THE COVID 19 IMPLICATION ON PLASTIC POLLUTION IN BANGLADESH

By

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A thesis submitted to the Department of Masters of Development Studies in partial fulfillment of the requirements for the degree of
Masters of Development Studies

Masters of Development Studies
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Declaration

It is hereby declared that

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2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
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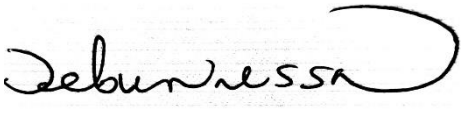

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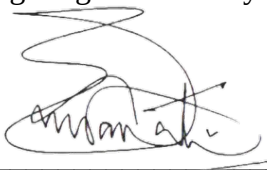

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Abstract/ Executive Summary

Bangladesh has one of the world's highest population densities. The country was just named one of the world's most polluted emerging countries. Despite its poor air quality, the country's overall environmental situation is improving significantly. Bangladesh increased its ranking in environmental pollution control from 179th to 162nd out of 180 countries, according to the Environmental Performance Index (EPI 2020). However, the ongoing COVID19 (new coronavirus illness 2019) pandemic has resulted in a public health crisis and socioeconomic disaster in every country. As a result, plastic management programs must be strengthened, with a particular emphasis on preventing the entry of micro and nano plastics into the environment and food chain. It is much more critical to understand how much plastic garbage is generated and how different countries manage their plastic waste in the current epidemic condition. To combat the COVID-19 pandemic, individuals used a variety of non-pharmacological therapies, including medical masks, goggles or face shields, gowns, and other respiratory protection equipment. During the pandemic, this equipment has already generated increased volumes of hazardous waste, which will undoubtedly have an influence on the country's inadequate waste management and overall environmental performance. The research is conducted using primary and secondary sources, as well as contemporary evidence. Additionally, this review paper proposes additional analysis and extensive documenting of Bangladesh's biomedical waste problem, which is crucial for remedial action. How worldwide plastic production increased during COVID-19 and how this increased output would have both short- and long-term environmental implications have been discus in this paper. Moreover, plastic pollution will increase GHS emissions from incineration facilities during a pandemic. This review will assist individuals in comprehending the use of plastic and its ensuing environmental repercussions during a pandemic such as COVID-19.

Keywords: Pollution; COVID 19; Environment; Microplastic; Bangladesh; Waste

Dedication:

To my parents.

Acknowledgement

I would like to express my gratitude to my primary supervisors, Professor Niaz Ahmed Khan and Professor Selim Reza, who guided me throughout this thesis. I would also like to thank my friends and family who supported me and offered deep insight into the study.

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List of Acronyms

COVID 19	New Coronavirus Illness 2019
PPE	Personal Protective Equipment
USD	United States Dollar
WHO	World Health Organization
SUP	Single Use Plastic
MDP	Marine Debris Program
UN	United Nations
FAO	Food and Agricultural Organization
UNEP	UN Environment Program

Glossary

Co2	CO2 is **carbon dioxide.**

Chapter1

Introduction and Context

1.1 Background: Plastic is a type of polymer made of long carbon chains. Because of its good physical and economic properties (like being lightweight, flexible, cheap to make, and available), plastic is used all over the place, from industries to households. Global plastic production reached 396 million tons in 2018 (Plastics Europe, 2019), an increase of 48 million tons from the previous year, and this figure is expected to rise over the next two decades (Boyle et al., 2020). Plastic waste can be reduced by prohibiting the use of single-use plastic (SUP), which is why reusable bags are becoming more popular (Schnurr et al., 2018). As a result of SARS-Cov-2 and the COVID-19 pandemic, interest in the SUPs has been revived. SUP PPEs, such as surgical masks, face shields, and other PPEs, have been adopted to reduce viral contamination and dissemination among frontline health workers and the general public (Kahlert and Bening, 2020). According to the World Bank, preventing a pandemic would undo years of work in reducing SUP use (Hossain. et. al, 2020). Polypropylene, polyvinyl chloride, and polystyrene are the most common materials used in the production of Personal Protective Equipment (PPE) (Kahlert and Bening, 2020). All of the world's oceans and rivers would become much more polluted as a result of this. In addition, pandemic lockdown has had a significant impact on plastic recycling facilities around the world, resulting in the erroneous and unlawful disposal of plastic waste into oceans and on the land (Shams et. al, 2021). Increased storms would increase the concentration of illegally dumped plastic in aquatic environments (Eerkes-Medrano et al., 2015). Discarded in nature, plastics are vulnerable to biotic and abiotic degradation processes (Lambert et.al, 2014). Plastic toxicity is caused by alterations in metabolism, oxidative stress, and inflammatory reactions in humans and other species (Benson. et.al,

2021). By Wang et. al, in 2021, COVID-19's short and long-term impacts on environmental plastic contamination will be examined in this assessment. According to COVID-19's latest plastic usage figures, researchers calculated the volume of waste produced and predicted the long-term effects on the ecosystem. In addition, the report discusses the current management approaches adopted by various governments and organizations to combat this plastic excess.

1.2 Research Problem: The COVID-19 pandemic has increased consumer demand for single-use plastics, adding to the already out-of-control global plastic waste catastrophe. A large volume of improperly disposed plastic waste is suspected to be a contributing factor in the outbreak, although neither the scale nor the long-term fate of this waste is known. It is estimated that the global plastic waste production in 2019 was 400 million metric tons. When it comes to COVID-19, the expected waste volume exceeded 530 Mt in the first seven months, which suggests that 2020 plastic trash totals will be at least double those of 2019. (Gola. et al. 2021). An estimated 3.4 billion protective face masks were thrown away every day between December 2019 and June 2020, according to estimates of the number of disposable face masks thrown away each day during this time period. Additionally, takeaway services, e-commerce, and fast-delivery enterprises have increased their use of plastic wrapping in response to social distancing requirements. There was an additional 1.21 million metric tons of plastic waste generated by Singapore's takeaway and home delivery services from April to May of next year (Gola. et al. 2021).

