A STUDY ON GARMENTS WASTE MANAGEMENT SYSTEM AND ITS EFFECT ON HUMAN HEALTH IN THE KONABARI (BSCIC) AREA OF GAZIPUR CITY

A Thesis Submitted to the Department of Civil Engineering
Daffodil International University

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DECLARATION

It is hereby declared that this project or any part of it has not been submitted elsewhere for the award of any degree or diploma. I am studying on this **"A Study On Garments Waste Management System And Its Effect On Human Health In The Konabari (Bscic) Area Of Gazipur City"** topic.

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I dedicate this research to my parents, Family, and Teachers for the continual support they gave me during my studies.

DELICATED

Dedicated
To
Our Parents & All Teacher

ABSTRACT

This study examines the waste management systems within the ready-made garment (RMG) industry in Konabari, Gazipur, and the subsequent health consequences for the local population. Improper waste disposal from this sector creates significant environmental and public health risks. The research aims to analyze current waste management practices, identify their shortcomings, and establish a clear connection between these industrial activities and the health status of the nearby community.

A descriptive cross-sectional research design was utilized, incorporating a mixed-methods approach for data collection. Primary data was gathered via structured questionnaires from 50 residents and workers, key informant interviews with factory managers and health officials, and direct field observations. This was supplemented by secondary data from a review of existing academic literature and official reports to build a comprehensive understanding of the situation.

The findings reveal that factories generate large amounts of daily waste, including 700 kg of plastics and significant quantities of chemical containers and agents. Consequently, residents report high rates of respiratory issues (35%), skin problems (30%), and other ailments, alongside environmental problems like clogged drains (39%). While nearly all respondents (97%) support installing Effluent Treatment Plants, current waste management is poor, with only 40% reporting systematic treatment. The results clearly indicate that garment industry waste is a growing threat, making improved management and factory accountability urgent priorities.

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Chapter I

INTRODUCTION

1.1 Background

Gazipur City, a rapidly urbanizing industrial hub in central Bangladesh with over 2.6 million people, faces significant challenges in managing its municipal solid waste (MSW). The city's industrial expansion, especially in the garment sector, contributes substantially to daily waste generation, estimated between 2,500 and 7,500 ton. Despite the Gazipur City Corporation (GCC) being responsible for waste management since 2013, rapid growth has overwhelmed existing infrastructure. One of the crucial problems is the absence of access to dedicated landfills and efficient treatment plants, resulting in rampant open dumping, even along national highways, posing threats to the environment and public health (ASEF). Overcoming these problems requires the implementation of appropriate waste management options, among which the 3R (Reduce, Reuse, and Recycle) approach. These approaches offer both environmental relief as well as economic gains from resource recovery and job creation. In the final analysis, if sustainable management of the waste in Gazipur City supported by people's active participation is needed especially with respect to garment waste in places such as Konabari, then a multi-prolonged intervention that includes infrastructural development, community involvement and sustainable measures to ensure the environmental health and citizen health.

1.2 Scope Of Work

This research is specifically focused on the Konabari (BSCIC) industrial area within Gazipur City. The scope is confined to the solid waste generated from Ready-Made Garment (RMG) factories, commonly known as jhut. While acknowledging the severe problem of liquid effluent pollution, the study will primarily concentrate on the solid waste management system. However, the health impacts resulting from water contamination by industrial discharge and waste leachate will be considered as part of the broader assessment of environmental health. The study will examine the human health effects on two primary groups: the workers directly involved in the formal and informal waste collection and recycling sectors, and the residents living in close proximity to the factories and waste disposal sites.

1.3 Objectives

The objective of this thesis is finding the effect of waste on human health in Konabari, Gazipur.

i. To investigate the waste management system in selected garments factory at Konabari in Gazipur city.
ii. To investigate the health problems of garments worker and general people who are living near the study area.

1.4 Limitations Of The Study

This study provides valuable insights into the waste management situation in Konabari, Gazipur, but it is subject to several limitations. Firstly, the research was geographically confined to a specific industrial area, and its findings may not be generalizable to the entire garment industry in Bangladesh. Secondly, the sample size for the survey was relatively small and utilized non-probability sampling, which may limit the statistical significance of the results.

Furthermore, the assessment of health impacts relied on self-reported symptoms from residents and workers rather than clinical diagnostics, establishing a correlation but not a definitive causal link. Finally, obtaining transparent and comprehensive waste management data from all factories proved challenging, meaning the study had to rely on survey responses and direct observation, which may be subject to response bias. Future research could address these limitations through a larger, multi-location study with clinical health assessments.

Chapter II

LITERATURE REVIEW

2.1 Introduction

The Ready-Made Garment (RMG) industry is the cornerstone of Bangladesh's economy, accounting for over 80% of the nation's export earnings and employing millions, the majority of whom are women. Industrial hubs such as Gazipur are epicenters of this economic activity, hosting a high concentration of manufacturing units. While the sector has driven significant socio-economic growth, it is also recognized as one of the world's most polluting industries. The immense volume of pre-consumer (post-industrial) textile waste, known locally as jhut, coupled with inadequate management systems, presents a grave threat to public health and the environment in areas like Konabari. Improper disposal of this waste leads to severe land, water, and air pollution, which directly impacts the health and livelihoods of local communities and workers. The growing global demand for sustainability and circularity in fashion, particularly from key export markets like the European Union, adds urgency to the need for improved waste management practices in Bangladesh. **(Habib et al., 2025)**

2.2 Types Of Garment Waste

Garment waste is a heterogeneous stream of materials generated throughout the production process. It is broadly classified into two categories:

- **Non-Hazardous Waste:** This constitutes the bulk of solid waste and includes materials that do not pose a direct chemical or biological threat if managed properly. It includes:
  - **Fabric and Yarn Waste:** This is the largest component, comprising cutting waste (cut pieces), fabric scraps, roll ends, damaged yarn, cotton lint, and fly fiber. **(Akter et al., 2025)**
  - **Paper and Plastic Waste:** Includes marker paper, plotter paper, packaging cartoons, poly bags, plastic cones, and hangers. **(Akter et al., 2025)**
  - **Thread Waste:** Consists of sewing thread scraps and rejected thread cones.
- **Hazardous Waste:** This includes materials that can pose significant risks to human health and the environment and require special handling and disposal. It includes:

- **Textile Effluent Sludge:** A semi-solid byproduct from Effluent Treatment Plants (ETPs) that contains a toxic mixture of dyes, heavy metals (like chromium, lead, and cadmium), and other organic contaminants.
- **Sharp Metal Waste:** Comprises broken or rejected sewing needles and other sharp metal parts from machinery that can cause physical injury and transmit diseases. **(Akter et al., 2025)**
- **Chemical Waste:** Includes residual chemicals from dyeing, printing, and finishing processes that may be present in fabric scraps and sludge**. (Islam et al., 2011)**

2.3 Risks And Impacts Of Improper Waste Management

The inadequate management of garment waste in industrial clusters like Konabari poses substantial risks to both public health and the local environment.

