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Way Forward To Sustainable Municipal Waste Management: *Appraisal Of Development Of Waste Transfer Station In Islamabad*

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Abstract: *Development of intermediate waste transfer station has crucial position in sustainable municipal waste management system. This research paper is aimed at appraisal of development of waste transfer station in Islamabad relying on international parameters. Methodology applied in this research entangles semi-structured questionnaire survey, in-depth interviews of Metropolitan Corporation Islamabad sanitation staff, waste management experts, academia, waste sorters, waste contractors and widespread literature view. Waste transfer station in Islamabad has been developed as a temporary arrangement in the vicinity of residential settlement and busiest wholesale market. The existing intermediate waste transfer station suffers from limited waste handling capacity, lack of technical arrangements for efficient monitoring and handling of environmental consequences during the unloading and shifting of waste to haulers, facilities relating to environmentally safe operation and inaccessibility to above eighty percent of capital area. As divulged by policy makers in Capital Development Authority, development of three waste transfer stations is in process. However, proposal for one waste transfer station has been spurned by Pakistan Environmental Protection Agency being no-compliant to international waste transfer station parameters primarily associated with close proximity to settlements and inappropriate access to the site and consequent environmental adverse impacts. Parallel to the assessment of present waste transfer station development, this paper insinuates benchmarks for development of waste transfer stations compatible with environmental considerations and sustainability.*

Keywords: *Sustainable Municipal Waste Management, Inadequate intermediate waste transfer facilities, international waste transfer station siting standards, Intermediate waste dumping capability, Capital Development Authority, Waste Management Practitioners, Service end users, Environmental considerations, Stakeholders, accessibility, Service area, Geographic Contests*

Introduction

Pakistan population census, 2025 suggests that taking into consideration the prevailing rapid urban growth, sixty percent world population would be living in urban areas (GoP, 2025) and largely in third world countries (Mukhtar et al., 2024). Urbanization has taken its toll on the cities across the globe including Pakistan planned cities like Islamabad (Bhatti et al., 2024). Likewise, fifty percent of Pakistan population will be urban residing in just seventeen cities by 2030 (PCP, 2016). Increasing population in general and its concentration in fewer areas in particular have severe impacts on the efficiency and effectiveness of existing infrastructure and community facilities. This unwarranted situation has unswerving link with environment and economy of cities (Haider & Badami, 2010). Corresponding with this increasing population, quantities of municipal waste also increase, these emerging waste quantities result in

challenges of management and warrant sustainable approaches. Agenda 21 suggests thatessential sanitation would not beaccessible to twobillion people and similarly, half of the population will be without access to necessary waste management services and the consequential accumulation of municipal waste would be causing forty diseases within the communities (Agenda, 21). Municipal Solid Waste Management (MSWM) in Islamabad historically, remained with CDA with the exception of a period of 4-5 years when this responsibility vested with Metropolitan Corporation Islamabad (MCI). Though, Waste Management (WM) approaches vary with the area of operation and in sixty percent area, informal sector undertakes MSWM operation (CDA, 2025a). Municipal Waste Management (MWM) in the capital citygenerally includes door to door collection, its transfer to communal waste transfer stations, transportation to either some designated areas or hidden sites whereas waste recycling rests in informal arrangement (Iqbal et al., 2023). In any case, development of intermediate waste transfer station and, appropriate waste disposal arrangement does not exist and thus, MSWMS suffers from issues of sustainability (CDA, 2025b).

1. MUNICIPAL SOLID WASTE MANAGEMENT IN CASE STUDY AREA

Development of Islamabad is in compliance of Master Plan prepared in 1960 over an area of 906 square kilometers – 225000 acres (CDA, 1960).According to the Islamabad Master Plan, development was permissible in municipal area of 65000 acres – zone 1&2 and was the resposibility of Capital Development Authority (CDA) besides provision and management of municipal services. However, for sometime period, waste managemen remained with Metropolitan Corporation Islamabad. As of today, responsibility of municipal waste management vests with CDA.

