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O.CREEDS

In cooperation with

A WASTE MANAGEMENT ANALYSIS IN NAWABGANJ, KERANIGANJ & DOHAR UPAZILAS AS PART OF A FEASIBILITY STUDY FOR A WASTE TO ENERGY POWER PLANT

APRIL 2024

FINAL REPORT

EXECUTIVE SUMMARY

Managing solid waste in densely populated countries poses challenges. To address this, many nations, both developing and developed, are adopting the 'Waste to Energy' approach, converting waste into energy resources. In Bangladesh, the 8th Five-Year Plan emphasizes executing power and energy projects effectively, focusing on diversifying primary fuel sources for electricity and prioritizing renewable energy to enhance security and reduce greenhouse gas emissions.

In Bangladesh, the local government has two main parts: urban authorities with 12 City Corporations and 328 municipalities, including Dohar Municipality, and a rural system with 64 Districts, 489 Upazilas, and 4562 Unions. Keraniganj Upazila has 12 Unions, and Nawabganj Upazila has 14 Unions.

Each Upazila has urban (city corporations or municipalities) and rural sections (Upazila Parishads and Union Parishads). Solid waste management is mostly handled in urban areas, while rural areas, specifically Union Parishads, lack adequate funds and infrastructure for proper waste management. The waste management practices are regulated by the Municipality Act of 2009 and the Upazila and Union Parishad Act of 2009 in the study areas.

The Bangladesh Power Development Board (BPDB) has been planning for the establishment of a waste-to-energy facility in the regions encompassing Keraniganj and Nawabganj Upazilas and Dohar Municipality, all located within the Dhaka District. To conduct the study, BPDB has entered into a collaborative partnership with GIZ Bangladesh, an organization based in Germany, to facilitate the necessary activities for the waste-to-energy plant within the aforementioned Upazilas. GIZ Bangladesh has appointed Onushandhani Creeds Ltd. (O. CREEDS) as a National Consulting Firm to conduct the detailed study and FICHTNER as an International Consulting Firm to develop a design of efficient technologies for waste-to-energy projects.

A comprehensive survey by O. CREEDS considered waste from various sectors, classifying it into organic and inorganic categories. The study included waste from households, industries, institutions, markets, hospitals, restaurants, and more. Focus Group Discussions (FGD) with waste collectors and evaluations of formal and informal dumpsites provided a nuanced understanding.

Dohar Municipality possesses waste management facilities, while Nawabganj Upazila lacks proper waste management. Keraniganj showcases a unique model with private sector cooperation. Challenges include narrow roads, slow waste collection using rickshaw vans, and the prevalence of illegal disposal sites. Regulatory failures and low environmental awareness contribute to the existence of these sites near water bodies and roadsides. The final disposal in Keraniganj, involving the mixing of waste with water bodies, raises ecological concerns. Land scarcity, driven by high property values near Dhaka, further complicates the situation.

Daily waste generation in the study areas totaled 628.29 MT (excluding industrial waste). Organic Matters dominate at 81.40%, while Plastic and Polythene follow at 9.27%, Textile at 2.80%, and Paper and Paper Products at 3.28%. Aluminum has negligible presence (0.00%), and the remaining categories contribute in the range of 0.05% to 1.19%. Currently, Dohar Municipality transports 26% of its generated 64.06 MT, Keraniganj Upazila transports 26% of its 353.53 MT,

while Nawabganj Upazila transports 0.6% of its 210.7 MT, resulting in a total of 110 MT being collected daily.

In line with the study methodology, O. Creeds Ltd gathered waste samples from dumping sites and secondary transfer stations in the study areas to analyze various parameters, including moisture, carbon, volatile components, ash, hydrogen, nitrogen, oxygen, chlorine, and gross calorific value. The laboratory tests were carried out at the Bangladesh University of Engineering and Technology. Laboratory results showed moisture content fluctuations from 87.5% to 59.70% in the wet season (October-November) and between 62.54% to 75.59% in the dry season (February). Similarly, the highest gross calorific value was 4304 kcal/kg in October, and the lowest was 2248 kcal/kg in November. During February's dry period, the average remained 3423 kcal/kg. Field visits and laboratory tests revealed minimal variation in moisture content between dry and wet seasons, indicating consistent waste composition and insignificant impact on collected waste weight despite logistical challenges during the rainy season.

