Traditional Journal of Law and Social Sciences (TJLSS)

January-June 2023, Vol. 02, No. 01, [73 – 88]

Published: 21th May 2023

https://ojs.traditionaljournaloflaw.com/index.php/TJLSS

RESEARCH PAPER

An Analysis of Legal Frameworks Concerning Waste Management in Bangladesh: Prospects and Challenges

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ABSTRACT

One of the most concerning problems facing Bangladesh's environment and society at large is the accumulation of hazardous waste. Developing nations like Bangladesh have more long-term difficulty when it comes to waste management. Also, the administration, particularly the relevant local Government of the municipality, is struggling to deal with the problem due to a lack of adequate manpower, an antiquated waste management system, a lack of necessary technological resources, and widespread corruption. As a direct consequence, ensuring the long-term viability of waste management practices has become significantly more difficult. This study discusses the cognitive Idea of electronic waste, environmental dangers, and waste creation mechanism associated with it, and the method by which waste is produced. At the same time, the research highlights the conceptual components included in the most recent waste management systems used across the country. In addition, this paper has made an effort to analyze the limitations and shortcomings of the Government's present national legal rules and suggested ideas to develop waste management systems that are effective and sustainable to remove the dangerous effects of hazardous wastes.

Keywords: GSCM, Sustainable waste Management, Extended producer responsibility, DOE, ECA.

INTRODUCTION

In Bangladesh, during the past several decades, waste management has emerged as one of the most serious challenges to Bangladesh's environment and sociopolitical stability. In this age of rapid advancement of science and technology, urbanization, rural-urban migration, and industrialization, the process of managing hazardous waste has been associated with many difficulties that have been taken on a major dimension. The term 'waste' comes from the Latin' res derilicta,' meaning 'the abandoned item.' The word is thought to have originated from the notion of 'throw away' culture. Hazardous waste is defined as waste that comprise liquids, solids, or gases that represent a serious risk to the environment or human health. The four characteristics of hazardous waste are flammability, corrosively, reactivity, and poisonousness. Hazardous waste

puts both the environment and human health at grave peril. Therefore, there is no doubt that the future viability of the global ecosystem is in danger. The use, storage, handling, transportation, and disposal of rubbish should all be done in accordance with effective, sustainable waste management practices. Being a developing country with an abundance of population, the waste management system in our country is not up to par, which is frightening for both human health and the environment. In Bangladesh, the collection rate of waste is not more than 37% in major cities of Bangladesh, which is risky. (Ahmed N., 2019) Existing disposal methods remain ineffective though there exist the efforts of the authority of local Government to improve waste collection systems. According to one survey, approximately 5,000 tons of garbage are generated every day in Dhaka city where only half of that amount is collected and deposited properly, while the other half goes untreated. (Shah, 2022) .The overall structure poses a threat to city dwellers since the City Corporation's services fall short of expectations .Even during the Covid Pandemic, Dhaka city alone produced 206 tons of medical waste per day due to the city's 654 government hospitals and 5,055 private hospitals, which result in the production of enormous volumes of biological waste (Golam Mahbub Faisal, 2021) .It is high time to analyze different types of mechanisms that other countries in the world apply for the sustainable development of integrated waste management. Because if waste is not properly processed, transferred, and disposed of, they become hazardous to nature, especially if they are ignitable, poisonous, corrosive, radioactive, or contagious. As a result, by taking into account about the risk to the atmosphere by reviewing existing laws on waste management systems in Bangladesh, this paper is trying to prepare a comprehensive waste management strategy.

LITERATURE REVIEW

In Bangladesh during the past several decades, industrial waste management has been associated with lots of difficulties that have been taken on a major dimension. It is high time to analyze different types of mechanisms that are applied by other countries in the world for the sustainable development of integrated waste management. Because if waste is not properly processed, transferred, and disposed of, they become hazardous to nature, especially if they are ignitable, poisonous, corrosive, radioactive, or contagious.

Author Hannan and Aigbogun have discussed cognitive conceptualizations of the waste collected from Electronics devices, Hazard of Environment, Procedure of waste generation etc. Besides, a comparative analysis between national and international perspective regarding the legal framework relating to waste management process have been discussed here by recommending possible ways for efficient and sustainable waste management system in Bangladesh (Aigbogun, 2021).

Author Shovon, Hannan, and Rahman have opined the usefulness of Bangladesh's current laws regarding managing waste. This paper also recommends taking a bottom-to-top approach for the proper enforcement of waste disposal related legislations. In addition to this, it has also been brought to people's attention that the time has come to develop a comprehensive national strategy in order to successfully handle the issue of garbage disposal in Bangladesh. But this paper has

failed to show why people are disinterested in abiding by the rules and what kind of complications arise during enforcement (Khan Md. Arman Shovon, 2022).

Author Nasrin aimed to shed awareness on the ineffective dumping zone for the waste management systems in both cities and countryside. Throughout this article, the need for integrated cooperation between private and public initiatives at all levels has been mentioned. Besides the suggestions have been given to eradicate this situation as it directly impacts on the environment (Nasrin, 2022).

Author Ashikuzzaman and Howlader have described about the facts relating the existing laws. Besides examining the existing legal instruments, this paper has tried to present the concept of 3R practices for waste management. The issues and challenges of sustainable solid waste management practices and proposed the way forward for Bangladesh to have sustainable solid waste management has been discussed by this paperwork by highlighting the impacts of waste management on global warming (Howlader, 2022).

METHODOLOGY

The present national standards for the safe and efficient disposal of hazardous waste are evaluated and analyzed in this qualitative research. Secondary material gathering and analysis include looking for and reading books, journals, reports, government documents, working papers, and websites pertinent to the problem at hand. Furthermore, this individual effort was based on material obtained from Research Gate, Springer, Google Scholar, and other publicly available sources that met the criterion of being internet accessible and published in English. Furthermore, publications from Sage, Study Gate, Springer, Google Scholar, and Web of Science are assessed in order to meet the research purpose.

THEORIES OF WASTE MANAGEMENT

The Theory of Waste Management provides a deeper dive into the topic, including analysis of waste as a concept, waste management as an activity, and the bigger picture of waste management's aims. The premise of the field of study known as 'Waste Management Theory' is that the primary goal of waste removal is to safeguard public health and the natural environment.

The social, economic, and environmental objectives of sustainable development are supported by this activity, which is why sustainable waste management is a systemic approach. The reduction of pollution, generation of energy, and the preservation of natural resources can be aided by sustainable waste management methods.

Japan's Prime Minister Koizumi proposed the '3R Initiatives on June 2004, at the G8 Summit in Sea Island of Georgia, U.S.A-' which aimed to build a society through the 3Rs with a sound material cycle (reduce, reuse, and recycle). (3R Initiative, 2). It was developed with the cooperation of the Japanese Ministry of the Environment and the United Nations Centre for Regional Development (UNCRD). Initially, the creation of waste materials is minimized under this method. Following that, materials with valuable aspects are used repeatedly. Finally, if the

material cannot be reused, the recycling process transforms it into a new product by melting, cutting, or other means.

Along time, after the 3R concept the '5R Concept' is introduced by adding 2 more stages of waste management process which are Recovery and Disposal. Recovery means finding a way to produce energy or new material by processing non-recyclable waste. Deposal means taking waste byproducts to the landfill to be processed when there are no alternatives after following these methods. (Waste for Change, 2019)

Landfill means dumping waste into a specified section of the landfill which is next followed by compaction (crushing) of the waste and finally burying the waste with soil. Waste is deposited in an open section of the landfill known as a cell. A bottom-line system is used to prevent any waste from reaching the environment, and especially groundwater. Rainwater that falls on the landfill is funneled into a storage facility via the storm water drainage system. Liquids can be collected using the leachate collection system. Systems designed to gather methane gas from trash piles do just that. When a landfill is closed, the final covering, or cap, is placed on top.

Recently, the newly evolved GSCM (Green supply chain management) concept is incorporating environmentally friendly concepts to increase environmental sustainability through various green activities. The goal of GSCM is to create an eco-friendly environment by minimizing environmental loss E-waste is a novel idea in the waste management industry. E-waste, often known as electronic rubbish, is created when an electronic device is abandoned after it has served its purpose. E-waste is predicted to develop rapidly in Bangladesh between 2020 and 2025, reaching an estimated 15% growth rate. (Raha, E-waste Management in Bangladesh: an overview, 2021).

Definition of Waste

Waste is something that may be created because of a variety of activities, including those that take place in households, hospitals, industry, urbanization, etc. Waste is everything that the producer no longer wants and disposes of once it has served its purpose. In the industrial economies of many developing nations, the customary approach to waste management has been to dispose of it in the most cost-effective manner feasible, without giving any thought to the environment once the material has been removed from the premises of the manufacturer.