Since the pandemic began in 2020, governments around the world have taken a range of precautions to protect their citizens from the virus, including the use of protective gear known as PPE. An unsustainable increase in plastic consumption, however, has resulted, putting the environment in grave jeopardy. Every person living in the current coronavirus epidemic needs Personal Protective Equipment (PPE), such as masks, gloves and goggles,

in order to stay safe. There's been an increase in the use of Personal Protective Equipment (PPE), which people believe will help them fight the illness. In order to safeguard people, particularly frontline workers, who have been working around the clock since the outbreak began, PPE is essential. This presents some challenging questions for those of us who are continually advocating for environmental protection and sustainability—how will we deal with the destruction caused by Covid-19's plastic waste? In the beginning, the global quarantine established during the epidemic had a positive impact on the ecosystem. CO2 emissions around the world have decreased significantly as a result of decreased air travel and automobile travel. Governments are stockpiling personal protective equipment (PPEs) in order to stop the spread of the Covid-19 virus, but this is an insurmountable challenge. Hoarding of single-use plastic grocery packaging has also been seen in an increasing number of households. It's estimated that 89 million medical masks and 76 million examination gloves will be needed every month for the length of the coronavirus epidemic, according to the World Health Organization. According to an article in The Economist, the use of single-use plastics in the United States has surged by up to 250-300 percent (Kabir & Rabbani, 2020). The global disposable-mask industry is predicted to expand from USD 800 million in 2019 to USD 166 billion in 2020, according to a report plastic production has been aided by the drop in the price of petroleum, a key ingredient in the material's composition. The country of Bangladesh has been found to be a major plastic polluter, according to a number of recent studies. To aid in the design of viable plastic reduction and mitigation techniques, data on the presence and amount of plastic pollution is required. Plastic contamination in Bangladesh has been the subject of increased study in recent years. However, this study's output has varied in terms of aims, techniques, and data formats because of a lack of central coordination. The goal of this study is to conduct a meta-analysis of published research on plastic pollution in Bangladesh in order to identify

gaps and biases in present research and to provide ways to enhance future research to bridge these gaps. Several research holes and biases were found, including a clear preference for marine studies and a predilection for certain environmental compartments within marine, riverine, and terrestrial systems that had readily applicable methods.

1.3 Objectives of the Study: Plastic pollution is a major global issue because of its widespread, near-unmanageable hazard to living and nonliving systems and the environmental stress it produces. Plastic pollution is the accumulation of macro-, micro-, and nano plastic debris as a result of the introduction or invasion of plastic materials (i.e., polymeric systems) into environments (to which they are not native) through direct introduction or degradation processes in order to adversely impact such environments. When it comes to environmental hazards like greenhouse gases or persistent pollutants, there are no borders or laws that can stop the spread of plastic pollution. The main objectives of this review paper are-

i. To review the global implications for plastic pollution between and during COVID era and its usage.

ii. To examine the major nature and features of COVID induced plastic pollution in Bangladesh.

iii. To identify the major policy and governance implications for COVID induced plastic pollution in Bangladesh

1.4 Methodology: Plastic pollution is a significant concern in Bangladesh, and this review study provides an overview of the current level of knowledge on the subject. The data can then be used to provide recommendations for plastic research in Bangladesh that address the identified shortcomings. This summary of the current literature on plastic pollution in Bangladesh was compiled using a meta-analysis of 83 peer-reviewed articles published between 1985 and 2020. A primary goal of this research is to shed

light on the types of research concerns that must be addressed in order to bridge knowledge gaps and enable policymakers to implement and evaluate effective solutions.

The entire study is conducted through a review of the available and most recent literature, which is a qualitative form of investigation. The snowball method was used to conduct the literature search. To begin, a literature search was conducted using various combinations of the following keywords: plastic, microplastic, litter, pollution, river, Bangladesh, global pollution debris, and trash.

To guarantee the data/information gathered was real, the review evaluated only journal articles, newsletters, and organizational papers. To ensure that the informative dataset remained relevant to the review article's topic, documents were manually screened based on their summary (for news articles and organizational reports) or abstract (for journal articles), excluding those that were not found to be exclusively relevant to the review topic. Finally, a total of 55 documents were considered and referred to for the review, including 30 journal articles, 15 organizational documents/reports, and 20 news stories.

Chapter 2

Literature Review:

2.1. Global Implications of Plastic Pollution:

According to media reports and newsletters, the mismanagement of plastic rubbish during the COVID-19 pandemic has contributed to an overall public perception of plastic as an environmental problem. In contrast to this widely held belief, consumers' reckless and careless attitude toward resource mismanagement and underutilization are the primary drivers of plastic pollution. According to American scientific study, global air quality has improved considerably due to social distance, which keeps people

off the highways and out of the air. 2020 is predicted to have a 4% drop in carbon emissions compared to 2019. The famed haze in China was eliminated thanks to long-term manufacturing shutdowns, which reduced pollution levels significantly. In Asia, the coronavirus's enhanced scrutiny of wet markets may have a longer-lasting effect of increasing wildlife conservation activities (where the virus is suspected to have spread to humans). Animal imports and wildlife marketplaces have been banned in Vietnam, one of the most egregious violators. What an incredible piece of news this has been.

