ENVIRONMENTAL ASSESSMENT REPORT

of

'SOLID WASTE MANAGEMENT' SUB-PROJECT

Dhaka Integrated Urban Development Project (DIUDP)
Dhaka North City Corporation (DNCC)
Gulshan-2, Dhaka

Bangladesh Municipal Development Fund (BMDF)
Municipal Governance and Support Project (MGSP)
Ministry of Local Government, Rural Development and Cooperatives
Government of the People's Republic of Bangladesh
July 2018

ABBREVIATIONS

BDT	Bangladesh Taka
BMD	Bangladesh Meteorological Department
BMDF	Bangladesh Municipal Development Fund
BNBC	Bangladesh National Building Code
CASE	Clean Air Sustainable Project
DNCC	Dhaka North City Corporation
DoE	Department of Environment
DWASA	Dhaka Water Supply Sewerage Authority
EA	Environmental Assessment
ECoP	Environmental Code of Practice
ECA	Ecologically Critical Area
ECR	Environment Conservation Rules
EIA	Environmental Impact Assessment
EMIS	Environmental Management Information System
EMP	Environmental Management Plan
FGD	Focus Group Discussion
GoB	Government of Bangladesh
GRC	Grievance Redress Committee
IEE	Initial Environmental Examination
IEF	Important Environmental Features
LGED	Local Government Engineering Department
MGSP	Municipal Governance and Services Project
MoEF	Ministry of Environment and Forest
NGO	Non-Government Organization
OHS	Occupational Health and Safety
OP	Operational Policy
PCAIP	Public Consultation and Access to Information Plan
PD	Project Director

PM	Particulate Matter
PM_{25}	Particulate Matter with Aerodynamic ≤ 2.5 micrometers
PM_{10}	Particulate Matter with Aerodynamic ≤ 2.5 micrometers
PMO	Project Management Office
PCSP	Primary Collection Service Provider
PWCSP	Primary Waste Collection Service Provider
SECs	Special Environmental Clauses
SEG	Small Ethnic Group
SPM	Suspended Particulate Matter
TDS	Total Dissolved Solids
ULB	Urban Local Bodies
WB	World Bank

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Executive Summary

To enhance the capacity of urban local bodies (ULB) in development and management of urban infrastructure, to improve municipal governance & services, the Government of Bangladesh is implementing Municipal Governance and Services Project (MGSP) through the Local Government Engineering Department (LGED) and the Bangladesh Municipal Development Fund (BMDF). The project is financed by IDA with GoB contribution for land acquisition, management and Municipality equity for accessing BMDF competitive finance. Under the MGSP the LGED will implement about 20 types of sub-projects in 26 ULBs, which include 22 Pourashava and 4 City Corporations; while the BMDF will implement about 13 types of sub-projects in 119 Pourashava.

'Dhaka Integrated Urban Development Project' is implementing by Dhaka North City Corporation (DNCC) taking both financial and technical assistance from Bangladesh Municipal Development Fund (BMDF).

The specific objectives of this EA are to assess the existing environmental conditions of the sub-project and its influence area; to identify and assess impacts resulting from the sub-project during its construction phase and operation phase; to develop an environmental management plan with recommendations for mitigating impacts and enhance positive impacts; and to summarize environmental monitoring requirements.

The sub-project has been identified by the Waste Management Department of Dhaka North City Corporation (DNCC) as Urban Local Bodies (ULB) prioritizing the need of local targeted beneficiaries and consultation with respective Ward Counselors. Requisition of equipment is made based on need and piloting of proposed items successfully for road cleaning and waste compaction for a few periods.

Considering the anticipated environmental impacts, the proposed sub-projects fall under Orange "B" as per ECR 1997 of DoE and WB.

The proposed sub-project will not create significant negative impact on ecological, physic-chemical aspect during construction period but it will be helpful to enhance clean environment and reduce hazard of manual road sweeping.

Suggested minor adverse environmental impacts are subject to mitigation and will be addressed through proper mitigation and enhancement measures during the operation period.

Table 1: Key information of sub-project

Name of the Sub-project	"Solid Waste Management".
Name of District	Dhaka
Name of ULB	Dhaka North City Corporation
Location of the sub-project	This subproject is located at whole DNCC area.
Name of the package	Supply of Brand New Latest Model 4 (four) Road Sweeping Truck with one year required consumables. Supply of Brand New Latest Model, Heavy Duty Swamp Track type (LGP) 1 (one) no. Bulldozer having minimum 25 Tons operating weight.
Service areas	All the VIP roads under the DNCC area for street sweeping and all over DNCC area for bulldozer.
Beneficiary population	All the people of DNCC area.
Estimated cost	212 BDT Million
Sub-project Duration (tentative)	8 months
Ave. Beneficiary	3,957,302

1. INTRODUCTION

1. Background

The Government of Bangladesh (GoB) is implementing Municipal Governance and Services Project (MGSP) to enhance the capacity of urban local bodies in development and management of urban infrastructure, and improve municipal governance and services in selected Pourashavas and City Corporations. The Local Government Engineering Department (LGED) and the Bangladesh Municipal Development Fund (BMDF) under the Ministry of Local Government, Rural Development and Cooperatives is implementing the project with participation of the selected ULBs. The project is providing performance-based infrastructure improvement block grants and pilot O&M grants to approximately 200 urban local bodies (ULBs), comprising Pourashavas and City Corporations, located along the growth corridors.

Under the MGSP Sub-component 1.1 of Component 1 (Municipal Governance and Basic Urban Services Improvement), the LGED will implement 20 types of sub-projects in 26 ULBs, which include 22 Pourashavas and 4 City Corporations. Under MGSP Sub-component 2.1 of Component 2 (BMDF Operation and Institutional Improvement), the BMDF will implement about 13 types of sub-projects in 119 Pourashavas. The LGED and the BMDF intends to ensure that the proposed infrastructure takes environmental concerns into account.

Both the LGED and the BMDF intends to ensure that the proposed infrastructure takes into account the environmental concerns in accordance with the Environment Conservation Rules 1997, and the World Bank Safeguard Policies. Considering this, MGSP has framework approach for Environmental Assessment (EA); the EA has two major components: (a) overall environmental assessment, and (b) development of Environmental Management Framework (EMF). So, to meet the regulatory requirement EA is mandatory to implement any sub-project under MGSP/BMDF.

‘Dhaka Integrated Urban Development Project’ is implementing by Dhaka North City Corporation (DNCC) taking both financial and technical assistance from Bangladesh Municipal Development Fund (BMDF).

‘Solid Waste Management’ is one of the proposed sub-projects among four. Procurement of four road sweeping track and one chain system Bulldozer are included under that sub-project.

2. Objective of the study

This assessment report presents the finding of Environmental Assessment (EA) of "solid waste management" sub-project. The objective of the study is to provide an examination and assessment of the principal environmental impacts of the sub-project activities. The outline of an environmental management plan also suggested with an indication of the extent of work to be done to keep the development and environment compatible. In this context, it should be noted that the term "environment" and its derivatives have been used in a wide sense, which covers not only physical and chemical aspect, but also the human dimension. The specific objectives of this EA are to:

1. To assess the existing environmental conditions of the sub-project and its influence area;
2. To identify and assess impacts resulting from the sub-project during its construction phase and operation phase;
3. To develop an environmental management plan with recommendations for mitigating impacts and enhance positive impacts;
4. To summarize environmental monitoring requirements.

1. Justification of sub-project

Proposed sub-project includes procurement of two equipments which are road sweeper truck and Swamp track type Chain system Bulldozer. Road sweeper will be used for cleaning, brushing and vacuuming of surface dusts, leaves, mud, soil, sand, stone chips, gravels and other small particles of VIP roads under DNCC. Swamp track type Chain Bulldozer will be used for waste compaction purposes at Aminbazar landfill.

There are 300 KMs VIP roads under the DNCC area. It has been observed that quality and timely work is difficult through manual cleaning by the Sweeper. There is possibility of fatal accident of assigned sweeper during manual sweeping by moving vehicles. Presently DNCC is using one road sweeper truck for mechanical cleaning of few roads from February 2018 which is cleaning 15 KMs roads everyday and approximately 4 tons waste is collected and disposed in the landfill. Mechanical cleaning is more effective, safe tools, economically viable, more environment friendly.

Total 36 wards are under DNCC and every day on an average 3000-3200 tons waste is dumped in the Aminbazar landfill. Presently one platform is using out of 4 at landfill due to shortage of Chain System Bulldozer. Chain system Bulldozer is using for waste dressing as well as compaction purpose at landfill. At present, 5 numbers of Chain System Bulldozers are using at Aminbazar landfill which are not enough considering the volume of waste dumped everyday at the landfill.

2. Scope and method of the study

The EA report was prepared on the basis of proposed engineering/project works, field investigations, stakeholder consultation, primary and secondary data collection, screening of all baseline environmental parameters, environmental quality baseline monitoring, and review of other similar IDA

funded project reports like; MGSP, LGSP etc. The study conducted on July 2018. The EA covers the general environmental profile of the sub-project area including physical, ecological, environmental, social, cultural and economic resources. The EA includes an overview of the potential environmental impacts and their severity, proposes necessary mitigation measures and environmental management plan for each of the identified and anticipated impacts.

The methodology used for this study is based on the procedures described in Environmental Guidelines, (Volume 1 and 2) published by Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF) and the other relevant regulation of Bangladesh as well as World Bank Guidelines for Environmental and Social Considerations. Analysis of collected data has been done. Documentation of baseline conditions has conducted through on-site environmental monitoring. Analysis and assessment of various alternatives have been done. Identification and assessment of various impacts along with formulation of mitigation, and avoidance measures have been done for identified impacts.

5. SUB-PROJECT DESCRIPTION

1. Background of Dhaka North City Corporation

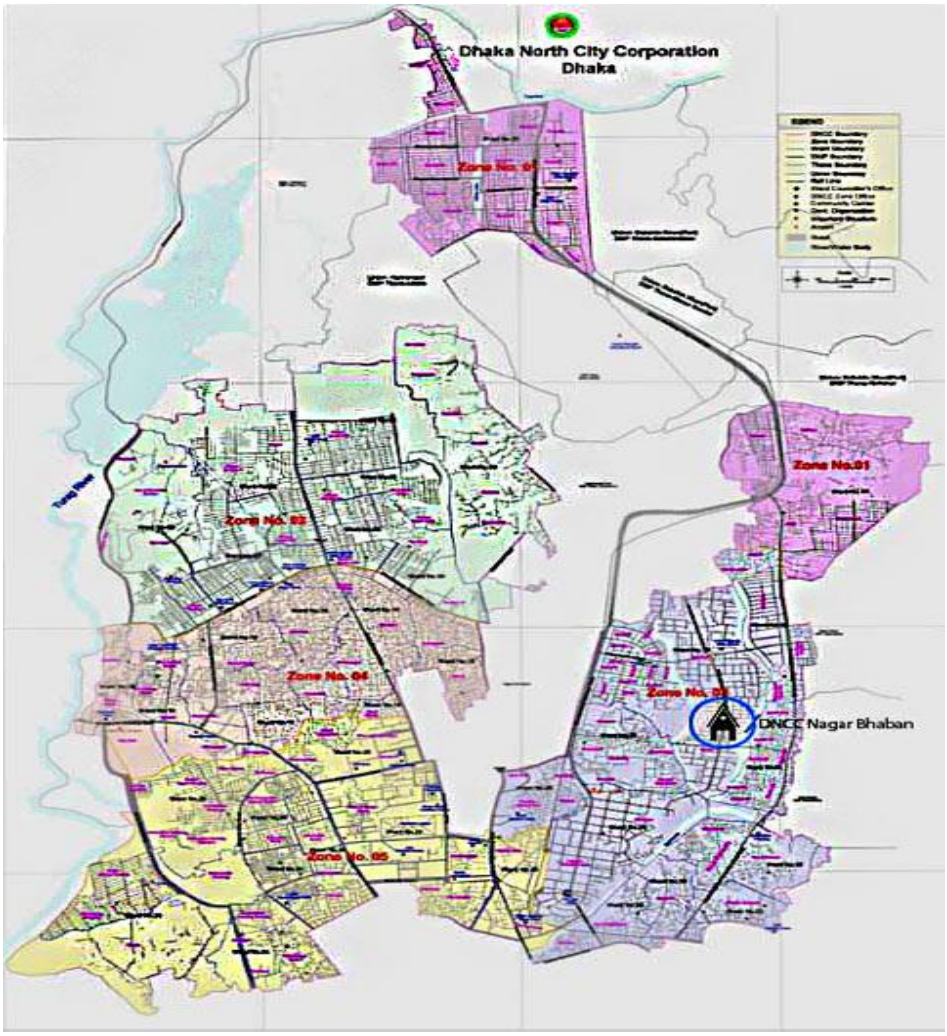
Dhaka became the capital of Bangladesh with the independence in the year 1971. City area was divided into 50 wards and election of Ward Commissioners was held in 1977 with the introduction of "Pourashava Ordinance, 1977". Ward Commissioners elected one of their members as the Chairman of the Municipality. In 1978, Dhaka Municipality was awarded the status of Corporation and the existing Chairman became the Mayor of the Corporation. Municipal Corporation was superseded by the promulgation of Martial law in March, 1982. Two adjacent municipalities, namely Mirpur and Gulshan Municipalities were merged with Dhaka Municipality in the same year. As a result the number of wards increased to 56. The corporation was statute with the introduction of Dhaka Municipal Corporation Ordinance, 1983, repealing the application of Pourashava Ordinance, 1977. Later, number of wards was increased to 75 and Administrators/Mayors were appointed by the Govt. till 1994. In 1990, Dhaka Municipal Corporation was renamed as Dhaka City Corporation and was divided in to 10 zones. In 1993, the Government with a view to democratize the city corporation, made drastic amendment in Ordinance, 1983 and repealing the application of pourashava that the Mayor and the Commissioners will be elected by direct election on the basis of adult franchise. The City area is divided into 90 wards to represent one Commissioner, elected directly, form each ward. The Local Govt. (City Corporation) Act 2009, (Amendment-2011), Dhaka City Corporation has divided as Dhaka South City Corporation (DSCC) and Dhaka North City Corporation (DNCC).

DNCC is located between $23^0 44'$ and $23^0 54'$ latitude and between $90^0 20'$ and $90^0 28'$ longitude. The DNCC area is surrounded by Gazipur City Corporation in north, DSCC in south, Savar in the west and Rupgonj Upazila in the east. DNCC is divided into 5 zones; total area is 82.638 sq. km. consisting of 36 wards approximately with total population of 3957302 (source:

population and housing census, 2011) among which 2201051 are male and 1756251 are female with the density of 47887 per sq.km. The total household of the DNCC is 899387 and average household size is 4.4.Highest population is 1,10,863at Ward number 36 and lowest population is 22,300 at Ward number 19.

Dhaka North City Corporation is implementing different kind of development projects like Internal Drainage Improvement Project (IDIP), Urban Resilience Project (URP) funded by World Bank, construction of road, drain & footpath, construction of housing building for shebok at Gabtali, etc. with the support of ADP allocated the Bangladesh Government, DNCC own generated fund and other donor supported fund. 'Solid Waste Management' sub-project has been co-funded by the Bangladesh Municipal Development Fund (BMDF).

