



**ST. MARY'S UNIVERSITY SCHOOL OF GRADUATE STUDIES QUALITY AND
PRODUCTIVITY MANAGEMENT PROGRAM**

**THE INFLUENCE OF WASTES ON OPERATIONAL PERFORMANCE: THE CASE OF
WONJI/SHOA SUGAR FACTORY**

BY: HABTAMU HAILU

**JUNE 2025 ADDIS ABABA,
ETHIOPIA**

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WONJI/SHOA SUGAR FACTORY**

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**A THESIS SUBMITTED TO ST. MARY'S UNIVERSITY SCHOOL OF GRADUATE
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SCHOOL OF GRADUATE STUDIES

APPROVAL OF THE THESIS

**THE INFLUENCE OF WASTES ON OPERATIONAL PERFORMANCE (THE CASE OF
WONJI/SHOA SUGAR FACTORY)**

As members of board of examining of the final MSc thesis open defense, we certify that we have read and evaluated the thesis prepared by Habtamu Hailu under the title “The Influence of Wastes on Operational Performance (The case of Wonji/Shoa Sugar Factory)” we recommend that this thesis to be accepted as fulfilling the thesis requirement for the Degree of Master of Science in Quality and Productivity Management.

APPROVED BY BOARD OF EXAMINER

Dean Graduate Studies

Signature

Advisor

Signature

External Examiner

Signature

Internal Examiner

Signature

DECLARATION

I, the undersigned, declare that this Thesis “The Influence of Wastes on Operational Performance (The Case of Wonji/Shoa Sugar Factory)” is my original work and that it has not been submitted partially or in full, by any other person for an award of a degree in any other university/institution.

HABTAMU HAILU

Name of Participant

Signature & Date

CERTIFICATION

This is to certify that HABTAMU HAILU has completed his thesis work entitled “The Influence of Wastes on Operational Performance (The Case of Wonji/Shoa Sugar Factory)”. As I have evaluated, his research is original work and appropriate to be submitted as a partial fulfillment requirement for the award of Degree in Masters of Science in Quality and Productivity Management.

Research Advisor:

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Signature & Date

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LIST OF ACRONYMS

AM – Aggregate Mean

ANOVA - Analysis of Variance

JIT – Just in Time

KPI – Key Performance Indicators

SOP – Standard Operating Procedures

SMED – Single Minute Exchange of Dies

SPSS – Statistical Package for Social Sciences

STD – Standard Deviation

TPM – Total Productive Maintenance

VSM – Value System Mapping

WIP – Work in Process

WSSF - Wonji/Shoa Sugar Factory

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Abstract

This study investigates the influence of waste on the operational performance of the Wonji/Shoa Sugar Factory, driven by the problem of inadequate waste management which leads to production inefficiencies, increased costs, environmental hazards, and safety risks. A mixed research approach employing descriptive and explanatory research designs was used to explore this issue. The study targeted a population of 2,145 employees, from which a sample size of 338 respondents was determined using Yamane's formula. Data were collected through questionnaires and structured interviews with managers, and analyzed using SPSS version 24, employing descriptive statistics, correlation, and regression analysis to identify relationships between waste practices and operational outcomes. The findings revealed that poor waste management practices, particularly in reduction, reuse, recycling, collection, and disposal, negatively impact factory productivity, compliance, and efficiency. Regression analysis confirmed statistically significant relationships between waste management dimensions and operational performance indicators. The study concludes that effective waste handling is essential for improving productivity, operational sustainability, and regulatory compliance. It recommends that the factory adopt integrated waste management strategies, enhance employee training, and implement lean manufacturing practices to mitigate waste-related challenges and optimize operational performance.

Keywords: *Waste Management, Operational Performance, ISO 14001, sustainability, Wonji/Shoa Sugar Factory, Sugar Industry*

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

In Ethiopian context, sugar production is carried out with paramount energy consumption. Moreover, relatively large amounts of waste results from the technological processes. This waste includes unwanted remains, residues, and byproducts.

Waste is supposedly considered to be something which is no longer wanted in a given place and time and has no current market value; solid waste is perceived as having little or no value. There is little incentive to handle it carefully and there is a temptation to relinquish responsibility from it at the earliest opportunity, (Rukunga, 2001). Solid wastes include manufacturing waste, agricultural waste, institutional waste, domestic waste, construction debris and waste from mining operations. The reduction and elimination of these wastes provides the opportunity to establish lean processes, where non-value adding activities are reduced and if possible removed. These efforts will in turn tremendously improve the efficiency and effectiveness of company operations with resultant effects on quality of the outputs and optimization of the use of resources (Womack .P.J. et al. 2010).

In the sugar industry, approximately 279 million metric tons of sugarcane waste is generated annually worldwide. From the global amount of sugarcane waste, South Africa has an annual share of over 1.353 million metric tons, of which more than 50% are recovered in cogeneration facilities. The uncontrolled disposal of sugarcane waste can generate major problems on the environment with consequence on human health. These wastes are of a solid, semi- solid, and liquid nature and can be classified into two categories: waste from the harvesting operation, represented by leaves and cane tips; and waste from the cane processing stream including bagasse, ash from bagasse incineration, press mud (sludge from juice settling and residual cake from juice filtration), wastewater, vinasse and molasses.

Waste is considered to be something which is of no value in a place and time and should be discarded or disposed of. Because waste is perceived as having little or no value, there is little effort and input in its management.

Waste is defined by Gobbi (2008) as unnecessary work or holding stocks as a result of errors, poor organization or communication. Contributing to the same, Li & Olorunniwo (2008) focused on the disastrous implication of having wastes in the form of repairs, recalls and image control. On their part, Elmas and Erdogmus (2011) summarize the importance of waste reduction as positive environmental impact, legal compliance, competitiveness advancement and improved customer service. To emphasize

the significance of waste reduction strategy, Rogers and Tibben- Lembke (2002) focused on quantitative implication in which they found that waste reduction strategy is the primary step.

Waste handling practice includes the collection of waste, transportation from origin to disposal site, recovery of collected waste, recycling of the different parts and finally the disposal of non- recyclable parts of waste (Gabrielli, Amato, Balducci, Magi, & Beolchini, 2017). Further on, Gabrielli et al. (2017) state that a superior management system is necessary to solve problems regarding the waste management cycle as they occur. If a company, for example, does not have information, routines, and protocols for waste and debris management it could potentially disrupt the service supply chain (Gabrielli et al., 2017). The system and employees would not know how to handle the severely increased amount of produced waste and debris if there are no guidelines regarding handling and disposal. It is a dry and pulpy residue left behind when sugarcane stalks are crushed.

Effective waste management is crucial for the operational performance of industrial facilities, as it directly impacts productivity, efficiency, and compliance with environmental regulations. The Wonji/Shoa Sugar Factory, a prominent sugar production facility in Ethiopia, has faced challenges related to waste management over the years. Besides that, (Abdillah & Puspita, 2022) product design has no positive significant effect on purchasing decisions, while, (Rincon-Guevara et al., 2020) established that there is a positive association between product designs on manufacturing system operations. Hence, there is a need for the adoption of lean manufacturing principle as a moderate step to address such mixed results and weak relations between product design and operational performance.

1.2. Statement of the Problem

Proper waste management is critical for protecting public health, safety, and environmental quality, as well as for maintaining operational efficiency in industrial settings. At the Wonji-Shoa Sugar Factory, inadequate waste management practices have led to significant challenges that adversely affect production performance and sustainability. These challenges include insufficient waste storage capacity causing overcrowding and unsafe working conditions, ineffective waste disposal leading to environmental pollution, and lack of proper waste disposal facilities hindering regulatory compliance. Additionally, poor segregation and handling of wastes such as sugarcane bagasse, filter cake, molasses, and other by-products reduce opportunities for recycling and resource optimization.

The factory suffers from inefficient waste monitoring, employee unawareness, and inadequate infrastructure that contribute to increased waste generation, higher operational costs, cluttered and unsafe workspaces, production disruptions due to machine malfunctions and downtime, and a negative

environmental footprint. These issues not only compromise the factory's ability to meet production targets but also impact workplace safety, environmental compliance, and financial sustainability. Despite efforts to optimize production, ongoing inefficiencies in waste management severely limit the factory's operational performance and competitive position.

There is an urgent need to comprehensively investigate the impact of waste generation, handling, and disposal practices on the factory's operational performance. Addressing this problem will facilitate the development of effective waste reduction, reuse, and recycling strategies aimed at improving productivity, safety, environmental stewardship, and regulatory compliance at Wonji- Shoa Sugar Factory.

1.3.Objectives of the study

1.3.1 General Objective

The general objective of this research is to examine the influence of waste on the operational performance of Wonji/Shoa Sugar Factory.

1.3.2. Specific objectives

The specific objectives of this study will be: -

1. To identify influences of waste management practice on operational performance
2. To explore waste disposal practice on operational performance parameters.
3. To examine the existing waste management practices and minimize their impact.

1.4.Research Questions

1. What are the effects of waste reduction, reuse, and recycling practices on the operational performance of Wonji/Shoa Sugar Factory?
2. How do waste management practices influence the overall operational performance of the factory?
3. In what ways does waste disposal practice impact the operational performance of Wonji/Shoa Sugar Factory?
4. How does waste collection practice affect key operational performance parameters at the factory?

1.5.Significance of the Study

This research focuses exclusively on the Wonji/Shoa Sugar Factory, despite the existence of several sugar factories within the Ethiopian Sugar Industry Group. The selection of Wonji/Shoa Sugar Factory as the study area is primarily due to its accessibility and convenience for data collection purposes. Geographically, the study is confined to the factory site and its immediate operational environment. The research specifically investigates the influence of waste management practices including waste reduction, reuse, recycling, collection, and disposal on the operational performance of the factory. The scope

excludes other sugar factories and broader regional or national scale analyses, thus concentrating on the unique challenges and practices within Wonji/Shoa Sugar Factory to provide targeted and practical insights.

1.6.Scope of the Study

Even though there are a number of sugar factories under the Ethiopian Sugar Industry Group, this study was limited to Wonji/Shoa Sugar Factory. Geographically, Wonji/Shoa Sugar Factory was taken as an area for this study for its convenience for the researcher to collect data easily.

Definition of Terms

The following key terms used in this document have been defined as follows to ensure common understanding among various stakeholders of this document.

Waste: - Waste is an unavoidable by-product of most human activity. Waste is considered to be something which is no longer wanted in a given place and time, which has no current market value and since solid waste is perceived as having little or no value. It is any material or substance in whatever form, whether solid, liquid, gaseous, hazardous or non-hazardous, organic or inorganic, that has lost its primary value and is disposed of or recycled (ISO 21070).

Operations performance: Operations performance comprises actual outputs of operations strategies employed, which is influenced by operating conditions (such as quality, manufacturing flexibility, lead time, inventory, productivity, and costs) and represents some internal properties of manufacturing system, Nawanir G. (2016)). It is inclusive of efficiency, effectiveness and profitability.

Influence: to have an effect or impact on something (Cambridge English Dictionary).

1.7.Organization of the Study

This study is organized into five main chapters. Introduction part of the study, covering study background, problem statement, the research goals, hypotheses, scope and purpose of the study is stated in the first chapter. The second chapter deals with the review of the related literature. It involves theory, conceptual and analytical discussions leading to the identification and conceptual framework for addressing the identified research gap. The third chapter is all about research design along with its approach, study population, methods of sampling, sample size, data collection tools, data analysis, and presentation methods. Chapter four, finally, displays demographic features, statistical analyses, results of the findings, and their specific interpretations. A review of the key findings, conclusion and recommendations are depicted in the last chapter, i.e. Chapter five.

CHAPTER TWO

RIVIEW OF RELATED LITERATURE

2.1. Introduction

This chapter mainly includes the theoretical base for investigating the influences of waste on operational performances in case of Wonji/Shoa Sugar Factory. It shows the conceptual framework and related research done before by different scholars.

2.1.Theoretical Literature Review

2.1.1. The Concept of waste

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

Waste is defined as unwanted remains, residues discarded, and material or by products which are no longer required by the initial user. These materials are by-products of human activities such as process of preparation, manufacture, packing, repacking, unpacking, construction, renovation of structures and mining operations (Flintoff, 1984). Waste is considered to be something which is no longer wanted in a given place and time, which has no current market value and since solid waste is perceived as having little or no value, there is little incentives to handle it carefully and there is a temptation to relinquish responsibility from it at the earliest opportunity, (Rukunga,2001). Solid wastes include trade waste, agricultural waste, institutional waste, domestic waste, construction debris and waste from mining operations (Tekele, 2004).

Waste management is the collection, transport, processing, recycling or disposal or monitoring of waste materials (Teka, 1997).Most authorities give attention to liquid waste giving little attention to solid waste management. Household waste is one of the most difficult sources of solid waste to manage because of its diverse range of composite materials. A substantial portion of waste is made up of garbage, which arises from the preparation and consumption of food and consists of Waste food, vegetable peelings and other organic matter. Other components of household solid waste include plastics, paper, glass, textiles, metals and some hazardous waste from household products such as paint, garden pesticides, pharmaceuticals, fluorescent tubes, personal care products, batteries containing heavy metals and discarded wood treated with dangerous substances such as anti-fungal and anti-termite chemicals

(UNCHS,1998), Arnawa et al., 2019 Waste is considered to be something which is of no value in a place and time and should be discarded or disposed of. Because waste is perceived as having little or no value, there is little effort and input in its management. In developed countries, forward planning, technical resources, sound financial resources and fairly static population growth have meant that the provision of adequate facilities is possible.