There is no such thing as good news for our oceans, which have been battered recently. An estimated 129 billion masks and 65 billion gloves will be used each month around the world as a result of COVID-19. If we stitched together all the masks that have been made or are expected to be made, we could cover the entire country of Switzerland. The use of single-use plastics will increase tenfold by 2020 as a result of the Covid-19 epidemic. Disposable masks and face shields, such as those used by 96 percent of the world's population, are thrown away in the trash, providing a risk of plastic pollution. Plastic waste is a health and environmental hazard. Plastic trash, particularly microplastics, have a significant negative influence on the marine ecosystem, and when they reach the food chain, they induce gastrointestinal distress in animals. Even in fresh water, humans can swallow microplastics, which are microscopic plastic particles. In countries including the United States, Germany, Brazil, and India, the most common methods of disposing of plastic waste are incineration and landfilling. Approximately 10,000 kg of dioxins/furans are released into the environment each year from plastics that are burned in landfills, causing substantial health hazards such as headaches, nausea, heart disease, respiratory illness, and reproductive issues.

166 million people call Bangladesh home, making it one of the most populous countries in the world at this point in time. Bangladesh's dense population hasn't slowed the country's

economic expansion. Three thousand small and large plastic factories are currently operating in Bangladesh, which placed 12th in the country's top export earners for fiscal year 2017–18. After increasing from 2.07 kg in 2005 to 3.5 kg in 2014, Bangladesh now generates 3000 tons of plastic waste every day, which accounts for around 8% of the country's total waste production. In comparison to other affluent and neighboring nations, Bangladesh's per capita use of plastics is relatively low, but the global share of uncontrolled plastic rubbish is extraordinarily large (Based on 2010 data). Per capita plastic use increased by 16.2 percent between 2005 and 2014, compared to approximately 25 percent worldwide. With a market value of roughly USD 3 billion, the plastics industry is expected to develop in the future, with USD 2.2 billion of that being local and USD 0.8 billion being foreign. To make matters worse for the environment, this company's rapid expansion is likely to result in massive amounts of plastic waste. Flooding occurs when waste plastic plugs drains, preventing water from flowing. Thousands of people are killed each year by Aedes mosquitoes that thrive in stagnant water. The Bay of Bengal's marine environment suffers greatly as a result of the massive buildup of plastic waste. On four sea beaches in Cox's Bazar, 63 percent of the 6,705 pieces of debris recovered were made from plastic. Fish reproduction could be harmed and helpful animals wiped off if these vast plastic wastes are allowed to accumulate. The biota, ecology, and fertility of soil are all harmed by plastic trash in soil, as is the entire agricultural industry as a result. A ban on poly bags was implemented by the Bangladeshi government on March 1, 2002, in order to reduce plastic pollution. Tax exemptions for recycling plastic are another way to encourage reuse and discourage single-use plastic. Despite this, there has been minimal progress throughout the course of time.

As a cost-effective and environmentally benign strategy of eliminating this huge plastic waste, recycling in Bangladesh is still at an early stage. In addition, many people prefer to

dispose plastic waste in open spaces, on the side of the road, in rivers, and at the shore instead of recycling it. When the country used up 545,300 tons of plastic in 2014 but only generated 50,213 tons of recyclable waste, it means that only 9.2 percent of the country's overall use of plastic is recyclable. There is a lack of information regarding the long-term effects of plastic pollution on human health because of the high cost of recycling, a lack of available technology, and a lack of awareness about the implications of plastic pollution. Currently, 51% of Bangladesh's plastic waste is recycled, but there is potential to save USD 801 million per year by recycling the other 49%. Even though most of it is dumped in landfill along with other debris, the two city corporations of Dhaka, Dhaka North and Dhaka South, have recently made collecting household plastic rubbish a priority. Exporting recycled plastic flakes is the primary goal of Bangladesh's plastic recycling business. Plastic trash has a high calorific value of 20 to 46MJ/kg, which means that gasification or incineration energy recovery from daily plastic waste can generate up to 5,115–11,760 MWh/d of electricity. As recently as a few months ago, the government began building two Dhaka-area waste-to-energy plants, one at Aminbazar Landfill and the other at Matuail Dump, to make use of the city's daily trash.

Chapter 3

Plastic Recycling Context:

3.1. An Overview:

An inadequate amount of effort has been made to measure the amount of plastic waste in various environmental compartments and the resulting effects on the environment and health of the public in Bangladesh. There are many studies out there that show how plastic pollution affects public health; this study aims to show how plastic pollution in Bangladesh affects the environment and how it affects people's lives. In addition, based on government-mandated data, this study will suggest some feasible measures for reducing the increase and impact of plastic pollution. Authorities worried about plastic pollution should

use the findings of this study to rethink current approaches and devise new strategies for tackling the problem. Since this pandemic has taken hold, there has been a shift in the momentum of a long-standing movement to limit SUP production and use (Shen et al., 2021). SUP bans were briefly rescinded or deferred in many countries due to concerns about cross-contamination from reusing plastic bags or containers that were spread by and supported by the plastics makers. United States officials said earlier this year that they were working on a strategy to reduce SUP pollution by requiring people to bring their own recyclable bags and prohibiting the use of plastic straws. In New York, for instance, a proposed state-wide plastic bag ban has been put on hold until May 2020. There have been recent pauses or delays in the limitations on SUP products in California and Oregon, as well as Connecticut and Delaware recently suspending their bans on plastic bags (USAToday,2021). In the face of coronavirus transmission, Massachusetts and New Hampshire have reintroduced SUP products to discourage the use of reusable plastic bags (World Bank,2020). SUP production has increased by 30% in Thailand despite a ban on single-use plastic bags that went into effect in January of this year (2020) in an attempt to minimize the country's plastic waste production (TEI, 2020). As a result of limited transit during pandemic-induced lockdowns, the cost of plastic manufacturing has fallen dramatically, contributing to the sudden growth in plastic product production and supply in proportion to demand.