- **Impacts on Human Health:** The health of both the general populace and the informal waste workers is severely affected.
  - **Water Contamination and Related Illnesses:** The discharge of untreated liquid effluents and leachate from solid waste dumps contaminates surrounding water bodies, such as the Turag River. This pollution of drinking and agricultural water sources leads to a higher incidence of water-borne diseases like diarrhea and dysentery, as well as painful skin diseases such as dermatitis and persistent sores.
  - **Respiratory and Other Diseases:** The open dumping and incineration of waste release fabric dust, microfibers, and toxic fumes containing harmful chemicals. Prolonged inhalation of these airborne pollutants is linked to a high prevalence of respiratory illnesses, including chronic cough, asthma, and bronchitis, among workers and nearby residents. **(Sarwar, 2023)**
  - **Occupational Hazards:** Workers in the informal *jhut* sector, who often handle mixed waste with bare hands, are exposed to constant risks of cuts and injuries from sharp objects like broken needles. They also face long-term health issues from direct contact with hazardous chemical residues in the textiles. **(Akter et al., 2025)**

- **Environmental Impacts:** The environmental degradation is extensive and multifaceted.
    - **Water Pollution:** Industrial effluents from dyeing and washing processes, often discharged with little to no treatment, have rendered rivers biologically dead in some areas, destroying aquatic ecosystems and making the water unsuitable for any use.
    - **Soil and Land Degradation:** The dumping of solid waste and sludge contaminates agricultural land with heavy metals and other toxins, reducing soil fertility and making crops unsafe for consumption.
    - **Air Pollution:** Gaseous emissions from factory boilers, which sometimes burn textile scraps for fuel, and the open burning of waste contribute to poor air quality and release harmful pollutants like dioxins and furans**. (Baizid, 2025)**

2.4 Background Of Garment Waste Management Systems Globally

Globally, the fashion industry is under increasing pressure to shift from a linear "take-make-dispose" model to a circular economy. A circular economy is a model of production and consumption that involves reusing, repairing, and recycling existing materials and products for as long as possible to minimize waste and environmental impact. This global movement is driven by growing consumer awareness, resource scarcity, and increasingly stringent environmental regulations, particularly in major markets like the European Union. This paradigm shift emphasizes treating waste not as a liability but as a valuable resource, promoting innovations in fiber-to-fiber recycling and the development of sustainable materials. **(Belal et al., 2015)**

2.5 Global Challenges In Garment Waste Management

Circles of life Despite the groundswell of support, creating a circular textile economy is fraught with challenges. "Whenever I do trend pieces, you always end up with massive amounts of waste because of the business model of fast fashion, which is based on overproduction, and selling as quickly as possible." The technical complexity of recycling, particularly for blended-fiber fabrics, is still a significant obstacle. Also, there is an insufficiency of infrastructure at a worldwide scale for collecting, sorting and high-value recycling of textile waste.

In many garment-producing nations, the waste supply chain is dominated by a fragmented and opaque informal sector, which complicates efforts to ensure traceability and supply high-quality feedstock for recycling. **(Focus, 2023)**

2.6 Global Regulatory Framework For Garment Waste Management

The regulatory landscape for textiles is being reshaped by policies aimed at enforcing sustainability and circularity. The European Union is at the forefront of this movement with its comprehensive Strategy for Sustainable and Circular Textiles. Key components of this strategy that will impact global supply chains include: **(Habib et al., 2025)**

- **Eco-design for Sustainable Products Regulation (ESPR):** This will establish mandatory minimum requirements for textile products sold in the EU, covering aspects like durability, repairability, recyclability, and minimum recycled content**. (Impacts of EU circular textiles policy, 2025)**
- **Digital Product Passport (DPP):** This will require products to carry detailed, accessible information about their entire supply chain, mandating a new level of transparency and traceability. **(Macintosh et al., 2025)**
- **Extended Producer Responsibility (EPR):** EPR schemes will make brands and manufacturers financially and logistically responsible for the collection and recycling of their products at the end of their life cycle, shifting the burden of waste management from municipalities to producers. **(Alam et al., 2024)**

2.7 Key Components Of Effective Regulatory Frameworks

An effective regulatory framework for garment waste management is crucial for protecting public health and the environment. Key components include:

- **Data and Transparency:** Mandating a national database to track waste volumes, material compositions, and flows from factories to recyclers to create a transparent market. **(Raihan, 2024)**
- **Economic Incentives:** Implementing tax structures, such as revised VAT and tariff rules, and providing subsidies to encourage formal trade in waste and investment in recycling technologies. **(Circular Textile Value Chains Through a Comprehensive Policy Approach, 2025)**

- **Standards and Infrastructure:** Developing clear industry guidelines for waste sorting and collection, and supporting the creation of centralized sorting hubs in industrial zones to ensure a supply of high-quality feedstock.
- **Worker Protection and Just Transition:** Formally recognizing the informal waste sector and integrating its workforce into national labor laws to enforce minimum wages, occupational health and safety standards, and eliminate child labor.

2.8 Background Of Garment Waste Management In Bangladesh

Bangladesh generates an estimated 400,000 to 700,000 metric tonnes of pre-consumer textile waste (*jhut*) annually. The management of this waste is dominated by a vast and complex informal economy. Despite the high volume of waste, which contains a significant amount of valuable raw material like cotton, the domestic recycling rate is remarkably low, with estimates ranging from only 5% to 25%. A large portion of the highest-quality waste is exported for a low value, while a significant amount is either incinerated in factory boilers or ends up in landfills, contributing to pollution. **(Akter et al., 2025)**

Table1.1: Garments Factories in Konabari

Si. No.	Garments Name	Si. No.	Garments Name
01	Vaajoh Apparels Ltd.	13	Dysin Chem Industries (Pvt.) Ltd.
02	Associat Industries (Pvt.) Ltd.	14	Tamijuddin Textile Mills Limited.
03	Fashion Poin Ltd.	15	Y.K Knitwear Ltd.
04	Bd Knit Dehign Ltd.	16	Shanon Swearters Ltd.
05	Minto Knit Fabrcis	17	Designtex Sweaters Ltd.
06	Rezul Apparels (Pvt.) Ltd	18	Meditex Industries Ltd.
07	Banika Fashions Ltd.	19	Tusuka Jeans Ltd.
08	Fashion Summit Ltd.	20	Knittex Industries Ltd.
09	R.R. Sweaters Ltd.	21	Aim Knit Wear.

10	Saimon Shining Fabrics	22	Limart Capitaland Apparels.
11	Life Textile Ltd.	23	Asha Cottage Industries.
12	Nam Trading And Manufacturing Co., Limited		

Figure 2.1: Garments Factories In Konabari

2.9 The Informal "Jhut" Economy And Its Health Impacts

The informal *jhut* sector is a critical component of the waste management system but operates largely outside of legal and social protections, creating significant health and safety risks.

- **Socio-Economic Conditions:** The workforce, which is predominantly composed of women, endures precarious working conditions. Workers typically face 10 to 12-hour workdays with low wages, often half that of a formal garment worker, and lack basic amenities, formal contracts, or social safety nets. This economic precarity creates a high risk of child labor, as families may depend on the supplementary income of children who can easily enter this low-skill sector.

