as above, the tanning process is applied with various tanning materials (materials able to form stable bonds with collagen) in order to provide the leather with a stable form and high thermal stability. Tanning materials such as vegetable tannins, mineral tanning materials and syntans (synthetic organic tanning materials) are used in tannage. Among mineral tanning materials, chrome tanning is the most widely used in leather production due to the unique features chrome that it gives to the leather; thermal stability. Chrome tanning is carried out in acidic solution at a pH ranging from 2.5 to 3.0. Aluminum and vegetable tanning materials are also widely used in leather production. The product of chrome tanning process is called as wet blue because of its color. c)Re-Tanning Processes

At re-tanning stage, the wet blue hide/skin is changed to crust leather. In this stage, structural differences within wet blue leathers are compensated to obtain uniform structure. It involves the following chemical and mechanical operations.(Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Shaving – is a mechanical process to even the hide thickness and permit greater precision than is possible by splitting. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Neutralizing – is removal process of the free acid present in the leather, to assure stability in heated conditions and resistant to boiling. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Re-tanning – is a process to give the material the required uniform fullness and ability to retain their consistency after the drying process that tend to flatten the hides and reduce their thickness. This is carried out at a pH ranging from 3.5 to 5.0 (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Fat liquoring – is done to lubricate the dermic fibers to avoid gluing and to provide the finished article with fullness and softness. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Dyeing – is a process of giving the required color characteristics. A good dyeing has good color uniformity, maximum color depth with the least amount of dye possible, good defect cover and high color and light fastness. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Setting out – is a process of pressing the leather to reduce the residual moisture in the hide from 100% to 65-70%. It also helps the hide to be widened and the grain to be flattened. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Drying – is an operation to reduce the moisture content from 70% to 20-22%. It is performed in the company through Vacuum drying, toggle frames, or overhead chain. After this stage, it is called as crust leather and prepared for finishing processes. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

d) Finishing Processes

Finishing operation is the mechanical modifications on the appearance of the leather such as elasticity, softness and feels by applying an aesthetic covering polymeric film to the derma. Finishing operation involves surface coatings and mechanical operations. Some of the finishing processes are given as follows. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Conditioning – is a process to provide moisture in to the dried hide or skin to eliminate the occurrence of cracking for the next operation. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Staking- is mechanical operation applied to increase smoothness of the leather

Milling – is a mechanical process to improve the softness of the leather and gives the grain a more precise design. A drum similar to the one used in the wet phases is used.

Spreading on toggle frame – is a useful operation of spreading out the hide under tension on the toggle frame and allow drying in a hot air tunnel for a short period of time, but long enough to reduce the humidity from 2224% to 15-16%. The objective of this operation is to take the advantage of the detachment of the fibers to spread and flatten the hides as much as possible. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Buffing - is a mechanical operation to remove the grain completely and to obtain soft and opaque surface, to make the flesh side of the leather to be refine and smooth, or to remove a more or less significant amount of surface material from low quality hides. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Impregnation – is an operation aims at increasing the ability to adapt to the extension and compression caused by folding, generating a more elegant behavior.

Coating – is the application of natural or synthetic products, generally water-based, for coloring, covering, sealing effects and for giving body to the leather. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Ironing – is pressing operation to make the leather smooth. It is performed in two different machines, flat presses that work in a discontinuous manner or cylindrical rotary presses that work in a continuous manner. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

Polishing – is the last finishing operation to provide a shiny appearance and pleasant feel. Figure 2.2 below shows the leather manufacturing process flow.

Figure 2.2 shows the name of the product output from the corresponding processing stages. (Reference Document for the Tanning of Hides and Skins. European Commission's Joint Research Centre, 2013)

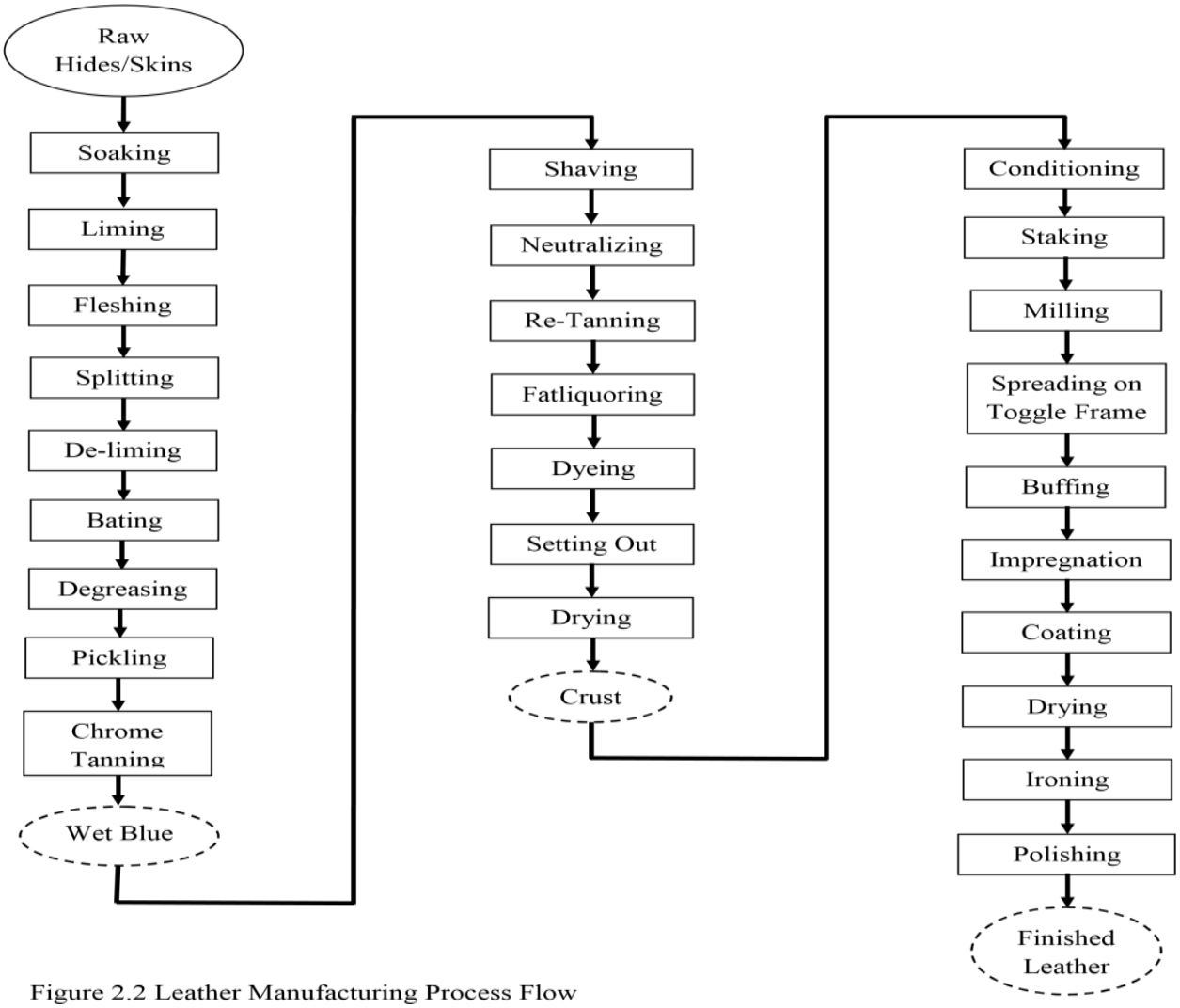


Figure 2.2 Leather Manufacturing Process Flow

2.3 Types of Tannery solid waste

The main releases of leather industries are wastewater, solid residues and odors. Wastes arising from industrial activities. Industrial process wastes include a very wide range of materials and the actual composition of industrial wastes in a country will depend on the nature of the industrial base. Composition of industrial waste depends on the kind of industries involved. Examples of the wastes which may be found under this category are general factory organic wastes from processing, acids, and alkalis, metallic sludge's, demolition and hazardous waste in*Figure 2.3,* you can have a general idea of the sources and types of pollutants generated in leather processing.

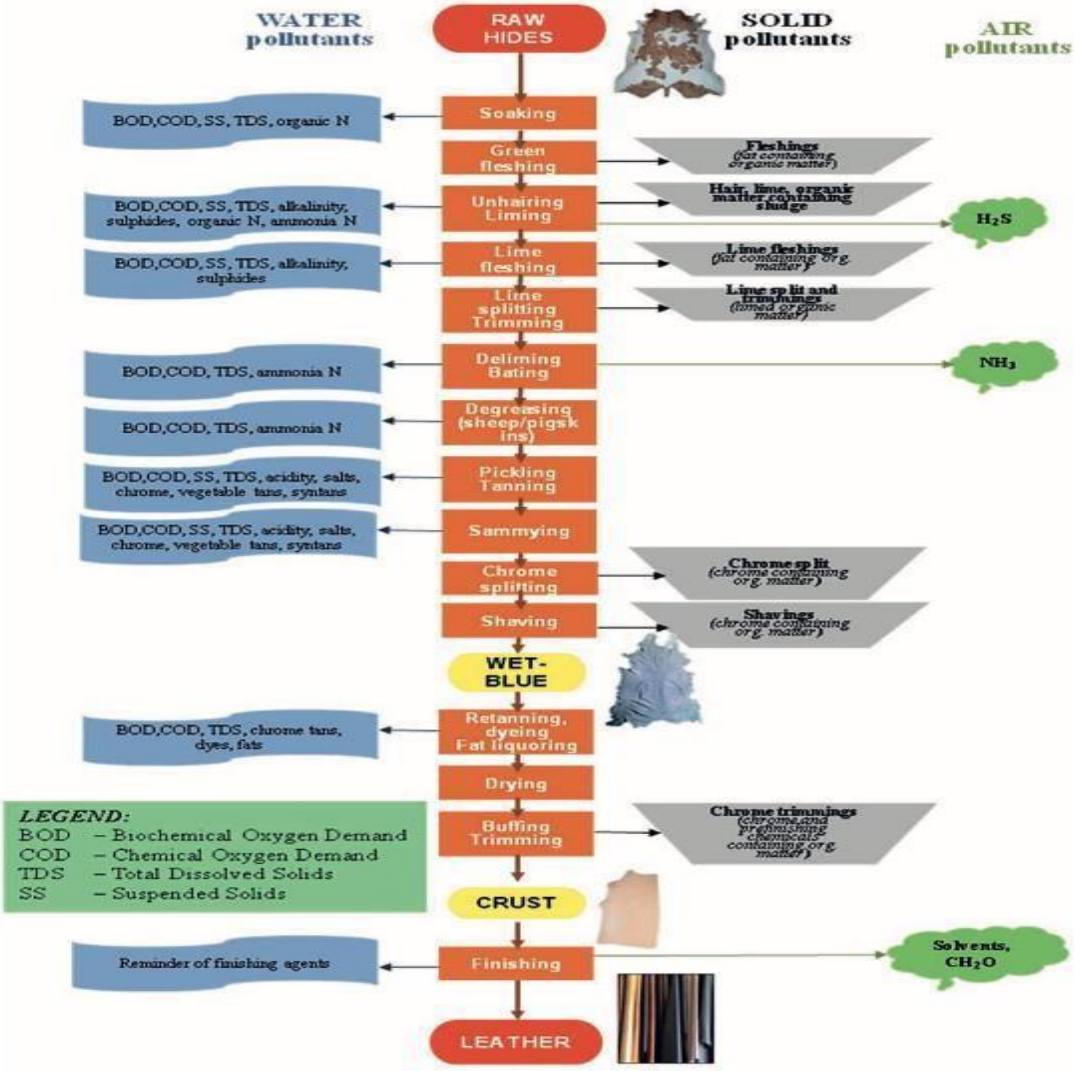


*Figure 2.3: Sources and types of pollutants generated (*UNIDOVienna, 2011*).*

Only 20 – 25 % of the weight of the rawhide or skin is processed to leather. The exact percentage varies depending on the animal species and product specification. Therefore, the rest of the weight plus the unused fraction of the process chemicals either is discharged in the wastewater or arises as a residue at some point in the process. Residues from tanneries can be categorized as by-products, hazardous waste or nonhazardous waste (AlebelAbebe Belay,2010).

Hazardous wastes: a waste or combination of wastes, which because of its quantity, concentration, or physical, chemical or pathogenic characteristics may cause an increase in serious illness, morbidity and mortality.

2.3.1 Liquid and Gaseous Waste

Tannery effluents are considered the highest pollutants among all industrial wastes (Dr. S Rajamani, 2010). These effluents are complex in nature and have variations in their characteristics depending on the processes and the case study tannery. They are mainly high in organic and inorganic pollutants.

The chemical reagents consumption is very high (about 246 different types in Addis Ababa Tannery) as a large amount of them is needed to obtain leather from the initial raw hides, goat, and sheepskins. The main inputs chemicals include sodium chloride, lime, sulphuric acid, sodium sulphide, basic chromium and others. A relevant part of these chemicals is discharged into the effluent because most of them are not absorbed during the whole process. Every year 16 million tons of hides and skins are used in the world leather process. The wastewater discharge from world tanneries is 600 million m3 approximately per year. That means that on average 45-50 m3of wastewater is discharged per ton of rawhide processed (J. Kanagraj, Velappen K.C., Chandra Babu N.K., Sadulla S, 2006).

The entire process of tanning is often accompanied by the consumption of large volumes of water. The pollution load discharged into the effluent includes mainly chemical oxygen demand (COD), biological oxygen demand (BOD), total dissolved solids (TDS), total solids (TS), chromium (Cr), sulphides (S_{2-}), sludge and others (COTANCE, 2002).It has been revealed that the main release of wastewater occurs during wet processing stages including beam house, the tanning processes and the re-tanning processes. Therefore, these stages contribute above 90% of the total pollution load.

The average percentage on each stage is shown in *Figure 2.3* below.

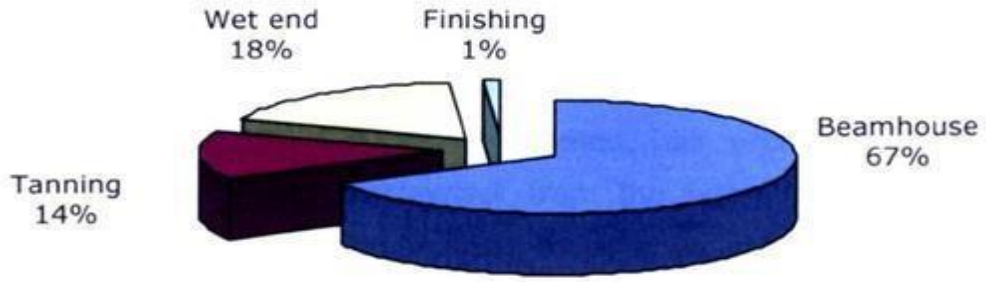


Figure 2.3.1: Pollution load % generated (. Methods of Analysis 1996, Northampton, UK)

Comparing to the magnitude of emissions to water, air emissions are released in relatively small quantities. They have variations among tanneries in accordance of the processes involved. However, air emissions from tanneries are associated with particulates, organic solvents, ammonia, hydrogen sulphide and odour (AlebelAbebe Belay, 2010).

These emissions to air not only have negative impact beyond the tannery area but also have harmful consequences at the workplace and possibly affect the health of the tannery employers (AlebelAbebe Belay, 2010).

2.3.2. Solid Waste

Apart of liquid and gaseous wastes, a large amount of solid waste is also generated among all the tannery stages and during effluent treatment.

Although the characterization of solid wastes from the tanning industry is well documented, leather wastes generated from each type of leather and process have different characteristics. Thus, in order to find applications of these wastes in various fields it is essential to have accurate information about their nature. In addition, some of these solid wastes contain chromium and are categorized as hazardous wastes. Consequently, a safe disposal needs to assured the solid wastes are mainly generated during fleshing, trimming, splitting and shaving processes but also the sludge generated in the wastewater treatment plant contributes to increase the amount of these wastes (IPPC, May 2000). The percentage of solid waste generated in every stage of leather processing from 1 tons of raw hides is represented in *Figure 2.3,2*.