Map1: Geographical location and area of Dhaka North City Corporation



2. Solid waste scenario of Dhaka North City Corporation

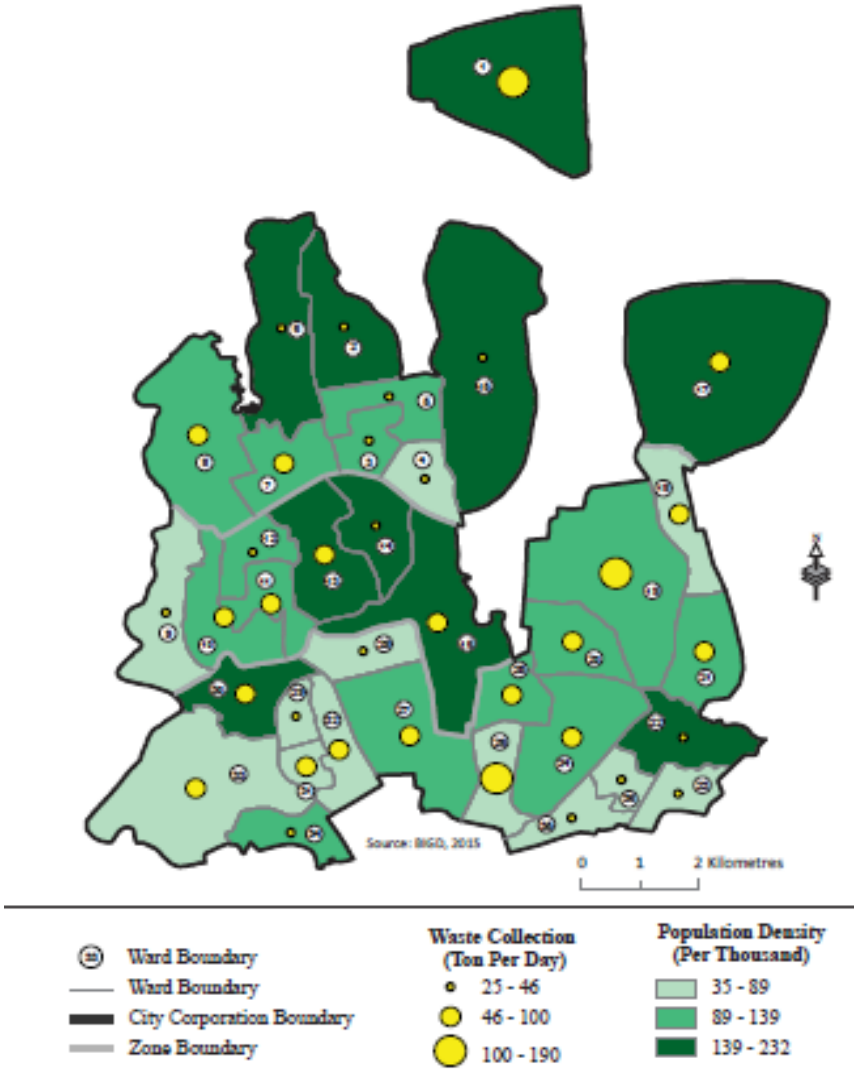
Considering overall Bangladesh; Dhaka is one of the most densely populated cities with many people living in slums and squatter settlements. Although it recently adopted a Solid Waste

Master Plan, most areas of the city lack of sufficient waste collection services. Only 70%-80% of Dhaka's waste is collected and transported to the landfills. Uncollected waste is deposited in open dumps and common areas, creating public health and environmental hazards. Considering the city's rapid growth and insufficient waste services, the need for improved solid waste management presents a key opportunity for simultaneously addressing health, development, and environmental issues in Dhaka.

According to DNCC Waste Report 2016-17; actual volume of waste generation/day: 3800-4000 tons. Total collected waste in FY 2015-16 is 683,174 ton and in FY 2016-2017 is 852,391 ton. So, waste collection growth in FY 2016-2017 is 24.77%.

Within 36 wards, DNCC has contracted out 8 wards (ward # 1, 17, 18, 19, 20, 21, 24, 25) to private owners which are 38% of total. Reports say that in FY 2017 highest waste had been collected on a day that was 17 June 2017 (3,520 ton) and on a month that was June 2017(86,594 tons). Per capita waste collection/day is 0.513 kg under DNCC. It has been estimated that waste transportation cost is TK. 665.00/ton for DNCC and TK. 553.00/ton for private contractor. Landfill operating cost is TK. 134.00/ton. Aggregate load per trip for DNCC vehicles is 3.7 ton and for contractor's vehicles is 7.8 ton. It is assumed that estimated waste volume 2017-2018 to 2021-2022 will be 6 million ton approximately.

Map 2: Population VS Waste Collection of DNCC

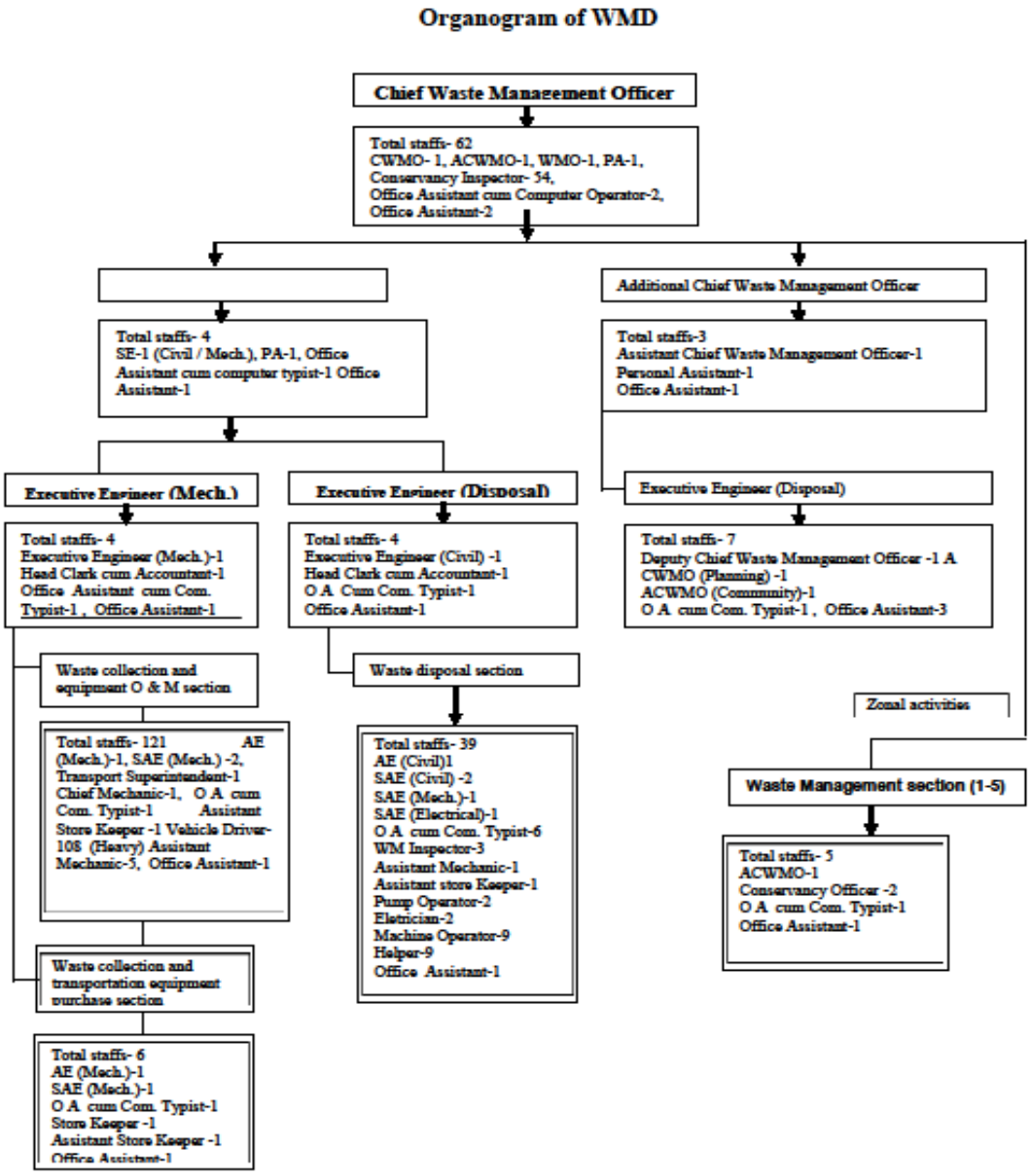


(Source: DNCC 2015)

3. Organogram of Waste Management Department (WMD) of DNCC

Within eighteen departments, waste management is one of the most important departments responsible to make a clean city for people. The organogram of waste management department is as follows.

Figure 1: Organogram of Waste Management Department of DNCC



4. Activities of Waste Management Department of DNCC

Solid waste management is the prime task of Waste Management Department of DNCC. Following activities are conducted by the waste management department (WMD) of DNCC.

1. Ensure collection of waste, transportation and disposal. DNCC is responsible for secondary waste collection to remove waste from its dustbin or containers and transfer to landfill site
2. Ensure clean road/street, drain, parking, footpath etc.
3. Aware and involve city people for waste management related activities
4. Ensure welfare for the daily basis cleaners/labors engaged for waste related work
5. Waste management related vehicle/equipment collection related work
6. Operation and maintenance of waste management related vehicle/equipment
7. Distribution of work for cleaners
8. Supervision of cleaner's activities
9. Provide permission to the private organizations interested for waste management
10. Monitoring and coordination PCSP (Primary Collection Service Provider), community based organizations involved for waste management
11. Ensure management of workshops under waste management department
12. Estimation and skim preparation for cleaning of waste management related vehicles/equipment
13. Formulate and implementation of waste management related mega plan
14. Capacity development of staffs involved with waste management department
15. Budget submission for waste management system

Table 2: Status of cleaners and equipments of DNCC

Category of workers/types of equipment	**Quantity**
Manual Cleaner (street sweeping)	2000 (approx.)
Manual Cleaner (Drain cleaning)	200 (approx.)
Mechanical Drain Cleaner (Jet & Sucker)	02
Waste management Drivers	120 (approx.)
Number of private operators were registered with the PWCSP	280 (approx.)
Numbers of Waste carrying container carrier (vehicle)	45 (approx.)
Number of Waste Collection Trucks (Dump truck)	40(approx.)
No. of Compactor	48 (approx.)
Wheel Dozer (landfill area)	02
Excavator (landfill area)	05
Jet & Sucker deep drain cleaner	02
Road Sweeping track	01
Chain Dozer (Landfill area) { oval type-6, elevated type-2}	08

Steps of activities

Street sweeping: Assigned cleaners sweep roads and alleys every day in the morning. Cleaners gather all collected waste and dump by hand cart to a selected point.

Drain cleaning: A cleaner team consists of 10 to 12 persons go to different location of ward for cleaning open drain/deep drain/surface drain and storm sewerage line everyday.

PWCSP activities: Primary Waste Collection Service Provider (PWCSP)collects household waste by van every day from 1 pm to 7 pm and dump to secondary transfer point.

Dumping of waste at landfill: Everyday, all solid waste is dumped at Amin bazar land fill by assigned vehicles collected from the secondary waste transfer system.

Landfill management: For proper dumping and enhance the longevity of dumping field, need to do systematic management of landfill which includes compaction of waste etc. Functions of the management unit of Aminbazar land field are as followings

1. Develop the disposal plan
2. Maintain the daily operation record
3. Manage the heavy equipment operation and daily cover application.

1. Background of Sub-Project

'Dhaka Integrated Urban Development Project' is implementing by Dhaka North City Corporation (DNCC) taking assistance from Bangladesh Municipal Development Fund (BMDF). The project is supported by the World Bank.

The sub-project includes procurement of two types of equipment. Those are Road Sweeping Truck and Swamp Track type Chain System Bulldozer. Dhaka North City Corporation (DNCC) as Urban Local Bodies (ULB) prioritizing the need of procurement considering the need and consultation with respective Ward Counselor.

Table 3: Brief information of sub-project

Name of the Sub-project	"Solid Waste Management".
Name of District	Dhaka
Name of ULB	Dhaka North City Corporation
Location of the sub-project	This subproject is located at whole DNCC area.
Name of the package	Supply of Brand New Latest Model 4 (four) Road Sweeping Truck with one year required consumables. Supply of Brand New Latest Model, Heavy Duty Swamp Track type (LGP) 1 (one) no. Bulldozer having minimum 25 Tons operating weight.

Service areas	All the VIP roads under the DNCC area for street sweeping and all over DNCC area for Bulldozer.
Beneficiary population	All the people of DNCC area.
Small Ethnic Group (SEG)	No specific small ethnic group settlement is under sub-project area
Estimated cost	212 BDT Million
Sub-project Duration (tentative)	8 months
Ave. Beneficiary	39,573,02

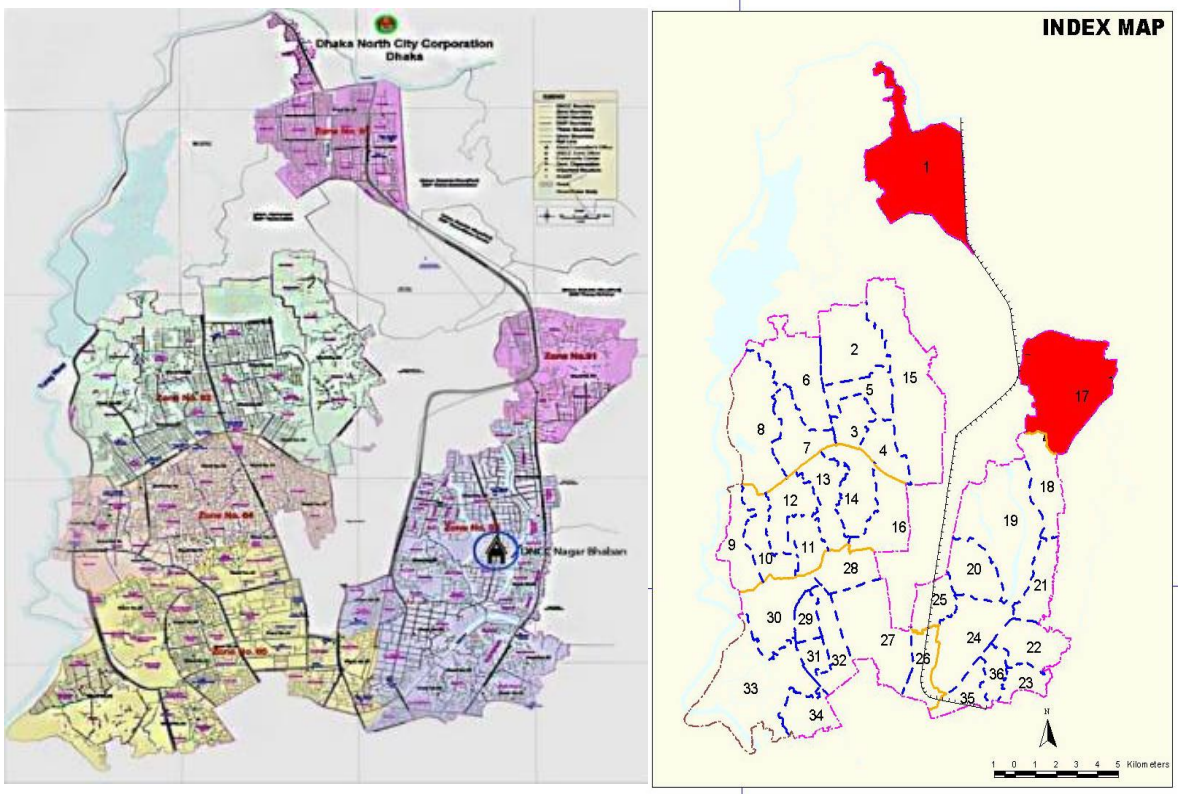
2. Location of proposed sub-project

The road sweeping truck will sweep all VIP roads all over DNCC area. Only VIP roads (mainly within ward number 9, 11, 12, 19, 22, 23, 26, 27) will be considered because, that vehicle can sweep only smooth roads.

The chain system Bulldozer will work at Aminbazar landfill to compact the dumped waste collected from all over DNCC area.

So, all the people lining in DNCC area will be benefited from proposed sub-project.

Map 3: Zone and ward boundary of Dhaka North City Corporation



3. Layout of the sub-project

Proposed type of Road Sweeper Machine

At present DNCC has one road sweeping truck to sweep main roads of Bangla Motor, Farmgate, Jahangirgate, Mohakhali flyover, Banani, Gulshan, Nutun Bazar areas from 12 am to 6/7am every day. After having proposed four road sweeping trucks, all main roads of all five zones will be under automatic sweeping system.

Photo 1: Road Sweeping Truck

Safety System of road sweeping truck includes following items-

1. Back up alarm
2. LED warning light
3. Flash light
4. Fluorescent marker for visible during night
5. Weather resistant paint.