FICHTNER's assessment indicates that 1 MW of power can be generated from 106 MT of waste daily. To achieve 2 to 3 MW, at least 300 MT of waste input is required. The proposed waste collection plan aims for 348 MT daily, distributing as 70% for Keraniganj Upazila, 20% for Nawabganj Upazila, and 90% for Dohar Municipality, involving additional vehicles and workforce expansion. The proposed number of vehicles required for the daily collection of 348 MT of waste is detailed in Chapter 7.

Consultations with private sectors, upazila parishad and municipal officials, coupled with an analysis of existing capacities, informed the proposed waste collection and transportation plan. It includes additional rickshaw vans and trucks for each area to achieve more effective waste collection rates. Finally, 39.9 MT of industrial waste is generated daily, with 31.72 MT of textile waste directed to the recycling market, and the remaining 8.18 MT is considered general waste, not included in the 628.89 MT figure.

After discussions in Keraniganj, Nawabganj, and Dohar, a proposal has emerged to establish a Waste-to-Energy (WtE) plant in the Suvaddya Union of Keraniganj. It is a 50-acre “Khas land” (owned by the government but currently used by the upazila parishad for various purposes). The selected site has electricity and road connectivity. There is a 12 ft wide road with brick soling. However, it is situated in a low-lying area. Thus, it requires road and land development.

As per Bangladesh's Solid Waste Management Rules 2021, waste-to-energy solutions take precedence in urban areas for effective solid waste management. Despite being designated as Upazilas, Keraniganj and Nawabganj exhibit urban characteristics due to their proximity to Dhaka South City Corporation, featuring numerous high-rise buildings. These areas, housing a substantial population connected to the capital city, warrant attention for enhanced waste management. Local governments have the opportunity to update policies to ensure comprehensive improvements in waste management practices.

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List of Abbreviations

BPDB	Bangladesh Power Development Board
DoE	Department of Environment
FGD	Focus Group Discussion
FYP	Five Years Plan
KII	Key Informant Interview
LGED	Local Government Engineering Department
LGIs	Local Government Institutes
Q&A	Questions & Answers
SWM	Solid Waste Management
WtE	Waste to Energy
BUET	Bangladesh University of Engineering and Technology

Chapter 1 : Background

1.1 Introduction of the Study

Bangladesh has now embarked on achieving a visionary goal of becoming a developed economy by 2041, and for which it has adopted the Perspective Plan 2041. For carrying out this Perspective Plan, energy has been playing a pivotal role in boosting economic growth, particularly during the rapid industrialization phase by expediting economic zones leading to quality job growth, as the country wants to move from middle-income to upper-middle income and developed stage.

The 8th Fiver Year Plan (2020-2025) of Bangladesh's Government focuses on the implementation of all power and energy projects so as to optimize achieving the goals of the Government's energy sector strategy, whose key element is the diversification of primary fuel for electricity generation with special focus in increasing renewable energy generation as part of energy security as well as greenhouse gas emission reduction.

After the formulation and start of implementation of the renewable energy policy from 2009 in Bangladesh, the government has taken initiatives to increase renewable energy in different ways such as solar, biogas and wind power, etc. However, in Bangladesh, there is an opportunity for waste to energy which will not only be renewable energy but in parallel will solve the crucial problem of solid waste in urban areas consequently to gain economic and environmental sustainability.

In this regard, the Bangladesh Power Development Board (BPDB) under the Ministry of Power, Energy and Mineral Resources has been planning to set up a waste-to-energy plant in the areas of Keraniganj, Nawabganj and Dohar Upazilas under Dhaka District, and has made a partnership with GIZ Bangladesh in this regard, a German-based organization to carry out the required tasks for waste to energy plant in the above proposed Upazilas.