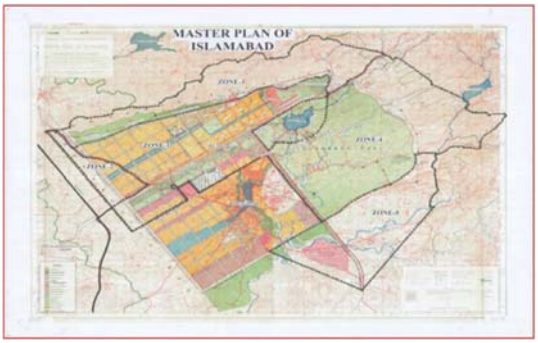

Figure 1: Master Plan of Islamabad

Source: Capital Development Authority, Islamabad

Associated with institutional and legal framework incapacities and incapabilities, Islamabad confronts with varying patterns of development corresponding to the zone specific development strategies (CDA, 1992). Municipal Solid Waste Management approaches as well vary following the area specific development patterns and strategies as outlined below:

Tablde 1. Development Pattern in Islamabad

	Area (Acres)	CDA Planned Area (Acres)	CDA Approved (Acres)	Unregulated (Acres)
Islamabad	225,000	40000 (18%)	28000/ (12%)	157050 (70%)
Zone-1	55,000	30000 (65%)	-	25000 (45%)
Zone-2	10000	-	3000 (30%)	7000 (70%)
Zone-3	50900	5090 (10%)	-	45810 (90%)
Zone-4	70000	1400 (2%)	14000 (20%)	54600 (78%)

2. DEVELOPMENT PATTERNS IN ISLAMABAD

Fundamental descriptions ofMunicipal Solid Waste Management models in Islamabad contain:

I. CDA Planned area – 18%

MSWM in this area historically rests with CDA and for short period, responsibility was shifted to MCI.However, in any case, it includes daily door to door collection, waste transfer to communal waste transfer stations – bins,

garbage trolleys and skips – waste transportation and final disposal.

II. CDA approved area – 12%

Provision of municipal services including MSWM in this area lies with developers in private sector. Service here is irregular and involves limited door to door collection mostly in informal arrangement, few show piece dustbins and disposal at hidden spaces.

III. Unplanned and unregulared developments – 70%

In these areas, there is no regular MSWM service other than placement of few communal waste transfer stations – skips, inconsistent transportation and unregulated haphazard disposal.

In nutshell, MSWM in Islamabadrests with CDA andentails to the extent of door - to - door collection of waste, it varies from settlement to settlement corresponding to the development pattern, waste transfer to communal waste bins, garbage trolleys and skips is uneven, waste transportationis unreliable andwaste disposal is open-air. As of MSWMS, availability of accurate waste data regarding waste quality and quantity, instititional professional incapabilities and, incapacities and inadequate legal framework are predominent features. With regards to the MSWM operation, inadequately and inappropriately located and developed waste disposal site and above all, ill-planned and inaptly developedIntermediate Waste Transfer Station are the key weak areas.Thus, the social, economical and environmental consequences of improperly planned and developed Intermediate Waste Transfer Station in Islamabad has led to the appraisal of existing and allocated sites of Intermediate Waste Transfer Station.

3. RESEARCH OBJECTIVES

To the best of the authors' comprehension, no research has been steeredregarding assessment of siting of Intermediate Waste Transfer Station in the project area and therefore, author regards this study as a location specificchallenge and could be undertakenindividually. Fundamentally, the studydetermines the essential criteria relating with siting of intermediate waste transfer station and assessingthe suitability of existing and proposed waste transfer station sites. The categorical objectives of the study include:

1. To unearth waste management system in Islamabad along with waste management data – waste generation and characteristics.

2. To examine the municipal waste management studies available in Capital Development Authority.

3. Underscore the plans and programs of the the service providing institutionfor adequate and appropriatewaste management service.

4. Examine the benefits associated withsustainable siting ofwaste transfer station.

5. Exploretactics by CDA to ascertain the sustainability of existing Islamabad waste transfer station.

6. To determine the benchmarks complied with for siting and development of intermediate waste transfer station and suggest potential parameters for improvement and its replication in other urban areas.

4. RESEARCH METHODOLOGY

Research methodology applied in this study encompasses visual observation, in-depth interviews and semi-structured questionnaire survey. In the first phase, Capital Development Authority staff responsible for daily municipal waste management operation with regards to waste management data – waste quantity and quality in Islamabadand existing intermediate waste transfer operation, and onward transportation,supervisory staff and consultant hired for planning and designing of waste transfer stationhave been interviewed to have comprehensive insight of parameters outlined for this exercise. In the second phase, interviews have been conducted with academia, waste management practitioners having in-depth knowledge of waste transfer station planning and designing national and global parameters. Above all, interview with residents around existing and proposed waste transfer sites, and representatives of NGOs is of key significance. Literature review remained essential component

of research methodology applied in this paper.In the light of information gathered so, efficacy and efficiency of existing waste transfer station - site and, its operation and suitability of waste transfer station site has been assessed.