However, in developing countries, most urban authorities have to function under pressure as a result of rural-urban migration that results in increase in generation of solid waste. This rapid accumulation of solid wastes poses major constraints to the collection, handling, transportation and disposal methods available. Most disposal methods are simply crude dumping in open grounds that is a health hazard. The waste is blown about by wind and most of the waste scatters everywhere, resulting in blockage of drains. The situation is made worse during the wet season and since the study area is situated on a valley, it receives most of the surface run-off loaded with wastes. All these wastes are considered to be the cause of land depreciation, unaesthetic appearance of the area and outbreak of diseases such as cholera, malaria and dysentery. Rodents such as rats breed in accumulated refuse and incidence of diseases such as dengue, leptospirosis and typhus (Hidalgo et al., 2018).

2.1.2. The concepts of Operational performance

Voss et al (1997) pointed out that operational performance in an organization could be defined as the measurable aspects of its internal processes. Mostly, it encompasses the defect rates and production reliability, the production cycle time associated with a particular line of production time delivery of the same, cost of quality and scrap minimization, productivity and the inventory within the organization. According to Shah and Ward (2003), the multi- dimensional measurement of operational performance combines changes in cost, cycle time, customer lead times, productivity and the quality of the services offered. Therefore, factors such as the expenses that are incurred in quest for better service delivery, time taken to complete the internal processes within the county government, the productivity of the service providers and the workers of the county and the quality of the service offered based on the customer feedback dictates the level of operational performance of the organization.

Krause et al (2008) also proposed the involvement and development of all stakeholders directly associated with an organization would be positively related to the operational performance of the same organization. In the local government context, involvement of all the relevant stakeholders from the suppliers of the county government to the residents of the same county to take part in open forums where new ideas on service delivery would have an impact on its performance, Performance measurement is a quantifying

process for the efficiency and effectiveness of an action. Performance of Lean can be measured through various indicators which are: quality, productivity, costs, capacity and inventory.

Throughput simply means the amount of material that enters and goes through a machine or system. In the case of manufacturing, it is basically the conversion rate of raw material to finished product per certain period of time. Business dictionary defines throughput as General Productivity of a machine, procedure, process, or system over a unit period, expressed in a figure-of-merit or a term meaningful in the given context, such as output per hour, cash turnover, and number of orders shipped. According to Ondiek and Kisombe (2012) factory time efficiency in the context of the sugar industries is the index that measures the ability of a factory to sustain operations throughout the year without interruptions. This is the time taken from when customers make an order to the time, they receive their order. How efficient a system is will determine the flow time of a particular process. Presence of waste in a system increase flow time. By eliminating wastes in a system, the customer is able to receive their orders in time. Shortening flow time reduces inventory. Business knowledge center (2010) points out that according to Little's law, $\text{flow time} = \text{WIP inventory} \times \text{cycle time}$. The flow time also known as flow rate is the length of the longest path through the process and includes both processing time and any time the unit spends between steps (Business knowledge center, 2010).

Work-in-process (WIP) materials are Inventory items, or units, that are released for manufacturing. These materials may include units currently being processed on equipment, units in transit within a manufacturing facility, and units waiting processing on equipment in the facility. In Carlos (1995) model, he points out that the amplification effects between WIP and quality defaults are evaluated under the assumption that defective items are reworked or substituted by good ones. The rework is waste that increases the cost of goods.

Operational performance is the overall company functioning against prescribed standards such as organizational overall productivity; resources use efficiency, compliance with regulations etc.

According to Han et al. (2014), organizations achieve a competitive advantage through innovation and outstanding performances in terms of customer satisfaction. Therefore, in the present competitive world, organizations are continually measuring their performance as it has direct implications to the overall organizational growth. Organizational performance measurement is indispensable for managing organizations resources and providing a strategic direction for sustaining the organizational competitiveness. Inadequate performance measurement often leads to poor product delivery to customers hence low competitiveness (Han et al. 2014). In accordance to Venkataraman (2014), measuring

organizational performance is a key ingredient for achieving total quality management. Harrington (1991) quoted that “Measurement is the first step that leads to control and eventually to improvement. If you can’t measure something, you can’t understand it. If you can’t understand it, you can’t control it. If you can’t control it, you can’t improve it.” Ridley (2008) noted that, organizational improvement is a continuous process in which measurement of performance is significant as it helps in tracking progress in line with set goals. It also aids the organization to gauge its performance against competitors. He further reiterated that, in ancient times, measures of organizational performance and their indicators were based only from cost accounting records based of outdated principles with minimal information to support performance improvement hence limiting continuous improvement due to inability to map process performance.

2.2.Theory of the study

2.2.1. Resource Based View Theory

This study was modeled on resource-based view theory advanced by Penrose in 1959. In the resource-based view theory, firm’s performance is affected by firm-specific resources and Capabilities. In view of RBV theory, technology adoption and lean manufacturing are taken as a strategic decision which can be used to fill gaps in the firm’s resource and capabilities. This implies that, the adoption of lean manufacturing will result to firms’ ability to utilize resources and capability to ring shortened time between customer order and the product build/shipment by eliminating sources of waste hence resulting to increasing firms’ competitive edge.

The resource-based view holds that firms can earn supra-normal returns if they have superior resources and the resources are protected by some form of isolating mechanism preventing their diffusion throughout the industry (Hibbets, Albright, & Funk, 2003). According to resource-based view, organizations that own “strategic resources” have important competitive advantages over organizations that do not. A strategic resource aid in improving the organization’s effectiveness and efficiency while neutralizing the opportunities and threats of competitors (Muhittin & Reha, 1990), Jay Barney who is considered as the father of modern RBV suggests that, there can be heterogeneity or firm level differences among firms that allow some of them to sustain competitive advantage. Therefore, the RBV emphasis on strategic choice, changing the firm’s management with the important tasks of identifying, developing and deploying key resources to maximize returns (Razzaque & Sheng, 2009).

Although the hotel industry is extremely competitive, the practice waste management practices turn a profit virtually every year. The capacity of a firm to cooperate and coordinate resources is seen as an intangible resource and earning positive returns on the value of resources depends on its sustainability.

2.2.2. Theory of Constraints

This study was also be guided by theory of constraints developed by Eliyahu in 1984. In the theory of constraints any element or factor that limits the system from doing more of what it was designed to accomplish (i.e., achieving its goal) is a constraint. In view of theory of Constraints, organizational performance is directly uplifted with the blending of technology adoption and lean manufacturing as catalyst of elimination of constraints with a view of ensuring systems do more of what they are designed to accomplish. This implies that to initiate and implement breakthrough improvement through focusing on a constraint that prevented a system from achieving a higher level of performance directly requires lean manufacturing practices hence increasing firms' competitive edge.

The theory says that every system no matters how well it performs, has at least one constraint that limits its performance. The same is used in the identification of the constraint and restructuring your operations so as you overcome it. It further suggests that constraints in an organization or system can be minimized for more efficiency towards the achievement of goals by working through the identification of the constraint, the management of the same and the final evaluation of the organizational performance. Goldratt (2004) further advises that if the outcome is not satisfactory, then the whole process goes back to the second step that involves the management of the constraint. If at all the outcome is as per required, then the whole process begins from step one that involves the identification of another constraint.

2.2.3. The goal setting theory

The Goal Setting Theory, originally proposed by Edwin A. Locke in 1968, posits that well-defined, challenging, and specific goals significantly improve task performance by directing attention, mobilizing effort, increasing persistence, and encouraging the development of strategies to achieve objectives (Locke, 1968; Locke & Latham, 2002). According to this theory, goals serve as motivational drivers by providing clear benchmarks for what needs to be accomplished, thereby aligning individual effort with organizational priorities.

Locke and Latham (2002) further refined the theory by establishing that goal difficulty and specificity are positively correlated with higher performance levels, provided that individuals are committed to the goals, possess the necessary capabilities, and that conflicting goals are minimized. They articulated a linear relationship between goal complexity, effort, and performance, emphasizing that goal commitment is critical to sustaining motivation and achieving results.

Recent research has expanded the scope and application of Goal Setting Theory in contemporary organizational contexts. For instance, Lunenburg (2011) highlights that modern organizations leverage

various goal-setting frameworks—such as Management by Objectives (MBO), Key Performance Indicators (KPIs), Balanced Scorecards, and benchmarking—to foster strategic alignment and competitive advantage. The integration of digital tools, including Management Information Systems (MIS) and performance analytics, has amplified the theory’s applicability by facilitating real-time feedback and adaptive goal adjustment (Locke et al., 2021; Seijts & Latham, 2015).

Moreover, contemporary studies emphasize the importance of goal-setting environments that support autonomy, provide timely and constructive feedback, and encourage employee participation in goal formulation to enhance commitment and psychological ownership (Rodríguez-Sánchez et al., 2021; Chen et al., 2018). This participatory aspect of goal setting is linked not only to improved motivation but also to higher job satisfaction and reduced turnover intentions, which collectively contribute to more sustainable operational improvements.

In the context of this study, Goal Setting Theory is particularly relevant as it underscores the critical linkage between employee goal alignment and the operational performance of the Wonji/Shoa Sugar Factory. By establishing clear, measurable waste management goals, and fostering employee engagement in these targets, the factory can enhance productivity, efficiency, and environmental compliance key factors affecting its competitiveness and sustainability.

2.3. Empirical literature review

2.3.1. The influence of Wastes on Operational Performances

Brito M. et al. (2020), in their literature review have learned that the Toyota way preaches that the worker is the most valuable resource not just a pair of hands taking orders, but an analyst and problem solver. The results of the research have shown that the respondents (production workers, managers and executives) answered that the eighth waste is related to the lack of one or more than one of the following components: rewards, recognition, justice, evaluation, motivation, goals, self-esteem, knowledge, and resources.

Developed a questionnaire to collect data to find out the major waste in Indian automobile industry. In the questionnaires the eight lean wastes were listed and respondents were asked to arrange them in the order of major wastage of productivity in their firm. However, the magnitude (the significance) of each waste was not studied where ranking in this regard gives little sense.

Generally, the manufacturing system is an input-output model (Wahab et al. 2013). The system receives the input elements and then later undergoes a few processes in the transformation stage. Finally, the desired product is produced in the output stage. Quality and cost of the final output rely heavily on the factors that affect or control the system during the transformation process. The goal is to produce the right

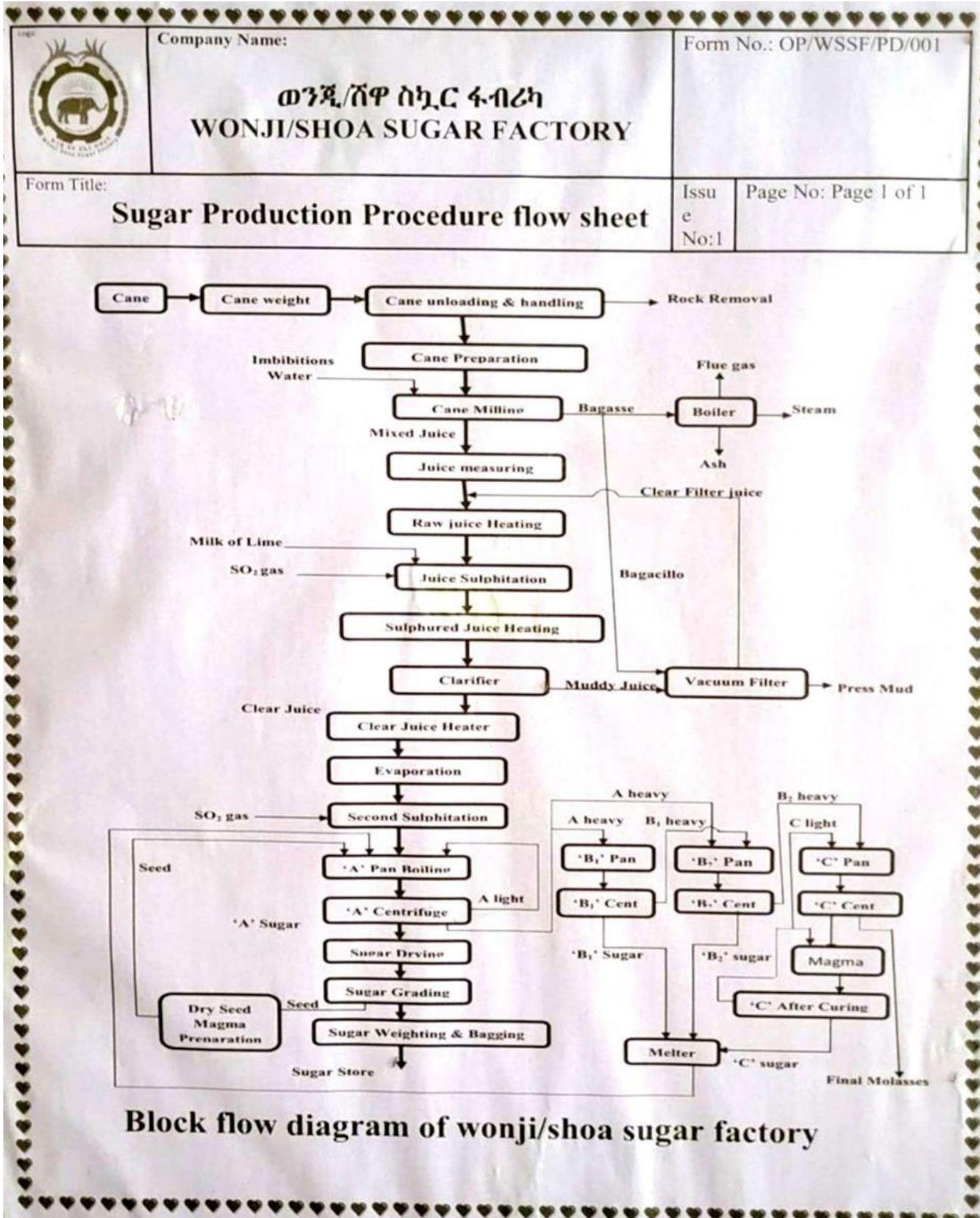
product at the right time and with the right cost in order to gain profitability and stay competitive by continuing the sales growth. This concept is in agreement with Pramadona and Adhiutama A. (2013). The model presented by Wahab et al (2013) has provided the opportunities to look at lean wastes in a holistic approach, including establishing a cause-and-effect relationship, such as, poor raw material becomes the sources of defects and defective products delays delivery until the issue is resolved with the customer and this in turn deteriorates people motivation which is in line with Deming principle 12, “Remove barriers that robe people of pride of workmanship”.

