

PUBLIC PARTICIPATION IN THE DECISION MAKING
OF DISPOSAL FACILITY SITINGS IN DHAKA,
BANGLADESH

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DHAKA, BANGLADESH**

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FULFILMENT OF THE REQUIREMENTS FOR
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**INSTITUTE OF BIOLOGICAL SCIENCES
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Field of Study: **WASTE MANAGEMENT**

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**PUBLIC PARTICIPATION IN THE DECISION MAKING OF
DISPOSAL FACILITY SITINGS IN DHAKA, BANGLADESH**

ABSTRACT

In recent years, the Bangladeshi public has shown concern on the expansion of solid waste landfills. Matuail and Amin Bazar landfills which serve the entire Dhaka city have been in operation for more than two decades. However, it has been reported that the two landfills were built without any environmental impact assessment and involving public participation. As the two landfills are approaching their full capacity, the government is currently planning for their expansion. This study aimed to find out mechanisms to improve the process and management of solid waste in Dhaka city. This study was carried out triangulation study and used a mixed methodologies approach (qualitative and quantitative). 31% of the respondents in this study area had been asked about the decision-making of present disposal facility siting. However, 42% of participants were unhappy regarding the present solid waste disposal facility location. It can be concluded that public participation in the decision-making for disposal facility siting in Dhaka city is minimal at present, the best approach to begin resolving the issue is for the city corporation's authorities to demonstrate their value to the people by incorporating them in the early planning process.

Keywords: Public Participation, Landfill, Environmental Impact Assessment, Solid Waste Management, Decision Making.

**PENYERTAAN AWAM DALAM PEMBUATAN KEPUTUSAN
KEMUDAHAN PELUPUSAN DI DHAKA, BANGLADESH**

ABSTRAK

Sejak beberapa tahun kebelakangan ini, penduduk Bangladesh telah menunjukkan kebimbangan terhadap projek memperluasan tapak pelupusan sisa pepejal. Tapak pelupusan sampah Matuail dan Amin Bazar yang menampung seluruh bandar Dhaka telah beroperasi selama lebih dua dekad. Bagaimanapun, terdapat laporan yang menyatakan bahawa kedua-dua tapak pelupusan sampah itu dibina tanpa kelulusan mengikut standard penilaian dampak alam sekitar kerana proses kelulusan projek tersebut dijalankan tanpa mengambilkira pandangan dan penilaian daripada penduduk. Memandangkan kedua-dua tapak pelupusan itu menghampiri kapasiti sepenuhnya, kerajaan sedang merancang untuk memperluaskan tapak tersebut. Oleh itu, kajian ini telah dijalankan dengan bertujuan untuk mengetahui mekanisme penambahbaikan proses dan pengurusan sisa pepejal di bandar Dhaka. Kajian triangulasi telah digunakan dengan menggunakan pendekatan metodologi campuran (kualitatif dan kuantitatif). Seramai 31% daripada responden telah terlibat dalam kaji selidik awal sebelum projek pembinaan tapak pelupusan sisa pepejal dijalankan. Namun, seramai 42% peserta tidak berpuas hati dengan lokasi kemudahan pelupusan sisa pepejal tersebut. Kesimpulannya, penyertaan penduduk dalam proses penilaian projek tapak pelupusan sisa pepejal di bandar Dhaka masih di paras yang kurang memberangsangkan. Antara cadangan yang boleh diusulkan pada masa ini adalah pihak berkuasa perbadanan bandar perlu menonjolkan ketelusan mereka dengan melibatkan penduduk sekitar dalam proses penilaian awal bagi sebarang projek di masa hadapan.

Kata kunci: Penyertaan Awam, Tapak Pelupusan, Penilaian Kesan Alam Sekitar, Pengurusan Sisa Pepejal, Pembuatan Keputusan.

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LIST OF SYMBOLS AND ABBREVIATIONS

APO	:	Asian Productivity Organization
BBS	:	Bangladesh Bureau of Statistics
BELA	:	Bangladesh Environmental Lawyers Association
CEAA	:	The Canadian Environmental Assessment Act
DCC	:	Dhaka City Corporation
DNCC	:	Dhaka North City Corporation
DOE	:	Department of Environment
DSCC	:	Dhaka South City Corporation
EIA	:	Environmental Impact Assessment
EIS	:	Environmental Impact Statement
EPA	:	United States Environmental Protection Agency
JDCF	:	Japan Debt Cancellation Fund
JICA	:	Japan International Cooperation Agency
MSW	:	Municipal Solid Waste
NGO	:	Non-Governmental Organisation
PWCSP	:	Primary Waste Collection Service Provider
RAJUK	:	Rajdhani Unnayan Kartripskkhs
SLAPP	:	Stategic Lawsuit Against Public Participation

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CHAPTER 1: INTRODUCTION

1.1 Study Background

Rapid urbanization and industrialization, which are critical components of global economic and social growth, are also connected to increased garbage output (Vij 2012). At the moment, landfills are the most popular form facility of garbage disposal (Kaza et al. 2018). A landfill is defined as a huge plot of land or excavated area that has been specially designed and constructed for final disposal of solid municipal waste (Abdel-Shafy & Mansour 2018). Around 37% of garbage is disposed of in landfills globally (Kaza et al. 2018), with around 52.6 percent in the United States, 59.1% in Brazil, 94.5 percent in Malaysia, 79 percent in China (Vaverkova 2019), and 42% in Bangladesh (Amin 2017). Numerous emerging Asian cities, like Dhaka, Bangladesh, are confronted with significant challenges in handling the rising volumes of solid garbage created by an urbanizing population (Idris et al. 2004).

Only two landfills cover the whole city of Dhaka, Matuail and Amin Bazar. The Dhaka North and South City Corporation is in charge of rubbish collection and management in Dhaka. The Matuail landfill is located north of the Dhaka-Demra highway, while the Amin Bazar landfill is located north of the Dhaka-Aricha highway. The Matuail landfill is used by the Dhaka South City Corporation (DSCC) to dispose of municipal solid trash in the city's southern sector, while the Amin Bazar landfill is used by the Dhaka North City Corporation (DNCC) to dispose of municipal solid waste in the city's northern sector. Matuail landfill site, which is 23 years old, will meet its maximum waste carrying capacity in a year. whereas Amin Bazar landfill exceeded its estimated maximum waste carrying capacity in 2017 (Mahmud, 2018). Over time, mountains of waste have accumulated in landfills, pouring onto nearby regions and water bodies and ultimately

poisoning the surrounding environment, since none of the two municipal companies constantly covers and compacts rubbish with dirt.

Needless to say, if an appropriate waste management system is not implemented, the situation will deteriorate further. Both landfills have devolved into open waste disposal grounds as 7,500 tonnes of solid garbage each day are collected from residences and disposed of in the two landfills (Jahidul, 2021). As a result, the primary aim of municipal corporations seems to be land acquisition for both landfill sites, rather than pursuing a sustainable method.

Previously, public input was disregarded in the site selection process for both Dhaka landfills. Public opinion is a significant element in determining the placement of a landfill. Nowadays, public awareness of solid waste management (SWM) concerns has grown in Dhaka, and several groups have taken steps to address them. In this context, this research will demonstrate the importance of public participation and preferences in determining the location of a solid waste disposal facility in Dhaka.

1.2 Problem Statement

Currently, Dhaka's inadequate waste management infrastructure is unable to keep up with the city's high garbage creation rate of around 4500 tonnes per day (Mahmud 2018). At the moment, two landfills at Matuail and Amin Bazar serve the Dhaka South City Corporation (DSCC) and the Dhaka North City Corporation (DNCC). Before 2006, the Japan International Cooperation Agency (JICA) and Japan Debt Cancellation Fund (JDCF) developed only the Matuail landfill (under the DSCC). Another landfill was established near Amin Bazar (under the DNCC) in 2006 with funding aid from the JICA, and it is still active despite reaching capacity in 2017. This financing was granted as assistance, and the JICA is not responsible for landfill operations or management, but it

engages with both the DNCC and DSCC on waste management activities carried out at the landfill.

Solid waste dumped in landfills may have a negative impact on the surrounding environment and on those who live near landfills (Njoku et al. 2019). Composting's influence on land and landfill gas production, landfill site, leachate treatment, and leachate contamination are all significant concerns that have been addressed in prior research (Hai & Ali 2005; Azim et al. 2011). Low birth weight, congenital malformations, and respiratory ailments are all common health consequences of living near a dump (Shaddick et al. 2018). Brender et al. (2011) established a substantial link between residential proximity to environmental dangers and bad health outcomes, including risks for central nervous system disorders, congenital heart problems, low birth weight, cancer, asthma, and chronic respiratory symptoms. Additionally, research conducted in South Africa found that residing within 5 kilometers of a garbage dump was connected with an increased risk of TB, asthma, diabetes, and depression (Tomita et al. 2020).

A vast tract of agricultural land is inside the 500 m threshold in Amin Bazar landfill, a very susceptible zone. This agricultural area, which is sensitive to leachate infiltration, is vital to the livelihoods of several adjacent residents. Additionally, several small water bodies may be detected inside the 500 m buffer zone on the eastern side, as well as numerous villages within the 500–1000 m benchmark. Although the adjacent areas of the Matuail landfill do not have as many water bodies and agricultural land as Amin Bazar, many settlements and water bodies are located within the 500 m benchmark, especially on the south and south-western sides (Urme et al. 2021).

In this scenario, The Matuail landfill site will be expanded from its current size of 100 acres to 181 acres under the New Clean Dhaka Master Plan 2018-2032. The 'Matuail Sanitary Landfill Extension Project with Land Development' is currently underway. It began in June 2017 and concluded in June 2021. The land acquisition took a long time and will end in July 2020. The DSCC has paid the district administration Tk 1.24 billion for land acquisition (Nahar, 2020).

The environmental clearance of the Amin Bazar landfill expired in 2017, Amin Bazar landfill covers 52 acres, including an additional 21 acres that the Dhaka North City Corporations is presently using for waste dumping without acquiring. DNCC intends to acquire an additional 100 acres for waste disposal at Amin Bazar (Devnath, 2020). Residents who live close to the two Dhaka dump sites under investigation experience significant environmental and health dangers (Urme et al. 2021).

According to recent reports in several national newspapers, the Amin Bazar landfill is located in a flood zone and is operating without environmental clearance as a result of a petition filed by a resident and a national non-governmental organization called BELA-Bangladesh Environmental Lawyers Association. The complaint alleged that the DCC's Waste Dumping Depo Project received no objection letters, clearances, and authorizations in violation of all relevant laws and legal restrictions. The letter of Rajuk, the Town Improvement Authority, dated 22.2.2004, and the Department of Environment's (DOE) Site Clearance letter dated 6.1.2005, both of which purport to permit the conversion/use of flood flow zone and agricultural lands in Mouza Baliarpur and Konda as Waste Dumping Depots, have been challenged. The government has been requested to explain why it should not be required to promulgate adequate waste management rules under the Environment Conservation Act and the DCC Ordinance.

According to the Bangladesh Bureau of Statistics (BBS) 2011, the placement of the landfill is regarded as the most challenging obstacle to overcome throughout the growth process in a metropolis like Dhaka, which has the greatest population density. However, the residents of Dhaka believe that government officials controlled their actions regarding landfill siting and eliminated several suitable sites without soliciting their input. Inadequate information, poor decision-making, and unreasonable expectations failed to meet public needs, yet this situation might have been avoided if public involvement had been included in landfill siting. In Dhaka, municipal or sanitary waste landfills were built without considering public concerns about their placement, leaving the public in the dark about waste management. Additionally, Dhaka South and North City Corporations are disposing of waste in an unsustainable manner near settlements, resulting in health and environmental problems associated with the landfills (Hossain et al., 2018).