Many aspects of the garbage disposal process were impacted by the epidemic, including the dynamics of rubbish generation and decomposition. Global plastic waste output has increased as a result of the unprecedented use of plastic-based personal protective equipment (PPEs) by health care workers and the general public (Patrcio Silva et al., 2020). Reverse transcription polymerase chain reaction (RT-PCR) diagnostic kits for coronavirus use disposable plastic components, which can be disposed of after use (RT-PCR). Plastic rubbish has been developed because of concerns about hygiene. Increased use of SUPs and plastic-based

packaging materials during the pandemic has also exacerbated the production of plastic garbage (Shams et.al, 2021; WEF,2020). During pandemics, the global demand for medical goods and packaging increases, which leads to an increase in plastic packaging waste (WHO-UNICEF, 2020). If there is a pandemic, most of the BMW stream will be infected PPE and other disposables from affected sources, along with unaffected non-infected equivalent products (UNEP,2020; Yang et al., 2021). The unique coronavirus outbreak, which necessitated the widespread use of PPE and other disposables mostly made of plastic, has been directly linked to the COVID-19 BMW generation's elevated plastic content (Klemes et al., 2020). During the pandemic, certain Asian countries' or their main cities' average daily creation of biological waste containing plastic garbage is provided. A report from China's Ministry of Ecology and Environment estimates that during the outbreak, medical waste generated in Wuhan increased from 40 tons per day before the epidemic to 240 tons per day after it, with a higher proportion of plastics (Klemes et al., 2020). In the event of a pandemic, individuals may believe that medical waste that contains plastics is exclusively generated in hospitals. A recent study discovered that 200 public trash bins in Wuhan, China, had 200 kg of abandoned masks (SUEZ, 2020). Medical waste creation soared by 370 percent during the outbreak in Hubei Province, China, resulting in 207 kilograms of plastic garbage (Kleme et al., 2020). It's estimated that Bangladesh produced 14,500 metric tons of hazardous plastic garbage in the first month after the COVID-19 outbreak, with Dhaka alone generating about 30,765 metric tons. There were face masks, gloves, and single-use plastic bags in the trash (ESDO, 2020). The production of 1216 million disposable hand gloves resulted in the creation of more than 12,000 tons of plastic garbage. It was estimated that in hospitals, plastic surgical masks and gloves made about 250 metric tons (MT) of medical waste. Between February and March of 2020, South Korea produced 295 metric tons of medical waste involving plastics. As many as 2,907 hospitals, 20,707 quarantine facilities, 1,539. samples are being collected,

and 264 testing facilities in India are all working together to create the COVID-19BMW Virus (CPCB, 2020b). According to one study, for every 1000 coronavirus tests, the RT-PCR process generates 22 kg of plastic trash. A whopping 14.5 tpd of plastic garbage is generated alone by the process of evaluating new products. COVID-19 biological waste, which includes plastic rubbish, generates roughly 101 tons of biomedical waste every day in India (CPCB, 2020b). The average daily production of COVID-19 biological waste comprising plastic debris at the state level in India. Plastic trash production has skyrocketed since pandemic-related lockdowns in many nations prompted an increase in the usage of single-use plastics and plastic packaging materials for online shopping and takeaway services. To effectively manage plastic garbage during a pandemic, sustainable techniques and robust infrastructures must be implemented to ensure long-term success.

Health care providers in cities with high incidence of COVID-19 infection are generating a considerable amount of medical waste. Medical waste creation at Jordan's King Abdullah University Hospital, for example, was 10 times greater when 95 COVID-19 patients were present (650 kg per day), as compared to the hospital's typical generation rate. Catalonia, Spain, has had a 350 percent increase in medical waste, while China has seen a 370 percent increase. Each country's or municipality's capacity to manage/treat medical waste is being strained by the enormous growth in the volume of medical waste generated. Because of the SARS-CoV-2 virus's tenacity and high contagiousness, many countries have declared all hospital waste infectious and mandated its incineration at high temperatures to assure sterilization before the ash was disposed of in landfills. When it comes to properly disposing of medical waste, some countries and municipalities (with greater financial and waste management resources) may have the option of doing so, while others (with fewer resources) may be forced to use ineffective management strategies, increasing the risk of a second epidemic wave. One day in February 2020, Wuhan's 11 million residents created 200 tons of

medical waste, four times the amount that can be burned in Wuhan's sole specialist facility, forcing officials to deploy mobile treatment facilities. On the other hand, many Indian municipalities rely significantly on landfilling and local burning schemes to dispose of medical waste. Toxic compounds such as heavy metals and dioxins, PCBs, and furans can be released into the atmosphere when medical waste, which is mainly constituted of plastic, is burned uncontrolled. Where this content is needed and vital, there is a dearth of it. To prevent the spread of infection, surgical masks and gloves should only be worn for a short period of time before being discarded. The disposal of potentially infectious personal protection equipment has been a major concern for many countries (PPE). According to the circular economy and sustainable development goals, this decrease in trash recycling may lead to the contamination of plastic garbage. PPE, like empty hand sanitizer bottles and organic solid waste, is prone to ending up in regular municipal solid garbage if no safeguards are taken. More and more public locations have been found littered with discarded plastic gloves and masks. When the NGO Oceans Asia was conducting environmental research on the Soko's Islands beach in Hong Kong (http://oceansasia.org/beach-mask-coronavirus/), they discovered many disposable masks (in compared to the one or two pieces recovered per month).