Crew Road Sweeper:

One set of Crew will be involved during operation of each sweeping truck. Each set includes one driver and one helper. Considering the weekend and other working conditions, three drivers and three helpers will be assigned for two road sweeping trucks to work by rotation. So, six drivers and six helpers will be involved for proposed four road sweeper.

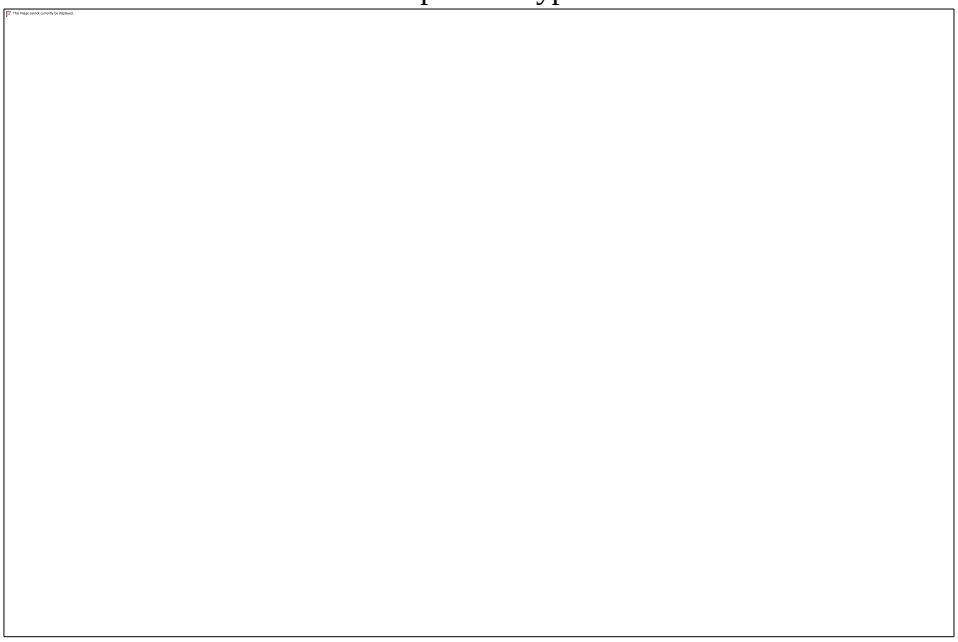
Every year, each Crew of road sweeping truck will get following items (free of cost)-

1.	Specific dress with selected design and color	3 sets
2.	Luminous jacket	2 no.
3.	Hand gloves	2 sets
4.	Raincoat	1 no.
5.	Gum boots	1 pair
6.	Facemask	2 no.
7.	Cap	2 no.
8.	Helmet	1 no.
9.	Torch light	1 no.

Proposed type of Heavy Duty Swamp Track Type Bull Dozer having minimum of 25 Tons operating weight

At present, DNCC has few swamp type of elevated chain system Bull Dozer to compact waste at Aminbazar landfill. Considering the volume and trend of solid waste of Aminbazar dumping site, another swan type Bull Dozer is needed to purchase for uninterrupted work.

Photo 2: Swamp Track type Bull Dozer



1. Ownership of sub-project

The proposed sub-project is mainly procurement work and will be operated and maintenance by (ULB) Dhaka North City Corporation.

2. Brief description of sub-project site

Socio economic characteristics:

Dhaka, the capital city of Bangladesh is one of the fastest growing megacities of the world having density of 23,234 people per square kilometer (World Population Review, 2016). The city bears a legacy of four hundred years and have undergone through a series of shifting political status. Dhaka witnessed a radical increase in population within four decades of its inception which constitutes about 40% of the total urban population of the country and 6% of the entire national population. The city is now growing vertically to accommodate the rising demand of housing and other facilities.

Population of Dhaka city

There is strong relationship between human habitat and waste generation. Human being generated diverse wastes for its livelihood, amenities and conforts. Waste generation pattern depends on social transform. DNCC experiences essential population growth, economic development resulting to diversity waste generation. Dhaka is the most densely populated city in the world. Population density of DNCC in FY 2016-17 has estimated at 57,499 per sq. km. Human settlement in Dhaka city still continue to increase due to employment opportunities, health care services and educational opportunities.

Flood characteristics of Dhaka

Generally inundation occurs in Dhaka in such a way that rising water levels in the three major rivers cause back flows in the tributaries, which in turn make it difficult to drain the surface water, thus resulting in inundation in the wetlands and in the surrounding areas in the hinterland. Major inundations occurred in 1988 and in 1998, bringing about significant damages. During these inundations, water level in Buringanga River in the western part of Dhaka exceeded 7.0 m.

Land use planning of Dhaka

Dhaka City consists of 90 wards within the 21 Thanas in Dhaka Metropolitan Area (DMA). Most of this area is already urbanized. The total administrative area is 15,768 hectare (38,963 acre, 157.68 Sq. Km.). The total population of this area has been increased from 2,464,504 inhabitants in 1981 to 3,583,480 inhabitants in 1991 and 5,333,571 inhabitants in 2001. From 1991 to 2001 the population has been increased by 1,750,091 persons. The average population density was about 338 persons per hectare in 2001.

Table 4: Land use composition in Dhaka City area

Land use category	Area (ha)	Ration (%)	Land use category	Area (ha)	Ration (%)
Residential area	5722.16	44.35	Park/playground/urban green area	154.78	1.20
Commercial	553.06	4.29	Restricted area/brick field	1086.30	8.42
Industrial area	259.16	2.01	Cultivated land/open space/forest	1015.36	7.87

Mixed use area	535.52	4.15	Swamp/marsh/char/island/water bodies	1194.74	9.26
Public facilities	1027.8	7.97	Not available	3.42	0.03
Road/railways	1350.05	10.45			

(Source: Dhaka urban transport network study)

Environmental features

Following tables includes structures, road, street and other settlements of DNCC area.

Table 5: Basic information of DNCC

Description	**Zone-1**	**Zone-2**	**Zone-3**	**Zone-4**	**Zone-5**	**Total**
Market's (Feb, 2014)	—	4	13	2	24	43
Road Length (KM)	260.31	283.48	367.55	218.03	208.268	1337.913
Footpath Length (KM)	18.186	39.80	95.72	25.48	46.463	223.049
Length of Drain (KM)	199.95	233.964	325.581	191.71	250.36	1201.565
Length of Mediam (KM)	4.67	13.035	15.891	9.573	14.941	58.11
Foot over bridge/Underpass	01	–	16	16	12	45 nos.
Community Centre	01	03	04	01	04	13 nos.
Graveyard	02	—	02	01	01	06 (5+1)nos.
Park	02	—	13	—	13	28 nos.
Play Ground	—	03	02	01	09	15 nos.
Bus / Truck Terminal	—	—	01	02	—	3 nos.
Underpass	—	—	—	01	01	2 nos.
Newspaper Booth (Feb, 2014)	—	05	05	05	05	20 nos.
Cinema Hall (Feb, 2014)	1	02	02	02	05	12 nos.
Public Toilet	06	03	07	07	14	37 nos.
Other	—	—	—	—	—	60,023
Hospital	13	17	19	18	51	118
Clinic	09	29	34	18	31	121
School (All Kinds)	114	208	138	82	179	721
Collage	28	54	32	28	49	191
University	08	03	08	05	13	37
Madrasha	24	97	65	36	80	302
Masjid	72	194	147	124	136	673
Mandir	01	05	24	08	04	42
Park	02	02	06	01	03	14
Play Ground	03	05	08	04	20	40

(Source: DNCC, http://www.dncc.gov.bd/site/page/c0b6953f-16d3-405b-85e9-dece13bb98de/লোকেশন-ও-আয়তন)

Environmentally Critical Area

In addition to protected areas, the 1995 Bangladesh Environment Conservation Act includes provision for Ecologically Critical Area (ECA) declarations by the director general of the Department of the Environment in certain cases where the ecosystem is considered to be in danger of reaching a critical state. There are two environmentally sensitive areas within RAJUK; Gulshan-Banani-Baridhara Lake and River ECAs (Buriganga, Turag, Balu andShitalakshya). Conservation of water bodies is essential to protect the eco-system, which,

in turn, will clean up the city's environment. The lakes of Dhaka City should be conserved properly, because they help reduce water logging, improve the drainage system, provide fresh water, and increase water retention capacity, among others, during monsoon. The lakes also help preserve biodiversity and recharge groundwater.

Drainage system

Drainage facility is one of the most important services for city dwellers. DNCC and Dhaka WASA jointly responsible for provide this service to the Dhaka city people. Dhaka City has two types of drainage network: 1) storm water drainage system and 2) household waste water drainage system. Dhaka Water Supply Sewerage Authority (DWASA) is responsible for storm water drainage system and City Corporation is for household waste water drainage system. DNCC has 1201.565 km. drainage network to run out the household waste water and storm water. The outlet of the drainage system has connected with nearby river of the city area.

Water Supply and sanitation facilities

DWASA is mainly responsible for water supply to the household level including the commercial areas. It has almost 100% water coverage and the water demand in Dhaka city is around 2.25 million cubic meters per day. Presently DWASA supplies 87% from ground water source using 605 deep tube-wells and 13% from surface water treatments. The upper and lower aquifers of Dhaka city are about to exceed its withdrawal limit and ground water depletion is occurring at alarming rate. In most places the layer of ground water has been decreasing by two to three meters each year due to lifting of ground water. Dhaka WASA has to change its focus to using surface water instead of underground water because abstracting ground water is no longer ecologically viable.

According to the population and housing census 2011, 61% people are using sanitary toilet with water seal, 34.2% people are using sanitary toilet without water seal, 4.6% people using non sanitary toilet and 0.2% people have no toilet facilities. There are 37 public toilets are available in DNCC area.

Fecal sludge management system

DWASA is responsible for management of fecal sludge in the Dhaka city area. There is no proper sludge management (emptying & treatment) is available in Dhaka city. Limited number of septic tank emptying services is available from private organization which is not affordable to all. Thus higher level of fecal sludge is discharging in to the storm water drain.

Waste generation

DNCC generates approximately 65 million metric tons of solid waste annually. The waste stream is more than 80% organic matter and contains a wide variety of substances, such food waste, municipal solid waste, industrial waste, construction waste, medical waste, and appliances.

Solid waste management system

Managing the solid waste is the main task of Waste Management Department of DNCC. Main activities in waste management are the collection, transportation and crude dumping of waste in landfill. Dhaka city is experiencing incremental waste generation and collection. In FY 2016-17, DNCC transported 852,391 ton waste to the landfill which is 24.77% higher than FY 2015-16.

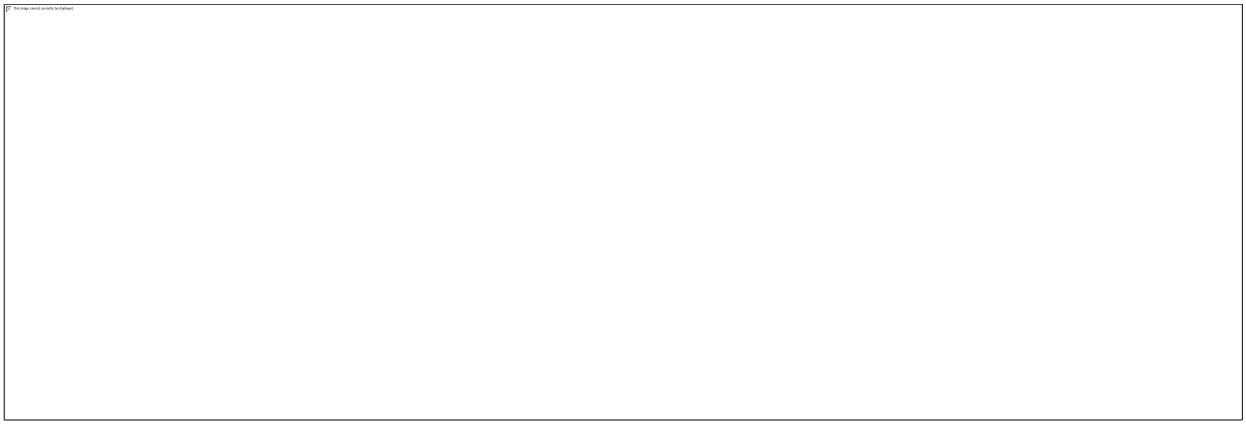
There are two layers of waste collection system, one is primary level (Household) and another is secondary level (Secondary Transfer Station) to landfill area. First waste is collected from house in small bin then carried with small van to big compactor vehicle/secondary transmission site. And segregation of waste is done yet now.

For proper management, DNCC has engaged private entrepreneurs to meet the challenge of waste management system. Presently four entrepreneurs in eight wards (25.976 sq km, 31.43% of DNCC area) sweep street and transport waste from Secondary Transfer Stations (STD) to landfill. DNCC constructed 52 STS for waste management. This helps DNCC to remove larger amount of waste containers/open dumping spots from streets and relief a lot to people.

Diagram 1: Household waste collection process

(Source: State of Cities, BRAC Institute of Governance and Development)

Photo 3: Secondary waste transfer station of DNCC

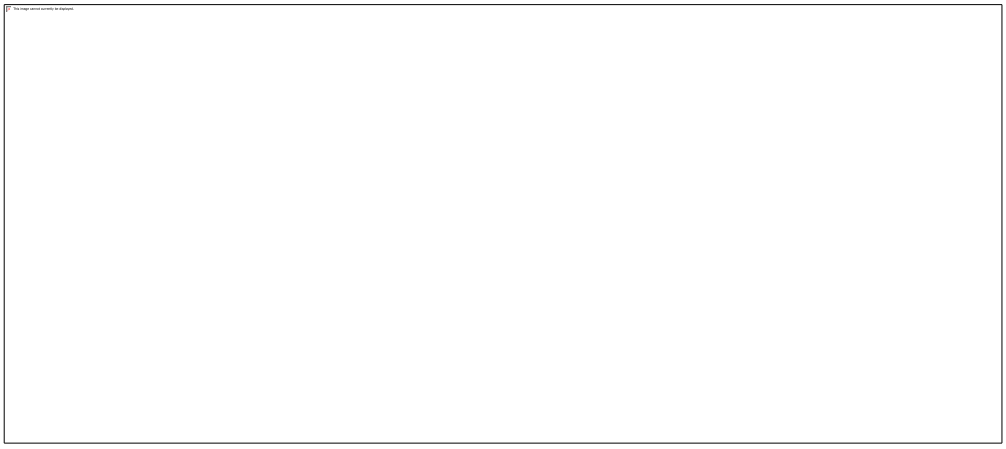


(Source: DNCC waste report 2016-2017)

Final disposal of solid waste to landfill

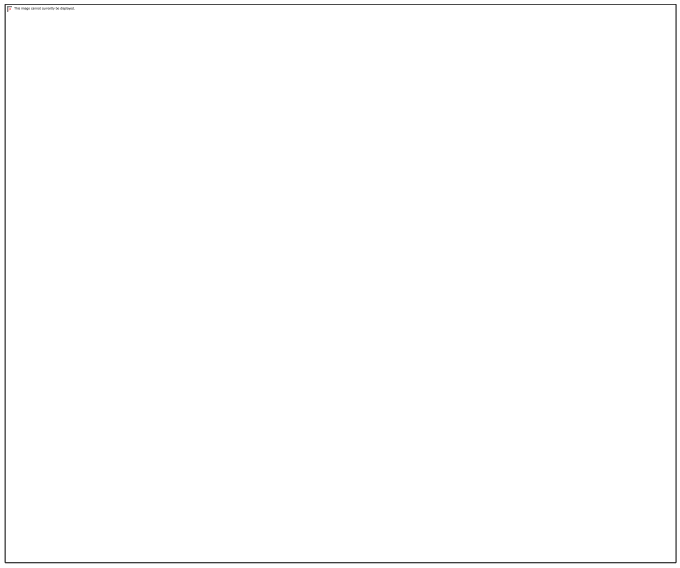
NGO as Primary Waste Collection Service Provider (PWCSP) coordinates solid waste collection from households and dumping to secondary transfer station. In 2016-2017, 340 private operators were registered with the PWCSP. Presently 280 registered private operators are working having 1503 rickshaw vans and 3300 manpower. All the solid waste then transferred from STS to Aminbazar land field by vehicles. According to FY 2016-17, DNCC operates 62% vehicles (for 28 wards) and contractors operates 38% vehicles (for 8 wards) to carry waste from STS to landfill. Waste transportation cost of DNCC was Taka 665/per ton and contractor's was Taka 553 per ton. Aggregated load per trip for DNCC vehicle was 3.7 ton and contractor's vehicle was 7.8 ton. It has been observed that highest waste was collected in June 2017. Around 0.513Kg Per capita waste was collection per day and landfill operation cost was Taka 134 per ton. Estimated waste volume from 2017-2018 to 2021-2022 is approximated 6 million ton. The considering the rising trends of waste, need to strengthen the WMD from all aspects. Presently the land filling is doing in a crude process.