However, there are few researches explored the necessity of public participation in the decision-making for the disposal facility sitings. Thus, this study is presented to include public participation and opinion in the decision-making of landfill sites for improved solid waste management in Dhaka, considering the possibilities and problems of potential sustainable waste management.

1.3 Research Questions

The research questions of this research are as followed:

- How is public participation integrated in the past and present decision-making for the Matuail and Amin Bazar disposal facility siting?
- What are the public's opinions on the decision to locate the present disposal facility?
- How did Dhaka north and south city corporation involve the public in the decision-making of disposal facility sitings in Dhaka?

1.4 Research Objectives

To address the gaps in existing studies, the objectives of this paper are as follows:

- To identify public participation in the decision-making of Matuail and Amin Bazar disposal facility sitings.
- To explore public opinion on current disposal facility siting.
- To explore the challenges involving the public in the decision-making of disposal facility sitings faced by Dhaka North and South city corporations.

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CHAPTER 2: LITERATURE REVIEW

2.1 Public Participation

2.1.1 Definition

Public participation is critical when it comes to waste facility siting since, in the past poor judgments concerning such facilities made by the technical expert, the developer, or the governor had a significant impact on the public. The process of establishing a new waste disposal plant grows more complex and ultimately fails due to public resistance. Numerous studies have so advocated for more public involvement in decision-making (Khun & Ballard, 1998; Merkhofer, Conway, & Anderson, 1997; Palerm, 1999; Rogers, 1998). This is because participation facilitates two-way communication between all interested parties. Not only does it disseminate information about the project, solicit stakeholders' opinions and concerns, and maintain or improve the organization's credibility and support, but it also ensures a transparent process, balances power between proponents and opponents, builds trust, and results in a decision that is more responsive to public preferences and concerns (Bopp 1994; Creighton 1994; Iacofano 1990; McLaverty 2002; Merkhofer et al. 1997).

Authors of theory have defined public participation as follows: Arnstein (1969); Kinhill Engineers (1994); Pareneau (1988); Potter and Norville (1983); Selin and Chavez (1995, as cited in Merkhofer, Conway, and Anderson, 1997); Sewell and O'Riordan (1976, as cited in Parenteau, 1988); Van Til and Van Til (1970, as cited in Kasperson, 1974). These definitions, however, are similar and are covered by Creighton (1981), who states that "public participation is a process, or series of processes, by which interested and affected individuals, organizations, agencies, and government entities are consulted and included in the decision-making processes of the government, agency, or corporate entity" (p. 3).

Kasperson (1974), on the other hand, defines "what is not involvement" in political engagement as follows: Participation is impossible when people are bound to organizations or procedures where agendas are predetermined, problems are specified, and results are constrained. When participation is motivated by legitimization and support rather than invention, it is "unreal." Meaningful engagement comes from a belief in man's talents despite his limits (p. 5). Combining these two interpretations results in a very valuable discussion in this research.

2.1.2 Strengths and Weakness

Since 1950, public participation has been used. However, it has both benefits and weaknesses. This section addresses how to properly include public engagement in site selection while avoiding many of the common pitfalls.

Numerous benefits of public participation have been demonstrated in the professional literature (Bopp 1994; Creighton 1994; Iacofano 1990; McLaverty 2002; Merkhofer et al. 1997), among which are the following:

1. Increasing the effectiveness of the decision-making process.
2. Limiting the time and financial costs associated with contested decisions.
3. Ensuring the organization's reputation and support are maintained and strengthened.
4. Making judgments that are more sensitive to public preferences and concerns.
5. Increase the psychological self-esteem of participants.
6. Supporting the learning process; enhancing social capital.

7. Tackling social isolation, alienation, and a range of other socio-economic challenges.
8. Averting the emergence of a significant divide between the "governed" and the "governors".
9. Decentralizing governmental authority and power.

While the numerous benefits of public participation are well-documented, many authors remain skeptical of its shortcomings, particularly given its high cost in terms of time, money, effort, frustration, confrontation, conflict, and litigation (Kweit & Kweit, as cited in DeSario & Langton, 1987; Delli Priscoli 1982, as cited in DeSario & Langton, 1987; Sarkissisian et al., 1997, as cited in Harding,

1. Interest groups' hegemony over the process.
2. Expenses in terms of money and time.
3. The possibility of the local government losing its decision-making role.
4. Difficulty in obtaining a representative sample of viewpoints.
5. Consultation and engagement disproportionately benefit middle-class, articulate individuals.
6. Does not always result in social transformation or participation of the "have-nots".
7. Economic considerations may take precedence.
8. Encourages the mobilization of adversarial forces.
9. Residents advocate for their interests and special privileges while ignoring the larger picture or city- or regional-wide or regional concerns.
10. Technical concerns may be beyond the comprehension of the average person.
11. It may be difficult to determine the extent to which public input should be considered when "weighing" various factors in the decision-making.

12. Not all participants will "play fairly," and some may disseminate selective or "tainted" information.
13. The outcomes of certain forms of public involvement are unpredictable, and the process can be difficult to control.

Due to these advantages and disadvantages, public engagement is said to have "peaks and troughs." In the United States, public participation peaked during the Carter administration, however, it waned during the Reagan administration (Daneke, 1983, pp. 21–23), and the "strategic lawsuit against public participation" (SLAPP) was developed to preclude public participation in the siting of a hazardous waste facility (Portney, 1991).

While there are several flaws, Robinson (1992) stated that these flaws occur only when incorrect models of public involvement are used, rather than as a result of general activity failure. Furthermore, Wiedemann and Femers (1993) suggest that public engagement is a "means" rather than an "end." It is thought that including the public in the process would result in a decent solution and, ultimately, major societal transformation (Creighton, 1981).

2.1.3 Participants

Participants are critical to the participation process because they are actors each with a distinct role in the process, and their involvement will both lead and be influenced by the decision. Howlett & Nagu (1997, as referenced in Hughes, 1998) defined participants or stakeholders as "all those individuals and organizations with an interest in the project's successful design, execution, and sustainability." This covers people who are benefited and those who are harmed by the endeavor. Stakeholder engagement refers to the process through which all parties interested in the result of a project may participate actively in its planning and administration. They exchange information and expertise and may contribute to the success of the initiative, so advancing their priorities (p. 22).

Numerous studies have shown comparable instances of who should participate categorized differently and referred to differently. For instance, Chawsitthiwong (2002) suggested that "public engagement" should include representatives from the government, local organizations, the local community, non-governmental organizations (NGO and academic), and laypeople. As with prior nominations, Palerm's investigation included the developer, the developer's public relations firm, a consultant, the competent environmental authority, important non-governmental organizations, and key impacted municipal governments (1999). The Irish EPA (1995, quoted in Hughes, 1998) and the OEPP & Policy Studies Institute (1996) offered participation as part of the EIA process, which includes impacted residents and representatives from other decision-making organizations. These participants include government agencies, citizens' groups, recreational interest groups, non-governmental organizations (NGOs), expert groups, academic groups, corporate associations, the EIA research team, EIA approval organizations, and the media. Additionally, the Constitution of the Kingdom of Thailand B.E. 2540 (1997) sections 290, 46, 56, and 59 states that environmental management should include the following five components: (a) government, (b) local organization, (c) local community, (d) independent organizations, and (e) the general public. It may be inferred that, in general, anybody is invited to participate and no one is excluded.

However, not all of these nominated persons may be active in practice. In Thailand, the participants with the authority to make choices may not include all of the above-mentioned participants, which means they may exclude minors under the age of 15 or may include just politicians or policymakers. The issue that arises is who will represent them. Will politicians or decision-makers speak for the developers or the impacted individuals? Are our representatives on an equal footing? Is there a connection between decision-making and non-participants? Creighton (1981, p. 39) characterizes this state of affairs as a "reality of political existence."

Additionally, the public may be interested in participating in a different manner. In practice, any stakeholder may be interested in and worried about the global, national, and local environmental impacts (Hughes, 1998).

Global concerns such as biodiversity loss, national concerns such as renewable and non-renewable resource usage, and local concerns such as pollution or market possibilities are all examples of these three degrees of care. Additionally, some may choose to be engaged via representatives, while others may prefer to join just at certain phases, and yet others may be uninterested in engaging at all if they perceive they are unaffected or unable to intervene. Increased non-participation due to lack of knowledge might seem to show that there is a limited number of participants; nevertheless, participation via representatives does not indicate that only a minority of individuals care about the proposed project (Ortolano, 1997).

These local representatives may serve as surrogates for the silent majority and/or the wider people (Willeke 1976, as referenced in Ortolano, 1977). That is why Creighton (1981) and Ortolano (1997) proposed that local representatives come from those whose normal environment is most likely to be impacted by physical and mental health issues, as well as those who are concerned about the proximity; those who will benefit or lose economically, those who will use the site, and those whose social concerns and values are impacted.

As a result, this research study includes participants from the general public and interested parties, such as developers, environmental government personnel, local leaders, the favorably and adversely impacted public, the general public, and opposing organizations.

2.1.4 Obstacles of Public Participation in the EIA process

This section discusses the obstacles to public participation that were discovered during the EIA study's conduct. It is critical to explore these obstacles in this research since public participation is required in Bangladesh's EIA studies.

Several variables, depending on the circumstances and context, prevent the public from engaging in the EIA process. Cost is the primary impediment that managers have mostly been unable to overcome. Other barrier factors include a lack of support for rights, a different culture in decision-making, the absence of guidelines, confidential information (Sriburi, 1998), a different social status (Potter & Norville, 2019), or demographic factors—such as being uneducated, black, elderly, or very young (Kasperson, 1974). Hughes (1998), on the other hand, utilized the barrier factors to public involvement summarized in the EIA process as a guideline for the suggested model in this research since the majority of the criteria are covered. Additionally, comprehending and defining such hurdles to public involvement is beneficial in a practical sense, as it enables the use of participation models to remove or mitigate the impact of such barriers. The following sections outline each factor.

2.1.4.1 Education

Individuals with a higher degree of education are more likely to engage in public participation (Sinclair, 1978), whereas those with a lesser level of education are unable to provide (Foonglin, 2000; Issariyamet, 1993; Itthipong, 1993; Khemcharoen, 1988), particularly when the issue is technical (Kaewthep, 1992).

2.1.4.2 Gender

Men engage in environmental activities at a higher rate than women in several regions of the globe (Daawsuwan, 1990; Foongglin, 2000; Leepan, 1994; Sombbonchai, 1991; Sootipanwihan, 1996). This is because when women's position is lower than men's, they often have little opportunity to participate in environmental activities.

However, in areas with equal opportunity, it is discovered that women often play a larger role than males.

2.1.4.3 Time and Money

Time and money are often intertwined in the participation process since the process itself includes many groups of participants and requires a significant financial investment, as well as several months or even a year. As a result, participating is time-consuming. These expenses must be borne by either the general public or the proposer or both. This is critical in an environment without finance; participants are consequently harder to engage.

Participants in certain locations lack the resources necessary to participate. Numerous stakeholders including affected communities, expert institutions, government agencies, and proponents lack the time and financial resources necessary to participate in the EIA process, for example, the cost of transportation, and the cost of leaving one's regular job to participate, and so forth.

Not only do participants have to invest time, but they may also have to invest money in certain countries, such as Australia (AUD\$15) and the United States (US\$25–75), where the general public is required to pay money to purchase an Environmental Impact

Statement (EIS) report in order to follow up on project information. This is because the proponent actively discourages schools from requesting big quantities of EIA reports.

In some countries, responsible organizations promote participation, such as in the United Kingdom, where this information is offered free of charge to anyone with a household income of more than £100 (Wood, 1995). Panel reviews are supported by intervention funding in Canada (Wood, 1995). Lynn and Wathern (1991), as reported in Wood, (1995) indicate that it facilitated decision-making since, on average individuals prepare well when they obtain financing assistance.

