Quantification and Classification of Household Solid Waste Material and its Possible Utilization in Construction Industry

By

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Project Supervisor:

Engr. Talha Bin Tahir

BS Civil Engineering

July, 2023

Department of Civil Engineering

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This is to verify that **Sajjad Khan, Muhammad Haider** and **Syed Taha** have integrated all comments, suggestions and observations made by the evaluate as well as the internal evaluator and project supervisor. Their project title is “Quantification and Classification of Household Solid Waste material and its possible Utilization in Construction Industry”

Forwarded for necessary action.

Engr. Talha Bin Tahir
(Project Supervisor)

Date: July, 2023

DEDICATION

This effort is devoted to our respected and cherishing parents, who helped us through each troublesome of our life and yielded every one of the comforts of their lives for our brilliant future. This is likewise a tribute to our best teachers who guided us to go up against the troubles of presence with ingenuity and boldness, and who made us what we are today.

DECLARATION

This report is a presentation of our assigned project work. Wherever commitments of others are included, each exertion is made to demonstrate this obviously, with due reference to the writing, and affirmation of communitarian project and exchanges. The work is carried out under the supervision of Engr. Talha Bin Tahir, at the Capital University of Science and Technology, Islamabad, Pakistan.

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MSW	Municipal Solid Waste
CW	Construction Waste
HW	House hold waste

ABSTRACT

Municipal solid waste is increasing day by day and it needs to be classified and quantified so that waste can be easily manage-able. An increase in solid waste production is one effect of global urbanization. It has been detailed that roughly 1.3 billion metric tons of solid waste produced by households and businesses were produced worldwide in the year 1990.Waste is classified on the bases of biodegradable and non- biodegradable and also classified on the base of different categories of material used like paper, plastic etc. There are various waste materials which is formed on daily basis around our surrounding that trash may be produced from our homes our workplaces, our construction sites, our playgrounds, our manufacturing companies, medical wastes etc. Inadequate solid waste disposal at open dump sites, streams, and sewers has contaminated water supplies, endangering natural resources, heritage, and the health and welfare of its people. We use ASTM D5231-92 to quantify and calculation this produces major environmental and health concerns such as sight pollution, odor pollution, and disease vectors such as dengue and malaria-causing flies. Because it is the most typical practice, open dumps can even be seen near container bins. Different type of bin is used to check waste smart bin use sensor so that they can identify item as well as capacity of bin. We collect sample in plastic bag and then weight them one by one. We have to collect item form number of houses that sample required then we quantify and classify this waste on base of different content. Many wastes can be recycled and reused in our daily life plastic is one of them it cannot be demolished easily so it can be recycled so that use again and play productive role in our society.

CHAPTER 1

INTRODUCTION

1.1 Background

Each country on Earth produces billions of tons of trash every year as a result of the planet's fast population expansion. Currently, there are over 1.6 billion metric tons of solid garbage generated each year. However, the rise in trash production is not just attributable to population growth; it may also be attributed to the construction industry Additionally, along with various others nearby factories. In the beginning of the 1990s, solid waste management costs in Asian nations alone were estimated to be over $25 billion USD annually; by 2025, it is anticipated that this amount will increase to nearly $50 billion USD (Hoornweg & Thomas, 1999). These numbers imply that solid waste management (SWM) has grown into a significant, intricate, and expensive service. The amount of waste being generated is on the rise, posing a major challenge for Pakistan particularly with regards to solid waste management. Islamabad and Rawalpindi are the major cities of Pakistan and their waste classification and quantification is major problem. Almost 67% of Pakistan's 130.579 million inhabitants live in rural regions, while 33% reside in urban areas, according to the 1998 Census. In addition, 54% of Pakistan's population—33% of whom reside in urban areas—does so in the country's 10 largest cities (GOP, 1996). The chosen cities are expanding at a pace that ranges from 3.67% to 7.42%, which is much faster than Pakistan's 2.8% overall growth rate (EPMC, 1996). The collection and disposal of hazardous waste produced by hospitals, businesses, and agricultural operations are not organized in Pakistan. In reality, local authorities handle and dispose of huge amounts of hazardous trash, frequently without any set protocols and occasionally without being aware of the potentially major issues they may cause. In Pakistan, industrial pollution is a serious issue. In the next ten years, it is predicted that the population of their major cities would double. Method for existing building stock in urban areas by Albayrak (2015) that proposed a scoring technique which symbolizes the seismic vulnerability of a structure.

Figure 1. 1: Map of Islamic Republic of Pakistan

1.2 Study Area

Our main area of study Bahria is we collect all waste from that society then we distribute them in different regions so that our work for collection is more accurate and our result is more efficient.

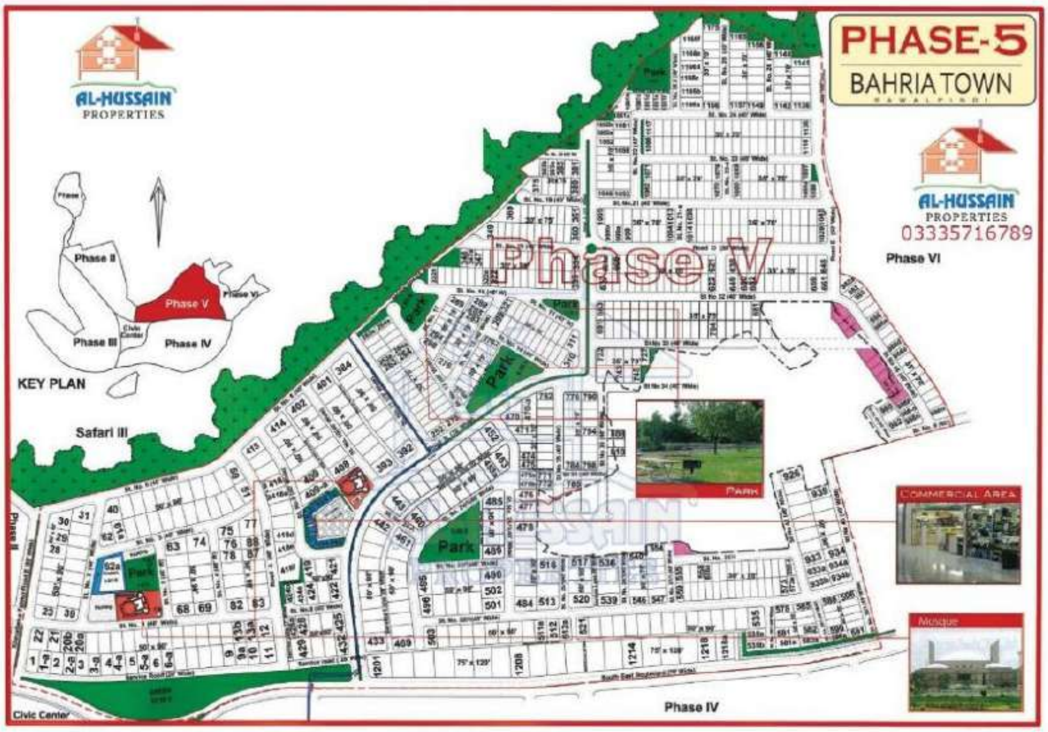

Figure 1. 2: Map of Bahria phase 5

1.3 Waste production in Urban Area

There is no such system of proper solid waste storage after waste generation. There are no separate plans for recyclables and non-recyclables, as in developed countries. Every family, particularly in low-income neighborhoods, where housewives and shopkeepers clean their homes and businesses and dispose of their rubbish outside their main gate, which is subsequently tossed haphazardly into the streets. The model's principal input collects both domestic and business garbage as one and makes no distinction between the two. Open dumping is highly widespread in Pakistani cities, such as dumps by the side of the road, sidewalks, vacant plots, storm water drains, open sewers, and roadways. Solid garbage production in these cities is quite substantial and is rising yearly along with the corresponding population expansion. The number of households has a notable influence on the generation and gathering of solid waste. The selected cities' average household sizes range from 6.7 to 7.3 people. In the recent decades, there has been a migration from rural to urban regions. The major reasons behind this migration are the agricultural sector's inadequate growth, insufficient crop productivity, limited employment opportunities, and environmental deterioration caused by issues such as water logging, salinization, deforestation, and desertification. Urban household solid trash is rising quickly in many nations throughout the world along with economic development and an improvement in citizens' living conditions. The two types of garbage listed here are biodegradable and non-biodegradable. Construction, household, and municipal solid trash are the three categories into which we divided this waste material. A third of all industrial waste produced worldwide is generated by the building industry, which is a problem in developing nations. Household waste, which includes both organic and inorganic garbage, is also considered solid waste. To ensure both environmental preservation and economic progress, there have been numerous environmental regulations and programs put in place.

Figure 1. 3: Dump of waste

1.4 Impact of Waste on Society

Landfills were originally created as a safer alternative to open-air burning, open dumping, and marine dumping, which posed significant environmental and societal risks. However, while landfills helped reduce some of these risks, they also created new problems, such as the production of methane and leachate, which can lead to fires, explosions, vegetation damage, bad odors, soil settling, groundwater contamination, air pollution, and global warming. Solid waste can have numerous negative effects on the environment, including threats to public health, using up all of the earth's resources and making the air unhealthy., surface water, and groundwater. For instance, some waste materials, such as fly ash, contain toxic metals like Cr, Th, Pb, Hg, Cd, etc., that can have harmful effects on human and animal health, as well as plant growth. However, some waste materials, like fly ash, can be recycled and used in different applications, such as in siliceous and aluminium materials or PCC mixtures, to improve their flow ability. On the other hand, other waste materials, such as bottom ash and paper sludge, can have a negative impact on the flow ability of mixtures.

Figure 1. 4: Waste on the side of road

1.5 Classification and collection of waste

There are different ways to measure waste. One way is to use a CI (centralized information) system that gets information from special trash cans around the city and figures out what amount and type of waste it is by using special computer programs. However, this method can be expensive, so it may be more practical to gather information through surveys of local residents. Waste material refers to items that are discarded after being used once or twice. There are two main categories of waste material: organic and inorganic waste. Research has looked into how living close to places where we put our trash like landfills, incinerators and dump sites can affect our health These studies looked at different health problems such as death, sickness in babies, cancer, breathing problems, stomach issues, infections from bugs, feeling sad or anxious, heart problems, and also checked what is in people's bodies. Out of the studies that fulfilled the inclusion requirements, a total of 29 were identified, there have been proposals that indicate a higher likelihood of adverse birth and neonatal consequences for individuals residing in close proximity to various municipal solid waste (MSW) locations. Additionally, there appears to be an increased potential for mortality, respiratory ailments, and detrimental effects on mental health related to living in the vicinity of landfills.

Figure 1. 5: Unhealthy Environment

The waste produced by the sources is merely dumped on the ground, which has the following negative effects: soil contamination, water contamination, air contamination, climate change, risk to life, etc. The effects of this waste are such that they are flammable, it pollutes the atmosphere, and it has an effect on aquatic life. Our environment and health are both harmed by the improperly managed waste. The waste material is creating illnesses and harm to the ecosystem. Which materials should be reused and which materials should be disposed of? Should be carefully categorized for this purpose. Which substance affected the environment in what way? Will the material's reuse aid in the development of a sustainable environment? The management of garbage is crucial for appropriately reusing this waste and ensuring that it does not harm the environment or present a health risk. In order to eliminate the flaw in the waste material, it can be measured, categorized, and reused in accordance with its properties. In order to provide a sustainable environment both organic & inorganic wastes should be collected, classified and quantified. This tactic will assist us in determining, in large part, the types of garbage produced in our area, their quantities, and the best places to recycle them in order to accomplish the desired aim of a sustainable environment. In order to manage waste materials properly, appropriate procedures that may be utilized to ascertain the qualities of the waste materials so that it is reused appropriately should be created. Reusing waste materials will also be very cost-effective. To encourage people to sort and recycle their garbage, the best thing to do is to make it easy for them by providing helpful things like recycling bins and collection services. The key elements for achieving this goal include raising environmental awareness among residents, ensuring easy access to recycling and classification facilities, promoting willingness to participate in the sorting process.

1.6 Quantification and Classification of Waste

The waste quantification process involves measuring the weight of the waste and determining the volume of stockpiled waste based on rectangular and pyramidal shapes. Another method for quantification is estimating the weight in kilograms or tons. In order to obtain accurate results from the survey, a certain number of samples must be collected from the field according to ASTM D5231-92. This standard specifies a manual sorting process for determining the average composition of municipal solid waste (MSW) based on hand sorting of trash samples over a specified period of time. The methodology includes gathering a small portion of unprocessed garbage, separating the different parts, making the information smaller, and sharing the findings. This method can be utilized in places where trash is disposed, recycled, and transported. Proper methodology should be explained in detail to ensure proper waste collection. Different types of solid waste have varying weights, with some being lightweight and others being heavy. Data on the different types of waste can be useful for many things like planning, designing waste management facilities, and helping with contracts and acceptance test plans for these facilities. By choosing and organizing garbage samples by hand.

Figure 1. 6: Weighing of waste

The method can be employed to describe and document the makeup of MSW. It is important to investigate the origin of the waste and any seasonal fluctuations as appropriate.

In cities, different kinds of vehicles are used to pick up and move garbage from different parts of the city to places where it can be disposed of, like landfills, incinerators, and transfer stations. Waste collection and disposal systems in most countries are changing a lot because of new laws and what people want. As there is less and less land available and laws get stricter, landfill sites are being shut down. Many towns are looking for other options besides landfills to get rid of their waste. They are trying out different methods like processing, exporting, and stopping waste from being created in the first place. Smart Trash Bins have sensors and technology to communicate. They are attached to the top of the bin, under the lid. These sensors can tell how full the bin is and if there is any gas, and then they send this information to the workstations. The detection device has two sensors.

1.7 Project Motivations:

In 2020, the world was estimated to generate 2.24 billion tons of solid waste, amounting to a footprint of 0.79 kilograms per person per day. With rapid population growth and urbanization, annual waste generation is expected to increase by 73% from 2020 levels to 3.88 billion tones in 2050. In Pakistan, waste material is simply thrown in the dump yards which is damaging the environment and creating health issues. For this purpose, an approach towards the sustainable environment is generated. Like other countries, we also need a proper management system so that solid waste can be managed efficiently. Our project involves calculating solid waste in a proper manner and how can we use it efficiently?

1.8 Problem Statement:

In today's world, solid waste has become a significant environmental issue, and Pakistan is no exception. Problems generated by solid waste is due to improper disposal and management of solid waste led to environmental pollution. Dumping waste in open spaces or water bodies contaminates soil and water, causing long-term damage to ecosystems and biodiversity. Accumulation of solid waste attracts pests, rodents, and disease-carrying organisms, posing health hazards to humans and animals. The release of harmful gases and leachate from landfills can also contribute to respiratory problems and other illnesses. Poor waste management leads to unsightly heaps of garbage in residential areas, parks, and public spaces. This negatively affects the aesthetics of the surroundings and can also impact tourism and social well-being. Many materials discarded as waste can still hold value and be recycled or repurposed. When waste is not properly managed, valuable resources are lost, and the demand for new raw materials increases, leading to resource depletion. Landfills produce methane gas, a potent greenhouse gas that contributes to climate change. Improper waste disposal practices contribute to increased greenhouse gas emissions, exacerbating global warming. Improperly disposed of solid waste can block drainage systems and contribute to flooding during heavy rains, leading to infrastructure damage and economic losses. Inefficient waste management requires additional resources and expenses for cleaning and waste removal. These costs burden the local economy and government budgets. To solve all these problems, we need to establish a proper solid waste management system, which will allow us to efficiently utilize the generated solid waste.

1.9 Overall Goals and Specific Aim:

What type of material is generated in our house hold solid wastes?

Quantification of that waste.

Exploring their possible reuse.

1.10 Methodology:

The working strategy followed for this research work is that:

- Defined problem statement.
    - Literature review.
    - Area of case study
    - Methods of quantification of waste.
    - Data collection
    - Result interpretation
    - Possible utilization

CHAPTER 2

LITERATURE REVIEW

2.1 Engineering Properties of Municipal Solid Waste

The design and operation of landfill lining systems depend heavily on the mechanical properties of the waste body. This includes stability concerns and the effectiveness of geocells and mineral lining components. A thorough understanding of the mechanical properties of waste is necessary to predict possible failure modes and design appropriate landfill engineering measures. To determine unit weight, compressive strength, shear strength, lateral stiffness, horizontal position, and hydraulic conductivity, several measurement and interpretation issues must be considered. There have been many studies on the mechanical properties of waste, both in-lab and in-house, and these studies have resulted in several articles being produced. Despite the heterogeneity of waste, municipal solid waste has demonstrated predictable and regular changes in mechanical properties with respect to stress state and placement method. To make the reported results understandable, it is recommended that the classification scheme and testing methodology be standardized internationally. This will lead to the development of appropriate constitutive models for the waste, fully accounting for the interaction between the waste and the liner system, and ultimately optimize landfill design (Dixon & Jones, 2005).

2.2 Quantification and Management of Construction Waste

Nowadays, the issue of construction and demolition waste (C&D waste) affects both governments and those involved in the construction industry on a global scale. To regulate the generation and management of C&D waste in Spain, a new national legislation has been in place since February 2008. The Al Cor concept, which has been successfully implemented in the Los Al Cor community, has served as a model for this mandate and is discussed in this paper from Seville, Spain. In order to effectively manage and dispose of C&D waste, those involved in construction must estimate the amount of waste generated from the project's initial stages. To achieve this, a comprehensive model has been developed that can estimate the waste generation at a construction site. This model was created by examining the bill of quantities of 100 household projects, which resulted in the development of three coefficients for estimating the volume of collapsed waste (CT), debris waste (CR), and packaging waste (CE). The usefulness of the model is demonstrated through two case studies that illustrate its application in determining the volume of C&D waste in both new construction and demolition projects (Solís-Guzmán et al., 2009).

2.3 Potential Utilization of Solid Waste

The industry has directed its research towards using agricultural and industrial waste products due to technical, financial, and environmental factors. Sugarcane bagasse, which is a fibrous byproduct of sugar refining with ethanol evaporation, is one such waste product that requires immediate attention due to its harmful impact on the environment. This study aims to assess the potential industrial use of bagasse ash by conducting chemical and physical characterizations. The physical properties and refractoriness of bagasse ash have been analyzed using SEM and EDAX, while X-ray diffractometric has been employed to determine its composition and the presence of crystalline materials (Aigbodion et al., 2010).