- **Health and Safety Risks:** The manual sorting process exposes workers to significant occupational hazards. They inhale high concentrations of fabric dust and microfibers, often without respiratory protection, leading to chronic coughs and asthma. Direct contact with hazardous chemicals from dyes and finishing agents embedded in the textiles causes skin allergies and diseases. Furthermore, workers are at constant risk of cuts and injuries from sharp objects like broken needles and metal accessories that are discarded along with fabric scraps. **(News details, 2025)**

2.10 Garment Waste Management Practices In Bangladesh

Current waste management practices in Bangladesh's RMG sector are largely inefficient and unsustainable. Most factories do not practice systematic segregation of waste at the source, leading to the contamination of high-value fabric scraps with other materials. This mixed waste is then sold at a low price to informal traders. In the informal sector, the waste is manually sorted. Larger, high-quality pieces are often sold to local markets to produce low-cost clothing, while smaller scraps are downcycled into products like mattress filling, insulation, and cleaning rags. A significant portion of the waste is either burned for fuel or disposed of in open dumps and landfills, and the highest quality segregated waste is often exported. **(Zami, 2025)**

Figure 2.2: Garbage Pile in kodda, Gazipur

2.11 Regulatory Framework In Bangladesh

Bangladesh has several legal frameworks that address environmental concerns and waste management, such as the Environment Conservation Act of 1995, the National Environmental Policy of 2018, and the Solid Waste Management Rules. The government has also introduced a National 3R (reduce, reuse, and recycle) Strategy to promote sustainable waste management. However, these policies are often general in nature and lack specific guidelines tailored to the

unique challenges of the textile and *jhut* sector. There is currently no comprehensive policy framework that specifically governs the collection, sorting, and recycling of post-industrial textile waste or formalizes the informal *jhut* economy.

2.12 Challenges In Implementation

Despite existing regulations, effective implementation remains a major challenge in Bangladesh. Key barriers include:

- **Weak Enforcement:** A lack of stringent enforcement mechanisms and regular inspections leads to widespread non-compliance with existing environmental and waste management regulations.
- **Lack of Data and Transparency:** The absence of a mandatory disclosure system results in a lack of reliable data on waste generation, making it difficult to plan and implement effective management strategies.
- **Informal Sector Dominance:** The opaque and unregulated nature of the *jhut* trade, often controlled by powerful local interests, prevents the formation of a transparent and efficient supply chain for recyclable materials.
- **Financial and Technological Gaps:** There is a significant lack of investment in modern recycling infrastructure and technology, and access to finance is a major hurdle for entrepreneurs looking to establish formal recycling facilities.

2.13 Sustainable Approaches And Innovations

To address these challenges, various sustainable approaches and innovations are being explored in Bangladesh.

- **Circular Economy Initiatives:** There is a growing recognition of the need to transition to a circular model. This includes promoting the principles of reducing waste at the source, reusing materials, and recycling them into new products. Multi-stakeholder platforms and partnerships are being formed to co-create circular business models with international brands and local manufacturers. **(Stenzel, 2022)**
- **Technological Advancements:** New technologies for fiber-to-fiber recycling are being introduced, which can transform textile waste back into high-quality fibers for new garments, effectively closing the production loop. Digital platforms are also emerging as a key innovation. For example,

Reverse Resources, a Software-as-a-Service (SaaS) platform, creates a transparent digital marketplace connecting factories, waste handlers, and recyclers, thereby improving traceability and ensuring a supply of high-quality, segregated waste.

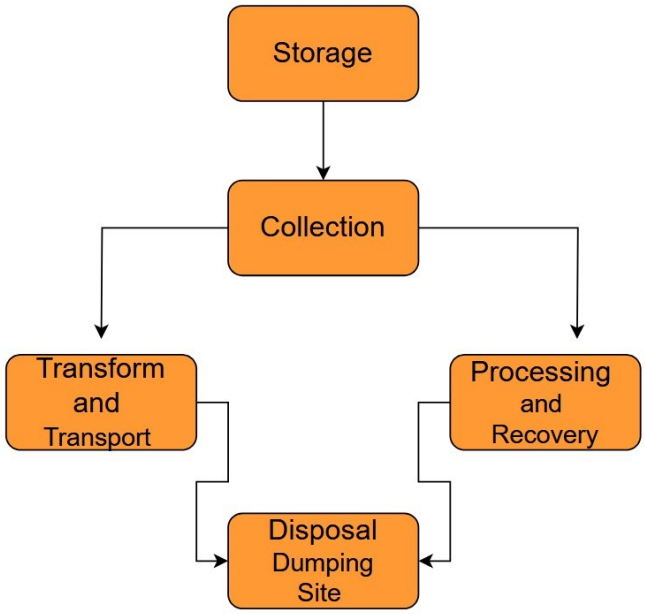

Figure 2.3: Solid Waste Management System.

2.14 At-Source Segregation: A Foundational Practice

A critical practice for enabling a high-value circular economy is the segregation of waste at its source—the factory floor. This involves separating textile scraps based on their exact material composition (e.g., 100% cotton, polyester blends) and color before they become mixed and contaminated. Proper at-source segregation is foundational because it significantly increases the economic value of the waste and makes it suitable for high-quality, fiber-to-fiber recycling. But this trend is rare in Bangladesh and there is no clear financial incentive. The informal market is also dominated by an opaque price system that especially along the first leg in the chain tends to get a low price for mixed waste, giving factories few reasons to invest in the labor and other resources needed for careful separation. Solutions like Reverse Resources are tackling this issue by connecting factory waste material with a transparent market that offers a much better price if the waste is properly segregated and traced, hence providing a strong business case to adopt the important practice.

2.15 Summary

The management of garment waste in the industrial belt at Konabari Gazipur is a significant challenge with serious implications for the public health, the environment and the future of Bangladesh RMG industry. The existing system, led by a highly problematic but dominant informal economy, leads to substantial resource loss and exposes workers and communities to major health risks. National environmental legislation is in place, but the absence of industry-specific policies for textiles and poor enforcement have held things back. But the circular economy is being forced into focus around the globe by new international regulations and consumer demand. Sustainable approaches, including technological innovations in recycling and digital traceability, offer viable pathways to transform waste into a valuable resource. For this transition to be successful and just, it must be supported by a comprehensive policy framework that formalizes the informal sector, protects its workers, and creates economic incentives for sustainable practices like at-source segregation.

Chapter III

METHODOLOGY

3.1 General

The study uses a mixed method that involves quantitative and qualitative data. Design: The study will be done based on descriptive survey and it will be conducted at garment factories in Konabari, Gazipur. We will collect primary data using pre-tested structured questionnaire and by interviewing factory managers as well as workers to know the current practice of waste generation, segregation and disposal. Semi-structured interviews with key stakeholders such as factory owners, local government officials and waste collectors will help delve further to understand the policy framework supporting informal recycling networks. Descriptive statistics will be performed, and qualitative thematic analysis will be conducted to summarize the results related to the present management system and impediments.