As explained by Okpala, C.C. (2014) all manufacturing processes either add waste or value to the production of a good or service. To identify and subsequently eliminate wastes, it is pertinent to have a complete understanding of waste and where it exists. Although products and services significantly differ between companies, the distinctive wastes inherent in manufacturing processes are quite similar. For each of the wastes, there is a proven strategy to reduce or possibly eliminate its effect on a company (such as, Cellular Manufacturing, Just in Time (JIT), Total Productive Maintenance (TPM), Value Stream Mapping (VSM), Poka Yoke (Error proofing), Five-S Practice, Single Minute Exchange of Dies (SMED), Take Time Analysis, Kaizen (Continuous Improvement), Visual Management, and Single Piece Flow) in order to improve the overall quality and performance.

2.3.2. Waste Management and Operational Performance

Waste management in the organizations is not only concerned with output of the operations that damage the environment but of great essence is the input of resources as well as totality of systems and processes involved in the operation of production facilities (Kirk, 1998; Lorente, 2001). Kirk (1998) indicates that, proper waste management practices are of much value to Firm’s operational performance in that it improves efficiency in service delivery, reduce organizations operational cost through efficient operations, reduces time spend to offer service, enhances quality of service, and productivity. As a result, organizations image is improved in the eyes of the public enhancing company’s competitive advantage (Kirk, 1996). Organizations are faced with challenges of cost containment, more demanding customers in terms of quality and speed of service delivery. The success of any organization is dependent to a large extent on its flexibility to the ever changing internal and external environment. Adoption of best waste management systems reduces operational cost through waste minimization and efficient production processes. Also, by practicing waste management, organizations improve on hygiene standards and as a result, the quality of its services and products are improved.

Figure 2.1 Process Flow Diagrams of WSSF



Block flow diagram of wonji/shoa sugar factory

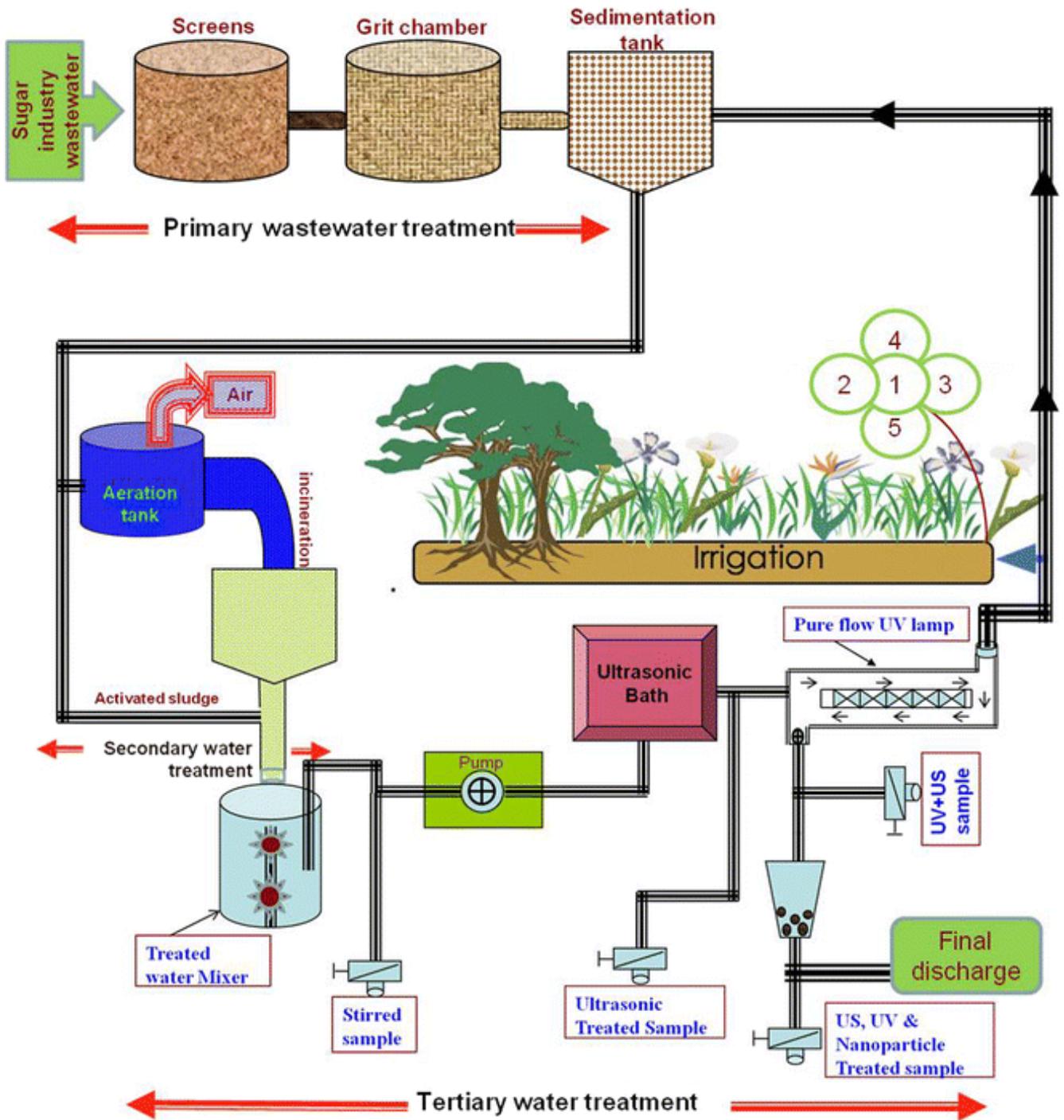


Figure 2.2 Block Diagram Effluent Treatment Plant Showing Waste Points

2.3.3. Waste Reduction, Reuse and Recycle

Companies have been pushed by competitive pressures towards cost reduction and performance improvement of operations to provide better quality products to very demanding markets. The approach of waste reduction and performance has been gaining importance in organizations operations (Gurumurthy & Kadal, 2011; Taj & Morosa, 2011). Waste reduction can be achieved through implementation of lean production systems that includes assessing current situation and designing a production system based on lean system concepts & techniques (Womack & Jones, 2003)

Emphasis is placed on the three R's reduction, reuse and recycle. This helps in creating of less waste and increased material recovery. Waste reduction is achieved through waste minimization at its source so as to minimize the quantity required to be treated and disposed of. This can be achieved through better product design and or process management. Waste recycling is the process for recovering waste products as inputs or resources. Promotion of waste re-use can be realized through using waste as an input for other purpose. Waste can as well be transformed into a form that is less costly or difficult to dispose of a process known as waste transformation (March, 1998).

2.3.4. Collection and Disposal of Waste

Waste collection and disposal should be undertaken regularly and people from economically backward section may be employed for the same. The collected non degradable material should be removed using covered trucks and trailers. Care should be taken not to spill the waste during transportation. Disposal of waste should be undertaken in prescribed scientific manner. A sanitary landfill designed specifically for the final disposal of waste should be built (Croner, 1998).

Solid waste management involves activities associated with six basic principles of waste generation, storage, collection, transfer and transport processing and disposal (Sharholly, Ahmad, Vaishya, & Gupta, 2007). The amount of waste generated and the way is disposed damages the environment (Choe & Fraser, 1999). Uncollected wastes cause bad smell, drain blockage, invites scavengers, general public nuisance and become good breeding site for insects.

2.3.5. Waste Composting

In waste composting, organic wastes are subjected to a rapid composting step at a high temperature using a hyper thermal composting machine followed by a further piling step in the atmosphere.

In this latter step, the temperature of the compost piles is kept at approximately 60 °C for several weeks by the heat generated metabolically by the microorganisms growing in the compost piles, as is the case for general composting (Fogarty & Tuovinen, 1991; Williams, Ziegenfuss, & Sisk, 1992). After the

metabolized organic compounds in the piles had been thoroughly utilized by the micro-organisms, the temperature of the piles is decreased to the ambient temperature, indicating the maturation of the compost piles. Large scale composting is an expensive venture and hotels might not engage in the exercise because of the cost involved. For it to work, focus should be on developing ward level or preferably community level, small scale composting process. Composting helps in diverting a major portion of waste generated close to the source, thereby significantly reducing transportation costs and prolonging the life span of landfills.

2.4.ISO 14001 Environmental Management System

ISO 14001 is an internationally recognized standard for environmental management systems (EMS) developed by the International Organization for Standardization (ISO). It provides a structured framework for organizations to systematically manage their environmental responsibilities in a way that contributes to sustainability. According to ISO (2015), the core objectives of ISO 14001 are to enhance environmental performance, fulfill compliance obligations, and achieve environmental objectives. The standard is particularly relevant to manufacturing industries such as sugar production, where significant environmental impacts result from waste generation, energy use, and resource consumption.

A key principle of ISO 14001 is the Plan-Do-Check-Act (PDCA) cycle, which enables continuous improvement in environmental performance. This cycle aligns closely with the waste management hierarchy (reduce, reuse, recycle), which is also emphasized in your study. Proper planning and implementation of EMS help industries like the Wonji/Shoa Sugar Factory to identify environmental aspects—such as waste types and sources—set objectives for reduction, monitor performance, and implement corrective actions (ISO, 2015). Integrating these steps supports better resource utilization and minimizes environmental risks, ultimately improving operational efficiency and reducing production costs (Rondinelli & Berry, 2000).

ISO 14001 also mandates life cycle thinking in the assessment of environmental impacts. This concept urges organizations to consider not only waste outputs but also the environmental effects associated with inputs, processes, and product life cycles. In sugar manufacturing, wastes such as bagasse, press mud, molasses, and wastewater can be managed more effectively when life cycle impacts are addressed systematically. Implementation of ISO 14001 can drive companies to optimize these waste streams through energy recovery, composting, and closed-loop recycling— practices that were highlighted as performance gaps in the Wonji/Shoa Sugar Factory case.

Moreover, ISO 14001 promotes compliance with environmental regulations and encourages transparent

documentation and stakeholder communication. As your study noted, non-compliance with waste handling regulations at Wonji/Shoa has led to reputational and financial risks. EMS adoption has been linked with improved legal compliance and reduced liability, as companies are better equipped to understand and address their environmental obligations (Delmas, 2002).

2.5. Conceptual Framework

This study examines the influence of various waste management practices on the operational performance of Wonji/Shoa Sugar Factory. The conceptual framework establishes the relationship between waste-related factors (independent variables) and operational performance (dependent variable), offering a structured approach to analyze how managing waste affects factory operations.

A. Dependent Variable

- **Operational Performance:** This refers to the overall effectiveness and efficiency of the factory's operations, including productivity, cost-effectiveness, resource utilization, process flow, quality output, and employee performance. Improving operational performance is critical for the factory's competitiveness and sustainability.

B. Independent Variables

The study focuses on key waste management practices hypothesized to influence operational performance:

- **Waste Reduction:** Strategies and efforts to minimize waste generation at the source, reducing raw material loss and disposal costs.
- **Reuse Practices:** The extent to which waste materials or by-products are reused within the production process to improve resource efficiency.
- **Waste Management Practices:** Systems and procedures for sorting, treating, and managing waste internally to reduce environmental impact and operational disruptions.
- **Waste Collection and Disposal Systems:** The effectiveness and efficiency of collecting and safely disposing of waste, including adherence to regulatory and environmental standards.

C. Theoretical Underpinning

This framework is grounded in principles from sustainable waste management and industrial operational efficiency, incorporating insights from circular economy models that emphasize minimizing waste and optimizing resource use. Unlike traditional linear models of production that follow a "take-make-dispose" pathway, this framework supports cyclical waste management approaches — where waste is reduced,

reused, or recycled — to enhance operational outcomes.