2.1.4.4 Timing

Because the purpose of public participation in the EIA process is to improve decision-making effectiveness by involving the public as early in the process as possible such as during screening (as in Western Australia, Wood & Bailey 1994, as cited in Wood 1995) or scoping (as in the United States and the Netherlands), this should identify issues that experts may have overlooked (Wood, 1995).

Following the submission of an EIA, public participation activities such as public review, public appeal, and monitoring are critical for enhancing decision-making and project approval.

However, in some countries where public participation occurs only after a decision has been made, participants may perceive themselves as acting in a reactive capacity, providing information about the decision rather than providing opportunities for constructive dialogue or influence on the design and decision-making processes. The public, abstains from participation, believing their choices are pointless in light of the fact that the decision has already been taken.

2.1.4.5 Poor Presentation of EIA Findings

The public cannot participate in the EIA process and make an informed decision about whether to support or oppose the project while they have access to project information. Hughes (1998) claimed that the EIA report is unavailable to participants due to the report's size, difficulty, and complexity.

2.1.4.6 Project Size

A huge number of participants may discourage engagement, since the developer may get an overwhelming quantity of information from the public that is difficult to handle. The public is less interested in on-site hazardous waste facilities than they are in off-site hazardous waste facilities according to experience in placing hazardous waste facilities. On-site facilities are often smaller locations inside privately held firms, but off-site facilities take a variety of hazardous wastes from outside the community and have a bigger and more sophisticated management structure than on-site facilities. Off-site facilities may have a greater impact on a broader segment of the public and a bigger geographic region than on-site amenities (LaGrega, Buckingham, & Evans, 2001).

2.2 Disposal Facility Site selection

2.2.1 The Need for Disposal Facility Sitings

Waste management has seen considerable changes throughout time (Defra, 2013). Since the industrial revolution and more recently, post-war consumerism in 1950. Population density, industrial intensity, complexity, and increase in household packaging trash have necessitated the supply of what is now referred to as modern waste management (Atkinson and New, 1993). Without such provisions, disposed of wastes may have a negative influence on human health via clinical hygiene issues or exposure to harmful components (Giusti, 2009). Additionally, there is the practical and logistical

difficulty of physically removing the substance. The problem of waste management has become much larger over the last several decades, owing to the rising quantities of materials utilized and consumed, as well as the projected scarcity of future resources (Modak et al., 2015). With rising consumption and demand for raw materials, the need to manage environmental resources responsibly is becoming more critical (Voulvoulis et al., 2013).

Waste management was emphasized as a priority in the first European Union (EU) Environmental Action Plan, issued in 1972, and was codified in 1970 with the ratification of the first Directives demanding a decrease in waste landfilling and appropriate waste management (EU Commission, 1999). Waste management principles outlined by EU waste regulations require waste to be handled in a manner that does not jeopardize human health, degrade the environment, cause annoyance via noise or odors, or have a negative impact on rural areas or locations of particular interest (EU, 2008). Waste management must also be integrated into resource management by repurposing wastes. For example, the European Union's Member States are required by a number of Directives to not only reduce waste sent to landfills but also to increase its recoverability through recycling (Iacovidou et al., 2012). The European Commission's (EC) Landfill Directive (99/31/EC) requires Member States to reduce Biodegradable Municipal Waste (BMW) sent to landfills to 35% of 1995 levels (European Commission, 1999), while the revised Waste Framework Directive (WFD) requires Member States (European Commission, 2008).

Another factor that contributes to the requirement for waste disposal facilities is the complexities associated with trash creation and management. When garbage is 'thrown away,' system intricacies and the entwined nature of materials and contamination become apparent. When an issue is solved improperly, it often results in the introduction of another, sometimes costlier and more difficult (World Bank, 2009). For instance, a

household's waste stream typically includes food and garden waste; packaging (including paper, card, metals, plastic, and glass); electronic equipment; some hazardous waste streams such as oils and batteries; and bulky waste streams such as construction materials, furniture, and textiles (Slack et al., 2004). Additionally, a composite residual waste including all of the aforementioned will exist (Gray, 1997; Williams, 2005; Modak et al., 2015).

Annually, Dhaka produces roughly 1.65 million metric tons of solid trash. The waste stream is composed of more than 80% organic matter and includes a diverse range of materials, including food waste, paper, textile, agricultural waste, building debris, metals, medical waste, and appliances. Estimates of per capita garbage creation vary between 0.29 and 0.60 kg per person per day, depending on the individual's income level (individuals with a higher income tend to create more waste) (APO, 2007).

Despite some progress toward meeting regulatory targets in terms of waste disposal delivery, it is anticipated that over the next two decades, materials, resources, and energy security for the country's growing population, as well as the need for renewed industrial growth will create additional 'waste infrastructure needs' (Figure 2.1)(Modak et al., 2015).

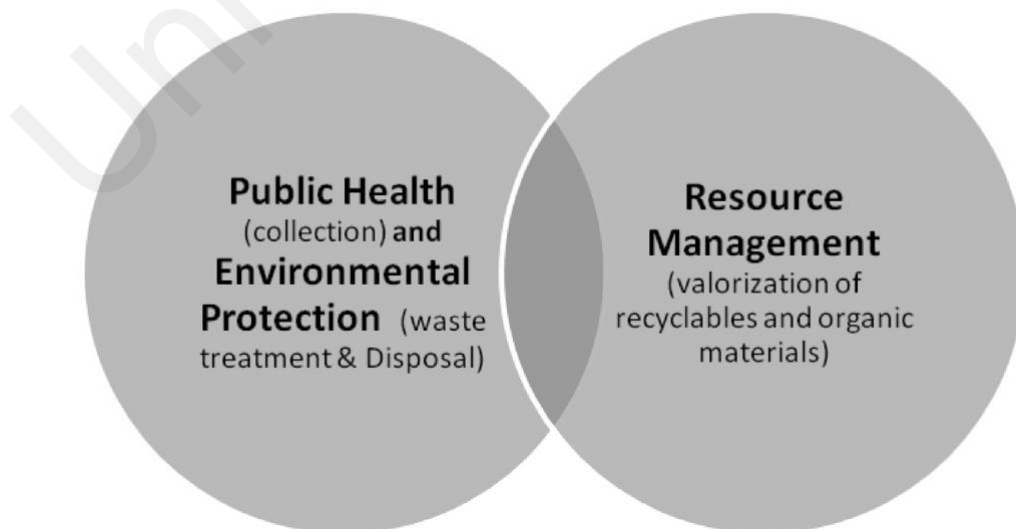


Figure 2.1: Dual aim of disposal facility siting.

2.2.2 Public participation in disposal facility planning

Choosing a landfill location is seen as a difficult cycle given the fact that several regulations must be fulfilled. The primary goal of developing a landfill is to safeguard human and environmental health (Chabuk, 2017). Community involvement is a strategy for collaborating with groups of persons who have a stake or interest in a situation to define challenges affecting their social, natural, and economic prosperity.

Modern waste management aims to accomplish difficult goals and tactics while representing community expectations and guaranteeing cost-effective compliance with legislative requirements. Its social acceptability, which influences both what systems (infrastructure) may be implemented and how well they are implemented and this is a multi-faceted and sometimes poorly understood phenomenon. Given mounting evidence that people's opinions of decisions to build new infrastructure are frequently contested, there is an urgent need to understand the role of scientific evidence in public perception, especially given that environmental infrastructure delivery is frequently opposed by the public on environmental grounds (Kirkman, R., and Voulvoulis, N., 2017).

Decisions over land use may have a big influence on communities. What communities have in terms of infrastructure and services has an effect on social life, culture, and health. For instance, towns with sidewalks, parks, and easily accessible health care facilities provide more opportunities for residents to be active and healthy. Without public infrastructure and services that support healthy behaviors, communities have fewer opportunities to be active and healthy (World Health Organization, 2010). Not simply a lack of infrastructure to promote healthy lifestyles may have a detrimental effect on health. Numerous studies have shown that a disproportionate number of low-income neighborhoods in North America have a diverse variety of harmful land uses (Pulido, 2017). Additionally, notably research from the United States indicates that planning

mechanisms such as zoning might perpetuate inequitable land use distribution (Pulido, 2017, Ross, et al., 2002).

Community involvement enables the consolidation of meetings and data exchange, as well as the dynamic interest of groups such as business, government, and networks. When both parties are committed, more favorable agreements are possible. Successful commitment rehearsals aid in the identification of potential development challenges, effects, opportunities, options, and solutions, and promote a more successful dynamic. The process of screening possible dump locations starts with the establishment of an elite of every conceivable site. As a starting point, this should include all extractive industrial locations in the region and may include underserved areas suitable for channel and fill or hill dumps. When screening for competing landfill locations, the following viewpoints should be considered local area demands, landfill type, and groundwater. Territorial waste management organizations are accountable for establishing a framework for the purposeful development of waste management facilities for both the public and commercial sectors. They are intended to provide a stable waste management system inside the region, including landfill airspace.

According to Kirkman, R., & Voulvoulis, N. (2017), the waste strategy sector is well-known for its natural conflicts. The relationship between open discernment and trash 31 framework transportation should be further investigated. The public commitment must begin at the beginning of the dynamic cycle. For foundation conveyance, informed local discourse, nearby conversation, and collaboration are critical.

2.2.3 Role of Public Participation

Understanding the function of public participation is crucial for the successful implementation of waste disposal facilities. Since the success of the Hampshire-type project, a standardized consultation approach has been used in the majority of places

exhibiting both achievements and failures in designing viable plans (Petts, 2004). For instance, various consequences have resulted from the strategy of consultation and public participation used to develop infrastructure in the United Kingdom (CBI, 2014).

The public often believes that "they do not make trash," that all garbage is recycled, or that mechanical biological treatment and gasification are the primary contemporary trends. Additionally, there seems to be a significant knowledge gap on what happens to garbage and recyclable products after they are collected. According to research conducted in London, a key perceptual barrier is a perception that the Council does not recycle all collected items. This lack of awareness results in trash being seen as "out of sight, out of mind" (Petts, 2004), creating the perception that waste reduction is unnecessary. On the other hand, regardless of the real advantages the goal of expanding recycling is viewed as a priority, despite the fact that the actual waste composition has an optimal point beyond which it becomes counterproductive (Defra, 2011). This creates additional obstacles to communicating information about the 'hierarchy' of waste management.

While energy recovery facilities, or incinerators have been the most visible targets of protest comparable resistance has arisen throughout the development process for recycling, composting, and anaerobic digestion plants (Davies, 2003). Local resistance has been problematic in virtually every instance (UKWIN, 2011), although these initiatives provide a local solution to waste generation. Success has been contingent on the selection of locations with feasible planning ideas, which are mostly determined by local political will and government backing resulting in a highly political choice (Petts, 2004). The public seems to be rejecting scientific and expert advice from impartial agencies, preferring instead to suggest their own financial and technological solutions in areas where they may not be best suited (Chandrappa and Brown, 2012). Could this be one of the primary reasons for public dissatisfaction with waste management facilities?

Despite these concerns, a recent study of public views toward infrastructure in the United Kingdom (Copper, 2015) found that 87% of the public support infrastructure investment, and 85% want to see world-leading or substantial enhancements to current infrastructure. The survey revealed that although almost nine out of ten Britons support investment in new infrastructure, many also want a greater role in how it is designed and delivered. Surprisingly, just 6% of British citizens believe that there is a 'very well coordinated' national or local strategy.

Public perception must be considered early on in the decision-making process. Informed local discourse is a necessary first step in constructing high-quality national infrastructure that extends beyond the consultation stage (Figure 2.2) Making a stronger public argument for infrastructure may help lessen resistance to local and large-scale projects that are often partially supported by UK tax collections (Steg and Vlek, 2009). Given that people tasked with making the case for infrastructure to local communities are the least trusted, it's somewhat unsurprising that an already suspicious public is often uninspired by their justifications for change. Gaining public support for new infrastructure would need a consistent message and a neutral, credible voice capable of laying out objective information about the difficulties confronting the UK and the potential solutions available.