When any creature in return produces chemicals to the environment –it becomes more eminently dangerous, according to the Environmental Literacy Council? Waste can be organic or inorganic, solid, or liquid, electronic or gaseous, according to that description. (World Health Organization, 2021).

Based on the many legal and regulatory instruments that are generally in place, it is possible to create two primary kinds of trash: hazardous waste and non-hazardous or solid waste. All rubbish that has not been designated as hazardous is considered to be non-hazardous or solid waste. This kind of waste includes things like paper, plastics, glass, metal and beverage cans, biological garbage, and so on. Even while solid trash does not contain any harmful substances, the environment and human health may suffer greatly as a result of its inappropriate collection and

handling. Waste that has been identified as having the potential to be detrimental, as a result, it must be treated and managed in a unique and specific manner is referred to as hazardous waste. Chemical and physical qualities are what decide the specific collection and recycling method to be followed. The following are some of the most important characteristics of hazardous waste: exclusivity, flammability, and corrosiveness, toxicity, and Eco toxicity.

The most common problems associated with health-care waste are a lack of awareness about the health hazards associated with the waste, insufficient training in proper waste management, the absence of waste management and disposal systems, insufficient financial and human resources, and a low priority given to the topic. Many countries either do not have or do not implement adequate regulations.

Dimension of waste

Household waste: The bulk of Dhaka's human waste is combined in a direct manner with the water that comes from the Buriganga, Turag, and Balu rivers daily. It is normal practice to dump household rubbish in public garbage cans, as well as on city streets and other open areas. People are exposed to significant risks to their health because of the alarming rise in pollution caused by the accumulation and deterioration of waste. The competent authority travels to the numerous garbage collection points and brings the trash that has been collected to the depots where it is stored.

Medical Waste: As a result of hospital and clinical waste, the environment inside the city corporation is deteriorating, and there have been increased reports of latent outbreaks of illnesses such as viral hepatitis, typhoid, pneumonia, and gangrene, amongst others. Clinical waste, laboratory trash, non-clinical waste, and culinary waste are the four categories that fall under the umbrella of medical waste. The handling of medical wastes, which should be done in a secure manner, is, regrettably, not done. Instead, they are thrown away in the common landfill of the city, where they are combined with the usual waste. Recently Government has taken an initiative on medical waste management that will establish disposal facilities in 69 government hospitals around the country (Antara, 2021). There are around 135 tons of medical waste collected every day from Dhaka city's hospitals, clinics, and other healthcare institutions (RAHMAN, 2022).

Industrial Waste: Dhaka's 7,000 enterprises release loads of unutilized poisonous waste, polluting the four rivers, canals, and low-lying areas (Ahmed A., 2019). Currently, industrial waste is the single largest contributor to environmental degradation in Bangladesh. A major cause of the severe water pollution in Buriganga, Balu, Turag, and Sitoulakha is the discharge of liquid waste from industrial plants. The rivers of this nation are dying because of the relentless and worsening pollution that has plagued them for decades. To properly clean their gaseous emissions, factories need both a reliable solid waste disposal system and the appropriate scrubbing equipment.

Agricultural Waste: A total of 822 kg of agricultural waste per month was calculated to be produced by households. Cow dung made up around 65% of the total trash, followed by animal feed rejection waste (11%), rubbish (7%), and other materials and kitchen waste 6% (Ma Monayem Miah 1, 2021). Many farmers in our nation use cow manure and dung as organic fertilizer and, to a lesser extent, as cooking fuel. Household waste output is significantly influenced by the total

amount of cultivated land, the size of the family, and the number of cattle and small ruminants per holding. Farmers may be urged by the Department of Agricultural Extension to manage and utilize agricultural waste properly in order to benefit from its potential benefits.

Electronic Waste: The term E -waste is commonly used to refer to all outdated electronic devices that have been abandoned by their previous owners. Technology such as TVs and refrigerators are included in this category, along with computers, entertainment gadgets, phone sets, and mobile phones. The term 'e-waste' is commonly used to refer to obsolete electrical devices. In 2018, Bangladesh produced almost 4 lakh tones of e-waste, and this is projected to climb to 5.5 lakh tones by 2020, according to a research conducted by the Bangladesh University of Engineering and Technology and supported by the Department of Environment (DoE) and Unfortunately, only 3% of all electronic waste is recycled; the remaining 97% is dumped in landfills along with regular garbage (Parvez, 2020) .Bangladesh's Government has spent the past decade working to establish legislation regarding hazardous waste and infrastructure for rubbish disposal. Since the informal sector in Bangladesh handles 97% of e-waste, monitoring their operations is crucial (Rahman, 2022).

Polythene: Polythene is an emerging category of trash in Bangladesh. Polythene is harmful to people's health and has a detrimental effect on the natural world around it. Being the first nation in the world, Bangladesh imposed prohibition the use of polythene bags by 2002's amendment in The Environment conservation act 1995 by inserting section 6(A) outlines the penalties that are to be imposed on those responsible for the production, import, marketing, sale, transportation, and distribution of polythene. According to research conducted by the Eco-Social Development Organization (ESDO), Bangladesh generates around 250 tons of garbage comprised of single-use plastic each month (Biswas, 2022). On the other hand, despite the passage of 17 years, the prohibition has not fully taken effect. Scientists in Bangladesh are working on the creation of a biodegradable polymer made from jute fiber as an alternative to polythene to curb the country's excessive usage of polythene.

LEGAL FRAMEWORK OF BANGLADESH ON HAZARDOUS WASTE MANAGEMENT

Constitution of Bangladesh: The Proclamation of Independence and the Preamble of the Constitution of Bangladesh is basically known as the guiding instrument though they haven't clearly ensured the right to healthy and clean environment. However, the state was compelled to preserve and safeguard natural resources, biodiversity, wetlands, forests, and wildlife for present and future citizens after the adoption of Article 18 A in 2011. In addition, Article 18A extends that right to acquire a healthy and pollution free environment for existing citizens as well as future citizens who have yet to be born, which is consistent with the concept of sustainable development. Besides Article 31 and 32 of Bangladesh Constitution together embody the concept of "Right to life" which extends including the right to a safe and healthy environment. Article 31 guarantees the right to be protected against activities that liberty, full to one's life, liberty, body, reputation, or property, whereas article 32 ensures personal liberty, right to life, liberty and security by prohibiting any obstructing activity which may prevent anyone from the enjoyment of their absolute right which includes environmental conservation and preservation, ecological balance

free of pollution of air and water, and sanitation, without which life would be difficult to enjoy and Any act or omission in violation of this right to life shall be punished. In the case of Dr. Mohiuddin Farooque V Bangladesh, judges said that –'The right to life does not only extend its ambit for the protection of life and limb, but also it includes ensuring healthy environment through the creation and maintenance of healthy environment for the protection of public health.

The Dhaka Municipal Ordinance, 1983*:* According to section 78(1) of this ordinance, the Dhaka city corporation is empowered to manage wastes from public roadways, drains, and all garbage and refuse by collecting under the supervision of the corporation's stuffs. Also, the occupiers of the land and buildings shall be accountable under the supervision of Government for the removal and refusal of waste under section 78(2). Section 78(3) requires that any waste removal and collection by Corporation employees or under their control and supervision be put in the Corporation's dustbins and other receptacles. Though there are specific provisions for garbage collection, DCC appears to have sufficient vehicle capacity, but the number of drivers appears to be insufficient along with slow motion in Vehicle Repair as it usually takes a long time. DCC doesn't comply with Environment Conservation Act and Rules and Preservation Act. When the Environmental Conservation Act of 1995 and the Environmental Conservation Rules of 1997 were put into effect, work on the final disposal of solid waste at the Berri Band and Uttara sites was implemented. The Environmental Clearance Certificate (ECC) is required under these requirements for earth filling by industrial, household, and commercial trash, however this has yet to be obtained.

The Environment Policy, 1992: Bangladesh is required, as a signatory to Agenda 21, to incorporate the international legal instrument's requirements into its national programmatic strategy. As a result, in 1992, the first Environmental Policy was adopted to remove major obstacles to environmental conservation and progress. In 1989, the Ministry of Environment, Ministry of Forest and the Department of Environment (DOE) have been established by Government. Indirectly, but in a sector-specific manner, the policy offers a wonderful solution to the expanding waste disposal challenges. The Policy offers numerous noteworthy sector-wide solutions to the rising waste disposal concerns.