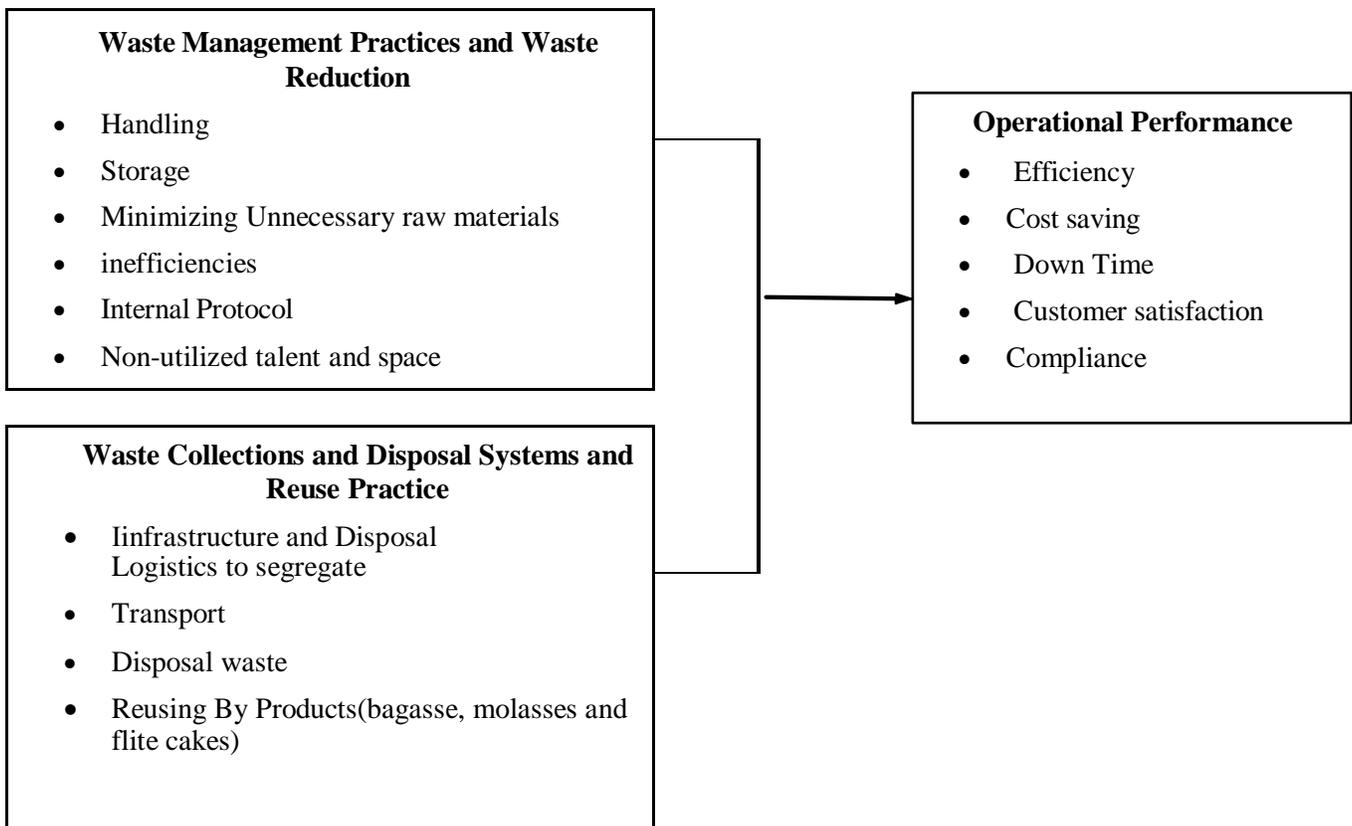
D. Relationships and Hypotheses

The waste management variables are expected to have a direct and measurable impact on operational performance. Specifically:

- Effective waste reduction is hypothesized to lower operational costs and improve process efficiency.
- Reuse practices are posited to conserve resources, thereby enhancing productivity and reducing raw material expenses.
- Comprehensive waste management practices reduce operational downtime and environmental compliance risks.
- Efficient waste collection and disposal systems ensure a clean, safe working environment, reducing health hazards and potential regulatory penalties.

Statistical methods such as regression and correlation analyses will be employed to quantify the strength and significance of these relationships.

Figure 4:3: Visual Illustration of Conceptual Frame



CHAPTER THREE

RESEARCH METHODOLOGY

3.1.Introduction

This chapter focuses on the numerous methods and procedures used by the researcher to perform the study and answer the research questions and address the objectives mentioned in the previous chapter. The research design, research approach, population characteristics, sampling design and sample size, data collection methods, research procedures, data analysis methods, and ethical issues have been organized in the following order: research design, research approach, population characteristics, sampling design and sample size, data collection methods, research procedures, data analysis methods, and finally the ethical issues. The data type, sample design and procedure, data gathering procedures, and data analysis approaches are also discussed.

3.2.Research Design

This study adopts a descriptive research design to systematically explore and describe the influence of wastes on the operational performance of the Wonji/Shoa Sugar Factory. Descriptive research is appropriate because it allows for an accurate, detailed, and systematic collection of data concerning the current status, characteristics, and perceived relationships of variables without manipulating the study environment or participants. This design aims to answer questions regarding what and how waste management practices impact operational performance, providing a comprehensive understanding of the phenomenon under investigation.

The research uses a mixed-methods approach within this descriptive framework, combining quantitative and qualitative data collection and analysis methods to ensure a robust and nuanced insight into the topic. Quantitative data are collected through structured questionnaires distributed to a randomly selected sample of employees involved in waste management and operations at the factory. These questionnaires gather measurable data on variables such as waste reduction, reuse practices, and the efficiency of waste collection and disposal systems, along with perceptions of their impact on operational performance.

In parallel, qualitative data are collected via in-depth interviews conducted with key informants such as supervisors, waste management staff, and managers. These interviews aim to capture rich, contextual information about challenges, experiences, and attitudes toward waste management practices, thus enriching the quantitative findings.

Data obtained from questionnaires will be analyzed using descriptive statistical techniques including frequencies, percentages, means, and standard deviations to summarize, describe, and present the characteristics of the sample and key variables. Thematic analysis will be applied to interview transcripts to identify patterns, themes, and insights related to waste management and operational performance.

This descriptive research design, utilizing both questionnaires and interviews, ensures the triangulation of data to enhance the credibility, validity, and comprehensiveness of the study findings. It provides a detailed snapshot of waste practices and their operational impact within the specific industrial context of the Wonji/Shoa Sugar Factory.

3.3. Research Approach

This study employs a descriptive research approach to investigate the influence of wastes on operational performance at the Wonji/Shoa Sugar Factory. Descriptive research is particularly suited for this study as it enables the systematic collection and analysis of data to describe characteristics, conditions, and relationships without manipulating any variables. This approach aims to provide a comprehensive and detailed understanding of how waste management practices affect operational outcomes in the factory setting.

The methodology integrates both quantitative and qualitative data collection methods to capture a full picture of the research problem. Quantitative data will be gathered through structured questionnaires, targeting a representative sample of employees and operational units within the factory. The questionnaire will capture measurable information such as frequencies, averages, and perceptions related to waste handling and operational performance.

Complementing this, qualitative data will be collected via interviews with selected key informants, including supervisors, waste management personnel, and managers. These interviews will provide deeper insights into the contextual factors, experiences, and challenges associated with waste practices, offering explanatory richness that supports and elaborates the quantitative findings.

The combination of questionnaires and interviews within the descriptive research framework allows for triangulation of data, enhancing the validity and reliability of the results. Data analysis will primarily consist of descriptive statistics such as means, percentages, and standard deviations for quantitative responses, while thematic analysis will be applied to interview transcripts to identify common themes relevant to operational performance.

This mixed-method descriptive approach ensures that the study not only characterizes the current state of waste management and its impact on operational performance but also explores underlying factors and

perceptions, thus providing actionable knowledge for improving efficiency and sustainability at the Wonji/Shoa Sugar Factory.

3.4.Data Sources

The data for the study both primary and secondary source of data were used. Data on from secondary sources including project financial reports, baseline, mid-term and end line evaluation reports, research reports, journals, and staff records and performance monitoring plan (PMP) were applied including magazines, published materials and others. A semi-structured modified and standard questionnaire and interview checklist were used to collect primary data from the professional employees.

3.5.Data Collection Tools

The Data collection used in this research was interviews and questionnaires. These were presented below accordingly:

3.5.1. Questionnaires

Primary data for the study was collected by using questionnaires for the targeted respondents. The choice of using questionnaires as method of data collection was made by considering the fact that the respondent may be very busy at the work place and employees may have a limited time. Therefore, questionnaires were distributed among the respondents who found their own time to fill them. Also, this method was adopted in order to avoid interfere of employees" working hours. For this study the researcher provided questionnaires employees of Wonji/Shoa Sugar Factory.

3.5.2. Interview

The interview method was additionally used in the study in order to enhance the quality of the information gathered. This method was used because it is the most effective means of obtaining information. The researcher used 15 open ended and close ended questions in the interview. The method used for obtaining information from heads of departments and other specific personnel was providing interview for employees, and managers of the Wonji/Shoa Sugar Factory.

3.6.Population and Sampling Design

3.6.1. Target Population

The target population considered was the total employees of Wonji/Shoa Sugar Factory. The sample respondents were selected from the total number of employees. The target population for this study comprises 2145, from which a sample of 338 were selected using random sampling method.

3.6.2. Sampling Design

Sampling was vital since it was impossible to take the entire population because of time, financial factors and errors which can discourage the researcher. For this research, random sampling was used for the case of giving equal chance for respondents.

3.6.3. Sampling Frame

The sampling frame for this study consists of all employees and operational units engaged in waste management and related activities at the Wonji/Shoa Sugar Factory. This includes factory workers, supervisors, waste collection and disposal staff, and managerial personnel responsible for overseeing operational and environmental management. From this defined population, a random sampling technique will be employed to select participants. Random sampling ensures that every individual within the sampling frame has an equal chance of being selected, thus minimizing selection bias and enhancing the representativeness of the sample. This approach improves the generalizability of the study findings to the broader population of the factory and provides a reliable basis for examining the influence of waste on operational performance. The sample size will be determined based on the total number of employees in the defined frame, balancing statistical validity and practical considerations such as accessibility and resource availability.

3.6.4. Sampling Technique

This study utilizes a simple random sampling technique to select participants from the population of employees and operational stakeholders at Wonji/Shoa Sugar Factory. Simple random sampling is a probability-based method in which every member of the population has an equal and independent chance of being selected (Etikan, 2017). This technique helps minimize sampling bias and ensures the representativeness of the sample, thus allowing findings to be generalized to the broader population with statistical validity.

The sampling process begins with the development of a comprehensive sampling frame, a list that includes all employees involved in operational and waste management activities. Each member of this list is assigned a unique identification number. Then, random numbers are generated using a computer software tool or a random number table to select the sample participants without any subjective influence.

Advantages of simple random sampling include fairness in selection, ease of implementation, and compatibility with many statistical analysis methods. Given the structured employee records at Wonji/Shoa Sugar Factory, this method provides a practical and effective approach to capturing a diverse and unbiased sample reflective of various roles and responsibilities.

By adopting simple random sampling, the study ensures the reliability and validity of data relevant to assessing the influence of wastes on operational performance at the factory.

3.6.5. Sample size

According to Cooper and Schindler (2008), sample size was described as a smaller set of elements from the larger population. Mugenda (2003) argued that the choice of sample size was governed by the confidence you need to have in your data, level of certainty, and the accuracy. You require for any estimates made in your sample, the type of analysis you are going to undertake and finally the size of the total population from which your sample is drawn. The sample computation was made using formula developed by Yamane, 1967.

$$n = \frac{N}{1 + N(e)^2}$$

Where:

N= number of total population n= sample

e=level of precision or the margin of error (5%)

$$n = \frac{2145}{1 + 2145(0.05)^2} = 337.301745 \sim 337.1316 \sim 338$$

3.6.6. Variables of the Study

Dependent Variable: The dependent variable in this study is the operational performance of the organization. While operational performance can be influenced by a variety of known and unknown factors, this research specifically focuses on evaluating the impact of waste-related factors. The determinants of employee and operational performance often arise from a complex interplay of multiple variables. Therefore, this study employs statistical techniques such as regression analysis and correlation analysis to assess the overall effect and the significance of the relationship between waste management practices and operational performance.

Independent Variables: The independent variables in this study represent specific waste-related factors hypothesized to affect operational performance at the Wonji/Shoa Sugar Factory. These factors include Waste Reduction, Reuse Practices, Waste Management Practices, and Waste Collection and Disposal Systems. Although operational performance may be influenced by a broad range of factors, this research

concentrates on these directly observable and measurable elements of waste management. The measurement of each independent variable is based on quantitative indicators such as frequency counts, mean scores, and standard deviations derived from survey data and observational assessments.

3.7.Methods of Data Analysis

The Statistical Package for Social Sciences (SPSS) version 24 was used to analyze both qualitative and quantitative collected data. The descriptive statistics (frequencies distribution) was applied to the factor that affected the reward system on employee performance. Data analysis that was conducted involved reducing the collected data to a manageable size, by developing summaries, through the utilization of data analysis techniques (Cooper and Schindler, 2008). The quantitative data was analyzed using both descriptive and inferential statistics.

For the qualitative data obtained from interviews, thematic analysis will be applied. This involves transcribing the interview responses, coding the data, and identifying common themes and patterns that emerge related to the research questions. Thematic analysis helps to provide contextual and in-depth understanding of participants' perspectives and experiences, complementing the quantitative findings from the questionnaires.

By combining descriptive statistics for quantitative data and thematic qualitative analysis for Interview data, this mixed approach ensured a comprehensive examination of the research problem, highlighting both measurable trends and nuanced insights.

3.8.Research Procedures

Research procedures refer to a detailed description of the steps to be taken and the conduct of research should be provided for by the purpose of the study. This study used the five-point Likert scale to affirm. Compared to two- and seven-scale systems, this scale is more reliable and an effective option, because if the number of response options is greater than five, the reliability will be reduced (Hayes, 1992).

- The target population for this study comprised 2145, from which a sample of 338 were selected using random sampling method.
- Data was collected through a questionnaire and interview, validated prior to administration.
- Collected data was checked for completeness and accuracy. Any incomplete or inconsistent responses were removed from the dataset.
- Data was coded and entered into SPSS v24 for analysis.
- Descriptive statistics including frequencies, percentages, mean, and standard deviation were

computed to summarize demographic and key study variables.

- Findings were presented in summary tables, bar graphs, and pie charts as appropriate.

All ethical guidelines concerning participant consent and data privacy were observed throughout the research process.