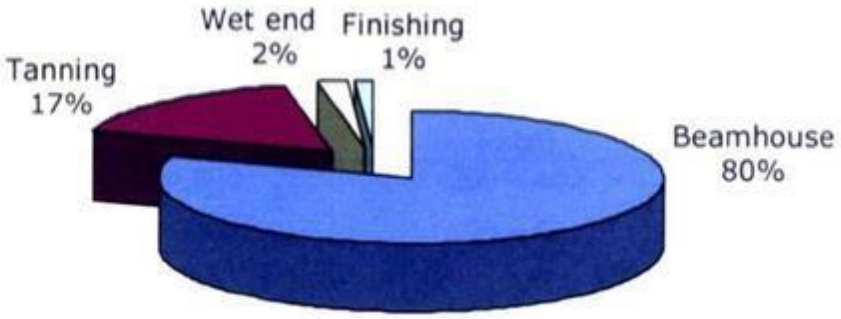


Figure 2.3.2: Solid waste percentage generated (Official Methods of Analysis 1996, Northampton, UK)

According to the data analyzed in different studies, only 200 kg of leather is manufactured from 1 tone of wet-salted hide (meaning 20% of the raw hide weight) (FAO, 2010, UNIDO, July 2010, Ethiopian Leather Journal, March 2012). Therefore, more than 600 kg of solid waste is generated during the leather processing.

An example of the types and quantities of solid wastes generated in a tannery processing one ton of raw hides/skins is represented in *Table 2.1* below

S.Nº	Nature of solid waste	Quantity (kg)
1	Salt from handshaking	80
2	Salt from solar pans (not realized)	220
3	Hair (pasting ovine)	100
4	Raw trimmings	40
5	Lime sludge (mostly bovine)	60
6	Fleshing	120
7	Wet blue trimmings (grain splits)	30
8	Chrome splitting (bovine)	65
9	Chrome shaving (mostly bovine)	95
10	Buffing dust (including shaving bovine after crust)	65
11	Dyed trimmings	35
12	Dry sludge from ETP	125

Table 2.1: Nature and Quantity of Solid Wastes Generated (PalanisamyThanikaivelan et al, 20)

2.4. Collection of solid waste

Efficient collection and transportation are essential parts of the overall solid waste management. In solid waste collection system, many scholars classified under different categories, one group classified into four and other group into three. According to United Nations Center for Human Settlement (1985), solid waste collection systems are generally classified under four types; but the company uses the fourth type of collection method, so that The solid waste collection system is from the machine works at the same time waste is also collected their wastes at predetermined location, the same type of communal storage facility, collecting vehicle vesting these at frequent interval usually all a day to remove accumulated wastes. The fourth type of collection system is known as door-to-door collection. In this system, the collection crews enter each premise, takes out the containers and sets it back after emptying the waste into collection vehicles.

2.5. Transportation of Solid Waste

The transporting of solid waste is usually from the collection district to the disposal site by collection vehicle (Italo R.A. 2014). According to this context used in their study, transportation of solid waste includes human crews those transport from industry to transfer stations and activities being done by human being up on disposal landfill.

The solid waste transport system has been assumed that semi-trailers' provide the mode of transportation for distance hauling. While trucks and semi-trailers most commonly used, railroad cars and barges are also utilized. **Engine-powered collection equipment:** This includes all motorized collection equipment. There exist three broad types of refuse collection systems namely door-to-door, block on communal collection and containers lift trucks, and these ways of collections are used in Addis Ababa solid waste collection systems from the case company.

Door to-door collection: the side loading and compacting trucks are usually served for door-to-door collection systems where container transfer stations are lacking and road accessibility is not limited, in such collection system the disposing wastes and truck is collection points met at a pre-defined time.

In order to manage the growing volume of wastes collected in various ways, proper policies need to be performed and implemented. For instance, in the developed world the approach to waste management is regarded as the most compatible with the environment and sustainable development. Environmentally sustainable approach of solid waste handling reduces pollution, seeks to maximize recovery of reusable and recyclable materials and protect human health and the environment. Integrated waste management aims to socially desirable, economically visible and environmentally sound approach in the process of waste handling (Medina, 2004).

2.6. Reuse, Recycling and Recovery of solid waste

In contrary to its negative impact, solid waste has large economic benefit to the society. Human and animal excreta are used in fish farms and organic fertilizer, in improving soil fertility and increasing agricultural productivity (Vander et al, 1992).

As some research indicates, the reuses of organic solid waste in developing countries have health risks because of shortage of having knowledge of the extent to use. In contrary to this, in one of the town of Nepal, Kathemandu, solid waste can be best reused by transforming it into solid waste fuel briquettes. The same fraction of waste is reduced in the land-fill site for final disposal. At household level, especially in low-income groups, waste is widely used as an economic resource. Such practices have to be encouraged because they contribute to reduce the quantity of waste to be carried to the collection containers and transported to the landfill. Therefore, the existing ideal approach to solid waste management in the first step is reducing waste at the source and then to recover reusable materials from the waste streams prior to disposal. This task is accomplished by recycling which is separately out and reusing these components of the waste stream that may have economic value (Melaku, 2008).

Environmentally sustainable approach of solid waste management has the following structure:

Waste prevention: - this is a preventive action that seeks to reduce the amount of waste that individuals and other organizations generate. By not creating waste; fewer collection vehicles, and fewer number of refuse collectors would be needed; smaller waste handling facilities would be required and ultimately it would extend the life of the land fill (Medina, 2004)

Reuse: Reuse involves cleaning and using materials over and over. In other words, it means the use of a product more than once in its original form for the same or a new purpose. It relies on items that can be used over and over instead of throw away items. This method is used to decrease the use of material and energy resources, cuts pollution, creates local jobs, and saves money (Miller, 2007). Reusing is more efficient and better than recycling and composting methods because cleaning and reusing materials in their present form avoids the cost of energy for remaking them into something else (Cunningham, 2008).

Recycling: in addition to reuse, recycling is also an obvious solution of solid waste problem. It is an important way of collecting solid waste materials and turning them into useful products that can be sold in the market place. Such materials can be reprocessed in two ways: primary and secondary. Primary recycling is a process in which original waste material is made back into the same material. For example, newspapers recycled to make newsprint. In secondary recycling, waste materials are made into different products that may or may not be recyclable for instance, cardboard from waste newspapers (Miller, 2007).

Composting - it is the process of decomposition of organic waste material considering the high proportion of organic material in waste generated. Composting can be an option to reduce the amount of wastes that are land filled. Composting is usually applied to solid or semi-solid materials and can be carried out under either aerobic or anaerobic conditions. When composting is conducted under controlled condition, it reduces the cost of waste disposal and does not produce odor but produces a clean and readily marketable finished product. Composting also increases nutrients by returning them back to the soil (Melaku, 2008).

Landfill: - landfill is a method of solid waste disposal that functions without creating a nuisance or hazard to public health or safety. The compacted layer effectively denies continued access to the waste by insects, rodents, and other animals. It also isolates the refuse from the air, thus minimizes the amount of surface water entering into and gas escaping from wastes. Land filling is necessary for municipal solid waste disposal but every landfill has its own finite capacity. The most common approach to extending the life of landfills is to introduce recycling, composting, and incineration into the solid waste disposal system (Chang and Nishat, 2005).

Incineration: - Incineration, which refers to the controlled burning of wastes at a high temperature, sterilizes and stabilizes the waste in addition to reducing its volume, and may be used as disposal option or means when land filling is not possible and the waste composition is highly combustible. Incineration is the term used for the combustion of solid wastes. In properly designed and operated incinerator, there is a substantial reduction in the volume of waste material. Thus, equipment for reducing the size of irregular objects is normally a prerequisite at most incinerator plants (World Bank, 2012).

2.7. Disposal of solid waste

The rate of solid waste generated in a given company is determined by Nashiimirimana (2004) people's attitude towards waste can also condition solid waste generation rate in the form of their pattern of material use and waste handling, their interest in waste reduction and minimization, and the degree to which they refrain from indiscriminate dumping and littering.

Therefore, an accurate knowledge of quantity and rate of solid waste generation in a given area is essential for preparation and implementation of appropriate solid waste management. Because it provides information on human, financial and equipment resources required for collection and transportation of waste, to enact appropriate laws on waste reduction, and establish current and future needs for solid waste disposal sites (Abel, 2007).

An effective disposal of solid waste can reduce land, water and air pollution. This can be achieved by using different methods. There are five main approaches of solid waste disposal like sanitary landfill, burning or incineration, barging it out into sea, pulverizing and composting (i.e., by digestion of bacteria agony). Collection involves the process of picking up of wastes from collection points, loading them into a vehicle, and transporting it to processing facilities, transfer stations or disposal site. In most municipal solid waste management systems, cost of collection accounts a significant portion of total cost. For instance, "in industrialized countries, collection accounts about 60-70% of total cost and 70-90% in developing and transition countries" (United Nations Environmental Program, 2016).

2.8. Challenges of Solid Waste Management in Addis Ababa Tannery

2.8.1 Inadequate land fill disposal

In most developing countries solid waste are disposed of on uncontrolled open dump sites. Thus, unsafe open dumps lay on large plot that is uneconomical. Further, it is exposed to scavengers, informal waste pickers, animal entry and ingesting of waste breeding insects and usually produced unpleasant odor.

Many authors suggested that the main reason to the inadequate landfill disposal is that poor financial and institutional arrangement, especially where local governments are under financed and low level of institutional capacity and rapid continuous population growth.

Regarding the factors behind the poor SWM system of the town, responses from the sampled households, KIs and the observation made revealed the following major factors.

2.8.2 Financial factors

Information obtained from other key informants also revealed that the problem of finance is very acute. There is inadequate and unequal distribution of annual budget for the sectors. So identified that financial aspect as a main hindering factor that determines the sustainability of effective solid waste management in Addis Ababa Tannery S.co, Ethiopia.

2.8.3 Institutional factors

Effective waste management services would not be fully actualized until all actors of waste management participate and assume their individual responsibilities (Guerrero *et al.,* 2013). Poor institutional coordination is another challenge that led to poor solid waste management in the case company. And institutional arrangement of the solid waste management has no integration or coordination and each sector is working independently.

2.8.4 Technical factors

There is no activity undertaken to convert waste to energy and reduce biodegradable solid waste at source in the case company. In addition to this, the information obtained from sampled indicated that most of the time dropped to river are practicing as major disposal methods. This indicates, as more attention is not given on recycling and resource recovery as a common practice. Beside the location of solid waste disposal site of the company also indicates as no focus made on the environmental impacts of solid waste, because there is surface water around organization. As a result, it possible to mention technical factors as another cause of solid waste management problem of the study area. These finding is the exact reflection of finding reported by Feleke (2015).

2.8.5 Social factors

Public awareness and attitudes to waste can affect the whole company solid waste management system (Zurbrugg, 2003). The response obtained indicated that residents of the town have poor awareness regarding the environmentally friendly methods of solid waste management and the impact of inappropriate solid waste management system on their environment and health. Therefore, in addition to financial, institutional and technical factors, social factors are other challenges behind solid waste management problem. With similar research work, Geofrey (2016) stated the fact that a lack of public awareness and co-operation are root causes of solid waste service delivery practices.

Likewise, in Addis Ababa Tannery, one of the major problems behind poor solid waste management system is lack of awareness in surrounding community.

2.9. Integrated Waste Management

Integrated waste management (IWM) can be defined as the selection and application of suitable techniques, technologies, and management programs to achieve specific waste management objectives and goals (wiki/Waste hierarchy). To be responsive to public attitudes, the disciplines that must be considered in integrated solid waste management include administrative, financial, legal, architectural, planning, environmental, and engineering functions. For a successful integrated solid waste management plan, it is necessary that all these disciplines communicate and interact with each other in a positive interdisciplinary relationship. The four basic waste management options (strategies) for IWM are: (1) source reduction, (2) recycling and composting, (3) combustion (waste-to-energy facilities), and (4) landfills.

Figure 2.9 below shows waste management hierarchy (wiki/Waste hierarchy).

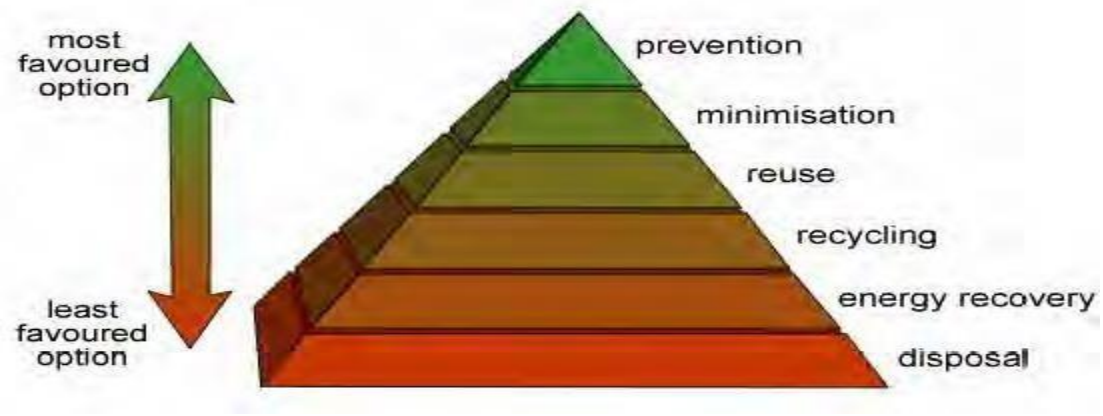


Figure 2.9**:** Waste Management Hierarchy

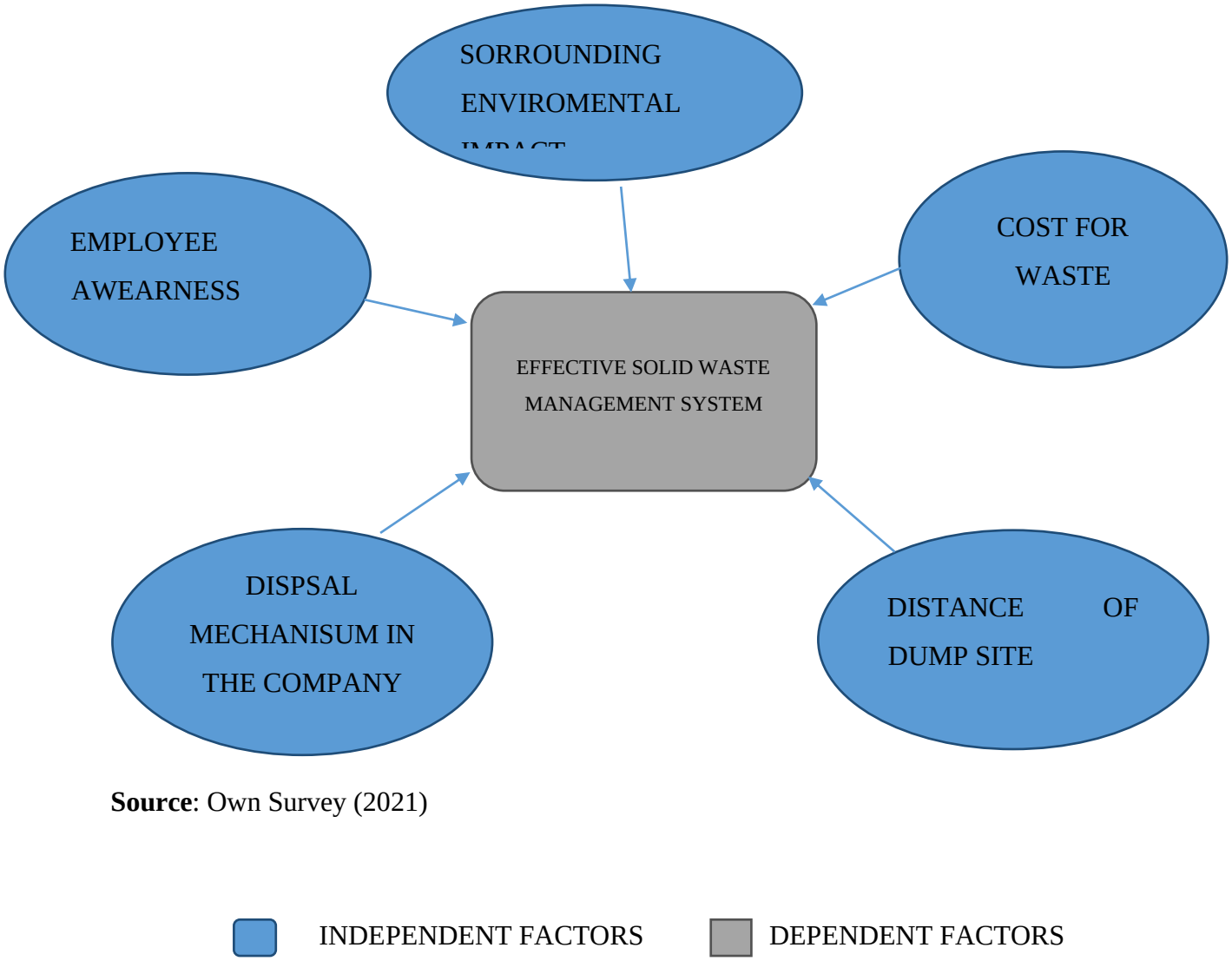
2.10 Summarized

- During the conversation of rawhide and skin in to leather generates liquid, solid and gaseous waste, which has an impact on the environment. So the tanneries and other manufacturing sectors have a great challenge and pressure on environmental protection.
- Leather industry has been categorizing as one of highly polluting industries and it has adverse impact on environment because of the generation of huge amount of liquid, solid and gaseous wastes. The simplified inflow and out flow of tanning industry
- The main releases of leather industries are wastewater, solid residues and odors. You can have a general idea of the sources and types of pollutants generated in leather processing. There for it need too much investigation and concentration from the government to dispose the tannery waste more than this study.