5. THEORATICAL BACKGROUND

Mos of the human history, people lived in rural area and world has witnessedrapid population expansion. UN World Urbanization Prospects report, 2018 (UN, 2019) suggests that:

- By the year 2050, fifty-five percent of world's urban population would rise to 68 %, 2.5 billion people will add to urban areas and 90% addition would take place just in Africa and South Asia.

Rapid growth of urban population and its concentration in fewer cities result most in urban challenges like increased urban sprawl, increased slums, increased inequality, increased insecurity, changging family patterns, increased migration and, over burdened urban services, climate change – water supply, drainage sewerage, andmost significantly solid waste management having multiple and direct impact on cities and population (Zainab et al., 2023). Recent years have witnessed maasive waste generation around the globe and it is projected that waste generation is going to double in South Asia, and triple in Sub Saharan Africa by 2050accounting for 35% of global output (World Bank, 2018).

Big gap exists in waste generation and waste collection resulting in taping the potential of resource generation in waste management sector. For instance, waste management sector is worth US $390 billion in developing regions while job provision in this sector is restricted to five percent in poor countries. Meaning by, waste management is a business and job creation sector however, it need not to take it as public service.It is interesting toremark that open dumping and burning is the predominant mode of disposal in developing countries as 2/3 of waste is disposed of openly without any controlling measures. Whereas in developed countries, 39% waste is landfilled and, 36% destinates at recycling and composting facilities (Shi et al., 2019).

Unceased population gowth and rapid urbanization paired with corresponding waste disposalarrangements has made the location of suitable waste transfer and disposal sites very thought-provoking within urban areas.Linked with growing urban population and conventional MWM liability approach,municipalities have been compelled by the growing communities around old waste disposal facilities for development of new facilities at longer distances (Betancourt & Zartha, 2020). Improper MWM upsurgesproblemsrelating to location of MSW facilities linked with public opposition, precicious land, and dearth of passable landresource. For improvementof costly waste collection and transportation of municipal waste,well-defined establishment of intermediatewaste transfer stationshas emerged as a sustainable substitute (Rathore & Sarmah, 2019). This situation has necessitated the establishment of intermediate communal collection facility closer to the waste generation source equiped with facilities like recycling, reuse, processing and disposal (Arlene, 2019). Intermediate Waste transfer station has fundamental position in the process of waste management operation (SL, 2023). Intermediate Waste Station is meant to be a better facility for disposal of waste compared to landfill and is all about convenience (Jeff Eriks , 2023). Generally, Waste Transfer Stations act as communal waste collection point having enough space to accommodate weigh-scale facilities, waste drop area and large transportation vehicles along with equipments like loaders, conveyors, cranes, mobility corridors, and others abetting loading to unloading and waste screening.Most commonly, waste transfer station denotes as "an integrated facility situated amid waste collection area and final disposal place" (EPA, 2000). Waste transfer station is labelled as intermediate point, usually developed in between the waste generation source and disposal meant for storage, loading / reloading from smaller to large haulers for transportation to waste trench area and waste processing but are not meant for long time storage (UNEPA, 2002). Waste segregation and re-sizing are the adding facilities besides waste treatment like incineration and composting at some sites. Waste transfer station