Since personal protective equipment (PPE) generated more garbage, other single-use plastics have seen an uptick in consumption and disposal (SUP). Packaging is expected to rise by 40%, while other uses of plastics, such as medical, are expected to grow by 17%. It is not obvious how reusable grocery bags contribute to a higher risk than clothing or shoes, a potential danger that can be addressed by adequate hand hygiene and decontamination baths (i.e., soaking in liquid soap and water temperature > 40 °C). Mixed municipal solid waste (MSW) may be used as the final disposal method for many SUPs at COVID-19 because of the global restrictions on recycling streams. It's becoming a global and rising problem as

COVID-19 disease continues to spread over the world due to the indiscriminate usage and wrong disposal of medical and plastic waste by billions of people (most of them with low biodegradation rates in open locations).

3.2. Governance and Policies in Bangladesh for Waste Recycling and Plastic Pollution

Implication: On March 1, 2002, Bangladesh's government banned the use of poly bags in order to reduce pollution from plastic bags. To encourage recycling and discourage the use of single-use plastics, the government is giving tax exemptions on the grounds of recycling. Despite this, little progress has been made over time. Even though recycling is the most cost-effective and environmentally-friendly way to get rid of this vast plastic waste, recycling is only just beginning to take hold here in Bangladesh. More often than not, people simply dispose their plastic garbage in open areas, on the side of roads, in rivers, or at the edge of the sea, rather than preparing it for recycling. It is estimated that just 9.2 percent of the 545,300 tons of plastic consumed in the country in 2014 could be recycled, based on the amount of plastic garbage that could be recycled at the time. There are several factors that contribute to the land filling or dumping of plastic debris into waterways such as canals, lakes, rivers and even the sea, including the high cost of recycling, the absence of accessible technology and a growing awareness of the harm caused by plastic pollution. More than half of the 633,129 tons of plastic garbage generated in Bangladesh's urban areas is recycled, saving the country an estimated USD 801 million annually. Despite recent efforts by the city corporations of Dhaka North and Dhaka South to increase the collection of plastic waste from residents, the majority of it is still deposited in landfills together with other waste. No items with a bright future are produced by Bangladeshi recyclers, who just sell recovered plastic flakes for export Plastic garbage has a high calorific value (between 20 and 46 MJ/kg) and may generate 5115–11,760 MWh/d of electricity by gasification or incineration. Two waste-to-energy generating

plants have recently been installed in Dhaka to generate electricity from the city's daily waste, one at the Aminbazar landfill and the other at the Matuiail landfill.

A lack of effort in Bangladesh has been made to estimate the amount of plastic garbage in different environmental compartments and the accompanying environmental and human health implications. As a result, the purpose of this research is to provide a comprehensive picture of Bangladesh's plastic pollution problem and the harm it causes to the environment, including air, soil, and water, as well as public health. Along with the government's measures, this study will provide some feasible solutions to reduce the growth and impact of plastic pollution. Researchers expect that the findings of this study will reshape public perceptions of plastic pollution and inspire innovative approaches to managing the garbage.

A significant rise in the usage of single-use plastic products like as masks and other medical and personal protective equipment (PPE) followed Covid-19 (MPPE). There are efforts underway to revise Bangladesh's plastic sector road map, which includes a goal to make the country a 50th-largest exporter of plastics by 2020, from its current position as an 89th-largest exporter. This indicates that Bangladesh's plastic manufacturing will continue to grow. A circular economy can only thrive if waste is minimized, the environmental impact is kept to a minimum, and pollution is minimized.

This industry is substantially behind the curve when it comes to trash management. According to various estimates, Dhaka generates roughly 1,825,000 tons of plastic and other rubbish each year (daily amount is 4,000-5,000 tons). Every year, around 6.5 million tons of plastic waste are dumped on land and in the ocean. (2018 report). Dhaka generates about 139,065 tons of plastic trash each year (daily around 381 ton). Bangladesh generates 800,200 tons of plastic waste per year, of which 36% is recyclable. According to the World Bank, only 8% of Dhaka's daily 381-ton plastic rubbish is recycled, with the rest 62% being dumped into the environment (Daily Bonik Barta, June 13). An estimated 87,000 metric tons of single-use

plastic waste is generated annually across the country. The image is so terrible that it needs to be taken care of immediately.

Despite the fact that about 70 percent of countries have formed government organizations with the duty to develop policies and execute rules for solid waste management, most governments try to address solid waste management at the subnational or local level (World Bank 2018). Solid waste management rules are in place in almost two-thirds of countries. However, implementation and adherence to these policies vary widely, and cities gather far more waste than rural areas (World Bank 2018). Local governments use a variety of instruments to help recover costs, including waste separation at the source, the establishment of disposal sites, a ban on certain waste materials, household and commercial user fees, and, in some cases, the sale of recycled materials and compost or a tax on consumer goods to help recoup the costs (World Bank 2018).