The Environmental Conservation Act, 1995: The Environmental Conservation Act of 1995 is the primary environmental law in Bangladesh nowadays. This Act provides that the Director General of the Department of Environment has the power to stop any actions that endanger human life or the environment. Claim for damages can be submitted to the DG by anybody who has been affected or who is at risk of being harmed because of hazardous waste. Also, DG shall have the power to appoint the stuffs of the department according to its own rules regulation and manners which shows its arbitrariness. The harsh reality is that the Department of Environment lags well behind any other bureaucratic organization. For example, while resettling the Rohingyas, no clearance was obtained from the DOE, resulting in hills being excavated and degraded with the authority of the DC office (Land). The clause concerning Ecologically Critical Areas is governed by Section 5 of the legislation (ECAs). The DOE has designated 13 ecologically important sites in which the Government has prohibited the start-up and continuation of industrial operations or processes. These restrictions are flagrantly ignored in ECAs. According to ECA

regulations, no power plant may be built within 12 kilometers of the Sundarbans buffer zone, but the proposed Rampal power plant is barely 4 kilometers away from the buffer zone (Akil, 2022). Except in cases of public interest, filling up wetlands is strictly prohibited under Section 6(e). The phrase "public interest" is not properly defined anywhere in the statute. According to Section 12 of the ECA 1995, without first obtaining an Environmental Clearance Certificate from the Director General, no industrial unit or project may be built or performed. The DOE has been given the power to issue Environment Clearance Certificates (ECC), which might be used abusively by concerned authorities. The court's jurisdiction to hear appeals of Act orders and directions is removed by Section 14 of the Act as appeals can only be heard and final decision can be made by the government-created Appellate Authority, even no review or revision of appellate orders permitted. According to the amendment of 2003, the Environment Court has been given the authority and powers to dispose of environment-related cases (Oikya, 2022). According to Section 16 of the Act, offenders can face up to ten years in prison, a fine of up to ten million taka (Tk. 10 lac), or both. Because of the need for the exercise of magisterial jurisdiction, the inclusion of criminal penalties complicates the application of this Act.

The Bangladesh Environment Conservation Rules (ECR) 1997: The Bangladesh Environment Conservation Rules (ECR), 1997 were enacted in line with the Environmental Conservation Act (ECA) to complement and meet the goals of the Act. The industries and projects were divided into four categories according to the Environmental Conservation Rules of 1997. The colors Green, Orange A, Orange B, and Red designate these groups. The severely polluting Red categories of companies are required by Rule 7 to get a "No Objection Certificate" (NOC) from the local government authority. However, the ECR, 1997 has not detailed the allowable level of emissions or the duties of remedial efforts. Both the BECA (1995) and the BECR (1997) are inadequate because they conflict with the necessities of the present moment.

Penal Code 1860: According to section 268, if waste is not disposed of correctly, it will be considered a public nuisance. This is because improper waste management can put the public in danger or cause them to be bothered in several different ways. According to Section 269, "Whoever commits illegally or negligently any act which spreads the infection of any illness, must be punished with imprisonment that may extend to six months, with fine, or with both," and the punishment can be either imprisonment for up to six months or a fine. The punishment can also be both of these things.

Environment Court Act, 2010: According to Section 2(c) of this Act, environment related cases shall be dealt by this act whereas and Environment law includes the Bangladesh Environment Conservation Act, 1995. According to Section 2(c) of this Act, the environment related cases should be dealt with by this act. No claim for compensation under environmental laws can be brought before the Environment Court, under Section 7(4) of the Environment Court Act, 2010, without accompanied by a written report from an Inspector of the Department of Environment. A Special Magistrate Court cannot take cognizance of a crime as stated in Section 6(3) of the Environment Court Act of 2010.From this provision, it should come as no surprise that members of the public do not have the legal standing to file a lawsuit or a complaint directly with the Environment Court. Despite the fact that the Act intended for there to be one or more

Environment Courts in each of the 64 districts, the DoE only maintains offices in 21 of them, with only one inspector in each (Sajal, 2015). As a result, without the DoE's office and people, it is very difficult to create an Environment Court. In fact, the offences relating to forest-forest resources, wildlife-biodiversity, fisheries, water resource and other natural resources- Environment court doesn't have any jurisdiction (Rhythm, 2015).

Urban Management Policy Statement, 1998*:* For municipalities to achieve the goal of providing services that are affordable, effective, and dependable as outlined in the policy, they are required to exhaust all possible avenues to subcontract the removal of solid waste, public sanitation, drain cleaning, and road maintenance.

Bangladesh Medical Waste Management and Processing Rules 2008*:* Except this, no other legislation pertaining to management and processing of medical wastes exists in Bangladesh. According to rule 8 of this act, dumping zones must be established in seven divisional areas within 3 months of the enactment of this rule under rule 3. However, for the disposal of medical wastes, only Dhaka has the only specialized dumping ground which is not sufficient to meet the demands of increasing number of hospitals in Dhaka. Also, the establishment of these dumping zones haven't been done in all divisional areas where 12 years have passed (Sejan, 2020) . From other general wastes, medical wastes must be kept separate during collection, covering, storage, and transportation to disposal sites, according to Rule 7 of the Medical Waste Rule. Under Rule No. 6, third parties were supposed to receive training for a better disposal system. Because divisional authority has not been established, training for disposal personnel appears to be a castle in the air.

The Hazardous (e-waste) Management Rules, 2021: Under The Bangladesh Environmental Protection Act, 1995, the Department of Environment (DoE) announced the "Hazardous Waste (e-waste) Management Rules 2021" on June 10, 2021 (NILS BANGLADESH, 2022) Manufacturers, wholesalers, retailers, truckers, mechanics, collectors, recyclers, dismantlers under this act must register with the DOE using a standardized registration form. To complete the registration process, they must also provide a WEEE management strategy. By this acts several restrictions on the usage of many toxic materials have been imposed. Manufacturers and importers are subject to penalties under Section 15(1). Companies are given up to five years to reach full compliance with the rule's requirements (under Section 14(2). Section 15(1) says, anyone who violates these regulations may face up to two years in prison or a fine of up to 200,000 taka, or both. Repeat offenders will face a sentence of two to ten years in jail and/or a fine of two hundred thousand to one million taka, or both. This act has some loopholes also. It says radioactive wastes under the Bangladesh Atomic Energy Regulatory Act, 2012 shall not be included in the term of waste under this act, which is problematic as through different division, we cannot separate the environment. Besides, Under Rule-3(9), raising of awareness by publication, leaflet, booklet, poster, and digital way has been told whereas most people are unaware of the phrase 'E-waste.' As a result, the awareness about the effects of electrical and electronic equipment through the digitalization process will never be able to create awareness unless it is applied in practical way. Here is a provision regarding importing electronic equipment for education and research purpose by following the rules and regulation without having any motoring section as there is a possibility to use these in another purposes.

Solid Waste Management Rules 2021: On December 23, 2021, the Bangladesh government announced the Solid Waste Management Regulations 2021 in accordance with the Bangladesh Environmental Protection Act of 1995. This regulation spells out the duties of businesses that deal with solid waste management and places collection, recycling, and disposal obligations on producers of non-biodegradable products. According to this rule 3R strategy, Responsibilities of manufacturers, importers, consumers, waste generators have been determined though the definition of manufacturers hasn't been defined. The way of disposing of waste separately without dumping, storing, or burning waste outdoors has been defined. For any violation of the above, the penalty is two years in jail and/or a fine of 200,000 takas, or both. The rule's addition of "extended producer responsibility" implies that manufacturers will now be held accountable for the trash their products generate. When this tiny waste gets mixed with other waste it becomes hazardous waste which is injurious to the human body. Undoubtedly, this step taken by the Government is not only environmentally friendly but also lifesaving.

PROSPECTS AND CHALLENGES

Energy Recovery: Waste-to-energy refers to the process through which waste that cannot be recycled is transformed into heat and power that may be used. An approach that has significantly aided in the advancement of renewable energy systems is the recovery of energy as a crucial component of waste management. The process of drawing energy from municipal solid waste (MSW) is becoming more significant in the realm of renewable energy. In today's world, this potentially helpful approach to the management of municipal solid waste (MSW) is now being put to full use via the process of incineration coupled with energy recovery. Recently The Bangladesh Power Development Board (BPDB) has signed a contract with China Machinery Engineering Corporation (CMEC) for implementing 42.5MW waste-to-power plant to generate electricity from waste using incineration technology in the capital's Amin bazar by 2024 (The Business Standard, 2021). Besides, 'Bangladesh Power Development Board (BPDB), the Narayanganj City Corporation (NCC), and Chinese firm U&D' signed the agreement that 600 tons of garbage to the U&D plant shall be supplied by Narayanganj City Corporation to generate 6 MW of electricity, which shall be purchased by the BPDB at a rate of US20.19 Cents (The Financial Express, 2022). Thus Bangladesh may by using waste can produce electricity which may prevent the deliberate shutdown of electric power in areas by eradicating the shortage of electricity. Notably, adequate laws should be made in providing the report of produced electricity by the authorized people so that there remains no illegality.