For conducting an extensive feasibility study for the proposed waste-to-energy power plant utilizing the available waste of Nawabganj, Keraniganj and Dohar Upazilas, GIZ Bangladesh has engaged two consulting firms, O. Creeds Ltd as a national and FICHTNER as an international consulting firm. The two different consulting firms will carry out individual scopes of services, but both firms shall share their findings and data for the successful completion of the feasibility study.

Under this feasibility study, O. Creeds Ltd. will estimate the current total waste generation with its composition and prediction for future waste generation through survey, physical observation, focus group discussion, Key Informant Interviews, Laboratory tests, and analysis of these primary data for waste to energy. FICHTNER is an International Consulting Firm tasked to study suitable technologies for waste to energy considering the field data and information provided by O. Creeds Ltd.

1.2 Objective of the Study

The overall objective of the study is to conduct a feasibility study for waste to energy in Keraniganj, Nawabganj, and Dohar Upazilas under Dhaka District.

This feasibility study is to be conducted in two steps, one step is to collect required field data and information regarding waste generation, composition, transportation and dumping places, etc. and analyses its findings for waste to energy. Another step is based on these field data, information and findings, to review the feasibility of waste-to-energy technology for the proposed 3 Upazilas.

Assigned tasks of O. Creeds Ltd:

Under this feasibility study, O. Creeds Ltd is assigned to collect required field data and information regarding waste generation, composition, transportation, and dumping places and analysed its findings for waste to energy. These specific tasks are as follows-

a) Estimation of waste generation on a daily/monthly/annual basis

Waste has been generated at different places in 3 Upazilas, such as households, industries, kitchen markets, general markets, restaurants, hospitals and clinics, and institutions are to be estimated on a daily/monthly/annual basis.

b) Waste characterization/ composition for waste to energy:

Waste characterization is to be analysed to determine its physical and chemical properties, such as combustible & non-combustible ratio; organic content; moisture content; calorific value; recyclable content, etc. Assessing the potential economic value of different waste components, such as recyclables, organic waste for composting, or energy recovery through WtE technologies. Each of the optimum scopes from the waste will be defined for the maximum output of the project for waste to energy.

c) Analysis of existing waste collection and proposing an innovative system

Assessment of the current waste collection including waste generation from the entities, segregated waste ratio, waste collection methods, etc. are being conducted where strengths, weaknesses, and potential areas for improvement of the existing system can be identified.

d) Analysis of existing waste transportation system and proposal of an innovative system

The waste transport systems to carry out the wastes to the dumping sites and identify the detailed optimum way to convey them are being analyzed to propose an innovative system that may include efficient waste collection methods, optimized routes, use of technology, community involvement, etc., to enhance waste collection and transportation efficiency.