2.4 Classification and Quantification of Construction Waste

This research study focuses on identifying and calculating the volume of waste produced at construction sites. Specifically, it examines two residential projects located in Mount Batu, Malaysia. The data was collected over a period of three months using on-site observation and quantification methods. To calculate the volume of waste, both rectangular prism and pyramid shape methods were utilized. The study found that the five primary waste categories produced at both sites were concrete, wood, steel, brick, and packaging debris. The total estimated waste generated by both sites was 154.31 m3. It was observed that wood waste accounted for 49% of the total waste generated at both sites, whereas steel waste was the least generated. The study concludes that there is a pressing need for environmental sustainability as the demand for construction materials from landfills is taking a toll on the ecosystem. Therefore, all participants in the construction process have a moral responsibility to reduce waste generation (Foo et al., 2013).

2.5 Potential Utilization of Waste Material for Sustainable Development

Waste generation is a significant problem globally, and unfortunately, recycling is not an effective solution in many cases as it often consumes more energy and creates additional issues. Land pollution is another problem caused by waste being left untreated, which results in further problems. Recycling waste in the construction sector is a challenging task, but it is an excellent way to dispose of waste in finished building materials. To optimize resource usage, assessing waste is the first step. Nowadays, waste utilization is a subject of extensive research, and this literature review examines various waste products and how they are utilized in real construction projects. The use of waste has two key benefits, namely, the reduction of pollution and the promotion of sustainable development by preserving natural resources. This study also demonstrates the positive outcomes of waste utilization strategies (Sudharsan & Sivalingam, 2019).

2.6 Methodology to Quantify and Classify Construction Waste:

The utilization of waste has two key outcomes. First, the reduction of pollution should be prioritized after the protection of natural resources to promote sustainable development. Second, this study demonstrates the positive results of waste utilization strategies. The research begins by identifying, quantifying, and classifying the most significant wastes generated during the construction process. Future studies will examine various construction solutions and material resources to minimize environmental impacts caused by the Common Construction Model (CCM). This methodology is then applied to a sample of ten buildings, with a focus on the housing sector, in a case study presented at the end. Additionally, both of the structures discussed in this article are part of a housing subsidy program [6]. Municipal solid waste recycling is a scientifically proven effective way to manage waste and is the best approach to reduce, reuse, and secure waste, which is a significant problem faced by many Chinese cities. This paper focuses on the classification of municipal solid waste and its primary effects on recycling. It is found that the traditional classification of waste, lack of relevant laws and regulations, unavailability of waste recycling facilities, and appropriate laws are some of the reasons behind the shortcomings of waste classification. (Pilar Mercader Moyano et al., 2011).

2.7 Barrier Factors of Municipal Solid Waste Classification Recycling

The main goal of the project is to explore the possibility of utilizing various solid wastes to manufacture construction materials. The research is based on an extensive review of existing literature on construction materials that includes different types of solid waste. Traditional methods of producing building materials use up valuable natural resources, and solid waste is generated by industrial and urban management systems that are often discarded in open fields, causing severe ecological harm. In order to protect the environment, extensive efforts are being made to recycle various solid waste types for use in manufacturing different construction materials. This study assesses the environmental impact of generating various types of solid waste that have the potential for material recycling and eventual conversion into construction materials. It also stresses the need for further research and provides examples of how construction materials based on solid waste have been used in actual construction (Wu & Xu, 2013).

2.8 Utilization of Solid Wastes in Construction Materials

The fertile soil is being significantly damaged due to waste dumping on agricultural lands. The proper disposal of municipal waste has become a top priority due to public concern over pollution and its environmental impact. Past practices such as waste disposal in rivers and burning of garbage are now restricted due to their negative impact on air and water quality. With the increase in urban waste disposal needs, there is a possibility of using more agricultural land for waste disposal purposes, which can either be done by mixing garbage with regular crop production or replacing crops with waste dumping sites. Agricultural scientists play a crucial role in maximizing the potential of soil waste disposal and utilization while also safeguarding soil and water resources. They should educate the public about the limitations of waste disposal techniques and work with engineers and economists to plan municipal waste disposal on cropland in a safe, reasonable, and visually appealing manner (Safiuddin et al., 2010).

2.9 Utilization of Demolished Concrete Waste for New Construction

The amount of waste produced is increasing with development. Instead of simply using demolished waste as backfill material, it would be beneficial to use it in concrete production. This would not only help keep costs down, but also improve the quality of fresh concrete. This approach is known as "Green Concrete Construction," which utilizes waste materials as aggregate in the concrete mix. The focus of this research is on the feasibility of using construction waste as recycled aggregate for producing new green concrete. Standard tests were conducted on the recycled aggregate, including water absorption, sieve analysis, impact value, abrasion value, crushing value, work ability, and comprehensive strength, using 150 mm standard cubes (Husain & Assas, 2013).

2.10 Utilization of paper waste sludge

The world generates a significant amount of waste, but its recycling is not carried out efficiently. Recycling also poses new challenges and consumes more energy. The practice of disposing of waste in landfills exacerbates the issue and causes land pollution in Leeds. The utilization of waste materials in the construction sector is a complex process, but it presents an excellent solution for waste disposal in construction materials. To effectively use such materials, we need to first evaluate them thoroughly (Ahmadi & Al-Khaja, 2001).

2.11 Utilization of Recycled and Waste Materials

The management and storage of waste from demolished concrete buildings has become a major global challenge in recent times. This problem needs to be addressed at the local level to preserve natural resources and minimize environmental pollution. Recycling the waste from demolished concrete structures is an ideal solution to this problem. In this research, an experimental study was conducted to investigate the feasibility of recycling concrete debris from demolished buildings for new construction. The aim of the study was to reduce construction costs and provide housing solutions for low-income communities worldwide. Before recycling the crushed debris from broken concrete into fresh concrete, several tests were carried out to determine the properties of the aggregate and size it as required. The study indicates that high-quality concrete can be produced using recycled site-derived aggregate. The compressive strength test results of normal concrete with fresh aggregate were found to be lower than those of partially replaced and fully recycled aggregate concrete (Bolden et al., 2013).

2.12 Precision Measurement for Industry

The current Industry 4.0 standards require accurate and efficient edge computing sensors for effective solid waste sorting. Improper waste management can negatively impact the health, economy, and environment worldwide. To achieve successful recycling, all stakeholders involved in solid waste generation and recycling should understand their respective roles and responsibilities. Proper and efficient sorting of waste is critical for recycling to be successful, particularly in the context of inorganic waste classification. Prior studies have utilized CNN architectures such as Alex Net, which are too heavy and unsuitable for low-cost computational complexity applications. This study proposes an enhanced lightweight deep learning model, based on MobileNetV2, that is effective for lightweight applications and edge computing devices. The proposed model utilizes Soft Max and Support Vector Machine classifiers, and its performance surpasses that of comparable models, achieving accuracies of 82.48% and 83.46%, respectively. Although MobileNetV2 may have inferior accuracy compared to large CNN architectures, it is more practical for edge computing devices and mobile applications (Qin et al., 2021).

2.13 Classification Management and Behavior Synergy of Municipal Solid Waste

Household waste management is just one aspect of a larger issue that involves the interaction between waste classification management and inclusion behavior. To address this issue, a mandatory waste classification management model for municipal solid waste and an evaluation index system were developed in this study by incorporating a subject-object-process model into the waste classification management system. Using Beijing, China as an example, the study assessed the degree of pairwise convergence between separate residential waste classification practices and the degree of convergence of household waste management and practices. The results indicate a positive correlation between enterprise participation in governance and resident behavior, ranging from 0.45 to 0.75, and between enterprise participation in governance and resident behavior, ranging from 0.40 to 0.68. The level of coherence between residential waste management and residents' involvement behavior is generally basic or slightly disharmonious. In terms of psychological factors influencing how residents rate their behavior, the superposition effect of integrated management measures is strengthened. However, while awareness and recognition of waste classification are high, social pressures and environmental responsibility are less well-known. In addition to quantifying the overall coherence between management and resident behavior, the study also provides a mechanism for implementing litter classification management in a targeted manner using covariance analysis and hierarchical management focused on promotion and education, monitoring and management, evaluation, incentives, and punishments according to the weak links of different regions (Cui et al., 2021).

2.14 Internet of Things-Based Urban Waste Management System for Smart Cities

Waste management is a significant challenge for smart cities due to the difficulty in keeping densely populated areas clean. Urban computing has found a solution in the Internet of Things (IoT), which enables the collection, integration, and interpretation of various data types. The aim of this project is to create an IoT-based system for urban waste management. IoT devices are utilized for waste management and human behavior monitoring. A long-short-term recurrent neural network optimized for Cuckoo search is used to collect and analyze data from a city. The network facilitates waste screening based on source, vehicle size, and waste type. Waste management facilities are then notified of this information so that appropriate measures can be taken. The effectiveness of the IoT-based waste management method is evaluated through empirical analysis. The system is designed to ensure that bins are handled promptly, with a minimum error rate (0.16) and maximum accuracy (98.4%). The IoT-based system has proven to be an effective waste management solution, allowing for efficient waste screening and timely handling of bin (Alqahtani et al., 2020)

2.15 Solid Waste Derivative Material:

The collapse of building foundations, particularly pavements, is causing CO_2 emissions and environmental degradation in Nigeria and other developing countries, which pose a significant threat to their economic growth. Poor solid waste disposal practices and regulations in these countries also lead to the careless disposal of waste in landfills, adding to the environmental concerns. Additionally, the lack of proper waste disposal facilities contributes to water pollution, which is a serious threat to water resources in developing nations. This review emphasizes the interconnection between these issues and proposes Geo-technical engineering as a potential solution. The study aims to describe solid waste materials that can be incinerated or crushed to produce Geo materials for use in concrete production, asphalt replacement, and soft soil stabilization. These derivatives are environmentally friendly and can be used as alternative cement in the stabilization of soft soils, as a partial replacement for Portland cement in concrete manufacturing, and as an asphalt modifier, resulting in construction without CO2 emissions. Moreover, by improving the strength of soft soil, concrete, and asphalt, these waste materials can be recycled for use in Geo-materials, concrete admixtures, and as sources of asphalt modification materials. Research has shown that these solid waste products, with high alum inosilicate concentration, enhance the mechanical and strength properties of soil, concrete, and asphalt (Onyelowe et al., 2019).

2.16 Asphalt Mix Solid Waste:

This article discusses how waste materials can be incorporated into asphalt mixes to decrease the amount of waste generated from various sources. This approach can decrease the need for mining resources, resulting in a reduction in the environmental impact of the pavement industry and its carbon footprint. The paper explores more than 20 underutilized wastes from different sectors, including industrial, agricultural, municipal, mining, construction, and demolition, that can be used as fillers in asphalt mixes. The study examines the physical and chemical characteristics of the waste and their impact on the mix's effectiveness concerning the primary concerns. By identifying areas that require further research and improvement, this article can serve as a guide for the use of unconventional fillers and inspire researchers. Recent studies have suggested that creating sustainable asphalt mixes can be achieved by incorporating waste materials into the mix in appropriate proportions (Choudhary et al., 2020).

2.17 Environmental and Socioeconomic Impacts of Urban Waste:

This article discusses how recycling companies' urban mining practices positively impact the environment and play a crucial role in waste management. Specifically, the study focuses on waste pickers in Cuenca, Ecuador, and examines their working conditions. The research has two objectives. Firstly, it aims to determine the reduction in greenhouse gas emissions resulting from the use of recycled municipal waste instead of virgin raw materials in manufacturing. Secondly, the study investigates the socio-economic aspects of the workforce employed in the urban solid waste sector. The primary city of focus is Cuenca, where a comprehensive database created by the non-governmental organization Alliance for Development is utilized. This information aids in identifying potential customers for the garbage disposal sector. The study employs the clean development mechanism and proposes a theoretical model for municipal solid waste management that incorporates circular economy principles (Burneo et al., 2020).

2.18 A Review on Plastic Waste as Sustainable Resource in Civil Engineering Applications:

Plastic waste can pose a serious threat to the environment as it is non-biodegradable and can remain in the ecosystem for an extended period, causing harm to ecosystems and living organisms. Due to this, there has been a search for a viable alternative to manage and dispose of plastic waste, leading to the discovery of various methods to recover and repurpose it. With the high demand for aggregates and cement in the construction industry, waste plastics can be recycled, reused, or reprocessed as a substitute for construction materials. This approach can also help reduce the use of natural aggregates in construction. This article provides a review of various forms of plastic waste and their potential uses in the building sector, along with discussing the challenges of plastic waste management. By changing the production design of plastics, we can find better ways to handle plastic waste and improve the environment. The review suggests that plastic waste can be an innovative alternative in the construction industry, promoting economic growth and contributing to the Sustainable Development Goals (Ogundairo et al., 2021).

2.19 Intelligent Solid Waste Classification:

The increasing pace of global consumption and population growth is resulting in a significant increase in waste production, making recycling an important economic and environmental solution to prevent pollution. To achieve the best efficiency during the recycling process, waste needs to be organized according to its content, and limiting human involvement is essential for plant efficiency, labor, and productivity. This study used machine learning algorithms to classify outdoor images of organic waste, paper, glass, and plastic. Four- and five-layer deep neural network techniques were utilized for classification, with the four-layer architecture achieving a 70% accuracy rate for trash discrimination. However, the accuracy of distinguishing plastic waste from other waste was found to be low in both network topologies, with accuracy rates of 37% and 56.7% for the four- and five-layer DCNN architectures, respectively. Organic waste was more accurately separated from other waste, with accuracy rates of 83% and 76.7% in the four- and five-layer DCNN architecture, respectively. This study shows the potential for machine learning in waste classification, which can improve recycling plant efficiency and productivity (Altikat et al., 2022).

2.20 A Cloud Based Smart Recycling Bin for Waste Classification:

The amount of urban waste is increasing due to modern lifestyles and population growth, with people consuming more and products being designed to have shorter lifespans. Recycling is necessary to maintain a sustainable environment, but waste separation is a challenging step in the process. Many research projects proposed in the literature are neither cost-effective nor efficient enough to be practical in the real world. This paper proposes a solution to waste classification using a low-cost, efficient smart recycling bin connected to a cloud-based information system. The system utilizes artificial intelligence and neural networks to classify waste in each bin, achieving an accuracy rate of 93.4% while consuming minimal power and being reasonably priced for deployment (Baras et al., 2020).

2.21 Utilization of Solid Waste for Soil Stabilization:

The term "Soil stabilization" is the process of modifying soil properties to meet technical standards. Techniques such as compaction and mixing can be used for consolidation. Cement and lime are commonly used stabilizers. However, studies have shown that solid waste products like fly ash and rice husk ash can also be used as stabilizers instead of lime or cement. This is important because these waste products can harm the environment if not properly disposed of. A literature review was conducted on the use of solid waste for soil stabilization, and the results are presented in this report (Dahale et al., 2012).

2.22 Survey on Household Solid Waste:

As urban populations grow rapidly, managing solid waste becomes a challenging task, especially in cities where waste generation surpasses the existing infrastructure. To reduce the amount of waste in landfills, basic principles such as waste avoidance, recycling, reuse, and recovery must be implemented in sustainable management techniques. This study examined the attitudes of Nur-Sultan (formerly Astana) residents towards household solid waste disposal and source segregation, as the city is rapidly expanding. A survey was conducted between April and July 2018, using stratified random sampling, with 3281 participants. The study, the first attempt to assess recycling trends from a household perspective in Kazakhstan, showed that 24% of respondents sorted household solid waste, despite the lack of a segregation system at the source. The results indicate that segregation at the source can be successful with the implementation of sensible public awareness programs and the placement of recycling bins near residential structures, as shown by the study (Sarbassov et al., 2019).

2.23 Benefits Analysis of Classification of Municipal Solid Waste:

Municipal solid waste (MSW) is becoming a growing concern for society, hindering peaceful development. China has recognized MSW classification as an important strategy to promote a national ecological civilization. However, current literature does not provide a comprehensive analysis of the economic, resource, and environmental impacts of MSW classification. To address this gap, an integrated system dynamics model was developed to evaluate the effects of waste classification on socioeconomic, environmental, and resource issues. The study used a case study from Tianjin, China from 2006 to 2017. The results indicate that increasing the separation rate of waste can lead to positive socioeconomic benefits, with a potential benefit of up to 0.36 percent of Tianjin's GDP. Additionally, waste classification can reduce greenhouse gas emissions (CO2 equivalent) by 1.03 to 1.46 million tons annually and save between 502.92 and 2918.59 m2 of land each year. Policy makers, planners, and researchers should consider these findings to promote trash sorting and encourage community participation (Wang & You, 2021).

2.24 Investigation on Decision-Making Mechanism of Residents:

This study focuses on understanding the factors that influence the household solid waste (HSW) disposal decisions of residents, which is critical to the success of municipal solid waste management. The researchers combined the theories of planned behavior and attitude-behavior-situation to examine the underlying mechanisms of HSW disposal decisions. The study surveyed 709 residents in Suzhou, China, and used structural equation modeling to analyze the data. The results showed that both intrinsic subjective factors and extrinsic objective factors strongly influenced residents' behavioral choices, with the latter having a cumulative effect almost twice that of the former. The most effective way to encourage HSW sorting and recycling was to provide convenient environmental facilities and services, such as access to recycling and sorting facilities. The lack of mandatory rules, regulations, and incentive mechanisms on HSW classification and recycling in Suzhou may explain the minimal influence of laws and regulations. The study provides policy recommendations for comprehensive management of urban HSW recycling and classification (Meng et al., 2019).

2.25 Garbage Waste Segregation Using Deep Learning Techniques:

Recycling programs in major cities face a significant problem of waste segregation, especially in India, where 62 million tonnes of waste are generated each year, including 5.6 million tonnes of plastic waste, of which 60% is recycled, and 43 million tonnes of solid waste, of which only 11.9 million tonnes is recycled. The main issue is that garbage is not segregated when collected from households, requiring a large amount of manpower and effort to sort and separate the waste, and exposing workers to various health hazards. Therefore, to increase productivity and reduce human interaction in the waste sorting process, the proposed study aims to develop a neural network-based image classifier that can recognize objects and determine the type of litter they contain. The study will extract features from images and use four different CNN models, including ResNet50, DenseNet169, VGG16, and AlexNet, to make predictions and classify garbage into respective categories. This innovative approach could potentially improve waste segregation and management practices in India and other countries with similar waste management challenges (Susanth et al., 2021).