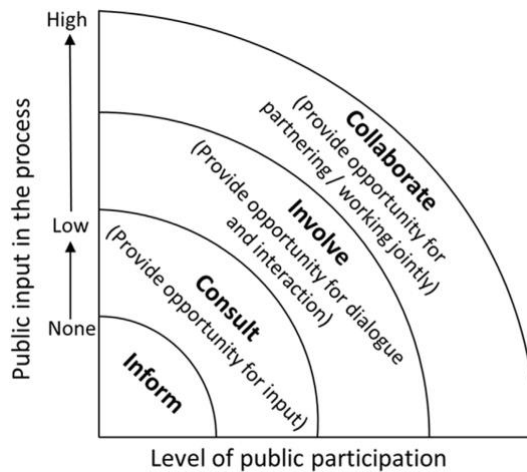


Figure 2. 2: Types of engagement as a function of public input in the process and level of public participation (Sourced from CEAA, 2008).

Modern community and public communication strategies imply that we can do more or that we may utilize different approaches to aid the essential players in society in making decisions, rather than continue to prescribe the answer dogmatically which only serves to erect hurdles. There seems to be an urgent need for people to comprehend and appreciate not only the necessity for infrastructure but also the nature of infrastructure investments and development; the costs and rewards; and the technical components. Individuals' and organizations' capacities for problem-solving and decision-making are recognized as critical competencies that the current change requires.

2.2.3 The cause of public opposition

Typically, public resistance happens during the siting of a waste facility project no developer enjoys public opposition since it has the potential to halt the project. Understanding the reasons for public resistance is critical to the site selection process because it allows for dialogue and the inclusion of new information processes that would not have been considered otherwise. Public resistance to hazardous waste facility sites may be classified into five distinct styles:

1. Widespread resistance;
2. The "not in my back yard" (nimby) syndrome (khun & ballard, 1998);
3. The "not-on-my-block" syndrome (regens et al.,1983);
4. He "not-in-anyone's-backyard" syndrome (heiman, 1990); and
5. The "locally undesirable land uses" (lulus) (minehart & neeman, 2002)

Naturally, NIMBY is the most well-known of them. Similar to Khun & Ballard's (1998) definition of NIMBY, Portney (1991, p. 11) characterized NIMBY as "a reflection of an almost self-contradictory public mentality in which individuals believe it is desirable to place a specific kind anywhere as long as it is not where they reside." This is in contrast to Kemp (1992, p. 10 as cited in Khun & Ballard, 1998, p. 534), who redefined NIMBY as "a vocal opposition to a proposal and siting process or an outcry against unfair decision-making and ineffective public involvement, particularly when the public is invited to participate in only one of the major decisions made."

The distinction between these two definitions is in terms of project acceptance likelihood. The first definition by Portney (1991) appears to have no chance if the facility is located in a public community. However, the second definition by Kemp (1992, as cited in Khun & Ballard, 1998) demonstrates that the solution to NIMBY and the possibility of project acceptance is based on providing an acceptable condition for the public and public participation.

According to Wright (1989), the grounds for widespread resistance, the NIMBY syndrome, the "not-on-my-block" syndrome, and the "not-in-backyard" anyone's syndrome, demonstrate that the challenge of siting a hazardous waste facility is social and psychological in nature, rather than technical. Thus, they may be classified into four categories: risk perception (Rogers, 1998), public distrust, risk-sharing disparities, and other variables (LaGrega, Buckingham, & Evans, 1994).

2.3 Significance of Public Participation in solid waste management

Communities continue to be seen as passive users of government services in many areas of the globe and are often overlooked even during local decision-making processes (Tadesse, 2006). Ultimately, this method leads to individuals being unaware of their potential contribution to the process. Thus, in the middle of a variety of waste management and disposal systems, participation may be a critical missing link/component in a prospective recipe for improved solid waste management. A significant study has been devoted to public engagement, even in areas such as recycling behavior like (Barr, 2004). These studies have shown some intriguing results in favor of public engagement in solid waste management.

The research indicates that landfill space is becoming limited but communities are also less willing to tolerate dumps near their homes for environmental, health, and aesthetic reasons (Barr, 2004). Because it may become unsustainable to adopt autocratic waste management approaches and public engagement in solid waste management choices and practices becomes inevitable.

In the research on Residential Solid Waste Management in India (Sauro, 2006), he discovered many deficiencies in the county's solid waste management methods that clearly lead to public engagement as the best answer. It was discovered that systematic trash sorting at various stages, from the source to the disposal locations, was inadequate (Joardar, 2000). Additionally, it was a significant discovery that incineration has not been successful in India owing to the different content of garbage that is not separated. In an ideal world, basic sorting would be a role performed by the public at the source of waste generation. Without garbage sorting, it becomes almost impossible to handle solid waste sustainably. Additionally, the way waste is disposed of particularly in the developing

world may need public engagement in order to counteract the impacts of inadequate solid waste disposal.

According to Joardar (2000:322), "the most extensively used technique of municipal waste disposal has been uncontrolled dumping, concentrating in low-lying periphery sites and resulting in leachate percolation and pollutant runoff, contaminating soil, groundwater, canals, and riverways." When uncontrolled dumping is conducted indiscriminately by the public, as Sauro points out, it has far-reaching consequences. However, although dumping is not a sustainable technique of waste management in and of itself, it may be managed and the impacts reversed if the public is engaged in the waste management and disposal framework.

The process of public engagement may be lengthy and time-consuming at times. To others, it may seem meaningless. However, it is almost difficult to discuss sustainable development without mentioning the need of including people. This is because an increased understanding of the value of non-expert experiences and knowledge has consistently resulted in a desperate need for shared decision-making in a variety of situations in current development practice (Barnes, 2019). The public's involvement is indispensable in any sector due to its exerted impact on the path of growth.

The significance of public engagement in solid waste management may be difficult to comprehend. However, it is critical to examine some of the strategies for solid waste management and to provide a mechanism for public engagement in determining the success and usefulness of such approaches. The most widely used approach and one that has sparked significant study in the subject of waste management is recycling. Although recycling has been lauded for its contribution to solid waste management (Hus et al. 2007; Bekin et al. (2007) suggest that there are alternative ecologically acceptable approaches to manage garbage.

They do not believe recycling is an ecologically sound method of waste management in its entirety due to the criticisms leveled against it. Recycling requires energy, bearing environmental consequences (Mackanness 2005 cited in Bekin et al., 2007:274).

Additionally, Read et al. (2001) emphasize that although it is typical for even wealthy nations to handle solid waste by recycling and disposal after treatment, this is not the optimal method of waste management.

The extent to which the public participates in solid waste management varies significantly between industrialized and developing nations. In industrialized nations, citizen involvement in solid waste management may extend as far as garbage sorting. After sorting the rubbish, commercial businesses collect it for a charge. The fees are collected to compensate for procedures in which the public should have been included in the waste management line. In other words, the cost is passed on to private garbage collectors on a fee-for-service basis.

The scenario is much different in emerging nations. To begin with, a group of population is unable to pay garbage collection costs on a regular basis. Second, many individuals dispose of garbage irresponsibly, although innocently, with little regard for the looming consequences of their irresponsible disposal. Thirdly, in certain circumstances individuals just do not comprehend the intricacy of the waste issue or the eventual consequence. The public seems to believe that it is entirely the responsibility of the local government to provide effective waste management at no additional cost to the people.

2.4 Waste Management in Dhaka

With a current population of 6.97 million people living in an area of about 126.34 square kilometers (BBS, 2011) the SWM scenario has not been as successful as projected. According to the WHO, Dhaka is rated 23rd among the 600 most polluting cities (Prothom-Alo, 2014; Daily Star, 2014). Dhaka's urbanization rate was 8.87 percent in 1974 and increased to 28 percent in 2011 (BBS 2011). With such a high pace of urbanization and population density, the municipal government is anticipated to collect a limited amount of SW and leave the remainder uncollected. Some of this recyclable debris is collected unofficially by scavengers for resale in the informal market. Over decades, Dhaka City Corporations have struggled to control trash. The latest developments are anticipated as a result of the foundation of two city corporations in November 2011. Dhaka South City Corporation (DSCC) and Dhaka North City Corporation (DNCC), which encompass 57 wards spanning 43.96 square kilometers (DSCC) and 36 wards covering 82.38 square kilometers (DSCC, 2015). This development is anticipated to result in noticeable changes in SWM.

2.4.1 Development of solid waste management in Dhaka City

SWM is not a new phenomenon nor an innovative practice in DCC. Since 1864, Dhaka City has used a conventional waste management method. The management system has evolved significantly over time. Table 2.1 summarizes the evolution of SWM in the city.

Table 2.1: Development of SWM in Dhaka city (Source: DSCC and DNCC 2015).

<i>Year</i>	<i>Development activities</i>
1864	Night soil collection by Bullock cart Liquid waste collection by Dhaka WASA
1963	Night soil collection by the Municipality
1982	Bullock cart system suspended, Septic tank system replaced, Waste collection by open truck introduced
1987	House to house collection in Kalabagan
1989	Night time Waste collection
1993	Demountable container system
2002	System of permission for primary collection
2003	Development study by JICA initiated
2005	Clean Dhaka Master Plan formulated
2007	Technical Cooperation Project by JICA began
2008	Waste Management Department officially approved
2010	Low Emission Compactor and 7 tonnes capacity containers introduced National 3R Strategy

To some extent, all of these approaches have enhanced the value of Dhaka's waste management system. The waste management issue on the other hand remains trapped in the old manner of managing waste. In light of this, Bangladesh's government has implemented a 3R plan in 2010 (Reduce, Reuse, and Recycle). This strategy is based on the waste hierarchy concept, which prioritizes waste reduction, reuse, and recycling.

2.4.2 Legal framework

The evolution of the legal framework for SWM for Dhaka City is given in Table 2.2.

Table 2.2: Legal framework related to SWM (Source: State of Cities 2015; Solid Waste Management in Dhaka City).

Time and legislation	Framework for SWM
1864, Municipal Act	Night soil collection by Bullock cart Liquid waste collection by Dhaka WASA (DWASA)
1983, Dhaka City Corporation Ordinance	Dhaka City Corporation held responsible for secondary waste collection to remove waste from its dustbins/containers, and transport the waste to final disposal sites. Residents are responsible for bringing their waste to DCC's waste collection points where dustbins/containers are located.
1995 National Environmental Management Action Plan (NEMAP)	Waste recycling has been promoted, less land filling encouraged, EMS promoted among industries.
1997, Environmental rules and regulation	This policy outlined mainly the hazardous industrial waste. No other SW related guideline provided.
1998, National Policy for Water Supply and sanitation	This policy suggested government to take measures for recycling waste as much as possible and use organic waste materials for compost and bio-gas production.
2004, Dhaka Declaration on Waste Management by SAARC countries	This strategy is based on the 4R principle i.e. reduce, reuse, recycle and recover the waste, stressing the need for composting, segregation of waste at source, separating collection and resource recovery from wastes.
2006, Lead Acid Battery Recycling and Management Rules	Under the rules collection and recycling were expected to improve as it had stressed the need for Dhaka Environment Management Plant.
2006, Draft National Urban Policy	CDM and recycling are emphasized in the policy.
2009, City Corporation Act	City Corporation held responsible for removal of waste from all public streets, public latrines, urinals, drains and buildings and land of the corporation and for proper disposal of waste.
2010, National 3R Strategy	3R Principal for Solid Waste reflected in the national and local government policies and plans.

As a result, DCC is given primary responsibility for SWM throughout the city. By virtue of the 1983 legislation, the Dhaka City Corporation is responsible for the removal, collection, and disposal of garbage (Part 4, Article 78). The DCC's Waste Management

Department (WMD) is responsible for the city's solid waste management. WMD's goal is to achieve integrated solid waste management via a centralized chain of command.