3.9. Reliability Test

Reliability test is the degree to which a construct's measure is consistent or reliable. Cronbach's alpha coefficient was used to perform the reliability test and items that scored higher than the acceptable value was kept. Dennick & Tavakol (2011) if a test has more than one idea or construct, reporting alpha for the entire test may not make sense because the higher number of questions will invariably inflate the value of alpha. As a result, rather than calculating alpha for the entire test or scale, alpha should be determined for each of the concepts. The alpha coefficient ranges from 0 to 1, with a value of 0.5 or below indicating unsatisfactory internal consistency dependability and unacceptability (Ramayah, 2011). Scales with coefficient alpha between 0.6 and 0.7, according to Zikmund et al. (2000), imply fair reliability and acceptability. A questionnaire adapted and constructed from this study has been pretested by using Cronbach's alpha coefficient through SPSS v 24; and this was found to be more than 0.60. Based on the above range all the variables designed were found to be a good measure of the dependent variable.

3.10. Ethical Considerations

Some ethical considerations had been examined by the researcher. Respondents have the option of participating or not participating in the survey, and the survey enumerator has informed them of the aim of the survey as well as the confidentiality of their responses. Emerging ethical considerations were evaluated and addressed during the study's execution. The objective and importance of the study, as well as confidentiality, were stated in the introduction section of the questionnaire for this purpose. Respondents were advised that they had complete freedom to fill out the questionnaires or withdraw from the study at any time, with no negative consequences, and that their participation or non-participation would not hurt them. Structured questionnaires were given to obtain primary data. To shield their responses from predisposition, only generic information was written in the paragraph of the questionnaire. Respondents' confidentiality was maintained, and their identities were not revealed. Finally, by recognizing every reference used all research findings have not been concealed and are free of plagiarism. Furthermore, the study was conducted in an open-minded manner, with attitudes expressed as they are. Nothing was changed or modified. As a result, the material that will be acquired will be provided as is, and all of the literatures gathered for the purpose of this study will be appreciated in the references.

CHAPTER FOUR
DATA ANALYSIS, FINDINGS AND DISCUSSION

4.1.Introduction

This chapter deals with the analysis, discussion and findings of the research study work that deals about the influences of waste on operational performances in case of Wonji/Shoa Sugar Factory. The chapter included the response rate, demographic data, the result or findings, the interpretation and discussion, data presentation tools, summary of the chapter and the link between chapter four & five based on the research study report section. The quantitative data that was gathered and organized and coded would be analyzed. Accordingly, the result of the coded data was translated to a tabular data using frequency and percentages in accordance with the value given for the coded categories above and below the median. As high & low and then the analysis of the tabular data was explained under it.

4.1.1. Response Rate

Table 4.1: Response Rate

No	Respondents' category	Frequency	Percentage
1	Responded	318	95%
2	Did not respond	20	5%
Total		338	100%

(Source: SPSS output survey data, 2024)

The survey had a sample size of 338 respondents and 318 returning questionnaires, yielding a response rate of 95% percent. It is a reliable response rate for data analysis as Babbie (2002) posited that any response of 50 % and above is adequate for analysis. Moreover, it is possible to generalize that as the response rate indicates all of the respondents were happy towards the study and its findings

4.1.2. General Information of the Respondents

This section profiles the respondents in respect to gender, age, level of education, year of experience of the respondents of employee's performance. The items in the research instruments used in the study informed profiling of the respondents in the influences of waste on operational performance.

Table 4.2 of General Information of Respondents

Category	Variable	Frequency	Percentage (%)	Justification
Gender	Male	170	53.5	Majority male respondents suggest male dominance in factory operations.
Gender	Female	148	46.5	Female respondents reflect gender balance and diverse input.
Age	Below 25	50	15.7	Younger staff bring fresh perspective but limited experience.
Age	26–35	140	44	Largest group, likely actively involved in factory operations.
Age	36–45	105	33	Experienced workers with operational insight.
Age	Above 46	7	2.2	Senior staff possibly in supervisory or managerial roles.
Education	Certificate or below	39	12.3	Basic skill-level contributors in manual operations.
Education	Diploma	75	23.6	Mid-level technical workers Engaged in day-to-day functions.
Education	First Degree	132	41.5	Majority educated workforce Capable of analytical responses.
Education	Master’s Degree	46	14.5	Supervisors and planners with advanced knowledge.
Education	Above Master’s	26	8.2	Senior professionals and management perspectives.
Experience	Below 1 year	25	7.9	New hires with minimal exposure to waste handling systems.
Experience	1–5 years	136	42.8	Largest group with moderate but Active involvement.
Experience	6–10 years	92	28.9	Well-versed in operational Routines and challenges.
Experience	11–15 years	45	14.2	Long-term insights into systemic issues and improvements.
Experience	Above 15 years	20	6.3	Veterans providing historical and strategic perspectives.
Marital Status	Single	86	27	Younger demographic contributing to field-level insight.
Marital Status	Married	200	63	Stable workforce forming the Backbone of operations.
Marital Status	Divorced	32	10	Represents a small yet important Diverse segment.

4.2. Descriptive Statistics of Wastes Management Practice

This section presents the analysis of waste management practice obtained from the results. Interpretation of the data and findings in the following discussion produced the mean score and standard deviation of the responses of respondents on the influences of waste on operational performances. The questions were scaled by using a five- p o i n t Likert scale in which 1= strongly disagree, 2= Disagree, 3 = Neutral, 4 = Agree, 5 = strongly Agree to rate the exhibited wastes management practice. The analysis of the wastes management practice was investigated by using means and standard deviations from the results. The results of the means were interpreted based on: 1 - 1.49 = Very Low; 1.5 - 2.49 = Low; 2.5 - 3.49 = Moderate; 3.5 - 4.49 = High; 4.5 - 5.0 = Very high.

Table 4.3 Descriptive statistics of waste management practice

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
The factory experiences minimal operational disruptions due to effective waste management	318	1.00	5.00	3.8239	.84834
The factory's waste management practices align with industry best Practices	318	1.00	5.00	3.7799	.76309
Proper waste management practices reduce operational costs at the factory	318	1.00	5.00	3.9748	.98538
The factory's waste management strategies align with sustainable operational goals	318	1.00	5.00	3.9245	1.15131
Waste management initiatives contribute to resource optimization at the factory.	318	1.00	5.00	3.7327	1.20760
The factory's waste management practices are well-integrated into overall Operational processes.	318	1.00	5.00	3.5849	1.28472
Effective waste management practices Improve compliance with environmental regulations.	318	1.00	5.00	3.6918	1.18321
Waste management practices at the factory are continuously monitored and improved	318	1.00	5.00	3.9403	1.09179
Valid N (list wise)	318				
Aggregate mean and STD				3.8066	1.103946

(Source: SPSS output survey data, 2024)

The results presented in Table 4.6 indicate that the sample mean for individual responses ranged between 3.5849 and 3.9748. These values of sample mean generally tends to 3.8066 on the Likert scale used in this

study and thus translates to agreement amongst respondents in respect to the activities implied by the statements. Similarly, the sample standard deviation for the different responses ranged between .76309 and 1.28472 demonstrating that the responses were fairly close together around the sample mean as the variability was narrow. Furthermore, the aggregate scores for sample mean and sample standard deviation for wastes management practice were 3.8066 and 1.103946 respectively.

According to the given table above providing majority of the respondents stated Proper waste management practices reduce operational costs at the factory having a highest means of and 3.9748 and STD of .98538, Waste management practices at the factory are continuously monitored and improved having a highest means of and 3.9403 and STD of 1.09179 , The factory's waste management strategies align with sustainable operational goals having a highest means of and 3.9245 and STD of 1.15131 and The factory experiences minimal operational disruptions due to effective waste management having a highest means of and 3.8239 and STD of .84834 respectively.

On the other hand respondents stated that The factory's waste management practices align with industry best practices having means of and 3.7799 and STD of .76309, Waste management initiatives contribute to resource optimization at the factory having means of and 3.7327 and STD of 1.20760, Effective waste management practices improve compliance with environmental regulations having means of and 3.6918 and STD of 1.18321 and The factory's waste Management practices are well-integrated into overall operational processes having means of and 3.5849 and STD of 1.28472 respectively.

In general, waste management practice of the respondents were measured and found with high influences of waste on operational performances having aggregate scores for sample mean and sample standard deviation of 3.8066 and 1.103946 respectively

4.3.Descriptive Statistics of Disposal Practice

This section presents the analysis of Disposal practice obtained from the results. Interpretation of the data and findings in the following discussion produced the mean score and standard deviation of the responses of respondents on the influences of waste on operational performances. The questions were scaled by using a five point Likert scale in which 1= strongly disagree, 2= Disagree, 3 = Neutral, 4 = Agree, 5 = strongly Agree to rate the exhibited Disposal practice. The analysis of the Disposal practice was investigated by using means and standard deviations from the results. The results of the means were interpreted based on: 1-1.49 = Very Low; 1.5-2.49 = Low; 2.5-3.49 = Moderate; 3.5-4.49 = High; 4.5-5.0 =Very High.

Table 4.4 Descriptive Statistics of waste Disposal practice

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
There is a Proper waste disposal practices at Wonji/Shoa Sugar Factory	318	1.00	5.00	4.0063	1.03562
Proper waste segregation and disposal processes enhance operational efficiency at the factory	318	1.00	5.00	3.8774	1.07483
Waste disposal methods at the factory comply with environmental regulations	318	1.00	5.00	3.7579	1.15154
The factory's waste disposal and handling procedures contribute to a safe work environment	318	1.00	5.00	3.7547	1.14675
Proper waste disposal practices contribute to a more efficient use of resources and improved operational Outcomes at the factory.	318	1.00	5.00	3.9748	1.08007
Proper waste disposal methods contribute to a more sustainable and environmentally conscious operational strategy for the factory	318	1.00	5.00	3.7799	1.13809
Implementing proper waste disposal procedures enhances resource optimization and operational effectiveness at the factory	318	1.00	5.00	3.8145	1.02347
Valid N (list wise)	318				
Aggregate mean and STD				3.85222	1.085743

(Source: SPSS output survey data, 2024)

The results presented in Table 4.7 indicate that the sample mean for individual responses ranged between 3.7547 and 4.0063. These values of sample mean generally tends to 3.85222 on the Likert scale used in this study and thus translates to agreement amongst respondent in respect to the activities implied by the statements. Similarly, the sample standard deviation for the different responses ranged between 1.15154 and 1.02347 demonstrating that the responses were fairly close together around the sample mean as the

variability was narrow. Furthermore, the aggregate scores for sample mean and sample standard deviation for waste Disposal practice were 3.85222 and 1.085743 respectively.

According to the given table above providing majority of the respondents stated There is a Proper waste disposal practices at Wonji/Shoa Sugar Factory having a highest means of and 4.0063 and STD of 1.03562, Proper waste disposal practices contribute to a more efficient use of resources and improved operational outcomes at the factory having a highest means of and 3.9748 and STD of 1.08007, Proper waste segregation and disposal processes enhance operational efficiency at the factory having a highest means of and 3.8774 and STD of 1.07483 and Implementing proper waste disposal procedures enhances resource optimization and Operational effectiveness at the factory having a highest mean of and 3.8145 and STD of 1.02347 respectively.

On the other hand respondents stated that T Proper waste disposal methods contribute to a more sustainable and environmentally conscious operational strategy for the factory having means of and 3.7799 and STD of 1.13809, Waste disposal methods at the factory comply with environmental regulations having means of and 3.7579 and STD of 1.15154 and The factory's waste disposal and handling procedures contribute to a safe work environment having means of and 3.7547 and STD of 1.14675 respectively.

In general waste Disposal practice of the respondents were highly influences of waste on operational performances in case of Wonji/Shoa sugar factory having aggregate scores for sample mean and sample standard deviation of 3.85222 and 1.085743 respectively

4.4.Descriptive Statistics of Waste Collection Practice

This section presents the analysis of waste collection practice obtained from the results. Interpretation of the data and findings in the following discussion produced the mean score and standard deviation of the responses of respondents on the influences of waste on operational performances. The questions were scaled by using a five point Likert scale in which 1= strongly disagree, 2= Disagree, 3 = Neutral, 4 = Agree, 5 = strongly Agree to rate the exhibited waste collection practice. The analysis of the waste collection practice was investigated by using means and standard deviations from the results. The results of the means were interpreted based on: 1-

1.49 = Very Low; 1.5-2.49 = Low; 2.5-3.49 = Moderate; 3.5-4.49 = High; 4.5-5.0 = Very high.

Table 4.5 Descriptive Statistics of waste collection practice

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Proper waste collection practices will improve the overall performance at the factory	318	1.00	5.00	3.9371	1.04284
Adequate waste collection practices lead to improved operational performance and cost-effective operations	318	1.00	5.00	3.7830	.97286
Efficient waste collection processes lead to improved operational performance and cost savings for the factory	318	1.00	5.00	3.8050	.82529
Adequate waste collection practices play a crucial role in ensuring smooth and efficient operations at the factory	318	1.00	5.00	3.8428	.92654
Efficient waste collection processes enhanced resource efficiency and operational productivity at Wonji/Shoa Sugar Factory	318	1.00	5.00	3.7610	.85149
Proper waste collection system reduces operational costs at the factory	318	1.00	5.00	3.7390	1.09103
Waste collection practices play a crucial role in maintaining a clean working environment	318	1.00	5.00	3.8019	.81878
Valid N (list wise)	318				
Aggregate mean and STD				3.7899	0.90263

(Source: SPSS output survey data, 2024)

The results presented in Table 4.8 indicate that the sample mean for individual responses ranged between 3.7610 and 3.9371. These values of sample mean generally tends to 3.80997 on the Likert scale used in this study and thus translates to agreement amongst respondent in respect to the activities implied by the

statements. Similarly, the sample standard deviation for the different responses ranged between .81878 and 1.09103 demonstrating that the responses were fairly close together around the sample mean as the variability was narrow. Furthermore, the aggregate scores for sample mean and sample standard deviation for waste collection practice were 3.80997 and .967154 Respectively.