2.26 Multi-Material Classification of Dry Recyclables from Municipal Solid Waste:

Over the past few decades, the amount of municipal solid waste (MSW) being generated has significantly increased due to rapid urbanization and industrialization. In countries where source separation is not implemented, there is a necessity for the automatic separation of recyclable materials from MSW. To address this issue, this study proposes a thermal imaging-based approach for identifying renewable materials within a synthetic MSW sample. By utilizing a robotic system and thermal imaging technology, recyclables can be sorted and classified in a single process step. Experimental results have shown that the accuracy of the proposed approach, which is comparable to current single-material recyclable classification systems, ranges from 85 to 96%. It is believed that this low-cost and practical thermal imaging-based system can be employed to classify and sort large-scale MSW in recycling facilities in underdeveloped countries (Gundupalli et al., 2017).

2.27 Municipal Solid Waste Generation and Characterizations:

The production of municipal solid waste (MSW) has seen a notable increase over the past few years, causing concerns worldwide. As the population grows, the amount of waste generated also increases, and managing it has become more challenging. The purpose of this research is to examine MSW and its distribution in Johannesburg (CoJ), South Africa. The findings indicate that plastic waste and organic waste are the most common types of waste, with daily waste (DR) and organic waste (OW) accounting for the majority of it. During the summer and winter seasons, DRs for plastic waste were 28% and 26%, respectively, while RCRs for organic waste were 28% and 29%. In this study, the food waste had a calculated carbon-to-nitrogen ratio (C:N) of 22.66, and the empirical formula $C27H44NO16$ was derived. The STATA 12 statistical software and ANOVA statistical approach were used to determine seasonal differences between winter and summer seasons over a six-month period. According to STATA 12 tests, DR (p-value = 0.9775) and RCR (p-value = 0.9760) were significant at the 95% confidence level. Similarly, using ANOVA tests at a 95% confidence level, the p-values for DR and RCR were (p-value = 0.999) and (p-value = 0.991), respectively. In addition, the Minitab software was used to forecast trash generation from 2016 to 2025. Based on the findings, waste generation does not differ significantly between the two seasons ($p > 0.05$). Furthermore, within the ten-year period considered, a total of 102,406 tonnes of waste will be generated, indicating a decrease in CoJ's waste generation (Ayeleru et al., 2018)

CHAPTER 3

METHODOLOGY

3.1 Study Area:

Study area of the site which is used are Bahria Town Phase 1 to Phase 6 Rawalpindi Pakistan. It's located near PWD and Gulraiz Housing Society. It's linked via GT Road and Islamabad Expressway as well. From Bahria Phase 4 there passes Soan River as well. The coordinates of our location are 33.5498 degree North, 73.1305 degree East.Bahria town Islamabad is the very first flagship housing project by Bahria Town. This modern housing scheme in all over Pakistan is owned by MR. MALIK RIAZ HUSSAIN. The society is a marvel of modern architecture in the twin cities and is situated at the center location. Bahria Town Islamabad is a tremendous step by the owner that is ready for a great success even during its developing phase just like all the other projects by them. The group has executed many more projects in all major cities of Pakistan. People residing there are happy and experiencing a lavish, peaceful life.

It has been calculated as Overall 40 to 50 Tons of waste is generated daily from Bahria Phase 1-6 according to Bahria Officials. There are 5 Waste Collection Trucks in total which carry the task from different Phases. Bahria Phase 1-4 have 4 trucks in total, 1 truck each Phase while for Phase 5 and 6 there is 1 truck which carry out the task in both phases.

Bahria Town Islamabad is situated in Islamabad on a prime location near to Rawalpindi. The housing project lies on the main location near Jinnah Avenue in zone IV of Islamabad. It is close to all the major landmarks of twin cities including the auspicious housing societies such as DHA, Park View City and Bahria Enclave.

3.2 Overview of Test Method Performed:

1. Based on the statistical parameters that the researchers have chosen, the number of samples that need to be sorted is determined.
2. A sorting sample is taken from the discharged vehicle load of garbage that is designated for sampling.
3. The Sample is manually divided into waste-related parts.

4. The weight of components is used to calculate the weight of fraction of each component in the sample that we are sorting.
5. The results of the composition of each of the sorting samples are used to compute the mean waste composition (Management, 2008).

3.3 Significance and Use:

Information on waste composition has several uses and can be utilized for tasks like solid waste planning, developing waste management facilities, and creating a reference waste composition for use as a benchmark standard in both facility contracts and acceptance test plans. By selecting and manually sorting waste samples, this approach can be technically used to define and report the composition of MSW. Care should be taken to take into account the waste's source and seasonal variations where appropriate. Following a waste composition study, representative samples of waste components or mixes of waste components may be subjected to laboratory studies for use in planning, managing, designing, testing, and operating resource recovery facilities (Management, 2008).

Sample Calculations:

- ► By using equation 1 of ATSM-D5231-92(Re-approved 2016):

$$n = \left(\frac{t * s}{e.\bar{x}}\right)^2$$

  - ○ t* = student t statistics corresponding to the desired level of confidence.
  - ○ $\bar{x}$ = estimated mean.
  - ○ s= estimated standard deviation.
  - ○ e = desired level of precision

- ► Calculation:
  - By taking "Food Waste" as a major component to be present in waste which we are going to classify (Reference table-3 0f ASTM-D5231-92):

Component		Value
Standard Deviation	s	0.03
Mean	$\bar{x}$	0.10

- By taking 95% confidence level & no of sample an infinity & desired level of precision as 10% (Reference Table-4):

Component		Value
Confidence level	t*	1.645
Desired level of precision	e	0.10

- Putting values in equation:

$$n = \left(\frac{t * s}{e.\bar{x}}\right)^2$$

$$n = \left(\frac{1.645 * 0.03}{0.1\ x\ 0.1}\right)^2$$

$$n = 25$$

(From table-04 picking up the numerical values of t* for n=36 is **1.711):**

$$n = \left(\frac{1.711 * 0.03}{0.1\ x\ 0.1}\right)^2$$

$$n = 26$$

3.4 Material definition:

Following are the some of the material which are defined as per the standard:

- Mixed paper: It contains the wide verity of paper in which the items are discarded emails, telephone books, paper boards, magazines etc.
- High grade paper: It consist of the paper which is used for the special purposes i.e., company latter heads, business forms, etc.
    - Computer printouts: It is the type of high-grade paper which is not used for ordinary purposes.
    - Other printouts: It includes dry copy news, typing paper, cards etc.
- Newsprint: It is mostly a low-cost paper made up of wood pulp.

- Corrugated: It is defined as little tough paper which is used for the purpose of packaging i.e., paper cotton used for material delivery and storage.
- Food waste: All types i.e., vegetables, fruits etc.
- Wood: wood waste particle that may be a proper material like chair or table or it may be wood particles.
- Ferrous: The material which contain irons and it includes steel, cost iron alloys etc.
    - Cans: All the soft drinks packaging cans falls in this category.
- Aluminum: It is a light silver-gray metal with the atomic number value 13.
    - Cans: Aluminum cans are the mostly used for food storage i.e., milk containers etc.
    - Foils: Aluminum foils are the thin metallic sheet used to the food items particularly fast foods.
- Glass: it is hard, brittle material with its multi-purpose of usage, it is transparent in nature it can be color full etc.
- Plastics all types: The main difference between PET, LDPE, and HDPE waste is their chemical and physical properties, which affect their recyclability, biodegradability, and environmental impact. PET (Polyethylene terephthalate) is a kind of plastic that is frequently employed in the manufacturing of water bottles, soda bottles, and other packaging materials.
    - PET is known for its durability and ability to withstand high temperatures, which makes it a popular choice for food and beverage packaging. However, PET waste can take hundreds of years to decompose in the environment, and recycling rates for PET are relatively low, as it requires specialized equipment to recycle.
    - LDPE (Low-density polyethylene) is a kind of plastic that is frequently employed in the manufacturing of shopping bags, plastic wrap, and other packaging materials. LDPE is known for its flexibility and ability to resist tearing, which makes it a popular choice for packaging products with irregular shapes. LDPE waste is generally considered to be less harmful to the environment than other types of plastic waste, as it can be recycled relatively easily and has a lower environmental impact than other plastics.

- HDPE (High-density polyethylene) is a form of plastic that is frequently employed in the manufacturing of milk jugs, shampoo bottles, and other rigid plastic containers. HDPE is a well-liked option for packing materials because of its strength and durability that need to withstand rough handling. HDPE waste is generally considered to be less harmful to the environment than other types of plastic waste, as it is relatively easy to recycle and has a lower environmental impact than other plastics.
- Film: Film is a thin continuous polymeric material which is mostly used for food covering.
- Other plastics: All other types of plastic.

3.5 Apparatus

This is the apparatus which is particularly followed on the field:

- ✓ Containers / Waste bags made of metal / plastic, or fiber that are big enough to hold and weigh each part of the garbage and are labeled appropriately. Metal or plastic containers / waste bags are advised for components that will have a high moisture content (such as food waste) in order to prevent moisture absorption by the container / waste-bags and the subsequent necessity for a large number of weighing's to maintain an appropriate tare weight for the container.
- ✓ A mechanical or electronic weigh scale.
- ✓ Heavy-duty tarp.
- ✓ Rakes.
- ✓ Shovels.
- ✓ Hand brooms.
- ✓ Dustpans.,
- ✓ First aid kits.
- ✓ Various small tools.
- ✓ Safety cones.
- ✓ Vests.
- ✓ Gloves.
- ✓ Protective clothing.
- ✓ Safety goggles
- ✓ Safety boots.
- ✓ Hand Sanitizers.
- ✓ Mask.

3.6 Hazards

- ✓ Before beginning the fieldwork, go over the risks and protocols with the operating andsorting staff. Solid garbage contains sharp items including nails, razor blades, hypodermic needles, and broken glass. Personnel should be warned about this risk, and when sorting trash, they should brush it aside rather than shoving their hands forcibly into the mixture. Heavy leather gloves, hardhats, dust masks, safety goggles, and safety boots are some examples of the protective gear that employees handling and sorting solid trash should wear.
- ✓ During the removal of trash from collection vehicles and the handling of waste with heavy equipment, projectiles from the garbage mass could fly out. A few examples of the projectiles that can be released are glass fragments from breaking glass containers and metal lids from plastic and metal containers that burst under pressure when struck by powerful machinery. The problem is worse if the waste handling surface is composed of concrete or another material with a high comprehensive strength. Personnel should be warned of this risk and provided with eye and head protection if they are near either the collecting vehicle unloading point or large machinery, or both.
- ✓ For the discharge of specified loads, manual sorting chores, and weighing operations, pick a location that is level, flat, and away from the typical waste handling and processing regions.
- ✓ To keep track of the tare weight, weigh storage containers once per day, or more frequently if necessary. The sorting sample's mass could be lost due to water evaporation. After collection, samples should be sorted as soon as is practical. The crew chief must separate and handle any liquid containers and other possibly dangerous waste (Management, 2008).

3.7 Calibrations

- ✓ All weigh scale equipment must be calibrated in accordance with the guidelines provided by the manufacturer. If the readings differ from those of the calibration weights, make the necessary corrections.

3.8 Procedure

- ✓ The procedure which is adopted on the field:
- ✓ Before releasing the load, the surface should be well cleaned with a broom or covered with a sturdy, clean tarp.
- ✓ Place the scale on a spotless, level surface and, if required, adjust the level of the scale.Analyze the scale's performance and accuracy using a known (or "reference" weight).
- ✓ As the scale have been placed on the level surface, now start collecting the sample in the plastic bag or steel container anything which is readily available.
- ✓ For the collection of samples, it should be kept in mind that sample should not be collected with the dumped waste material. Sample should be collected Fresh while the waste collection truck in dumping the waste on site.
- ✓ One or Two Samples should be collected from one truck each time. While Samples should be collected from all the trucks which came on the dumping site.
- ✓ While on a collection day you have to collect at least one sample from each truck. For example, if there are 5 trucks then at least 5 samples should be collected. While in case of Bahria Town there were 6 Trucks and we collected the sample from six trucks each time.
- ✓ Each day of the one-week sampling period, a random selection of vehicles must be made, or the affected parties may decide to choose vehicles that are typical of the waste stream. Any technique that doesn't bring bias into the selection is appropriate in terms of the random selection of cars. A random number generator can be used as a method that is acceptable. The number of vehicles sampled daily for a k-day weekly sampling period must be roughly n/k, where n is the total number of vehicles loads to be chosen for the analysis of waste composition. Five to seven days make up a week. Alternately, we might gather the data twice a week.
- ✓ When the sample have been collected, take the weight of whole sample, the taken weight of the sorting sample should be 90 kg per sample.

- ✓ Now lay down a clean sheet and put all the waste of that sample onto the sheet or clean ground and start sorting the sample.
- ✓ Place different plastic bags or steel container and put a name tag of the specific waste material you are about to put it in. Like for waste plastic put a name tag of Plastic, for waste glass put a name tag of waste glass etc. Further photos of these are given in Annexure A.
- ✓ After Sorting of sample in different major categories (Organic, Plastic, Glass, Pampers, Papers, Wood, Steel, Cans etc.) weight the categories via weight balance and note down the weight.
- ✓ It's clear that when all of these category's weight will be taken and added it might not be making 90 kg as due to wastage while handling the sample.
- ✓ When these major categories have been defined now scale it down to smaller categories and weight it again, like Paper (Computer Print outs, Newspaper, cardboards etc.) and same goes for all of the material.
- ✓ Dispose of the waste on the site and clear the area.
- ✓ Same process should be repeated for all the samples.

Table 3. 1: List of waste material

TABLE 1 List of Waste Component Categories

Mixed paper	Other organics
High-grade paper	Ferrous
Computer printout	Cans
Other office paper	Other ferrous
Newsprint	Aluminum
Corrugated	Cans
Plastic	Foil
PET bottles	Other aluminum
HDPE bottles	Glass
Film	Clear
Other plastic	Brown
Yard waste	Green
Food waste	Other inorganics
Wood	

Table 3. 2: Different Categories

Category	Description
Mixed paper	Office paper, computer paper, magazines, glossy paper, waxed paper, and other paper not fitting the categories of newsprint and corrugated
Newsprint	Newspaper
Corrugated	Corrugated medium, corrugated boxes or cartons, and brown (kraft) paper (that is, corrugated) bags
Plastic	All plastics
Yard waste	Branches, twigs, leaves, grass, and other plant material
Food waste	All food waste except bones
Wood	Lumber, wood products, pallets, and furniture
Other organics/ combustibles	Textiles, rubber, leather, and other primarily burnable materials not included in the above component categories
Ferrous	Iron, steel, tin cans, and bi-metal cans
Aluminum	Aluminum, aluminum cans, and aluminum foil
Glass	All glass
Other inorganics/ non-combustibles	Rock, sand, dirt, ceramics, plaster, non-ferrous non-aluminum metals (copper, brass, etc.), and bones

Table 3. 3: Sampling of Record

Waste Composition Data Sheet

Day/Date: ________________ Collection Company: ________________

Site: ________________ Vehicle Type: ________________

Weather: ________________ Route No: ________________

Recorded by: ________________

Component	Weight in Pounds			Percent of Total
	Gross	Tare		
Mixed Paper				
High Grade Paper				
Computer Printout				
Other Office Paper				
Newsprint				
Corrugated				
Plastic				
PET bottles				
HDPE bottles				
Film				
Other Plastic				
Food Waste				
Wood				
Other Organics				
Ferrous				
Cans				
Other Ferrous				
Aluminum				
Cans				
Foil				
Other Aluminum				
Glass				
Clear				
Brown				
Green				
Other Inorganics				

TOTALS ________________

NOTES: ________________

Lab sample taken? Yes ______ No ______

CHAPTER 4

RESULT AND DISCUSSION

When the sample is collected, eight major categories was founded in them, which include organic waste, tin/can waste, plastic waste, paper waste, and other waste. Now their possible utilization will be discussed as every solid waste had its own properties such as woods and papers are a great source of carbon while the food waste and sewage sludge provide significant amount of nitrogen. We also discuss quality of waste we obtained from our site. Quality of waste is varying place to place and time to time.

The figure 4.1, is explaining the major classification i.e., organic and inorganic waste in the 90 samples. The percentage of each component is in total which is 2340 kg.

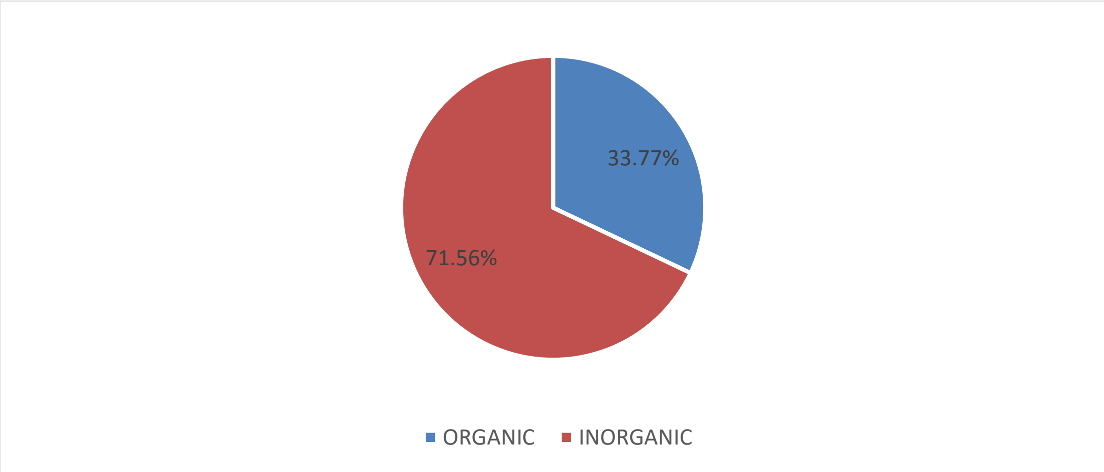

Figure 4. 1: Pie chart Information on major classification

4.1 Data analysis:

In figure 4.2, the detailed classification of 26 sample is discussed. In which it is observed that the food waste is in major quantity and it is because of the society which is selected for our final year design project is a residential society with almost 80% of residential units including 5 Marla, 10 Marla, and 1 Kanal and 20% of commercial.