Diagram 2: Secondary and tertiary waste management process



(Source: State of Cities, BRAC Institute of Governance and Development)

Waste collection trend since FY 2014-15 and growth percentage are presented in following chart-

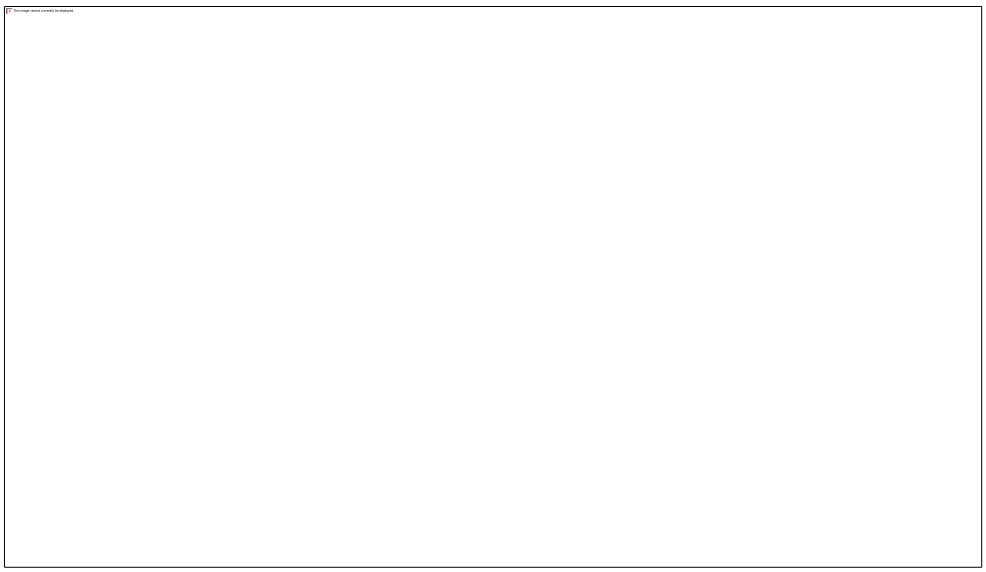


(Source: DNCC waste report 2016-2017)

Recycling and Composting

Recycling is termed to be the tertiary stage in which inorganic waste is recycled. The tertiary waste of DNCC is done mainly by the private organizations, waste pickers and vanmen. The waste pickers search for the recyclable items from the containers and landfills. These waste pickers collect the recyclables and sell to Bhangari (the petty traders), Bhangari inspect the materials which have scrap values. Subsequently, they sell those to Mohajans (wholesalers). Mohajans clean up the materials and sell to different factories. Those factories use the recyclable substances as raw materials and after some processing. The final products are sold in enlisted local markets.

Diagram 3: The recycle process



(Source: State of Cities, BRAC Institute of Governance and Development)

Waste Concern is one of the NGOs that have been composting organic waste of Dhaka since 1995. Now they have composting plant following the Clean Development Mechanism (CDM) act.

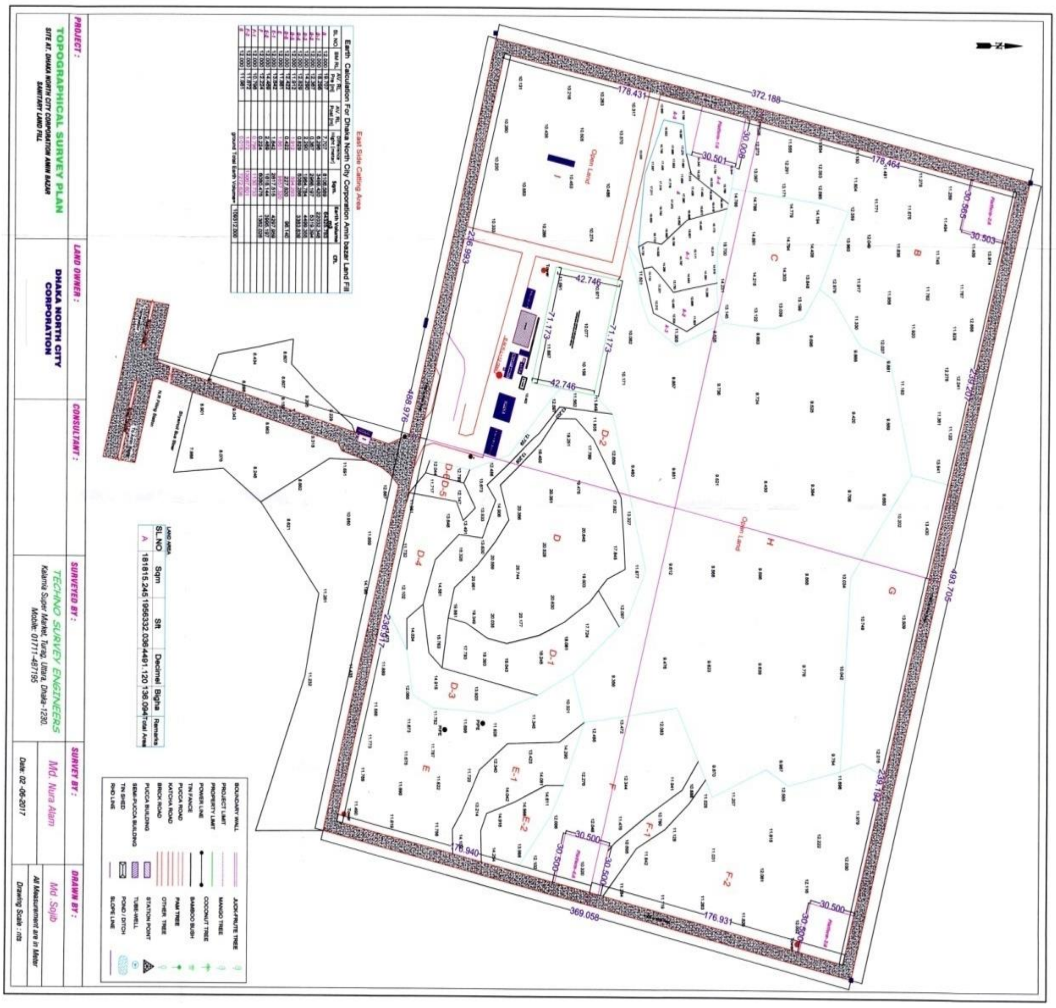
Aminbazar landfill

The final disposal of solid waste is done in landfill sites. From containers, the wastes are transferred to landfill sites. Landfill sites are depository of the final residuals of solid waste after re-use, re-cycle and reduction. Considering the scarcity of land and density of household, the landfill of DNCC is situated outside of Dhaka city which is at Aminbazar, Savar. It is the integral part of waste management. Landfill of Aminbazar, Savar is the only one landfill to dump waste under DNCC. The landfill is on 52 acres land and developed in 2005. The proposed road sweeper truck also will carry the waste directly to the dumping site. The waste carried by the truck is measured first and then they are dumped at the dumping platform. The trucks are unloaded using excavator or automatically. Finally the dozers compact the waste at the dumping platform. To make the compaction more efficient the proposed chain system Bulldozer has included under this sub-project.

Photo 4: Satellite image of landfill at Bliarpur (Aminbazar), Savar

Still now dumping process is crude here and no segregation is done from household to landfill but the construction process of sanitary landfill is under process. There is no human settlement is in and around that landfill. As the area is low land, total landfill has been separated by constructing raised mud made edge. This also reduces opportunity of direct contamination with nearby land or water.

Photo 5: Boundary of Aminbazar landfill



Landfill operating cost is as followings-

1.	Fuel cost for landfill equipment	50 Million Taka
2.	Equipment depreciation cost	10 Million Taka
3.	Outsourcing and infrastructure cost	30 Million Taka
4.	Staff salary	15 Million Taka
5.	Miscellaneous	10 Million Taka
6.	Total	115 Million Taka
7.	Waste handled	8,52,391 ton
8.	Landfill operating cost per ton	Taka 134.00

Waste transportation by DNCC and contractor’s vehicle are as followings-

1.	Petroleum, Oil, Lubricant	200 Million Taka

2.	Vehicle Maintenance Cost	45 Million Taka
3.	Driver’s and staff’s wages	55 Million Taka
4.	Vehicle depreciation cost	50 Million Taka
	Total:	350 Million Taka

Photo 6: Aminbazar landfill.

Aminbazar landfill site

Aminbazar landfill visited by DIUDP Consultants


Waste carrying and measured at Aminbazar landfill


Aminbazar landfill operation



Compaction of waste by chain dozer at Aminbazar landfill


Waste dressing at Aminbazar landfill


Development of sanitary landfill is on process at Aminbazar landfill

At the end of service life, the landfill will be covered hygienically and convert as sports complex which may take 30 years.

Photo 7: Sports complex, a plan for post closure use of landfill

(Source: DNCC waste report 2016-2017)

1. Key activities of sub-project

The general activity of sub-project includes purchase of equipment.

Following are the major activities to be carried out during the construction phase of road improvement

1. Purchasing of equipment
2. Train up on operation
3. Operation and maintenance

1. Potential benefit from sub-project

There are 300 KM VIP roads under DNCC which are needed to be cleaned by due time. It has been observed that manual cleaning is not satisfactory for the entire time. Monitoring of sweeping activity is also a difficult task when done manually. Road sweepers may not dump the waste at proper dumping site. On the other hand, manual sweeping of major roads are risky for the cleaners. Sometimes cleaners fall under fatal accident during sweeping. Existing road sweeping vehicle of DNCC sweep 15 KM roads per day and collected around 4 tons dust. So, road sweeper truck can reduce dust pollution and provide environment friendly road communication for citizen. On an average 3000-3200 tons waste is dumped every day from DNCC area to Aminbazar dumping site. Within four platforms of Aminbazar land only one is now using due to lack of chain system Bulldozer. So proper compaction and dressing of solid waste need to purchase more chain system Bulldozer.

2. Specification of proposed equipment

1. Road Sweeping truck

Technical Specification of Brand New, Latest Model Heavy Truck Mounted Vacuum Type Road Sweeper Machine with one year required consumables.

General:

Truck mounted and hydraulically operated Vacuum Cleaner with sweeping system is to be suitable for all cleaning, brushing and vacuuming of surface dusts, leaves, mud, soil, sand, stone chips, gravels and other small particles on the ground of city/ municipal roads and areas. This unit shall be suitable for street cleaning job as well as dust suppression with water spray in the road side and narrow lanes. A high pressure water system shall be used for removing & cleaning the stubborn road debris and the machine itself. The spray bar and sweep gear can be used together for high performance cleaning, particularly around building sites or on road laying operations etc. All the sweeping as well as cleaning system shall be control from within the cab. Noise sources shall be soundproofed to minimize disturbance making the machine particularly suited to urban use throughout the day and night.

All the components of the equipment shall be brand new and factory in build. The manufacturer and their authorized Assembly/Mounting factory shall be latest ISO 9001, ISO 14001 certified. The manufacturing year of the equipment shall be latest 2018 or onward. Reconditioned elements or components shall not be considered. The supplied equipment should be of UK/USA/Japan standard.

Any other distinctive feature not mentioned above, the tenderers are requested to elaborate in their offer and shall be supported by original catalogue.

a) Name of the Manufacturer: To be mentioned by the tenderer.
b) Brand of the Equipments: To be mentioned by the tenderer.
c) Model of the Equipments: To be mentioned by the tenderer.
d) Country of Origin of Sweeping Unit: UK/USA/JAPAN/EU Standard.
e) Country of Origin of Chassis: UK/USA/JAPAN/EU Standard.
f) Country of Assembly & Shipment: K/USA/Japan/Germany/France/EU/Thailand/Malaysia
g) Year of Manufacture: Not before 2018 or onward

Hydraulic Systems/Controls:

All sweeping operations are controlled from the master module inside the cabin. This incorporates an audible and visual raised hopper warning, equipment fuel gauge; auxiliary engine is infinitely variable ensuring optimum operational and fuel efficiency with no performance compromise. Exhauster fan will be driven from the auxiliary engine via step-up gear box and fluid flywheel coupling driven.All the components required for operation of the complete system are grouped and mounted at a convenient place, so that the entire control/operation of the system can be carried out from within the cab.The vacuum tank with all above vacuum and hydraulic system is to be mounted on a suitable Truck Chassis (with 2

people with driver) with hydraulic tipping/dumping to 50 degree (min.) at rear. All above arrangements must be suitable for vacuuming dust and dirt as mentioned above.

a) Type of Pump: To be mentioned by the bidder.
b) Hydraulic Steering Pump Type: To be mentioned by the bidder.
c) Hydraulic circuit diagram: To be submitted by the bidder.
Hydraulic System components shall be of reputed brand from USA/UK/JAPAN/EU Standard.
Brand Name: To be mentioned by the bidder
Manufacturing Country: To be mentioned by the bidder

Truck Chassis With Engine:
4x2, RHD with Forward control driver?s cabin for 02 person ; 2 front and 4 rear tire & 1 Spare.

Wheel Base: Min. 3700 mm
Overall Length: Min. 6300 mm
Ground Clearance: Min. 235 mm
Pay load: 5 ton to 6 ton
GVW: 13000-15000 Kg.
Turning radius: Max. 6.8 m

Engine: 6 Cylinder, in-line, Diesel operated Water cooled, Direct injection, Turbo intercooler.
Fuel System: Electronic Control. Common rail Type.
Combustion System: Direct Injection Type.
Piston Displacement: min. 7500 CC
Emission Standard: Min. EURO III
(Certificate in this regards from Engine Manufacturer or appropriate authority is to be submitted with bid) The power shall not be less than 175 KW @ rated rpm and it shall be enough to operate the truck and hydraulic system. For Sweeping and Vacuum System Power Must be come from a separate Auxiliary Engine.

Main Engine:
a) Power: Min. 175 KW (HP-235) @ speed not exceeding 2500 RPM (The Corresponding engine performance curve must be enclosed with the bid).
b) Torque: 700 N-m @ 1400-1500 RPM
c) Drive: 4x2, RHD (right hand drive)
d) Steering L Telescopic type recalculating ball with Hydraulic Booster.
e) Electrical system:
i) 12x2 Volts, 120 AH
ii) Alternator 24Volts, 60A
All external loom connections are full automotive IP67 rated or better.
f) Clutch: Single plate with cushioning springs, dry Friction. Hydraulic power assisted
g) Transmission: Minimum 6 forward & 1 reverse, Synchromesh.
h) Brakes:

i) Service Brake: Air Over Hydraulic, Dual circuit.
ii) Parking brake: Mechanical at rear transmission
iii) Auxiliary brake: Exhaust Brake

i) Suspension : Semi-elliptical alloy steel leaf spring
j) Fuel Tank Capacity: Main Vehicle: Min. 150 Ltrs. Sweeping System: Min. 120 Ltrs.
k) No. of Wheels: 7 (Front 2, Rear 4 & Spare 1)
l) Tire size: Min. 11.00-20-16 PR (Textile) suitable for off and on road use.