According to the given table above p majority of the respondents stated Proper waste collection practices will improve the overall performance at the factory having a highest means of and 3.9371 and STD of 1.04284, Adequate waste collection practices play a crucial role in ensuring smooth and efficient operations at the factory having a highest means of and 3.8428 and STD of .92654, efficient waste collection processes lead to improved operational performance and cost savings for the factory having a highest means of and 3.8050 and STD of .82529 and Waste collection practices play a crucial role in maintaining a clean working environment having a highest means of and 3.8019 and STD of .81878 respectively.

On the other hand, respondents stated that adequate waste collection practices lead to improved operational performance and cost-effective operations having means of and 3.7830 and STD of .97286, Waste disposal methods at the factory comply with environmental regulations having means of and 3.7610 and STD of .85149 and Proper waste collection system reduce operational costs at the factory having means of and 3.390 and STD of 1.09103 respectively.

In general waste collection practice of the respondents were highly influences of waste on operational performances having aggregate scores for sample mean and sample standard deviation of 3.80997 and .967154 respectively

4.5.Descriptive Statistics of Operational Performances

This section presents the analysis of operational performances obtained from the results. Interpretation of the data and findings in the following discussion produced the mean score and standard deviation of the responses of respondents on the influences of waste on operational performances in case of wonji/shoa sugar factory. The questions were scaled by using a five- p o i n t Likert scale in which 1= strongly disagree, 2= Disagree, 3 = Neutral, 4 = Agree, 5 = strongly Agree to rate the exhibited operational performances. The analysis of the operational performances was investigated by using means and standard deviations from the results. The results of the means were interpreted based on: 1-1.49 = Very Low; 1.5-2.49 = Low; 2.5-3.49 = Moderate; 3.5-4.49 = High; 4.5-5.0 = Very high.

Table 4.6 Descriptive Statistics of Operational Performances

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
The operational flow at Wonji/Shoa Sugar Factory is smooth and efficient.	318	1.00	5.00	3.7516	1.18797
The factory meets its production targets consistently	318	1.00	5.00	3.7390	1.21419
The factory's equipment is well-maintained and reliable	318	1.00	5.00	3.7107	1.17463
The factory's work environment is conducive to productivity and morale	318	1.00	5.00	3.6384	1.21168
I am satisfied with the operational performance of Wonji/Shoa Sugar Factory	318	1.00	5.00	3.5975	1.19208
The factory effectively operate by recycles and reuses waste materials, contributing to sustainability goals	318	1.00	5.00	3.6195	1.20849
Employees operate at Wonji/Shoa Sugar Factory are well-trained and competent in their roles	318	1.00	5.00	3.7987	.80440
factory's operational cost is low and short time of service delivery with meeting operational needs	318	1.00	5.00	3.8585	.98991
Valid N (list wise)	318				
Aggregate mean and STD				3.71424	1.167294

(Source: SPSS output survey data, 2024)

The results presented in Table 4.9 indicate that the sample mean for individual responses ranged between 3.8585 and 3.5975. These values of sample mean generally tends to 3.71424 on the Likert scale used in this study and thus translates to agreement amongst respondent in respect to the activities implied by the statements. Similarly, the sample standard deviation for the different responses ranged between .80440 and 1.21419 demonstrating that the responses were fairly close together around the sample mean as the variability was narrow. Furthermore, the aggregate scores for sample mean and sample standard deviation for operational performances were 3.71424 and 1.167294 respectively.

According to the given table above p majority of the respondents stated factory's operational cost is low and short time of service delivery with meeting operational needs having a highest means of and 3.8585 and STD of .98991, Employees operate at Wonji/Shoa Sugar Factory are well- trained and competent in their roles having a highest means of and 3.8585 and STD of .80440, The operational flow at Wonji/Shoa Sugar Factory is smooth and efficient having a highest Means of and 3.7516 and STD of 1.18797 and the factory meets its production targets consistently having a highest means of and 3.7390 and STD of 1.21419 respectively.

On the other hand respondents stated that the factory's equipment is well-maintained and reliable having means of and 3.7107 and STD of 1.17463, the factory's work environment is conducive to productivity and morale having means of and 3.6384 and STD of 1.21168, the factory effectively operate by recycles and reuses waste materials, contributing to sustainability goals having means of and 3.6195 and STD of 1.20849 and satisfied with the operational performance of Wonji/Shoa Sugar Factory having means of and 3.5975 and STD of 1.19208 respectively.

In general, operational performances of the respondents were highly influences of waste on operational performances in case of Wonji/Shoa sugar factory having aggregate scores for sample mean and sample standard deviation of 3.71424 and 1.167294 respectively.

5. Correlation Analysis

The purpose of correlation in research is to measure and describe the strength and direction of a relationship between two or more variables. Correlation allows researchers to identify associations, quantify relationships, guide further analysis, and predict outcomes. It's important to remember that correlation does not imply causation: two variables might be correlated due to a third, unmeasured variable or pure coincidence. Thus, while correlation is vital for exploring potential connections, it cannot alone establish cause-and-effect relationships.

In order to decide the relationship between independent variables of the study with influences of waste on operational performances and to evaluate strength of this relationship, the product moment correlation coefficient was used. The product moment correlation coefficient is the most widely used method of measuring the degree of relationship between two variables (Kothari, 2004). This coefficient assumes that there is linear relationship between the two variables. Positive values of "r" indicate positive correlation between the two variables (i.e., changes in both variables take place in the statement direction), whereas negative values of "r" indicate negative correlation i.e., changes in the two variables taking place in the opposite directions. A zero value of "r" indicates that there is no association between the two variables. According to Bartz (2009) a correlation coefficient enables to quantify the strength of the linear

relationship between variables. This coefficient is usually denoted by “r” and can take only the value from -1 to +1. If $r = +1$ there is perfect positive relationship between variables.

Table 4. 7 Interpretation of R

Range of R	Description
1.00	Perfect relationship
0.80 or higher	Very strong
0.6 to 0.8	Strong
0.4 to 0.6	Moderate
0.2 to 0.4	Low
0.2 or lower	Very low
0.00	No relationship at all

Source: Bartz, (2009)

Table 4.8 Correlations Analysis Result

Correlations						
		Waste Reduction, Reuse, Recycle	Wastes management practice	Waste Disposal practice	Waste collection practice	Operational performances
Waste Reduction, Reuse, Recycle Practice	Pearson Correlation	1	.838**	.776**	.782**	.848**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	318	318	318	318	318
Wastes management practice	Pearson Correlation	.838**	1	.761**	.752**	.795**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	318	318	318	318	318
Waste Disposal practice	Pearson Correlation	.776**	.761**	1	.709**	.756**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	318	318	318	318	318
Waste collection practice	Pearson Correlation	.782**	.752**	.709**	1	.789**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	318	318	318	318	318
Operational performances	Pearson Correlation	.848**	.795**	.756**	.789**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	318	318	318	318	318

** . Correlation is significant at the 0.01 level (2-tailed). (Source: SPSS output survey data, 2024)

As indicated in Table 4.10 the relationship among all the variables was found by using Pearson’s correlation coefficient. The correlation value $r = .848^{**}$ shows that there is a strong relationship between

Waste Reduction, Reuse, Recycle Practice and operational performances and the p-value showed that the relationship is significant.

Regarding to operational performances and Wastes management practice, $r = .795^{**}$, which shows a strong relationship between the two variables, and the p-value indicates that the relationship is significant. When coming to the relationship of operational performances in case of Wonji/Shoa sugar factory with Waste Disposal practice, the $r = .756^{**}$ showed a strong relationship between the two variables, also p-value shows that the relationship is significant. The value of $r = .789^{**}$ for operational performances in case of Wonji/Shoa sugar factory and Waste collection practice shows a strong relationship, and the p-value indicates a significant relationship between them. The result of correlation analysis shows that all study variables have positive and significant relationship with operational performances in case of Wonji/Shoa sugar factory.

5.1 Regression Analysis

Multiple regression analysis studies the relationship between a dependent (response) variable and independent variable (predictors, repressors, IV's). In this study multiple regression analysis was used. Regression analysis is a statistical method that relates one dependent variable to a linear combination of one or more independent variables. Regression identifies how much each independent variable has an effect on dependent variable. Multiple regression analysis calculates multiple correlation coefficients and R-square (Kerlinger and Lee, 2000).

5.1.1. Testing Assumptions of Multiple Regression Model

Before conducting multiple regression analysis, the study assessed whether the collected data satisfied multiple regression model assumptions or not. According to Dhakal, (2018) any fit of a multiple regression model is valid, if and only if it should satisfy assumptions of linear relationship between, data must not show multi-collinearity, homoscedasticity, and the residuals (errors) are approximately normally distributed. The tested assumptions are shown as follows:

Assumption 1: Linearity Test

Linearity means the relationship between dependent and independent variables is to be linear. This relationship characterized by a straight line. Linearity allowed the researcher to predict the dependent variable based on one or more several independent variables. The assumption was checked through a scatter plot by looking at whether the two variables approximately form a straight-line. As presented in **Figure 4.3**, there was linear relationship between dependent and each of independent variables in the study area.

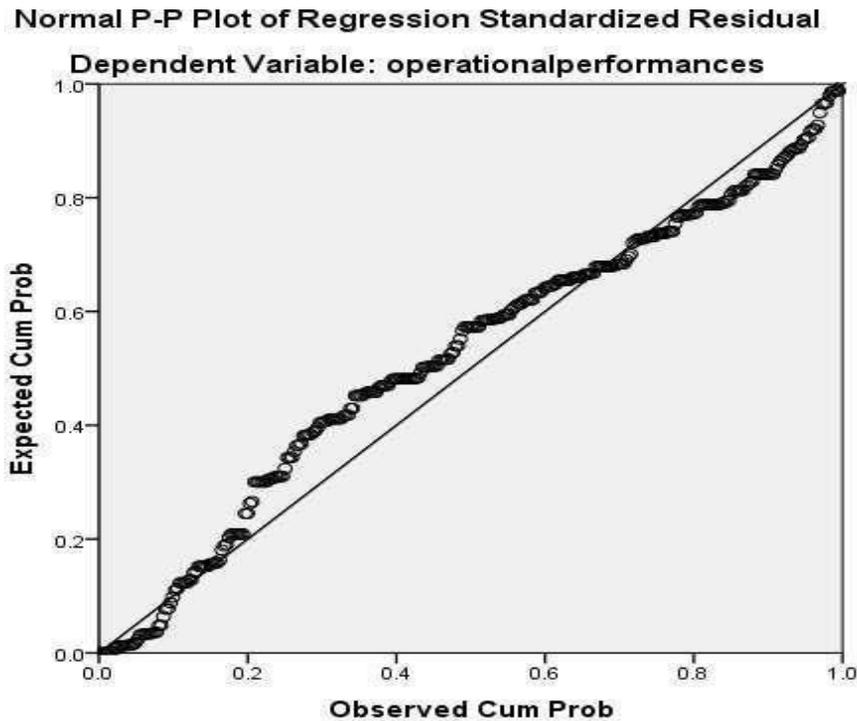


Figure 4.3 Linearity test

(Source: SPSS output survey data, 2024)

Assumption 2: Multi-Collinearity Test

Multi-collinearity is the undesirable situation when one independent variable is a linear function of other independent variables or high correlations between the independent variables (Gelman, 2006). Andy (2006) suggests that a tolerance value less than 0.1 almost certainly indicates a serious collinearity problem. According to Liu, (2010) a VIF value greater than 10 is because for concern. In this study the researcher checked this assumption with tolerance and VIF statistics. As it can be observed from Table 4.11 taking in to account the Variance Inflation Factor not to exceed the allowable value (10) and Tolerance value greater than (0.1) for all independent variables. Therefore, multi-collinearity problem does not exist.

Assumption 3: Normality Test

Most statistical analysis works on the assumption and requirement of normality (Kline, 2016). Pallant (2011) explained normal distribution as it describes a symmetrical bell-shaped curve that portrays the greatest frequency of scores in the middle, with smaller frequencies towards the extremes.

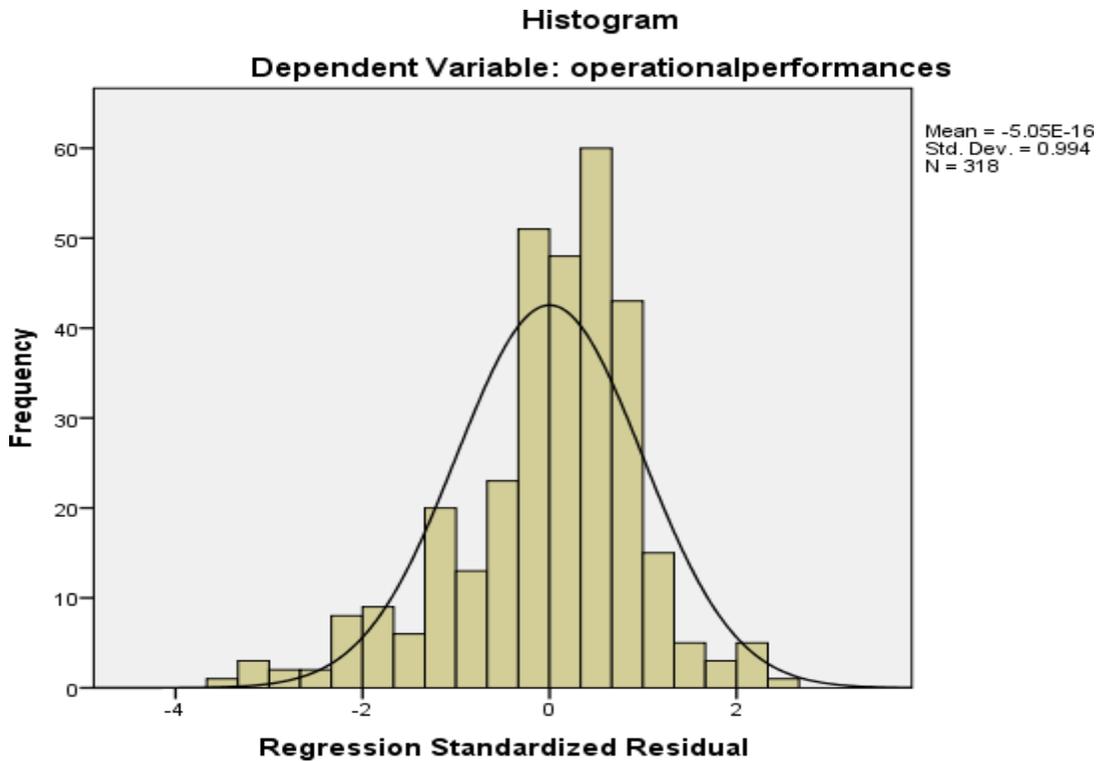


Figure 4.4 Normality test

(Source: SPSS output survey data, 2024)

Assumption 4: Homoscedasticity Test

This is the assumption that the variation in the residuals (or amount of error in the model) is similar at each point across the model. In other words, the spread of the residuals should be fairly constant at each point of the predictor variables (or across the linear model). It can be getting an idea of this by looking at our original scatter plot but to properly test this, we need to ask SPSS to produce a special scatter plot for us that includes the whole model (and not just the individual predictors). To test this assumption, we need to plot the standardized values our model would predict, against the standardized residuals obtained. As shown in figure 5 the spread of the residuals were fairly constant at each point of the predictor variables or our plot of standardized residuals vs standardized predicted values showed no obvious signs of funneling, suggesting the assumption of homoscedasticity has been met.