works best in case of larger distance between the collection area and waste disposal facilities especially, when it is between 15 to 20 miles, and it also serves as vehicle ephemeral parking and servicing (UNEPA, 2002)**.** Waste transfer station meant for transit storage unlike waste disposal sites, warrants due respect to environmental, socio-economic and people relating parameters.Benefits associated with waste transfer stations include Reduced Road Travel, Public Convenience, Optimise Recycling, flexible selection of waste disposal alternatives, Enhanced Safety and Efficiency at End point, revenue generation, road wear and air emissions (UNEPA, 2000 & 2002)**.** The fundamental concerns associated with siting and operation of waste transfer station include breeding space for flies, vectors, insects, traffic and noise on account of waste collection vehicle movement, workers and drivers and cause antipathy of adjoining communities. Waste transfer stations can have the capacity of few hundred tons to hundreds of thousands of tons and wide range of recycling facilities (Andrew, 2024). Waste transfer stations can be categorized as small, medium and large waste transfer stations depending upon the capacity of waste handling, size of waste collection vehicles, population, population density and frequency of waste collection (NPTL, 2024). Solid waste potentially to be handled at intermediate waste transfer station include municipal waste generated by households, businesses, institutions and industry, yard waste, garden waste, construction and demolition waste, degradable and non-degradable waste and recyclables.Most commonly, types of waste unacceptable at intermediate waste transfer station are large and bulky items, hazardous waste, infectious medical waste, explossives, appliances, radioactive and asbestos materials, batteries, sludges and other dust prone waste materials (UNEPA, 2002)**.** Key debates while planning the waste transfer stations involve surrounding land uses, connectivity with transportation network, immediacy from residential communities, proximity of infrastructure, consideration of neighbours and waste quantitiesbeing received, types, capacity and number of waste collection vehicles, time required for waste storage at the tipping area and waste unloading time (NPTL, 2024). Waste transfer station is meant for waste screening, supporting waste reclamation, diminution of contamination, cut transportation expenses, place for identification and apprehend of harmful materials, accessible for local community and waste transfer stations are securer, pleasing when compared with waste disposal facilities (Sandra et al., 2022). The key principles of suitable waste transfer station designincorporate waste sorting facilities prior to disposal areas**,** traffic arrangement avoiding intersections, crossing and especially one way traffic movement**,** segregation of small and long vehiclesand moving plants and manual movement to be separated (Ramachandran ,2009). Advantages linked with appropriately planned waste transfer station feature, a) it reduces the cost of waste collection, b) waste carrier vehicles operation cost in terms of fuel and labour, c) enhances the resource recovery, d) it results in improvement of efficiency of waste collection vehicles, e) waste transfer station maximizes the opportunity of inspection and waste processing, f) reduces the cost of waste management in terms of number of waste collection vehicles and allied costs of operation and g) Planning and development of waste disposal site far away in cheaper and easily available areas (Rathore & Sarmah, 2019). Appropriately sited immediate waste transfer stations could possiblly hoard millions annually from the operation and management cost (Rathore & Sarmah, 2019).

Ministry of Environment of Ecuador, implies a distance of 500m to be maintained between populated areas and WTSs (Rahimi et al., 2019), a radius of 1000m is suggested by few researchers (Manzaras et al., 2017). However, in consideration of heavy traffic at WTSs, a buffer of 200m to 500m is recommended around the WTSs sites (Lin et al., 2020)

There are no customaryyardsticks to determine the suitability of planning and operation of Intermediate Waste Transfer Station and therefore, a set of parameters has been outlined after extensive literature review from varying geographical settings (Rathore & Sarmah, 2019

& UNEPA, 2002). However, variables like several technical, environmental, political, social and economic parameters are fundamentallyrelevant to the site suitability.These twenty nine benchmarks were evinced such as:distance from road network, populated areas, rivers, protected natural areas, slopes, power grid, tourist sites and churches,health centers, water bodies, airports, educational centers, distance to landfills, andwaste generating nodes, land use, basic services availability,, transportation costs, , type of property, amount of waste generated, public health effects, groundwater, hydrocarbon or conduction infrastructure, job opportunities, elevation, soil permeability, waste type, public acceptability, child population density, industrial areas, and soil compaction factor (UNEPA, 2000 & 2002). The first six yardsticksstrongly stain the socio-economic and environmental implications.Rathore and Sarmah divulge transportation expensesdiminution by using a intermediate waste transfer station when the distance between waste disposal site and waste generating source is above 15 km (Rathore & Sarmah, 2019). Six top most worth considering factors among many others for siting, developing and operating intermediate waste transfer station include location, efficiency, durability, flexibility, cost, and safety besides accessibility, drive time, fuel efficiency, size of site and tipping area corresponding to waste received and space for queing prior to weighing (Jeff Eriks , 2023). Miller quotes zoning preferably industrial zone, distance from residential and bussiness establishments, surrounding properties, access to and from the site, potential city expansion trends and likelihood of commuity development in the surrounding, size of site capable of handling the designed waste generation and larger traffic streams and technical capibility to encounter odour, noise, dust and vector breeding.

Figure 2: Typical waste transfer station. *Source*: The Cape Girardeau Transfer Station in Montana, designed and built by CambridgeCompanies.