Extended Producers Responsibility (EPR) may be a realistic option for waste management in view of the aforementioned predicament. EPR is a policy approach that compels producers of plastic items or enterprises that utilize plastic packaging to take on some of the burden for post-consumer waste management. It is possible for producers to be directly or indirectly responsible for garbage collection and management, either financially or physically. By reducing waste management costs and taxes, EPR has the potential to help municipalities cut their budgets for waste management. Environmental Conservation Act (ECA) may have a new shape because of this change in the Polluter's Pay Principle. Reduce the strain on biodiversity and infrastructure, make rubbish collection easier, and ensure that products and packaging are built responsibly.

An EPR Special Regulation Order (SRO) was suggested by the Department of Environment in 2018, however it has not yet been finalized. Manufacturers of food, beverage, and agri-insecticide products are held responsible for the usage of plastic packaging. The SRO states

that producers must either collect waste packaging materials themselves or contract with a third party to do so on their behalf. In order to meet the goal of collecting 100% of packaging by 2025, producers must register their recovered packaging and make preparations for recycling or environmentally acceptable treatment. A plastic waste management plan is also required when filing for an Environment Clearance Certificate (ECC) and when renewing an ECC by submitting information on recycling or treatment of plastic trash. Section 15 of the 1995 Criminal Code lays out the parameters of what constitutes a crime.

3.3. Global Practices: From Pollution to Solution: A global evaluation of marine litter and plastic pollution,' which was issued on October 21, 2021, serves as evidence that urgent action is needed in reducing plastic emissions into the ecosystem. Most marine litter is composed of plastics, which account for at least 85% of the total, according to the authors. Plastic waste emissions or leakage into aquatic environments have increased dramatically in recent years, according to the analysis, and are expected to nearly treble by 2040.

The ubiquitous plastic bag has come to symbolize the growing global problem of plastic litter in recent years. Although seven distinct definitions exist around the world, it is more difficult to reduce the use of plastic bags.

The most generally used method of decreasing plastic waste is to ban plastic bags and other kinds of plastic packaging. This strategy has been implemented by 115 countries so far, each in their own unique style. Thinner than 50 microns are not allowed to be used in France, according to the law. Tunisia prohibits the use of bags with a thickness of less than 40 microns. Discrepancies like these allow illegal bags to slip through the cracks and wind up in the hands of market vendors and stall owners. Smuggled bags from Uganda and Somalia have been a problem for Kenya, which adopted the world's strictest bag ban in 2017. Similar changes have occurred in Rwanda.

Although a Rwandan recycler enquired about the packaging, millions of mosquito nets imported from the United States arrived in plastic packaging with no indication of the chemicals contained within. Consequently, they were rendered unusable and therefore unrecyclable. It's a huge task for global firms like Nestlé that sell products in 187 countries to comply with 187 different regulatory limitations on plastic packaging. These are only a few of the many irregularities, discrepancies, and a lack of transparency in the global plastics trade that make it impossible to keep track of the massive buildup of plastic waste.. For example, there are no global norms for operations such as deciding which plastic components can be blended together to form a single product; this offers a potential nightmare for recyclers as there are no global laws for such practices. Measuring the amount of plastic waste emitted into the environment is difficult due to the lack of globally recognized methods. Putting everything back together becomes practically impossible without standard operating procedures and specific knowledge.

A global agreement to eliminate plastic waste is finding increasing public backing. Many countries have voiced support for a plastics treaty and many involved in preliminary discussions are optimistic that one will be passed at a pace that will have an impact, comparable to how the groundbreaking Montreal Protocol was established in 1987. Nations will not be able to fulfill their obligations in the future without international collaboration and an international framework, according to the author of this article. "It is not going to work," says Hugo-Maria Schally, head of the European Commission's unit for worldwide environmental cooperation. According to the president, "it is a concrete problem that requires a concrete solution, and that solution will be delivered by a global agreement."

When it comes to making plastic more environmentally friendly, Schally tells the plastics industry: "You can either engage with public policy to make this material more sustainable and thus be a part of the solution, or you can get defensive and become a part of the issue.

The main argument against attempting to impose a convention through the United Nations and its 193 member states is that negotiations might drag on for a decade or more, and there is little time to spare on the plastics crisis.

Around 303 million tons of plastic waste is produced each year (275 million metric tons). Seventy-five per cent of all plastic ever produced has been dumped into our environment, and by the year 2050, that number is expected to have tripled. Ocean plastic waste is expected to triple by 2040, reaching an average yearly accumulation of 32 million tons (29 metric tons) according to new research published in this year.

Given those numbers, it should come as no surprise that none of the countries who are the largest producers of environmental plastic trash have been able to establish control over their improperly managed waste. Despite the fact that international treaties take time to finalize, no environmental crisis of this magnitude has been effectively addressed without one. Unprecedented efforts were made to regulate "all aspects of sea resources and ocean uses, and thus bring stability to mankind's very source of life" with the 1982 United Nations Convention on The Law of the Sea (UNCLOS). UNCLOS came into force ten years later in 1994 and is commonly referred to as a "Constitution for the Oceans" (Gagain, 2012). United Nations, 1982). In spite of its wide range of topics, including territorial sea limits, economic jurisdiction, the legal status of resources on seabed beyond national jurisdiction, conservation and management of living marine resources and environmental protection, the Convention did not include any specific provisions regarding plastic pollution. The United Nations Convention on the Law of the Sea contains 320 articles, of which 46 (Articles 192-237, Part XII) are devoted to maritime environmental conservation and preservation. When it comes to protecting the marine environment from pollution caused by dumping, Article 210 of the UN Convention on the Law of the Sea states that each signatory state has the right to allow, regulate or restrict the practice after consulting with other states that may be harmed as a