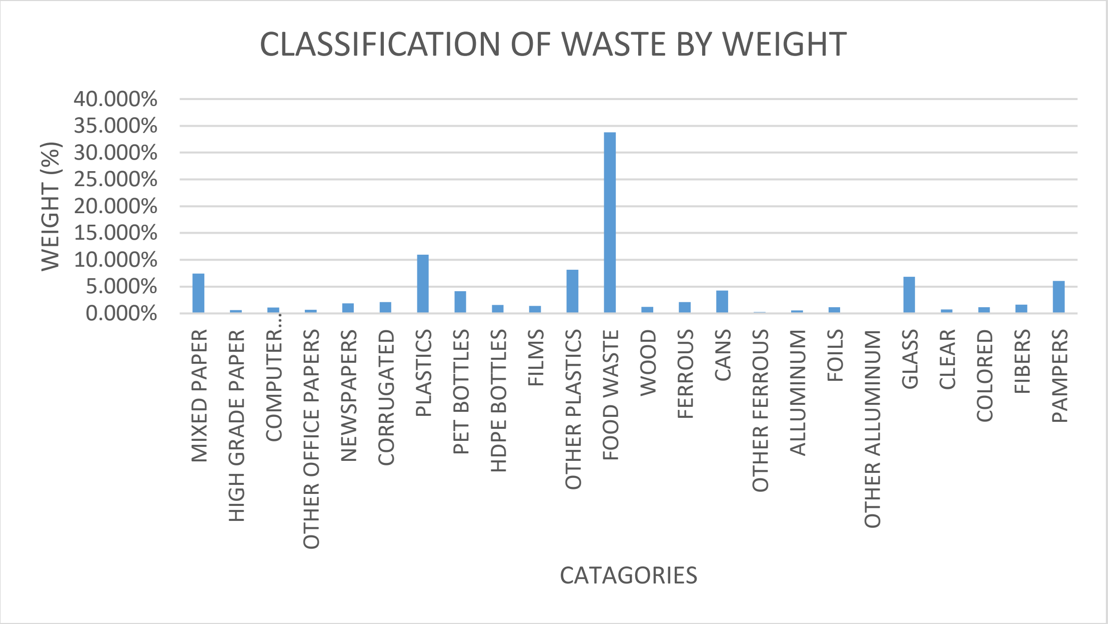

Figure 4. 2: Bar Graph on Classification of Waste By weight

4.2 Major categories:

The figure 4.3, shows that the waste classified lies under the 8 categories which was observed in the field detail amount is shown in pie chart (figure 4.4):

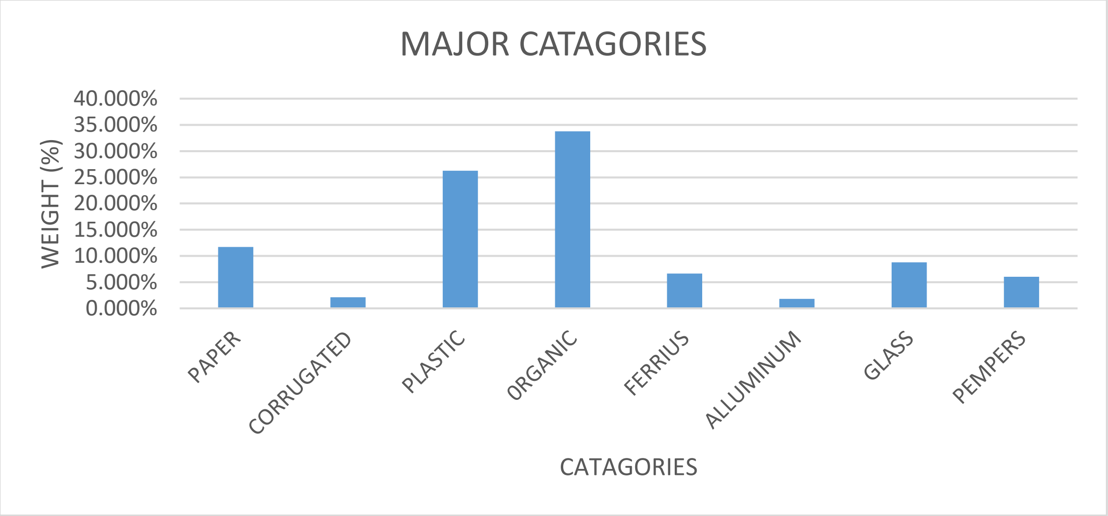

Figure 4. 3: Bar graph of Major Categories

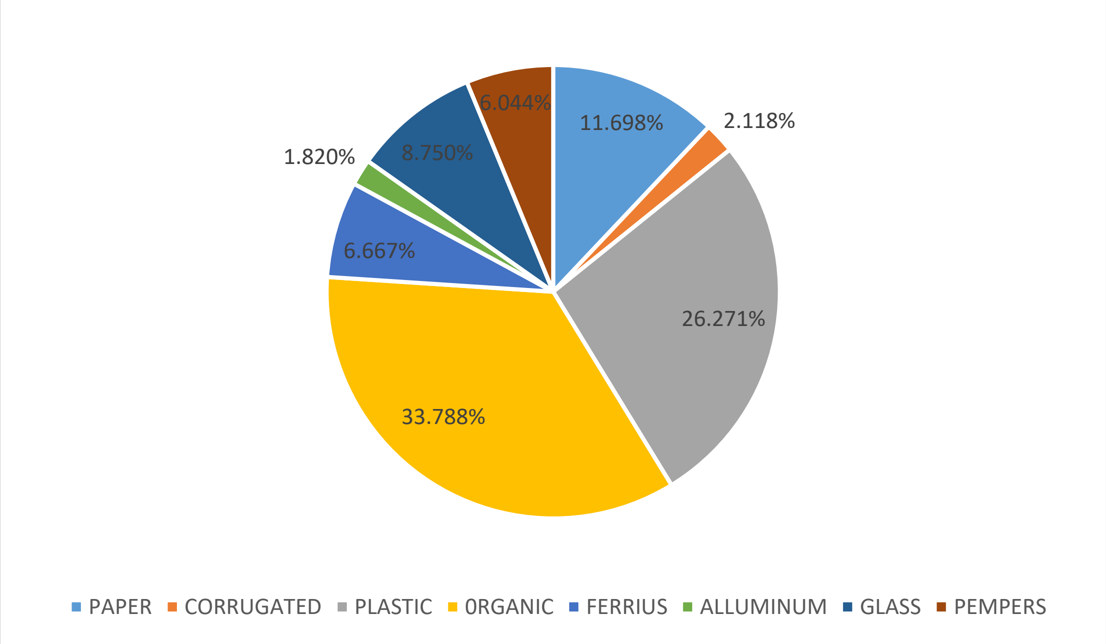

Figure 4. 4: Pie Chart of Major categories

4.3 Commercial vs Residential:

The observation of commercial and residential is on the basis of trucks which collect the waste from the society in which among 6 trucks 1 truck is collect waste from commercial area among 26 sample the 6 samples (21% approximately) is obtained from commercial areas.

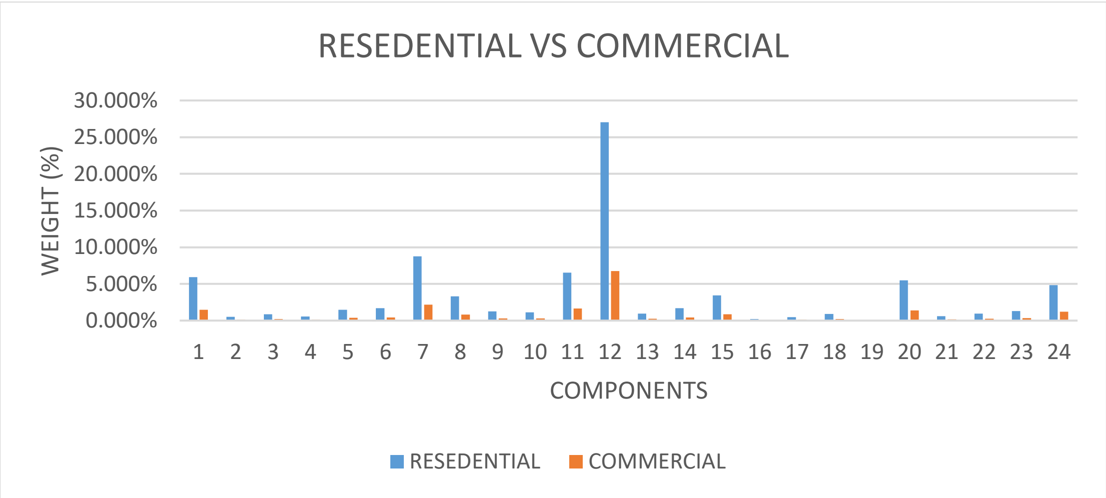

Figure 4. 5: Commercial vs residential waste by weight

In figure 4.5, the detailed comparison of each component of the classified waste is shown with the help of bar graphs, in which it is observed the residential waste is in greater quantity as compare to the commercial waste this is because of the reason that, of total area of the selected society 79 % is residential unit so per capita waste is generated in greater quantity.

4.4 Quality of Waste Generated:

on the basis of quality of waste generated it can give us benefits on its utilization:

4.5 Paper Waste:

As paper is heavily affected by moisture so we collected waste on site mostly in sunny day so that there will be less chance of get paper waste moist. As we mostly get office paper waste, Packaging waste, newspaper waste, magazines and catalogs, Printed marketing materials, Paper-based packaging inserts, Paper napkins and tissues, Books and notebooks etc. As the paper waste we collected from the dumping site was quite rough because the data we obtained was also taken from the dumping site. Due to this reason, any paper waste we had was mixed with other waste, causing it to become rough or partially disintegrated.

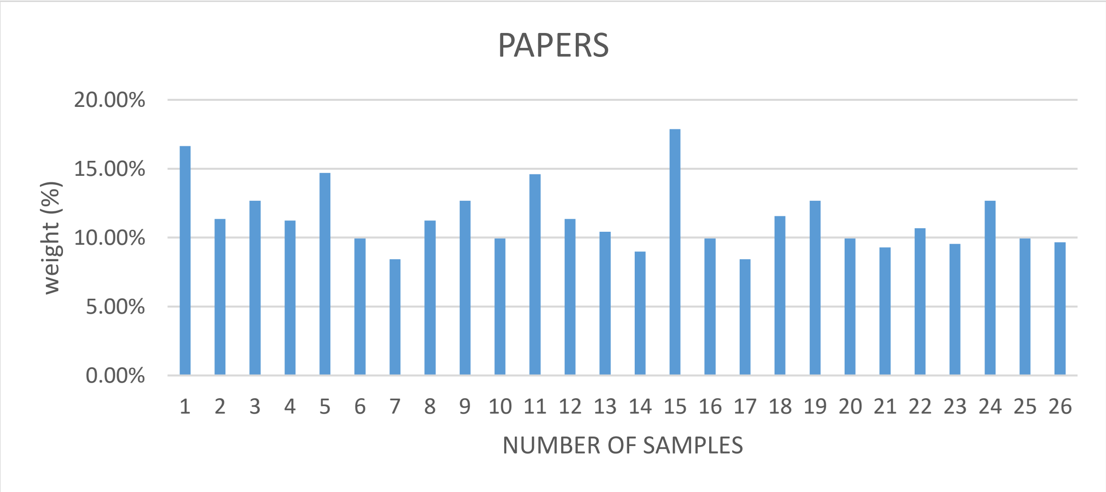

Figure 4. 6: Paper Waste of 26 Samples

The figure 4.6, is showing the comparison of paper waste among the all 26 samples. As it is practically observed from the bar charts there is fluctuation in the waste this is because of the different collecting truck which is collecting from all types of residential units and commercial areas and the sample was collected from the trucks directly.

4.6 Organic waste:

Organic waste is biodegradable so that Organic waste is biodegradable, which is why organic waste starts to decompose and break down quickly, making it challenging to handle. When we transport organic waste, it will begin to release its original weight as decomposition start. Number of organic wastes is generated on site as Food waste, Agricultural waste.

In figure 4.7, is showing the comparison of organic waste among the all 26 samples. As it is practically observed from the bar charts there is fluctuation in the waste this is because of the different collecting truck which is collecting from all types of residential units and commercial areas and the sample was collected from the trucks directly.

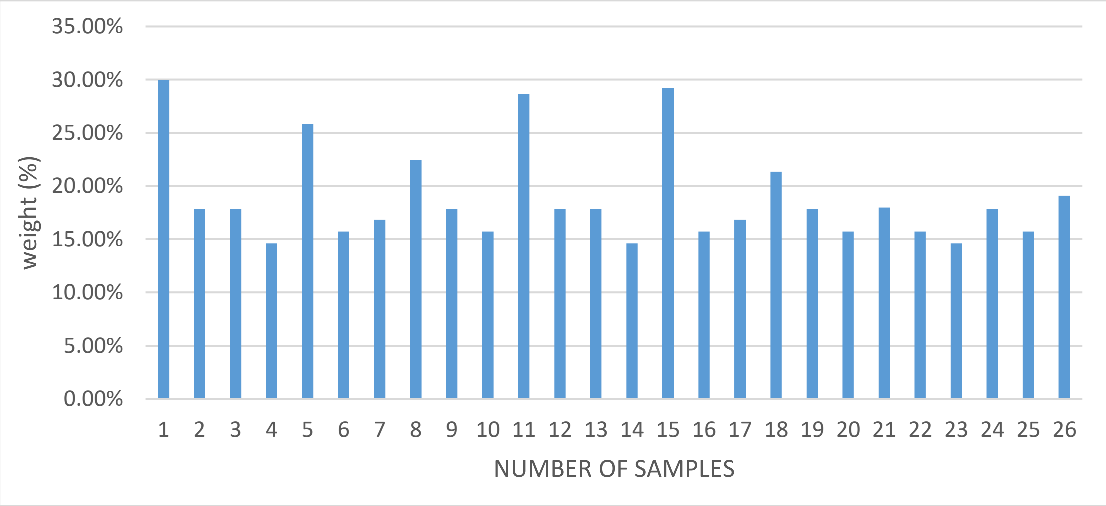

Figure 4. 7: Organic Waste of 26 Samples

4.7 Plastic Waste:

Plastic waste is the most prevalent type of waste generated after organic waste. There are various types of plastic waste in the market. PET bottles, HDPE bottles, Film plastic waste is mostly non-decomposition. The plastic waste we received from the site was in good condition. Some plastic waste had disintegrated, but most of it was reusable. However, there was also some waste that was not reusable, such as plastics containing chemicals that can contribute to various diseases. The plastic waste at the site was relatively easy to handle.

The figure 4.8, is showing the comparison of plastic waste among the all 26 samples. As it is practically observed from the bar charts there is fluctuation in the waste this is because of the different collecting truck which is collecting from all types of residential units and commercial areas and the sample was collected from the trucks directly.

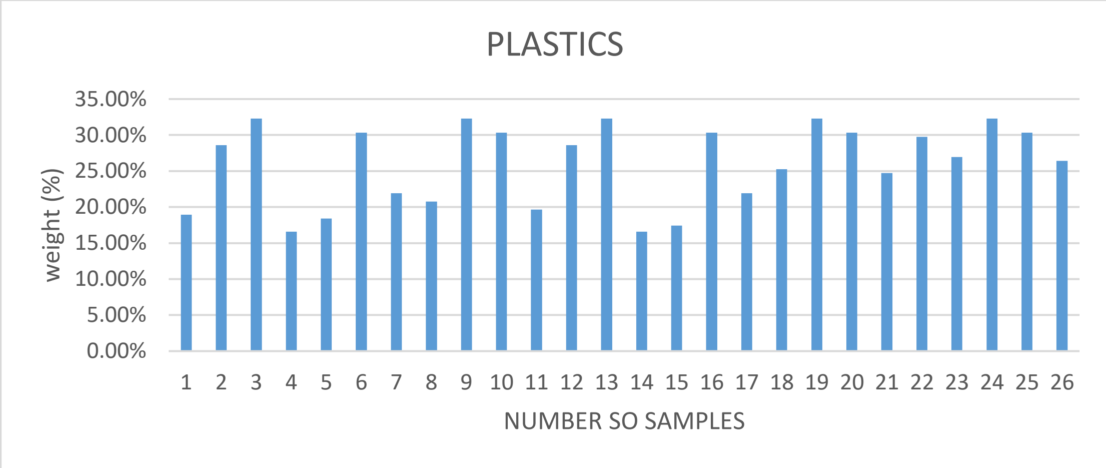

Figure 4. 8: Plastic Waste of 26 Samples

4.8 Corrugated

There was also noticeable quantity of corrugated sheets available. Corrugated sheets can be made of paper or metal, but the ones found on-site were mostly paper sheets, which are primarily used for packaging purposes. These paper sheets usually have a double layer to absorb moisture. In high moisture conditions, paper sheets can get damaged, leading to their deterioration. Metal sheets, on the other hand, have a chance of rusting, which can cause them to deteriorate. On-site, there was less occurrence of such issues, especially during fewer sunny days. The paper corrugated sheets did not sustain much damage.

In figure 4.9, is showing the comparison of corrugated waste among the all 26 samples. As it is practically observed from the bar charts there is fluctuation in the waste this is because of the different collecting truck which is collecting from all types of residential units and commercial areas and the sample was collected from the trucks directly.

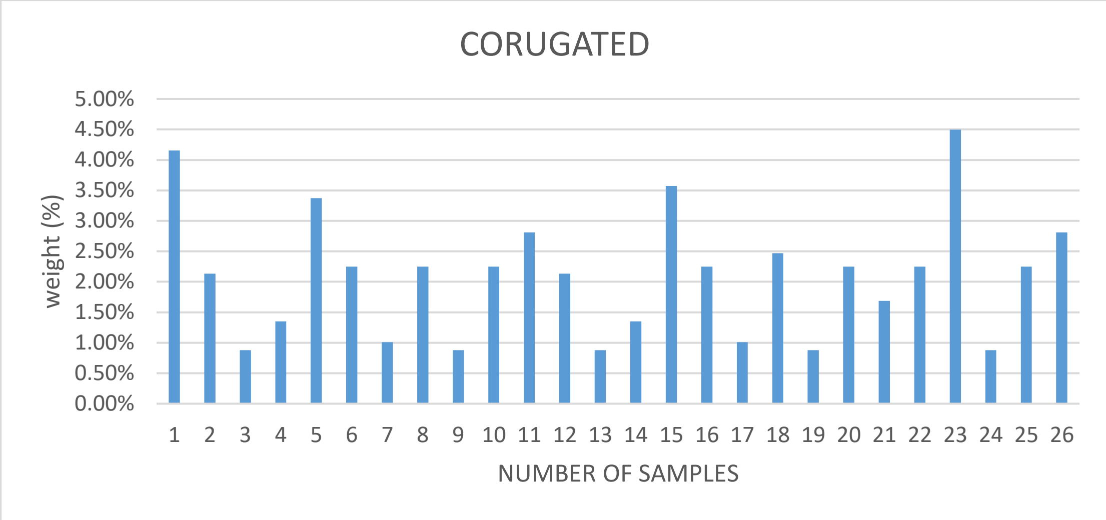

Figure 4. 9: Corrugated Waste of 26 Samples

4.9 Ferrous

Ferrous waste was found in very small quantities, mostly in the form of soda cans or spray cans. Iron tends to rust easily, but Corrosion of ferrous materials occurs through an electro chemical reaction known as oxidation. In the presence of water and oxygen, iron undergoes oxidation and forms iron oxide, commonly known as rust. Rusting can lead to the degradation and weakening of ferrous materials over time. Therefore, it was easier to separate the rusted iron from the waste. Iron was mostly found in new tracks at the site. The sample taken from the site had very little rust and a minimal amount of iron waste.