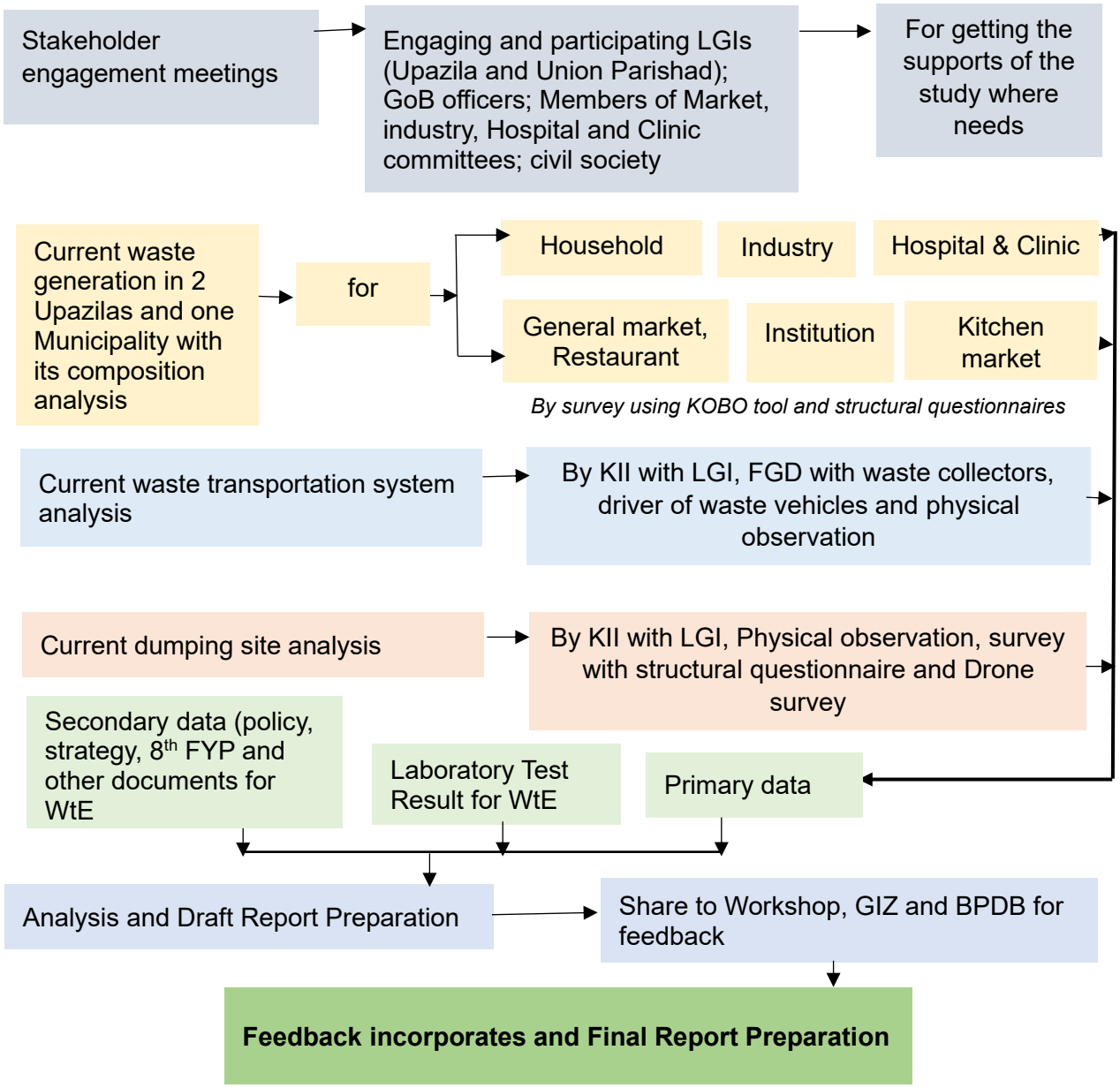
e) Evaluation of dumping sites

Drone technology has been applied by O. CREEDS Ltd. to identify the location and extent of major dumping sites in Nawabganj, Keraniganj, and Dohar. Then the sites were visited by an expert team. FGDs at the dumping site is to be conducted with workers engaged in waste collection, dumping, and sorting. In addition, collected information from Drone technology-based surveys, physical observation, and FGD are being analyzed critically with a view to evaluating the environmental and social safeguards issues at the current level and the scope of opportunity for the future.