Waste Processing Center: In Bangladesh, Because of its effective approach to waste management, the southwestern district of Jessore has emerged as a leading example in the recycling of wastes. This initiative is the first of its type to be implemented in Bangladesh, and it entails the recycling of everyday garbage into biogas, electrical power, and fertilizers. After a preparation period of 28 days, the decomposable waste materials, such as fruit peels and vegetable scraps, are recycled into the fertilizer. The fertilizer is then processed and packaged. The remainder is sent to a biogas factory, where it is converted into energy. This electricity is then utilized to power the plant itself. The plants have the capability of generating four tons of fertilizer, 400 cubic meters of biogas per day, additionally, the plants are producing 200 kilowatts of power at the

moment despite having a capacity of 430 kilowatts (Zaman, 2019).According to the opinion of scientists, if this project can be implemented in a scientific way, in future, there shall have a great future of Bangladesh by exporting the fertilizer and biogas to Abroad which is a great challenge.

Extended Producer Responsibility (EPR) system: The Department of Environment has introduced EPR in Bangladesh in by drafting Solid waste management Rules 2021 though hasn't finalized it yet. Under this concept manufacturers will be held accountable for the waste which has been generated by their product. The manufacturer will have to take the responsibility financially for using decomposable products. By using the polluters pay principle defined in environment conservation act, EPR can stop the cost of waste management for municipality. Additionally, it can reduce the pressure on biodiversity and infrastructure by ensuring sustainable design of product and packaging. In India, this process is being used. For obtaining license or renewal, producers will have to submit their plan to their state control boards. Collection segregation and sorting of waste shall be the responsibility of urban local bodies.in Bangladesh during making an application the environment clearance certificate the producer will have to submit waste management plan. Moreover, information about recycling during renewal of environment clearance certificate will have to provide by the producer, unless it will be a punishable act under section 15(1) of the ECA 1995.It will be a challenging matter to convince the manufacturer about this provision unless a monetarization authority is set up along with strict provisions of laws.

Green Supply Chain Management: This is an environmentally friendly concept to increase environmental sustainability through various green activities. The goal of GSCM is to create an eco-friendly environment by minimizing environmental loss by chain-related activities like: (a) green design (b) green manufacturing process (c) Green waste management (d) green construction (e) Green distribution etc. The goal of green design is to produce environmentally responsible and sustainable building projects. The goal of green manufacturing practices is to cut down on the number of raw materials and other resources that are used during production. This is done to indirectly cut down on the amount of waste produced throughout the manufacturing process by reducing the amount of energy and resources that are put into use. In order to reduce greenhouse gas emissions to 5 % in the energy and power, transport, and industrial sectors, Bangladesh is working by ensuring the implementation of the Environmental Protection Act 1995.But the major challenges of environmental sustainability is being faced in the major export industries in Bangladesh resource inefficient production processes, unavailability of natural gas, lack of waste management which are not enough to cause a fruitful green industrial development. That's why more effective measures should be taken along with forming a unified code for national requirements for a green industry with proper implementation as green industry has benefits of the tripartite aspects of sustainability also building a structured green sector would help us to meet the global Sustainable development goals in 2030 and enable our society to strive for environmental peace.

Food for plastic Initiative: Besides Government, Non-Governmental Organization like Bidyanondo Foundation has recently come up with this innovative and praiseworthy Idea. Rice, lentils, eggs, and even t-shirts, lungis, and sandals will be offered in return for unwanted articles of plastic that can be brought to the Bidyanondo Exchange Center in Saint Martin's. This is part of

a limited-time promotion that the center has developed. A Plastic Exchange Store has been established by this foundation which will remain open twice a month, individuals will be able to deposit their plastic garbage monthly, and on a particular day the following month, they will be able to collect their desired products in exchange for their waste. Volunteers from Bidyanondo have been spreading the word about their organization's campaign by going door to door in the days leading up to the start of the program. Locals are all praise over this unusual Idea. It has been decided to keep the "Plastic Exchange Store" open twice a month. People then have the opportunity to trade the plastic they have kept or collected for commodities that are essential to meeting their requirements (Karmaker, 2022). It will stimulate both the waste management process of collecting recyclables and recycling materials. Thus, other private or non-governmental sectors should come forward with these innovative ideas along with Government to save Bangladesh from the dangerous consequence of hazardous waste management.

FINDINGS

1. Absence of the management of various waste in different ways by proper segregation and maintenance of health policies.
2. There are no legislative instruments that pertain to the management of radioactive waste; thus, it is not managed correctly.
3. Failure to conduct an adequate investigation into the impacts of hazardous wastes on both the natural environment and human health to make the general public more aware of the problem.
4. Absence of creation of proper laws in individual level for throwing out wastages anywhere, though there are adequate legislations for the management of waste by different sectors and organizations.
5. The failure to effectively establish effective monitoring and workshop programs for relevant parties to guarantee compliance with national and international protection mechanisms.
6. Failure to implement and comply with national and international rules and legislation.
7. There is no codified legal instrument or law in Bangladesh governing the management and disposal of waste.
8. Failure to keep appropriate and trustworthy records of total hazardous waste production in Bangladesh.
9. Lack of current personnel and a distinct legal cell for the settlement of legal issues regarding mismanagement of wastes under DOE.
10. Absence of cooperation between the Government and non-profit organizations which are working for this issue.
11. Lack of implementation of law in case of using polythene or plastic objects especially in coral islands which may pose a threat to coral and other living creatures.
12. Absence of a regulatory body to supervise and guarantee the waste reduction process.
13. The allowable level of emissions of gases or the duties of remedial efforts for the industries or factories haven't been defined in none of the acts.

CONCLUSION

In Bangladesh, the current issue with garbage management is one of the main sources of worry. The ever-increasing rubbish problem is just making matters worse, even though the country has a legitimate framework and regulations for waste management. There is always a clear risk to the health of the population that is hampered by the lack of scheduled disposal services, which results in insufficient collection and open dumping. Similarly, the presence of poisons in waste, unchecked leachate, and the mixing of biomedical and municipal waste all contribute to an increasing number of health problems. Despite the lack of funding, the Government of Bangladesh is determined to deploy waste management technologies. However, it has been exceedingly difficult for the Government to guarantee effective and proper collection and disposal of solid waste for the full population due to inadequate resources and organizational capacities. ***Recommendations.***

1. For the purpose of managing all of the many kinds of garbage that are produced in urban areas, such as municipal, medical, and electronic waste, a complete set of regulatory rules has to be devised.
2. The laws regarding throwing out wastage anywhere by individual should be made, though there are adequate legislations for the management of waste by different sectors and organizations.
3. A community of practice and collaborations between the relevant public and private organizations are required to guarantee that everyone can benefit from a waste management strategy that is ecologically friendly.
4. Based on sanitary norms, long-term strategy, and better equipment –Landfills should be established.
5. It is essential to keep accurate and trustworthy records detailing the overall quantity of hazardous waste produced on a daily, weekly, or annual basis.
6. The establishment of a regular monitoring authority is recommended in the case of waste management to verify the implementation of national and international legal frameworks as well as bureaucratic obstacles.
7. Training and education programs should be arranged for the workers and the authorities who are playing role for proper management of waste.
8. To ensure effective collaboration and partnership between the Government, municipalities, city corporations, NGOs, industries, restaurants, markets, factories, and the neighborhood, a ward-level committee should be established.
9. The millions of people who reside in the nation's capital generate millions of gallons of liquid waste every day, making it imperative that adequate sewage and industrial waste treatment facilities be built and maintained.
10. The usage of plastic goods and polythenes by both visitors and locals may endanger coral and other living animals. Consequently, it should be strictly prohibited on this island.
11. Recycling facilities, such as composting and biogas plants, should be installed at every industrial site, and their ability to receive an Environmental Clearance Certificate, as well as the emission limitations of their gas and liability remedies arising from its production, should be closely monitored.

12. In the spirit of this term, efforts should be made to spread awareness of the 5 R Principles (Reduce, Reuse, Recycle, Recovery, and Disposal).
13. Strict adherence to the Environmental Conservation Act of 1995 and the Rules of 1997 is essential.
14. The practice of combining trash streams into a single container should be avoided and separate bins for recyclable materials should be kept and then transferring it to specific location should be preferred.
15. The notion of extended producer responsibility (EPR), which should be firmly enforced in accordance with the environmental conservation act, should be applied to industrial waste as well as electronic waste.
16. It is imperative that provisions be provided for the active engagement of city corporations and municipalities in the management of medical waste.