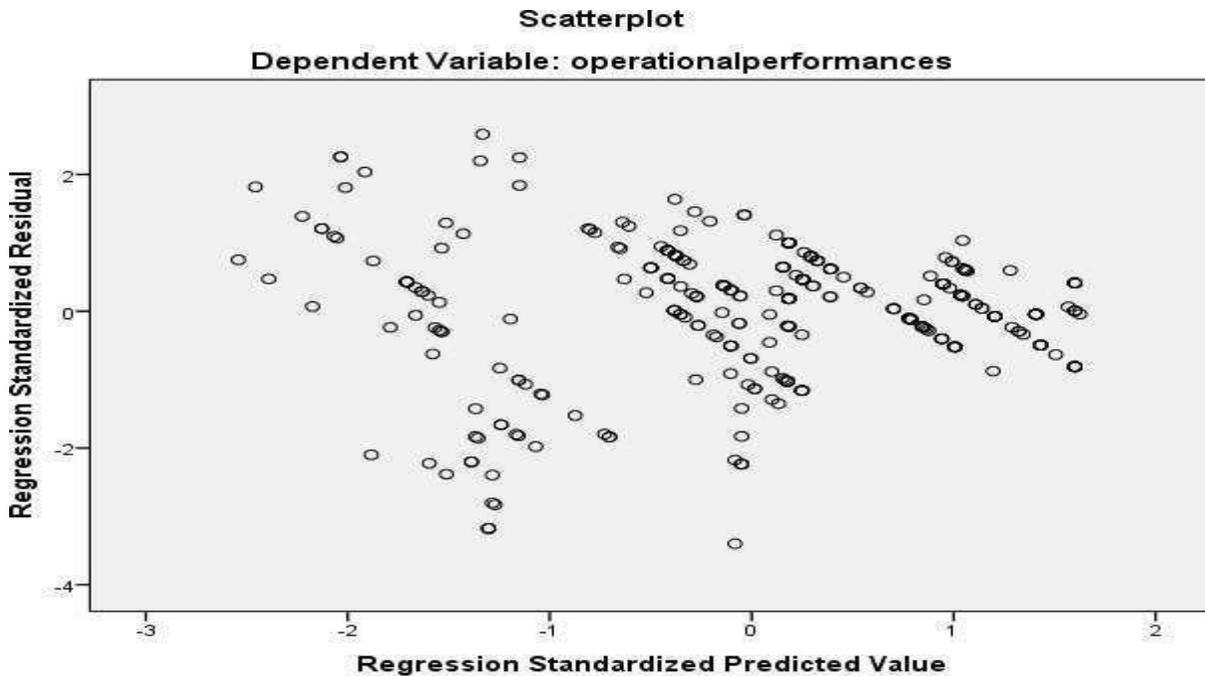


Figure 4.5 Homoscedasticity Test

(Source: SPSS output survey data, 2024)

5.1.2. Result of Regression Analysis

Multiple regression analysis calculates multiple correlation coefficients and R-square. The contribution of independent variables towards dependent variable is measured by Beta value and can be explained on bases of p or t values. From the study finding each point were presented below:

Table 4. 9 Model Summaries

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.881 ^a	.777	.774	.30651

Predictors: (Constant), waste collection practice, Waste Disposal practice, wastes management practice, Waste Reduction Reuse Recycle

Dependent Variable: operational performances (Source: SPSS output survey data, 2024)

In Table 4.12 R value represents the correlation strength between dependent variable and independent variables of the study. The value 0.881 shows strong correlation between variables tested (dependent and independent variables) R-square is the coefficient of determination and measures the proportion of variance in dependent variable (operational performances) that is explained by independent variables

(waste collection practice, Waste Disposal practice, wastes management practice, Waste Reduction Reuse Recycle) in operational performances

Table 4. 10 ANOVA

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	102.358	4	25.590	272.371	.000 ^b
	Residual	29.407	313	.094		
	Total	131.765	317			

A. Dependent Variable: operational performances

B. Predictors: (Constant), waste collection practice, Waste Disposal practice, wastes management practice, Waste Reduction Reuse Recycle

(Source: SPSS output survey data, 2024)

Table 4.13 shows whether the test carried out was statistically significant for the regression model used in the study using ANOVA and degree of variability. Since the sig = .000 which is less than 0.05, the model is good fit of the data tested i.e. the independent variables (waste collection practice, Waste Disposal practice, wastes management practice, Waste Reduction Reuse Recycle) statistically significant to predict the dependent variable operational performances in case of Wonji/Shoa sugar factory and the F calculated at 5% level of significance is 272.371 this shows that the overall model is significant.

Table 4.11 Regression Coefficient

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.057	.125		.461	.645
	Waste Reduction Reuse Recycle	.386	.052	.417	7.363	.000
	Wastes management practice	.149	.053	.150	2.822	.005
	Waste Disposal practice	.128	.041	.141	3.093	.002
	Waste collection practice	.300	.054	.251	5.531	.000

A. Dependent Variable: operational performances

B. (Source: SPSS output survey data, 2024)

According to Kabir (2016) one of the approaches used to test a research hypothesis is p-value approach. In this approach, researchers compute the p-value on the basis of a test statistic and then compare it with the significance level (test size). If the p-value is smaller than the significance level, researchers reject the null hypothesis. A p-value is considered as amount of risk that researchers have to take when rejecting the null hypothesis. This study used the test size of $\alpha =$

.05 Which is at 95% confidence level or 5% level significance. Pallent (2016) states the general rule to reject H_0 if $p < 0.05$ and accept H_0 if $p \geq 0.05$. Table 4.14 above presents regression coefficient result. According to Dhakal (2018) unstandardized coefficients indicate how much the dependent variable varies with an independent variable when all other independent variables are held constant. The regression coefficient provides the expected change in the dependent variable for a one-unit increase in the independent variable. In order to measure the contribution of each independent variable on the dependent variable the study considers the following model specification by using unstandardized coefficient values.

Where: x_1 , x_2 , x_3 and x_4 are independent variables of the study (i.e. waste collection practice, Waste Disposal practice, wastes management practice, Waste Reduction Reuse Recycle) respectively. From the above regression equation the researcher understands that keeping all other variables constant: For every one-unit increment on Waste Reduction Reuse Recycle, the percentage of operational performance increases by 38.6% the study area. For every one-unit increment on Wastes management practice, the percentage of operational performance increases by 14.9%. For every one- unit increment on Waste Disposal practice, the percentage of operational performance increases by 12.8%. For every one-unit increment on Waste collection practice, the percentage of operational performance increases by 30%. As it can be seen from the regression result, out of four independent variables, the effect of Waste Reduction Reuse Recycle is the most significant, followed by Waste collection practice, Wastes management practice and Waste Disposal practice.

6. Interview

The operations at Wonji/Shoa Sugar Factory generate various types of waste, including organic waste from sugar cane processing, wastewater from production processes, packaging materials, paper waste, plastics, metals, and other by-products. The accumulation of waste can have a

Significant impact on the operational performance of the sugar factory. Excessive waste generation can lead to increased costs for waste disposal, potential regulatory compliance issues, reduced efficiency in production processes, and negative environmental consequences. Wonji/Shoa Sugar Factory has implemented various measures and strategies to manage and reduce waste effectively. These include implementing waste segregation practices, recycling programs for materials like paper and plastics, investing in wastewater treatment facilities, promoting resource efficiency, and adhering to environmental regulations to ensure responsible waste management practices. The management at Wonji/Shoa Sugar Factory places a high priority on waste reduction and operational efficiency. By emphasizing the importance of sustainable practices, promoting a culture of waste minimization among employees, and investing in technologies that support resource conservation, the factory strives to enhance both environmental sustainability and operational performance.

Despite efforts to improve waste management practices, Wonji/Shoa Sugar Factory faces challenges in effectively addressing waste management issues. These challenges may include limited resources for implementing advanced waste management technologies, changing regulatory requirements, lack of awareness or training among staff members, and the need for continuous improvement in waste reduction strategies. The influences of waste on operational performances at Wonji/Shoa Sugar Factory are significant. The implementation of waste reduction, reuse, and recycle practices, efficient waste management practices, proper waste disposal methods, and systematic waste collection practices all contribute to improved operational performances. By prioritizing these aspects and continuously improving waste management strategies, the factory can enhance efficiency, reduce costs, comply with regulations, and achieve sustainable operation

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1. Introduction

This chapter outlines the summary of the findings and its relationship to related theories, and determines how the identified findings of influence of waste on operational performances in case of Wonji/Shoa Sugar Factory. Based on the results obtained from the research, the theoretical and practical significance are discussed. The contribution of this research can give the direction for future researchers.

5.2. Summary of Findings

The purpose of this study was to investigate the influences of waste on operational performances in case of Wonji/Shoa Sugar Factory. In this study the sample size of 338 questionnaires was distributed and 320 responses have correctly filled and returned which accounted 95% of response rate.

The result of the aggregate mean of all Waste Reduction, Reuse and Recycle practice related items was 3.78786 with standard deviation 1.17286313, which lies between the ranges of [3.5 - 4.49] and it felt high mean range section and Waste Reduction, Reuse and Recycle practice influences of waste on operational performance.

- The result of the aggregate mean of all wastes management practice related items was 3.8066 with standard deviation 1.103946, which lies between the range of [3.5 - 4.49] and it felt high mean range section and wastes management practice influences of waste on operational performance.
- The result of the aggregate mean of all wastes Disposal practice related items was 3.85222 with standard deviation 1.085743, which lies between the range of [3.5 - 4.49] and it felt high Mean range section and wastes Disposal practice influences of waste on operational performance.
- The result of the aggregate mean of all wastes collection practice related items was 3.80997 with standard deviation .967154, which lies between the range of [3.5 - 4.49] and it felt high mean range section and wastes collection practice influences of waste on operational performance.
- The result of the aggregate mean of all operational performances related items was 3.71424 with standard deviation 1.167294, which lies between the range of [3.5 - 4.49] and it felt high mean range section and operational performances used in the influences of waste on operational performance.
- The correlation value $r = .848^{**}$ shows that there is a strong relationship between Waste Reduction, Reuse, Recycle Practice and operational performance. and the p-value showed that the relationship is significant. Regarding to operational performances in case of Wonji/Shoa Sugar Factory and Waste

management practice, $r = .795^{**}$, which shows a strong relationship between the two variables, and the p- value indicates that the relationship is significant.

- When Coming to the relationship of operational performances with Waste Disposal practice, the $r = .756^{**}$ showed a strong relationship between the two variables, also p-value shows that the relationship is significant. The value of $r = .789^{**}$ for operational performances and Waste collection practice shows a strong relationship, and the p-value indicates a significant relationship between them. The result of correlation analysis shows that all study variables have positive and significant relationship with operational performances in case of Wonji/Shoa sugar factory
- For every one-unit increment on Waste Reduction Reuse Recycle, the percentage of operational performances in case of Wonji/Shoa sugar factory increases by 38.6% the study area. For every one-unit increment on Wastes management practice, the percentage of operational performances in case of Wonji/Shoa sugar factory increases by 14.9%. For every one-unit increment on Waste Disposal practice, the percentage of operational performances in case of Wonji/Shoa sugar factory increases by 12.8%. For every one-unit increment on Waste collection practice, the percentage of operational performances in case of Wonji/Shoa sugar factory increases by 30%.
- As it can be seen from the regression result, out of four independent variables, the effect of Waste Reduction Reuse Recycle is the most significant, followed by Waste collection practice, Wastes management practice and Waste Disposal practice
- Overall, the findings of this research underscored the importance of implementing comprehensive waste management strategies at Wonji/Shoa Sugar Factory. By focusing on waste reduction, reuse, and recycling practices, effective waste management protocols, proper waste disposal methods, and efficient waste collection practices, the factory can enhance operational performances, reduce costs, comply with environmental regulations, and contribute to a sustainable future.

5.3. Conclusion

This study set out to investigate the influence of waste on operational performance at Wonji/Shoa Sugar Factory, with specific objectives to examine the effects of waste reduction, reuse, recycling practices, waste management practices, waste disposal practices, and waste collection practices on the factory's operational effectiveness.