Auxiliary Engine:

Diesel engine, 4 strokes, 4 cylinder, in line, Liquid cooled and shall be suitable for smooth operation of the sweeping systems and others.
i) Power: Min. 80 KW (HP107) @ rated rpm Min. 2200
ii) Emission Level: Min. Tier 3 or Equivalent

Performance:

Broom sweeper type: Mechanical and vacuum technologies
Broom operation: Hydraulic motor
Channel Brush Dia : Min. 700 mm
Wide Sweep Brush Dia : Min. 400 mm
Brush speed: 0-200 rpm
Sweeping width: Min. 2400 mm
Suction Hose: Heavy duty, Flexible hose, and minimum 250 mm diameter.
Dumping Angle: Variable tilting to a min. of 50º
Discharge System: Two stage double acting ram
Monitoring System: Camera Monitoring

Water Sprinkler and dust suppression system:

Pressurized sprinkler system through nozzles at min. 0.5 bar. Dust spray bar pressure shall not be less than 3.5 bar. Super wash pressure min. 100 bar. The system shall be capable of operation as street washer as well as self-cleaning of the body.
Water Tank capacity: Min. 1500 liters.
Water Tank material: Heavy Duty Stainless steel.

Debris Hooper:

a) Volume: 5.5 m3- 6.5 m3
b) Material: Min 4003 Grade Stainless steel, with 5mm or more thickness.

Spare Parts:

a) The supplier should provide manufactures certificate stating that the spare parts will be made available for the period of next 10 years.
b) Renderer should have enough capability to undertake after sales services with documentary evidences and that would be taken into consideration during tender evaluation.

Safety System:

a) Back up alarm when the transmission is set in reverse, all sweep function shall stop & rise.
b) One top mounted LED warning lights shall be supplied with light protector, LED warning lights shall be provided at the rear of cab.
c) In cab noise min. <75 dB(A) generally (dependent on chassis selection)
d) Exterior noise/Sound power level LWA 110 dB(A) for standard power engines measured in accordance with EC directive 2000/14/EC. LWA 112 dB (A) for high power engines measured in accordance with EC directive 2000/14/EC.
e) Two flush mounted LED warning lights should be installed on tail gate/bumper bottom right and left corners.
f) Fluorescent marker should be placed across and around the truck to make is visible during night operation. Paint should be weather resistant

Following must be supplied with each Unit:

a) Original Operation/Owners manual, Original Brochure with the offer;
b) Manufacturers standard tools with equipment;
c) Drivers Manual (English)-one copy each with equipment; and
d) Workshop manual (English): one set original parts catalogue, repair manual one copy each with equipment.

Training & Other Services:

Training shall be imported by expert Technician or Engineer in Supplier?s/Local agent?s workshops or stockyards for at least two weeks for the following :
Operators-2 persons
Technicians-2 persons
Engineers -2 persons
For 2 (two) person nominated by the purchaser to be trained in the Manufacturer?s factory on the detailed operation, repair and maintenance for minimum of 10 (Ten) working days. The cost of this service shall not be paid as a separate item but be deemed to be included with the tender price.

Warranty: 1(one) Years

The Road Sweeper after sales service and Warranty period shall be for 1(one) Years.

2. Heavy Duty Swamp Track type Bull Dozer

Specification of Supply of Brand New Latest Model, Heavy Duty Swamp Track Type 1 (one) Nos. Bull Dozer having minimum 27 Tons operating weight.

General Purpose of Procurement: Supply of Brand New Latest Model, Swamp Track Type (LGP) 2(Two) Nos. Bull Dozer will be used for waste dressing as well as compaction purposes at Aminbazar landfill.

(1) General:

Supply of Brand New Latest Model, Heavy Duty Swamp Track Type 1(one) Nos. Bull Dozer having minimum 27 Tons operating weight.

All the components of the equipment shall be brand new, Unused and factory in-built. The manufacturer should have latest ISO 9001 & ISO 14001 certified. The manufacturing year of the equipment shall be latest 2018 or onward.

Any other distinctive feature not mentioned above, the tenderer are requested to elaborate in their offer and shall be supported by original catalogue.

Name of Manufacturer: To be mentioned
Name of the Equipment: To be mentioned
Brand of the Equipment: To be mentioned.
Country of Origin: To be mentioned.
Year of Production: 2018 or onward.

Operating Weight: Operating weight is 25 ton (includes lubricants, coolant, 100% fuel, hydraulic oil and operator).

General Dimension:

(a) Overall length: 5000- 6500 mm
(b) Width: 3500- 4500 mm
(c) Height (TOP of ROPS): 3400- 3800 mm
(d) Ground Clearance: Min 500 mm

Engine:

(a) Type: The engine is of diesel type, four stroke cycle, cylinders vertical in line, direct fuel system, water cooled direct injection.
(b) Make &Model: 2018 or onward.
(c) Rated Horse power: Engine shall be Horse Power 200 - 250 HP@Rated RPM.
(d) Displacements: 10.00-15 Ltr.
(e) Bore: 120 - 150 mm
(f) Stroke: 145-165 mm
(g) RPM: Manufacturer's standard.
(h) No. of Cylinder: 6 Cylinder

Transmission:

(a) Type: Planetary gear, multi disc clutch, hydraulically connected.
(b) Travel Speed: Shall provide at least three speeds forward and three speeds in reverse.

Monitoring System: Monitoring System Shall have

i. Fuel level gauge
ii. Hydraulic oil temperature gauge
iii. Engine coolant temperature gauge
iv. Engine oil level gauge
v. Hour meter

Undercarriage:
(a) Type: Heavy Duty Swamp Track Type
(b) Track Rollers: Min. 6(Six) nos. Track rollers each side & Min. 2(two) nos. Carrier roller each side.
(c) Length of Track (On Ground): 3000-3700 mm
(d) Width of track shoe: 900 – 965 mm

Hydraulics System:
i. Max. Pressure of relief valve is 20 mpa.
ii. Max. Pump output is 230 – 300 litre/min.

Dozer Blade:
(a) Type: Blade landfill with tilting
(b) Capacity: 10- 15 m3
(c) Blade Length: 4100 - 4500 mm
(d) Blade Height: 1300 - 1500 mm

Brake System: To be mentioned
Electrical System: 12X2 Volts

Lighting System: Min. 2 (Two) nos. at front side & Min. 2 (Two) nos. at rear side.
Cabin: Fully protected operators ROPS cabin for easy operation.

Standard accessories: Backup alarm, Horn (forward warning) adjustable seat, rear-view mirror, necessary indicators and gauges, seatbelt, wiper, etc.

Warranty: 1 (One) year

1. Training shall be imparted by expert Technician or Engineer in Supplier's/Local agent's workshops or stockyards for least one weeks for the following:
1. Operators- 2 persons
2. Technicians- 2 persons
3. Engineers- 2 persons
4. 2 (Two) Mechanical Engineers nominated by the procuring entity to be trained in the Manufacturer's factory on the detailed operation, repair and maintenance of the Heavy Duty Swamp Track Type Bull Dozer for 5 (five) days. The cost of this services shall not be paid as a separate item but be deemed to be included with the tender price.

5. PUBLIC CONSULTATION

Public consultation about the planning, design, implementation and operation is done at different stages following several participatory methods. The methods followed in public consultation are: (a) consultative meeting with different stakeholders, (b) focus group discussion with community people and (d) key informant interview with relevant persons of City Corporation and local elites.

Two consultation meetings were organized at Amin Bazar land field and Kawranbazar where local leaders, representative from elite community, household and local traders were present. The participants were briefly informed about the equipment and its activities. They were asked to share their opinion, feedback and suggestions on potential social and environmental impacts of the sub-projects as well as on the mitigation measures to avoid or reduce the potential impacts. All the participants provided their opinions spontaneously.

Photo 8: Community Consultation

Key findings of community consultation and FGD

Following recommendation and concerns have been raised by the participants-

1. All type of community people (pedestrians, officials, businessmen etc.) informed that the proposed equipment will be very helpful for city dweller;
2. Operation and maintenance should be done properly to enhance the longevity of proposed equipment;
3. The cleaners and operators should have proper safety tools to be protected from hazardous waste;
4. Hazardous waste should be segregated from source;
5. Aminbazar land field should avoid crude dumping;
6. Community people, school children should be aware on waste management system;
7. The construction work should be completed within the contract time frame.

8. BASELINE ANALYSIS OF ENVIRONMENTAL CONDITION

Part of the Dhaka is covered by Pleistocene Madhupur Clay and Holocene sediments of the Ganges- Brahmaputra floodplain. The Madhupur Clay is situated in north-west part and lies elongated from the middle of the north to south of the project area and these are oxidized Pleistocene sediments. In the east, south and western half of the Dhaka area are covered by the Ganges-Brahmaputra floodplain sediments. The area has been divided into 6 geological units and these are: i) Chandina Alluvium, ii) Alluvial Silt and Clay, iii) Alluvial Sand, iv) Alluvial Silt, v) Marsh Clay and Peat and vi) Madhupur Clay Residuum.

1. Physical/a biotic environment

1. Lithosphere

Soil characteristics:

Dhaka district conceives greater variety of soils than any other district of Bangladesh. The soils of the Dhaka area are described under the headings of the six major geomorphologic units within which the different parent material occur, viz.-i) Madhupur Tract, ii) Arial Beel, iii) Ganges floodplain, iv) Old Brahmaputra floodplain, v) Jamuna floodplain, and vi) Middle Meghna floodplain. There are three layers in most soils: topsoil, sub-soil and substratum. Topsoil is usually a ploughed layer 5 cm to 80 cm thick. The floodplain topsoil varies in thickness from 5 cm to about 15 cm. The subsoil is the layer undisturbed by tillage. In the floodplains it ranges from 15 cm to 45 cm. The topsoil grades uniformly into the substratum which may range from loose sand to Madhupur clay (Soils Resource Development Institute). Most parts of Dhaka City and surrounding area have already been occupied. As a result, the city is expanding on reclaimed sites. Most of these sites are developed by filling lowlands (3~12 m) using dredge materials.

Seismology

The National Seismic Zoning Map divides the country into three regions. The city of Dhaka falls within the medium-risk zone (zone 2). In the medium risk zone, shocks of moderate intensity are possible, with a probable maximum magnitude of 6-7 on the Richter scale. This map clarifies the seismological status of the various regions of the country. The earthquake risk factor for this zone 2 is 0.15, while the risk factors for zone 1 and zone 3 are 0.075 and 0.25 respectively. More than 20 large earthquakes have been recorded in and around Bangladesh over the last 130 years (MPO, 1987). A recent study by Comprehensive Disaster Management Program (CDMP) on the liquefaction susceptibility of Dhaka indicates that the city's eastern and south-western parts lie within the high to very high liquefaction susceptibility range. These parts are recently filled and developed marshy lands. Liquefaction is a physical process of ground failure that takes place during earthquake.

2. Hydrosphere

River water level

Dhaka is surrounded by tributaries and branches of the three major rivers. The urban district of Dhaka is delimited by Turag River, Buriganga River, etc. on the east, and Balu River, Situlakhya River, etc. on the west. Water levels in these rivers vary in sync with the water level in the major rivers, and rise as high as 5.0 to 6.0 m in an ordinary rainy season, but are about 1.0 to 2.0 m in the dry season.

Precipitation

Dhaka has yearly precipitation of 1,400 to 2,400 mm, 80% of which concentrated in the rainy season (June to September). Since the river water levels rise in the rainy season, an intense rainfall may easily cause flood damage due to drainage failure in the city of Dhaka.

Groundwater Table of Dhaka City

There are various reasons that are responsible for gradual declination of groundwater level in Dhaka city of which high groundwater withdrawal from the aquifer is the most crucial. In addition, rapid urbanization including construction of roads, buildings, other engineering structures, flood protection dams, and embankments are continuously hindering the natural groundwater recharges from rainfall and perennial water sources existing in and around the city (Rahman and Alam, 2005). A network of 22 lakes, canals, and small rivers facilitate the natural drainage for the floodwaters and groundwater recharge in this city. Illegal encroachment and disappearances of them also depreciated groundwater recharge over the last four decades. In Bangladesh, the depth of water tables varies from less than a meter to more than 30m. The shallowest water table occurs in the coastal region whereas the deepest water table occurs in the Barind Tract and Dhaka City (more than 30m from the ground surface) (Banglapedia, 2006). The depth to the water table moves seasonally with annual recharge and discharge conditions. The amount of seasonal fluctuation varies from less than a meter to more than 10m depending on the local hydro geological conditions, amount of groundwater abstraction and natural discharge of groundwater. In recent years, there is a declining trend in the water table due to larger amount of groundwater withdrawal. Some scientific studies on the groundwater of the city revealed that the aquifer piezometric level which is the natural water level of a confined aquifer of the city main aquifer, has gone down significantly in last few years due to over-withdrawal of groundwater (Akther, Ahmed and Rasheed, 2009).

Wetland

Dhaka city play important roles of flood control and environment protection, by performing various functions as listed below. However, wetlands have been in an irreversible course of disappearing in recent years, as poorly planned development projects are rampant, while relevant regulatory agencies remain poorly coordinated. Wetlands retention flood water mitigates the inundation damage by temporarily retaining the flood water coming from rivers. Rain water falling in Dhaka is stored in wetlands in the surrounding areas, while rain water falling in the urban district is discharged through drainage and khals into rivers.

3. Atmosphere

Ambient Air Quality

Like other major metropolises in developing countries, deterioration of air quality in the Dhaka area is a key environmental concern. The main air pollutants in Dhaka are Nitrogen Oxides (NOx), Sulfur Dioxide (SO2), Particulate Matter (PM), usually expressed as PM with diameter of 10 microns or smaller: PM10, or PM2.5 microns or smaller: PM2.5, Carbon Monoxide (CO), Ozone, and Lead. The motor vehicles and traditional brick kilns contribute predominantly tothe air pollution. The motor vehicles are major source of PM pollution that contributes to the risk of developing cardiovascular and respiratory diseases, as well as lung cancer. Most of the PM pollution comes from the diesel-run vehicles. Hundreds of brick kilns operate during the dry season from November to April in the low agricultural land surrounding Dhaka City and generate smoke dust including SO2, NOx and hydrocarbons that contribute to worsening the ambient air and damage of public health.

Table 6: National ambient air quality standards for Dhaka

Pollutant	Objective	Average
CO	10 mg/m^3 (9 ppm)	8 hours (a)
	40 mg/m^3 (35 ppm)	1 hours (a)
Pb	0.5 $\mu g/m^3$	Annual
NO_x	100 $\mu g/m^3$(0.053 ppm)	Annual
PM10	50 $\mu g/m^3$	Annual (b)
	150 $\mu g/m^3$	24 hours (c)
PM2.5	15 $\mu g/m^3$	Annual
	65 $\mu g/m^3$	24 hours
O_3	235 $\mu g/m^3$(0.12 ppm)	1 hour (d)
	157 $\mu g/m^3$(0.08 ppm)	8 hours
SO_2	80 $\mu g/m^3$(0.03 ppm)	Annual
	365 $\mu g/m^3$(0.14 ppm)	24 hours (a)

Note: NAASQ-National Ambient Air Quality Standards; DNA-Data not available; PM-Particulate matter.
(Source: Monthly air quality monitoring report, June 2018, CASE Project, DoE)

Table 7: Air quality status of selected points of Dhaka city

Parameter	Unit	NAAQS	Summary	Period	Location		
					SangshadBhaban, Sher-e-bangla Nagar (23.76N; 90.39E)	Farmgate (23.76N; 90.39E)	Darus-salam (23.78N; 90.36E)
SO_2-24 hours	ppb	140	Average	July 2018	DNA	DNA	DNA
			Max		DNA	DNA	DNA
			Min		DNA	DNA	DNA
			Average	2013	5.05	7.74	10.3
			Average	2014	4.93	6.44	9.95
			Average	2015	DNA	6.63	7.89
NO_x-24 hours	ppb	53 (annual)	Average	July 2018	DNA	DNA	5.34
			Max		DNA	DNA	9.37
			Min		DNA	DNA	1.33
			Average	2013	33.0	104	49.4
			Average	2014	33.5	153	45.4
			Average	2015	32.7	143	45.4
CO-1 hr	ppm	35	Average	July 2018	DNA	1.54	2.81
			Max		DNA	6.72	5.43
			Min		DNA	0.05	2.20
			Average	2013	1.09	1.15	2.62
			Average	2014	1.15	1.92	2.08
			Average	2015	0.68	2.66	1.96
O_3-1hr	ppb	120	Average	July 2018	DNA	5.59	1.78
			Max		DNA	23.8	8.05
			Min		DNA	0.08	0.51
			Average	2013	4.51	15.7	6.45
			Average	2014	2.50	6.98	5.63
			Average	2015	0.99	6.64	12.2
$PM_{2.5}$-24 hr	$\mu g/m^3$	65	Average		DNA	47.8	37.5

Parameter	Unit	NAAQS	Summary	Period	Location		
					SangshadBhaban, Sher-e-bangla Nagar (23.76N; 90.39E)	Farmgate (23.76N; 90.39E)	Darus-salam (23.78N; 90.36E)
			Max	July 2018	DNA	78.4	90.6
			Min		DNA	26.2	9.47
			Average	2013	81.6	85.7	90.2
			Average	2014	72.6	130	96.8
			Average	2015	78.0	78.3	88.4
PM10-24hr	$\mu g/m^3$	150	Average	July 2018	DNA	71.8	77.7
			Max		DNA	122	124
			Min		DNA	37.4	33.7
			Average	2013	148	123	156
			Average	2014	139	94.4	160
			Average	2015	131	152	162

(Source: Air quality monitoring report, CASE Project, DoE)

Noise Environment

Noise level of Dhaka City is now a major concern for the city people because it has exceeded the tolerance level. According to WHO survey at 45 locations of Dhaka City, most of the traffic points and many of the industrial, residential, commercial, silent and mixed areas are suffering noises exceeding the standard limits of Bangladesh due to vehicular horns and movement, loudspeakers from processions and meetings, high volume of audio players from roadside small business enterprises and others. Noise exposure is a threat to human health, especially for elderly people and children. On the other side, the traffic personnel, rickshaw pullers, open vehicle drivers, road side workers, small scale business enterprise workers etc. are exposed for long-term noise pollution which might cause severe mental and physical health problems. The examples of noise pollution in Dhaka city is presented at following tables.