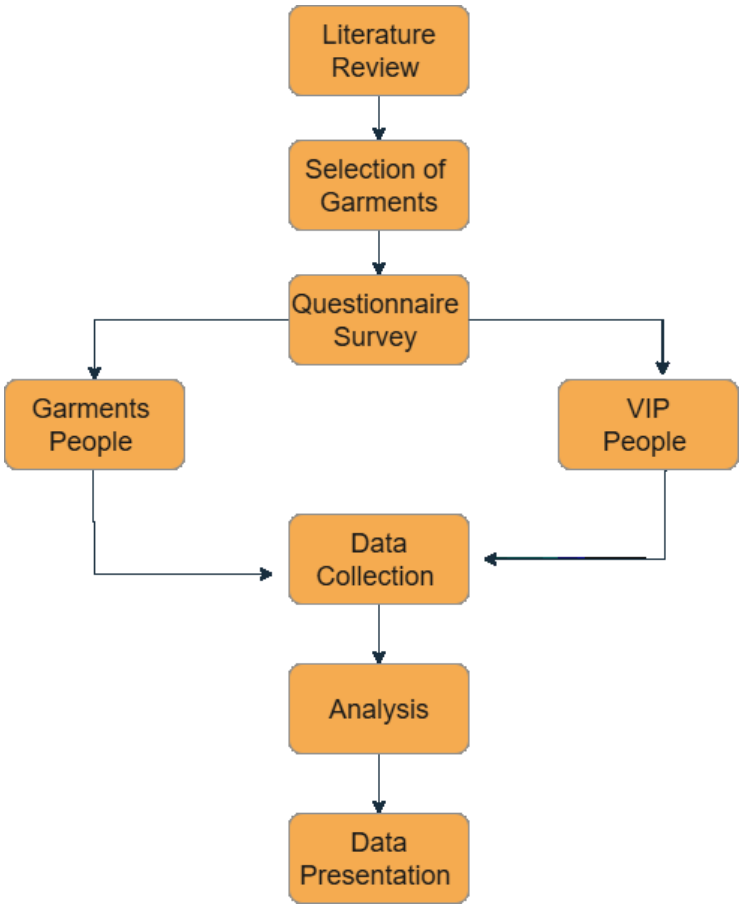

Figure 3.1 : Flow of Methodology

3.2 Study Area Selection

The Konabari (BSCIC) industrial area in Gazipur City was selected for this research due to its significant concentration of Ready-Made Garment (RMG) factories and the severe, well-documented environmental and health challenges it faces. Gazipur district is one of the primary epicenters of Bangladesh's RMG sector, hosting thousands of manufacturing units. Within this broader industrial landscape, the Konabari area has been identified as a particularly dense industrial agglomeration and a significant environmental "hot spot". The Bangladesh Small and Cottage Industries Corporation (BSCIC) industrial zone, Konabari is now a production hub. This rapid, mostly ad-hoc industrial growth has had a severe impact on the local environment, and it is evident that the overall ecosystem is deteriorating. This site has been chosen because of close proximity to Turag River where large quantity of untreated or partly treated industrial effluents are directly discharged continuously and therefore, the area is relatively significant from the viewpoint of studying the effect of industrial pollution. Water quality indicators Water in the Turag River and water from its surrounding wetland area in this location is highly polluted, which is not suitable for consumption for human and animal use without any treatment as the studies found. The heavy pollution has lead to degradation of croplands, greenery and water sources, thus affecting local agriculture and people's lives. Thus, the dense population of industrial workers and residents and the significant and obvious environmental (both aquatic and terrestrial) degradation associated with the disposal of garments in the the Konabari (BSCIC) area of Bangladesh make this area an ideal and highly relevant area to explore the direct relationship between garment waste disposal schemes and their impacts on human health.

Figure 3.2: Konabari, Gazipur

Table 3.1: Survey Report Of Garments Waste Management in konabari, Gazipur

Sl.No.	Question	Survey Result			
01	What do you think about the sources of waste in your garments?	Polybags, straps & Plastic	Paper	Chemical containers & oily rags	Softeners, water-repellent agents
02	How much waste can be produced in every day?	700 KG	327 KG	50 KG	215 KG
03	What are the problems you feel regarding garments waste?	Dirty Drain 39%		Odour Pollution 36%	Breathing Problem 25%
04	Do you think the environment of your locality is affected by this factory waste?	Yes 95%		No 05%	
05	Do you face any health related problems by garments waste?	Respiratory Problems 35%	Skin Irritation & Dermatitis 30%	Headaches & Dizziness 20%	Eye Irritation 15%
06	Do you think installation of Effluent Treatment Plant is mandatory to minimize garment waste pollution?	Yes 97%		No 3%	
07	What are the probable measures to prevent health risks due to garment waste?	Recycling (%) 48%	Preventive Measures 22%	Use of Masks 20%	Others 10%
08	Do you think the garment owners are responsive enough to protect health of the garments workers and the inhabitants of the locality affected by garments wastes?	Yes, fully responsive 50%	Partially responsive 25%	Largely unresponsive 15%	No, not responsive at all 10%
09	What are the process of waste management system in your Garments?	No formal system 10%	Basic Separation 45%	Systematic Segregation and Treatment 40%	Advanced Circular Model 5%
10	Do you have any suggestion to minimize the waste of garments	Source Reduction 30%	Recycle 24%	Biological Treatment 26%	Proper Management 20%

3.3 Methods Of Data Collection

This study employed a mixed-methods approach, utilizing both primary and secondary data to ensure a comprehensive and robust investigation.

3.3.1 Primary Data

The main input data was obtained by field survey of the Konabari (BSCIC) industrial estate. This was accomplished through a structured questionnaire. Questions of direct relevance included those on waste management activities by household and workplace; the kind and quantity of waste generated; characteristics of residents and workers; and prevalence of certain health problems. In addition to the questionnaires, Key Informant Interviews (KIIs) with factory managers, local community leaders and health workers has been conducted to get the expert insights of the issues of systemic root. Direct field observation was also used to note the visible environmental situation, waste resting places and labor situation at informal waste sorting sites.

3.3.2 Secondary Data

Secondary sources were also reviewed to complement the primary data. This included academic journals and research papers, government reports (e.g., from DoE) and reports from NGOs and international bodies (such as UNICEF and UNIDO) that are involved in environmental and labor concerns in Bangladesh's RMG sector. This backdrop data proved useful to provide contextual reference, to confirm field observations, and to use to contextualize the study in terms of the national and international discussion on industrial waste and health.

3.3.3 Sampling Methodology

The study population was comprised of three distinct groups within the Konabari (BSCIC) area: (1) local residents living in proximity to the industrial units and waste dumping sites; (2) workers engaged in the informal collection, sorting, and processing of garment waste (jhut); and (3) management personnel from selected RMG factories.

Due to the diverse and partially informal nature of the population, a non-probability sampling technique was adopted. A combination of purposive sampling and convenience sampling was utilized. Purposive sampling was used to specifically target informal waste workers within the Konabari waste trading cluster and residents living in the most affected areas to ensure their perspectives were captured. Convenience sampling was employed to select accessible residents and factory officials for the survey. The total sample size for the questionnaire survey consisted

of respondents, broken down into 15 local residents, informal waste workers, and 40 factory officials, allowing for a comparative analysis of the issue from multiple stakeholder perspectives.