In figure 4.10, is showing the comparison of ferrous waste among the all 26 samples. As it is practically observed from the bar charts there is fluctuation in the waste this is because of the different collecting truck which is collecting from all types of residential units and commercial areas and the sample was collected from the trucks directly.

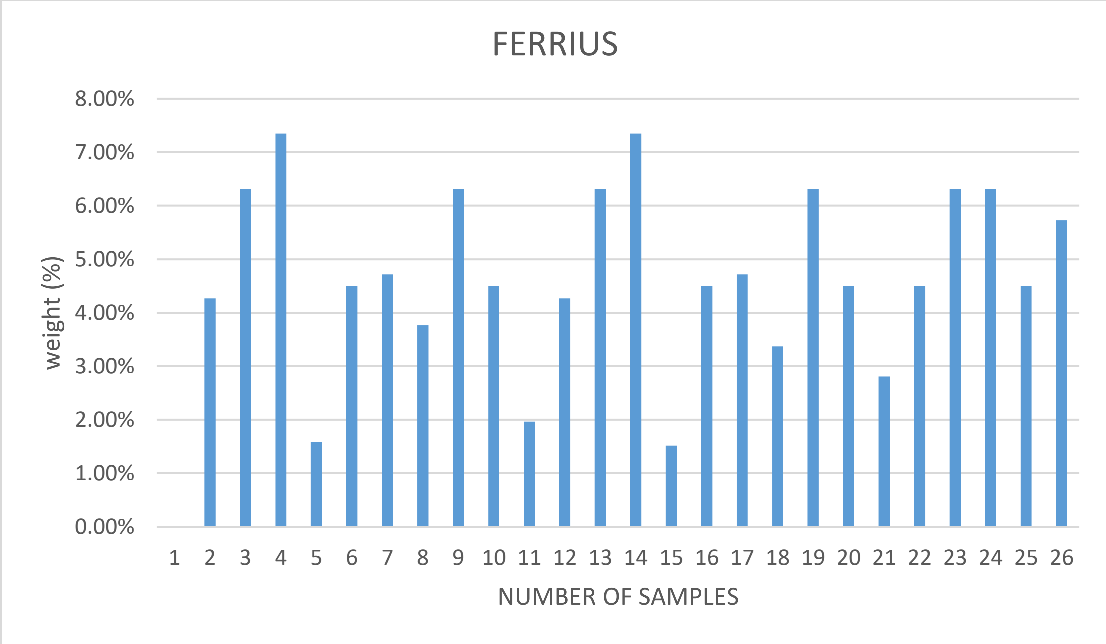

Figure 4. 10:Ferrous Waste of 26 Samples

4.10 Glasses:

Glass was found in a significant amount. Glass is a sensitive material as it can break with a little pressure, but some types of glass are very strong and can withstand a considerable amount of pressure. Glass waste is typically generated from broken windows, glass bottles, or other glass objects. It may have sharp edges and poses a safety risk if not handled carefully. Sometimes, glass waste can be contaminated with other materials, such as plastic, paper, or organic waste. This contamination can occur when glass items are improperly discarded or not sorted correctly.

In figure 4.11, is showing the comparison of glass waste among the all 26 samples. As it is practically observed from the bar charts there is fluctuation in the waste this is because of the different collecting truck which is collecting from all types of residential units and commercial areas and the sample was collected from the trucks directly

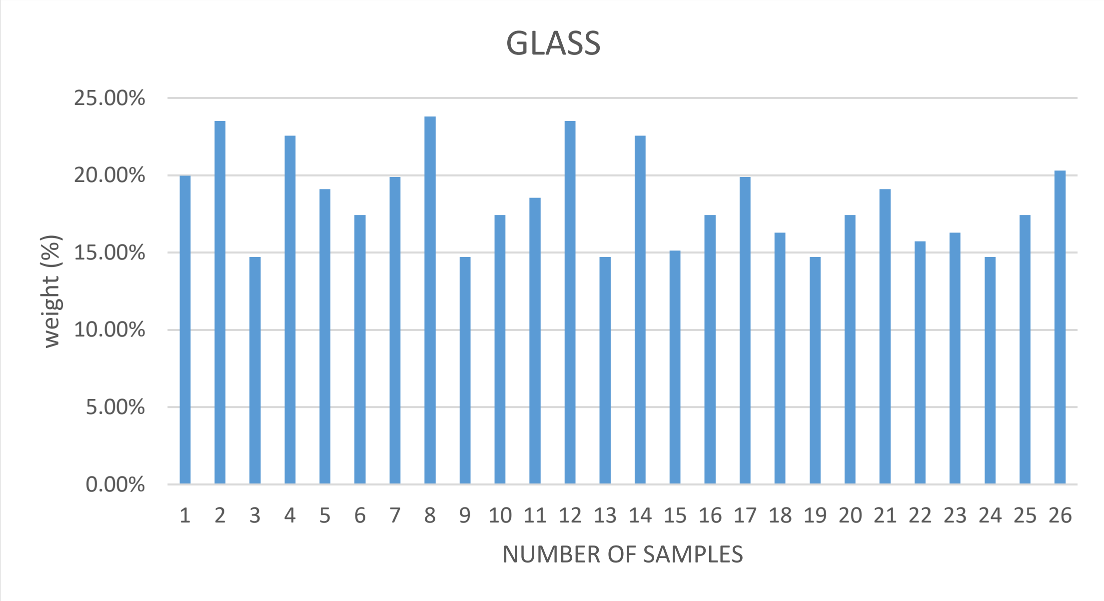

Figure 4. 11: Glass Waste of 26 Samples

4.11 Aluminum:

Aluminum is present on a waste dumping site. It is usually in the form of aluminum waste or scrap. Aluminum waste can come from various sources and may have different conditions on-site. Some common forms of aluminum waste found in waste aluminum cans, aluminum packaging: aluminum household items, aluminum construction materials. Condition of aluminum on a waste site can vary depending on various factors such as the type of waste site, the source of the aluminum waste, and the handling and disposal practices in place. Aluminum waste is mostly in good condition on site.

Figure 4.12, is showing the Aluminum of glass waste among the all 26 samples. As it is practically observed from the bar charts there is fluctuation in the waste this is because of the different collecting truck which is collecting from all types of residential units and commercial areas and the sample was collected from the trucks directly.

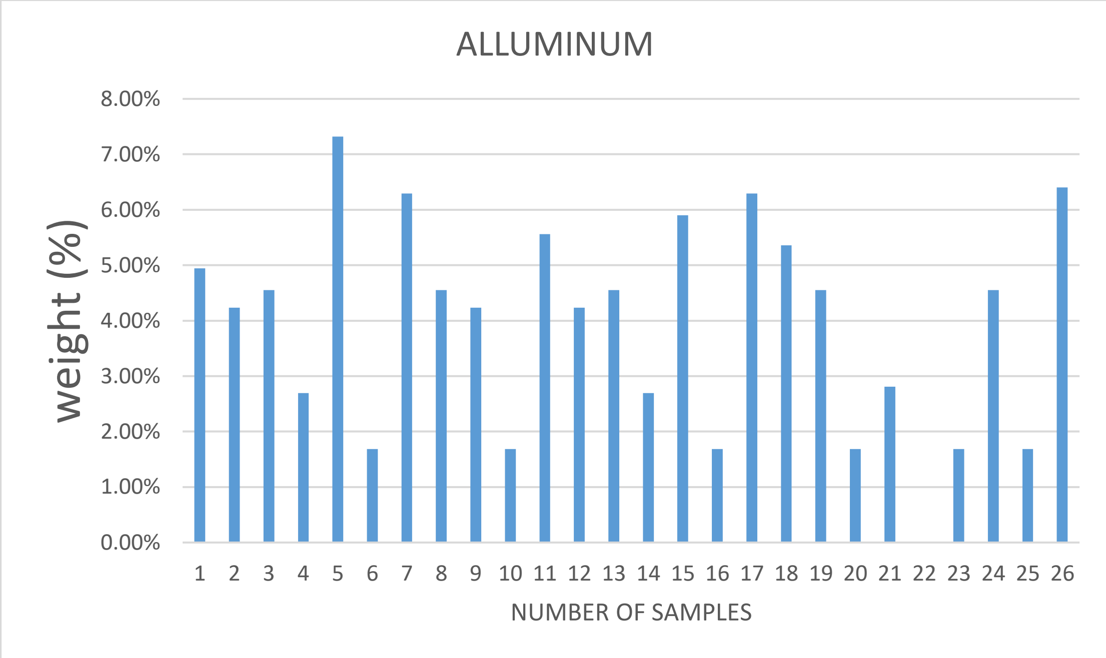

Figure 4. 12: Aluminum Waste of 26 Samples

4.12 Pamper waste:

The most challenging waste to handle is diaper waste. It is mainly found on our site because it replaces a significant portion of household waste. Diaper waste primarily consists of used diapers that have been soiled with urine and feces. These diapers are typically discarded after being worn by infants, toddlers, or individuals with incontinence issues. Diaper waste can emit strong and unpleasant odors, especially when it accumulates in bulk or is exposed to warm temperatures. Diaper waste is considered contaminated due to the presence of bodily fluids, including urine and feces. Diaper waste can be heavy and bulky, particularly when it accumulates in large quantities.

Figure 4.13, is showing the comparison of pamper waste among the all 26 samples. As it is practically observed from the bar charts there is fluctuation in the waste this is because of the different collecting truck which is collecting from all types of residential units and commercial areas and the sample was collected from the trucks directly, in case of pampers it is 95% from the residential areas rarely it is from the commercial areas.

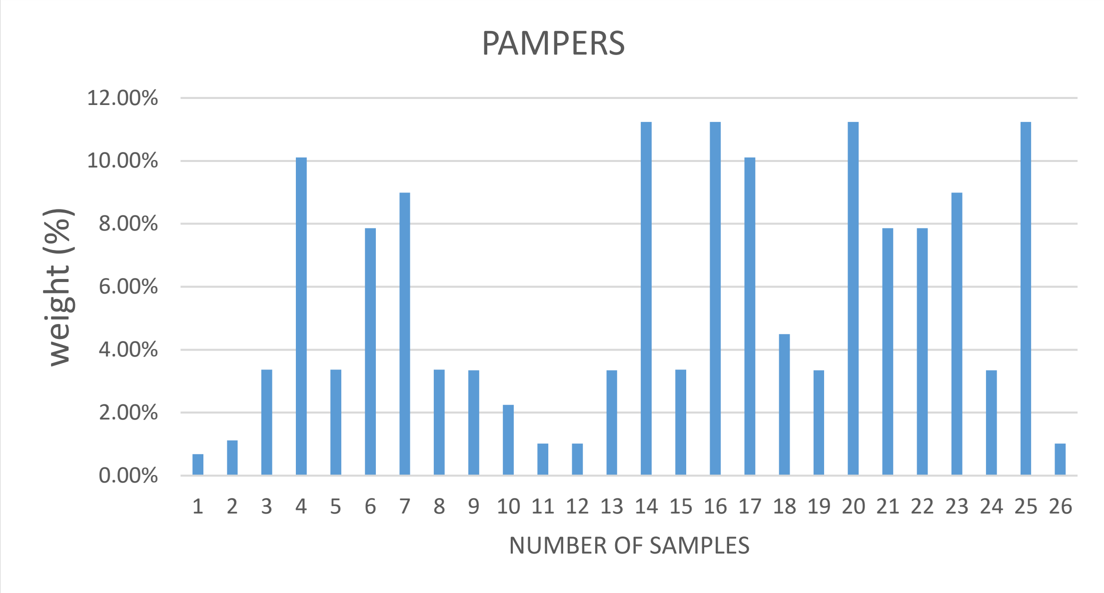

Figure 4. 13: Pamper Waste of 26 Samples

4.13 Possible utilization:

The waste obtained from 26 samples has some major categories and it is proposed that they can be used very effectively, for having a healthy and cleaned environment.

4.14 Paper waste:

Paper waste can be recycled and re purposed for various applications. Shredded paper can be used as insulation material in walls, attics, or roofs, while corrugated cardboard waste can be transformed into form-work for casting concrete structures. Additionally, paper waste can be processed into recycled paper products like cardboard sheets, packaging materials, or building boards. The extracted cellulose from paper waste can be utilized as a binder or reinforcement in construction materials such as particleboard or fiberboard. Moreover, paper waste can be recycled to produce new paper products like packaging materials, stationery, or newspapers. In industries such as power generation or biofuel production, paper waste can serve as a biomass feedstock for energy production.

4.15 Organic waste:

Organic waste generated in construction can be managed through composting or other methods. Wood scraps, plant trimmings, and other organic waste can be composted to produce nutrient-rich soil amendments used in landscaping or gardening. Additionally, organic materials can be utilized for erosion control measures such as mulching or revegetation. Furthermore, organic waste finds utilization in various other industries. It can be converted into organic fertilizers or soil amendments used in farming and agriculture. Moreover, the biomass derived from organic waste can serve as a valuable feedstock for biogas production or as a renewable energy source.

4.16 Plastic waste:

Plastic waste has utilization possibilities in various sectors. For instance, plastic waste, including bottles or packaging materials, can be processed into plastic lumber or composite materials used in decking, fencing, or other construction applications. Certain types of plastic waste, such as expanded polystyrene (EPS) or polyurethane foam, can be utilized as insulation materials in buildings. Additionally, plastic waste can be recycled and transformed into new plastic products, thereby reducing the reliance on virgin materials. It can also be repurposed into new packaging materials for various products. The utilization of plastic waste presents opportunities for resource conservation and waste reduction across multiple industries.

4.17 Corrugated waste:

Corrugated waste can find utilization in the construction sector. Corrugated cardboard can serve as temporary floor or surface protection during construction, effectively preventing damage. Furthermore, corrugated sheets or boxes can be reused for packaging construction materials or for transporting fragile items, promoting sustainability and resource conservation. Additionally, corrugated waste holds potential for utilization in other industries. It can be repurposed for creative projects, such as crafting sculptures or models. Moreover, in the shipping and logistics industry, corrugated sheets or boxes can be reused for packaging and transportation purposes, contributing to efficient and eco-friendly practices. The versatile nature of corrugated waste allows for its beneficial utilization across various sectors.

4.18 Ferrous Waste:

Ferrous waste offers versatile utilization opportunities in the construction sector and beyond. In the construction industry, ferrous scrap metal can be recycled and effectively employed in the production of new steel or iron products, thereby reducing the demand for virgin materials. Moreover, scrap metal can be utilized as reinforcement in concrete structures or incorporated into steel frameworks, enhancing their strength and durability during construction projects. Additionally, ferrous waste holds utilization possibilities in other industries as well. It can be utilized as a raw material in various manufacturing processes like casting or forging, supporting efficient resource utilization. Furthermore, through the process of melting down, ferrous waste can be transformed into a valuable feedstock for the production of new automotive parts, promoting sustainability and circularity. The utilization of ferrous waste across different sectors showcases its significant contribution to resource conservation and the reduction of environmental impacts.

4.19 Glass waste:

Glass waste can be effectively utilized in the construction sector through diverse means. For instance, crushed glass can serve as an aggregate in concrete and asphalt mixtures, imparting both structural advantages and aesthetic appeal. Additionally, glass waste can be transformed into glass blocks or tiles, enabling their utilization for decorative purposes or for facilitating the transmission of natural light. Moreover, glass waste holds potential for utilization in other industries as well. It can be recycled and incorporated into the production of new glass products, contributing to resource conservation and minimizing the need for raw materials. Furthermore, glass waste can be re-purposed for artistic endeavors, finding applications in creative projects, and can be utilized in crafting unique glassware and decorative items. The versatility and adaptability of glass waste enable its valuable utilization in various sectors.

4.20 Aluminum waste:

Aluminum waste holds significant potential for utilization in the construction sector as well as other industries. In the construction industry, aluminum waste can be effectively recycled and utilized in the production of new aluminum products, effectively reducing the requirement for primary aluminum extraction while conserving energy resources. Furthermore, aluminum waste can be re-purposed for architectural elements, such as railings, doors, windows, or facade cladding, contributing to sustainable and aesthetically appealing construction practices. Additionally, aluminum waste showcases utilization possibilities across diverse industries. Through the process of melting down, aluminum waste can be transformed into a valuable feed stock for the production of new automotive parts, promoting resource efficiency and circularity. Moreover, aluminum scrap can serve as a valuable raw material in various manufacturing processes like casting or fabrication, fostering sustainable practices in the manufacturing sector. The versatile nature of aluminum waste enables its valuable utilization across multiple industries, promoting sustainable resource management and reducing environmental impact.

4.21 Pamper waste:

Pamper waste presents specific challenges when it comes to its utilization in the construction sector, primarily due to its unique composition. Currently, there are limited applications for re-purposing pamper waste within construction practices. However, in certain regions, ongoing efforts are being made to explore alternative uses for this waste stream. For example, advanced waste-to-energy technologies are being developed to convert waste diapers into valuable bio-fuel or energy through processes like gasification or pyrolysis. This innovative approach holds promise for effectively managing pamper waste while harnessing its energy potential. Furthermore, specific components of pamper waste, such as plastic or absorbent materials, can be recovered and recycled for alternative purposes, including plastic production or the manufacturing of absorbent products. While the utilization of pamper waste in the construction sector remains limited, advancements in waste-to-energy technologies and material recovery provide opportunities for responsible management and resource utilization in other industries.

CHAPTER 5

CONCLUSION & RECOMMENDATION

Waste Generation and its improper utilization is causing a real damage to the environment. Each day the pollution caused by these land wastes is creating severe problems for humans and other living organisms. Water Pollution due to waste is causing serious damage to Aquatic life. Improper waste disposal is causing a rapid increase in land filling. Pakistan is a country where no focus has been yet made to encounter these all-major issues related with human waste. It may be because we have no yet researched data that give the statistics to the types of waste generated. Hence To encounter the adverse effect of landfill on environment the project was adopted. By this we came to know how much waste have been generated and where we could possibly utilize that waste so that land filling and pollution caused by this human waste should be minimized on rapid basis.