Table 8: Noise standards of Bangladesh and WHO guideline

Category of areas	Bangladesh noise standards (equivalent sound level in dBA)		Guidelines for community noise (WHO, 1999)	
	Day (6:00-21:00)	Night (21:00-6.00)	Day (7:00-21:00)	Night (22:00-7.00)
Silent zone	45	35	-	-

Residential area	50	40	55	45
Mixed area	60	50	-	-
Commercial area	70	60	70	70
Industrial area	75	70	70	70

(Source: DHUTS. Phase-II, Environmental Assessment Study, November 2015)

Table 9: Result of noise pollution in selected areas of Dhaka city

Location	Noise level (Equivalent sound level in dBA)	
	Day (6.00-21.00)	Night (21.00-6.00)
Pallabi near to police station, Mirpur	83	78
South side of Farmgate on ground level, Farmgate	90	85
South side of Firmgate on foot over bridge (7m above ground), Farmgate	89	85
South side of Bangla Academy along Sir Sayed road	76	68
South side of Banga Bhaban along Folder street	91	89

(Source: DHUTS. Phase-II, Environmental Assessment Study, November 2015)

2. Biological/biotic environment

Ecosystems

The ecosystems of Bangladesh could be categorized into two major groups, i.e. (i) land based and (ii) aquatic. The land-based ecosystems include forest and hill ecosystems, agro-ecosystem and homestead ecosystem; while seasonal and perennial wetlands, rivers, lakes, coastal mangroves, coastal mudflats and chars, and marine ecosystem fall into the aquatic category. Each of the ecosystems has many sub-units with distinct characteristics as well.

Moist Deciduous Forest (Sal Forest), Agro-ecosystem, Homestead Ecosystem and Wetland Ecosystem are observed within Dhaka city.

Floral

The proposed sub-project is in a residential area and limited open spaces at surrounding area. This includes homesteads, roadside plantation, natural vegetation, fruit trees and ornamental

plants. Due to high price residential area, floral diversity is poor here. Still in Dhaka city, rich biodiversity is visible at botanical garden, Boldha garden.

Faunal

The presence of ammonia and other pollutants in the river water at unacceptable levels made them totally inhospitable for all the aquatic life. Meanwhile, according to Dhaka Water Supply and Sewerage Authority, at least 200 crore liters of untreated domestic sewage are dumped in the rivers every day. Besides, 120 tanneries illegally operating at Hazaribagh in the capital continue to pollute the Buriganga by dumping tones of untreated wastes every day. Wet land is limited in and around sub-project area. Still some minor and catfishes categories local and cultured fish are available during rainy season. Few rivers with law water flow are available surrounding Dhaka city. The Buriganga, the Turag, the Balu, the Shitalakkha are some of those. But due to water pollution, aqua species are not heavily available at those rivers. Birds like crow, sparrow etc. are available. The common types of reptiles are found in the area, water snake, house lizard, soft-shell, turtle etc.

9. ENVIRONMENTAL SCREENING

According to Environmental Management Framework (EMF) of Municipal Governance and Services Project (MGSP), all sub-projects are subject to an environmental screening before final selection. Environmental screening helps to get primary idea on sub-project, to reduce negative environmental impact and to enhance potential environmental impact. The environmental screening helps to assess the impact of ecological, physic-chemical and socio-economic environment of surrounding areas of sub-project named 'solid waste management'.

1. Potential environmental impact during construction phase

1. Ecological impacts

1.	Felling of trees	Significant □	Moderate □	Minor □	No. of trees
2.	Clearing of vegetation	Significant □	Moderate □	Minor □	
3.	Potential impact on species of aquatic (i.e., water) environment	Significant □	Moderate □	Minor □	

Proposed sub-project is procurement of equipments, so no ecological impact will be done.

1. Physic-chemical impacts

1.	Noise pollution	Significant □	Moderate □	Insignificant □
2.	Air pollution	Significant □	Moderate □	Insignificant □
3.	Drainage congestion	Very likely □	Likely □	Unlikely □
4.	Water pollution	Significant □	Moderate □	Insignificant □
5.	Pollution from solid/ construction waste	Significant □	Moderate □	Insignificant □
6.	Water logging	Significant □	Moderate □	Insignificant □

Proposed sub-project is procurement of equipments, so no physic-chemical impact will be done.

1. Socio-economic impact

1.	Traffic congestion	Very likely □	Likely □	Unlikely □
2.	Health and safety	Significant □	Moderate □	Insignificant □
3.	Impact on archaeological and historical	Significant □	Moderate □	Insignificant □
4.	Employment generation	Significant □	Moderate □	Insignificant □

Proposed sub-project is procurement of equipments, so no socio-economic impact will be done.

1. Potential environmental impact during operational phase

1. Ecological impacts

1.	Potential impact on species of aquatic (i.e., water) environment	Significant □	Moderate □	Minor □

Proposed sub-project is procurement of equipments, so no ecological impact will be done.

1. Physicochemical impacts

2.	Potential air quality and noise (especially for road)	Improvement □	No-improvement □	**Deterioration** √□
3.	Drainage congestion (especially for drain)	Improvement □	**Minor Improve**√□	No Impact □
4.	Risk of Water pollution (especially for storm drain and jetty)	Significant □	Moderate □	Minor □
5.	Pollution from solid waste (especially for SWM, and market)	**Improvement** √□	No-improvement □	Deterioration □

During operation, equipment will generate small scale air pollution from burning diesel and dust. To mitigate it, proper maintenance, using fine diesel and regular servicing is suggested. It will be operated during night.

As road sweeper will remove waste, possibility of drainage congestion from dust particulate materials will be reduced at minor level.

There is no risk of water pollution.

Road sweeper and chain dozer will reduce solid waste pollution by sweeping and compacting waste.

1. Socio-economic impacts

1.	Traffic (especially for road, bridge, box culvert, bus/truck terminal)	Improvement □	**No-improvement**√□	Adverse □
2.	Safety	**Improvement** √□	No-improvement □	Adverse □

3.	Employment generation	Significant	□	Moderate	□	**Minor**√	□

There will be no improvement of traffic due to purchase of equipment. The road sweeper has slight possibility to generate traffic congestion and to avoid it, the operation will be done during night time (from12 am to 6/7am for 5/6 days in a week which includes Friday and Saturday). Maintenance will be done on Wednesday and Thursday will be counted as weekend.

As the road sweeper will replace manual road sweeping, it will improve the safety status of cleaners. Approximately 2000 cleaners are working under DNCC at present.

Only 13 people will be employed for operation of equipments and on the other hand, road sweepers will reduce employment opportunity for manual cleaner.

1. Summary of possible environmental impacts of the schemes

The environmental assessment of sub-project named ‘solid waste management’ have been conducted and observed that there will be no significant adverse environmental impacts.

Sub-project specific activities are only procurement of two types of equipments which are road sweeper truck and chain system Bulldozer.

Regular maintenance and servicing of both road sweeper and chain system Bulldozer will reduce the possibility of air pollution that usually happen from vehicles.

It will reduce manual road sweeping along with the possibility of accident for cleaners specially for woman road cleaners.

There has possibility to increase traffic. To mitigate traffic congestion, road sweeper will work from 12 am to 6am.

Road sweeper will improve the possibility of drainage congestion by proper and regular cleaning of roadside.

Thirteen people will get opportunity to be employed for operation of proposed equipment. To reduce workplace hazard, all of them will get needed safety tools, like, hand gloves, torch, boot shoe, etc. People involved with road sweeper will work by rotation considering the odd timing of work (12am-6am).

Health issue is very limited here, still, the involved persons will be equipped by needed hand gloves, mask, boot shoe, torch, spectacles, and helmets. To address occupational health & safety, chain system Bulldozer having AC cabin will be purchased.

All potential environmental features have been closely observed and shared with local communities. After reviewing and analysis of all observations and findings, it has been assumed that the proposed sub-project will not create significant negative impact on ecological, physic-chemical aspect. Rather than, it will be helpful to enhance positive socio-economic impact during operation period by improving clean environment and reducing risk of road cleaners.

As assumed, some insignificant/minor adverse environmental impacts are subject to mitigation and would be addressed through proper mitigation and enhancement measures during the implementation period. Proper maintenance and servicing of equipment, providing safety tools to operators and roaster duty of operators will be limiting the health & safety of workers. Night shift of work has been prescribed to reduce possibility of traffic.

2. Category of sub-project

According to ECR 1997 : Green / Orange A / **Orange B** / Red / Not Listed
According to WB classification : **Category B** / Category C

3. Proposed mitigation measure

The impacts, which are likely to be occurred in different phases of the sub-project, are identified and evaluations of those impacts have been done along with possible mitigation/enhancing measures.

1. Potential impacts and mitigation measures at construction phase

The sub-project is only requirement of equipment there is no need for mitigation measures at construction phase. Still following mitigation measures will be undertaken during selection of equipment.

Work time hazard:
Operator for chain system Bulldozer will need to work within dumping waste at land filling site which is very crude area for stinky environment and excess hot weather. On the other hand, operators of road sweepers need to work at night shift.

Mitigation measure:
4. Work friendly road sweeper and chain system Bulldozer will be purchased which will have AC cabin for driver.

1. Potential impacts and mitigation measures at operation phase

Following mitigation measures will be undertaken during operation of equipment.

Occupational health and safety
Operation of equipment has opportunity of facing accident of operators/drivers during operation of equipment.

Mitigation measure:
1. Operators/drivers will use personal protective equipment (PPE) like, hand gloves, helmet, gum boots, raincoat, torch light, face mask, luminous jacket, specific dress with selected design and color, cap etc.

2. Operators/drivers will be oriented on health and safety by the suppliers.
3. Workers for road sweeping truck will work roaster basis considering the odd working time.
4. First aid box will be available at each road sweeper vehicle and at landfill site for any urgent need.

Air pollution

Equipment will use diesel as fuel. As usual, both road sweeper and chain system Bulldozer will emit air pollutant at local level.

Mitigation measure:

1. Regular and proper maintenance will be done to keep equipment fit for work.
2. Regular and proper servicing will be done as prescribed by producers.

Traffic congestion

There is possibility for traffic congestion for road sweeping truck.

Mitigation measure:

3. Road sweeping will be done during night time, 12am to 6am.

Noise pollution

As usual both road sweeping truck and chain system Bulldozer will generate limited noise at local level.

Mitigation measure:

1. Road sweeper will work during night time.
2. Road sweeper will use permeable horns only.

1. Overall comments

The proposed sub-project will not create significant negative impact on ecological, physic-chemical aspect during construction period but it will be helpful to enhance clean environment and reduce hazard of manual road sweeping.

Suggested minor adverse environmental impacts are subject to mitigation and will be addressed through proper mitigation and enhancement measures during the operation period.

3. ANALYSIS OF ALTERNATIVE

The analysis of alternatives is done to examine the proposed technology in terms of their potential environmental impacts and the feasibility of mitigating these impacts. It also states the basis for selecting this option for the component. The analysis of that alternative for the sub-project components have been carried out as a part of the feasibility study and have been taken forward.

As the sub-project is on procurement, analysis of alternative design and route are not applicable. Only compares is possible with existing technology.

1. Analysis of Alternative Technologies

One land sweeping truck and swan category chain system Bulldozer are performing as pilot basis. So, the technology is already been proven. On the other hand, to minimize occupational health and safety risks and for effective use of the human labors, it is always highly recommended to adapt mechanical system where as possible.

Analysis of road sweeping truck comparing the present manual sweeping system

Manual sweeping: At present, most of the roads/streets are under manual sweeping system. Manual sweeping is risky for busy roads. During FY 2012-13 to FY 2017-18, 26 accidents happened within which 7 cleaners were death, 8 cleaners lost working power and 11 cleaners injured badly.

Photo 3: Manual road sweeping
(photo credit: Ashik Mohammad)

Collected dust also has been dumped manually using hand cart. Proper sweeping is not possible for all the time. Need strong monitoring system for better performance.

Initial expenditure is less but considering risk factor, needed monitoring system; long term benefit is not higher.

Manual sweeping is possible for all kinds of roads and streets.

On the other hand, improper sweeping create drainage congestion and water logging during rainy season.

Road sweeping truck: Road sweeping truck is safe cleaning system.

Performance tracking is easier from KM measurement and volume of dust. It does not need separate dumping system because it directly goes to landfill.

Initial costing is higher but proper maintenance can reduce cost and ensure perfect sweeping.

Road sweeping truck can sweep only smooth roads and cannot work during rainy period.

Still in Bangladesh the necessary apparatus/accessories of road sweeping truck is not available. Thus need long term contract with suppliers.

Analysis of swan chain system Bulldozer compare to other chain system Bulldozer

Chain system Bulldozer works at Amin Bazar land field for dressing and compacting waste. Bangladesh weather is monsoon. Most of the time, dumped wastages are wetted at Aminbazar dumping site. Usual chain system Bulldozer can work only at corner part.

Swan chain system Bulldozer can go little bit of deeper site, can work like floating equipment within wetted waste, it is also elevated shaped and more suitable for compacting and dressing waste.

4. ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Environmental management plan (EMP) is to record environmental impacts resulting from the sub-project activities and to ensure implementation of the identified "mitigation measures", in order to reduce adverse impacts and enhance positive impacts. Besides, it would also address any unexpected or unforeseen environmental impacts that may arise during construction and operational phases of the sub-projects. EMP is needed to be taken during both construction and operation phases of a sub-project to eliminate or offset adverse environmental impacts, or reduce them to acceptable levels. It is an integrated part of the project planning and execution. It includes mitigation and enhancement measures, monitoring plan, grievance redress mechanism, estimation of cost of EMP and institutional arrangement for implementation of EMP.

1. Mitigation and enhancement measures, monitoring plan

Potential environmental impacts of sub-projects and corresponding mitigation and enhancement measures during construction and operation phase

Table 10: Table: Anticipated impacts and mitigation measures during procurement phase

Activity/issues	**Potential Impact**	**Proposed Mitigation and Enhancement Measure**	**Monitoring Method**	**Frequency of Monitoring**	**Responsible for Monitoring**	
					Implement	**Supervision**
Procurement of equipment	Work time hazard	Work friendly road sweeper and chain system Bulldozer will be purchased which will have AC cabin for driver.	Specification verify and observe manually	One time during purchase	Supplier	Primarily by PIU of DNCC. Secondarily by PMU of BMDF.