2.4.3 Comparative study: Public Participation in Decision-making Processes

According to research by Kaur & Lodhia (2014) on stakeholder involvement in sustainability disclosure in Australia, local councils are situated on Arnstein's ladder of public participation at the third (informing), fourth (consulting), and fifth (placing) rungs. Stakeholder engagement was stated to include the use of newsletters, e-newsletters, direct mailings, and local newspapers to update stakeholders. Peer reviews, seminars, and public meetings were some of the methods used to get feedback on the project. Public forums, focus groups, and in-person dialogues served as the last forms of placation. In a research, the consultative strategy was found to be the best method since it allowed for the identification of public problems as well as the collecting of responses. Cummings (2001) found a similar conclusion from a research conducted in the United Kingdom, indicating that the most often adopted technique for stakeholder involvement was informing and partnering.

Nguyen and Virginia (2005) studied the various kinds of protests against a newly built landfill in Hanoi in 1999. According to the research, numerous locals living near the dump sent complaint letters to district and higher officials regarding the site's pollution and some even obstructed vehicle access to the landfill immediately after it opened. The garbage piled up in the streets of Hanoi for many days, forcing municipal authorities to negotiate with locals and provide pledges of enhanced operations at the site in exchange for increased compensation. This clearly demonstrates that municipal governments are not always proactive in their approach to involving local communities. The investigation discovered that the municipal authorities in charge of the dumpsite had not completely established social legitimacy, despite having had a legal license to operate.

Additionally, policies' effectiveness requires widespread compliance or support from the general population. However, such support is contingent on the amount to which the public is involved and consulted as well as on public views of who is consulted (Vogel, 1986). This is because involvement is thought to have a significant impact on the degree of confidence that groups have in the policy process and their perception of the legitimacy of policy results. Wang (2007) found that when public engagement is low, suspicion of local government agencies develops. As a leading proponent of civil society engagement in development, particularly in poor countries, the World Bank has not only made public participation in policymaking an integral aspect of its financing operations. However, it has maintained that civil society contributes to the generation of input that supports the public sector's efficiency and openness, as well as public responsibility (Harrold, 2000; Esau, 2008).

Neshkova and Guo (2012) used two theoretical frameworks to conduct research on public engagement and organizational performance utilizing data from state agencies. The conventional view maintains a trade-off between democratic and administrative decision-making, and a competing view maintains that citizen involvement provides administrators with vital site-specific knowledge and adds to more efficient and successful public programs. The public participation data came from a large survey conducted in 2005. To ascertain the influence of involvement on organizational performance, an online questionnaire was sent to state official administrators. The results show that democracy and bureaucracy do not have to be mutually exclusive. The findings offered compelling evidence in favor of the concept that public engagement improves organizational effectiveness. According to the research, including stakeholder input in the decision-making process has a favorable influence on the policy output and result. The reason for this is that stakeholders support the policy and ensure its success, as the

proponents of the initiative gain, not just social legitimacy but also the residents' confidence.

2.5 Research Gap

Following research gaps were noted from reviewing the literature

The majority of the studies have been focused on how to include public participation in the environmental decision, reviewing current solid waste management practices, EIA, and legal regulation gap. Comparatively, lesser researches have examined public participation in the decision-making of disposal facility sitings in Bangladesh.

Similarly, most of the studies focused on hazardous waste disposal facility siting over any other disposal facility siting. Significant studies preferred GIS and remote sensing models used for siting disposal facilities ignoring public inclusion.

Since siting disposal facility is a time consuming and complex process, more studies are required to examine how public opinion may help to achieve a sustainable disposal facility. The benefit of public inclusive decisions for siting disposal facilities has not been fully explored yet. There is limited number of studies on this. Hence, more research is required.

CHAPTER 3: MATERIALS AND METHODS

3.1 Study Area

The study was conducted in two disposal facility areas of Dhaka, Mutail and Amin Bazar (Figure 3.1). DNCC's Amin Bazar disposal facility, located in Savar Upazila, 24 kilometers north of Dhaka, began operations in 2007 on 52 acres (21 hectares) of land. This disposal facility encompasses nearly five zones and 36 wards inside the DNCC. The second disposal facility at Matuail, controlled by the DSCC, is located around 8 kilometers from Gulistan in the Matuail Union to the south of Dhaka. It was built in 1995 as a 50-acre (20-hectare) open disposal facility site, with a further 50 acres (20-hectare) added in 2006. It encompasses 57 wards within the DSCC's five zones. Dhaka's tertiary garbage treatment happens in the Matuail and Amin Bazar disposal facilities.

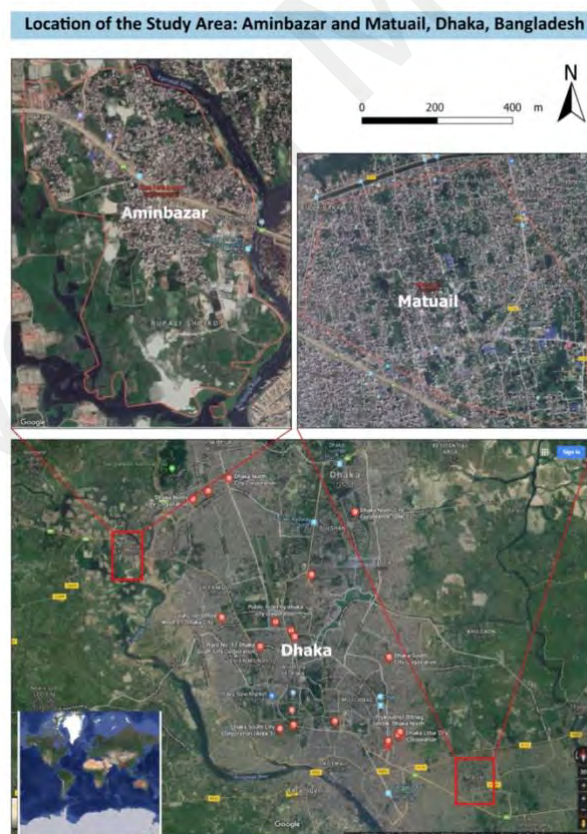


Figure 3.1: Locations of the study areas of the Amin Bazar and Matuail disposal facility.

The Matuail disposal facility is located roughly 300 meters from Matuail's principal highway in the south-eastern region of Dhaka and approximately 3.75 kilometers from Dhaka's center point Gulistan.

This disposal facility covers about 100 acres (40.5 hectares), and the authorities are attempting to purchase an additional 81 acres (32.8 ha). At the opposite end of Dhaka, the Amin Bazar disposal facility is roughly 1 km from the primary highway in Ward 9, which is located in the city's north-western region. Both disposal facilities are situated within roughly 500 meters of residential neighborhoods, water bodies, and agricultural land, exposing these regions to a variety of risks. The settlement density and built-up areas are more concentrated near the Matuail than they are near the Amin Bazar disposal facility.

However, the Amin Bazar disposal facility is built on top of a lower flood flow zone, which is surrounded by several water bodies, agricultural areas, and a river explored during the field visit. A disposal facility must be positioned 250–300 meters from ecosystems, according to a rule (Central Pollution Control Board 2017). Following that, water bodies and roadways must be kept 200 meters away from the disposal facility.

Additionally, Guiqin et al. (2009) and Sener et al. (2010) suggested that disposal facilities should be located at least 500 meters away from bodies of water. Water bodies and agricultural fields, on the other hand, were discovered within 300 meters of the reported disposal facilities, making them very vulnerable to contamination. Within the 500-meter buffer zone, settlements and roads were discovered. Settlements and roads, particularly at the Matuail disposal facility, were substantially closer to the disposal facility.

Dhaka City Corporation used to take care of the municipal government of Dhaka, Bangladesh, in 2011 DCC was split into two corporations to ensure better civic facilities.

DSCC and DNCC, headed by two mayors, area within city corporations were divided into several wards in total the city has 130 wards and 725 mohallas (The Daily Star,12 February 2015).

3.2 Research Design

The descriptive method was used in this research. A descriptive study was designed to offer information about the nature and status of the situation as it was at the time of the study, as well as to characterize current situations, events, or systems based on the perceptions or responses of the research's respondents. The researcher conducted a triangulation study using a mixed methodologies approach (that is, qualitative and quantitative approaches).

Triangulation Design - Convergence Model had been adopted to guide the collection, sorting, and analysis of quantitative data. Triangulation Design is a one-phase process in which quantitative and qualitative methodologies are used simultaneously and equally. The convergence model is one of the triangulation design models (it represents the standard mixed techniques triangulation design model) (Creswell, 1998). According to this model, quantitative and qualitative data on comparable occurrences are collected and dissected individually, and then the different findings are integrated (by evaluating the various outcomes) during interpretation. In this study, quantitative data were compared to qualitative findings in order to approve, confirm, or validate quantitative outcomes. The objective of this paradigm is to get to reasonable and generally accepted conclusions concerning a specific phenomenon.

3.3 Sample size estimation and Selection criteria.

The research was conducted in regions near two landfills in Dhaka (Matuil and Amin Bazaar landfills). Matuil union has a population of 13,193 residents (2011 Bangladesh Population and Housing Census, Bangladesh), while Amin Bazar union has a population

of 29,992 residents. According to Bangladesh's Population and Housing Census 2011, two study areas contain a total of 16,672 households: Matuail has 7765 houses, and Amin Bazaar has 8907 households. Residents, merchants, market vendors, municipal garbage collectors, DNCC, DSCC, private non-governmental organizations, and other relevant stakeholders were included in the sample frame. Quantitative data were gathered by selecting random respondents and participants from stakeholders (Table 3.1, section-residents & public) from the two study areas.

Table 3.1: Stakeholders list.

Stakeholders	
Government Agencies	<ul style="list-style-type: none"> ● Ministry of Land: Ministry of Local Government and Rural Development and Cooperatives ● Ministry of Environment and Forest ● Ministry of Housing and Public Works ● Dhaka North & South City Corporation ● RAJUK- Rajdhani Unnayan Karttripakkha (Town Improvement Authority) ● Department of Environment
Non-Government Organizations (NGOs)	<ul style="list-style-type: none"> ● Bangladesh Environmental Lawyers Association (BELA) ● Waste Concern
Residents	<ul style="list-style-type: none"> ● Land owners ● Farmers ● Vendors ● Local Influencer (Chairman) ● Local Tenants
Public	<ul style="list-style-type: none"> ● Matuail ● Amin Bazar

The exact sample size was determined using the Krejcie, R. V., & Morgan, D. W. (1970) equation. The research employed the method below to determine a sample size typical of the population in two study areas, Matuail and Amin Bazar, for quantitative analysis.

$$n = \frac{x^2 * N * P * (1 - P)}{(ME^2 * (N - 1)) + (x^2 * P * (1 - P))}$$

Where:

n= sample size

X²=Chi-square for the specified confidence level at 1 degree of freedom

N=Population Size

P=population proportion (.50 in this table)

ME=desired Margin of Error (expressed as a proportion)

In the two research areas, a total of 16,672 households exist. Each region is defined by a primary road and a network of feeder roads. Flats, ad hoc buildings, rowhouses, and bungalows are all types of households. The analysis used the assumption that the margin of error would be 5%. This would guarantee that the study has a confidence level of at least 95% as is scientifically accepted. The sample size was determined to be 378 by following the formula. As a result, 378 houses and businesses in Matuail and Amin Bazaar were surveyed.

Sample size selected under consideration of data collection methods for qualitative analysis, Interviews lies under phenomenological approach where 10 (ten) interviews (Creswell, 1998) had been taken place and for focused group discussion 4 (four) groups been interviewed (Krueger, 1994; Morgan, 1997; Onwuegbuzie et al., 2007).