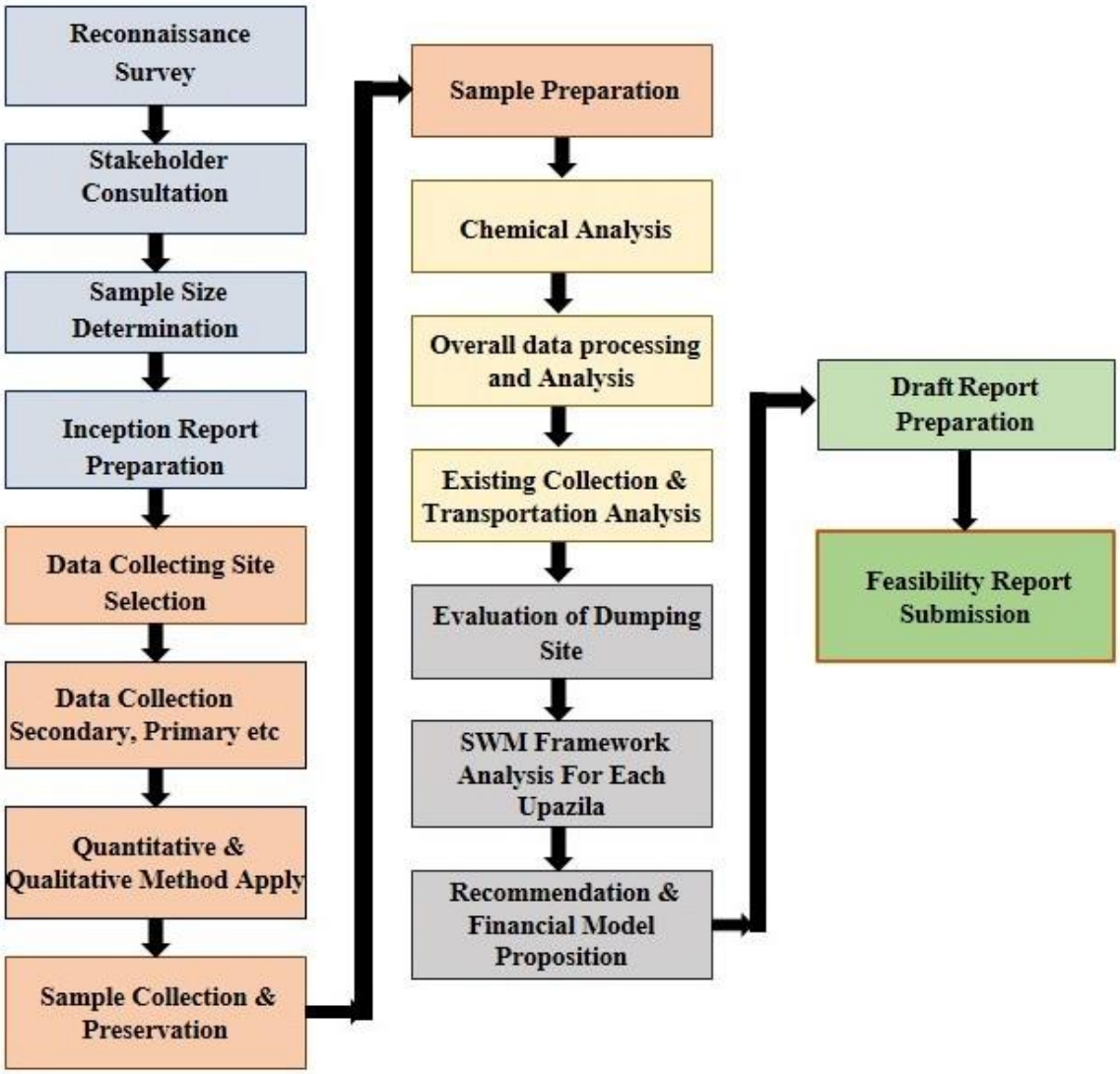
1.3 Methodology

For conducting the feasibility study, O. Creeds Ltd has been following the mixed-method approach where active participation in and response from different stakeholders is to be the prime consideration for carrying out the Survey, Focus Group Discussion, Key Informant Interview, Physical observation, and laboratory test aiming to collect the current information regarding Solid Waste Management (waste generation, transportation and dumping) and for waste to energy. By sharing the findings with each other among the stakeholders and incorporating the feedback, the final feasibility study report is to be prepared. The methodology of the feasibility study has been shown as follows.

Methodological Framework



Working procedures for this feasibility are shown below.



Quantitative and qualitative methods are to be applied during the feasibility study. The survey will be used as a technique of quantitative data collection for the study, and the sample size will be calculated depending on the number of households, industries, kitchen markets, general markets, restaurants, hospitals & clinics, and institutions accessible in the area as well as the categories. Triangulation is to be ensured during the survey to ensure the quality.

Qualitative data is also to be ensured by techniques such as key informant interviews, focus group discussions, physical observations, and laboratory test.

1.4 Work Programme

This work programme provides a structured approach for the waste management analysis, outlining key activities and engagement plans necessary for the successful execution of the feasibility study for a waste-to-energy plant. It will be continuously reviewed and updated to align with project progress and evolving requirements.

i) **Stakeholders Meeting on Inception Report** was held on 31 July 2023, 10;00 AM-12:30 PM (GMT+6) at GIZ, Dhaka project office. The overall objectives of this meeting were to, launch the project, introduce the team, and establish goals and scope.