6. SURVEY RESULTS AND DISCUSSION

Summary of interviews and questionnaire survey encompasses the interviews of waste management professionals (10), Town planning professionals (10), representatives of NGOs (5), residents of areas adjoining to existing and proposed waste transfer station (25), sanitary workers at waste transfer station (10), CDA sanitary office representatives (10), Environmental Protection Agency (EPA) representatives (3), Private contractors (2) and waste scavengers working at existing waste transfer station (5) – 80. Most interestingly,waste management professionals and all other respondents showed dis-satisfaction with regards to location and operation of WTS at I-11/4, and siting of waste transfer station at I-9/1, Town planners in CDA are unaware of siting waste transfer station and residents of adjoining areas have denied of any public hearing by the department or public survey by the consultant. City planning practitioners, supported the siting at appropriate and, convenient location and transformation of waste transfer station into a sustainable and profitable environment friendly development. Relying on the consultation with key stakeholders, there was a consensus that operation of existing waste transfer station needs to be improved making it environment friendly, compliant to set parameters and further, discontinue its operation at the earliest possible time.

7. CASE STUDY AREA

The project area comprises of existing waste transfer station in sector I-11 developedto cater for the requirements of waste collection amid shifting of waste disposal facilityinRawalpindi and site allocated in sector I-9/4 for intermediate waste collection generating inzones-1&2 over an area of 220 sq. kms out of 906 sq. kms - 65000 acres (30%) out of 225000 acres. For rest of area of 160000 acres (70%), there isno waste transfer so far.

8.1 Municipal Solid Waste Management System in Project area

In line with the varying development patters ranging from planned communities compliant to sustainable urban development planning to semi planned and privately owned developments to informal developments, municipal solid waste management models also vary.These waste management models entail formal waste management system comprising of door-to-door collection, transfer to communal waste transfer stations, waste management in zones -2, 4, 5 – development in private sector is limited to irregular door-to-door collection and its transportation to undefined inappropriately developed destination and informal waste collection and its disposal in informal settlements.Waste disposal site located in sector I-12 was shifted in Rawalpindi area on public and judiciary interventions in the year 2022.Historically, intermediate waste transfer station never remained part of municipal waste management system in Islamabad and to fill this gap, CDA established an intermediate waste transfer station in sector I-11- meant for development of wholesale markets.

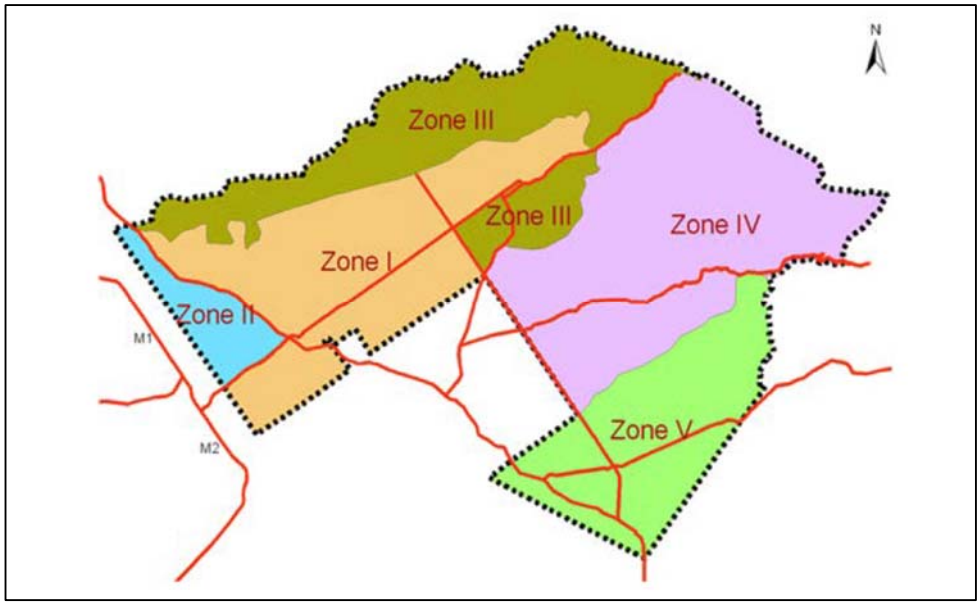

Figure 3: Zones of Islamabad. *Source*: ICT Zoning Regulation, 1992, Islamabad.