The Bahria Town Phase 1-6 is an elite residential area. where almost 40 to 50 Tons of waste is generated daily. This waste is carried out via waste trucks and is dumped on the site which is located beside Bahria Paradise near Bridge of Bahria Phase 4. From there a contractor company takes out the useful waste like plastic, steel, wood, Glass and further waste is dumped on a site outside Islamabad.

The Project was performed at this Waste Site in Bahria, there were 26 Samples calculated according to the calculations via Standard ASTM D5231-92. Out of 5 Trucks these samples were taken randomly. Each truck came from each phase while for phase 5 and 6 Truck Number 5 take two tours. Almost 4 times each sample was taken from each truck. These samples were sorted out and waste were noted down on Tables via Excel sheets. These samples showed a little variation in the types of waste generated.

Overall Waste is divided into two Broader categories;

- Organic Waste
- In-organic Waste.

Overall, in all 26 samples 33.77 percent was Organic waste and 71.56 percent was in-organic waste. Further these wastes have been classified into 7 Major Categories which were experienced on site which are as follows;

1) Organic Waste
2) Plastic Waste
3) Paper Waste
4) Glass Waste
5) Pamper Waste
6) Ferrous Waste
7) Aluminum Waste
8) Corrugated

The most quantity waste that have been generated and sorted out is Organic waste which is around 33.78 %. The Second number is of Plastic which is most generated and it's around 26.27 %. The Third waste which is most generated is Paper which is 11.69 %. The Fourth most generated waste that have been found was Glass that was around 8.75 %. The fifth most generated waste was of Ferrous items which was around 6.67 %. After it comes Pampers on sixth place it was generated around 6.04 %.

The seventh most generated waste was Corrugated items which is around 2.11 %. The last eighth most generated waste was found out to be the Aluminum materials which was quantified around 1.82 %. This was the whole data calculated via sorting of 26 samples.

These waste materials can be utilized in various industries rather dumping this all waste and causing damage to the environment. By utilizing this waste in construction industry or any other industry our country will bring one step closer towards Environmental Sustainability.

5.1 Recommendation:

This research was based on providing a Base to further researches of the same category. In which more data would be found and comparing all the data we could calculate the total waste generated of each type and could utilize in any industry. There are following recommendations that could help out future researchers to endure research in more efficient way.

- As we have collected almost all of the data on the weekends, research should be performed to collect the same data on week days (From Monday to Friday) and thus we can see the variation of type of waste in this society.

- Bahria Town is an elite class area, hence our research was performed in an area where all of the Elite Class of Rawalpindi/Islamabad is living. A same type of research and data collection should be carried out in middle class and lower middle-class societies so we came to know which type of waste have been generated in those areas. By comparing the data, we could open a door to new sustainable future.
- Same type of research could be carried out in industrial area and note the variations in the type of waste. As of industrial zones the waste generated would be different from that of residential waste. It could include less organic waste and more industrial waste.
- Research could be carried out in commercial areas and follow the variation in the type of waste generated.
- For more precise work number of samples could be changed and increased to get more quantity of data with more precision.
- By combining this data and multiplying it with the number of societies we will came to know the total waste generated in Rawalpindi / Islamabad. By that data various outcomes could be predicted.
- By this data Bahria Town Management could work out on the possible utilization of these waste inside the Society and make Bahria Town a Environment Sustainable Society.

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ANNEXURES

Annexure A

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-11

SAJJAD KHAN NIAZI	BCE193074
MUHAMMAD HAIDER MEHMOOD	BCE193010
SYED TAHA HUSNAIN	BCE193042
SAMPLE NUMBER:	**1**
DATE:	MARCH-11TH 2023
TIME:	10:23:00 AM
TOTAL COLLECTED WEIGHT	91 KG

S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	7.81	0	7.81	8.77%
2	HIGH GRADE PAPER	1.76	0	1.76	1.98%
3	COMPUTER PRINTOUTS	1.64	0	1.64	1.84%
4	OTHER OFFICE PAPERS	2.25	0	2.25	2.53%
5	NEWSPAPERS	1.345	0	1.345	1.51%
6	CORRUGATED	3.7	0	3.7	4.16%
7	PLASTICS	4.5	0	4.5	5.06%
8	PET BOTTLES	3.45	0	3.45	3.88%
9	HDPE BOTTLES	1.555	0	1.555	1.75%
10	FILMS	1.8	0	1.8	2.02%
11	OTHER PLASTICS	5.555	0	5.555	6.24%
12	FOOD WASTE	26.678	0	26.678	29.97%
13	WOOD	0.876	0	0.876	0.98%
14	OTHER ORGANIC	3.3	0	3.3	3.71%
15	FERROUS	0	0	0	0.00%
16	CANS	0	0	0	0.00%
17	OTHER FERROUS	0	0	0	0.00%
18	ALLUMINUM	0	0	0	0.00%
19	CANS	2.7	0	2.7	3.03%
20	FOILS	1.7	0	1.7	1.91%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	3.8	0	3.8	4.27%
23	CLEAR	0.76	0	0.76	0.85%
24	COLORED	3.1	0	3.1	3.48%
26	OTHER ORGANICS	7.8	0	7.8	8.76%
27	FIBERS	2.315	0	2.315	2.60%
28	PAMPERS	0.61	0	0.61	0.69%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	89.004		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-11

SAJJAD KHAN NIAZI	BCE193074
MUHAMMAD HAIDER MEHMOOD	BCE193010
SYED TAHA HUSNAIN	BCE193042
SAMPLE NUMBER:	**2**
DATE:	MARCH-11TH 2023
TIME:	2:12:00 PM
TOTAL COLLECTED WEIGHT	181 KG

S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	7.45	0	7.45	8.37%
2	HIGH GRADE PAPER	0.34	0	0.34	0.38%
3	COMPUTER PRINTOUTS	0.45	0	0.45	0.51%
4	OTHER OFFICE PAPERS	0.67	0	0.67	0.75%
5	NEWSPAPERS	1.2	0	1.2	1.35%
6	CORRUGATED	1.9	0	1.9	2.13%
7	PLASTICS	8.9	0	8.9	10.00%
8	PET BOTTLES	5.4	0	5.4	6.07%
9	HDPE BOTTLES	2.78	0	2.78	3.12%
10	FILMS	2.11	0	2.11	2.37%
11	OTHER PLASTICS	6.26	0	6.26	7.03%
12	FOOD WASTE	15.87	0	15.87	17.83%
13	WOOD	0.78	0	0.78	0.88%
14	OTHER ORGANIC	5.2	0	5.2	5.84%
15	FERROUS	3.4	0	3.4	3.82%
16	CANS	0	0	0	0.00%
17	OTHER FERROUS	0.4	0	0.4	0.45%
18	ALLUMINUM	0	0	0	0.00%
19	CANS	3.1	0	3.1	3.48%
20	FOILS	0.67	0	0.67	0.75%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	5.45	0	5.45	6.12%
23	CLEAR	1.345	0	1.345	1.51%
24	COLORED	1.45	0	1.45	1.63%
26	OTHER ORGANICS	8.9	0	8.9	10.00%
27	FIBERS	3.78	0	3.78	4.25%
28	PAMPERS	1	0	1	1.12%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	88.805		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-12

SAJJAD KHAN NIAZI	BCE193074
MUHAMMAD HAIDER MEHMOOD	BCE193010
SYED TAHA HUSNAIN	BCE193042
SAMPLE NUMBER:	**3**
DATE:	MARCH-12TH 2023
TIME:	11:04:00 AM
TOTAL COLLECTED WEIGHT	271 KG

S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	7.65	0	7.65	8.61%
2	HIGH GRADE PAPER	0.29	0	0.29	0.33%
3	COMPUTER PRINTOUTS	0.65	0	0.65	0.73%
4	OTHER OFFICE PAPERS	0.69	0	0.69	0.78%
5	NEWSPAPERS	2	0	2	2.25%
6	CORRUGATED	0.78	0	0.78	0.88%
7	PLASTICS	10.75	0	10.75	12.11%
8	PET BOTTLES	6.1	0	6.1	6.87%
9	HDPE BOTTLES	3.1	0	3.1	3.49%
10	FILMS	1.7	0	1.7	1.91%
11	OTHER PLASTICS	7.09	0	7.09	7.98%
12	FOOD WASTE	15.87	0	15.87	17.87%
13	WOOD	0.56	0	0.56	0.63%
14	OTHER ORGANIC	5.8	0	5.8	6.53%
15	FERROUS	2.1	0	2.1	2.36%
16	CANS	3.12	0	3.12	3.51%
17	OTHER FERROUS	0.4	0	0.4	0.45%
18	ALLUMINUM	0.25	0	0.25	0.28%
19	CANS	2.9	0	2.9	3.27%
20	FOILS	0.9	0	0.9	1.01%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	7	0	7	7.88%
23	CLEAR	0.5	0	0.5	0.56%
24	COLORED	0.2	0	0.2	0.23%
26	OTHER ORGANICS	3.5	0	3.5	3.94%
27	FIBERS	1.9	0	1.9	2.14%
28	PAMPERS	3	0	3	3.38%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	88.8		

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-13

SAJJAD KHAN NIAZI	BCE193074
MUHAMMAD HAIDER MEHMOOD	BCE193010
SYED TAHA HUSNAIN	BCE193042
SAMPLE NUMBER:	**4**
DATE:	MARCH-18TH 2023
TIME:	11:13:00 PM
TOTAL COLLECTED WEIGHT	361 KG

S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	8	0	8	9.01%
2	HIGH GRADE PAPER	0	0	0	0.00%
3	COMPUTER PRINTOUTS	0	0	0	0.00%
4	OTHER OFFICE PAPERS	0	0	0	0.00%
5	NEWSPAPERS	2	0	2	2.25%
6	CORRUGATED	1.2	0	1.2	1.35%
7	PLASTICS	6	0	6	6.76%
8	PET BOTTLES	0	0	0	0.00%
9	HDPE BOTTLES	0	0	0	0.00%
10	FILMS	1.9	0	1.9	2.14%
11	OTHER PLASTICS	6.87	0	6.87	7.74%
12	FOOD WASTE	13	0	13	14.64%
13	WOOD	1.45	0	1.45	1.63%
14	OTHER ORGANIC	8	0	8	9.01%
15	FERROUS	2.54	0	2.54	2.86%
16	CANS	4	0	4	4.50%
17	OTHER FERROUS	0	0	0	0.00%
18	ALLUMINUM	0	0	0	0.00%
19	CANS	2	0	2	2.25%
20	FOILS	0.4	0	0.4	0.45%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	8	0	8	9.01%
23	CLEAR	0.42	0	0.42	0.47%
24	COLORED	0.65	0	0.65	0.73%
26	OTHER ORGANICS	8.9	0	8.9	10.02%
27	FIBERS	2.1	0	2.1	2.36%
28	PAMPERS	9	0	9	10.14%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	86.43		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-14

SAJJAD KHAN NIAZI	BCE193074
MUHAMMAD HAIDER MEHMOOD	BCE193010
SYED TAHA HUSNAIN	BCE193042
SAMPLE NUMBER:	**5**
DATE:	MARCH-19TH 2023
TIME:	10:44:00 AM
TOTAL COLLECTED WEIGHT	451 KG

S.NO	COMPONENT	WEIGHT GROSS	TARE	TOTAL	PERCENT OF TOTAL
1	MIXED PAPER	4.35	0	4.35	4.88%
2	HIGH GRADE PAPER	2.76	0	2.76	3.10%
3	COMPUTER PRINTOUTS	2.32	0	2.32	2.60%
4	OTHER OFFICE PAPERS	1.87	0	1.87	2.10%
5	NEWSPAPERS	1.789	0	1.789	2.01%
6	CORRUGATED	3	0	3	3.37%
7	PLASTICS	2.98	0	2.98	3.34%
8	PET BOTTLES	3.56	0	3.56	4.00%
9	HDPE BOTTLES	2.35	0	2.35	2.64%
10	FILMS	2.5	0	2.5	2.81%
11	OTHER PLASTICS	5	0	5	5.61%
12	FOOD WASTE	23	0	23	25.81%
13	WOOD	1.5	0	1.5	1.68%
14	OTHER ORGANIC	4.2	0	4.2	4.71%
15	FERROUS	0.65	0	0.65	0.73%
16	CANS	0.76	0	0.76	0.85%
17	OTHER FERROUS	0	0	0	0.00%
18	ALLUMINUM	0.227	0	0.227	0.25%
19	CANS	3.79	0	3.79	4.25%
20	FOILS	2	0	2	2.24%
21	OTHER ALLUMINUM	0.5	0	0.5	0.56%
22	GLASS	4	0	4	4.49%
23	CLEAR	1	0	1	1.12%
24	COLORED	2.5	0	2.5	2.81%
26	OTHER ORGANICS	7.5	0	7.5	8.42%
27	FIBERS	2	0	2	2.24%
28	PAMPERS	3	0	3	3.37%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	89.106		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-15

SAJJAD KHAN NIAZI	BCE193074
MUHAMMAD HAIDER MEHMOOD	BCE193010
SYED TAHA HUSNAIN	BCE193042
SAMPLE NUMBER:	**6**
DATE:	MARCH-19TH 2023
TIME:	2:30:00 PM
TOTAL COLLECTED WEIGHT	541 KG

S.NO	COMPONENT	WEIGHT GROSS	TARE	TOTAL	PERCENT OF TOTAL
1	MIXED PAPER	6.34		6.34	7.12%
2	HIGH GRADE PAPER	0		0	0.00%
3	COMPUTER PRINTOUTS	1		1	1.12%
4	OTHER OFFICE PAPERS	0		0	0.00%
5	NEWSPAPERS	1.5		1.5	1.68%
6	CORRUGATED	2		2	2.24%
7	PLASTICS	14		14	15.71%
8	PET BOTTLES	3		3	3.37%
9	HDPE BOTTLES	0		0	0.00%
10	FILMS	0		0	0.00%
11	OTHER PLASTICS	10		10	11.22%
12	FOOD WASTE	14		14	15.71%
13	WOOD	0.5		0.5	0.56%
14	OTHER ORGANIC	6		6	6.73%
15	FERROUS	1.5		1.5	1.68%
16	CANS	2.5		2.5	2.81%
17	OTHER FERROUS	0		0	0.00%
18	ALLUMINUM	0		0	0.00%
19	CANS	0		0	0.00%
20	FOILS	1.5		1.5	1.68%
21	OTHER ALLUMINUM	0		0	0.00%
22	GLASS	7		7	7.86%
23	CLEAR			0	0.00%
24	COLORED	0.5		0.5	0.56%
26	OTHER ORGANICS	8		8	8.98%
27	FIBERS	0		0	0.00%
28	PAMPERS	7		7	7.86%
29	OTHERS			0	0.00%
30	OTHERS			0	0.00%
31	OTHERS			0	0.00%
32	OTHERS			0	0.00%
33	OTHERS			0	0.00%
34	OTHERS			0	0.00%
		TOTAL	86.34		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMABAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-16

SAJJAD KHAN NIAZI			BCE193074		
MUHAMMAD HAIDER MEHMOOD			BCE193010		
SYED TAHA HUSNAIN			BCE193042		
SAMPLE NUMBER:			**7**		
DATE:			MAY-06TH 2023		
TIME:			11:34:00 AM		
TOTAL COLLECTED WEIGHT			631 KG		
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	4	0	4	4.60%
2	HIGH GRADE PAPER	0.5	0	0.5	0.58%
3	COMPUTER PRINTOUTS	0.5	0	0.5	0.58%
4	OTHER OFFICE PAPERS	0.5	0	0.5	0.58%
5	NEWSPAPERS	2	0	2	2.30%
6	CORRUGATED	0.9	0	0.9	1.04%
7	PLASTICS	11	0	11	12.66%
8	PET BOTTLES	2	0	2	2.30%
9	HDPE BOTTLES	0	0	0	0.00%
10	FILMS	1	0	1	1.15%
11	OTHER PLASTICS	5.5	0	5.5	6.33%
12	FOOD WASTE	15	0	15	17.26%
13	WOOD	2.5	0	2.5	2.88%
14	OTHER ORGANIC	6	0	6	6.90%
15	FERROUS	2.5	0	2.5	2.88%
16	CANS	1.7	0	1.7	1.96%
17	OTHER FERROUS	0	0	0	0.00%
18	ALLUMINUM	3	0	3	3.45%
19	CANS	1.9	0	1.9	2.19%
20	FOILS	0.7	0	0.7	0.81%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	4	0	4	4.60%
23	CLEAR	1.2	0	1.2	1.38%
24	COLORED	1.5	0	1.5	1.73%
26	OTHER ORGANICS	11	0	11	12.66%
27	FIBERS	0	0	0	0.00%
28	PAMPERS	8	0	8	9.21%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	86.9		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMABAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-17

SAJJAD KHAN NIAZI			BCE193074		
MUHAMMAD HAIDER MEHMOOD			BCE193010		
SYED TAHA HUSNAIN			BCE193042		
SAMPLE NUMBER:			**8**		
DATE:			MAY-06TH 2023		
TIME:			2:10:00 PM		
TOTAL COLLECTED WEIGHT			721 KG		
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	6	0	6	6.90%
2	HIGH GRADE PAPER	0.5	0	0.5	0.58%
3	COMPUTER PRINTOUTS	1	0	1	1.15%
4	OTHER OFFICE PAPERS	0.5	0	0.5	0.58%
5	NEWSPAPERS	2	0	2	2.30%
6	CORRUGATED	2	0	2	2.30%
7	PLASTICS	7	0	7	8.06%
8	PET BOTTLES	3	0	3	3.45%
9	HDPE BOTTLES	2	0	2	2.30%
10	FILMS	1.5	0	1.5	1.73%
11	OTHER PLASTICS	5	0	5	5.75%
12	FOOD WASTE	20	0	20	23.01%
13	WOOD	0.5	0	0.5	0.58%
14	OTHER ORGANIC	5	0	5	5.75%
15	FERROUS	2.5	0	2.5	2.88%
16	CANS	0.45	0	0.45	0.52%
17	OTHER FERROUS	0.4	0	0.4	0.46%
18	ALLUMINUM	0.5	0	0.5	0.58%
19	CANS	2	0	2	2.30%
20	FOILS	0.67	0	0.67	0.77%
21	OTHER ALLUMINUM	0.6	0	0.6	0.69%
22	GLASS	5	0	5	5.75%
23	CLEAR	2	0	2	2.30%
24	COLORED	1.5	0	1.5	1.73%
26	OTHER ORGANICS	8.9	0	8.9	10.24%
27	FIBERS	3.78	0	3.78	4.35%
28	PAMPERS	3	0	3	3.45%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	87.3		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-18