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An Analysis of Legal Frameworks Concerning Waste Management in Bangladesh: Prospects and Challenges

by Asif Khan

Submission date: 21-May-2023 09:49AM (UTC+0500)
Submission ID: 2098105183
File name: Article.mw.docx (57.03K)
Word count: 7406
Character count: 42992

An Analysis of Legal Frameworks Concerning Waste Management in Bangladesh: Prospects and Challenges

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ABSTRACT

One of the most concerning problems facing Bangladesh's environment and society at large is the accumulation of hazardous waste. Developing nations like Bangladesh have more long-term difficulty when it comes to waste management. Also, the administration, particularly the relevant local Government of the municipality, is struggling to deal with the problem due to a lack of adequate manpower, an antiquated waste management system, a lack of necessary technological resources, and widespread corruption. As a direct consequence, ensuring the long-term viability of waste management practices has become significantly more difficult. This study discusses the cognitive Idea of electronic waste, environmental dangers, and waste creation mechanism associated with it, and the method by which waste is produced. At the same time, the research highlights the conceptual components included in the most recent waste management systems used across the country. In addition, this paper has made an effort to analyze the limitations and shortcomings of the Government's present national legal rules and suggested ideas to develop waste management systems that are effective and sustainable to remove the dangerous effects of hazardous wastes.

Keywords: GSCM, Sustainable waste Management, Extended producer responsibility, DOE, ECA

Introduction

In Bangladesh, during the past several decades, waste management has emerged as one of the most serious challenges to Bangladesh's environment and sociopolitical stability. In this age of rapid advancement of science and technology, urbanization, rural-urban migration, and industrialization, the process of managing hazardous waste has been associated with many difficulties that have been taken on a major dimension. The term 'waste' comes from the Latin' res derilicta,' meaning 'the abandoned item.' The word is thought to have originated from the notion of 'throw away' culture. Hazardous waste is defined as wastes that comprise liquids, solids, or gases that represent a serious risk to the environment or human health. The four characteristics of hazardous waste are flammability, corrosively, reactivity, and poisonousness. Hazardous waste puts both the environment and human health at grave peril. Therefore, there is no doubt that the future viability of the global ecosystem is in danger. The use, storage, handling, transportation, and disposal of rubbish should all be done in accordance with effective, sustainable waste management practices. Being a developing country with an abundance of population, the waste management system in

our country is not up to par, which is frightening for both human health and the environment. In Bangladesh, the collection rate of waste is not more than 37% in major cities of Bangladesh, which is risky. (Ahmed N. , 2019) Existing disposal methods remain ineffective though there exist the efforts of the authority of local Government to improve waste collection systems. According to one survey, approximately 5,000 tons of garbage are generated every day in Dhaka city where only half of that amount is collected and deposited properly, while the other half goes untreated. (Shah, 2022) .The overall structure poses a threat to city dwellers since the City Corporation's services fall short of expectations .Even during the Covid Pandemic, Dhaka city alone produced 206 tons of medical waste per day due to the city's 654 government hospitals and 5,055 private hospitals, which result in the production of enormous volumes of biological waste (Golam Mahbub Faisal, 2021) .It is high time to analyze different types of mechanisms that other countries in the world apply for the sustainable development of integrated waste management. Because if wastes are not properly processed, transferred, and disposed of, they become hazardous to nature, especially if they are ignitable, poisonous, corrosive, radioactive, or contagious. As a result, by taking into account about the risk to the atmosphere by reviewing existing laws on waste management systems in Bangladesh, this paper is trying to prepare a comprehensive waste management strategy.

Literature Review

In Bangladesh during the past several decades, industrial waste management has been associated with lots of difficulties that have been taken on a major dimension. It is high time to analyze different types of mechanisms that are applied by other countries in the world for the sustainable development of integrated waste management. Because if wastes are not properly processed, transferred, and disposed of, they become hazardous to nature, especially if they are ignitable, poisonous, corrosive, radioactive, or contagious.

Author Hannan and Aigbogun have discussed about cognitive conceptualizations of the waste collected from Electronics devices, Hazard of Environment, Procedure of waste generation etc. Besides, a comparative analysis between national and international perspective regarding the legal framework relating to waste management process have been discussed here by recommending possible ways for efficient and sustainable waste management system in Bangladesh (Aigbogun, 2021).

Author Shovon, Hannan, and Rahman have opined the usefulness of Bangladesh's current laws regarding managing waste. This paper also recommends to take a bottom-to-top approach for the proper enforcement of waste disposal related legislations. In addition to this, it has also been brought to people's attention that the time has come to develop a comprehensive national strategy in order to successfully handle the issue of garbage disposal in Bangladesh. But this paper has failed to show why people are disinterested to abide by the rules and what kind of complications arise during enforcement (Khan Md. Arman Shovon, 2022).

Author Nasrin aimed to shed awareness on the ineffective dumping zone for the waste management systems in both cities and countryside. Throughout this article, the need for integrated cooperation between private and public initiatives at all levels has been mentioned. Besides the

suggestions have been given to eradicate this situation as it directly impacts on the environment (Nasrin, 2022) .

Author Ashikuzzaman and Howlader have described about the facts relating the existing laws .Besides examining the existing legal instruments, this paper has tried to present the concept of 3R practices for waste management. The issues and challenges of sustainable solid waste management practices and proposed the way forward for Bangladesh to have sustainable solid waste management has been discussed by this paper work by highlighting the impacts of waste management on global warming (Howlader, 2022).

Research Methodology

The present national standards for the safe and efficient disposal of hazardous waste are evaluated and analyzed in this qualitative research. Secondary material gathering and analysis include looking for and reading books, journals, reports, government documents, working papers, and websites pertinent to the problem at hand. Furthermore, this individual effort was based on material obtained from Research Gate, Springer, Google Scholar, and other publicly available sources that met the criterion of being internet accessible and published in English. Furthermore, publications from Sage, Study Gate, Springer, Google Scholar, and Web of Science are assessed in order to meet the research purpose

Theories of Waste Management

The Theory of Waste Management provides a deeper dive into the topic, including analysis of waste as a concept, waste management as an activity, and the bigger picture of waste management's aims. The premise of the field of study known as 'Waste Management Theory' is that the primary goal of waste removal is to safeguard public health and the natural environment.

The social, economic, and environmental objectives of sustainable development are supported by this activity, which is why sustainable waste management is a systemic approach. The reduction of pollution, generation of energy, and the preservation of natural resources can be aided by sustainable waste management methods.

Japan's Prime Minister Koizumi proposed the '3R Initiatives on June 2004, at the G8 Summit in Sea Island of Georgia ,U.S.A-' which aimed to build a society through the 3Rs with a sound material cycle (reduce, reuse, and recycle). (3R Initiative, 2). It was developed with the cooperation of the Japanese Ministry of the Environment and the United Nations Centre for Regional Development (UNCRD). Initially, the creation of waste materials is minimized under this method. Following that, materials with valuable aspects are used repeatedly. Finally, if the material cannot

be reused, the recycling process transforms it into a new product by melting, cutting, or other means.

Along time, after the 3R concept the '5R Concept' is introduced by adding 2 more stages of waste management process which are Recovery and Disposal. Recovery means finding a way to produce energy or new material by processing the non-recyclable waste.Diposal means taking waste byproducts to the landfill to be processed when there is no alternatives after following these methods. (Waste for Change, 2019)

Landfill means dumping waste into a specified section of the landfill which is next followed by compaction (crushing) of the waste and finally burying the waste with soil. Waste is deposited in an open section of the landfill known as a cell. A bottom liner system is used to prevent any waste from reaching the environment, and especially groundwater. Rainwater that falls on the landfill is funneled into a storage facility via the storm water drainage system. Liquids can be collected using the leachate collection system. Systems designed to gather methane gas from trash piles do just that. When a landfill is closed, the final covering, or cap, is placed on top.

Recently, the newly evolved GSCM (Green supply chain management) concept is incorporating environmentally friendly concepts to increase environmental sustainability through various green activities. The goal of GSCM is to create an eco-friendly environment by minimizing environmental loss E-waste is a novel idea in the waste management industry. E-waste, often known as electronic rubbish, is created when an electronic device is abandoned after it has served its purpose. E-waste is predicted to develop rapidly in Bangladesh between 2020 and 2025, reaching an estimated 15% growth rate. (Raha, E-waste Management in Bangladesh: an overview, 2021) .

Definition of Waste

Waste is something that may be created as a result of a variety of activities, including those that take place in households, hospitals, industry, urbanization, etc. By definition, waste is everything that the producer no longer wants and disposes of once it has served its purpose. In the industrial economies of many developing nations, the customary approach to waste management has been to dispose of it in the most cost-effective manner feasible, without giving any thought to the environment once the material has been removed from the premises of the manufacturer.