8. INTERMEDIATE WASTE TRANSFER STATION IN ISLAMABAD

Associated with shifting of waste disposal site miles away from Islamabad, cost of waste transportation and efficiency of waste transportation fleet, philosophy of establishment of intermediate waste transfer station sensitized the respective institutions. Considering the urgency of the waste disposal, Intermediate Waste Transfer Station was temporarily established in sector I-11 till the development of formal facility.

9.1 Intermediate Waste Transfer Station Sector I-11

On discontinuing the waste disposal operation in sector I-12, waste transfer station has been established over a site measuring approx. five acres on temporary basis in sector I-11 and is meant to handle the waste generation in the capital city.

Figure 4: Waste Transfer Station Site Sector I-**11. Source: Islamabad Master Plan, 1960**

Sector I-11 is meant for development of wholesale markets and Fruit & Vegetable. Waste transfer station is surrounded by Metro Cash &Carry and residential settlement on its west, F&V Market on south, wholesale markets on north and residential sector on its east. In order to have firsthand insight of operation, waste transfer station has been visited in the month of May, 2025 and sanitary workers, waste transport drivers, machine operators, site supervisors and waste scavengers have been interviewed.It has been reported that:

- Waste transfer station is situated within the developed wholesale markets, closer to F&G market and in the close vicinity of residential developments – does not fulfil the criteria of safe distance.
- Waste transfer station has been established as gap stop arrangement till the development of formal waste transfer station in Islamabad.
- The waste transfer station is not appropriately and adequately developed rather, is being used for open-air waste dumping.
- There is no infrastructure supporting the waste loading, unloading, vehicle mobility,weigh bridge and, leachate and, gas emission control and otherenvironmental hazards allied with waste disposal operation.
- There is no watch & ward and other security arrangement concerning CDA staff, waste scavengers and waste transportation machineryworking at site.
- No precautionary measures are being exercised for environmental pollution, odour and insect control.
- Waste transportation / shifting operation is unregulated and non-compliant to globally accepted SOPs.
- There is no waste screening arrangement and waste scavenging is informal and unregulated.

Figure 05 Waste Management processing

Siting and establishment of inappropriately and inadequately sited waste transfer station in the middle of developed neighbourhoods and communities has resulted in shifting of waste

dumping closer to the urban population, environmental degradation, health issues, foul odour spread within adjoining communities, real estate price deterioration and continuing use of a temporary informal facility for years has emerged as big question mark on the capability of management in CDA.

9.1Waste Transfer Site in Sector I-9/1

In compliance to the Waste Management Plan in Islamabad, three waste transfer stations are to be developed and as first priority, a site measuring two acres has been allocated in sector I-9/1 for development of intermediate waste transfer station on west of sewerage treatment plant. Area of operation of the allocated site allocatedcomprises of planned, semi planned and predominantly informal settlements. Thus, accurate data with regards topopulation, types of settlements and, waste quantities and characteristics is not available linked with varying development patterns in study area.Noteworthy residential settlements around site are:

- North Sector I-9/1 370 ft
- West. Sector I-10/4 600 ft
- South. Rawalpindi 400 ft
- North-east. Imam Bargah Building 50 ft

Figure:06, Location Plan of Intermediate Waster Transfer Station in I-9/1

Source: CDA Environmental Impact Assessment, 2024

- The site does not comply with the fundamental yardstick of minimum distance of 300 to 500 meters – 980 to 1600 feet.
- The IWTS site does not have direct access to and from major corridor and further, waste carrying vehicles would have to follow the over-crowded roads confronting from traffic congestions.
- The site islocated above thirty kilometers away from the waste generation node and, is coupled with varying / informal development pattern and inefficient and inadequate communication network.
- Development of Intermediate Waste Transfer Station at this location lacks conformity with waste management models in the area of operation.
- The site is located on the bank of natural water stream traversing all along Islamabad and Rawalpindi.
- The waste transfer site is situated at much lower level than the adjoining Sewerage Treatment Plant (STP) and close to religious place.
- The site is undulating and situated on steep slopes.
- Environmental Impact Assessment (EIA) submitted by CDA for this site has been rejected by Environmental Protection Agency (EPA).

10 APPRAISAL CONCLUSION

In consideration of key parameters derived from waste management related literature, assessment of waste transfer station site and its operation in sector I-11 and site in sector I-9/1 is outlined below.