3.4 Data Collection Methods

The researcher applied both qualitative and quantitative techniques of data collecting because qualitative methods include the use of words rather than numbers; the methods involved descriptions of the study and this permitted the researchers to move beyond concepts and generate and update frameworks. This method assisted the researcher to create quality information that was providing meaning to numbers. While quantitative approaches entailed the gathering of numerical data in order to understand, forecast, and regulate phenomena of interest and the data to be collected was displayed as a table of numbers. The numerical data acquired was utilized to explain the public participation in the present and past decision-making of the disposal facility. These methods included survey questionnaires, focused group discussions, and in-depth interviews.

3.5 Data Collection and Analysis Procedure

3.5.1 Structured Questionnaire

Comprehensive questionnaires were developed for quantitative data collection (Appendix A) to achieve the research objective (1). Survey data was collected from September 2019 to January 2020 with help of a local leader. Public who had the experience of living beside Matuail and Amin Bazar disposal facility within 2 km radius for at least one year previous to the interview were interviewed face-to-face to obtain public participation in the past and present decision making of disposal facility sitings in Dhaka. The survey interview was conducted with the help of a structured questionnaire (Appendix A).

After completion of survey data collection, for quantitative analysis data has been cleaned, sorted, and analyzed using Microsoft Excel software. After establishing the frequencies of variables, data had been displayed in tabular or visual form such as pie charts, bar graphs, and frequencies and percentages were formed.

Cronbach's alpha was used for estimating the internal consistency reliability of this research. The reliability of instruments used in published scientific education research is sometimes expressed in terms of a statistic called Cronbach's alpha (Cronbach, 1951). And Pearson correlation coefficients are used to determine the strength of a linear connection between two variables of socio-demographic influence on public participation in the decision-making of Matuail and Amin Bazar disposal facility sitings. It ranges from -1 to 1, with -1 indicating complete negative linear correlation, 0 indicating no connection, and + 1 indicating entire positive linear correlation (Bonett & Wright, 2000).

3.5.2 Focus Group Discussion (FGD)

According to Creswell (2013), FGDs are used in qualitative research to obtain group meanings and understandings of the phenomena being studied. Face-to-face interviews were undertaken to gather expressive reactions from the respondent about the study's purpose. These expressive reactions include, but are not limited to, experiences, feelings, emotions, and acts (Denscombe, 2009; Talmy, 2010).

A total of 4 (four) focused group discussions were conducted in which each group consisted of 10 to 12 participants ensuring gender, age, and professional sensitivity were selected. A natural group of people, the participants are among stakeholders as listed in Table 3.1 (public) was included in the FGD to discover differences and similarities between what people say and how they operate, as well as how other participants respond and remark in response. A set of questionnaires (discussion guide) (Appendix B) developed and used during FGD's to get relevant data to achieve objective (2). With help of local leader, FGD's been arranged from September 2019 to January 2020 excluding 378 respondent those who participated in survey questionnaire. At Matuail and Amin Bazar, interview sessions lasted a maximum of forty-five (45) minutes. The researcher

played the role of the moderator while conducting the FGDs, audio recordings and detailed minutes were taken down with help of another person.

Before data analysis, the entire study process has been conceptualized. FGD's data analyzed consists of several phases such as transcribing recorded statements, coding the transcription, reviewing the memos, analyzed and interpreted the data using phenomenological analysis adopted from Lester (1999) and lastly data validity and reliability are ensured through triangulation. To support the findings of qualitative data, quantitative data were incorporated during data analysis. The results are presented using Microsoft tables and graphs.

3.5.3 In-depth interview

Ten in-depth interviews were conducted of which the respondents were relevant government and non-governmental organization officials (Table 3.1) to achieve the objective (3). The interviews were conducted by phone and face to face with the help of semi-structured questions (Appendix C).

The facts were initially transcribed and properly summarized without missing any critical components. The data were analyzed qualitatively by grouping interview responses into descriptions and themes and supplemented with appropriate literature and theories (Huberman and Miles, 2002). Some respondents expressed discomfort with their voices being recorded. However, such data were transcribed during interviews and analyzed in the same way as the audio-recorded data. Qualitative data have been analyzed by phenomenological approach. The results are presented through narration.

CHAPTER 4: RESULT AND DISCUSSION

4.1 Socio-economic and demographic characteristics

For quantitative data, a total of 387 respondents were questioned through structured questionnaire instrument. The quantitative data was particularly to answer the first research questions of this study.

The following characteristics of households were evaluated in this study: age, gender, education level, environmental education, primary occupation, income, and duration of living near disposal facilities. The goal of selecting these variables was to get a broad understanding of the respondents' background and how that composition affects public participation in the decision-making process about the Matuail and Amin Bazar disposal facility sitings.

Table 4.1 indicates that more female respondents were sampled than male respondents in the key respondent groups. This was not done on purpose, but rather as a result of the random sample process used in this research. Female respondents were more available and eager to provide information for a variety of reasons than male respondents, who seemed to be always preoccupied with outside work.

Respondents were questioned about their educational attainment. The results in Table 4.1 show that the majority of respondents 27% had completed middle school, whereas respondents 26% had completed high school also neither formal education nor elementary education backgrounded respondents share the same percentage. 21% of respondents had completed their primary schooling. The findings indicate that 74% of respondents have some degree of education, whereas 26% have no formal education. Data findings indicated that 74% of respondents lacked enough environmental knowledge, which might result in decreased participation in environmental activities in the study locations.

Table 4.1: Respondent's household characteristics.

No table of figures entries found.	Response	Percentage
Female	203	53.42%
Male	175	46.05%
Level of Education		
No School Completed	98	26.00%
Elementary School	80	21.00%
Middle School	103	27.00%
High School	97	26.00%
Environmental Knowledge		
Yes	99	26.05%
No	279	73.42%
Income Level		
≥5,000 TK	66	17.00%
5,000-10,000 TK	65	17.00%
10,001- 15,000 TK	70	18.00%
15,001 – 20,000 TK	83	22.00%
≤ 20,000 TK	94	25.00%
Occupation		
Formal Employment	94	25.00%
Business/Entrepreneurship	92	24.00%
Informal/Casual Employment	97	26.00%
Not Employed	95	25.00%
Duration of Living Near Landfill Site		
3-4 Years	114	30.00%
5-6 Years	126	34.00%
≤10 Years	138	36.00%

According to the data in Table 4.1, 25% of respondents are unemployed or do not work at all, while 25% are formally employed. The majority of respondents from the research regions are informal or casual workers, accounting for 26%. 24 percent of respondents identified as business or entrepreneur. Income level data revealed several intriguing percentage figures, such as 17% of respondents earn between 5000- 10,000 TK (approx. US \$58- \$116), while 25% earn more than 20,000 TK (approx. US \$231). 18% of respondents earn between 10,000-15,000 TK (approx. US \$116- \$174) per month, while 22% earn between 150001- 20,000 TK (approx. US \$174- \$231) per month. While there is strong evidence that economic disparity reduces public engagement in decision-making at the national level (van Holm and E. J., 2019). Respondents were questioned about their primary employment. 25% of respondents are unemployed or do not work at all, while 25% are formally employed. The majority of respondents from the research regions are

informal or casual workers, accounting for 26%. 24% of respondents identified as business or entrepreneur.

To ensure the relevance of public engagement in the disposal facility siting process and future disposal facility site selection activities, respondents were questioned about their living duration overtime near the present landfills. Table 4.1 shows 30% of respondents living near landfills between the ages of 3 and 4 years, followed by 34% of respondents living near landfills between the ages of 5 and 6 years. And 36% of respondents had lived within 2 km radius for at least one year previous. The data indicate that 36% of respondents are more likely to be aware of earlier processes involving disposal facility selection in two study areas.

Age is a significant demographic indicator that is used to classify people in vital statistics, censuses, and surveys (URT, 2005). Table 4.2 shows the age groupings of respondents who participated in community activities between the ages of 20 and 61 years. About 12% of respondents in the research region were between the ages of 20-30 years and 20% were between the ages of 31-40 years. According to the United Nations, the contributions of older individuals extend beyond their economic activity and include their responsibilities in families and communities. The third most prevalent age group is 51-60 years, which accounts for 19% of respondents. And 18% of respondents were 61 years of age or older. According to the percentage of responders, the age group 31-50 years is the most engaged in the studied regions.

URT's (2005) observation that the age range of 26–57 years is inside the labor force age group, implying that persons in this age range are active, creative, and involved in a variety of social and economic activities. Table 4.2 the findings indicate that the majority 31% of the respondents are from 41-50 age group.

Table 4.2: Respondent's age.

<i>Age category (Years)</i>	<i>Frequency</i>	<i>Percentage</i>
20 – 30	45	12%
31 – 40	76	20%
41 – 50	116	31%
51 – 60	73	19%
> 61	68	18%
<i>Total</i>	378	100%

4.2 Public Participation in the Decision Making of Matuail and Amin Bazar Disposal Facility Sitings.

4.2.1 Reliability Test for the Survey Questionnaires

Cronbach's alpha was used for estimating the internal consistency reliability of this research's survey questionnaires. Cronbach's Alpha values vary between 0 and 1, with higher values suggesting greater reliability of the survey or questionnaire. George and Mallery (2003) provide the following rules of thumb: “ $\alpha > .9$ – Excellent, $\alpha > .8$ – Good, $\alpha > .7$ – Acceptable, $\alpha > .6$ – Questionable, $\alpha > .5$ – Poor, and $\alpha < .5$ – Unacceptable” (p. 231). Table 4.3, the alpha coefficient for the sixteen items is .942, suggesting that the items have relatively high internal consistency of this research. After finding out high internal consistency of survey questionnaires, the data set been used for further data analysis on other research variables.

Table 4.3: Cronbach's Alpha test for survey questionnaires.

ANOVA						
<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
Rows	261.575881	378	5.82256566	0.73192415	0	1.13883182
Columns	3860.84308	16	241.302692	214.712668	0.00038	2.37550056
Error	5718.0981	5088	0.33384004			
Total	9840.51706	5422				
0.94266						

4.2.2 Public Participation During Previous and Current Decision-Making for Matuail and Amin Bazar Waste Disposal Facilities

4.2.2.1 Public Involvement

White (1996) used the term 'instrumental' participation to refer to the kind of involvement that maximizes the chance to depend on the beneficiaries' services. This is because this kind of engagement involves local residents by requiring them to provide labor, so ensuring their commitment to the project. She went on to demonstrate how cost-effective this method of involvement is. Similar to what was revealed in the literature, it was determined that public engagement in landfill management helps guarantee that policies are executed properly and with the fewest possible setbacks (White, 1996; Neshkova & Guo, 2011). However, the response to the survey questionnaire shows, 31% of respondents have heard of the disposal facility site selection process regarding information and 69% of respondents have never heard of such information ever (Figure 4.1).

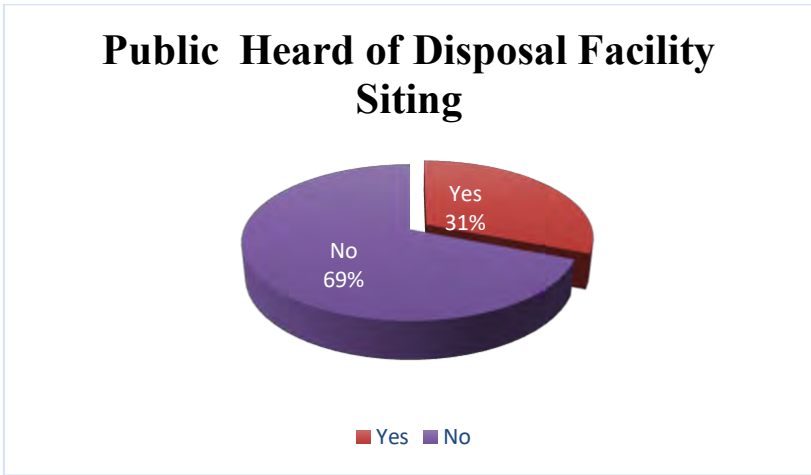


Figure 4.1: Public heard of disposal facility siting.