2.11. Conceptual Framework of solid waste management system practice.

Based on the above review of related literature the researcher has developed the following conceptual framework for the purpose of analysis. Overall, the focus and scope or boundary of this study is summarized on the following conceptual framework.

Figure 2.10.Conceptual Framework of solid waste management system practice and challenge.



Source: Own Survey (2021)

CHAPTER THREE:RESEARCH METHODOLOGY

3.1 Research approach and design

The purpose of this research is to investigate the practice and challenge of the solid waste management in selected case company. The research approaches used is descriptive methods, which collects information from employee of Addis Ababa Tannery S.co. In order to evaluate the collected data. In such condition the process of collection of information has not affect the activity of the respondents. A case study involves careful and complete observation, data collection and analysis of a unit in the waste management systems of the case company.

As mentioned in specific objects, this study majorly attention for those major practice and challenge pillars, i.e. Employee health condition, surrounding environmental impact, Disposal mechanism in the company and cost are assumed as independent variable, whereas the implementation of solid waste management system is assumed outcome variable, which are the main concept of this research paper. Accordingly, the researcher applied quantitatively research method to show those descriptive and explanatory variables.

3.1.1 Population of the study

The study area, which this research is focused on Addis Ababa Tannery s.co. Generally, AATSC has more than 350+ staff working for the organization including finance department, production department, R&D Department, Administration office and Technical Department, some of the organization employee is Contract and not related with the case. The AATSC has the below limited employee, that gather information from secondary data resource such that:

- Production Department: - 154 employee
- Technical Department: - 12 employee
- R&D Department: - 6 employee Generally, from those employee, there are around 172 employees are expected. Thus, the sample population size was calculated from 172-population size.

3.3 Sampling techniques and Sample Size

This study implies probability-sampling technique in order to select the sample from the total population. In Addis Ababa Tannery S.co there are around of 172 employees who works on the production, technical and R&D department that integrated directly with solid waste. Thus the stratified random sampling method (Yamane, 1967):

$n=N/1+N\ (e)^2$

$n= 172/\ (1+172(0.05)^2)$

$n=\underline{120.27}$

$\underline{n=120}$

Where:

n= number of Sampling Size in which the research is used (120)

N= Total number of population in which employee who works on AATSC (172)

E= error term (5%)

3.3 Source of Data

3.3.1 Primary Data Source

The primary data was collect from the questionnaire that distributed for respondent of the case company. Thus, the result is evaluating and analyze on the next chapter.

3.3.2 Secondary Data Source

Secondary source of data may be use accordingly when the study is required additional data. Moreover, the data collected from different reports, articles, research paper, and other resource. In addition, tries to review different types of documentation such as; reports, training documents and implementation follow up cards and so on.

3.4 Data collection techniques and procedures

The primary data were collected from employee of AATSC who works on the integrated with solid waste practices in the case company. Collection method or technique utilized questionnaires which is designed to hold different information such as demographic information about the respondent, general information about functional works and other specific information for the situation which holds the evaluation of given objective. Additionally, the questionnaire holds free-form questions, which tries to reveal the overall opinion of the respondent towards challenge and practice of the solid waste management. The questionnaire is organized with different major parts and sub parts.

3.5 Description of study variables and measurement

The study methods used to meet the specific objective that describe as in the following sub-title and the variable as researcher tried to mentioning in the framework of the study. The investigation of those determinate in this research is tries to identify those variables, which are the major factor in Assessment of tannery solid waste management practice and challenge. The following table describe list of variable and their description.

Table 3.4.Variables, Definition and Measurement of variables.

Variables	Definition (brief)	Measurement (based on Renjit Kumar(2011))
Employee Awareness	Directly interact with chemical and naturally it has bad smell and xenon	3.4 to 5.0- 'strongly agree/agree' 3.3 to 3.4 – 'neutral' 0.0 to 3.3 – 'strongly disagree/disagree
Surrounding Environmental Impact	When the municipal service took the waste by transportations through the surrounding area	3.4 to 5.0- 'strongly agree/agree' 3.3 to 3.4 –'neutral' 0.0 to 3.3 – 'strongly disagree/disagree
Disposal Mechanism in the Company	Dispose the waste is dropping to the river and used poor disposing method	3.4 to 5.0- 'strongly agree/agree' 3.3 to 3.4 –'neutral' 0.0 to 3.3 – 'strongly disagree/disagree
Cost and distance of dump site.	Relatively disposal cost is high that paid to municipal service.	3.4 to 5.0- 'strongly agree/agree' 3.3 to 3.4 –'neutral' 0.0 to 3.3 – 'strongly disagree/disagree
Solid Waste Management for Disposal(Dependent)	Which is used in the research show that the effect of System	3.4 to 5.0- 'strongly agree/agree' 3.3 to 3.4 –'neutral' 0.0 to 3.3 – 'strongly disagree/disagree
Effective Solid Waste management System	Finally show that the system implementation in the company	3.4 to 5.0- 'strongly agree/agree' 3.3 to 3.4 – 'neutral' 0.0 to 3.3 – 'strongly disagree/disagree

3.6 Data analysis techniques

The data that have been collected with the above collection methods have been analyzed quantitatively and qualitatively using Microsoft Excel (SPSS), and we use the 'five point Likert scale' is used with 1 for 'strongly disagree' 2 for 'disagree', 3 for 'Neutral', 4 for 'agree' and 5 for 'strongly agree' to measure the items prepared in the questionnaires. The result is further analyzing and interpreted using simple descriptive statistics analysis testing and Ordinary Least Squares (OLS) Regression is used manifestly indicated to the correlation variables and some attributes of waste management at the case company.The quantitative data mainly obtained using close-ended questionnaire was analyzed by simple descriptive statistics like percentage, average and etc., and the result was summarized in the form of table and graph. The qualitative data /perception, opinion, attitude etc.) Mainly obtained using open ended questionnaire and semi structured interview including the researcher's observation were analyzed, described and interpreted.

After the whole efforts attempted above have been made the researcher was endeavored to identify the prevailing problems, comments and suggestions forwarded concerning the problem understudy and improvements that need to be made over the problem in order to tackle the major causes of the problem and ensure safe and environmentally sound solid waste management system.

3.6.1 Specification of Econometric Model

This study Searches for the determinants that affects the Company's SWM Practice and Challenges. The survey data was collected randomly from Addis Ababa tannery S.co. The researcher Uses OLS model Specification to identify Those Determinates and their Level of effect using continuous variable which is calculated from 5point Likert scale data.

The econometric model such as OLS techniques was applied. The primary data for the model was collected by using of five-point Likert scale questionnaires for each variable and analyze using quantitative techniques such as descriptive statistics (mean, standard deviation, min max). The Model Specification is given as follows:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_4 X_4 + \beta_5 X_5 + \mu$$

Where

Y= Effectiveness of SWM Practice and challenge at Addis Ababa Tannery S.co;

β_0= Constant Term, β_1, β_2, β_3, β_4, andβ_5 are coefficients of the independent variable in the mode;

X_1= Employee Awareness (EA)

X_2= Surrounding Environmental Impact (SEI)

X_3= Disposal Mechanism in the Company (DMC)

X_4=Cost For Waste (CFW)

X_5=Distance of the Dump Site (DDS)

μ=the error term in the model (represents all other factors the dependent variable other than the independent variables in the study)

3.7Ethical Consideration

Designated Participants have given information regarding the aims of this study, appropriateness to participate in this study, possible benefits of participating in this study and concerns with regard to data keeping and confidentiality issues. Moreover, they were informed that participating in the study was completely voluntary. Among the research ethics, all the data were highly confidential with regarding the right to privacy of the respondents

CHAPTER FOUR: DATA PRESENTATION, ANALYSIS, RESULT AND DISCUSSION

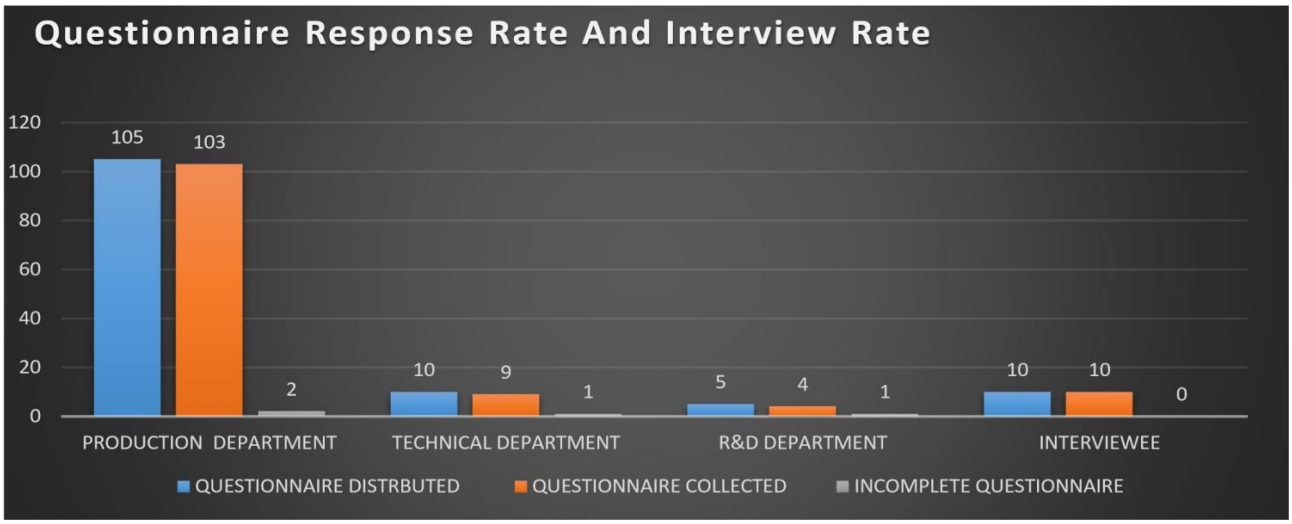
This Section analysis and discus the Sex of respondent, age of respondent, work experience (service years) in the organization, educational level and respondents position (Level) in the organization. The main focus of this section is to show the proportion female and male respondents, their work experience in the company, educational level of employees in the project etc. Based on this, we will see all the demographic characteristics of the respondents one by one as below.

This chapter presents the findings from the study following the different research questions. The data represented in this chapter was collected and processed using quantitative and qualitative techniques. The chapter first gives a summary of the respondents' characteristics in terms of whether they were residents or business people, and then goes on to present the empirical findings following through the research questions.

4.1. Response Rate

Response rate is a percentage of the actual samples participated in responding the study questionnaires of the researcher after completely filling them to the total of the samples that the researcher intended to consult with. The researcher used the responses of the respondents for answered questionnaires. Out of 120 sample questionnaires only 116 were returned back completely filled. Three of the questionnaires were not returned totally and one of the questionnaires were returned being negligently filled and were very incomplete and the researcher rejected this questionnaire. From production department out of 102 of 100 is returned back, from Technical Department out of 9 respondents are 9 are completely filled the questionnaire and from R&D Department out of 5 employees 4 questionnaire are responded and one is incomplete. The researcher found a response rate of 116/120*100% =96.6%. And a response rate that is greater than or equal to 80% is very good. And hence this research's survey has an excellent response rate.

Figure 4.1: Questionnaire and Interview Rate



***Source**: own data analysis, (2021)*

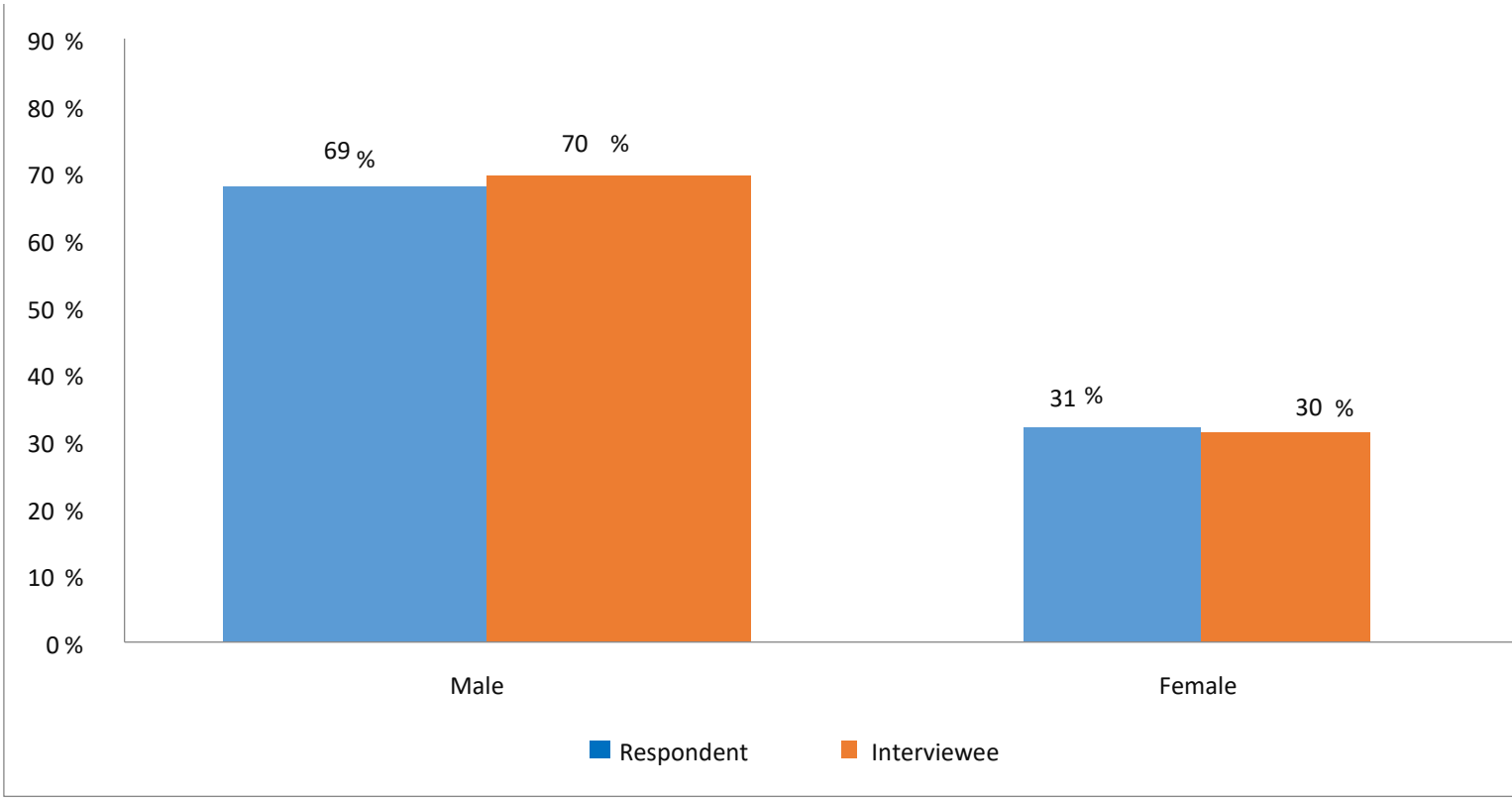
4.2. Demographic and Socioeconomic Profile of Respondents

One hundred twenty respondents from the company employee were given a well-structured questionnaire instrument for quantitative and qualitative data while another 10 (4 from Company production managers, R&D manager, technical manager and fleet manager each), 2 from company's health center clinic, 2 from Finance department) were interviewed by semi-structured interview instrument for qualitative data. Solid waste generation and composition shows a great variation related with differences in background and characteristics of households. In this section, the researcher tried to constitute different sample with various demographic characteristics.