When any creature in return produces chemicals to the environment –it becomes more eminently dangerous, according to the Environmental Literacy Council? .Waste can be organic or inorganic, solid or liquid, electronic or gaseous, according to that description. (World Health Organization, 2021).

On the basis of the many legal and regulatory instruments that are generally in place, it is possible to create two primary kinds of trash: hazardous waste and non-hazardous or solid waste. All rubbish that has not been designated as hazardous is considered to be non-hazardous or solid waste. This kind of waste includes things like paper, plastics, glass, metal and beverage cans, biological garbage, and so on. Even while solid trash does not contain any harmful substances, the

environment and human health may suffer greatly as a result of its inappropriate collection and handling. Waste that has been identified as having the potential to be detrimental, as a result, it must be treated and managed in a unique and specific manner is referred to as hazardous waste. Chemical and physical qualities are what decide the specific collection and recycling method to be followed. The following are some of the most important characteristics of hazardous waste: exclusivity, flammability, and corrosiveness, toxicity, and Eco toxicity.

The most common problems associated with health-care waste are a lack of awareness about the health hazards associated with the waste, insufficient training in proper waste management, the absence of waste management and disposal systems, insufficient financial and human resources, and a low priority given to the topic. Many countries either do not have or do not implement adequate regulations.

Dimension of waste

1. **Household waste:** The bulk of Dhaka's human waste is combined in a direct manner with the water that comes from the Buriganga, Turag, and Balu rivers on a daily basis. It is normal practice to dump household rubbish in public garbage cans, as well as on city streets and other open areas. People are exposed to significant risks to their health as a consequence of the alarming rise in pollution caused by the accumulation and deterioration of waste. The competent authority travels to the numerous garbage collection points and brings the trash that has been collected to the depots where it is stored.
2. **Medical Waste:** As a result of hospital and clinical waste, the environment inside the city corporation is deteriorating, and there have been increased reports of latent outbreaks of illnesses such as viral hepatitis, typhoid, pneumonia, and gangrene, amongst others. Clinical waste, laboratory trash, non-clinical waste, and culinary waste are the four categories that fall under the umbrella of medical waste. The handling of medical wastes, which should be done in a secure manner, is, regrettably, not done. Instead, they are thrown away in the common landfill of the city, where they are combined with the usual waste. Recently Government has taken an initiative on medical waste management that will establish disposal facilities in 69 government hospitals around the country (Antara, 2021). There are around 135 tons of medical waste collected every day from Dhaka city's hospitals, clinics, and other healthcare institutions (RAHMAN, 2022).
3. **Industrial Waste:** Dhaka's 7,000 enterprises release loads of unutilized poisonous waste, polluting the four rivers, canals, and low-lying areas (Ahmed A. , 2019). Currently, industrial waste is the single largest contributor to environmental degradation in Bangladesh. A major cause of the severe water pollution in Buriganga, Balu, Turag, and Sitoulakha is the discharge of liquid wastes from industrial plants. The rivers of this nation are dying as a consequence of the relentless and worsening pollution that has plagued them

for decades. To properly clean their gaseous emissions, factories need both a reliable solid waste disposal system and the appropriate scrubbing equipment.

4. **Agricultural Waste:** A total of 822 kg of agricultural waste per month was calculated to be produced by households. Cow dung made up around 65% of the total trash, followed by animal feed rejection waste (11%), rubbish (7%), and other materials and kitchen waste 6% (Ma Monayem Miah 1, 2021) .The majority of farmers in our nation use cow manure and dung as organic fertilizer and, to a lesser extent, as cooking fuel. Household waste output is significantly influenced by the total amount of cultivated land, the size of the family, and the number of cattle and small ruminants per holding. Farmers may be urged by the Department of Agricultural Extension to manage and utilize agricultural waste properly in order to benefit from its potential benefits.

5. **Electronic Waste**: The term E -waste is commonly used to refer to any and all outdated electronic devices that have been abandoned by their previous owners. Technology such as TVs and refrigerators are included in this category, along with computers, entertainment gadgets, phone sets, and mobile phones. The term 'e-waste' is commonly used to refer to obsolete electrical devices. In 2018, Bangladesh produced almost 4 lakh tones of e-waste, and this is projected to climb to 5.5 lakh tones by 2020, according to a research conducted by the Bangladesh University of Engineering and Technology and supported by the Department of Environment (DoE) and Unfortunately, only 3% of all electronic waste is recycled; the remaining 97% is dumped in landfills along with regular garbage (Parvez, 2020) .Bangladesh's Government has spent the past decade working to establish legislation regarding hazardous waste and infrastructure for rubbish disposal. Since the informal sector in Bangladesh handles 97% of e-waste, monitoring their operations is crucial (Rahman, 2022).

6. **Polythene:** Polythene is an emerging category of trash in Bangladesh. Polythene is harmful to people's health and has a detrimental effect on the natural world around it. Being the first nation in the world, Bangladesh imposed prohibition the use of polythene bags by 2002's amendment in The Environment conservation act 1995 by inserting section 6(A) outlines the penalties that are to be imposed on those responsible for the production, import, marketing, sale, transportation, and distribution of polythene. According to a research conducted by the Eco-Social Development Organization (ESDO), Bangladesh generates around 250 tons of garbage comprised of single-use plastic each and every month (Biswas, 2022) ¨ On the other hand, despite the passage of 17 years, it would seem that the prohibition has not fully taken effect. Scientists in Bangladesh are working on the creation of a biodegradable polymer made from jute fiber as an alternative to polythene in an effort to curb the country's excessive usage of polythene.

Legal framework of Bangladesh on Hazardous Waste Management

1. **Constitution of Bangladesh**: The Proclamation of Independence and the Preamble of the Constitution of Bangladesh is basically known as the guiding instrument though they haven't ensured clearly the right to healthy and clean environment. However, the state was compelled to preserve and safeguard natural resources, biodiversity, wetlands, forests, and wildlife for present and future citizens after the adoption of Article 18 A in 2011. In addition, Article 18A extends that right to acquire a healthy and pollutionfree environment for existing citizens as well as future citizens who have yet to be born, which is consistent with the concept of sustainable development. Besides Article 31 and 32 of Bangladesh Constitution together embody the concept of "Right to life" which extends including the right to a safe and healthy environment. Article 31 guarantees the right to be protected against activities that are harmful to one's life, liberty, body, reputation, or property, whereas article 32 ensures personal liberty, right to life, liberty and security by prohibiting any obstructing activity which may prevent anyone from the enjoyment of their absolute right which includes environmental conservation and preservation, ecological balance free of pollution of air and water, and sanitation, without which life would be difficult to enjoy and Any act or omission in violation of this right to life shall be punished. In the case of Dr.Mohiuddin Farooque V Bangladesh, judges said that –'The right to life does not only extend its ambit for the protection of life and limb, but also it includes ensuring healthy environment through the creation and maintenance of healthy environment for the protection of public health.

2. **The Dhaka Municipal Ordinance, 1983**: According to section 78(1) of this ordinance, the Dhaka city corporation is empowered to manage wastes from public roadways, drains, and all garbage and refuse by collecting under the supervision of the corporation's stuffs. Also the occupiers of the land and buildings shall be accountable under the supervision of Government for the removal and refusal of waste under section 78(2). Section 78(3) requires that any waste removal and collection by Corporation employees or under their control and supervision be put in the Corporation's dustbins and other receptacles. Though there are specific provisions for garbage collection, DCC appears to have sufficient vehicle capacity, but the number of drivers appears to be insufficient along with slow motion in Vehicle Repair as it usually takes a long time. DCC doesn't comply with Environment Conservation Act and Rules and Preservation Act. When the Environmental Conservation Act of 1995 and the Environmental Conservation Rules of 1997 were put into effect, work on the final disposal of solid waste at the Berri Band and Uttara sites was implemented. The Environmental Clearance Certificate (ECC) is required under these requirements for earth filling by industrial, household, and commercial trash, however this has yet to be obtained.

3. **The Environment Policy, 1992:** Bangladesh is required, as a signatory to Agenda 21, to incorporate the international legal instrument's requirements into its national programmatic strategy. As a result, in 1992, the first Environmental Policy was adopted to remove major obstacles to environmental conservation and progress. In 1989, the Ministry of Environment, Ministry of Forest and the Department of Environment (DOE) have been established by Government. Indirectly, but in a sector-specific manner, the policy offers a wonderful solution to the expanding waste disposal challenges. The Policy offers numerous noteworthy sector-wide solutions to the rising waste disposal concerns.