3.3.4 Data Examination

Analysis The answers obtained from the questionnaires were systematically integrated and analyzed. Descriptive statistics (absolute frequencies and percentages) were used where appropriate on quantitative data obtained from closed-ended questions by using MS Excel and Statistical Package for Social Science (SPSS). Enrolment and frequency, percentages, means were used to describe the demographic, waste management practices and reported health problems.

A thematic analysis method was adopted for the qualitative data from the open-ended questions in the questionnaire and the Key Informant Interviews. The replies were transcribed and coded and categorized to reveal common themes, trends, and key learning. This approach provided the opportunity to go in-depth into attitudes, experiences, and challenges related to waste garment management and health impacts with a rich thread that supported the quantitative results.

3.4 Ethical Considerations

Throughout this investigation, high ethical standards were maintained to guarantee the wellbeing and human dignity of all participants, especially of the vulnerable populations that were included in the research. The core ethical considerations included:

Informed Consent Before starting, we explained the purpose and their role in the study and the use of data, to all subjects. All of the participants provided verbal consent prior to the administration of the questionnaire or interview.

Voluntary Participation: The participants were informed that their participation was voluntary; they could choose not to answer any question and could withdraw from the study at any time without any adverse effect.

Privacy/Anonymity: Participant privacy was of utmost importance. All sensitive information has been treated as confidential and anonymized by the final thesis to make sure that no persons or factories can be identified.

Limitations No harm: There was no harm done to the subjects in the study. The questionnaire and interview questions were designed in a sensitive manner no psychological harm would be inflicted and none of the research activities placed participants at physical risks.

3.5 Summary

The design of the study is mixed-method research and it aimed at exploring the garment waste disposal practice and its health consequences in Konabari (BSCIC). A structured questionnaire survey was used to collect primary data from a sample of the local residents, informal waste workers and the factory employees who were purposively and conveniently sampled. This was complemented by Key Informant Interviews and direct observations. The secondary data from existing literature also enriched the contextual perspectives. Content was thematically analyzed for qualitative data while descriptive statistics were used for quantitative data. The entire research was carried out under strong ethical guidelines taking into the account the principles of informed consent, confidentiality, and safe being of all researchers and participants.

Chapter IV

RESULT AND DISCUSSION

4.1 Introduction

The main findings of the study were acquired from the primary data obtained through the questionnaire survey, and key informant interview, and direct field observation in the industrial area of Konabari (BSCIC) under Gazipur City. The results are systematically presented and discussed according to the research objectives and existing literature. This section starts with the socio-demographic profiles of the survey participants to situate their views and experiences. After which the chapter provides an extensive discussion of the existing waste management process of garments waste starting with the collection, segregation and disposal in operation in factories and conducted by the informal sector. The discussion is centered on the study of negative health effects on the community and waste workers, placing the pattern of health symptoms (respiratory and skin diseases) in relation to local environment. The findings are critically discussed to interpret their significance and to highlight the direct relationship between industrial waste practices and human health in the study area.

4.2 Questionnaire Analysis:

4.2.1 What Do You Think About The Sources Of Waste In Your Garments?

Description

Polybags, straps, plastic, and paper are primarily associated with the packaging and shipping phase. Garments are individually packed in polybags for protection, then bundled and secured with plastic straps in cardboard boxes (paper) for transport. Once the goods reach their destination and are unpacked, all of this material becomes waste. Softeners and water-repellent agents represent waste from the fabric finishing or 'wet processing' stage. These chemicals are applied to textiles to give them specific qualities. Waste is generated from unused or expired chemicals, spills, and most significantly, from the wastewater (effluent) discharged after treating the fabrics. This effluent can be a major source of water pollution if not treated properly.

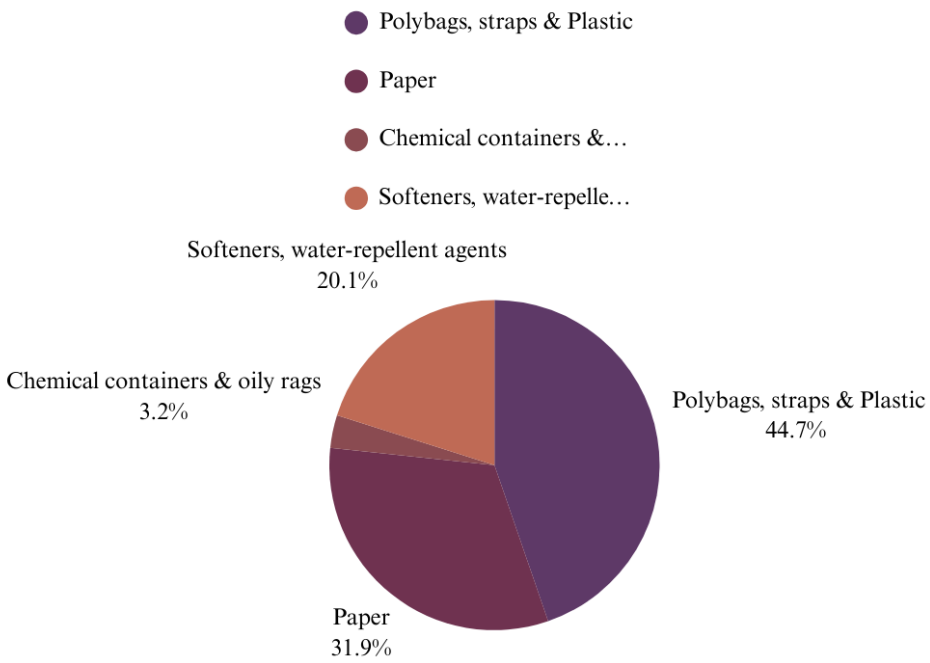

Figure4.1 : Sources Of Waste

4.2.2 How Much Waste Can Be Produced In Every Day?

Description

Based on the provided data, a typical large-scale garment factory in a hub like Konabari, Gazipur generates a substantial and varied amount of waste daily, painting a clear picture of its operational scale.

The overwhelming majority of waste originates from the final packaging and shipping stages. Each day, between 700 kg of plastic, including polybags and straps, and another 327 kg of paper from cardboard cartons are discarded. This massive volume of packaging material is a direct reflection of a high-output facility preparing thousands of finished garments for export.

In stark contrast, waste from routine production and maintenance is much smaller in volume but requires careful handling. The 50 kg of empty chemical containers and oily rags generated daily is a byproduct of maintaining the sewing machinery and using various process chemicals.

Furthermore, the factory's activities in wet processing are evident from the 215 kg of waste from softeners and water-repellent agents. This figure typically represents the chemical sludge collected from the Effluent Treatment Plant (ETP) after treating the wastewater used in dyeing and finishing fabrics. The significant weight of this sludge indicates that the facility has a large,

integrated finishing unit, handling the entire production process from fabric treatment to final packaging.