SAJJAD KHAN NIAZI	BCE193074
MUHAMMAD HAIDER MEHMOOD	BCE193010
SYED TAHA HUSNAIN	BCE193042
SAMPLE NUMBER:	**9**
DATE:	MAY-07TH 2023
TIME:	10:05:00 AM
TOTAL COLLECTED WEIGHT	811 KG

S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	7.65	0	7.65	8.62%
2	HIGH GRADE PAPER	0.29	0	0.29	0.33%
3	COMPUTER PRINTOUTS	0.65	0	0.65	0.73%
4	OTHER OFFICE PAPERS	0.69	0	0.69	0.78%
5	NEWSPAPERS	2	0	2	2.25%
6	CORRUGATED	0.78	0	0.78	0.88%
7	PLASTICS	10.75	0	10.75	12.11%
8	PET BOTTLES	6.1	0	6.1	6.87%
9	HDPE BOTTLES	3.1	0	3.1	3.49%
10	FILMS	1.7	0	1.7	1.91%
11	OTHER PLASTICS	7.09	0	7.09	7.99%
12	FOOD WASTE	15.87	0	15.87	17.88%
13	WOOD	0.56	0	0.56	0.63%
14	OTHER ORGANIC	5.8	0	5.8	6.53%
15	FERROUS	2.1	0	2.1	2.37%
16	CANS	3.12	0	3.12	3.51%
17	OTHER FERROUS	0.4	0	0.4	0.45%
18	ALLUMINUM	0.25	0	0.25	0.28%
19	CANS	2.9	0	2.9	3.27%
20	FOILS	0.9	0	0.9	1.01%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	7	0	7	7.88%
23	CLEAR	0.5	0	0.5	0.56%
24	COLORED	0.2	0	0.2	0.23%
26	OTHER ORGANICS	3.5	0	3.5	3.94%
27	FIBERS	1.9	0	1.9	2.14%
28	PAMPERS	2.98	0	2.98	3.36%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	88.78		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-19

SAJJAD KHAN NIAZI	BCE193074
MUHAMMAD HAIDER MEHMOOD	BCE193010
SYED TAHA HUSNAIN	BCE193042
SAMPLE NUMBER:	**10**
DATE:	MAY-07TH 2023
TIME:	2:00:00 PM
TOTAL COLLECTED WEIGHT	900 KG

S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	6.34	0	6.34	7.14%
2	HIGH GRADE PAPER	0	0	0	0.00%
3	COMPUTER PRINTOUTS	1	0	1	1.13%
4	OTHER OFFICE PAPERS	0	0	0	0.00%
5	NEWSPAPERS	1.5	0	1.5	1.69%
6	CORRUGATED	2	0	2	2.25%
7	PLASTICS	14	0	14	15.77%
8	PET BOTTLES	3	0	3	3.38%
9	HDPE BOTTLES	0	0	0	0.00%
10	FILMS	0	0	0	0.00%
11	OTHER PLASTICS	10	0	10	11.26%
12	FOOD WASTE	14	0	14	15.77%
13	WOOD	0.5	0	0.5	0.56%
14	OTHER ORGANIC	6	0	6	6.76%
15	FERROUS	1.5	0	1.5	1.69%
16	CANS	2.5	0	2.5	2.82%
17	OTHER FERROUS	0	0	0	0.00%
18	ALLUMINUM	0	0	0	0.00%
19	CANS	0	0	0	0.00%
20	FOILS	1.5	0	1.5	1.69%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	7	0	7	7.88%
23	CLEAR		0	0	0.00%
24	COLORED	0.5	0	0.5	0.56%
26	OTHER ORGANICS	8	0	8	9.01%
27	FIBERS	0	0	0	0.00%
28	PAMPERS	10	0	10	11.26%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	89.34		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-11

SAJJAD KHAN NIAZI			BCE193074		
MUHAMMAD HAIDER MEHMOOD			BCE193010		
SYED TAHA HUSNAIN			BCE193042		
SAMPLE NUMBER:			**11**		
DATE:			MAY-13TH 2023		
TIME:			12:14:00 AM		
TOTAL COLLECTED WEIGHT			990		
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	6.25	0	6.25	7.09%
2	HIGH GRADE PAPER	2	0	2	2.27%
3	COMPUTER PRINTOUTS	1	0	1	1.13%
4	OTHER OFFICE PAPERS	1.75	0	1.75	1.98%
5	NEWSPAPERS	2	0	2	2.27%
6	CORRUGATED	2.5	0	2.5	2.83%
7	PLASTICS	5	0	5	5.67%
8	PET BOTTLES	3	0	3	3.40%
9	HDPE BOTTLES	2	0	2	2.27%
10	FILMS	1.5	0	1.5	1.70%
11	OTHER PLASTICS	6	0	6	6.80%
12	FOOD WASTE	25.5	0	25.5	28.91%
13	WOOD	0.5	0	0.5	0.57%
14	OTHER ORGANIC	4	0	4	4.54%
15	FERROUS	0	0	0	0.00%
16	CANS	0.75	0	0.75	0.85%
17	OTHER FERROUS	1	0	1	1.13%
18	ALLUMINUM	1.25	0	1.25	1.42%
19	CANS	2	0	2	2.27%
20	FOILS	1.7	0	1.7	1.93%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	3	0	3	3.40%
23	CLEAR	1	0	1	1.13%
24	COLORED	2.5	0	2.5	2.83%
26	OTHER ORGANICS	7	0	7	7.94%
27	FIBERS	3	0	3	3.40%
28	PAMPERS	2	0	2	2.27%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	88.2		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-11

SAJJAD KHAN NIAZI			BCE193074		
MUHAMMAD HAIDER MEHMOOD			BCE193010		
SYED TAHA HUSNAIN			BCE193042		
SAMPLE NUMBER:			**12**		
DATE:			MAY-14TH 2023		
TIME:			10:28:00 PM		
TOTAL COLLECTED WEIGHT			1080		
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	7.45	0	7.45	8.45%
2	HIGH GRADE PAPER	0.34	0	0.34	0.39%
3	COMPUTER PRINTOUTS	0.45	0	0.45	0.51%
4	OTHER OFFICE PAPERS	0.67	0	0.67	0.76%
5	NEWSPAPERS	1.2	0	1.2	1.36%
6	CORRUGATED	1.9	0	1.9	2.15%
7	PLASTICS	8.9	0	8.9	10.09%
8	PET BOTTLES	5.4	0	5.4	6.12%
9	HDPE BOTTLES	2.78	0	2.78	3.15%
10	FILMS	2.11	0	2.11	2.39%
11	OTHER PLASTICS	6.26	0	6.26	7.10%
12	FOOD WASTE	15.87	0	15.87	17.99%
13	WOOD	0.78	0	0.78	0.88%
14	OTHER ORGANIC	5.2	0	5.2	5.90%
15	FERROUS	3.4	0	3.4	3.85%
16	CANS	0	0	0	0.00%
17	OTHER FERROUS	0.4	0	0.4	0.45%
18	ALLUMINUM	0	0	0	0.00%
19	CANS	3.1	0	3.1	3.51%
20	FOILS	0.67	0	0.67	0.76%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	5.45	0	5.45	6.18%
23	CLEAR	1.345	0	1.345	1.52%
24	COLORED	1.45	0	1.45	1.64%
26	OTHER ORGANICS	8.9	0	8.9	10.09%
27	FIBERS	3.78	0	3.78	4.29%
28	PAMPERS	0.91	0	0.91	1.03%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	88.715		

NOTE:

WASTE COMPOSITION DATA SHEET					
	CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD DEPARTMENT OF CIVIL ENGINEERING DESIGN PROJECT-II ENVIRONMENTAL ENGINEERING DOMAIN				
	GROUP-12				
SAJJAD KHAN NIAZI			BCE193074		
MUHAMMAD HAIDER MEHMOOD			BCE193010		
SYED TAHA HUSNAIN			BCE193042		
SAMPLE NUMBER:			**13**		
DATE:			#REF!		
TIME:			3:00:00 AM		
TOTAL COLLECTED WEIGHT			#REF!		
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	7.65	0	7.65	8.62%
2	HIGH GRADE PAPER	0.29	0	0.29	0.33%
3	COMPUTER PRINTOUTS	0.65	0	0.65	0.73%
4	OTHER OFFICE PAPERS	0.69	0	0.69	0.78%
5	NEWSPAPERS	2	0	2	2.25%
6	CORRUGATED	0.78	0	0.78	0.88%
7	PLASTICS	10.75	0	10.75	12.11%
8	PET BOTTLES	6.1	0	6.1	6.87%
9	HDPE BOTTLES	3.1	0	3.1	3.49%
10	FILMS	1.7	0	1.7	1.91%
11	OTHER PLASTICS	7.09	0	7.09	7.99%
12	FOOD WASTE	15.87	0	15.87	17.88%
13	WOOD	0.56	0	0.56	0.63%
14	OTHER ORGANIC	5.8	0	5.8	6.53%
15	FERROUS	2.1	0	2.1	2.37%
16	CANS	3.12	0	3.12	3.51%
17	OTHER FERROUS	0.4	0	0.4	0.45%
18	ALLUMINUM	0.25	0	0.25	0.28%
19	CANS	2.9	0	2.9	3.27%
20	FOILS	0.9	0	0.9	1.01%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	7	0	7	7.88%
23	CLEAR	0.5	0	0.5	0.56%
24	COLORED	0.2	0	0.2	0.23%
26	OTHER ORGANICS	3.5	0	3.5	3.94%
27	FIBERS	1.9	0	1.9	2.14%
28	PAMPERS	2.98	0	2.98	3.36%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	88.78		

WASTE COMPOSITION DATA SHEET					
	CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD DEPARTMENT OF CIVIL ENGINEERING DESIGN PROJECT-II ENVIRONMENTAL ENGINEERING DOMAIN				
	GROUP-13				
SAJJAD KHAN NIAZI			BCE193074		
MUHAMMAD HAIDER MEHMOOD			BCE193010		
SYED TAHA HUSNAIN			BCE193042		
SAMPLE NUMBER:			**14**		
DATE:			MAY-19TH 2023		
TIME:			10:30:00 PM		
TOTAL COLLECTED WEIGHT			#REF!		
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	8	0	8	9.01%
2	HIGH GRADE PAPER	0	0	0	0.00%
3	COMPUTER PRINTOUTS	0	0	0	0.00%
4	OTHER OFFICE PAPERS	0	0	0	0.00%
5	NEWSPAPERS	2	0	2	2.25%
6	CORRUGATED	1.2	0	1.2	1.35%
7	PLASTICS	6	0	6	6.76%
8	PET BOTTLES	0	0	0	0.00%
9	HDPE BOTTLES	0	0	0	0.00%
10	FILMS	1.9	0	1.9	2.14%
11	OTHER PLASTICS	6.87	0	6.87	7.74%
12	FOOD WASTE	13	0	13	14.64%
13	WOOD	1.45	0	1.45	1.63%
14	OTHER ORGANIC	8	0	8	9.01%
15	FERROUS	2.54	0	2.54	2.86%
16	CANS	4	0	4	4.51%
17	OTHER FERROUS	0	0	0	0.00%
18	ALLUMINUM	0	0	0	0.00%
19	CANS	2	0	2	2.25%
20	FOILS	0.4	0	0.4	0.45%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	8	0	8	9.01%
23	CLEAR	0.42	0	0.42	0.47%
24	COLORED	0.65	0	0.65	0.73%
26	OTHER ORGANICS	8.9	0	8.9	10.02%
27	FIBERS	2.1	0	2.1	2.37%
28	PAMPERS	10	0	10	11.26%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	87.43		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-14

SAJJAD KHAN NIAZI			BCE193074		
MUHAMMAD HAIDER MEHMOOD			BCE193010		
SYED TAHA HUSNAIN			BCE193042		
SAMPLE NUMBER:			**15**		
DATE:			MAY-20TH 2023		
TIME:			11:40:00 AM		
TOTAL COLLECTED WEIGHT			#REF!		
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	5.9	0	5.9	6.73%
2	HIGH GRADE PAPER	3	0	3	3.42%
3	COMPUTER PRINTOUTS	2	0	2	2.28%
4	OTHER OFFICE PAPERS	2.65	0	2.65	3.02%
5	NEWSPAPERS	2.35	0	2.35	2.68%
6	CORRUGATED	3.18	0	3.18	3.63%
7	PLASTICS	3	0	3	3.42%
8	PET BOTTLES	4	0	4	4.56%
9	HDPE BOTTLES	1.75	0	1.75	2.00%
10	FILMS	1.75	0	1.75	2.00%
11	OTHER PLASTICS	5	0	5	5.71%
12	FOOD WASTE	26	0	26	29.67%
13	WOOD	1	0	1	1.14%
14	OTHER ORGANIC	3	0	3	3.42%
15	FERROUS	0	0	0	0.00%
16	CANS	0.85	0	0.85	0.97%
17	OTHER FERROUS	0.5	0	0.5	0.57%
18	ALLUMINUM	0.75	0	0.75	0.86%
19	CANS	3	0	3	3.42%
20	FOILS	1.5	0	1.5	1.71%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	4	0	4	4.56%
23	CLEAR	0.76	0	0.76	0.87%
24	COLORED	2.7	0	2.7	3.08%
26	OTHER ORGANICS	5	0	5	5.71%
27	FIBERS	1	0	1	1.14%
28	PAMPERS	3	0	3	3.42%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	87.64		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-15

SAJJAD KHAN NIAZI			BCE193074		
MUHAMMAD HAIDER MEHMOOD			BCE193010		
SYED TAHA HUSNAIN			BCE193042		
SAMPLE NUMBER:			**16**		
DATE:			MAY-21TH 2023		
TIME:			2:38:00 PM		
TOTAL COLLECTED WEIGHT			#REF!		
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	6.34	0	6.34	7.23%
2	HIGH GRADE PAPER	0	0	0	0.00%
3	COMPUTER PRINTOUTS	1	0	1	1.14%
4	OTHER OFFICE PAPERS	0	0	0	0.00%
5	NEWSPAPERS	1.5	0	1.5	1.71%
6	CORRUGATED	2	0	2	2.28%
7	PLASTICS	14	0	14	15.97%
8	PET BOTTLES	3	0	3	3.42%
9	HDPE BOTTLES	0	0	0	0.00%
10	FILMS	0	0	0	0.00%
11	OTHER PLASTICS	10	0	10	11.41%
12	FOOD WASTE	14	0	14	15.97%
13	WOOD	0.5	0	0.5	0.57%
14	OTHER ORGANIC	6	0	6	6.85%
15	FERROUS	1.5	0	1.5	1.71%
16	CANS	2.5	0	2.5	2.85%
17	OTHER FERROUS	0	0	0	0.00%
18	ALLUMINUM	0	0	0	0.00%
19	CANS	0	0	0	0.00%
20	FOILS	1.5	0	1.5	1.71%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	7	0	7	7.99%
23	CLEAR		0	0	0.00%
24	COLORED	0.5	0	0.5	0.57%
26	OTHER ORGANICS	8	0	8	9.13%
27	FIBERS	0	0	0	0.00%
28	PAMPERS	10	0	10	11.41%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	89.34		

NOTE:

WASTE COMPOSITION DATA SHEET						
	CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD **DEPARTMENT OF CIVIL ENGINEERING** **DESIGN PROJECT-II** **ENVIRONMENTAL ENGINEERING DOMAIN**					
	GROUP-16					
SAJJAD KHAN NIAZI			BCE193074			
MUHAMMAD HAIDER MEHMOOD			BCE193010			
SYED TAHA HUSNAIN			BCE193042			
SAMPLE NUMBER:			**17**			
DATE:			MAY-26TH 2023			
TIME:			10:30:00 AM			
TOTAL COLLECTED WEIGHT			#REF!			
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL	
		GROSS	TARE	TOTAL		
1	MIXED PAPER	4	0	4	4.55%	
2	HIGH GRADE PAPER	0.5	0	0.5	0.57%	
3	COMPUTER PRINTOUTS	0.5	0	0.5	0.57%	
4	OTHER OFFICE PAPERS	0.5	0	0.5	0.57%	
5	NEWSPAPERS	2	0	2	2.28%	
6	CORRUGATED	0.9	0	0.9	1.02%	
7	PLASTICS	11	0	11	12.51%	
8	PET BOTTLES	2	0	2	2.28%	
9	HDPE BOTTLES	0	0	0	0.00%	
10	FILMS	1	0	1	1.14%	
11	OTHER PLASTICS	5.5	0	5.5	6.26%	
12	FOOD WASTE	15	0	15	17.06%	
13	WOOD	2.5	0	2.5	2.84%	
14	OTHER ORGANIC	6	0	6	6.83%	
15	FERROUS	2.5	0	2.5	2.84%	
16	CANS	1.7	0	1.7	1.93%	
17	OTHER FERROUS	0	0	0	0.00%	
18	ALLUMINUM	3	0	3	3.41%	
19	CANS	1.9	0	1.9	2.16%	
20	FOILS	0.7	0	0.7	0.80%	
21	OTHER ALLUMINUM	0	0	0	0.00%	
22	GLASS	4	0	4	4.55%	
23	CLEAR	1.2	0	1.2	1.37%	
24	COLORED	1.5	0	1.5	1.71%	
26	OTHER ORGANICS	11	0	11	12.51%	
27	FIBERS	0	0	0	0.00%	
28	PAMPERS	9	0	9	10.24%	
29	OTHERS		0	0	0.00%	
30	OTHERS		0	0	0.00%	
31	OTHERS		0	0	0.00%	
32	OTHERS		0	0	0.00%	
33	OTHERS		0	0	0.00%	
34	OTHERS		0	0	0.00%	
		TOTAL	87.9			
NOTE:						

WASTE COMPOSITION DATA SHEET						
	CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD **DEPARTMENT OF CIVIL ENGINEERING** **DESIGN PROJECT-II** **ENVIRONMENTAL ENGINEERING DOMAIN**					
	GROUP-17					
SAJJAD KHAN NIAZI			BCE193074			
MUHAMMAD HAIDER MEHMOOD			BCE193010			
SYED TAHA HUSNAIN			BCE193042			
SAMPLE NUMBER:			**18**			
DATE:			MAY-28TH 2023			
TIME:			2:45:00 PM			
TOTAL COLLECTED WEIGHT			#REF!			
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL	
		GROSS	TARE	TOTAL		
1	MIXED PAPER	7	0	7	7.96%	
2	HIGH GRADE PAPER	0.75	0	0.75	0.85%	
3	COMPUTER PRINTOUTS	0.25	0	0.25	0.28%	
4	OTHER OFFICE PAPERS	0.6	0	0.6	0.68%	
5	NEWSPAPERS	1.7	0	1.7	1.93%	
6	CORRUGATED	2.2	0	2.2	2.50%	
7	PLASTICS	8	0	8	9.10%	
8	PET BOTTLES	4	0	4	4.55%	
9	HDPE BOTTLES	2.5	0	2.5	2.84%	
10	FILMS	2	0	2	2.28%	
11	OTHER PLASTICS	6	0	6	6.83%	
12	FOOD WASTE	19	0	19	21.62%	
13	WOOD	0.7	0	0.7	0.80%	
14	OTHER ORGANIC	4.5	0	4.5	5.12%	
15	FERROUS	3	0	3	3.41%	
16	CANS	0	0	0	0.00%	
17	OTHER FERROUS	0	0	0	0.00%	
18	ALLUMINUM	0.6	0	0.6	0.68%	
19	CANS	3	0	3	3.41%	
20	FOILS	0.67	0	0.67	0.76%	
21	OTHER ALLUMINUM	0.5	0	0.5	0.57%	
22	GLASS	6	0	6	6.83%	
23	CLEAR	1.5	0	1.5	1.71%	
24	COLORED	1.35	0	1.35	1.54%	
26	OTHER ORGANICS	5	0	5	5.69%	
27	FIBERS	0.65	0	0.65	0.74%	
28	PAMPERS	4	0	4	4.55%	
29	OTHERS		0	0	0.00%	
30	OTHERS		0	0	0.00%	
31	OTHERS		0	0	0.00%	
32	OTHERS		0	0	0.00%	
33	OTHERS		0	0	0.00%	
34	OTHERS		0	0	0.00%	
		TOTAL	85.47			
NOTE:						

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-18

SAJJAD KHAN NIAZI	BCE193074
MUHAMMAD HAIDER MEHMOOD	BCE193010
SYED TAHA HUSNAIN	BCE193042
SAMPLE NUMBER:	**19**
DATE:	JUNE-03TH 2023
TIME:	10:50:00 AM
TOTAL COLLECTED WEIGHT	#REF!