Table 11: Table: Anticipated impacts and mitigation measures during operation phase

Activity/issues	Potential Impact	Proposed Mitigation and Enhancement Measure	Responsible Parties
Regular operation of equipment	Occupational health and safety	5. Operators/drivers will use personal protective equipment (PPE) like, hand gloves, helmet, gum boots, raincoat, torch light, face mask, luminous jacket, specific dress with selected design and color, cap etc. 6. Operators/drivers will be oriented on health and safety by the suppliers. 7. Workers for road sweeper will work roaster basis considering the odd working time	PIU of DNCC.
	Air pollution	8. Regular and proper maintenance will be done to keep equipment fit for work. 9. Regular and proper servicing will be done as prescribed by producers.	PIU of DNCC.
	Traffic congestion	10. Road sweeping will be done during night time, 12am to 6am.	PIU of DNCC.
	Noise pollution	11. Road sweeper will work during night time. 12. Road sweeper will use permeable horns only.	PIU of DNCC.

Table 12: Table: Matrix table of monitoring plan (analytical monitoring during operation phase)

Monitoring issues/parameter	Monitoring method	Location of monitoring	Monitoring frequency
Noise level monitoring	Hearing observation	Sub-project site	Once during operation phase Reporting: once in a month
Ambient air quality	Visual black smoke	Sub-project site	Once during operation phase Reporting: once in a month
Traffic congestion	Visual observation	In and around sub-project site	Once during operation phase Reporting: once in a month

1. Grievance Redress Mechanism

The sub-project-specific Grievance Redress Mechanism (GRM) has been established by the PIU of DNCC to receive, evaluate, and facilitate the solution of affected people's (APs) concerns, complaints and grievances concerning the social and environmental performance of the sub-project with the aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns.

The grievance mechanism is related to resolve the risks and adverse impacts of the sub-project. It addresses APs concerns and complaints promptly, using an understandable and transparent process that is also gender responsive, and culturally appropriate. It is readily accessible to all segments of the affected people at no costs and without retribution. The mechanism should not impede access to the country's judicial or administrative remedies. The affected people will be appropriately informed about the mechanism.

BMDF has its own Grievance Redress Procedure (GRP) and they operate it to address any dissatisfaction and complaints by the local people regarding its activities. This procedure is being applied to address any complaints or grievances through negotiations with the community leaders and representatives of the APs during implementation of the MGSP.

2. Grievance Redress Committee (GRC)

DNCC has formed a Grievance Redress Committee (GRC) headed by the Chief Executive Officer (CEO). Considering the larger governor body, CEO is the Chairman and Project Director is the Member Secretary of GRC of DNCC**.** CEO nominated GRC members and included representative from the Government Agencies, local NGO, and Civil Society. The GRC nominates a focal person. Complaints will be received through drop box, by post, email and website of City Corporation. The grievance box will be set up at construction site to receive complaints. The grievance response focal point will be available at the DNCC for recording the complaints and necessary response to an aggrieved person. It will receive complaints or suggestions, and produce them to the GRC for hearing and resolution. If any complaint is not resolved at City Corporation level then the complaint will be produced to MD-BMDF. If it is not resolved by the MD-BMDF, then the sub-project will be dropped.

The structure of the GRC and membership are given as below:

Chairman : Chief Executive Officer of DNCC

Member-Secretary: Project Director, Dhaka Integrated Urban Development Project

Member : Representative from local administration

: Teacher from a local Educational Institution

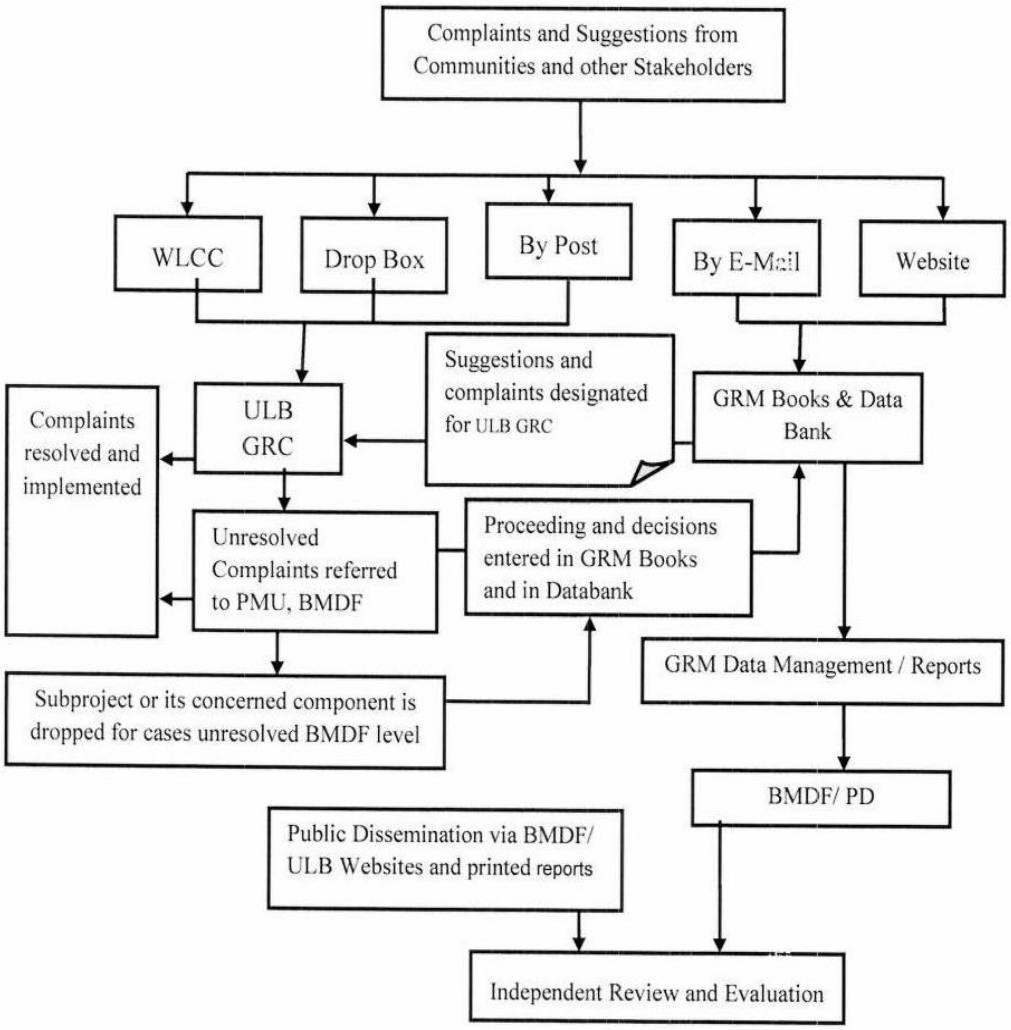
: Representative of a local NGO

: Representative of civil society

: Female ward councilor (of respective area)

It is to be noted that if the appellant is still not satisfied, he or she has the right to take the case to the public courts. The DNCC should also publish the outcome of the cases on the public notice boards. All costs involved in resolving the complaints (meetings, consultations, communication, and information dissemination) will be borne by the DNCC. The grievance resolution is a systematic process.

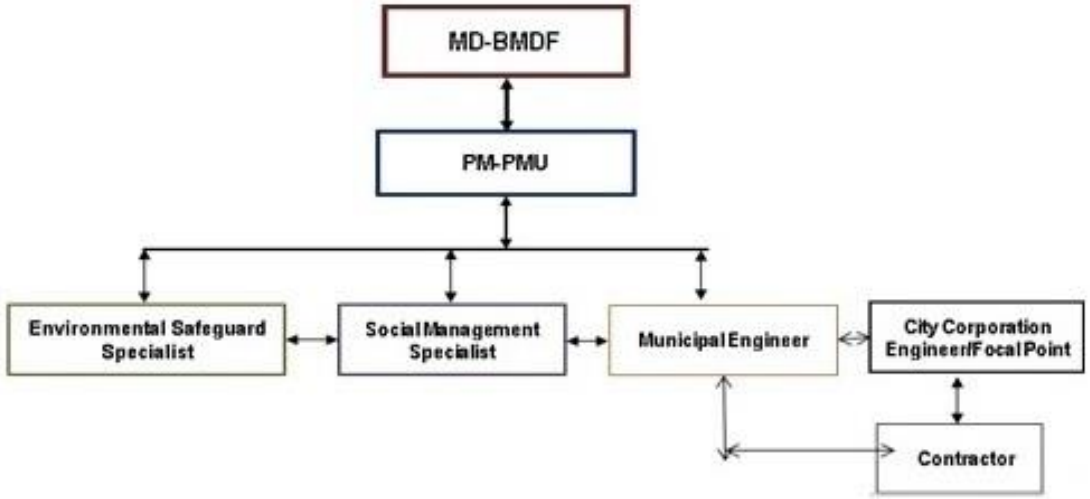
Diagram 4: Grievance Redress Process



3. Institutional Arrangement for the Safeguard Compliances

In the institutional arrangement procedure, Project Director and Project Manager are directly involved. Both the Director and Manager are supported by an environmental management specialist (as Environmental safeguards specialists) and social management specialist. The City Corporation Officials, especially members of PIU, is responsible for supporting the sub-project related activities as well as environment and social management with the facilitation of the PMU, BMDF consultants. The PMU (BMDF), with the facilitation of environment and social management specialist, will submit the monthly and quarterly progress reports on environmental and social compliances to the World Bank. A tentative Environmental and Social Management Team with specific roles has been formed for ensuring environmental safeguard in the overall subproject implementation.

Diagram 5: Institutional arrangement for Safeguards Compliances



4. Estimation of cost of EMP

The estimated cost for Environmental management plan as following table

Table 13: Cost of Environmental Mitigation and Enhancement Works

Item No.	Description of Activities	Approximate Costs (million)	Remark
1	First Aid box	1.70	Calculated for thirteen persons for three years.
2	PPE like, hand gloves, helmet, gum boots, raincoat, torch light, face mask, luminous jacket, specific dress with selected design and color, cap etc.		

5. Capacity building

The PIU has been oriented informally on EMF and assessment of sub-project component by the assigned environmental management specialist of DNCC. PIU of DNCC will be organized an orientation of operators/drivers, workers and other support staff on environmental safeguard issues and mitigation measures to be taken during operational phases before deploying to the work sites in order to achieve the expected standards.

6. Access to information and disclosure

The key parts of environmental safeguards assessment report should be translated into Bengali and disseminated locally. The copies of the report (both in English and Bengali) will be sent to all the concerned personnel responsible for sub-project implementation. It will also be made available to the public. The final assessment report (both English and Bangla) will also be uploaded in the Dhaka North City Corporation website, BMDF website and the World Bank website after approval. In addition, a signboard containing all information of the sub-project

will be displayed at the different places along the roads so that mass people can know about the sub-project.

13. RECOMMENDATION AND CONCLUSION

Recommendation:

Recommendations made for the sub-project development on the basis of EA study are as following

14. Proposed environment management plan should be implemented according to EA both during procurement and operation of the sub-project;
15. Need proper coordination between Waste Management Department and Traffic Circle Department of DNCC to ensure smooth roads to continue automatic sweeping by road seeping truck;
16. Need to change/repair existing road design of VIP roads to close feeder drainage system. Proper slopping can replace the feeder drain;
17. Proper operation and maintenance is essential for better performance of equipment;
18. After sell service and availability of accessories are essential for proposed equipments;
19. Environmental monitoring should be conducted as proposed in environment management plan.

Conclusion:

Environmental assessment is very important for any project for better implementation. The proposed sub-project will not create significant negative impact on ecological, physic-chemical aspect during construction/procurement period but it will be helpful to enhance positive socio-economic impact during operation period. Suggested minor adverse environmental impacts are subject to mitigation and will be addressed through proper mitigation and enhancement measures during the implementation period.

20. REFERANCES

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7. Dey A. R. N. Kabir and D Eftroymson; 2010; ‘Noise pollution in Dhaka: current situation and suggestions for action’.

8. Environmental Assessment Volume 2: Environmental Management Framework (EMF), September 2013. Municipal Governance and Services Project (MGSP), Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF), Ministry of Local Government, Rural Development and Cooperatives, Government of the People's Republic of Bangladesh.

9. The Project on The Revision and Updating of the Strategic Transport Plan for Dhaka (RSTP) Draft Final Report, November 2015, JICA

10. Monthly air quality monitoring report; June 2018; Clean Air Sustainable Project, DoE

11. APPENDIX

1. Appendix-1: Form-2 ENVIRONMENTAL SCREENING

Form-2 ENVIRONMENTAL SCREENING

Name of ULB: ----------

Name of Sub-project: ----------

1. Potential Environmental Impact during Construction Phase:

a)Ecological impacts:

1.	Felling of trees	Significant □	Moderate □	Minor □	Number of tress
2.	Clearing of vegetation	Significant □	Moderate □	Minor □	
3.	Potential impact on species of aquatic (i.e., water) environment	Significant □	Moderate □	Minor □	

(b) Physicochemical impacts:

4.	Noise pollution	Significant □	Moderate □	Insignificant □
5.	Air pollution	Significant □	Moderate □	Insignificant □
6.	Drainage congestion	Very likely □	Likely□	Unlikely □
7.	Water pollution	Significant □	Moderate □	Insignificant □
8.	Pollution from solid/ construction waste	Significant □	Moderate □	Insignificant □
9.	water logging	Significant □	Moderate □	Insignificant □

(c) Socio-economic impacts:

10.	Traffic congestion	Very likely □	Likely □	Unlikely □
11.	Health and safety	Significant □	Moderate □	Insignificant □
12.	Impact on archaeological and historical	Significant □	Moderate □	Insignificant □
13.	Employment generation	Significant □	Moderate □	Insignificant □

14. Potential Environmental Impact during Operational Phase:

(d) Ecological impacts:

15.	Potential impact on species of aquatic (i.e., water) environment	Significant □	Moderate □	Minor□

(e) Physicochemical impacts:

1.	Potential air quality and noise level (especially for road)	Improvement □	No-improvement □	Deterioration □
2.	Drainage congestion (especially for drain)	Improvement □	Minor Improve □	No Impact □
3.	Risk of Water pollution (especially for storm drain and jetty)	Significant □	Moderate □	Minor □
4.	Pollution from solid waste (especially for SWM, and market)	Improvement □	No-improvement □	Deterioration□

(f) Socio-economic impacts:

Traffic (especially for road, bridge, box culvert, bus/truck terminal)	Improvement □	No-improvement □	Adverse □
Safety	Improvement □	No-improvement □	Adverse □
Employment generation	Significant □	Moderate □	Minor□

5. Summary of Possible environmental impacts of the Schemes :

6. Category of Scheme : (follow Table 1 of EMF)

(a) According to ECR 1997 : Green / Orange A /Orange B / Red / Not Listed

(b) According to WB classification : Category B / Category C

7. Proposed mitigation measure (follow Table 9 of EMF as appropriate)

8. **Overall Comments**

9. Prepared by:

Signature with date:

Reviewed by:

Signature with date:

1. Appendix-2: Analysis of Alternatives

Form 3: Analysis of Alternatives

Name of ULB **: ----------**

1. **Name of sub-project:----------**

2. Brief description of sub-project:

1. Analysis of alternative roads:

2. Analysis of alternative designs:

(c) Analysis of alternative technologies/methods of construction:

(d) **No sub-project scenario:**

(c) **Conclusion:**

1. Appendix-3: Attendance sheet of screening

Name of Sub-Project : "Solid Waste Management"

Name of package : Procurement of Brand New latest model Truck Mounted Vacuum type road sweeper machine and Brand New latest model, swamp/Apex track type chain Dozer.