result of the dumping (United Nations, 1982). It appears that UNCLOS' proposed measures to combat ocean plastic pollution are ineffective, given that pollution is a transnational issue that transcends national borders and that marine waste, in general, and plastic debris in particular, are often difficult to identify as a source of marine wastes. Although this large and complex document has inherent limits that result from fundamental regional, historical and economic issues. This Convention has no signatory state in addition to the United States, an important role in regional marine security and environmental preservation. According to Bateman (2007a). Flag states typically fail to fulfill their obligations under the Convention because of intermittent adherence to its standards and principles. As a result, coastal governments have increasing obligations in areas including as pollution prevention and response, search and rescue, and navigational information and infrastructure under the UN Convention on the Law of the Sea (UNCLOS). In these cases, UNCLOS does not allow for compensation. It is nonetheless an important milestone and the de facto basis for dialogue between member states and the beginning of processes that, if successful, may drastically reduce the amount of plastic trash entering the environment in the long term even though UNCLOS is no longer in effect. There is a global agenda for marine debris that is especially developed for prevention, reduction, and management. UNEP and the Marine Debris Program (MDP) of the United States National Oceanic and Atmospheric Administration (NOAA) worked on this global agenda. "Preventing, mitigating, and abating" the ecological, human health and economic impacts of marine debris worldwide, as well as "raising public understanding of the relevance of marine litter" (UNEP/NOAA, 2011) are some of the goals of the text. Its execution, however, depends on the countries that have signed on to the agreement's non-binding nature in order to address the widely acknowledged problem of plastic pollution in their own country. MARPOL, 73/78, was designed in a similar manner to cope with ocean-based litter pollution, and it was a success. The International Maritime

Organization's Annex V, which was amended in 2012, is another key international regulation document. (IMO, 1988). The MARPOL convention mandates that all ships must use land-based disposal facilities to dispose of their refuse (Vince and Hardesty, 2018). More than 154 countries have ratified the treaty by the middle of 2016, effectively accounting for 99 percent of global annual shipping traffic. International Oceanographic Commission and Food and Agriculture Organization (FAO) recommendations have been produced as a follow-up to MARPOL on marine litter and lost, abandoned, and discarded fishing gear surveys and monitoring (Crawford and Quinn, 2017). The flag state is the jurisdiction whose laws the vessel is registered or licensed under and which is regarded the nationality of the vessel when it comes to enforcing marine pollution rules and bans in international waters. Flag states, on the other hand, are often unable or unwilling to fulfill their obligations (Dewey, 2018). MARPOL compliance may be improved through multilateral trade and investment agreements, such as Free Trade Agreements, according to Huang and Hu (2018). Microplastics, which are plastic particles less than 5 millimeters in diameter, were recently addressed by the United Nations Environment Assembly (UNEA) in Nairobi (Kenya) and adopted a draft resolution on marine litter and microplastics (UNEP, 2017), which can either be directly discharged into waterways or formed once in the environment, as in the case of fragmentation of larger particles (UNEP, 2017). da Costa and coworkers (2017a). According to the paper, many "challenges (...) tackling marine plastic pollution in the face of rising production and consumption of plastics in products and packaging" have been identified as part of this draft report. According to the statement, it also calls on "all countries and other stakeholders to make responsible use of plastic while making every effort to limit needless plastic consumption, as well as to promote research and deployment of environmentally sound alternatives." The importance of both public and private efforts to reduce pollution is also underlined. Cross-industry agreements have been made, and some corporations have

created their own initiatives in this area. As an example of such a proposal, a collection of European industry organizations with a combined membership of around 180.000 enterprises has proposed an agreement on "preventing microplastic leakage into aquatic habitats during the washing of synthetic fabrics" (AISE et al., 2017). Single-use plastics have been phased out or reduced in some businesses' products, and refillable containers have replaced single-use plastic containers in their products' packaging as a means of decreasing waste (Beament, 2018; Butler, 2018; Eschener, 2019). In the same year, the United Nations declared the Ocean Science Decade for Sustainable Development (2017). From 2021 until 2030, the Decade will be in effect. (United Nations, year 2020) Aside from dealing with the pressing issues of pollution and marine debris, we want to help create and promote science-policy interfaces that will aid in the long-term management of our oceans and coastal areas (United Nations, 1982). With public support for ocean conservation on the rise (2018–2020), this program could reap considerable advantages. As an added bonus, the creation of ocean preservation policy based on knowledge from several disciplines – including geology, chemistry, and physics – may provide an opportunity that comes along only once in the field of ocean preservation.

Chapter 4

Lessons and Conclusion:

4.1 Lessons for Bangladesh:

Bangladesh's plastics and plastic goods sector was established in the 1960s and has since evolved into a major contributor to the country's GDP. PVC bags less than 55 micron in thickness (whose use has increased drastically over the years) are particularly convenient and readily available, which has contributed to the growth of the sector. Bangladesh's plastics industry is a major source of revenue and job creation in the country's overall economy. For the past decade, the yearly growth rate of the plastic

manufacturing industry has amounted to almost 20% (IDLC, 2015). Since the 2015-16 fiscal year, Bangladesh has begun exporting plastics, including waste, from the country. According to the World Bank, Bangladesh exported USD 477 million in 2018-19, with USD 120 million in direct exports and USD 357 million in indirect exports. Every year, Bangladesh imports about 0.4 million tons of plastic raw materials, including HDPE, LDPE, PP, PET, PVC, PC, and PS. Most often imported plastic raw materials are HDPE and LDPE, as well as PP and PET. Despite the fact that PVC is the most dangerous and harmful of the common polymers, it is also the most extensively utilized. An estimated 0.8 million metric tons of plastic waste is generated each year. Approximately 36 percent of all plastic waste generated is recycled, 39 percent is landfilled, and the other 25 percent is leaking or uncontrolled and enters the marine environment (Waste Concern, 2019). Approximately 10% of this plastic waste is single-use plastic, which cannot be recycled, while the rest is recycled. The outcome is that these trash items end up in landfills and rivers.