- **Agenda:**
    - Project Overview and Objectives
    - Roles and Responsibilities
    - Project Timeline
    - Data Collection and Analysis Methods
    - Stakeholder Engagement Plan
    - Q&A Session

ii) **Regular Exchange Meetings** have been conducted bi-weekly in virtual or in-person meetings to provide progress updates, address challenges, and ensuring coordination.

- **Agenda:**
    - Progress Update
    - Data Collection and Analysis
    - Stakeholder Engagement Updates
    - Problem-solving and Coordination

iii) **Stakeholder Engagement Meetings** have been held in Keraniganj Upazila on Tuesday, 8 August 2023, 3:00 PM – 4:00 PM, in Dohar Upazila on Thursday, 10 August 2023, 10:30 AM – 11:30 AM and in Nawabganj Upazila on Wednesday, 16 August 2023, 3:00 PM – 4:00 PM. The overall objective was to gather insights on waste management challenges and opportunities in the study areas.

- **Agenda of Stakeholder Engagement Meeting in Keraniganj Upazila:**
    - Welcome and Introductions
    - Upazila Engineer’s Insights
    - Konda Union Chairman’s Observations
    - Input from the Garments Committee President
    - Q&A and Discussion

- **Agenda of Stakeholder Engagement Meeting in Dohar Upazila:**
    - Welcome and Introductions
    - Councilors' Insights
    - School Principal's Perspective
    - Joypara Market President's Input
    - Q&A and Discussion
- **Agenda of Stakeholder Engagement Meeting in Nawabganj Upazila:**
    - Welcome and Introductions
    - Upazila Chairman's Insights
    - Waste Management Expert's Presentation
    - Upazila Vice Chairman's Remarks
    - Q&A and Discussion

iv) Survey Outline

Household Survey has been conducted in Nawabganj Upazila from 20 August 2023 to 12 September 2023, in Dohar Municipality from 03 September 2023 to 11 September 2023, and in Keraniganj Upazila from 12 September 2023 to 28 September 2023. The overall objective of the household survey is to estimate the waste generation of the households of these two Upazilas and one municipality.

Industry Survey has been conducted from 13 September 2023 to 05 October 2023 to calculate the waste generation per day of total number of industries in Keraniganj Upazila, Nawabganj Upazila and Dohar Municipality.

Kitchen market survey was carried out between September 14 and September 29, 2023, to determine how much waste was produced everyday by all the kitchen markets in Keraniganj Upazila, Nawabganj Upazila, and Dohar Municipality.

A survey on the waste generation per day by the total number of general markets was conducted on September 05, 2023 in Keraniganj Upazila, Nawabganj Upazila, and Dohar Municipality.

Another survey of institutions was conducted from September 29 to October 5, 2023, to determine how much waste was produced everyday by all the institutions in Keraniganj Upazila, Nawabganj Upazila, and Dohar Municipality. Institutions include organizations like government offices, schools, cattle farms, poultry farms, and agricultural and farming organizations.

A survey on the waste generation per day by the total number of restaurants was conducted from October 05 to October 10, 2023 in Keraniganj Upazila, Nawabganj Upazila, and Dohar Municipality.

Additionally, survey of hospitals/clinics was carried out between September 13 and September 20, 2023 to calculate the waste generation per day of total number of hospitals, clinics and diagnostic centers in Keraniganj Upazila, Nawabganj Upazila, and Dohar Municipality.

v) Focus Group Discussion (FGD)

Focus group discussion has been conducted with the waste collectors to estimate the waste collection the transportation from different sectors in the Keraniganj Upazila, Nawabganj Upazila and Dohar Municipality on 30 September and 03-04 October, 2023.

vi) Key Informant Interview (KII)