S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	7.65	0	7.65	8.62%
2	HIGH GRADE PAPER	0.29	0	0.29	0.33%
3	COMPUTER PRINTOUTS	0.65	0	0.65	0.73%
4	OTHER OFFICE PAPERS	0.69	0	0.69	0.78%
5	NEWSPAPERS	2	0	2	2.25%
6	CORRUGATED	0.78	0	0.78	0.88%
7	PLASTICS	10.75	0	10.75	12.11%
8	PET BOTTLES	6.1	0	6.1	6.87%
9	HDPE BOTTLES	3.1	0	3.1	3.49%
10	FILMS	1.7	0	1.7	1.91%
11	OTHER PLASTICS	7.09	0	7.09	7.99%
12	FOOD WASTE	15.87	0	15.87	17.88%
13	WOOD	0.56	0	0.56	0.63%
14	OTHER ORGANIC	5.8	0	5.8	6.53%
15	FERROUS	2.1	0	2.1	2.37%
16	CANS	3.12	0	3.12	3.51%
17	OTHER FERROUS	0.4	0	0.4	0.45%
18	ALLUMINUM	0.25	0	0.25	0.28%
19	CANS	2.9	0	2.9	3.27%
20	FOILS	0.9	0	0.9	1.01%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	7	0	7	7.88%
23	CLEAR	0.5	0	0.5	0.56%
24	COLORED	0.2	0	0.2	0.23%
26	OTHER ORGANICS	3.5	0	3.5	3.94%
27	FIBERS	1.9	0	1.9	2.14%
28	PAMPERS	2.98	0	2.98	3.36%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	88.78		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-19

SAJJAD KHAN NIAZI	BCE193074
MUHAMMAD HAIDER MEHMOOD	BCE193010
SYED TAHA HUSNAIN	BCE193042
SAMPLE NUMBER:	**20**
DATE:	JUNE-03TH 2023
TIME:	3:00:00 PM
TOTAL COLLECTED WEIGHT	#REF!

S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	6.34	0	6.34	7.14%
2	HIGH GRADE PAPER	0	0	0	0.00%
3	COMPUTER PRINTOUTS	1	0	1	1.13%
4	OTHER OFFICE PAPERS	0	0	0	0.00%
5	NEWSPAPERS	1.5	0	1.5	1.69%
6	CORRUGATED	2	0	2	2.25%
7	PLASTICS	14	0	14	15.77%
8	PET BOTTLES	3	0	3	3.38%
9	HDPE BOTTLES	0	0	0	0.00%
10	FILMS	0	0	0	0.00%
11	OTHER PLASTICS	10	0	10	11.26%
12	FOOD WASTE	14	0	14	15.77%
13	WOOD	0.5	0	0.5	0.56%
14	OTHER ORGANIC	6	0	6	6.76%
15	FERROUS	1.5	0	1.5	1.69%
16	CANS	2.5	0	2.5	2.82%
17	OTHER FERROUS	0	0	0	0.00%
18	ALLUMINUM	0	0	0	0.00%
19	CANS	0	0	0	0.00%
20	FOILS	1.5	0	1.5	1.69%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	7	0	7	7.88%
23	CLEAR		0	0	0.00%
24	COLORED	0.5	0	0.5	0.56%
26	OTHER ORGANICS	8	0	8	9.01%
27	FIBERS	0	0	0	0.00%
28	PAMPERS	10	0	10	11.26%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	89.34		

NOTE:

WASTE COMPOSITION DATA SHEET					
	CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD DEPARTMENT OF CIVIL ENGINEERING DESIGN PROJECT-II ENVIRONMENTAL ENGINEERING DOMAIN				
	GROUP-20				
SAJJAD KHAN NIAZI			BCE193074		
MUHAMMAD HAIDER MEHMOOD			BCE193010		
SYED TAHA HUSNAIN			BCE193042		
SAMPLE NUMBER:			**21**		
DATE:			JUNE-09TH 2023		
TIME:			10:18:00 AM		
TOTAL COLLECTED WEIGHT			#REF!		
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	5.78	0	5.78	6.66%
2	HIGH GRADE PAPER	0	0	0	0.00%
3	COMPUTER PRINTOUTS	1.5	0	1.5	1.73%
4	OTHER OFFICE PAPERS	0	0	0	0.00%
5	NEWSPAPERS	1	0	1	1.15%
6	CORRUGATED	1.5	0	1.5	1.73%
7	PLASTICS	12	0	12	13.83%
8	PET BOTTLES	2	0	2	2.30%
9	HDPE BOTTLES	0	0	0	0.00%
10	FILMS	0	0	0	0.00%
11	OTHER PLASTICS	8	0	8	9.22%
12	FOOD WASTE	16	0	16	18.44%
13	WOOD	2	0	2	2.30%
14	OTHER ORGANIC	8	0	8	9.22%
15	FERROUS	1.5	0	1.5	1.73%
16	CANS	1	0	1	1.15%
17	OTHER FERROUS	0	0	0	0.00%
18	ALLUMINUM	2	0	2	2.30%
19	CANS	0	0	0	0.00%
20	FOILS	0.5	0	0.5	0.58%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	9	0	9	10.37%
23	CLEAR		0	0	0.00%
24	COLORED	0	0	0	0.00%
26	OTHER ORGANICS	8	0	8	9.22%
27	FIBERS	0	0	0	0.00%
28	PAMPERS	7	0	7	8.07%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	86.78		
NOTE:					

WASTE COMPOSITION DATA SHEET					
	CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD DEPARTMENT OF CIVIL ENGINEERING DESIGN PROJECT-II ENVIRONMENTAL ENGINEERING DOMAIN				
	GROUP-21				
SAJJAD KHAN NIAZI			BCE193074		
MUHAMMAD HAIDER MEHMOOD			BCE193010		
SYED TAHA HUSNAIN			BCE193042		
SAMPLE NUMBER:			**22**		
DATE:			JUNE-09TH 2023		
TIME:			2:47:00 PM		
TOTAL COLLECTED WEIGHT			#REF!		
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	7.5	0	7.5	8.64%
2	HIGH GRADE PAPER	0	0	0	0.00%
3	COMPUTER PRINTOUTS	1	0	1	1.15%
4	OTHER OFFICE PAPERS	0	0	0	0.00%
5	NEWSPAPERS	1	0	1	1.15%
6	CORRUGATED	2	0	2	2.30%
7	PLASTICS	13	0	13	14.98%
8	PET BOTTLES	3.5	0	3.5	4.03%
9	HDPE BOTTLES	0	0	0	0.00%
10	FILMS	0	0	0	0.00%
11	OTHER PLASTICS	10	0	10	11.52%
12	FOOD WASTE	14	0	14	16.13%
13	WOOD	0.5	0	0.5	0.58%
14	OTHER ORGANIC	10	0	10	11.52%
15	FERROUS	1.5	0	1.5	1.73%
16	CANS	2.5	0	2.5	2.88%
17	OTHER FERROUS	0	0	0	0.00%
18	ALLUMINUM	0	0	0	0.00%
19	CANS	0	0	0	0.00%
20	FOILS	0	0	0	0.00%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	6	0	6	6.91%
23	CLEAR		0	0	0.00%
24	COLORED	0	0	0	0.00%
26	OTHER ORGANICS	8	0	8	9.22%
27	FIBERS	0	0	0	0.00%
28	PAMPERS	7	0	7	8.07%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	87.5		
NOTE:					

WASTE COMPOSITION DATA SHEET					
	CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD **DEPARTMENT OF CIVIL ENGINEERING** **DESIGN PROJECT-II** **ENVIRONMENTAL ENGINEERING DOMAIN**				
	GROUP-22				
SAJJAD KHAN NIAZI			BCE193074		
MUHAMMAD HAIDER MEHMOOD			BCE193010		
SYED TAHA HUSNAIN			BCE193042		
SAMPLE NUMBER:			**23**		
DATE:			JUNE-10TH 2023		
TIME:			10:54:00 AM		
TOTAL COLLECTED WEIGHT			#REF!		
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	5.5	0	5.5	6.29%
2	HIGH GRADE PAPER	0	0	0	0.00%
3	COMPUTER PRINTOUTS	3	0	3	3.43%
4	OTHER OFFICE PAPERS	0	0	0	0.00%
5	NEWSPAPERS	0	0	0	0.00%
6	CORRUGATED	4	0	4	4.57%
7	PLASTICS	14	0	14	16.00%
8	PET BOTTLES	3	0	3	3.43%
9	HDPE BOTTLES	0	0	0	0.00%
10	FILMS	0	0	0	0.00%
11	OTHER PLASTICS	7	0	7	8.00%
12	FOOD WASTE	13	0	13	14.86%
13	WOOD	4	0	4	4.57%
14	OTHER ORGANIC	6	0	6	6.86%
15	FERROUS	1.5	0	1.5	1.71%
16	CANS	2.5	0	2.5	2.86%
17	OTHER FERROUS	0	0	0	0.00%
18	ALLUMINUM	0	0	0	0.00%
19	CANS	0	0	0	0.00%
20	FOILS	1.5	0	1.5	1.71%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	7	0	7	8.00%
23	CLEAR		0	0	0.00%
24	COLORED	0.5	0	0.5	0.57%
26	OTHER ORGANICS	7	0	7	8.00%
27	FIBERS	0	0	0	0.00%
28	PAMPERS	8	0	8	9.14%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	87.5		
NOTE:					

WASTE COMPOSITION DATA SHEET					
	CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD **DEPARTMENT OF CIVIL ENGINEERING** **DESIGN PROJECT-II** **ENVIRONMENTAL ENGINEERING DOMAIN**				
	GROUP-23				
SAJJAD KHAN NIAZI			BCE193074		
MUHAMMAD HAIDER MEHMOOD			BCE193010		
SYED TAHA HUSNAIN			BCE193042		
SAMPLE NUMBER:			**24**		
DATE:			JUNE-10TH 2023		
TIME:			3:13:00 PM		
TOTAL COLLECTED WEIGHT			#REF!		
S.NO	COMPONENT	WEIGHT			PERCENT OF TOTAL
		GROSS	TARE	TOTAL	
1	MIXED PAPER	7.65	0	7.65	8.74%
2	HIGH GRADE PAPER	0.29	0	0.29	0.33%
3	COMPUTER PRINTOUTS	0.65	0	0.65	0.74%
4	OTHER OFFICE PAPERS	0.69	0	0.69	0.79%
5	NEWSPAPERS	2	0	2	2.29%
6	CORRUGATED	0.78	0	0.78	0.89%
7	PLASTICS	10.75	0	10.75	12.29%
8	PET BOTTLES	6.1	0	6.1	6.97%
9	HDPE BOTTLES	3.1	0	3.1	3.54%
10	FILMS	1.7	0	1.7	1.94%
11	OTHER PLASTICS	7.09	0	7.09	8.10%
12	FOOD WASTE	15.87	0	15.87	18.14%
13	WOOD	0.56	0	0.56	0.64%
14	OTHER ORGANIC	5.8	0	5.8	6.63%
15	FERROUS	2.1	0	2.1	2.40%
16	CANS	3.12	0	3.12	3.57%
17	OTHER FERROUS	0.4	0	0.4	0.46%
18	ALLUMINUM	0.25	0	0.25	0.29%
19	CANS	2.9	0	2.9	3.31%
20	FOILS	0.9	0	0.9	1.03%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	7	0	7	8.00%
23	CLEAR	0.5	0	0.5	0.57%
24	COLORED	0.2	0	0.2	0.23%
26	OTHER ORGANICS	3.5	0	3.5	4.00%
27	FIBERS	1.9	0	1.9	2.17%
28	PAMPERS	2.98	0	2.98	3.41%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	88.78		
NOTE:					

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-24

SAJJAD KHAN NIAZI	BCE193074
MUHAMMAD HAIDER MEHMOOD	BCE193010
SYED TAHA HUSNAIN	BCE193042
SAMPLE NUMBER:	**25**
DATE:	JUNE-11TH 2023
TIME:	10:45:00 AM
TOTAL COLLECTED WEIGHT	#REF!

S.NO	COMPONENT	WEIGHT			PERCENT OF
		GROSS	TARE	TOTAL	TOTAL
1	MIXED PAPER	6.34	0	6.34	7.10%
2	HIGH GRADE PAPER	0	0	0	0.00%
3	COMPUTER PRINTOUTS	1	0	1	1.12%
4	OTHER OFFICE PAPERS	0	0	0	0.00%
5	NEWSPAPERS	1.5	0	1.5	1.68%
6	CORRUGATED	2	0	2	2.24%
7	PLASTICS	14	0	14	15.67%
8	PET BOTTLES	3	0	3	3.36%
9	HDPE BOTTLES	0	0	0	0.00%
10	FILMS	0	0	0	0.00%
11	OTHER PLASTICS	10	0	10	11.19%
12	FOOD WASTE	14	0	14	15.67%
13	WOOD	0.5	0	0.5	0.56%
14	OTHER ORGANIC	6	0	6	6.72%
15	FERROUS	1.5	0	1.5	1.68%
16	CANS	2.5	0	2.5	2.80%
17	OTHER FERROUS	0	0	0	0.00%
18	ALLUMINUM	0	0	0	0.00%
19	CANS	0	0	0	0.00%
20	FOILS	1.5	0	1.5	1.68%
21	OTHER ALLUMINUM	0	0	0	0.00%
22	GLASS	7	0	7	7.84%
23	CLEAR		0	0	0.00%
24	COLORED	0.5	0	0.5	0.56%
26	OTHER ORGANICS	8	0	8	8.95%
27	FIBERS	0	0	0	0.00%
28	PAMPERS	10	0	10	11.19%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	89.34		

NOTE:

WASTE COMPOSITION DATA SHEET

CAPITAL UNIVERSITY OF SCIENCE & TECHNOLOGY-ISLAMBAD
DEPARTMENT OF CIVIL ENGINEERING
DESIGN PROJECT-II
ENVIRONMENTAL ENGINEERING DOMAIN

GROUP-25

SAJJAD KHAN NIAZI	BCE193074
MUHAMMAD HAIDER MEHMOOD	BCE193010
SYED TAHA HUSNAIN	BCE193042
SAMPLE NUMBER:	**26**
DATE:	JULY-06TH 2023
TIME:	10:25:00 AM
TOTAL COLLECTED WEIGHT	#REF!

S.NO	COMPONENT	WEIGHT			PERCENT OF
		GROSS	TARE	TOTAL	TOTAL
1	MIXED PAPER	5	0	5	5.60%
2	HIGH GRADE PAPER	0.45	0	0.45	0.50%
3	COMPUTER PRINTOUTS	0.95	0	0.95	1.06%
4	OTHER OFFICE PAPERS	0.7	0	0.7	0.78%
5	NEWSPAPERS	1.5	0	1.5	1.68%
6	CORRUGATED	2.5	0	2.5	2.80%
7	PLASTICS	6	0	6	6.72%
8	PET BOTTLES	5	0	5	5.60%
9	HDPE BOTTLES	3	0	3	3.36%
10	FILMS	2.5	0	2.5	2.80%
11	OTHER PLASTICS	7	0	7	7.84%
12	FOOD WASTE	17	0	17	19.03%
13	WOOD	1	0	1	1.12%
14	OTHER ORGANIC	4	0	4	4.48%
15	FERROUS	3.4	0	3.4	3.81%
16	CANS	0.75	0	0.75	0.84%
17	OTHER FERROUS	0.95	0	0.95	1.06%
18	ALLUMINUM	0.75	0	0.75	0.84%
19	CANS	4	0	4	4.48%
20	FOILS	0.5	0	0.5	0.56%
21	OTHER ALLUMINUM	0.45	0	0.45	0.50%
22	GLASS	4	0	4	4.48%
23	CLEAR	1.345	0	1.345	1.51%
24	COLORED	1.95	0	1.95	2.18%
26	OTHER ORGANICS	7	0	7	7.84%
27	FIBERS	3.78	0	3.78	4.23%
28	PAMPERS	0.91	0	0.91	1.02%
29	OTHERS		0	0	0.00%
30	OTHERS		0	0	0.00%
31	OTHERS		0	0	0.00%
32	OTHERS		0	0	0.00%
33	OTHERS		0	0	0.00%
34	OTHERS		0	0	0.00%
		TOTAL	86.385		

NOTE:

Annexure B


Picture 1: Working Picture


Picture 2: Working pictures


Picture 3: Working pictures


Picture 4: Working pictures

Picture 5: Wood waste

Picture 6: Cans waste

Picture 7: Plastic waste

Picture 8: pampers waste

Picture 9: organic waste

Picture 10: paper waste

Picture 11: Working site

Picture 12: Group discussion on waste management

Picture 13: With helpers

Picture 14: Working site

Picture 15: Dump yard