4.2.1 Gender

The below figure shows the gender profile of the respondents and the interviewees. It shows that, from the major respondent category, more male respondents (69% of the total 116 respondents) and 31% of the total of 116 respondents are female. On the other hand, 70% of the total 10 interviewees were male respondents and 30% of the total 10 interviewees are Female. However, due to the suitability sampling procedure that was adopted in this study.

Figure 4.2: Gender Profile of the Respondents in Percentage



Source: *Own survey, 2021*

According to the collected data of personal information of questionnaire respondents: Sex; 80 (69%) male, 36(31%) females, and conversely the interviewees are 7(70%) male and 3 (30%) female. As a chance the participation of large percentage of male of the case company in the respondents' of questionnaire, decreases the degree of validity and accuracy of the research findings to some extent because woman is on cleaning and collection activity much better than better man. But on the case company men are more information than women particularly in the study area.

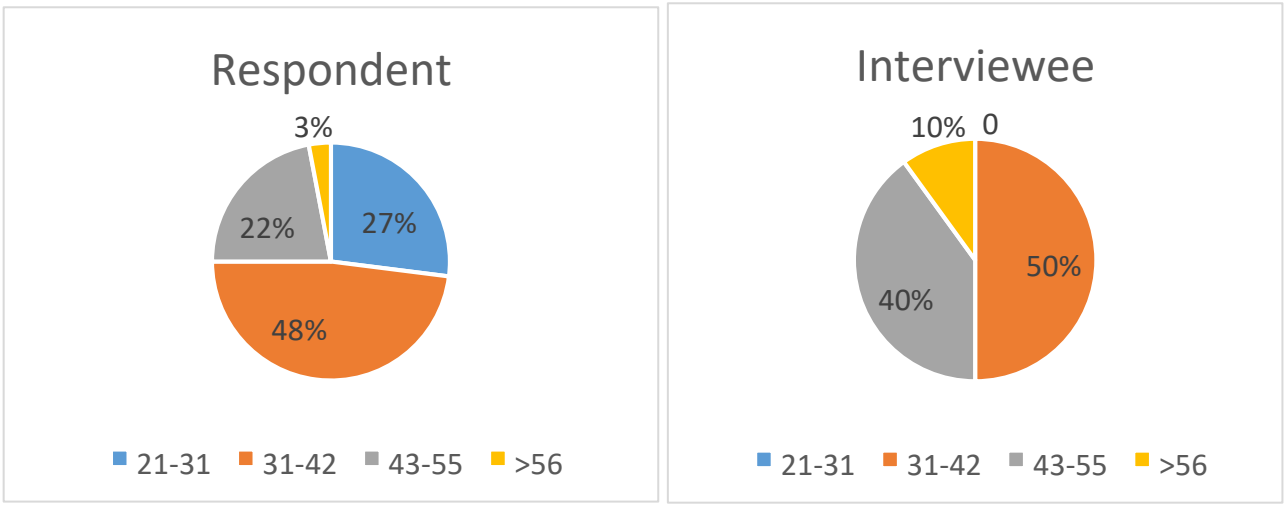
4.2.2Age Distribution

The age distribution of the employee respondents is also important for determining his/her ability to participate in the process of company solid waste management. Table 2 revealed the current age distribution of employees or respondents.

Table 4.1: Age Distribution

Title and sub title of identifications		Respondent		Interviewee		Remark
Age	21-31	31	26.7			
	31-42	56	48.3	5	50%	
	43-55	25	21.6	4	40%	
	>56	4	3.4	1	10%	
	Total	**116**	**100%**	**10**	**100%**	

Source: *Own survey, (2021)*



It is indicated that most of the respondents are found in the working age group. Out of the total respondents about 89% of sample respondents and 100% of the interviewees belong to adult age group (21-55 years). This contributes to the accuracy of the information gathered from such respondents. The survey showed that out of 116 respondents 31(26.7%) belong to the age group 20-31 years, 56 (48.3%) were aged between 31and 42 years, 25(21.6 %) were aged between 43 and 55 years, 4 (3.4%) were aged above 56 years of age. In general, the age group structure indicates high proportion of the respondents were found in the age of 31 to 42 years, productive age they have even high potential for higher population growth rate thathave direct impact on solid waste generation rate and may affect the composition and disposal of solid waste management.

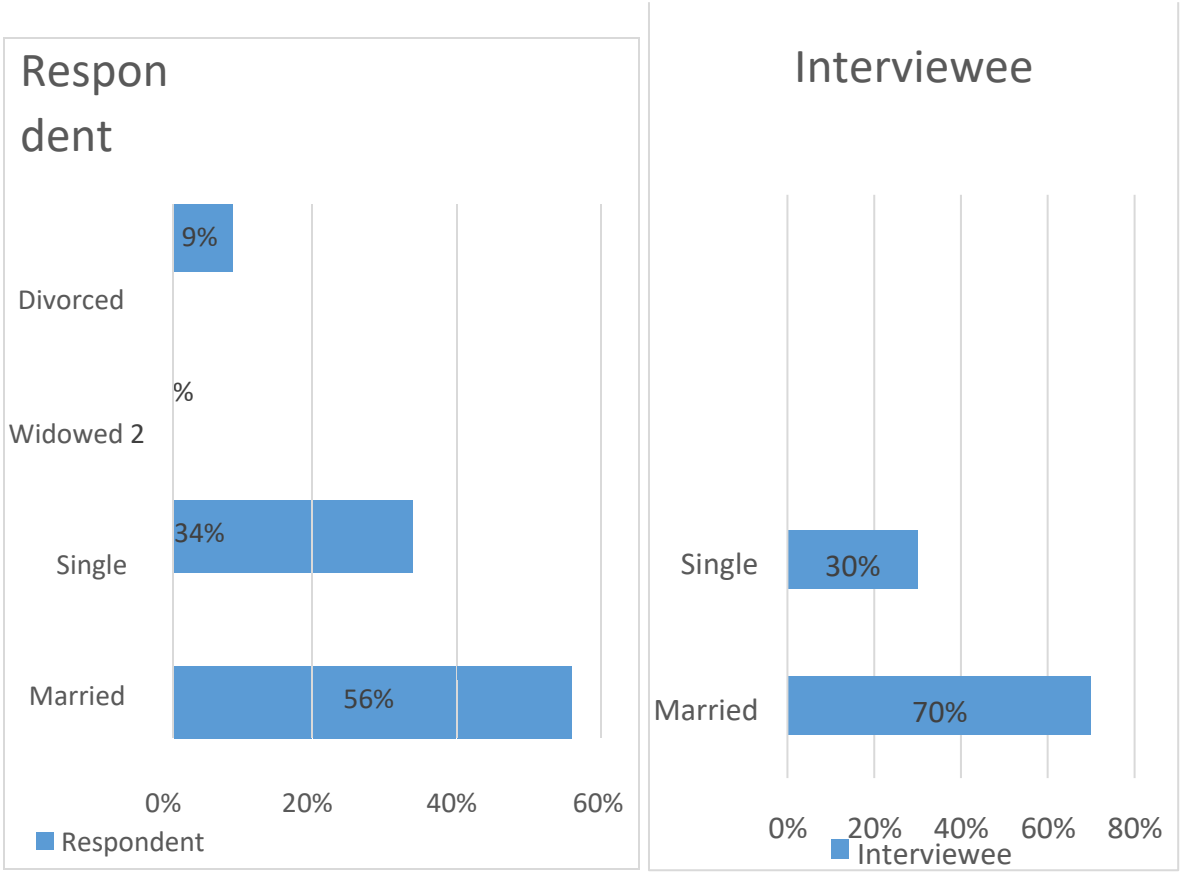
4.2.3Marital Status

Family is central to income maintenance, economic status and social adjustment. Therefore, marriage statistics has economic and social implications. Table 3: shows the marital status of the respondents and the interviewees.

Table4.2: Marital Status

Title and sub title of identifications		Respondent		Interviewee	
		No.	%	No.	%
Marital Status	Married	65	56.0	7	70
	Single	39	33.6	3	30
	Widowed	2	1.7		
	Divorced	10	8.6		
	Total	116	100		100

Source: *Own survey, (2021)*



As the above table 3 illustrates more than half of the questionnaire respondents, 65(56.0%) and interviewee of 7(70%) are married. Single occupied the second position of marital status. Therefore, based on the above figure the largest population gets married. At this status they believed to have adequate knowledge about waste generation and its management experience at home and the surrounding Area.

4.2.4Monthly Income

The average monthly income of respondents was also considered as an important variable that could influence people's perception and attitude about SWM system in the company as SW generation rates have direct relationship with income level (D. Wells 2006).

From the socioeconomic conditions, the amount of annual income of the employees has an impact on organizational solid waste management. Income is directly proportion with level of education that obtained terminates fears of being taxed, inability to keep the record of their sales and irregularity of their income. The researcher categorized and presented the income level in detail according to the following.

Table 4.3: Monthly Income

Title and sub title of identification		**Respondent**		**Interviewee**	
		No	**%**	**No**	**%**
monthly average income	2,001 – 3,000	7	6.0		
	3,001 – 4,000	34	29.3		
	4,001 – 5,000	43	37.1		
	> 5,000	32	27.6	10	10
	Total	116	100	10	100

Source: *Own survey, (2021)*

As data of table 4, the monthly average income of the case company employee greatest is between 4,001 – 5,000 birr/month i.e. 43(37.1%) of the total respondent and 34(29.3%) of respondent's monthly income is 3,001 - 4,000 birr/month of the total respondents and also above 5000 and in between 2,001 – 3,000birr/month responded 32(27.6%) and 7(6.0%) respectively. On the other hand, the average monthly income of interviewees was totally above 5,000 birr/month. The income level of respondents can affect the rate of waste generation and collection, transportation and disposal. Low-income contributes low participation which leads to low level of waste management at large.

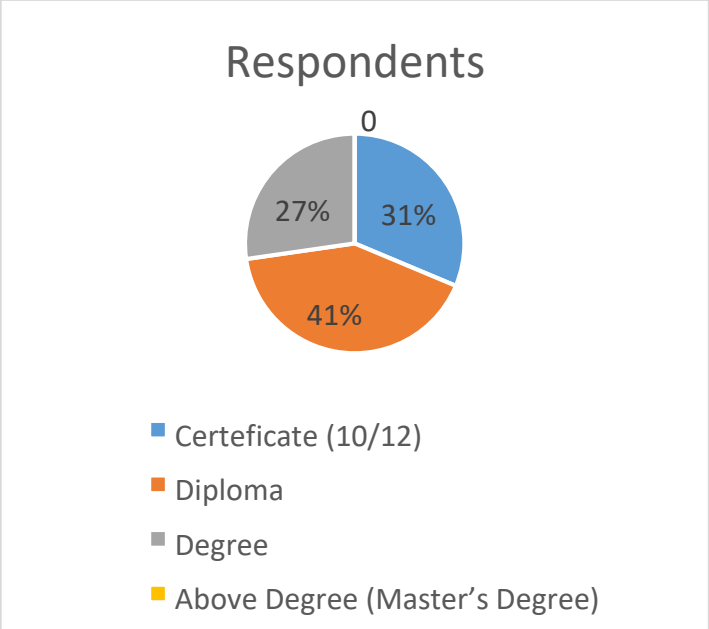
4.2.5Educational Status

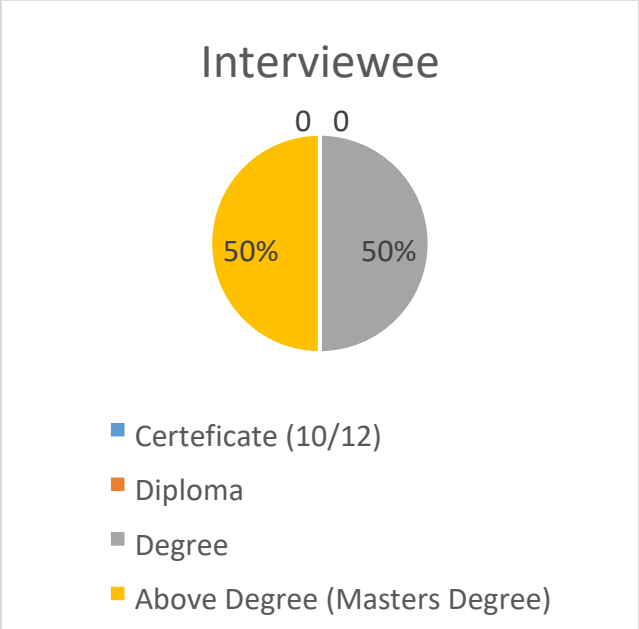
The majority of the employees in the Addis Ababa tannery s.co have different educational backgrounds. This educational background of the respondents influences their active participation and handling of solid waste on their working environment. Therefore, to improvement their accepting about the problems caused by wastes continues and organized training and awareness campaigns are needed. This problem is seen in the study area. Table 5 shows that the level of education completed by the respondents.

Table 4.4: Educational Status of the Respondents

Title and sub title of identifications		Respondent		Interviewee	
		No	%	No	%
Education Status	Certificate(10/12+)	36	31.1		
	Diploma	47	40.6		
	Degree	31	26.7	5	50
	Above degree	2	1.7	5	50
	Total	116	100 .0	10	100.0

Source: *Own survey, (2021)*





Education enables to find rational solution towards the problem identified. Most of the respondents and all of the interviewees are above grade 10 and we assume that they could have a better understanding of SWM.

Large number of respondent's educational level falls on certificate and diploma level that qualifies them to read and understand any written materials, proclamations, policies, etc. about SWM and its impact on environmental ecosystem.

4.2.6Employment Condition

Employment condition of the respondents and interviewees has a relation in waste type and its management systems.

Table 4.5: Employment Condition of the Respondents.

Title and sub title of identifications		Respondent		Interviewee	
		No	%	No	%
Employment condition	Contract	9	7.8		
	Permanent	107	92.2	10	100
	Total	116	100	10	100

Source: *Own survey, (2021)*

As table 6 shows the employment status of Addis Ababa Tannery S.co respondents are higher in permanent condition 107(92.2%) and some of employees are contact that is 9(7.8%). Employment condition helps to estimate the condition of work level which in turn determines the contribution of company working environment that has to think their home to SWM activities. The average monthly income of respondents was also considered as an important variable that could influence people's perception and attitude toward SWM system in the sub-city as SW generation rates have direct relationship with income level.