4. **The Environmental Conservation Act, 1995:** The Environmental Conservation Act of 1995 is the primary environmental law in Bangladesh nowadays. This Act provides that the Director General of the Department of Environment has the power to stop any actions that endanger human life or the environment. Claim for damages can be submitted to the DG by anybody who has been affected or who is at risk of being harmed as a result of hazardous waste. Also DG shall have the power to appoint the stuffs of the department according to its own rules regulation and manners which shows its arbitrariness. The harsh reality is that the Department of Environment lags well behind any other bureaucratic organization. For example, while resettling the Rohingyas, no clearance was obtained from the DOE, resulting in hills being excavated and degraded with the authority of the DC office (Land). The clause concerning Ecologically Critical Areas is governed by Section 5 of the legislation (ECAs). The DOE has designated 13 ecologically important sites in which the Government has prohibited the start-up and continuation of industrial operations or processes. In actuality, these restrictions are flagrantly ignored in ECAs. According to ECA regulations, no power plant may be built within 12 kilometers of the Sundarbans buffer zone but the proposed Rampal power plant is barely 4 kilometers away from the buffer zone (Akil, 2022). Except in cases of public interest, filling up wetlands is strictly prohibited under Section 6(e). The phrase "public interest" is not properly defined anywhere in the statute. According to Section 12 of the ECA 1995, without first obtaining an Environmental Clearance Certificate from the Director General, no industrial unit or project may be built or performed. The DOE has been given the power to issue Environment Clearance Certificates (ECC), which might be used abusively by concerned authorities. The court's jurisdiction to hear appeals of Act orders and directions is removed by Section 14 of the Act as appeals can only be heard and final decision can be made by the government-created Appellate Authority, even no review or revision of appellate orders permitted. According to the amendment of 2003, the Environment Court has been given the authority and powers to dispose of environment-related cases (Oikya, 2022). According to Section 16 of the Act, offenders can face up to ten years in prison, a fine of up to ten million taka (Tk. 10 lac), or both. Because of the need for the exercise of magisterial jurisdiction, the inclusion of criminal penalties complicates the application of this Act.

5. **The Bangladesh Environment Conservation Rules (ECR) 1997:** The Bangladesh Environment Conservation Rules (ECR), 1997 were enacted in line with the Environmental

Conservation Act (ECA) to complement and meet the goals of the Act. The industries and projects were divided into four categories according to the Environmental Conservation Rules of 1997. The colors Green, Orange A, Orange B, and Red designate these groups. The severely polluting Red categories of companies are required by Rule 7 to get a "No Objection Certificate" (NOC) from the local government authority. However, the ECR, 1997 has not detailed the allowable level of emissions or the duties of remedial efforts. Both the BECA (1995) and the BECR (1997) are inadequate because they conflict with the necessities of the present moment.

6. **Penal Code 1860:** According to section 268, if waste is not disposed of correctly, it will be considered a public nuisance. This is due to the fact that improper waste management can put the general public in danger or cause them to be bothered in a number of different ways. According to Section 269, "Whoever commits illegally or negligently any act which spreads the infection of any illness, must be punished with imprisonment that may extend to six months, with fine, or with both," and the punishment can be either imprisonment for up to six months or a fine. The punishment can also be both of these things.

7. **Environment Court Act, 2010:** According to Section 2(c) of this Act, environment related cases shall be dealt by this act whereas and Environment law includes the Bangladesh Environment Conservation Act, 1995. According to Section 2(c) of this Act, the environment related cases should be dealt with by this act. No claim for compensation under environmental laws can be brought before the Environment Court, under Section 7(4) of the Environment Court Act, 2010, without accompanied by a written report from an Inspector of the Department of Environment. A Special Magistrate Court cannot take cognizance of a crime as stated in Section 6(3) of the Environment Court Act of 2010.From this provision, it should come as no surprise that members of the general public do not have the legal standing to file a lawsuit or a complaint directly with the Environment Court. Despite the fact that the Act intended for there to be one or more Environment Courts in each of the 64 districts, , the DoE only maintains offices in 21 of them, with only one inspector in each (Sajal, 2015). As a result, without the DoE's office and people, it is very difficult to create an Environment Court. In fact the offences relating to forest-forest resources, wild life-biodiversity, fisheries, water resource and other natural resources-Environment court doesn't have any jurisdiction (Rhythm, 2015).

8. **Urban Management Policy Statement, 1998**:In order for municipalities to achieve the goal of providing services that are affordable, effective, and dependable as outlined in the policy, they are required to exhaust all possible avenues in an effort to subcontract the removal of solid waste, public sanitation, drain cleaning, and road maintenance.

9. **Bangladesh Medical Waste Management and Processing Rules 2008**: Except this, no other legislation pertaining to management and processing of medical wastes exists in Bangladesh. According to rule 8 of this act, dumping zones have to be established in seven

divisional areas within 3 months of the enactment of this rule under rule 3. However for the disposal of medical wastes, only Dhaka has the only specialized dumping ground which is not sufficient enough to meet the demands of increasing number of hospitals in Dhaka. Also the establishment of these dumping zones haven't been done in all divisional areas where 12 years have passed (Sejan, 2020) . From other general wastes, medical wastes must be kept separate during collection, covering, storage, and transportation to disposal sites, according to Rule 7 of the Medical Waste Rule. Under Rule No. 6, third parties were supposed to receive training for a better disposal system. Because divisional authority have not been established, training for disposal personnel appears to be a castle in the air.

10. **The Hazardous (e-waste) Management Rules, 2021:** Under The Bangladesh Environmental Protection Act, 1995, the Department of Environment (DoE) announced the "Hazardous Waste (e-waste) Management Rules 2021" on June 10, 2021 (NILS BANGLADESH, 2022) Manufacturers, wholesalers, retailers, truckers, mechanics, collectors, recyclers, dismantlers under this act must register with the DOE using a standardized registration form. To complete the registration process, they must also provide a WEEE management strategy. By this acts several restrictions on the usage of many toxic materials have been imposed. Manufacturers and importers are subject to penalties under Section 15(1). Companies are given up to five years to reach full compliance with the rule's requirements (under Section 14(2). Section 15(1) says, anyone who violate these regulations may face up to two years in prison or a fine of up to 200,000 taka, or both. Repeat offenders will face a sentence of two to ten years in jail and/or a fine of two hundred thousand to one million taka, or both. This act has some loopholes also. It says radioactive wastes under the Bangladesh Atomic Energy Regulatory Act, 2012 shall not be included in the term of waste under this act which is problematic as through different division, we cannot separate the environment. Besides, Under Rule-3(9), raising of awareness by publication, leaflet, booklet, poster and digital way has been told whereas most people are unaware of the phrase 'E-waste.' As a result, the awareness about the effects of electrical and electronic equipment through the digitalization process will never be able to create awareness unless it is applied in practical way. Here is a provision regarding importing of electronic equipment for education and research purpose by following the rules and regulation without having any motoring section as there is a possibility to use these in another purposes.

11. **Solid Waste Management Rules 2021:** On December 23, 2021, the Bangladesh government announced the Solid Waste Management Regulations 2021 in accordance with the Bangladesh Environmental Protection Act of 1995. This regulation spells out the duties of businesses that deal with solid waste management and places collection, recycling, and disposal obligations on producers of non-biodegradable products. According to this rule 3R strategy, Responsibilities of manufacturers, importers, consumers, waste generators have been determined though the definition of manufacturers hasn't been defined. The way of disposing of waste separately without dumping, storing, or burning waste outdoors has been defined. For any violation of the above, the penalty is two years in jail and/or a fine of 200,000 taka, or both. The rule's addition of "extended producer responsibility" implies that manufacturers will now be held accountable for the trash their products generate. When this tiny waste get mixed with other wastes it becomes hazardous waste which is injurious for human body. Undoubtedly, this step taken by Government is not only environment friendly but also lifesaving.

Prospects and Challenges

1. **Energy Recovery:** Waste-to-energy refers to the process through which waste that cannot be recycled is transformed into heat and power that may be used. An approach that has significantly aided in the advancement of renewable energy systems is the recovery of energy as a crucial component of waste management. The process of drawing energy from municipal solid waste (MSW) is becoming more significant in the realm of renewable energy. In today's world, this potentially helpful approach to the management of municipal solid waste (MSW) is now being put to full use via the process of incineration coupled with energy recovery. Recently The Bangladesh Power Development Board (BPDB) has signed a contract with China Machinery Engineering Corporation (CMEC) for implementing 42.5MW waste-to-power plant to generate electricity from waste using incineration technology in the capital's Amin bazar by 2024 (The Business Standard, 2021). Besides, 'Bangladesh Power Development Board (BPDB), the Narayanganj City Corporation (NCC), and Chinese firm U&D' signed the agreement that 600 tons of garbage to the U&D plant shall be supplied by Narayanganj City Corporation to generate 6 MW of electricity, which shall be purchased by the BPDB at a rate of US20.19 Cents (The Financial Express, 2022). Thus Bangladesh may by using waste can produce electricity which may prevent the deliberate shutdown of electric power in areas by eradicating the shortage of electricity. Notably, adequate laws should be made in providing the report of produced electricity by the authorized people so that there remains no illegality.