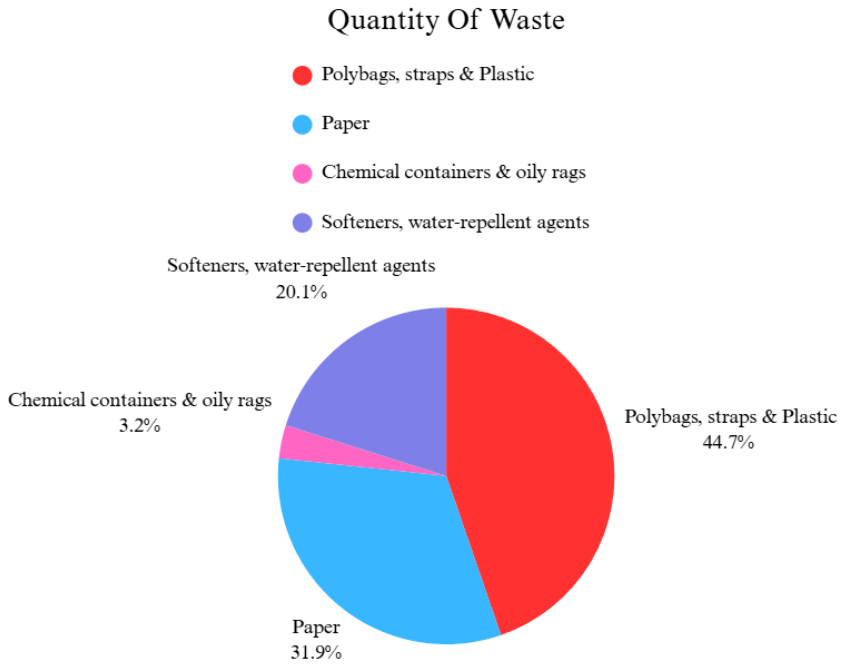

Figure 4.2 : Quantity of Waste

4.2.3 The Problems Feel Regarding Garments Waste?

Description

The problems stemming from garment waste in industrial zones like Konabari, Gazipur, are profound, creating a dual crisis of severe environmental pollution and significant human health risks. Environmentally, the sheer volume of fabric scraps, plastic packaging, and chemical containers quickly overwhelms local landfills. As this waste accumulates, toxic dyes and finishing agents leach into the ground, contaminating the soil and essential groundwater sources. Compounding the issue, untreated wastewater and chemical sludge are often discharged directly into local water bodies like the Turag River, destroying aquatic ecosystems and rendering the water unsafe for community use. This cycle of pollution leads directly to severe health consequences, particularly for factory workers and nearby residents. Within the factories, daily exposure to airborne fabric dust and chemical fumes results in widespread respiratory illnesses, including chronic coughing and asthma. At the same time, direct contact with chemically-treated materials and waste causes a high incidence of skin diseases like dermatitis and persistent rashes. For the wider community in Konabari, using the contaminated

water for daily activities spreads disease, turning a localized industrial problem into a public health emergency.

Figure 4.3 : Problems of Garments Factories

4.2.4 The Environment Of Your Locality Is Affected By This Factory Waste?

Description

A poll to understand whether air and water pollution in areas close to factories are seen as having an effect on the environment. An overwhelming 95% of respondents believe that the factory waste is harmful to the environment in Bhagalpur. Unfortunately, a small minority of 5% are not confident it does anything at all. This indicates a near-unanimous view on the negative impact of waste gases to the environment.

Figure 4.4 : Locality affected by Garments Wastes

4.2.5 Health Related Problems By Garments Waste?

Description

In major garment industry hubs like Konabari, Gazipur, workers face significant occupational health hazards directly stemming from daily exposure to chemical and physical waste. These risks manifest in several common medical conditions that affect their well-being. Skin irritation and dermatitis are widespread, caused by direct contact with fabrics treated with chemicals, handling oily rags, or touching residue from waste containers. Beyond surface contact, the very air inside factories poses a threat, as it is often filled with airborne lint and chemical vapors that lead to respiratory problems, including persistent coughing and asthma, which could represent as much as 35% of all health complaints. The same poor ventilation that traps dust also concentrates chemical fumes, frequently causing headaches and dizziness, which might account for another 20% of reported issues. Furthermore, eye irritation from accidental splashes or ambient fumes is a consistent problem, potentially making up 15% of cases. While exact statistics are unavailable, this illustrative breakdown suggests that skin conditions, at a likely 30%, and respiratory ailments are the most dominant health challenges, painting a clear picture of the pervasive risks tied to waste in the garment sector.

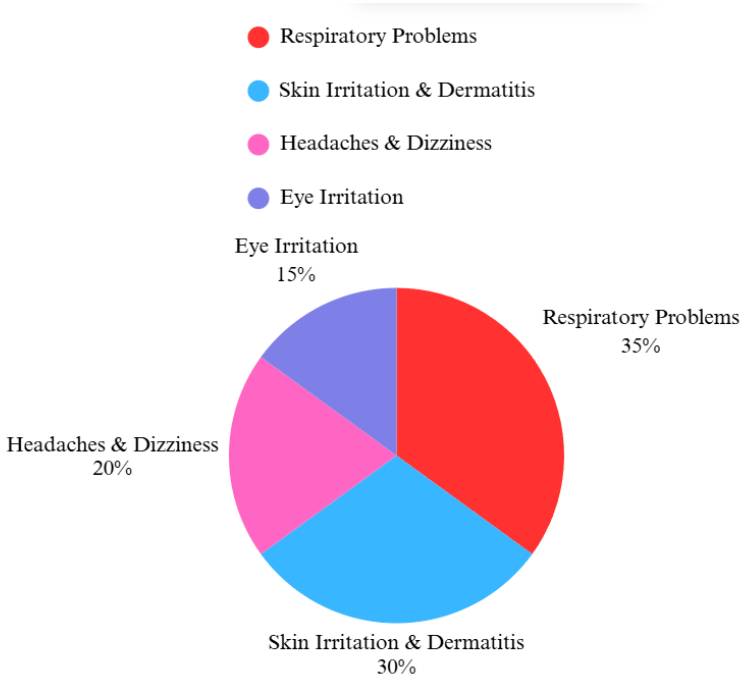

Figure 4.5 : Health Problem by Garments Wastes

4.2.6 Installation Of Effluent Treatment Plant Is Mandatory To Minimize Garment Waste Pollution?

Description

A public survey conducted to know, The necessity of ETP (Effluent Treatment Plants) required for reducing garments waste pollution. In those round results, 97% of respondents argued the ETPs were necessary in near total agreement. Only a tiny minority (3%) believe they should not be compulsory. These results reveal considerable public backing for measures to regulate pollution from the garment sector.

Figure 4.6: Effluent Treatment Plant

4.2.7 What Are The Probable Measures To Prevent Health Risks Due To Garment Waste?

Description

We Surveyed To Find Out The Best Preventive Measures Against Health Risks By Garments Waste The overall results show that "Recycling" is the highest ranked item among all of respondents, being chose by 48%. Next is “Preventive Measures” with 22% and “Use of Masks” gets 20%. The "Other" category represents 10% of the responses. Recycling as the Solution of Choice This survey suggests a large focus on recycling as the answer to solve health problems.