Package number : 01(One)

Name of ULB : Dhaka North City Corporation (DNCC), Name of District: Dhaka

Name of place : Landfill at Boliarpur (Amin Bazar), Savar Date: 19/07/2018

Level of participants : Local stakeholders, community members, ULB representatives

Attendance of local participants in Social /Environmental screening exercise

SL No.	Name	Gender	Social Status	Contact number	Signature
01	Md. Ekramul Haque Khandaker	Male	Assit. Engineer (Landfill Manager)	01711533576	[signature]
02	মো: আনোয়ার	"	হেলপার	01777682058	[signature]
03	মো: [illegible] কবির		ট্রাক হেলপার	01719623619	[signature]
04	[illegible]	[illegible]	[illegible]	01782220462	[signature]
05	মো: আবদুর রহিম [illegible]	Male	ড্রাইভার	01714-580664	[signature]
06	Md. Jobed	"	প্রধান [illegible]	01872556558	[signature]
07	Md. Mahfuzullah	"	Supervisor	0174-6853828	[signature]
08	Ruksana Begum	"	SDS, DIUDP DNCC	01711824537	[signature]
09	Farhana Shamim		Consultant DNCC	01715121652	[signature]
10					
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Nayeem 22/07/18

[signature] 26/07/18

Name of sub-project: Solid Waste Management

Name of package: Procurement of Brand New latest model truck mounted vacuum type road sweeper machine and brand new latest model swamp/apex track type chain dozer.

Package number: 01 (One)

Name of ULB: Dhaka North City Corporation; Name of district: Dhaka

Name of place: Farmgate Date: 23 July 2018

Level of participants:Local stakeholders, community members, CBO/WLCC representatives

Attendance of local participants in screening exercise

Sl no.	Name	Gender	Social Status	Contract number	Signature
1.	Robin choudhury	Male	Service	01730303389	Rahury
2.	Irin Ahmed	Female	House wife	01777658565	Irinahmed
3.	Munir Hossain	Male	Guard	01739418769	[illegible]
4.	Selim Mia	Male	Care taker	01688036310	[illegible]
5.	Alauddin Mia	Male	Security	01704484028	[illegible]
6.	Shawakat Ali	Male	Business	01673771050	Shawat
7.	Rasheda	Female	House maid	01742542295	[illegible]
8.	Hadish Mia	Male	Support service	01926718793	Hadish
9.	Raihan Reza	Male	Service	01718015133	[illegible]
10.	Farhana Sharmin	Female	Service DNCC	01715121652	F.Sharmin

Nayeem 23/7/18

মোঃ সাইদুর রহমান
নির্বাহী প্রকৌশলী (পুর)
ঢাকা উত্তর সিটি কর্পোরেশন

2. Appendix-4: Attendance sheet of consultation meeting

Name of Sub-Project : "Solid Waste Management"

Name of package : Procurement of Brand New Latest model Truck Mounted Vacuum type road Sweeper machine and Brand New Latest model Swamp/Apex track type chain Dozer.

Package number : 01(One)

Name of ULB : Dhaka North City Corporation (DNCC), Name of District: Dhaka

Name of place : Landfill at Boliarpur (Amin Bazar), Savar Date: 19/07/2018

Level of participants : Local stakeholders, community members, ULB representatives

Attendance of ~~local participants in Social /Environmental screening exercise~~ stakeholder's meeting

SL No.	Name	Gender	Social Status	Contact number	Signature
01	Md. Ewramul Haque Khandaker	Male	Asst. Engr. Landfill Monitg	01711533576	
02		"		01777688058	
03		"		01719623619	
04				01382220 -462	
05		"		01714-520664	
06	Md. Jabed	Male		01872556558	
07	MD. Mahfuzullah	"	Supervisor	01746853828	
08	Ruksana Begum	Female	SDS, DUDP DNCC	01711824537	RBegum
09	Farhana Sharmin	"	DNCC Consultant	01715121652	
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3. Appendix-5: Grievance Redress Committee

ঢাকা উত্তর সিটি কর্পোরেশন

নগর ভবন

গুলশান সেন্টার পয়েন্ট, প্লট নং-২৩-২৬, রোড-৪৬, গুলশান-২, ঢাকা।

উন্নয়নের গণতন্ত্র
শেখ হাসিনার মূলমন্ত্র

স্মারক নং-৪৬.১০.০০০০.০০৬.০৬.০০১.১৭- ৫৬৬

তারিখঃ ০৬/০৭/২০১৮ খ্রি.

অফিস আদেশ

বাংলাদেশ মিউনিসিপ্যাল ডেভেলপমেন্ট ফান্ড (বিএমডিএফ) এর অর্থায়নে Dhaka integrated urban development Project (DIUDP) এর আওতাধীন Development drainage Rehabilitaion and Communication Network System শীর্ষক উপপ্রকল্প বাস্তবায়নের নিমিত্তে নিম্নবর্ণিত কর্মকর্তাগণের সমন্বয়ে Grievance Redress Committee গঠন করা হলোঃ

১)	মোঃ মেসবাহুল ইসলাম প্রধান নির্বাহী কর্মকর্তা, ডিএনসিসি	আহ্বায়ক, গ্রিভেন্স রিড্রেস কমিটি
২)	মোহাম্মদ আরিফুর রহমান প্রকল্প পরিচালক, ঢাকা ইন্টিগ্রেটেড আরবান ডেভেলপমেন্ট প্রজেক্ট (ডিআইইউডিপি)	সদস্য সচিব, গ্রিভেন্স রিড্রেস কমিটি
৩)	মোহাম্মদ সাজিদ আনোয়ার নির্বাহী ম্যাজিস্ট্রেট, ডিএনসিসি	সদস্য, গ্রিভেন্স রিড্রেস কমিটি
৪)	মোঃ আসাদুজ্জামান সিনিয়র শিক্ষক, নওয়াব হাবিবুল্লাহ মডেল স্কুল এন্ড কলেজ	সদস্য, গ্রিভেন্স রিড্রেস কমিটি
৫)	লাল মনসুর রহমান (সুইট) এ্যাসিস্ট্যান্ট জেনারেল ম্যানেজার (এজিএম) রিসোর্স ইন্টিগ্রেশন সেন্টার, (আরআইসি)	সদস্য, গ্রিভেন্স রিড্রেস কমিটি
৬)	মাহবুবুর রহমান সহ সম্পাদক, উত্তরা ৩নং সেক্টর কল্যাণ সমিতি	সদস্য, গ্রিভেন্স রিড্রেস কমিটি
৭)	তসলিমা হোসাইন হুরী সদস্য, উত্তরা ৩নং সেক্টর কল্যাণ সমিতি	সদস্য, গ্রিভেন্স রিড্রেস কমিটি

কমিটির কর্মপরিধিঃ

ক) Grievance Redress Committee (GRC) এর মাধ্যমে স্থানীয় অধিবাসীগণ প্রকল্প চলাকালীন সময়ে এলাকাবাসীর মৌলিক অধিকার সংরক্ষণ ও উক্ত এলাকার জনসাধারনের স্বাভাবিক জীবনযাত্রার মান সংরক্ষন ও জনদুর্ভোগ লাঘবের বিষয়ে বিভিন্ন প্রস্তাবনা/অভিযোগ/পরামর্শ প্রদানের মাধ্যমে প্রকল্পে সক্রিয় অংশগ্রহন করবে।

খ) প্রস্তাবিত কমিটি আলোচ্য প্রকল্পটি বাস্তবায়নকালে Social and Environmental Impect এর উপর গুরুত্বারোপ করবে।

০২। যথাযথ কর্তৃপক্ষের অনুমোদনক্রমে এ আদেশ জারি করা হলো।

স্বাক্ষরিত/-
০৩/০৭/২০১৮ খ্রিঃ
(সুলাল কৃষ্ণ সাহা)
সচিব
ফোন-৮৮৩৪৯৩০
ফ্যাক্স-৮৮৩৪৯৮৩

বিতরণঃ গঠিত কমিটির আহবায়ক/সদস্য/সদস্য সচিব...।

স্মারক নং-৫৬.৯০.০০০০.০০৬.০৬.০০১.১৭ - ৫৬৬

তারিখ: ০৮/০৭/২০২৪ খ্রি.

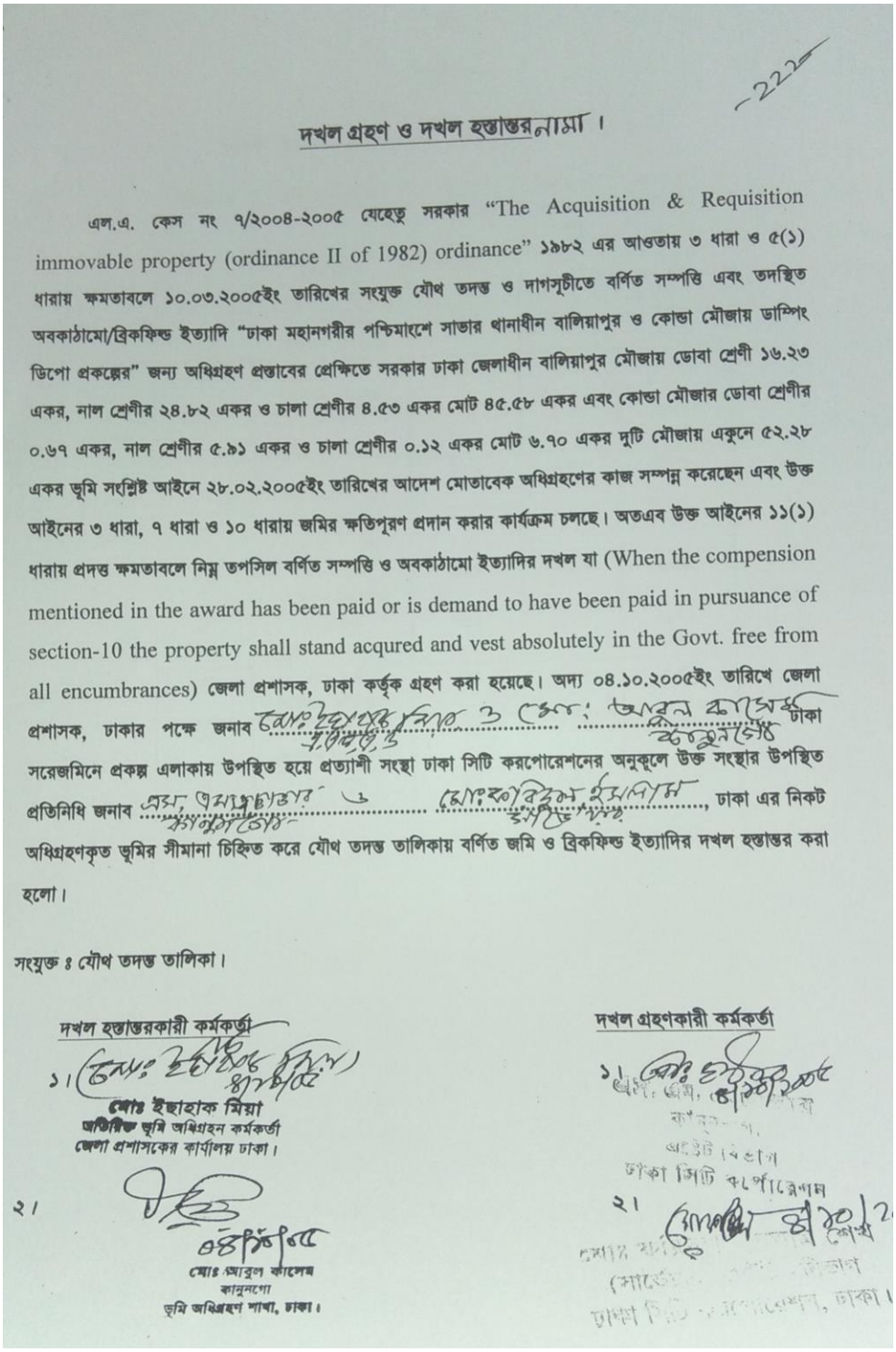
অবগতি ও প্রয়োজনীয় ব্যবস্থা গ্রহণের জন্য অনুলিপি প্রেরিত হলো (জ্যেষ্ঠতার ভিত্তিতে নয়):

১) বিভাগীয় প্রধান (সকল)..... ঢাকা উত্তর সিটি কর্পোরেশন।
২) প্রধান নির্বাহী কর্মকর্তার স্টাফ অফিসার, ঢাকা উত্তর সিটি কর্পোরেশন (প্রধান নির্বাহী কর্মকর্তা মহোদয়ের সদয় অবগতির জন্য)।
৩) মেয়র মহোদয়ের ব্যক্তিগত সহকারী, ঢাকা উত্তর সিটি কর্পোরেশন (প্যানেল মেয়র মহোদয়ের সদয় অবগতির জন্য)।
৪) সচিব মহোদয়ের ব্যক্তিগত সহকারী, ঢাকা উত্তর সিটি কর্পোরেশন (সচিব মহোদয়ের সদয় অবগতির জন্য)।
৫) অফিস কপি।

৮/৭/২৪

(মোঃ ইমান আলী)
সহকারী সচিব
সাধারন প্রশাসন শাখা
ঢাকা উত্তর সিটি কর্পোরেশন

4. Appendix-6: Land acquisition paper of Aminbazar landfill



দখল গ্রহণ ও দখল হস্তান্তরনামা।

এল.এ. কেস নং ৭/২০০৪-২০০৫ যেহেতু সরকার "The Acquisition & Requisition immovable property (ordinance II of 1982) ordinance" ১৯৮২ এর আওতায় ৩ ধারা ও ৫(১) ধারায় ক্ষমতাবলে ১০.০৩.২০০৫ইং তারিখের সংযুক্ত যৌথ তদন্ত ও দাগসূচীতে বর্ণিত সম্পত্তি এবং তদস্থিত অবকাঠামো/ব্রিকফিল্ড ইত্যাদি "ঢাকা মহানগরীর পশ্চিমাংশে সাভার থানাধীন বালিয়াপুর ও কোন্ডা মৌজায় ডাম্পিং ডিপো প্রকল্পের" জন্য অধিগ্রহণ প্রস্তাবের প্রেক্ষিতে সরকার ঢাকা জেলাধীন বালিয়াপুর মৌজায় ডোবা শ্রেণী ১৬.২৩ একর, নাল শ্রেণীর ২৪.৮২ একর ও চালা শ্রেণীর ৪.৫৩ একর মোট ৪৫.৫৮ একর এবং কোন্ডা মৌজার ডোবা শ্রেণীর ০.৬৭ একর, নাল শ্রেণীর ৫.৯১ একর ও চালা শ্রেণীর ০.১২ একর মোট ৬.৭০ একর দুটি মৌজায় একুনে ৫২.২৮ একর ভূমি সংশ্লিষ্ট আইনে ২৮.০২.২০০৫ইং তারিখের আদেশ মোতাবেক অধিগ্রহণের কাজ সম্পন্ন করেছেন এবং উক্ত আইনের ৩ ধারা, ৭ ধারা ও ১০ ধারায় জমির ক্ষতিপূরণ প্রদান করার কার্যক্রম চলছে। অতএব উক্ত আইনের ১১(১) ধারায় প্রদত্ত ক্ষমতাবলে নিম্ন তপসিল বর্ণিত সম্পত্তি ও অবকাঠামো ইত্যাদির দখল যা (When the compension mentioned in the award has been paid or is demand to have been paid in pursuance of section-10 the property shall stand acqured and vest absolutely in the Govt. free from all encumbrances) জেলা প্রশাসক, ঢাকা কর্তৃক গ্রহণ করা হয়েছে। অদ্য ০৪.১০.২০০৫ইং তারিখে জেলা প্রশাসক, ঢাকার পক্ষে জনাব ..... ঢাকা সরেজমিনে প্রকল্প এলাকায় উপস্থিত হয়ে প্রত্যাশী সংস্থা ঢাকা সিটি করপোরেশনের অনুকূলে উক্ত সংস্থার উপস্থিত প্রতিনিধি জনাব ..... ঢাকা এর নিকট অধিগ্রহণকৃত ভূমির সীমানা চিহ্নিত করে যৌথ তদন্ত তালিকায় বর্ণিত জমি ও ব্রিকফিল্ড ইত্যাদির দখল হস্তান্তর করা হলো।

সংযুক্ত ঃ যৌথ তদন্ত তালিকা।

দখল হস্তান্তরকারী কর্মকর্তা

১। মোঃ ইছাহাক মিয়া
অতিরিক্ত ভূমি অধিগ্রহন কর্মকর্তা
জেলা প্রশাসকের কার্যালয় ঢাকা।

২। মোঃ আবুল কাশেম
কানুনগো
ভূমি অধিগ্রহণ শাখা, ঢাকা।

দখল গ্রহণকারী কর্মকর্তা

১।

২।