4.2.7Socio-Economic Profile

In this section the socio economic profile of 116 respondents from the company who were given a well-structured questionnaire instrument for quantitative data and another 10 who were interviewed by semi structured interview instrument for qualitative data are presented.

4.3. Description of Existing SWM practices

Nature and Magnitude of SWM Problem in Addis Ababa Tannery

Solid waste management is influenced by the social status of the company; this is due to pattern of waste generation and handling of the employees. The company based waste management and social condition of waste workers are conditioned by the attitude and culture of the organization. Medina, (2004) indicated that in many low income residential areas Community Based Solid

Waste Management is the only feasible solution. Therefore, functional links between the company's employee and the municipality is essential.

However, employee's participation in solid waste management was low in the company. This was mainly due to lack of promotion through general awareness building programs as well as focused solid waste management information campaign.

Nature of SWM

To determine the type and way of SWM waste prevention, recycling, reuse, composting and incineration, knowing the composition and characteristics of waste is essential. For instance, according to (Medina, 2004), if wastes have high proportion of organic matter, the possibility of composting and biogas regeneration as means of handling wastes is a better mechanism than incineration, reuse and recycling. Moreover, using incineration as a means of waste disposal has been mostly negative experience due to environmental pollution. Therefore, using the waste in a suitable manner is advisable. To make it sustainable an integrated way of solid waste management system should be practiced in the process of storage, separation, reuse, and recycling of wastes.

In table 7, it is exposed that, all wastes are produce in case company that the respondents answered the questionnaire depending on their own working area that generate the waste by the machine. About 16.4% of the respondents produced Lime and fleshing Organic wastes and shaving chrome contain wastes with the same percentage. Some hair and organic matter contain sludge waste and curst trimming are being produced by about 11.2% respondents at the same percentage, 19.8% of respondents produce Chrome trimming waste that use for upper shoe, female bag and wallet and 12.1% respondent are produce Buffing Dust and 12.9% of respondent are produce other types of wastes like paper, plastics, rope type materials and oil type grace. This is common in any tanneries company. And among all, most of them (98.3%) have their waste storage for daily generated waste. The types of wastes include both organic and inorganic materials mainly dominated by (above 95%) are organic one.

In the study at the case company on the working area the solid waste is mostly stored in temporary containers such as plastic bags, sacks, baskets, local free space and others. The type of waste storage used by respondent or the employee has great impacts on solid waste management.

Table 4.6: Nature of SWM

Description		Frequency	Percentage	Cumulative %
Types of waste produced	Lime and fleshing Organic wastes	19	16.4	16.4
	shaving chrome contain waste	19	16.4	32.8
	Hair and organic matter contain sludge	13	11.2	44.0
	Chrome trimming waste	23	19.8	63.8
	Buffing Dust	14	12.1	75.9
	Crust trimming	13	11.2	87.1
	Other	15	12.9	100.0
Have Own waste storage	Yes	114	98.3	98.3
	No	2	1.7	100.0
Solid waste storage system used in your company	Local basket	9	7.8	7.8
	Sacks (Madaberia)	23	19.8	27.6
	Open Space	71	61.2	88.8
	Plastic bucket	6	5.2	94.0
	Pill or Pit	7	6.0	100.0
How do you put your daily solid wastes	All together	92	79.3	79.3
	Separated	24	20.7	100.0
The waste bins stayed without picking	2 days	34	29.3	29.3
	3 days	26	22.4	51.7
	5 days	22	19.0	70.7
	A week	27	23.3	94.0
	more than a week	7	6.0	100.0

Source: *Own survey, (2021)*

It has been observed that majority of the respondent 61.2% are using open space that beside the working machine and 19.8% are using sacks *(Madaberia)*. This is followed by local basket 7.8% and piles and pits 6%, while others 5.2% of the respondents claimed to use plastic bucket for solid waste storage. For the question raised to the case company concerning the separation of SW generated at respondent level, 92(79.3%) responded 'No' and 24(20.7%) of them separate

"sometimes" if not often. Therefore, only very few say they separated the SW every time they store it and put on the right place. It is the way the waste generated is handled, stored, collected and disposed of that can pose risks to the environment and to public health. It has been shown in the above table that the waste stays in the waste bins for longer time which may bring health problem to the employee at the case company. According to most of the respondents (29.3%) of the company waste stays in the containers for a 2 days, some respondent 27(23.3%) said a company wastes stays in the container for a week and the waste containers stayed without picking 3 days are responded 26(22.4%) and 5 days are responded 22(19.0%) stays for short period of time in the container.

Magnitude of SWM Problem

The generation of solid waste from the tannery during hide processing reveals that more than 300 kilogram of solid waste is generated per ton from raw hide processed as fleshing trimming and splitting waste. In the similar manner 150kilogram of solid waste per ton generated from raw skin trimming, hair waste fleshing waste and pickling trimming. There are many factors that affect magnitude of SWM. As in table 8 the seriousness of the waste generated in the Addis Ababa Tannery s.co was calculated by the respondents and it was high problem of solid waste problem for example 50(43.1%) was agreed with the high problem of solid waste in the case company next very high problem agreed 46(39.7%) from 116 populations. 19(16.4) % of the respondents agreed that to the minimum there is a moderate solid waste problem.

The quantity of SW generated is above 1000kg waste is generated. As estimated by respondents, out of the SW generated from this tannery is 44.8% responded for above 1000kg, very small amount of it is reused. Out of the total respondents 77(66.4%) completely not reused the SW in part and 39(33.6%) reused.

Table 4.7: Magnitude of SWM problem

Description		**Respondents (N=130)**		
		Frequency	**Percent**	**Cumulative %**
How do you evaluate the problem of solid waste in your city?	Little	1	0.9	.9
	Moderate	19	16.4	17.2
	High	50	43.1	60.3
	Very High	46	39.7	100.0
	No problem	-	-	
Quantity of SW generated in kgs /month	0-200	3	2.6	2.6
	300-400	2	1.7	4.3
	500-600	7	6.0	10.3
	700-800	22	19.0	29.3
	900-1000	30	25.9	55.2
	>1000	52	44.8	100.0
Of generated SW amount how much is reused and recycled:	Almost all	-	-	
	¾ of it	-	-	
	Half of it	-	-	
	Quarter of it	-	-	
	Very small	39	33.6	33.6
	None of it	77	66.4	100.0
Average birr paid by company in SW per month:	600-1000	7	6.0	6.0
	1100-1500	5	4.3	10.3
	1600-2000	27	23.3	33.6
	>2000	77	66.4	100.0

Source: *Own survey, (2021)*

On table 8 shows the finding of the research indicates that the case company paid above 2000 per month for labor and monthly fee for Addis Ababa municipal. Above 2000 birr/month with 77(66.4%) response. As suggested by most of the respondents this is paid with water bill and the

amount is an average estimation. The magnitude of the problem of disposal system is shown in the following table.

Table 4.8: The magnitude of the problem of disposal system

		Frequency	Percent	Cumulative Percent
Valid	Burning	1	.9	.9
	Open Space	51	44.0	44.8
	Left For Collection	64	55.2	100.0
	Total	116	100.0	

Source: *Own survey, (2021)*

To evaluate the type of disposal system used by the respondent in above table 9, it indicates that the "Left for collection" is achieved by 64(55.2%) respondents. Which means that large amount of waste is stored in pits or piles or container for waste collectors in order to be taken to disposal site or transfer station. The second system of disposal selected is "Open Space" by 51(44.0%) respondents and at the "Burning" selected only 1(0.9%). **Tannery Solid Waste Management Practices at Addis Ababa Tannery t**hrough industrial solid waste has to be managed altogether and separately. It depending on the working section. The solid waste has to be separated due to the problem of waste that contain hazardous components that affect both human health and environment. The assessment of tannery waste management practice of Addis Ababa Tannery indicates that during leather production and from the primary effluent treatment plant of the tannery the solid waste is collected, separated transported and disposing along with municipal solid waste to an open dumping area called" koshe" which is more than 90 years to serve the company.

It was practical that there are different types of tannery solid wastes generated during hide and skin processing having different properties. In addition to this, some of the solid wastes contain chromium metal which is toxic to human and the environment. Therefore, tannery solid wastes have to be segregated from being disposed along with municipal solid waste and appropriate solid waste management has to implemented based the physical and chemical nature of the solid wastes.

The bad practices of a company in respect to solid waste management in most tannery of the country have been manifested mainly in three ways: dumping of solid waste illegally anywhere in the organization, improper handling of waste at working area, and improper use of community waste

bins. Municipal solid wastes are generally poorly treated or handled and this has partly aggravated the problem of solid waste management in Addis Ababa Tannery s.co. Therefore, the bad practice of the company has greatly contributed to the poor solid waste management. In fact, for furthermost of the bad practice of the company, the poor and inadequate solid waste management practice has contributed much for the occurrences bad practice of the company. But it may not be the only reason; sometimes negligence or lack of awareness among the community towards solid waste management may have also play a role for poor solid waste management practice.

The participation level of respondent "Above Very strong" in source collection are 55(47.4%) and strong 46(39.7%), the remaining 12(10.3%) is average. However, the overall average obtained by the finding is 4.29 out of 5. That is above average, and in activity of source collection a good participation was observed.

Table 4.9: the area and extent of company level SWM

Area of activity		**Employee Participation Level**						
		Very strong(5)	**Strong (4)**	**Average (3)**	**Poor (2)**	**Almost none (1)**	**Not at all (0)**	**mean**
I collect waste from the beginning / source	Nº	55	46	12	-	-	3	4.29
	%	47.4	39.7	10.3	-	-	2.6	
I properly store all the wastes at company.	Nº	37	64	12	1	5		4.04
	%	29.3	55.2	10.3	0.9	4.3		
I recycle and reuse the solid waste generated from the company	Nº	-	-	3	23	51	39	.91
	%	-	-	2.6	19.8	44.0	33.6	
I burn the waste from the tannery	Nº	1	-	2	3	28	82	.39
	%	.9	-	1.7	2.6	24.1	70.7	
I bury the waste from the tannery	Nº	1	-	2	3	25	85	.35
	%	0.9	-	1.7	2.6	21.6	73.3	
I transport and dump the stored waste from my working area to container	Nº	11	32	20	26	22	5	2.73
	%	9.5	27.6	17.2	22.4	19.0	4.3	
Total		105	142	48	56	131	214	

Source: *Own survey, (2021)*

The participation of respondent in collect waste from the beginning or from source of SW is very strongly 55 (47.5%), strongly 46(39.7%), Average 12(10.3%) and not at all 3(2.6%) respectively.it show that the waste is collected from primary source.

The respondent practice to store properly store all the wastes at company is 37(29.3%) and 64(55.2%) very strong and strong respectively, and the average achieved value is 3.5 out of 5 is at better performance of participation.

The finding above specifies that in recycling/reusing, burying, transporting and disposing to disposal site of solid waste, the company contribution is very poor or weak but to some extent transportation is much better.

Therefore, their average achieved value out of 5 is 0.91, 0.39 and 0.35 respectively. Recycling and Reusing, Burying, Burning and disposing at disposal site are at very poor participation level. As an average of overall seven participation variables of industry SWM practices, whereas the transportation is achieved value out 5 is 2.73. This can be considered as weak.

And the extent and the area of contribution of the respondents are revealed in the following table.

Table 4.10: Types of actions that Employee contributes in SWM at Addis Ababa Tannery.

Area of contribution		**Table Respondent Participation Level**						
		5	**4**	**3**	**2**	**1**	**0**	**Mean**
contributed financially	Nº	-	-	1	-	-	115	0.03
	%	-	-	0.9	-	-	99.1	
contributed materials used for	Nº	21	57	21	4	2	11	3.50
SWM	%	18.1	49.1	18.1	3.4	1.7	9.5	
contributed labor	Nº	35	56	13	5	4	3	3.90
	%	30.2	48.3	11.2	4.3	3.4	2.6	
given consultation	Nº	30	59	21	3	2	1	3.94
	%	25.9	50.9	18.1	2.6	1.7	0.9	
participate in awareness creation	Nº	29	52	28	2	4	1	3.84
	%	25.0	44.8	24.1	1.7	3.4	0.9	
Total	Nº	164	314	84	14	12	131	3.042
	%	19.76	38.62	14.48	2.4	2.04	22.6	

Source: *Own survey, (2021)*

The numbers on the header row means; 5=Very high, 4=High, 3=Moderate, 2=Less, 1=Least, 0=none

In the above **table 11** above indications the extent the company respondent participation in SWM at Addis Ababa tannery s.co level; findings are the material contribution, labor contribution, consultation and awareness creation contribution of the company of Addis Ababa Tannnerys.co are better status with an average achievement value of 3.5, 3.90, 3.94 and 3.84 out of five (5) respectively.

In contrary to this, the contributed financially are at lower level with the achievement of 0.03 mean out of 5. Which is totally the Addis Ababa tannery employment being not participate finically contribution totally. Because all payment of the solid waste paid by the company.

4.4.Factors Affecting Effective SWM

4.4.1Poor Coordination

Poor employee coordination is a challenge that leads to poor solid waste management in almost all parts of the company. As the researcher observed during the interviews of the managers, there is very weak coordination between the employee and owner of the company and also municipality officials of the sub city involved in the environmental protection issues. Tanneries waste management is a complex task that requires appropriate organizational integration between investors or owners because I am mentioning before tannery's waste are very toxic and harmful for human and environment.

The findings of **table 12** shows that there is poor coordination; the coordination being done by anybody, whether socially at local level or any governmental structure affects the SWM at household level "strongly and very strongly" is 60(51.7%), "strong" is 49(42.2%)," Average" 5(4.3%) and below average and no challenge 1(0.9%) responded, and the average weighted value is 3.43 out of 4, which is under category of strong influential challenge. And also lack of awareness, unreliable service provision, financial shortage/economic poorness, lack of rule and regulation and lack of initiative are the strong influential challenge that hinder company participation in solid waste management with the average weighted value of 3.29, 3.28, 3.22 and 3.02 respectively out of 4.

Table 4.11: factors Affecting Effective SWM

Factors		Factors Level					Mean
		Very strong (4)	Strong (3)	Average (2)	Less influence (1)	No influence (0)	
Poor coordination	No	60	49	5	1	1	3.43
	%	51.7	42.2	4.3	0.9	0.9	
Lack of awareness	No	59	40	11	4	2	3.29
	%	50.9	34.5	9.5	3.4	1.7	
Financial shortage/economic poorness	No	56	40	11	8	1	3.22
	%	48.3	34.5	9.5	6.9	0.9	
Lack of rules and regulation	No	56	44	10	4	2	3.28
	%	48.3	37.9	8.6	3.4	1.7	
Lack of initiative	No	58	48	7	2	1	3.38
	%	50.0	41.4	6.0	1.7	0.9	
Unreliable service	No	35	50	29	2	-	3.02
	%	30.2	43.1	25.0	1.7	-	

Source: Own survey, 2021

4.4.2Lack of Awareness

Awareness and attitudes concerning waste can affect the whole company solid waste management system. All steps in municipal solid waste management starting from household waste storage, to waste segregation, recycling, collection frequency, willingness to pay for waste management services, and disposal facilities depend on public awareness and participation. Thus, lack of awareness and training about the importance of proper solid waste management for health and well-being of people, ruthlessly restricts use of company environment based approaches in developing countries, and also crucial challenge for failure for SWM practices in the Addis Ababa tannery s.co. Most proportions of the respondents agreed that lack of awareness has effect on good SWM. The mean greater than two indicates it has an effect.

4.4.3Financial Constraint

According to the interviewees, company solid waste management is given low priority and very limited funds are allocated to the sector by government. In addition to limited funds, and have lack of good financial management planning for solid waste management. This Lack of financial management and planning the case of financial constraints particularly when this limited resources

available for the leather sector are completed quickly and causes solid waste management services to halt for some periods, will result in losing good working environment. Therefore, financial constraint is one of the challenge affecting effective SWM as shown in the table above.