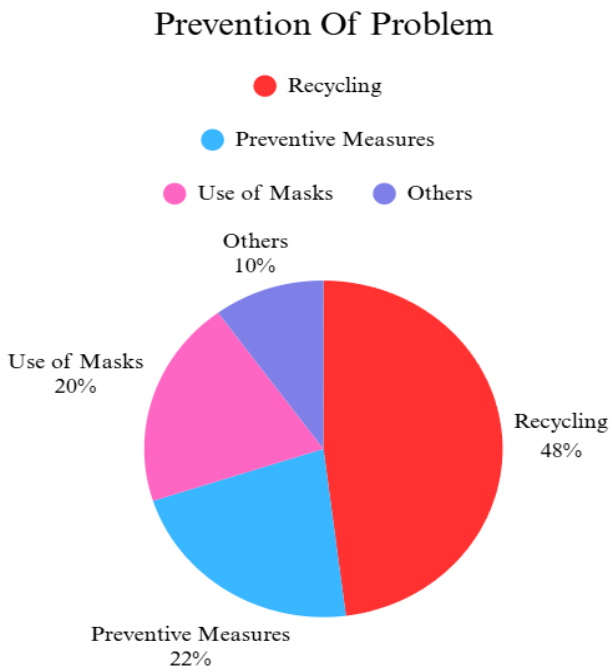

Figure 4.7 : Health Risks due to Garment Waste

4.2.8 Do You Think The Garment Owners Are Responsive Enough To Protect Health Of The Garments Workers And The Inhabitants Of The Locality Affected By Garments Wastes?

Description

This survey on the garment industry in Konabari, Gazipur, reveals a sharply divided perception of owners' responsiveness to health and safety. A significant 50% of respondents believe that owners are "fully responsive," suggesting a strong level of trust in their commitment to protecting workers and the local community. However, the other half of those surveyed express considerable skepticism. A quarter of all respondents (25%) view the owners as only "partially responsive," indicating a belief that safety measures are basic and not comprehensive. This doubt is stronger among the remaining quarter, with 15% seeing owners as "largely unresponsive" and 10% believing they are "not responsive at all." Ultimately, the results show that while half of the community feels the owners are doing their duty, an equal number believe these efforts are incomplete or entirely inadequate, highlighting a major split in public opinion on the issue in Konabari.

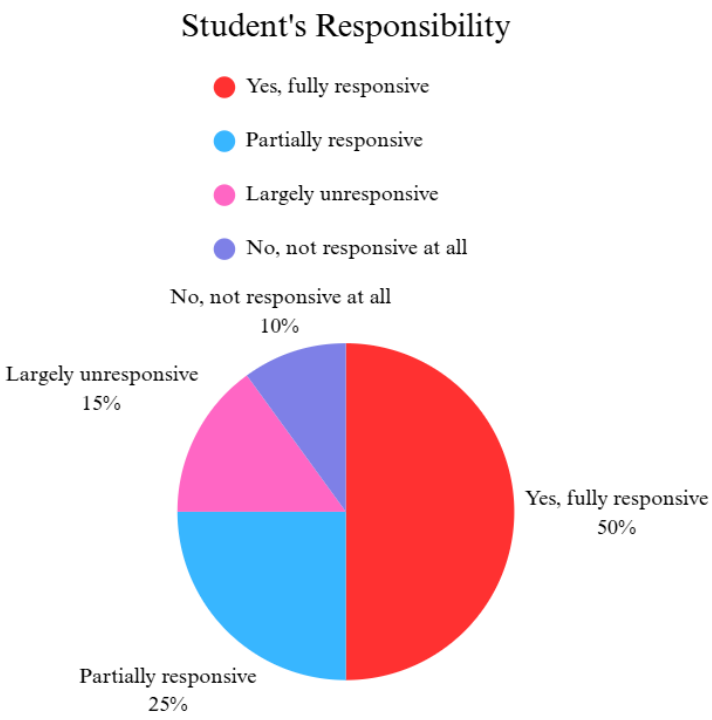

Figure 4.8: Responsibility of Garments Owners

4.2.9 What Are The Process Of Waste Management System In Your Garments?

Description

In a compliant garment factory in Konabari, Gazipur, the waste management system is a multi-step process designed to minimize environmental impact and recover value from waste materials. The process begins with segregation at the source, where different types of waste are immediately separated into designated, color-coded bins across the production floor. The most valuable solid waste, fabric scraps or Jhoot, is carefully collected, baled, and sold to textile recycling companies that downcycle it into new yarn or other materials. Similarly, plastic and paper waste from packaging are also baled and sold to certified recycling companies. A crucial part of the system is the management of liquid waste from the dyeing and washing units. All contaminated water is channeled to an Effluent Treatment Plant (ETP), where it is chemically and biologically treated to remove harmful substances and meet national environmental standards before being safely discharged. The solid byproduct of this process, known as chemical sludge, is collected separately and handled by specialized hazardous waste management services. This systematic approach ensures that different types of waste are managed appropriately, reducing pollution and aligning with the environmental regulations required by both the government and international buyers.

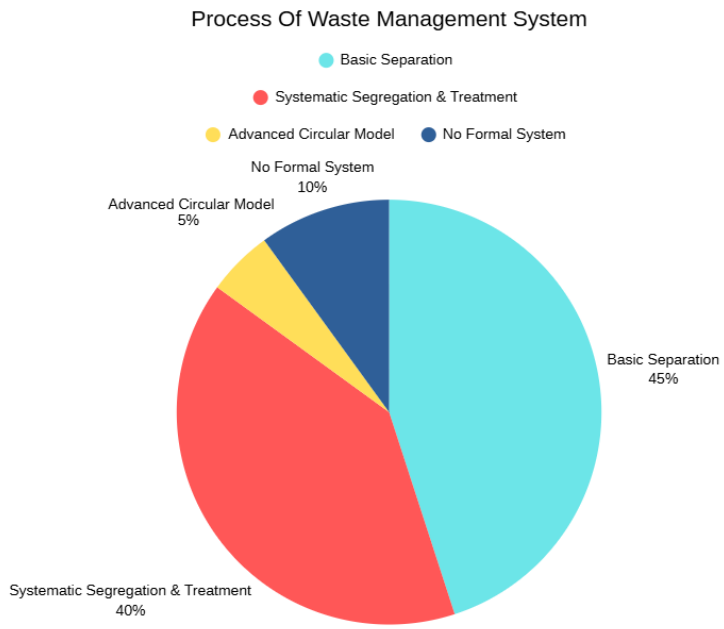

Figure 4.9: Process of Waste Management System

4.2.10 Do You Have Any Suggestion To Minimize The Waste Of Garments?

Description

In this context, a survey was made and we asked for suggestions to minimize wastage of clothes. The answers give a glimpse of different options, and the highest 30% voters favor source reduction. This is closely followed by Biological Treatment at 26% and Recycling at 24%. Recommended Management was also a major suggestion that covered 20% of the responses. This research shows that the respondents found a multifaceted approach beginning with waste prevention to be the most effective strategy of all.