Table 2. Assessment of the waste transfer station sites in Islamabad

	Variable	Existing Waste Transfer Station I-11		Proposed Waste Transfer Station I-9/1	
		Yes	No	Yes	No
1	Distance from populated areas 650 ft to 1600 ft		x		x
2	Accessibility and Road Network	x			x
3	Zoning and Industrial Areas		x		x
4	Environmental considerations	x			x
5	Combined facilities		x		x
6	Distance		x		x
7	Community input		x		x
8	Basicservices availability		x		x
9	Traffic patterns	x			x
10	Future Growth		x		x
11	Cost-effectiveness		x		x
12	water bodies	x			x
13	Distance from rivers	N.A		N.A	
14	amount of MSW generated		x		x
15	Distance from tourist sites and churches/mosque	x			x
16	Public health effects		x		x
17	Distance to landfills		x		x
18	Acceptability		x		x
19	Child population density		x		x
20	Waste type		x		x
21	Industrial areas		x		x
22	Transportation costs		x		x
23	Distance from protected natural areas&slopes	x			x

11 CONCLUSION AND RECOMMENDATION

Municipal waste generation in urban areas is increasing rapidly corresponding to growing urban population, changing development trends and specifically, in Islamabad, municipal waste increase is significant linked with highest annual population growth rate of 2.68% and population affluence. As of today, municipal solid waste generation in Islamabad estimates approx. 1100 tons a day at a rate of 0.80 kg/capita/day and 40 million tons per year. Appropriately planned and developed waste disposal arrangement could not be made in Islamabad in last above fifty years. In the year 2024, shifting of waste disposal in Rawalpindi area has compelled for development of intermediate waste transfer for efficient waste collection and transportation. Intermediate Waste Transfer Station in Islamabad in sector I-11/4 does not comply with the siting, development, operation and management set SOPs and is resulting in social, economic, health and environmental challenges. Intermediate Waste Transfer Station site in sector I-9/1 is surrounded by residential communities, religious buildings and suffers from challenges of inappropriate to and from access, social, economic and, environment deteriorationand most importantly, incapacity to handle the waste generation and area coverage. As pronounced by Environmental Protection Authority respondent, this site for Intermediate Waste Transfer Station does not match the defined yardsticks for such developments.

12 RECCOMMENDATIONS

Intermediate waste transfer has a key position in practicing Integrated Municipal Solid Waste Management and therefore, warrants its development in true compliance of parameters outlined globally to harness the potential challenges of waste management operation efficiency, social, economic and, environmental degradation and public health & hygiene. Following recommendations seem to be fundamental for sustainable municipal waste management operation and public well-being.

I. INTERMEDIATE WASTE TRANSFER STATION – I-11/4

- Necessary remedial measures must be executed within the shortest possible time like construction of security wall, watch & ward arrangement, construction of demountable sheds, regulated waste loading / unloading arrangements, safety kits for workers, well-monitored waste scavenging, incoming and outgoing waste weighing facility, environmental hazards mitigation, waste flying control, waste spread on adjoining roads, odour control and vehicle in and out and on site mobility plan, and above all, thick and tall plantation ensuring buffer between waste transfer area and surrounding communities.
- The soonest possible operation of intermediate waste transfer station needs to be discontinued.

II. INTEGRATED WASTE MANAGEMENT PLAN - Intermediate Waste Transfer

Towards implementation of Integrated Waste Management Plan in Islamabad, development of Intermediate Waste Transfer Stations is fundamental and therefore, needs serious professional considerations while siting and developing this facility.

- Intermediate waste transfer stations need to be developed on multiple locations taking into consideration the development pattern, waste quantity and quality, area specific waste management approach and mobility network.
- In consideration of rapid population growth, corresponding waste quantities, waste characteristics and prevailing development patterns, following locations merit consideration:
  - **Zone-1** over an area of 55000 acres – **two** locations **one for CDA planned developments** and **one for unplanned developments.**
  - **Zone-2** over an area of 10000 acres –**one** – land is to be allocated by the private societies as per approvals by CDA.
  - **Zone-3** over an area of 51000 acres – **one** – low density of developments.
  - **Zone-4** over an area of 70000 acres – **two** – land is o be allocated by private developers as per approvals by CDA.
  - **Zone-5** over an area of 39000 acres – **two** – land is to be allocated by private developers as per approvals by CDA.
- Appropriate siting and development of Intermediate Waste Transfer Station as thumb rule is need of the day for ensuring waste management operation and environmental sustainability, financial efficiency and socially sustainable communities in all cities and growing urban centres.

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