4.4.4Lack of Rules and Regulations

The study has found that lack of adequate legislation makes it difficult to assign clear obligations to different sectors connected with waste management services. According to interviewees the rules and regulations and their implementation program at Addis Ababa tannery S.co was weak. On the other hand, there was no enough effort made to create awareness about solid waste management in the company including the rules and regulations and associated penalties in a regular basis. Challenges like lack of incentive the least challenge when compare with the other challenges, lack of rules and regulation is the 2nd least, and financial shortage is the 3rd influential challenge specified and so on. Therefore, as to these results lack of rules and regulations and lack of incentive can be considered as influential factor.

As the finding of analysis, the six factors mentioned in **table 12** above when observed as a whole of one influential challenge the average weighted value is 3.28 out of 4.

4.4.5Distance

The other variable which was associated with SWM was distance of storage for waste generated from the tannery. Distance was taken as independent variable and SWM as dependent variable. Table 13 shows this distribution.

Table 4.12 Distance of Waste Dump

Title /issues		Respondent in		Interviewee	
		No	%	No	%
The distance of transfer station/container/ from the factory in meter	- Below 10	2	1.7		
	- 21-30	8	6.9		
	- 31-40	13	11.2		
	- 41-50	30	25.9	2	20
	- 51-60	46	39.7	4	40
	-Above 60	17	14.7	4	40
	Total	116	100	10	100

Source: *Own survey, 2021*

To evaluate the distance of transfer station of SW from working area, the response achieved 51-60m is 46(39.7%), 41- 50m is 30(25.9) and above 60m achieved is 17(14.7%). This clearly indicates most of the respondents have to move a distance over 50 -60m from their working place to put off the waste.

Table 4.13 Correlation between factors and Effective SWM.

Description		**Properly managed**		**Improperly managed**		**Total**		**Ratio**
		No.	**%**	**No.**	**%**	**No.**	**%**	
Income	2.001 to 3,000	4	3.4	3	2.6	7	6.0	1.3
	3,001 to 4,000	21	18.1	13	11.2	34	29.3	1.6
	4001 to 5,000	31	26.7	12	10.4	43	37.1	2.6
	Above 5,000	18	15.5	14	12.1	32	27.6	1.2
	Total	74	63.7	42	36.3	116	100.0	
Education Level	Certificate(10/12)	22	18.9	14	12.1	36	31	1.6
	Diploma	33	28.5	14	12.1	47	40.6	2.4
	Degree	16	13.8	15	12.9	31	26.7	1.1
	Above Degree	2	1.7	0	0	2	1.7	2
	Total	73	62.9	43	37.1	116	100.0	
Distance	Below 50m	23	19.8	30	25.8	53	5.4	0.8
	Above500m	46	39.7	17	14.7	63	54.4	1.5
	Total	69	59.5	47	40.5	116	100.0	

Source: *Own survey, 2021*

Solid waste management practice of Company was associated with monthly income in order to measure the relationship between these two variables and to see its impact on SWM. The ratio of frequencies of properly managed to improperly managed result shows (Table 14) a significant positive association between income of the household and SWM. The ratio is increasing as income gets better. The study also asserted that as the amount of income of households increase the capacity of proper solid waste management increased and vice versa. This was strongly mentioned by (Mesfin, 2006) that enhanced economy enables the company employee to allocate more for SWM practice, by providing more sustainable financial base. The conceivable clarification for the positive relationship

between salary and SWM within the study are clarified underneath. The essential work of utilization design and its result of legitimate dealing with were affected by financial designs of the company.

The result portrayed that the extent of these respondents which were utilized legitimate strong squander administration expanded and the proportion result expanded from 1.1 to 2.4 showing legitimate administration increment with headway in Instructive level. But the appropriately overseen SW is exceptionally little. Solid squander era and administration is conditioned by people's state of mind toward strong squander, their design of fabric utilize and strong squander hones, interface to play down the degree to which they partitioned squanders and the degree to which they abstain from careless dumping and littering. These are affected by open data and mindfulness creation measures; at the same time instruction speed up the capacity to assemble data and create positive demeanor towards strong squander administration. The other variable which was related with SWM was remove of stockpiles from houses. Separate was taken as autonomous variable and SWM as subordinate variable. There's a noteworthy connection between the two.

4.5 Reliability and Validity Test

Cronbach's Alpha Test where applied: Nunnally (1978) recommends that instruments used in research should have reliability of result 0.70. Thus, all 5 explanatory variables have reliability coefficient of 0.73, hence the data collection instrument which the researcher is used is reliable and valid.

Table 4.14. Reliability and Validity Test

Test scale	Mean
Avg inter item covariance:	0.47
No of items in the scale:	37
Scale reliability coefficient:	0.73

Source: own data analysis, (2021)

4.6. Descriptive Statistics Result

This part describes those investigated determinants of their contribution and level of effect on the assessment of solid waste management practice and challenges at Addis Ababa tannery S.co.

TheseDeterminates are classified as a variable which are independent in our scenario is presented with their relative table of detail data presentation. The main purpose of using this statistics parameters is to interpret the average response rate of respondent for each statement. According to Rengit Kumar (2011), from those 5 points Likert scale data, a variable with a mean score of: 3.4 to 5 is considered as "Strongly Agree / Agree" 3.3 to 3.4 is considered as "Neutral" 0.0 to 3.3 is considered as "Strongly Disagree / Disagree.

4.6.1 IMPLEMNTATION OF SWMS

Table: 4.15 Implementation of SWMS

N0	STATEMENT	OBS	MEAN	STD.DEV	MODE	MIN	MAX
1	SWMS is Available all Working time	116	3.44	1.03	4.00	1.00	5.00
2	Management has commitment to implement the SWMS	116	3.65	0.92	4.00	1.00	5.00
3	The training is held in the proper order and level of trainees understanding.	116	3.43	0.93	4.00	1.00	5.00
4	Employee have active participation of the Implementation of the SWMS	116	3.39	1.05	4.00	1.00	5.00
5	Employees have commitment to accept implementation of SWMS	116	3.60	0.90	4.00	1.00	5.00
6	Same issue with high frequency of support request are solved permanently.	116	3.46	0.99	4.00	1.00	5.00
	OVERALL AVERAGE	116	3.50	0.97	4.00	1.00	5.00

The outcome result of the implementation of SWMS is the dependent variable which is the study tries to relate with other explanatory variables. Table 4.16 shows management commitment to implement the SWMS is the most critical determinant factors on the implementation of system with the mean value of 3.65 and standard deviation of 0.92. This shows the respondents responds strong agree/ agree for this result shows that the factor is more than everything which need to implementation the system effectively. The training is held in the proper order and level of trainees understanding, Employee have active participation of the Implementation of the SWMS, Employees have commitment to accept implementation of SWMS, Same issue with high frequency of support request are solved permanently have at mean scores of 3.39 to 3.65 with standard deviation 1.03 to 0.92

indicates that the respondents were responded with strongly agree/agree that to show these factors have effects on the implementation of SWMS.

4.6.1 Employee Awareness due to Effective of SWMS.

Table 4.16 Employee Awareness

N0	STATEMENT	OBS	MEAN	STD.DEV	MODE	MIN	MAX
1	Employees have active awareness of SWMS	116	3.71	0.90	4.00	1.00	5.00
2	Knowing the Importance of SWMS	116	3.58	0.97	4.00	1.00	5.00
3	Importance and benefits of SWM to environment	116	3.43	0.97	4.00	1.00	5.00
4	Roles of Employee on SWM	116	3.13	1.13	4.00	1.00	5.00
5	Policies and Guidelines of SWM	116	3.33	1.00	4.00	1.00	5.00
	OVERALL AVERAGE:	116	3.44	0.99	4.00	1.00	5.00

***Source**: Own Data Analysis. (2021)*

According to the above table 4.16, factors such as Employee awareness the knowing the importance of SWMS are score mean value of 3.43 to 3.71and the standard deviation of 0.97 to 0.90. therefore, these result shows that respondent were responds on these factors strongly agree/ agree and these factors shows that knowing the importance of SWMS. Secondly polices and guideline of SWM has a mean score of 3.33 and the standard deviation of 1.00. this result shows that respondents were responded neutrally and it shows that the dedication on full working. The rest factors, i.e.; roles of employee are score a mean value of 3.13 with standard deviation pf 1.13. According to the above result that respondent is responded dis agree/ strongly disagree for this factors. Which is in turn shows that there is shortage of support staff to address all issues with a given period of time. There for to succeed the implementation of of SWMS the researcher selects the time at better condition.

4.6.2 Surrounding Environmental Impact due to the Effective of SWMS.

Table 4.17 Surrounding Environmental Impact

N0	STATEMENT	OBS	MEAN	STD.DEV	MODE	MIN	MAX
1	employee get involved in trying to solve environmental problems	116	3.78	0.94	4.00	1.00	5.00
2	Do you think the environment can recover on it's from problems caused by humans?	116	3.30	1.03	4.00	1.00	5.00
3	the way of SW reduce the damage you cause to the environment	116	3.57	1.04	4.00	1.00	5.00
4	We can all do our bit to reduce the effects of climate change	116	3.57	0.95	4.00	1.00	5.00
5	Nothing I do on a daily basis contributes to the problem of climate change	116	3.59	0.90	4.00	1.00	5.00
	OVERALL AVERAGE:	116	3.50	0.97	4.00	1.00	5.00

Source: Own Data Analysis. (2021)

Based on calculated means and standard deviation, the summary of surrounding environmental impact of the SWMS as a determinant s factors (which is describe in table4.17) show that the employee gets involved in trying to solve environmental problems which provided for the system activity has a mean score of 3.78 with standard deviation 0.94. This shows the respondents responds strong agree/ agree for this result shows that the factor is more than everything which need to implementation the system effectively. The way of SW reduce the damage you cause to the environment, We can all do our bit to reduce the effects of climate change, and Nothing I do on a daily basis contributes to the problem of climate change have placed on the second place which can affect the implementation of the SWMS effectively at mean scores of 3.57 to 3.59 with standard deviation 1.04 to 0.90 indicates that the respondents were responded with strongly agree/agree that to show these factors have effects on the implementation of SWMS. . The Do you think the environment can recover on it's from problems caused by humans has mean value of the 3.30 with the standard deviation of 1.03. This shows that the respondent's responds disagree/strongly disagree.

4.6.3 Disposal Mechanism in the company due to the Effective of SWMS.

Table 4.18 Disposal Mechanism in the company

N0	SATEMENT	OBS	MEAN	STD.DEV	MODE	MIN	MAX
1	The practice of Proper Segregation	116	3.43	1.02	4.00	1.00	5.00
2	The practice of Proper Recycling	116	3.31	0.96	4.00	1.00	5.00
3	The practice of Proper Reusing	116	3.30	1.05	4.00	1.00	5.00
4	The practice of Proper transporting	116	3.17	1.04	4.00	1.00	5.00
5	The practice of Proper Disposing	116	3.22	1.05	4.00	1.00	5.00
	OVERALL AVERAGE:	116	3.21	1.05	4.00	1.00	5.00

***Source**: Own Data Analysis. (2021)*

As seen the above table 4.18, the practice of proper segregation and one of contribution for the disposal mechanism in the company. It shows that mean scores to 3.43 and standard deviation1.02. It shows that the respondent with strongly agree/agree. The practice of proper recycling, the practice of proper reusing, transporting and the practice of proper Disposing were score a mean 3.17 to 3.31 and standard deviation1.05 to 0.96. This implies that the respondent was responded with disagree/strongly dis agree on this factors. From these indication, the lack of activities like recycling, reusing, transporting and disposing in the case company.

4.6.4 Cost for Solid Waste due to the Effective of SWMS.

Table 4.19 Cost for Solid Waste

N0	STATEMENT	OBS	MEAN	STD.DEV	MODE	MIN	MAX
1	Should the government provide more money to support solid waste management system	116	3.67	1.04	4.00	1.00	5.00
2	Do the company pay Container fees for municipal	116	3.87	0.89	4.00	1.00	5.00
3	You don't want to pay	116	3.44	1.03	4.00	1.00	5.00
4	Do the company charge per month for waste collection	116	3.67	0.85	4.00	1.00	5.00
5	Costs is the main reason for your level of satisfaction	116	3.40	0.99	4.00	1.00	5.00
	OVERALL AVERAGE:	116	3.59	0.99	4.00	1.00	5.00

***Source**: Own Data Analysis. (2021)*

According to the table 4.19, Should the government provide more money to support solid waste management system, do the company pay Container fees for municipal, Do the company charge per month for waste collection, Costs is the main reason for your level of satisfaction were great contribution for the Cost for solid waste in the company. It shows that mean scores to 3.40 to 3.87 and standard deviation1.00 to 0.99. It shows that the respondent with strongly agree/agree. From these indication result shows that the respondents responded on these factor with strongly agree/agree this shows implies that all these factors have good progress to improve the cost for solid waste.

4.6.5 Distance of dump site due to the implementation of SWMS

Table 4.20 Distance of Dump Site

N0	STATEMENT	OBS	MEAN	STD.DEV	MODE	MIN	MAX
1	Uncontrolled burning of waste in open dumpsite could result air pollution	116	3.44	1.00	4.00	1.00	5.00
2	There are not enough containers in major company area	116	3.46	0.97	4.00	1.00	5.00
3	Garbage truck cause some leakage of leachate or trash in to the working area and road	116	3.51	1.02	4.00	1.00	5.00
4	Garbage truck doesn't comes frequently	116	3.54	0.98	4.00	1.00	5.00
5	Concerned distance Dumpsite has impact to health problem for collection	116	3.49	1.03	4.00	1.00	5.00
	OVERALL AVERAGE:	116	3.49	1.00	4.00	1.00	5.00

***Source**: Own Data Analysis. (2021)*

The descriptive result of the above table 4.20 show that all factors such as Uncontrolled burning of waste in open dumpsite could result air pollution, there are not enough containers in major company area, Garbage truck cause some leakage of leachate or trash in to the working area and road, Garbage truck doesn't come frequently, concerned distance Dumpsite has impact to health problem for collection the researcher are thought the main factor for distance of dump site. It shows that mean scores to 3.44 to 3.54 and standard deviation1.03 to 0.97. It shows that the respondent with strongly agree/agree. From these indication result shows that the respondents responded on these factor with strongly agree/agree this shows implies that all these factors have good progress to improve the distance of dump site.

4.7 Correlation Between the variable

According to Gujarati (2009), Correlation between two variable measures the degree of linear association between them. To find the association of the independent variables with the assessment of solid waste management and practices and challenges of Addis Ababa tannery S.co, correlation coefficient was used. The values of the correlation coefficient are always ranged between +1.0 to -1.0. A correlation coefficient of positive one indicates a perfect positive association b/n the two

variables. A correlation coefficient of negative one indicates a perfect negative association b/n the two variables. A correlation coefficient of zero indicates that there is no linear relationship b/n the two variables.

Table 4.21 Research Result:

N = 116	EA	SEI	DMI	CO	DDS
EA	1.00				
SEI	0.76	1.00			
DMI	0.75	0.65	1.00		
CWM	0.76	0.67	0.62	1.00	
DDS	0.81	0.68	0.68	0.63	1.00

Source: Own Data Analysis. (2021)

When we look at the correlation with EA, we can see that almost all variable has strong correlation with the Assessment of solid waste of the case company. Among Them DDS, CO, DMI and SEI have the strongest correlation result between 0.70 and 0.81. The correlation has positive sign means that the value of one variable goes up, the value of the other variable tends to go up. Thus we can conclude that these variables are strongly associated with EA, and we can predict that they would be statistically significant predict variable. The list wise correlation is based on every data which is encoded. Through we wouldn't need to test the pairwise correlation using A STATA command. Because of we wouldn't have any incomplete information and there is no dropped observation as a missing value.