Respondents have been asked when their opinion has been asked on the disposal facility siting process. Figure 4.2 shows, 44.44% of respondents have never been asked, 12% of respondents answered in recent years, and don't remember the timeline opinion has answered by 17.59% of respondents. The environmental assessment report (DNCC, 2018), stated that two public consultations had been conducted at Amin Bazar landfill and Kawranbazar where local leaders, representatives from the elite community, households and local traders were present.

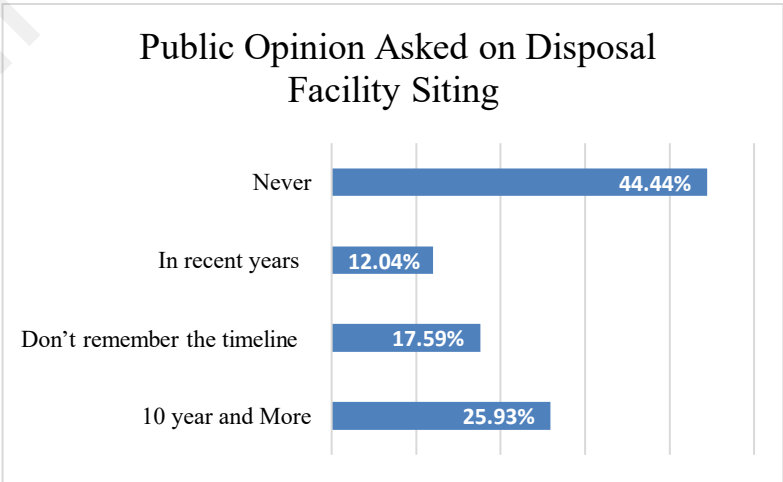


Figure 4.2: Public opinion asked on disposal facility siting.

4.2.2.2 Public Engagement

The decision-making process for solid waste management involves many steps. These are the phases of planning, execution, and assessment necessary to meet the needs of a sound and healthy society. The choices taken at each level of decision-making apply equally to the management of solid waste landfills. The landfill management guideline puts a high focus on public engagement throughout the planning phases of a landfill project. Prior to the project's execution, an EIA is completed during the planning stage.

The EIA is a critical process that must be followed whenever a structural project is proposed. However, the field replies revealed a range of perspectives from all respondents. The responses (FGD) from the Matuail and Amin Bazar indicate that no attempt is being made to include the public throughout the planning phases of decision-making. The Rajuk official's statement is comparable with what White (1996:7) said in her research, "... the involvement of local communities in implementation is inadequate." They should also be involved in administration and decision-making for a genuine inclusive initiative."

On the other hand, Figure 4.3 shows that 37% of respondents answered that they have been asked to share their opinion on the disposal facility siting in the planning stage and 61% public shared their opinion in the post-implementation stage. White (1996) used the term 'instrumental' participation to refer to the kind of involvement that maximizes the chance to depend on the beneficiaries' services. This is because this kind of engagement involves local residents by requiring them to provide labor, so ensuring their commitment to the project. She went on to demonstrate how cost-effective this method of involvement is. Similar to what was revealed in the literature, it was determined that public engagement in landfill management helps guarantee that policies are executed properly and with the fewest possible setbacks (White, 1996; Neshkova and Guo, 2011).

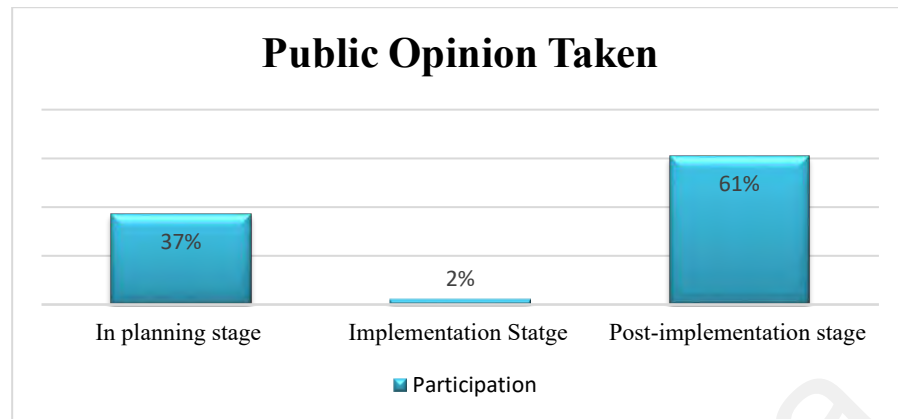


Figure 4.3: Public opinion taken in the decision-making process for disposal facility siting.

The waste concern's respondent officer's response was that public participation must be meaningful and begin at the planning phases of project development. In general, public engagement in decision-making at the planning stage is defined by educating, advising, negotiating, and collaborating with stakeholders. Ordinary citizens participate in public engagement by offering recommendations and alerting the public about current developments during durbars and traditional festivals. This kind of public engagement is comparable to what Arnstein (1969) referred to as 'manipulation and treatment.' The research discovered that regular folks had essentially little effect on decision-making during the planning phase. It was discovered that part of the cause for this condition is due to decision-makers representation of common individuals.

48% of respondents among 378 respondents answered that they have never attended any workshop, or meeting regarding disposal facility siting as shown in Figure 4.4. 35% of respondents attend more than 10 years and 7% of respondents don't remember the timeframe of their presence in the public hearing and 10% of respondents attend meetings or workshops regarding disposal facility siting.

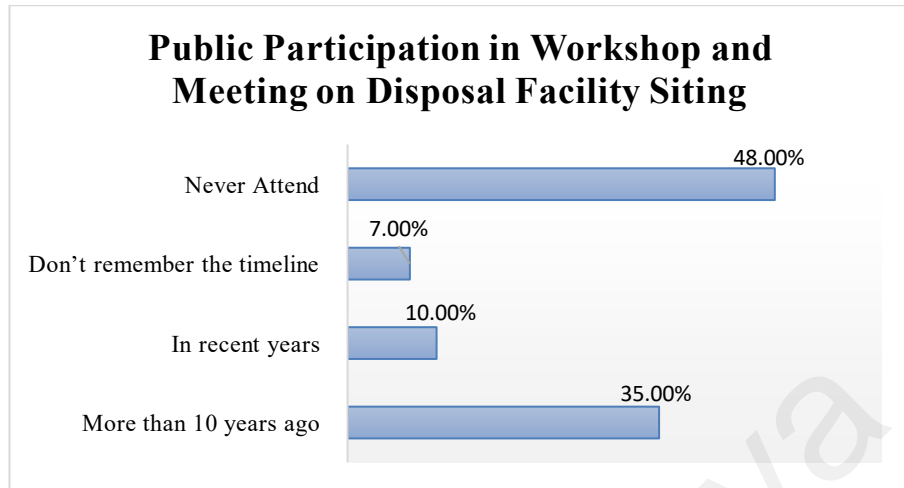


Figure 4.4: Public participation in workshop and meeting on disposal facility siting.

Statistical analysis shows the educational level of respondents has moderate positive correlation with respondents' attendance in any workshop, or meeting regarding disposal facility siting (Table 4.4).

Table 4.4: Pearson's Correlation between educational level and public participation in workshop, meeting regarding disposal facility siting.

<i>Education Level</i>	<i>Participated in any workshop, meeting regarding disposal facility siting</i>
Education Level	1
Participation in any workshop, meeting regarding disposal facility siting?	0.049363398
	1

Figure 4.5 shows how the public contributed to the public meeting, workshop, and hearings during the disposal facility site selection process. 44% of 107 respondents didn't put any of their opinions whereas 34% of respondents agreed with facilitators without knowing the consequences. Only 7% of respondents agreed knowing consequences thinking, that such an establishment may create work opportunities for them. 9% of respondents answered they disagreed with knowing consequences and 6% disagreed without knowing consequences, which has a strong correlation with the educational level of survey respondents, Table 4.5 shows.

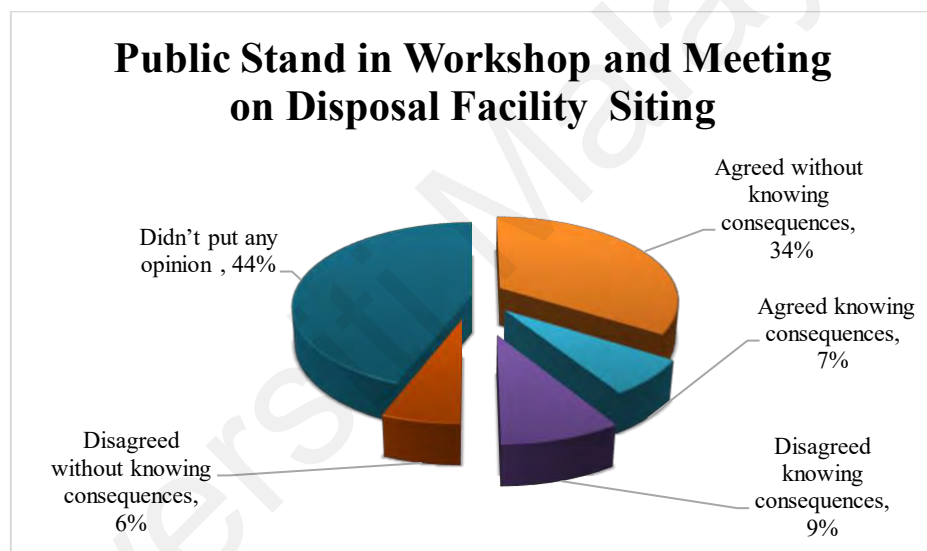


Figure 4.5: Public stand in the decision-making process for siting disposal facility.

Statistical analysis shows (Table 4.5), that the educational level of respondents has moderate positive correlation with respondents' stand at any workshop, meeting regarding disposal facility siting.

Table 4.5: Pearson's Correlation between Educational level and public stand in any workshop, meeting regarding disposal facility siting

	<i>Education Level</i>	<i>Public stand in meeting</i>
Education Level	1	
<i>Public stand in meeting</i>	0.617	1

4.3 Public Opinion on Current Disposal Facility Siting

To acquire a more complete knowledge of the influence of public opinion on current disposal facility siting questions specific to this theme (Appendix B) were used to extract respondents' perspectives.

4.3.1 Public Conviction

Wang (2007) stated in his research that "an age-old technique for mitigating the impact of public hearings is to offer little public notice and to schedule hearings at inconvenient times or places." Similar to Wang's argument, the public believes that important stakeholders utilize this negative manipulative strategy because of concern that the project would be rejected by the public during public hearings and meetings. As a consequence of this condition, the public lacks faith in the Amin Bazar's and Matuail's actions and operations.

Local residents of the disposal facility site reviled their opinion on the current disposal facility location. Approx. 37% of participants from FGD (Figure. 4.6), strongly disagree or are strongly unhappy with the decision and Approx. 42% of participants were unhappy with the present solid waste disposal facility location.

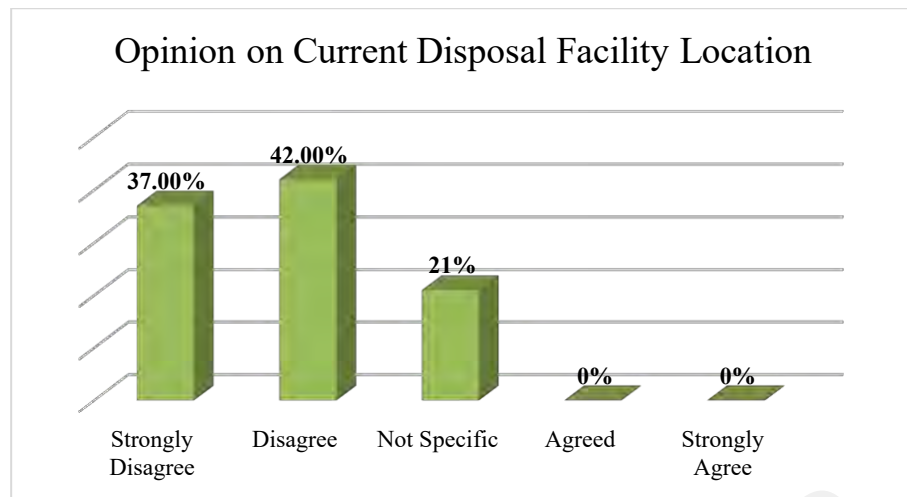


Figure 4.6: Public opinion on current disposal facility location.