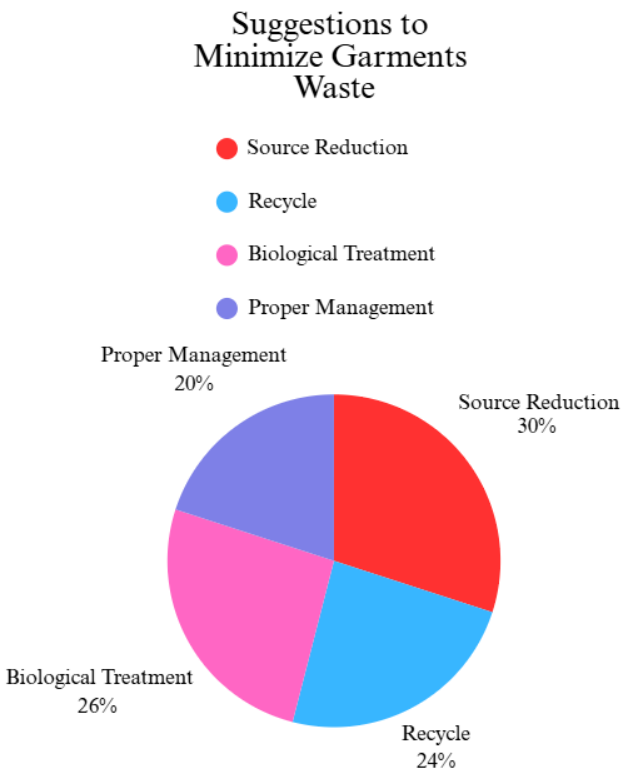

Figure 4.10: Suggestion to Minimize the Waste of Garments

4.3 Summary

In summary, the results from the field survey unequivocally establish a strong and direct link between the deficient garment waste management system in the Konabari (BSCIC) area and a high prevalence of adverse health outcomes among the local population and informal waste workers. The data confirms that current waste management practices are largely inadequate, characterized by a lack of systematic at-source segregation, widespread open dumping, and the uncontrolled release of pollutants into the environment. The analysis of health-related data reveals a significant incidence of respiratory problems, chronic coughs, and various skin diseases among residents and workers, which they directly attribute to exposure to fabric dust and contaminated water sources. Furthermore, the findings highlight the severe socio-economic vulnerabilities and occupational hazards faced by the informal *jhut* workforce, who operate with minimal safety protections and are exposed to hazardous materials daily. The discussion has contextualized these findings within the broader literature, confirming that the situation in Konabari is a microcosm of a systemic issue within Bangladesh's RMG sector. The evidence presented in this chapter provides a compelling foundation for the policy recommendations that will be proposed in the concluding section of this thesis.

Chapter V

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This final chapter consolidates the findings of the research on the garment waste management system and its effects on human health in the Konabari (BSCIC) industrial area of Gazipur City. This section will draw a conclusion on the efficacy and impacts of the existing waste management practices, delineate essential recommendations for improvement, and suggest avenues for future research based on the comprehensive analysis provided in the preceding chapters. The objective is to propose a holistic approach to tackle the multifaceted challenges associated with garment waste management, with the ultimate goal of safeguarding public health and promoting environmental sustainability in one of Bangladesh's most critical industrial hubs.

5.2 Conclusion

Our First findings of this study was to finding the **"waste management system in selected garments factory at Konabari in Gazipur city."** We have found most of the Garments factories are generating polybags , plastic , paper, chemical , oil rags, softeners water repellent agents as waste and they are harmful for our environment and health also. The amount of the waste is also a large number, we calculate it from different sources and found 700 KG of plastic , 327 KG of paper, chemical & rags 50 KG, softeners & water repellent agents 315 KG as waste.

These waste is responsible for the many problems, for example environmental and human health. Odour pollution, breathing problem, respiratory problem 35%, skin irritation & dermatitis problem 30%, headaches 20%, eye irritation 15% are the main problem for garments waste. Most of the Garments don't take a proper steps to reduces these waste. We approach some suggestion to minimize these waste by adapting source reduction 30%, recycle 24%, biological treatment 26%, proper management 20%. The study concludes that a direct link exists between inadequate waste management in the Konabari garment sector and the severe, widespread health and environmental problems, underscoring the urgent

need for stricter regulatory enforcement and the adoption of more sustainable waste handling practices. Public data concerning the practices of individual garment factories in Konabari, Gazipur with regards to internal waste management are very difficult to obtain, since such data is not commonly made public. But larger export-focused companies are some of a few that actually promote their environmental systems. For example, Tusuka Group's environmental policy clearly shows that it is dedicated to reduce pollution and to treat waste water. Likewise, chemical suppliers, including Dysin Group, have attained ZDHC (Zero Discharge of Hazardous Chemicals) certification at their top unit level to show great emphasis on sustainability. There are also other companies such as Knittex Industries Ltd. and Meditex Industries Ltd.] that have some information which is publicly available regarding their efforts at sustainability So as environmental assessment. For most of the other facilities on the list, detailed information is not available to the public about the ways in which they handle their waste. However, it is a, 'supplier's compliance' that a factory must have operational ETP (Effluent Treatment Plant) and basic waste management facility (please note, that these facilities are not addressing the hazardous waste Permit).

5.3 Recommendations For Future Research

Future research should focus on the following areas:

- Expand the stu`dy to include a larger, more representative sample of factories and communities across multiple industrial zones in Bangladesh to allow for a comparative analysis and broader generalization of the findings.
- Conduct a longitudinal study to track the long-term health impacts of exposure to garment waste and industrial pollution on workers and residents over several years.
- Carry out an in-depth economic analysis of the costs and benefits of formalizing the *jhut* sector, including the potential impact on livelihoods, national revenue, and investment in recycling infrastructure.
- Investigate the social and cultural barriers to adopting safer work practices and new technologies within the informal waste sector to better inform policy and intervention design.

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Appendix

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5	Md.Jahangir ALom	Lalmonirhat	01785718002	VIP
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11	Md.Zubayar Islam	Gazipur Kapashiya	01615267543	VIP
12	Md.shimul Choudhary	Gazipur chourasta	01714627575	VIP
13	Md. Rifat Ahammed	Gazipur	01618595134	VIP
14	Md.Limon Mia	Konabari,Gazipur	01795714813	VIP
15	Md.Habibur Rahman	Konabari Gazipur	01738338099	Worker
16	Md.Shaddam Hossain	Konabari,Gazipur	01746775097	VIP
17	Md.Shohel Islam	Gazipur Kapashiya	01889642176	VIP
18	Suddho Susom	Kashimpur,Gazipur	01727016852	VIP
19	Promithuse Sarkar	Mohona,Gazipur	01979183582	Worker
20	Md Shorot	Mohona,Gazipur	01761291984	VIP
21	Diponkor Dip	Shirajgong	01785234017	VIP
22	Rajibul Islam Ripon	Shimultoli,Gazipur	01873125512	VIP
23	Asraful Islam	Shimultoli,Gazipur	01938518772	VIP
24	Md.Ruddro	Mohona,Gazipur	01621700074	Worker
25	Md.Saddam Hossen	Tonggi,Gazipur	01765047873	VIP
26	Md. Shah Jalal	Gazipur	01615534333	VIP
27	Md. Shah Oly	Gajipur	01935249261	Worker

Fig: Garments Waste And some factory's Image

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