4.7.1 Econometrics Model Result

In this study the researcher used linear regression result which concerned with requires various test such as normality, autocorrelation, heteroscedasticity, model misspecification and multi collinearity. The data were categorized to questions according to each variable. In subsequent Section, some of the required test and model result are presented as follows:

4.7.2 Model Diagnostic Result

In this part the regression diagnostics test was calculated to check whether the data fit the basic assumption of the classical linear regression model. Diagnostic test suggests that the model passes the test of multi-collinearity and heteroscedasticity, auto correlation, and normality associated with the model. The following parts discusses the result of the testing to some extent.

4.7.3 Test for Normality of Residuals

Normality of the residuals is only required for valid hypothesis testing, that the normality assumption assures that the p-values for the t-test and f-tests will be valid. As noted in Brooks (2008), a normal distribution is skewed and is defined to have a coefficient of kurtosis of 3. And also states that, if the residuals are normality distribution, the histogram should be bell-shape as seen in the below figure 4.2 regarding the normality tests in this shown in the table 4.18 the coefficient of kurtosis was close to 3, and the probability of the residual is greater than 0.05. Accordingly, the statistic had a p-value of 0.448 implying that the data were consistent with a normal distribution assumption.

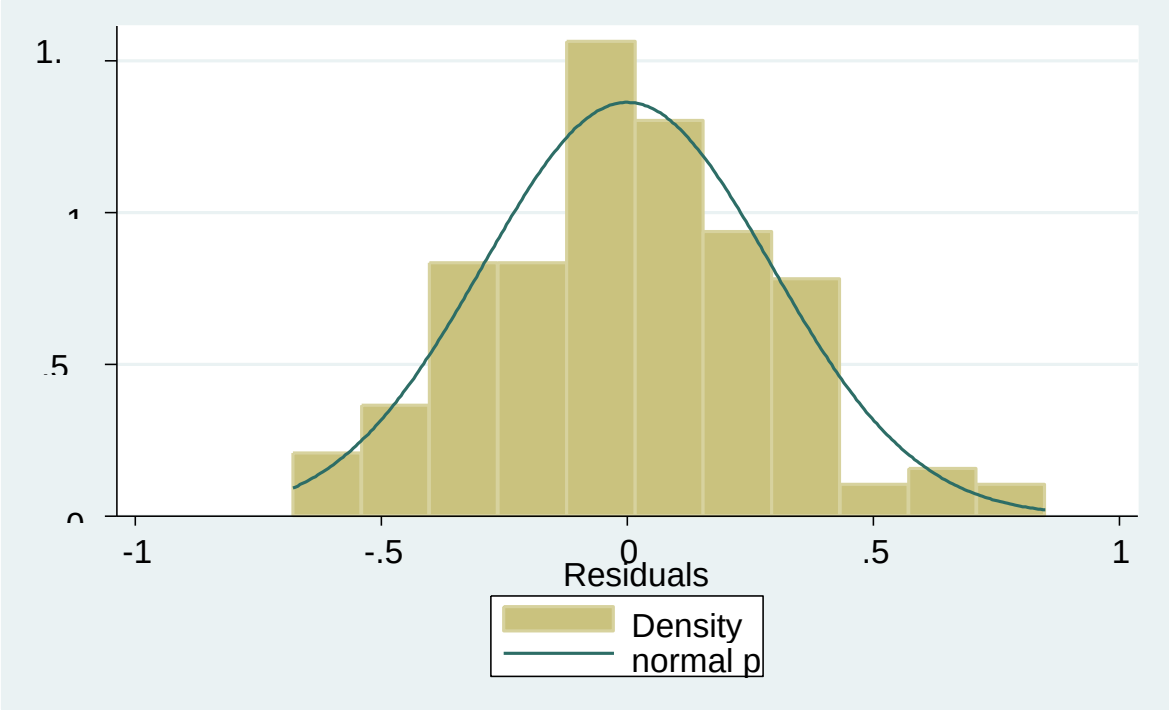
The probability of skewness which is 0.43 implying that skewness is asymptotically normally distributed (p-value of skewness> 0.05). Similarly, Pr(kurtosis)indicates that kurtosis is also asymptotically distributed (p-value of kurtosis>0.05). Finally, chi (2) is 0.6332 which is greater than 0.05 implying its significance at 5% level. Consequently, the null hypothesis cannot be rejected. Therefore, according to skewness test for normality, residuals show normal distribution.

Table 4.22 Normality Test

Variable	Obs	Pr (Skewness)	Pr (Kurtosis)	Adj chi2(2)	Prob> chi2
P (Residual)	116	0.4308	0.5966	0.91	0.6332

Source: *Own DataAnalysis(2021)*

Figure 4. 2 Histogram residual



***Source**: Model result, (2021)*

4.7.4 Test for homoscedasticity of Residuals

The assumption of homoscedasticity (same variance) is central to linear regression models. Homoscedasticity describes a situation in which error term is the same across all values of the independent variables. Homoscedasticity (Non- constant variance of the error term or non-homoscedasticity) is present when the size of the error term differs across values of an independent variable. The violation of this assumption would lead to baize the estimator of unknown parameters. To test for the presence of homoscedasticity, the popular white test employed in this study. This test involves testing the null hypothesis that the variance of the error is constant (homoscedasticity) or no homoscedasticity verses the alternative that the error does not have a constant variance. Since the p-values are greater than 0.05. The researcher shouldn't reject the null (h0) hypothesis of homoscedastic.

H0: there is homoscedasticity (Constant variance)

H1: There is heteroscedasticity (No constant variance)

If p-value < alpha, reject HO, so is hetro and if p-value > alpha accept H0 so is no hetro=homeo, as indicated on the table 4.22 the p-value is greater than 0.05 that is o.067, therefore, the researcher acceptsthe null hypothesis and reject the alternative hypothesis. And also the researcher has been checked heteroscedasticity by Breushpagan test. Based on the table 4.24 result shows that the p-value

of Heteroscedasticity is 0.844 the first test on Heteroscedasticity given by in test is the white's test and the second one given by hottest is the breush-pagantest. Both tests of the null hypothesis proved that the variance of the residuals is to no heteroscedasticity. If the p-value is greater than the margin of error at 5 %, (p-value > alpha). Therefore, the researcher has accepted H0 and rejected alternatively hypothesis (H1) at the 5% significance level. The study concludes that there is homoscedastic by accepting the null hypothesis and rejected the null hypothesis that mean, there is no problem of heteroscedasticity with this study.

Table 4.23 Homoscedasticity residual test

Berusch-pagan/Cook-Weisberg test for heteroscedasticity H0: constant variance Variables: fitted values of		
Chi2(1)		7.58
Prob> chi2		0.0059

Source: own data analysis (2021)

Table 4.24 Homoscedasticity residual test using whites

	White's test for H0: Homoscedasticity Against Ha: unrestricted heteroscedasticity		
Chi2(20)		30.19	
Pro > chi2		0.0668	
	Cameron &Trivedi's Decomposition of IM-test		
Source	Chi2	df	p
Heteroscedasticity	30.19	20	0.0668
Skewness	11.66	5	0.0398
Kurtosis	0.10	1	0.7549
Total	41.95	26	0.0248

Source: own data analysis, (2021)

4.7.5 Regression Analysis Result

The regression result is presented in the following table, table 4.25. Before presenting the result, the overall goodness of the model result explained by a combination of both F-statistics and R- squared value (Gujarati, 2009). R-squared value measure how well the regression model explains the actual variation in the dependent variable. To describe the goodness-of –fit of the regression, the r-squared of 0.8216 means that approximately 82% of the variance of SWM system is accounted for by the

model, which is Employee Awareness(EA), Surrounding Environmental Impact, Disposal Mechanism in the company (DMC), Cost (Co), and Distance of Dump Site (DDS). The t-test for each explanatory variable are different from 0. Meaning that the regression coefficient for every variable is significant different from zero. The remaining 18% in the model is extraneous uncontrollable variable (error terms in the mode). There is a rule of thumb which can be used to determine the R^2 value as follows:

R2 Values: 0.1 ---- Poor Fit

0.11 to 0.30 --- Modest Fit

0.31 to 0.50 --- Moderately Fit and

Greater than 0.50 Strong Fit (Muijs, 2004, p.166)

Thus, in the study R^2 accounts for 0.822, which is greater than 0.50 and then the model is strongly fit for predicting the dependent variableAssessment of Solid Waste Management Practice and challenge at Addis Ababa Tannery S.co**.**

Table 4.25 Regression Result

ASWMPC	Coef.	Std. Err.	t	P >|t|	[95%conf.interval]	
EA	0.15	0.055	2.75	0.007	0.042	0.258
SEI	0.18	0.046	3.81	0.000	0.085	0.268
DMC	0.21	0.058	3.60	0.000	0.094	0.325
CSW	0.28	0.048	5.95	0.000	0.189	0.377
DDS	0.14	0.048	2.98	0.003	0.048	0.237
_cons	0.16	0.14	1.14	0.256	-0.121	0.451
No of obs	116					
R-squared	0.8216					
Adj R-squared	0.8148					

Source*: Own Data analysis, (2021)*

4.8 Interpretation of Variables Coefficients based on Empirical

Using OLS analysis, here Employee Awareness (EA), Surrounding of Environmental Impact (SEI), Disposal mechanism in the company (DMC), Cost (CSW), and Distance of Dump Site (DDS) are variable that is used in the study. These variables are determinants of the Assessment of SWM practice and challenges of all variables. The Employee Awareness (EA, b=0.15) is statistically significant at the 0.05 level (p=007). The coefficient 0.15 indicate that increasing the implementation

of SWMS has directly related with increase of Employee awareness relatively. The Surrounding environment impact (SEI, b=0.18) is statistically significant at the 0.05 level (p=000). The coefficient 0.18 shows that the one-unit increase of surrounding environment impact will also cause 18% increase in the implementation of SWM system. Disposal mechanism in the company (DMC, b=0.21) is statistically significant at the 0.05 level (p=000). The coefficient 0.21 shows that the one-unit increase of Disposal mechanism in the company will also increase 21% of in the implementation of SWM system. Cost for Solid Waste (CSW, b=0.28) is statistically significant at the 0.05 level (p=000). The coefficient 0.28 shows that the one-unit increase of Cost for Solid Waste will increase 28% of in the implementation of SWM system. Distance of Dump Site (DDS, b=0.14) is statistically significant at the 0.05 level (p=003). The coefficient 0.14 shows that the one-unit increase of distance of dump site will also affect 14% for the implementation of SWM system.

4.9 Result found by Hypothesis Testing

According to Gujarati (2009), if P-value is less than the specific level of significant (α), reject the null hypothesis; otherwise, do not reject the null hypothesis based on this standard, the researcher constructed five major hypotheses in this study to test the investigating determinants of implementation of SWMS. Hypothesis testing was conducted at 5% significant levels.

4.9.1 Employee Awareness

Employee Awareness is one factor for Effective solid waste management in the case company as shown in the OLS results in the table 4.25, the employee awareness factor hasstatistically significant positive coefficient of 0.15 at 5% significant level. Therefore, the researcher has sufficient statistical evidence to reject the null hypothesis stating employee awareness is a significant factor for Effective solid waste management system; hence, the p-value is 0.007 which is less than 0.05 coefficient levels. This implies that Employee Awareness factor affecting positively by 0.15 coefficients for the Effective solid waste management which is the first factors in p-value in respect to other factors. However, by rejecting the null hypothesis, the researcher made a standard error of 0.055 and accept H_1A.

4.9.2 Surrounding environment impact

Surrounding environment impact is one factor for Effective solid waste management in the company as shown in the OLS results in the table 4.20, the Surrounding environment impact factor have statistically significant positive coefficient of 0.18 at 5% significant level. Therefore, the researcher has sufficient statistical evidence to reject the null hypothesis stating employee awareness is a significant factor for Effective solid waste management system; hence, the p-value is 0.000 which is less than 0.05 coefficient levels. This implies that surrounding environment impact factor affecting

positively by 0.18 coefficients for the Effective solid waste management which is the first factors in p-value in respect to other factors. However, by rejecting the null hypothesis, the researcher made a standard error of 0.055 and accept H_2A (alternatively).

4.9.3 Disposal mechanism in the company

Disposal mechanism in the company is one factor for Effective solid waste management in the case company as shown in the OLS results in the table 4.20, the employee awareness factor hasstatistically significant positive coefficient of 0.21 at 5% significant level. Therefore, the researcher has sufficient statistical evidence to reject the null hypothesis stating disposal mechanism in the company is a significant factor for Effective solid waste management system; hence, the p-value is 0.000 which is less than 0.05 coefficient levels. This implies that disposal mechanism in the company factor affecting positively by 0.21 coefficients for the Effective solid waste management which is the first factors in p-value in respect to other factors. However, by rejecting the null hypothesis, the researcher made a standard error of 0.055 and accept H_3A (alternatively).

4.9.4 Cost of SW

Cost for Solid waste is one factor for Effective solid waste management in the case company as shown in the OLS results in the table 4.20, the Cost for Solid waste factor have statistically significant positive coefficient of 0.28 at 5% significant level. Therefore, the researcher has sufficient statistical evidence to reject the null hypothesis stating cost for solid waste is a significant factor for Effective solid waste management system; hence, the p-value is 0.000 which is less than 0.05 coefficient levels. This implies that Cost for Solid waste factor affecting positively by 0.28 coefficients for the Effective solid waste management which is the first factors in p-value in respect to other factors. However, by rejecting the null hypothesis, the researcher made a Standard error of 0.055 and accept H_4A (alternatively).

4.9.5 Distance of Dump site

Distance of dump site is another factor for Effective solid waste management in the case company as shown in the OLS results in the table 4.20, the distance of dump site factor have statistically significant positive coefficient of 0.14 at 5% significant level. Therefore, the researcher has sufficient statistical evidence to reject the null hypothesis stating distance of dump site is a significant factor for Effective solid waste management system; hence, the p-value is 0.003 which is less than 0.05 coefficient levels. This implies that distance of dump site factor affecting positively by 0.14 coefficients for the Effective solid waste management which is the first factors in p-value in respect to other factors. However, by rejecting the null hypothesis, the researcher made a standard error of 0.055 and accept H_5A (alternatively).

Table: 4.26 Hypothesis test Result

Individual Hypothesis Test Result	P-Value	Relationship Direction	Decision (Accept/Reject)
H1A: Employee Awareness is the determinant factor for effectiveness of SWMS.	0.007	Positive	Reject H0
H2A: Surrounding Environmental impact is Activity is the determinant factor for effectiveness of SWMS	0.000	Positive	Reject H0
H3A: Disposal mechanism in the company is Activity is the determinant factor for effectiveness of SWMS	0.000	Positive	Reject H0
H4A: Cost for solid waste Activity is the determinant factor for effectiveness of SWMS	0.000	Positive	Reject H0
H5A: Distance of dump Site Activity is the determinant factor for effectiveness of SWMS	0.003	Positive	Reject H0

Source: own data analysis, (2021)

4.10. Result from Field Observation

Regardless of the present concerns of individuals and the government about waste management in Ethiopia, the practices are seen insignificant. Addis Ababa tannery still is facing serious SWM problems. From observation, solid wastes are commonly seen in the study area Addis Ababa Tannerys.co. Most of the internal wastes come from activities of the machines from the beginning to finishing production. Such as Form Socking and liming there is lime and fleshing organic wastes, hair and organic matter contain sludge Shaving chrome contain waste, chrome trimming waste, Buffing Dust, and crust trimming. Solid waste, when treated well, can be turned into a resource, but the greater part of wastes generated in Addis Ababa tannery S.co seem to undergo any treatment before their final disposal sites. Solid wastes generated in Addis Ababa tannery are most often disposed of in open dumps that prepared by municipal, and inside the company they have more than three solid waste equipment that put with long distance between them due to the long distances to the sanitary sites.