Firstly, the findings demonstrated that waste reduction, reuse, and recycling practices significantly enhance the operational performance of the factory. By minimizing the volume of waste generated and promoting the efficient use of resources, these practices contribute to reducing operational costs, improving productivity, and fostering environmental sustainability. The implementation of these measures also helps lower the factory's carbon footprint and conserves natural resources, confirming their critical role in driving both economic and environmental benefits.

Secondly, the study found that effective waste management practices including waste segregation, recycling programs, and compliance with environmental regulations are vital for maintaining a clean, safe, and productive work environment. These practices improve employee morale and foster an organizational culture oriented towards operational efficiency and environmental responsibility, which in turn positively affects overall performance outcomes.

Thirdly, the research highlighted the importance of proper waste disposal practices in maintaining operational continuity and regulatory compliance. Investments in infrastructure and environmentally responsible disposal methods, such as incineration and composting, minimize operational disruptions and environmental risks. This ensures that waste disposal does not negatively impact factory performance while meeting regulatory standards.

Finally, efficient waste collection practices were identified as a key factor in optimizing operational performance. By streamlining waste collection schedules, routes, and methods, the factory ensures timely removal of waste from production areas, thereby enhancing cleanliness, reducing potential environmental hazards, and preventing operational interruptions. These improvements contribute to sustaining a safe and hygienic working environment.

In summary, the research underscores that comprehensive, integrated waste management strategies—which combine waste reduction, reuse, recycling, effective management protocols, proper disposal, and efficient collection—play a pivotal role in enhancing the operational performance of Wonji/Shoa Sugar Factory. The findings highlight that leveraging these strategies supports cost reduction, productivity improvement, environmental stewardship, and regulatory Compliance.

It is therefore recommended that the factory continues to prioritize and strengthen these waste- related practices to further optimize operational performance and promote sustainable industrial development.

5.4.Recommendation

Based on the summary of the finding on this research entitled the influences of waste on operational performances in case of Wonji/Shoa sugar factory, the following recommendation were given to Wonji/Shoa sugar factory.

- The factory should conduct a comprehensive analysis of the current waste generation, disposal, and collection practices at Wonji/Shoa Sugar Factory to identify areas for improvement and implement a waste reduction, reuse, and recycle program to minimize the generation of waste materials and promote resource efficiency within the factory.
- Wonji/Shoa Sugar Factory should evaluate the potential cost savings and environmental benefits associated with the implementation of waste reduction, reuse, and recycle practices at the factory and develop and implement training programs to educate employees about the importance of waste reduction, reuse, and recycle practices and encourage their active participation in these initiatives.
- The factory should establish key performance indicators (KPIs) to measure the impact of waste reduction, reuse, and recycle practices on operational performances at Wonji/Shoa Sugar Factory.
- The factory should integrate waste management considerations into the overall operational strategy of the factory to ensure that waste reduction, reuse, and recycle practices are given due importance and collaborate with suppliers and vendors to explore opportunities for reducing packaging waste and promoting the use of recyclable materials in the supply chain.
- Wonji/shoa sugar factory should invest in technology and equipment that support waste reduction, reuse, and recycling efforts, such as compactors, shredders, and recycling machinery and conduct regular audits of waste management practices to monitor progress, identify challenges, and make continuous improvements.
- Wonji/Shoa Sugar Factory should establish a dedicated waste management team or committee responsible for overseeing and coordinating waste reduction, reuse, and recycle initiatives at the factory and implement a robust tracking and reporting system to monitor the volume and types of waste generated, recycled, and disposed of at Wonji/Shoa Sugar Factory.
- Wonji/Shoa sugar factory should collaborate with local recycling facilities and waste management companies to establish partnerships for the efficient collection and recycling of waste materials and

develop standard operating procedures (SOPs) for proper waste disposal practices to ensure compliance with environmental regulations and minimize negative impacts on operational performances.

- The factory should provide adequate resources and infrastructure for safe and environmentally responsible waste disposal methods, such as incineration or composting facilities and train employees on proper waste disposal techniques and the importance of adhering to established waste management protocols to maintain a clean and safe working environment.
- The factory should implement regular inspections and maintenance of waste disposal facilities to prevent potential environmental hazards and operational disruptions and optimize waste collection routes, schedules, and methods to ensure timely and efficient removal of waste materials from production areas.
- The factory should invest in appropriate waste collection equipment, such as bins, containers, and transportation vehicles, to facilitate effective waste management practices and encourage employee engagement in waste collection efforts through awareness campaigns, incentives for proper waste disposal, and recognition programs for contributions to waste management.
- The factory should foster a culture of environmental responsibility and sustainability within the organization by promoting the value of efficient waste management practices in enhancing operational performances at Wonji/Shoa Sugar Factory.

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APENDIX

Combined Open and Closed-Ended

Interview Questions for Secondary Data Collections

This section presents 15 interview questions (both open-ended and closed-ended) used to collect secondary data from management and employees at Wonji/Shoa Sugar Factory during the study titled 'The Influence of Wastes on Operational Performance'. The questions are designed to capture documented insights and historical records relating to waste and operational performance.

No.	Interview Question (Open/Closed)	WSSF Management Responses	WSSF Employee Responses
1	Is there a written waste management policy in the factory? (Closed)	Yes. The policy includes handling, segregation, and compliance standards.	Yes. We're informed of it during onboarding or training.
2	What type of secondary documents are available on waste-related costs? (Open)	Financial reports detailing disposal, recycling, and penalty expenses.	We don't directly access cost documents but hear updates during meetings.
3	Are operational disruptions due to waste documented in official reports? (Closed)	Yes. Included in production logs and downtime analysis reports.	Yes. We report incidents to supervisors who log them.
4	Describe how waste disposal is tracked in your department. (Open)	Tracked via electronic and paper logs reviewed weekly.	We fill waste sheets and report to line supervisors.
5	Have you seen improvements in factory performance from better waste control? (Closed)	Yes. Reduced machine downtime and fewer safety incidents.	Yes. Workflows feel smoother and cleaner.
6	What kinds of performance indicators (KPIs) are influenced by waste issues? (Open)	Downtime rate, cost per unit, safety incidents, and compliance scores.	Production delays and safety risks are common indicators.
7	Is employee waste segregation behavior documented or monitored? (Closed)	Yes. Monitored via supervisor checklists and monthly audits.	Yes. We're checked randomly and given reminders.

8	Which departments submit waste management data for reporting? (Open)	Production, Quality Assurance, Environmental, and Maintenance.	Mainly production and cleaning teams.
9	Are ISO 14001 compliance records available for review? (Closed)	Yes. Maintained in the environmental audit log and policy binder.	We're told about ISO but don't access the documents ourselves.
10	How are secondary records on waste reuse and recycling compiled? (Open)	Through monthly summaries from operations and waste recovery units.	Our team leader's record reused materials weekly.
11	Do regulatory audit findings influence internal waste procedures? (Closed)	Yes. Non-compliance triggers corrective actions and policy updates.	Yes. We sometimes get training after audit visits.
12	What systems are used to archive historical waste-related performance data? (Open)	Digital systems backed by paper archives in admin offices.	Mostly paper forms stored in the supervisor's office.
13	Is employee training in waste handling recorded and filed? (Closed)	Yes. Training logs are stored in HR and compliance units.	Yes. We sign attendance sheets after training.
14	Describe any record showing year-on-year improvement in waste-related KPIs. (Open)	Annual reports compare previous years' KPIs and waste ratios.	We hear about progress in team meetings, though we don't see the charts.
15	Are there any visual summaries (graphs, dashboards) showing waste performance? (Closed)	Yes. Dashboards in management offices and audit summaries.	Yes, some charts are posted in our common areas.

APPENDIX

SURVEY QUESTIONNAIRE DESIGNED FOR RESPONDENTS

St. Mary's University

DEPARTMENT OF QUALITY AND PRODUCTIVITY MANAGEMENT

Questionnaire Prepared for respondents

Dear Respondents

These survey questionnaires designed for master thesis accomplishment needed for partial fulfillment of **Master of Science Degree in Quality and Productivity Management** by student

Habtamu Hailu at St. Mary's University.

So the objective of this questionnaire is to collect information for the study conducted on the influences of waste on operational performances in case of Wonji/Shoa sugar factory. The information you provide below was be essential for accomplishment of this study. Therefore, your genuine, honest, and prompt response is a valuable input for the quality and successful completion of the research. The information you give is used only for academic purpose and was been kept confidential.

Thank you in advance!!!

Directions for filling the questionnaires

- ❖ Do not write your name
- ❖ Put “√ or ×” mark in the box provided for choice questions
- ❖ Your response was being utilized only for the purpose of this survey

Part I: General Information

SECTION A: PERSONAL INFORMATION

1. Sex: Female Male
2. age group 25 and below 26-35 36-45 46 & above
3. Educational level: certificate and below College diploma
Degree Masters above Masters
4. Work Experience on waste on operational performances
1- 5 years 6-10 years 11-15 years above 15 years
5. Marital status: Single Married Divorced

Part II: Independent Variables

Please indicate the extent to which you agreed or disagreed on the following question by using 5 points Likert scale: Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4 and Strongly Agree = 5 Please circle one number to indicate the extent to which you agree or disagree with the following question

Section: A, Waste Reduction, Reuse and Recycle practice

Kindly indicate your views Waste Reduction, Reuse and Recycle practice by ticking in the liker scale whereby; 5-Strongly Agree, 4-Agree, 3-Indifferent, 2-Disagree, 1- Strongly Disagree.

No	Questions Items	SD	D	N	A	SA
		1	2	3	4	5
1	Waste reduction contributes to minimizing environmental impact at The factory.					
2	Reuse of materials within the production process enhances resource efficiency and cost savings					
3	Recycling waste materials generates additional revenue streams for the factory					
4	Reuse of materials within the production process improves operational performance					
5	Recycling waste materials enhances the overall reputation of the Factory.					
6	Waste reduction practices improve resource efficiency in the production process					
7	Reusing materials within the production process reduces waste generation at the factory					
8	The waste reduction practices at Wonji/Shoa Sugar Factory impact operational performance					

Section B: wastes management practice

Kindly indicate your views on wastes management practice by ticking in the Likert scale whereby;
5-Strongly Agree, 4-Agree, 3-Indifferent, 2-Disagree, 1- Strongly Disagree.

No.	Questions Items	SD	D	N	A	SA
		1	2	3	4	5
1	The factory experiences minimal operational disruptions due to effective waste management					
2	The factory's waste management practices align with industry best practices					
3	Proper waste management practices reduce operational costs at the factory					
4	The factory's waste management strategies align with sustainable operational goals					
5	Waste management initiatives contribute to resource optimization At the factory.					
6	The factory's waste management practices are well-integrated into Overall operational processes.					
7	Effective waste management practices improve compliance with Environmental regulations.					
8	Waste management practices at the factory are continuously monitored and improved					

Section C: waste disposal practice

Kindly indicate your views on waste Disposal practice by ticking where appropriate; 5-Strongly Agree, 4-Agree, 3-Indifferent, 2-Disagree, 1-Strongly Disagree.

No	Questions Items	SD	D	N	A	SA
		1	2	3	4	5
1	There is a Proper waste disposal practices at Wonji/Shoa Sugar Factory					
2	Proper waste segregation and disposal processes enhance operational efficiency at the factory					
3	Waste disposal methods at the factory comply with environmental Regulations					
4	The factory's waste disposal and handling procedures contribute to a safe work environment					
5	Proper waste disposal practices contribute to a more efficient use of					
6	Resources and improved operational outcomes at the factory.					
7	Proper waste disposal methods contribute to a more sustainable and environmentally conscious operational strategy for the factory					
8	Implementing proper waste disposal procedures enhances resource optimization and operational effectiveness at the factory					

Section D: waste collection practice

Kindly indicate your views on solid waste collection by ticking where appropriate; 5-Strongly Agree, 4-Agree, 3-Indifferent, 2-Disagree, 1-Strongly Disagree.

No	Questions Items	SD	D	N	A	SA
		1	2	3	4	5
1	Proper waste collection practices will improve the overall performance at the factory					
2	Adequate waste collection practices lead to improved operational performance and cost-effective operations					
3	Efficient waste collection processes lead to improved operational performance and cost savings for the factory					
4	Adequate waste collection practices play a crucial role in ensuring smooth and efficient operations at the factory					
5	Efficient waste collection processes enhanced resource efficiency and operational productivity at Wonji/Shoa Sugar Factory					
6	Proper waste collection system reduce operational costs at the factory					
7	Waste collection practices play a crucial role in maintaining a clean working environment					

Part II: Dependent Variables

Please indicate the extent to which you agreed or disagreed on the following question by using 5 points Likert scale: Strongly Disagree = 1, Disagree = 2, Neutral = 3, Agree = 4 and Strongly Agree = 5 Please circle one number to indicate the extent to which you agree or disagree with the following question.

Section E: - operational performances

Kindly indicate your views on operational performances by ticking where appropriate; 5- Strongly Agree, 2-Agree, 3-Indifferent, 4-Disagree, 1-Strongly Disagree.

No	Questions Items	SD	D	N	A	SA
		1	2	3	4	5
1	The operational flow at Wonji/Shoa Sugar Factory is smooth and Efficient.					
2	The factory meets its production targets consistently					
3	The factory's equipment is well-maintained and reliable					
4	The factory's work environment is conducive to productivity and Morale					
5	I am satisfied with the operational performance of Wonji/Shoa Sugar Factory					
6	The factory effectively operate by recycles and reuses waste materials, contributing to sustainability goals					
7	Employees operate at Wonji/Shoa Sugar Factory are well-trained and competent in their roles					
8	factory's operational cost is low and short time of service delivery with meeting operational needs					