2. **Waste Processing Center**: In Bangladesh, Because of its effective approach to waste management, the southwestern district of Jessore has emerged as a leading example in the

recycling of wastes. This initiative is the first of its type to be implemented in Bangladesh, and it entails the recycling of everyday garbage into biogas, electrical power, and fertilizers. After a preparation period of 28 days, the decomposable waste materials, such as fruit peels and vegetable scraps, are recycled into the fertilizer. The fertilizer is then processed and packaged. The remainder is sent to a biogas factory, where it is converted into energy. This electricity is then utilized to power the plant itself. The plants have the capability of generating four tons of fertilizer, 400 cubic meters of biogas per day, additionally, the plants are producing 200 kilowatts of power at the moment despite having a capacity of 430 kilowatts (Zaman, 2019).According to the opinion of scientists, if this project can be implemented in a scientific way, in future, there shall have a great future of Bangladesh by exporting the fertilizer and biogas to Abroad which is a great challenge.

3. **Extended Producer Responsibility (EPR) system:** The Department of Environment has introduced EPR in Bangladesh in by drafting Solid waste management Rules 2021 though hasn't finalized it yet. Under this concept manufacturers will be held accountable for the waste which has been generated by their product. The manufacturer will have to take the responsibility financially for using decomposable products. By using the polluters pay principle defined in environment conservation act, EPR can stop the cost of waste management for municipality. Additionally it can reduce the pressure on biodiversity and infrastructure by ensuring sustainable design of product and packaging. In India, this process is being used. For obtaining license or renewal, producers will have to submit their plan to their state control boards. Collection segregation and sorting of waste shall be the responsibility of urban local bodies.in Bangladesh during making an application the environment clearance certificate the producer will have to submit waste management plan. Moreover, information about recycling during renewal of environment clearance certificate will have to provide by the producer, unless it will be a punishable act under section 15(1) of the ECA 1995.It will be a challenging matter to convince the manufacturer about this provision unless a monetarization authority is set up along with strict provisions of laws.

4. **Green Supply Chain Management:** This is an environmentally friendly concept to increase environmental sustainability through various green activities. The goal of GSCM is to create an eco-friendly environment by minimizing environmental loss by chain-related activities like: (a) green design (b) green manufacturing process (c) Green waste management (d) green construction (e) Green distribution etc. The goal of green design is to produce environmentally responsible and sustainable building projects. The goal of green manufacturing practices is to cut down on the amount of raw materials and other resources that are used during production. This is done to indirectly cut down on the amount of waste produced throughout the manufacturing process by reducing the amount of energy and resources that are put into use. In order to reduce greenhouse gas emissions to 5 % in the energy and power, transport, and industrial sectors, Bangladesh is working by ensuring the implementation of the Environmental Protection Act 1995.But the major challenges of environmental sustainability is being faced in the major export industries in Bangladesh resource inefficient production processes, unavailability of natural gas, lack of waste

management which are not enough to cause a fruitful green industrial development. That's why more effective measures should be taken along with forming a unified code for national requirements for a green industry with proper implementation as green industry has benefits of the tripartite aspects of sustainability also building a structured green sector would help us to meet the global Sustainable development goals in 2030 and enable our society to strive for environmental peace.

5. **Food for plastic Initiative**: Besides Government, Non-Governmental Organization like Bidyanondo Foundation has recently come up with this innovative and praiseworthy Idea. Rice, lentils, eggs, and even t-shirts, lungis, and sandals will be offered in return for unwanted articles of plastic that can be brought to the Bidyanondo Exchange Center in Saint Martin's. This is part of a limited-time promotion that the center has developed. A Plastic Exchange Store has been established by this foundation which will remain open twice a month, individuals will be able to deposit their plastic garbage on a monthly basis, and on a particular day the following month, they will be able to collect their desired products in exchange for their waste. Volunteers from Bidyanondo have been spreading the word about their organization's campaign by going door to door in the days leading up to the start of the program. Locals are all praise over this unusual Idea. It has been decided to keep the "Plastic Exchange Store" open twice a month. People then have the opportunity to trade the plastic they have kept or collected for commodities that are essential to meeting their requirements (Karmaker, 2022). It will stimulate both the waste management process of collecting recyclables and recycling materials. Thus other private or non-governmental sectors should come forward with these innovative ideas along with Government to save Bangladesh from the dangerous consequence of hazardous waste management.

Findings

- Absence of the management of various waste in different ways by proper segregation and maintenance of health policies.
- There are no legislative instruments that pertain to the management of radioactive waste, thus it is not managed correctly.
- Failure to conduct an adequate investigation into the impacts of hazardous wastes on both the natural environment and human health in order to make the general public more aware of the problem.
- Absence of creation of proper laws in individual level for throwing out wastages anywhere, though there are adequate legislations for the management of waste by different sectors and organizations.

- The failure to effectively establish effective monitoring and workshop programs for relevant parties to guarantee compliance with national and international protection mechanisms.
- Failure to implement and comply with national and international rules and legislation.
- There is no codified legal instrument or law in Bangladesh governing the management and disposal of waste.
- Failure to keep appropriate and trustworthy records of total hazardous waste production in Bangladesh.
- Lack of current personnel and a distinct legal cell for the settlement of legal issues regarding mismanagement of wastes under DOE.
- Absence of, cooperation between the Government and non-profit organizations which are working for this issue.
- Lack of implementation of law in case of using polythene or plastic objects especially in coral islands which may pose a threat to coral and other living creatures.
- Absence of a regulatory body to supervise and guarantee the waste reduction process.
- The allowable level of emissions of gases or the duties of remedial efforts for the industries or factories haven't been defined in none of the acts.

Recommendation

- For the purpose of managing all of the many kinds of garbage that are produced in urban areas, such as municipal, medical, and electronic waste, a complete set of regulatory rules has to be devised.
- The laws regarding for throwing out wastages anywhere by individual should be made, though there are adequate legislations for the management of waste by different sectors and organizations.
- A community of practice and collaborations between the relevant public and private organizations are required to guarantee that everyone can benefit from a waste management strategy that is ecologically friendly.
- Based on sanitary norms, long-term strategy and better equipment –Landfills should be established.
- It is essential to keep accurate and trustworthy records detailing the overall quantity of hazardous waste produced on a daily, weekly, or annual basis.
- The establishment of a regular monitoring authority is recommended in the case of waste management in order to verify the implementation of national and international legal frameworks as well as bureaucratic obstacles.

- Training and education programs should be arranged for the workers and the authority who are playing role for proper management of waste.
- To ensure effective collaboration and partnership between the Government, municipalities, city corporations, NGOs, industries, restaurants, markets, factories, and the neighborhood, a ward-level committee should be established.
- The millions of people who reside in the nation's capital generate millions of gallons of liquid waste every day, making it imperative that adequate sewage and industrial waste treatment facilities be built and maintained.
- The usage of plastic goods and polythenes by both visitors and locals may endanger coral and other living animals. As a consequence, it should be strictly prohibited on this island.
- Recycling facilities, such as composting and biogas plants, should be installed at every industrial site, and their ability to receive an Environmental Clearance Certificate, as well as the emission limitations of their gas and liability remedies arising from its production, should be closely monitored.
- In the spirit of this term, efforts should be made to spread awareness of the 5 R Principles (Reduce, Reuse, Recycle, Recovery, and Disposal).
- Strict adherence to the Environmental Conservation Act of 1995 and the Rules of 1997 is essential.
- The practice of combining trash streams into a single container should be avoided and separate bins for recyclable materials should be kept and then transfer it to specific location should be preferred.
- The notion of extended producer responsibility (EPR), which should be firmly enforced in accordance with the environmental conservation act, should be applied to industrial waste as well as electronic waste.
- It is imperative that provisions be provided for the active engagement of city corporations and municipalities in the management of medical waste.

Conclusion

In Bangladesh, the current issue with garbage management is one of the main sources of worry. The ever-increasing rubbish problem is just making matters worse, despite the fact that the country has a legitimate framework and regulations for waste management. There is always a clear risk to the health of the population that is hampered by the lack of scheduled disposal services, which results in insufficient collection and open dumping. Similarly, the presence of poisons in waste, unchecked leachate, and the mixing of biomedical and municipal waste all contribute to an increasing number of health problems. Despite the lack of funding, the Government of Bangladesh is determined to deploy waste management technologies. However, it has been exceedingly difficult for the Government to guarantee effective and proper collection and disposal of solid waste for the full population due to inadequate resources and organizational capacities.

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