CHAPTER FIVE: SUMMARY, CONCLUSIONAND RECOMMENDATION

5.1 Summary

The study has been carried out to assess practices and challenged of solid waste management in the case of Addis Ababa tannery s.co. It is obvious that improper solid waste handling and disposal leads to substantial negative environmental and health impacts. The objective of this study was to assess nature and magnitude of the solid waste management problem, assess practices of tannery towards SWM, and assess factors that constrains the effectiveness of SWM in Addis Ababa Tannery S.co. One hundred twenty respondents were selected based on random sampling. Information was collected through questionnaire, interview and observation. Each person who working in Addis Ababa tannery were categorized according to their sex, age, educational level, per capita income and marital status to assess associations with solid waste management.

Waste handling and processing at source are an essential element of solid waste management, however, in Addis Ababa TanneryS.co. There is poor solid waste handling and processing at sources.

The main demographic and socio-economic factors which determine SWM are educational level of the employee, average monthly income of the employee, location of Waste Containers and its distance from their working area had shown a reasonable correlation and impact on SWM. Moreover, institutional involvement on solid waste management particularly from collection sites was poor and disintegrated. Major institutional and social factors responsible for the poor solid waste management are problems related to lack of institutional coordination, financial constraint, and low priority given to the issue, socio-cultural factors, lack of rules and enforcement specific to the issue, and lack of awareness creation.

5.2Conclusion

This study has been conducted to address the demographic, socio-economic factors affecting Addis Ababa solid waste management. Based on the literature revised, the data collected, the analysis made, the findings obtained and discussions helps to develop necessary and important conclusions drawn as follows:

Analysis based on the key elements of solid waste management such as waste handling and processing, waste collection and disposal practiced in the case company shows that the solid waste management practice was ineffective and inadequate. In the study area solid waste management in general and waste handling in Addis Ababa tannery is very poor, there is a problem of solid waste segregation, collection, reuse, recycling, composting and disposal. The Addis Tannery's Solid Waste Management lacks combination of different actors like government and municipality. It has bottleneck for sustainable solution like cleaning for Solid waste management in the case company.

Due to inadequate existence of formal arrangement, practicality of policies, laws, rules and procedures of challenges associated with the present condition of SW collection, storage, transportation and disposal, action oriented approach is employed to address the research problems. The reuse or recycling of SW as a source of income and benefits are not well understood and deep rooted in the company. Consequently, the inadequate management of SW results in environmental degradation and human health risk.

These problems can be minimized and resolved only when SWM stakeholders/actors of responsible bodies are coordinately participate upon it in planning, implementing, monitoring, deciding and arriving at common consensus on SWM; especially the company owner participation is the basic and core to reduce from its source, reuse or recycling of SW.

On the other hand, the research findings observed that there is no good enough waste separation activity in the case company. This indicates that in addition to no reuse and recycling, different types of wastes storage and disposal at the same place without necessary precaution measure taken exacerbates the degradation, pollution and health problem on the environment and human beings through intake mechanism. However, the financial contribution made by company stakeholders alone not covers by the tanneries employees. So the indicated insufficient budget allocation that covered by the company's owner through the government/municipality observed has to be improved and the awareness creating activity to employee has to be strengthen.

The study also indicates that the major problems irritating Addis Ababa Tannery s.co solid waste management which includes: lack of institutional coordination, insufficient and unskilled man power, very low financial capacity, weak enforcement of rules and regulations, socio-cultural factors and lack of awareness among the community.

5.2.Recommendations and Direction of Future Work

Based on the study made at Addis Ababa Tannery s.co the following recommendation are given

- Improving the standards of SWM system will have a great effect on the issue of environmental protection. Therefore, the city needs proper organizational structure that enables to manage SW and attain clean environment that suites to live in and work so that fundamental factors that affects management of SW in all tanneries.
- Based on the solid waste proclamation number 513/2007, enabling conditions has to be created to promote entrepreneurs on utilization of tannery solid wastes to produce valuable products and generate energy.

- There must be solid waste management division lead by professionals in the organizational structure of tanning industry which has the responsibility of managing the solid wastes generated from the tannery.
- Especially the activities of training and awareness creation are the main tools to reduce SW from its source and strengthen the reuse and recycling of SW. Through continues monitoring and evaluation, the effective remedy measure must be taken.
- One of the basic obstacles to proper solid waste management in the case company was inefficiency and inaccessibility of storages. Therefore, the municipality should establish additional disposal containers in every 300 to 500 m interval.
- Many of the problems associated with tannery solid waste management practice in the organization are related to the lack of adequate emphasis from the responsible body. Therefore, solid waste management in general requires policy priority and adequate budget allocation. The locals and municipals should prepare specified rules and regulations that focuses on local problems such as institutional issues about the company solid waste management services. Responsible bodies, stakeholder's participation and sustainable solid waste management options should strictly enforce these rules and regulations under close supervision and inter organizational linkage.
- The community has to be provided with adequate education and develop awareness how to handle its solid wastes at Tanneries and about the consequences of disposing solid wastes everywhere illegally, and not placing of solid wastes into the disposal sites properly.

Measures to be taken

- For questions requested to raise Addis Ababa Tannery s.co participation in SWM "what actions must be taken sequentially to be ranked are responded as follows" (See table below). From the below table data respondents are selected Creating means of initiation in the first rank, and respondents select "Need designation of new rules and regulation with community second rank and Transferring SWM totally to informal social organization respondent selected in third place, Revision of policy and regulation, increasing awareness creation, taking strong punitive action, increasing governmental support in material, financial and human resource is recognized. The increasing of awareness creation through educating and training community, creating means of initiation etc. are taking sequential positions. Therefore, the respondents agree strongly on creating means of initiation who dispose SW illegally, those who did not keep their working area clean and those who do not participate in campaign of solid waste management.

Table 5.1Measures to be taken

		No of respondents select at each level					
		1	**2**	**3**	**4**	**5**	**Rank**
To raise community participation actions to be taken:	- Increasing awareness creation	27	13	6	18	7	5
	- Revision of policy and regulation	-	22	16	20	20	4
	- Transferring SWM totally to informal social organization	3	14	22	24	19	3
	- Taking strong punitive action	12	8	9	7	8	6
	- Need designation of new rules and regulation	10	14	22	22	22	2
	- Creating means of initiation	39	28	30	25	27	1
	- Increasing governmental support in material, financial and human resource	25	17	11	-	13	7
Total		**116**	**116**	**116**	**116**	**116**	

- **Source:** Own survey, 2021

Direction for Future Work

There are problems in Tannery industries solid waste management system both in areal coverage and the depth of the study. This study is limited to only in the case company Addis Ababa tannery S.co.

- It would be good if the problems of solid waste management systems are deeply studied in all Tannery industries so that there would be a good project system that can be efficiently developed for efficient waste disposal system.
- Effective solid waste management is an important component of for all tanneries that should be given more attention, but it is not sufficiently predictable and has been ignored in almost all parts of Addis Ababa tanneries.
- Investigation of the existing management practices and Challenges of the case company should be studied very deeply to get the solution for the face problem. Since they are influential bodies if proper organizational structure is implemented it would be important to gain understanding of the challenges and issues involved in tannery solid waste management and give solution soon. This needs to be studied immediately after every problem is studied it would be better a project is planned, analyzed and executed by the concerned body.

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APPENDICES

APPENDIX A: QUESTIONNAIRE

ST'MARRY UNIVERSITY COLLEGE DEPARTMENT OF PROJECT MANAGEMENT

Dear Sir/Madam, this is a research work being undertaken aiming to assessment of Tannery's waste practices, challenges and prospects of solid waste management in Addis Ababa Tannery S.co. This work will be for the Partial fulfillment of the Requirements for the Award of Master's degree in project management from St, Marry University. Any information given will be kept confidential. Thank you for your co-operation.

PART I

SECTION I: Questions concerning the Demographic and socio Economic profile of the respondents (Please, put "X" at the appropriate response of space provide)

1. Sex: □ Male □ Female

2. Age: □ 21-30 □ 31-42 □ 43-55 □ 56 and above

3. Marital Status: □ Married □ Single □ Widowed□ Divorced □ Other

4. Monthly average income in birr. □ 2,001 – 3,000 □ 3,001 – 4,000 □ 4,001 – 5,000 □ 5,001 and above

5. Educational status:

□ Certificate (10/12+1) □ Diploma □ Degree □ Above degree

6. Employment condition: □ Permanent □ Contract □ casual

SECTION II: Questions related to nature and magnitude of the solid waste management problem in Addis Ababa Tannery.

Nature:

1. Types of wastes produced:

 Lime and fleshing Organic wastes shaving chrome contain waste Hair and organic matter contain sludge Chrome trimming waste Buffing Dust Crust Trimming Others

2. Do you have waste storage for your daily-generated wastes? Yes No
3. How do you put your daily solid wastes? Altogether Separated
4. Which of the following solid waste storage system is used in your company?

 Local basket Sacks (Madeira) open space Plastic bucket Other

5. For how long the waste stayed without gathering?

 2 days 3 days 5 days A week more than a week Magnitude: -

6. How do you evaluate the problem of solid waste in your Company?

 Very high High Moderate Little No problem

7. How much kilogram SW per month do the machine generate?

 0-200 300-400 500-600 700-800 900-1000 Above 1000

8. How much of SW generated from your company did you use it (Reuse and recycling)?

 Almost all ¾ of its Half of it Quarter of its Very small none of it

9. How much birr did the company pay for solid waste Management per month?

 Below 500, 600-1000, 1100-1500, 1600-2000, above 2000 birr No payment

10. Which disposal system do you use around your working Area? Burning in River

(ditch) Burying Open space Left for collection other, specify

SECTION III: Questions related to the degree to which the town administration is organized and capable of carrying out effective SWM.

11. How do you evaluate your Keeble's' service provision in SWM system?

 Very good (4), Good (3) Fair (2) Poor (1) none (0)

12. Do you think the company have local rules and regulation concerning SWM with your city administration?

Yes No

13. If your answer for question 12 is 'Yes' how is its practicality?

 Very strong (4) Strong (3) Moderate (2) Weak (1) practical (0)

14. Is there rules and regulations concerning SWM in municipality and government level?

Yes No

15. If your response for your question No 14 above is 'yes' how do you evaluate its application level?

 Very strong (5) Strong (4) Moderate (3Weak (2) Not to mention (1)
 completely no (0)

SECTION IV: Questions Related to Practice

To what extent and area of activities below is your work Area doing in SWM activities. (Indicate by making 'X' at available level).

	Extent Of Participation					
	Very Strongly(5)	**Strongly (4)**	**Averagely (3)**	**Poorly/weak (2)**	**Almost No participation (1)**	**Not at all (0)**
I collect waste from the beginning / source						
I properly store all the wastes in local space.						
I recycle and reuse the solid waste from the organization.						
I burn the waste from the Company.						
I bury the waste from the tannery.						

16. How do you evaluate your contribution in SWM in the following aspects? (Make 'X' at the level you agree)

Area of contribution (participation)	Degree of contribution agreement					
	Very high (5)	High(4)	Moderate(3)	Less(2)	Least (1)	No participation (0){0, No Participation}...
I have contributed financially						
I have contributed materials use for SWM						
I have contributed labor						
I have given consultation						
I participate in awareness creation						

SECTION V: Questions related to the main policy and socio-cultural as well as economic factors that constrain the effectiveness of community participation in SWM in Addis Ababa TanneryS.co.

17. How far does the transfer station (SW container) from your working area in meter?

□ Below 10 □ 10-20 □ 21-30 □ 31-40 □ 41-50 □ 51-60 □ Above 60

18. Tick under your choice of degree of agreement in the table below about challenge entity that affecting solid waste management in your company.

19.

Factors	Factors level				
	Very strongly (4)	Strongly (3)	Average (2)	Less influence (1)	No influence (0)
Poor coordination					
Lack of awareness					
Financial shortage/economic poorness					
lack of rules and regulations					
Lack of initiative					
Unreliable service					
Others					

20. How is waste managed in your company? □ Properly Managed □ improperly managed
21. To raise company based SWM what action should be taken? Rank them in assigning numbers for the best means 1, to the next better 2, and so on including what you assume as a means out of those below:

□including awareness creation

□ Reusing the existing policy and regulation,

□transferring totally SWM to informal social organization,

□ Taking punitive action,

□ Designing new rules and regulation in participating of employee,

□ Creation means of incentive,

□ Increasing governmental support in finance, materials and human resources, □ other

PART II: VARAIABLE INFORMATION

SECTION A: EMPLOYEE AWARENESS

N0	Employee Awareness	Strongly Agree	Agree	Neutral	Disagree	Strong Disagree
1	Employees have active awareness of SWMS					
2	Importance of SWM					
3	Importance and benefits of SWM to environment					
4	Roles of Employee on SWM					
5	Policies and Guidelines of SWM					

SECTION B: SURROUNDING EVIROMENTAL IMPACT

N0	Surrounding Environmental Impact	Strongly Agree	Agree	Neutral	Disagree	Strong Disagree
1	you get involved in trying to solve environmental problems					
2	How well do you think the environment can recover on its from problems caused by humans?					
3	the way of SW reduce the damage you cause to the environment					
4	We can all do our bit to reduce the effects of climate change					
5	Nothing I do on a daily basis contributes to the problem of climate change					

SECTION C: DISOPSAL MECHANISM IN THE COMPANY

N0	Disposal Mechanism in the company	Strongly Agree	Agree	Neutral	Disagree	Strong Disagree
1	The practice of Proper Segregation					
2	The practice of Proper Recycling					
3	The practice of Proper Reusing					
4	The practice of Proper transporting					
5	The practice of Proper Disposing					

SECTION D: COST FOR SOLID WASTE

N0	Cost for Solid Waste	Strong Agree	Agree	Neutral	Disagree	Strong Disagree
1	Should the government provide more money to support solid waste management system					
2	Do the company pay Container fees for municipal					
3	You don't want to pay					
4	Do the company charge per month for waste collection					
5	Costs is the main reason for your level of satisfaction					

SECTION F: DISTANCE OF DUMP SITE

N0	Distance Of Dump Site	Strongly Agree	Agree	Neutral	Disagree	Strong Disagree
1	Uncontrolled burning of waste in open dumpsite could result air pollution					
2	There are enough garbage receptacles in major towns					
3	Garbage truck cause some leakage of leachate or trash in to the road					
4	Garbage truck lead to noise pollution that cause annoyance					
5	Concerned distance Dumpsite has impact to health problem for collection					

SECTION G: IMPLEMNTATION OF SWMS

N0	Implementation of SWMS	Strongly Agree	Agree	Neutral	Disagree	Strong Disagree
1	SWMS is Available all Working time					
2	Management has commitment to implement the SWMS					
3	The training is held in the proper order and level of trainees understanding.					
4	Employee have active participation of the Implementation of the SWMS					
5	Employees have commitment to accept implementation of SWMS					
6	Same issue with high frequency of support request are solved permanently.					

APPENDIX B: INTERVIEW GUIDE

1. How much Kg of SW is generated per month from Addis Ababa tannery?
2. How much of SW generated from the tannery per month is reused, recycling, disposed in kg?
3. In what mechanism is the SW generated from your company collected, separated, transported and disposed.
4. How much budget the company allotted to company SWM in the last year (2020)?
5. What types of equipment are used to transport SW from Company to transfer stations landfill site? Who cover the cost of it?
6. How do you evaluate the employee participation in SWM?

a. Extremely high b. Very high c. good d. fair e. No

7. In which types of SWM activities do the employee Participate? (Collection, storage, recycling, reusing, transporting, other)?
8. How many transfer stations for SW exist in the company? How much distance are they apart?
9. In how many days per week the waste collected by the municipal?
10. Do the company have rules and regulation locally in SWM? If there exist to what extent, it is practical?
11. To what extent do company employee participate in SWM activity?
12. Do you have training program in SWM? How many people are trained? For how long?
13. What problems exist concerning the SW container and transfer site?
14. What are the main problems concerning SWM?
15. What are the factors that negatively affect employee at work place?
16. What effective measures should be undertaken to raise organizational practice in SWM?

APPENDIX C: PHOTOGRAPHS

Shaving Waste

Buffing Dust

Chrome Shaving waste and shaving Trimming waste

Waste Transporting

Waste Sorting and Storing

Crust trimming