It is impossible to quantify the amount of plastic waste generated because there is no data on the trans-border pollution of single-use plastics migrating from India to Bangladesh. If the Bay of Bengal's plastic pollution includes both Bangladesh and India, it will be substantially larger than the national estimates of the problem. Researchers have revealed that micro and nano plastics can infiltrate animal cells and enter the food chain, posing a major health risk to humans. Clause 6(A) of the Bangladesh Environmental Conservation Act (BECA) 1994 forbids the use of polythene bags that are less than 55 microns in thickness. Only polythene bags with a thickness under 55 microns are covered under this section. The High Court has ordered the proper authorities to restrict single-use plastic goods in coastal areas, hotels, motels, and restaurants all over the country since they are a health and environmental hazard. Unfortunately, the law's full implementation was impossible due to a lack of staff at the Department of the Environment (DOE) (DOE).

Recycled plastic makes up 37% of the country's total plastic trash. 50 percent of plastics will be recycled by 2025, and 80 percent will be recycled by 2030, under the action plan's goals for plastic recycling. Its most favorable characteristics have been turned into a curse due to an increase in the amount of plastic being manufactured, used, and disposed of in the environment. Due to its impact on marine ecosystems, aesthetics, and marine life's health, pollution has gained much attention in the recent decade. A majority of plastic materials can only be used once, hence packaging materials account for half of all worldwide plastic rubbish (UNEP, 2018). While the majority of this waste is generated in Asia, the World Bank says that the United States, Japan, and the European Union are the three greatest per capita producers of plastic waste worldwide. In contrast, just 9% of the nine billion metric tons of plastic manufactured to date have been recycled (UNEP, 2018). Because most plastics are not biodegradable, sunlight causes them to break down into microscopic fragments known as microplastics.

Every year, more than a million seabirds are killed by plastic pollution, making it one of the most significant forms of marine pollution. Plastic dissolves slowly when exposed to ultraviolet radiation, according to a Florida study, but the rate of disintegration is so slow that it might take years to achieve the half-life of a single plastic disposable cup. Adding UV stabilizers to plastic to increase its lifespan just makes the problem worse. Turtles, for example, have been known to take plastic bags to their stomachs and regurgitate them as food. Container degradation into microplastic is one of the most serious dangers of not treating plastic trash. As a result of animals ingesting the toxic substances used to make plastics, researchers believe that these contaminants have made their way into humans' food chain. For more information, see The State of Plastics (2018).

4.2 Conclusion: Given the alarming trend, it is important to identify the pressing need for a rethinking of the world's fundamental goals and ambitions, taking into account the

implications for economies, societies, and, most crucially, the environment. Worldwide, massive amounts of plastic rubbish (including medical waste) are generated, with the vast majority being landfilled or burned (both of which are less environmentally friendly and have a greater negative impact on the environment), and just a small percentage being recycled. As a result, current projections (4–12 million tons of plastic garbage poured into the seas and oceans each year) will be exacerbated. When health-related issues are resolved, it will be important to address not only plastic waste, but also all of the consequences (indirect impacts) that will arise as a result of our failure to consider the long-term consequences of changing our priorities. Consider that human health is intricately tied to and dependent on the health of our environment and ecosystems; if we continue to think in terms of "today," rather than "today in the context of a sustainable future," there will be no future. Researchers should take a more active role in promoting goal-oriented dialogue between legislators, producers, and members of the general public by embracing their ethical responsibilities as information brokers.

Due to the intrinsic qualities of plastic, the COVID-19 incident demonstrated the need of plastic as a protective barrier in the healthcare industry and public health safety. As a result of the pandemic-induced increase in plastic use and trash generation, the widespread impression of plastic as a nasty polluter has been reinforced by its improper management and underutilization of resource value in the aftermath of the pandemic's increased use and waste creation. If one compares the functions of plastic with its drawbacks, it becomes clear that inadequate social awareness on the part of customers, along with the inadequacy of the present waste management system, are the primary factors that contribute to plastic becoming a pollutant of the environment. When circular economy ideas are effectively implemented, plastic can serve as a protector rather than a polluter, which is critical to understanding. Maintaining a high level of progress in the reprocessing and reusing of personal protective

equipment, particularly for firefighters, requires the adoption of effective decontamination processes that do not cause significant disruption to the supply chain, in order to maintain the circular economy as a top priority. Also encouraged should be research and product innovation in order to develop ecologically friendly and reusable personal protection equipment kits and carry bags made of bio-plastics with a better recycling rate. Machine learning and the Internet of Things (IoT) can help automate existing waste management systems and infrastructures so that plastic trash can be sorted out and recycled more easily, according to this report. In order to contribute to the circular economy, pathogenic plastic trash must be encouraged through legal laws to be mechanically recycled. It's hard to deny the value of chemical recycling, which turns mixed plastic waste into useful materials like fuels and chemicals. A long-term strategy is needed to change customers' behavior and raise public awareness about the consequences of plastic pollution through IEC programs and educational curricula. In order to prevent plastic from degenerating into a polluter rather than a protector with high functionality, it is necessary to implement better safety practices and long-term technical solutions, as well as stringent regulations for the shift to a circular economy paradigm and consumer education to raise awareness.

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