In the FGD, one lady contended that- "The authorities see employed people as knowledgeable, and our judgments are meaningless."

This has become increasingly prevalent and has an influence on the quality of inputs presented to the decision-making process. As the market lady highlighted, some residents are overlooked due to their economic situations and are not invited to voice their opinions on issues that need to be considered.

The focus group discussion found that although key stakeholders attempt to portray representative democracy, ordinary residents feel disconnected from the decision-making process of solid waste disposal management. According to these responses, practically everyone who participates on decision-making levels and even at the planning stage should be a successful businessman or in productive job.

The research indicated a lack of confidence on the part of government stakeholders as a barrier to successful cooperation. To begin, from the side of regular residents and certain political leaders the worry expressed was that since prior meetings resulted in little progress, there is no need to participate in future talks. Some participants in the FGDs,

particularly the young, commented that there is no incentive to be involved in choices that remain on paper. Additionally, they noted that if participation is any indication their cooperation is only for the purpose of completing lawful criteria. This is because they are unable to witness participation at work since they think Municipal Assembly officials disseminate letters to 'cronies' they feel matter. As previously stated, DNCC and DSCC meet with the local chairman to discuss property purchase and negotiation with the aim of establishing a disposal facility. In turn, the local chairman releases lands without consulting residents. Similarly, other members of the FGDs stated that: "The subject of who participates is quite political. No organization will invite you late or will disregard your participation at the public hearing."

4.3.2 Quality of life

Crops are grown informally by adjacent residents in the Matuail landfill. While this provides an extra revenue stream for farmers, it also poses a potential health danger owing to the high metal concentration of such soils as a result of the massive amount of disposed of garbage. According to a Matuail landfill official, immediately after the winter season, the adjacent agricultural area will take on a totally different appearance, since farmers will begin planting crops at that time. On the other hand, residents living next to the Amin Bazar landfill are unable to produce crops due to contamination of the soil and groundwater caused by leachate penetration and waste dumping. According to one FGD respondent, we formerly farmed crops on this property (near the disposal facility). However, polythene has been buried in that farmed area (a field next to the disposal facility) in recent years. Now since all the fields are barren, we are unable to plant any crops. Additionally, this research discovered that several agricultural fields are situated within a 200–300 m radius of the Amin Bazar landfill's dumping zone which is a high-risk zone. Additionally, particularly during the monsoon season, trash gets blocked in agriculture, resulting in soil infertility.

The current study's results establish a relationship between waste's intense odor and poor health impacts. The release of a pungent smell from landfills is a major source of concern for landfill employees and neighboring residents. According to the FGD respondents, their lives have become intolerable as a result of the landfill's emitted odor. This also has a negative impact on persons strolling or traveling along the highways/roads next to the dumps, as well as contaminating the air.

According to study findings, numerous flies congregate and reproduce on the disgusting excrement. Mosquito breeding is significantly increased inside and around landfills, which leads to the spread of different vector-borne illnesses among local residents. A member in a focus group discussion who lives near the Amin Bazar dump remarked the following: "We are unable to sleep well inside the home due to the commotion caused by flies and mosquitoes."

Along with mosquitoes and flies, the dump is home to rats, dogs, snakes, egrets, hawks, and a variety of migration birds. The landfill's management staff said that egrets remain from dawn until 10 a.m., and then kites arrive and stay until 4 p.m. They come to feed, which results in the destruction of neighboring agricultural crops and the spread of pathogens across waste regions. A few residents living near the dumps with adequate financial capabilities migrated owing to the terrible odor. However, the majority of present individuals living near the dump are landowners, making relocation difficult. While landfill authorities and municipal corporation officials admit that mosquito infestation is a significant issue and have raised the yearly budget for mosquito control programs that include the landfills, they have yet to make significant progress. There was no indication that the landfill or municipal corporate officials took anything to resolve the animal infestation problem.

Waste incineration is illegal, according to landfill authorities. However, respondents to the FGD said that they could see and smell combustible debris and smoke emanating from the dump site. In this respect, a KII responder from the dumpsite stated: "No, we do not burn rubbish here; nevertheless, if it does catch fire, we take prompt steps to extinguish it." If the fire is not brought under control within an hour, it will burn for about two to three days. It spreads swiftly; garbage releases methane gas, which causes the fire to spread quickly and deep, around 3–4 feet.

However, residents living near the dump offered a contrary view: "Yes, sometimes the rubbish is burned, it catches fire, and it seems as if the wind blows in that direction [...], you can't live in your home at that time owing to the terrible smell emanating from the waste." During the authors' visit to the Amin Bazar dump, they saw spontaneous rubbish incineration, confirming the preceding findings. This process produces harmful smoke that is detrimental to individuals who live and work near landfills. The local administration has announced plans to create a waste-to-energy facility in Amin Bazar, which would need 3000 tons of rubbish daily, significantly lowering the amount of waste spread across the city. JICA is presently evaluating the project's viability. However, due to a lack of waste separation maintaining the energy's quality continues to be difficult (Prothom Alo, 2020). During the landfill inspection, it was learned that the DNCC has begun negotiations with the China Machinery Engineering Corporation to establish a 42.5 MW power plant at the dump to generate energy by incinerating garbage at a high temperature (The Daily Observer 2020).

Residents living near landfills may get pneumonia, bronchitis and skin problems as a result of the massive volumes of trash put there, according to FGD respondents. Additionally, nearby residents suffer from frequent headaches, gastrointestinal issues, and a lack of appetite as a result of the unpleasant odor.

Another FGD participant stated: "I am unable to eat properly; I have lost my appetite since moving here [near the garbage] [...]." Respondents to the FGD indicated that they were suffering from pneumonia, bronchial, and skin disorders, with youngsters mostly suffering from pneumonia. Farmers working in close proximity to the dump endure many injuries, with rashes often appearing as a result of soaking their feet in polluted rivers or agricultural fields. Needles, ceramic pieces, and shattered glass puncture the feet of individuals working near dumps, according to one FGD respondent. They are unable to immerse themselves in water since it creates severe rashes on their skin. However, they have become used to this and hence enter only when absolutely necessary.

However, if you [pointing to the researcher] plunge your feet into the water abruptly, your skin will be severely damaged.

The results indicated that, on the whole inappropriate waste management had a negative impact on persons who work in or live near landfills.

4.4 Challenges faced by Dhaka North and South City Corporation involving the public in the decision making of disposal facility sitings in Dhaka.

The replies to the in-depth interviews and focus groups revealed a multitude of problems that limit public engagement in Dhaka's solid waste disposal management. The research identifies DNCC, DSCC, and residents as the primary decision-makers and so queries them about the obstacles associated with public involvement. This portion of the research discusses the difficulties and how they impact the actualization of public engagement. Among the highlighted obstacles include distrust of the DNCC and DSCC, inefficient communication, insufficient coordination, and ad hoc planning methods. The other one is poor governance, which results in noncompliance with legal provisions, public complacency, concerns about transparency, and budgetary constraints.

4.4.1 Public Apathy

The research identified public indifference as one of the barriers to successful public engagement in disposal facility siting. According to one of the responders at government agencies, some of them seem unconcerned but they become concerned when the initiative is realized and looks to be detrimental to their interests. According to one responder from Amin Bazar, the majority of residents in this municipality dislike attending public hearings. They will only appear when they want to convey their anger or disapproval of a project. The emerging data from the studies paint a picture of public resistance and a lack of information flow, both of which were previously observed. This confirms Turner's (2014) observation that people are apathetic as a consequence of the way public hearings are conducted. He noted that the people believed their interests were not being served at such events which included a limited opportunity for conversation and extensive speeches by Matuail and Amin Bazar landfill authorities.

Finally, members of the public voice expressed their dissatisfaction. Similar to Turner's (2014) result, this research may restrict the cause of indifference to a deliberate endeavor by DCC to people's active involvement in choices that affect them. Evidence demonstrates that some segments of the population are politically marginalized. As a result, there is no need for their representation and inclusion on the grounds that they are seen to be opposed to the existing administration.

4.4.2 Ad-hoc Planning of Landfills

The research revealed that the steps employed to acquire land, prepare for the start of the projects, and deal to the issues posed by Dhaka's solid waste are primarily ad hoc in character. The research discovered that even if communities do not endorse their ideas, DOE would proceed with the programs. According to a DOE responder, the complete process of adhering to RAJUK's land purchase requirements might take an extended

length of time, which is inconvenient. According to observations made at dump sites and comments made by the majority of respondents, it was determined that the municipal corporation's officials confront difficulty managing the landfills.

One respondent from NGO averred that:

“DCC’s authorities failed to plan and manage both of the landfills. Only land acquisition for waste disposal facility won’t work in near future for the sole purpose of solid waste management for Dhaka city as there won’t be left enough lands even for human residents. Whenever funding comes from foreign agencies only then city corporations think of landfill expansion rather than establishing a sustainable approach for solid waste management”.

4.4.3 Political influence in waste management

In Dhaka, the political economics of waste management has been rather problematic. There have been allegations of discord between PWCSOs and local councilors over waste management control in a specific ward. Collusions with PWCSOs are also often mentioned.

"PWCSOs are City Corporation-authorized organizations with a track record of effectively delivering services. However, if the authority is transferred to Councilors, ‘Their agents would disregard the legal approval procedure; they will charge more and give worse service.’" -Leader of the PWCSO Association.

Conservancy Inspectors and other officials, on the other hand, feel more at ease carrying out their duties in a community if elected representatives of ward councilors are engaged in any ward.

"Councilors are directly responsible to community members, and direct supervision enables them to improve waste management service. Thus, a more favorable picture for waste management will become apparent very soon." – DSCC Ward Councilor

There is an issue with cooperation, a government official said. Other stakeholders must provide us with the necessary assistance. When the essential assistance is lacking, it becomes more difficult to attain the desired outcome of a safe and pollution-free environment.

The BELA believes that by including the public in monitoring landfills, significant lessons may be learned that will help make the case for future disposal facility siting.

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CHAPTER 5: CONCLUSION

The majority of residents in the study area indicated worry and sensitivity to solid waste. The findings indicate that the vast majority of respondents are interested in participating in future decisions regarding disposal facility siting because they previously did not have an opportunity to share their tangible experience in developing a sustainable solid waste management system for Dhaka.

Current waste management methods must take into consideration the intricate linkages between diverse urban systems. Urban waste management policies and practices may have a detrimental influence on the environment and public health. This research reveals that inhabitants living near the two Dhaka dump sites under investigation experience increased environmental and health dangers. Although these landfills have made substantial improvements in recent years, major improvements are required to dispose of garbage in a sustainable and healthy way. This research may aid Dhaka's urban decision-makers and the general public in comprehending the imperatives for health and sustainability improvement.

Numerous barriers to public participation were identified in the study, including widespread distrust of local government officials, ineffective communication between the public and the Municipal authorities, institutional deficiencies in collaboration, political interference, a lack of accountability and transparency, and public apathy. These constraints were identified as hurdles to public involvement in the management of Dhaka's solid waste landfill. To a level, these challenges were identified as the source of previous conflicts and mismanagement of Dhaka's solid waste disposal sites.

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