Key informant interviews were conducted with Conservancy Officer of Dohar Municipality, and Upazila Engineer, Nawabganj Upazila on 07 September 2023, Executive Engineer of Dohar Municipality on 10 September 2023 and Upazila Engineer of Keraniganj Upazila on 11 September 2023 to validate the field data and to understand the involvement of Upazila Parishad and Municipality in the current scenario of SWM approach.

vii) **Drone Survey** has been conducted using high-resolution drone cameras to assess dumpsites' locations, conditions, and interactions with the environment in Nawabganj, Keraniganj, and Dohar Upazilas.

viii) **Engagement of the Expert Team** has visited the three Upazilas during surveys and their own inspections to ensure data quality and integrity through a team of experts involved in data collection and analysis. They are continuously conducting regular meetings to review and improve survey processes and share their valuable suggestion in the report.

ix) **Waste Collection and Transportation System Evaluation** has been completed by doing focus group discussions (FGD) with waste collectors to assess the waste collection and transportation system in the three Upazilas.

Chapter 2 : Baseline Information of The Studied Areas

2.1 Generic Information of the studied places

Figure 2-1: Map of Study Area

The feasibility study for waste to energy in Keraniganj, Nawabganj and Dohar Upazilas are situated in Dhaka District has been shown in the above Map.

Keraniganj Upazila:

Keraniganj is an Upazila in Dhaka District. On the Buriganga river's bank, the town of Keraniganj is located on the southwest side of Dhaka City. With a total area of 166.87 km2, Keraniganj Upazila is bordered to the northeast by Savar Upazila and Mohammadpur, to the east by Shyampur Thana and Narayanganj and Sadar Upazilas, to the east by Serajdikhan Upazila, and to the west by Nawabganj and Singair Upazilas. The Buriganga and Dhaleshwari rivers are the main rivers (Source: Wikipedia).

Based on this population, the population for 2023 and projected for 2024 to 2036 for three Upazilas have been calculated by using the following formula:

$$P_t = P_O\ (1 + r)\ ^n$$

Where,

P_t = Projected Population
P_0 = Base Year Population
r = Growth Rate, 1.1%
n = Number of Periods

According to the 2011 Population Census, there are 794360 people living in this Upazila. The population forecast for 2023 is shown below using a projected growth rate of 1.1%:

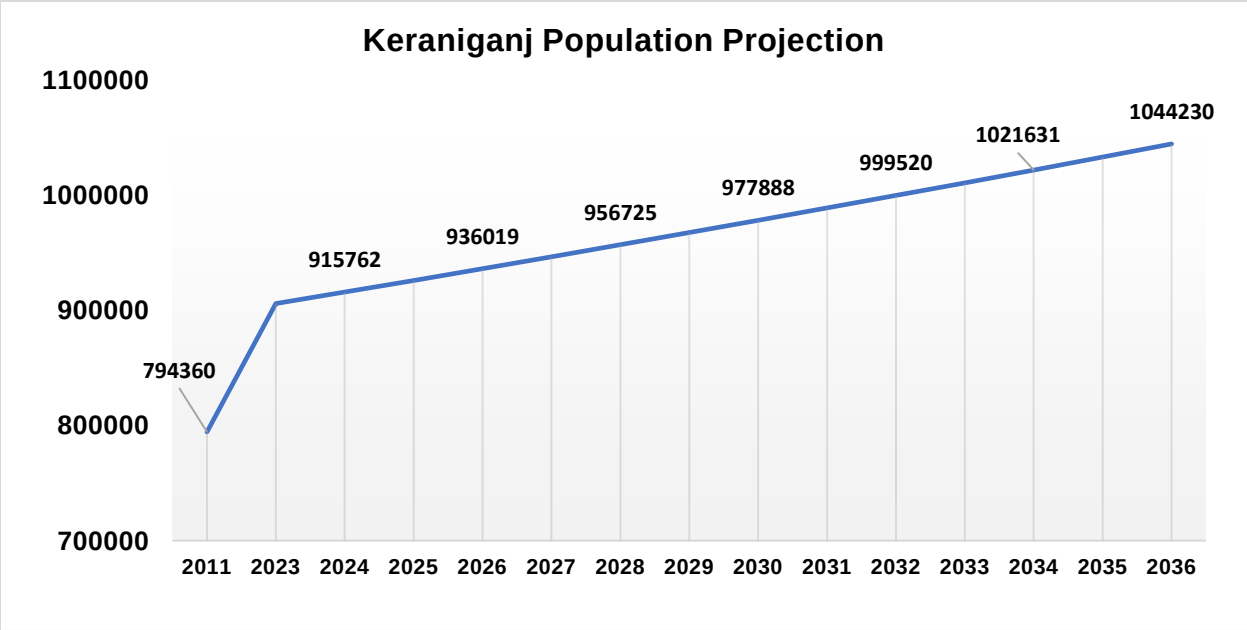


Figure 2-2: Population Projection for Keraniganj Upazila

Nawabganj Upazila:

Nawabganj is an Upazila in the Dhaka district. It is situated at 23.6667°N 90.1667°E. With a total area of 244.81 km2, it contains 47,411 households. Nawabganj is bounded by the three Upazilas of Singair on the north, Dohar on the south, Keraniganj, Sirajdikhan, and Sreenagar on the east, and Harirampur and Manikganj Sadar on the west (Source: Wikipedia).

According to the Population Census 2011, 320822 people live in this Upazila. Using the projected growth rate of 1.1% for 2023, the population projection is shown below:

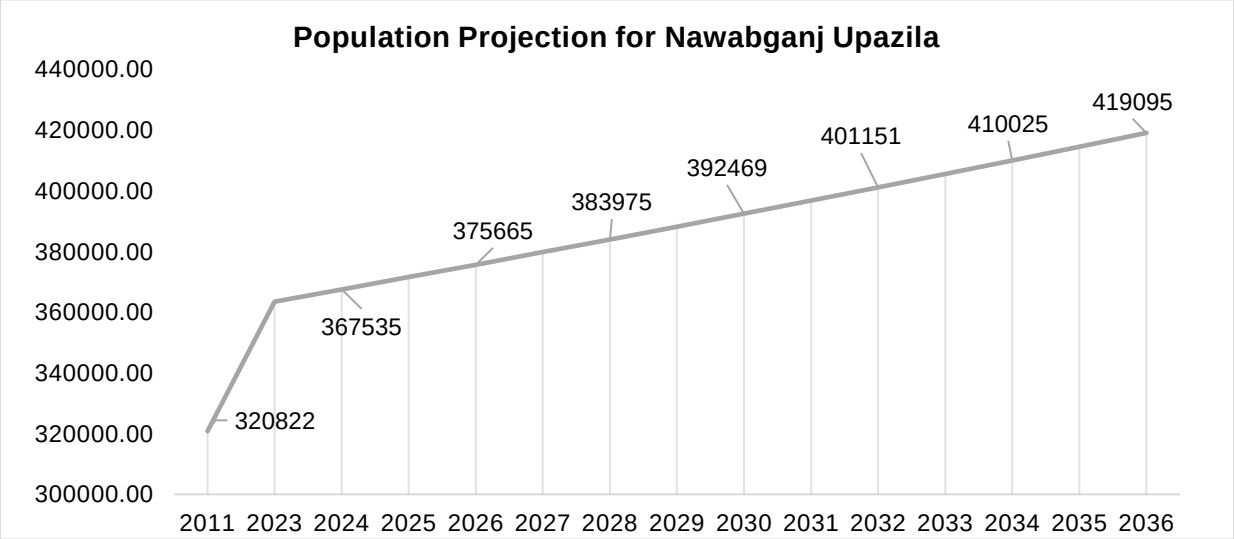


Figure 2-3: Population Projection for Nawabganj Upazila

Dohar Municipality:

Dohar Municipality is in Dohar Upazila, which is situated in Dhaka District at 23.5958°N 90.1222°E. The Upazila is located at the farthest southern region of Dhaka District. The Upazila's southern border is formed by the Padma River. Dohar is an Upazila in the Dhaka district. Contains 31,645 households. Dohar Municipality whose population is 71365, according to the 2011 Population Census. The population prediction for 2023 is depicted below using the assumed growth rate of 1.1%:

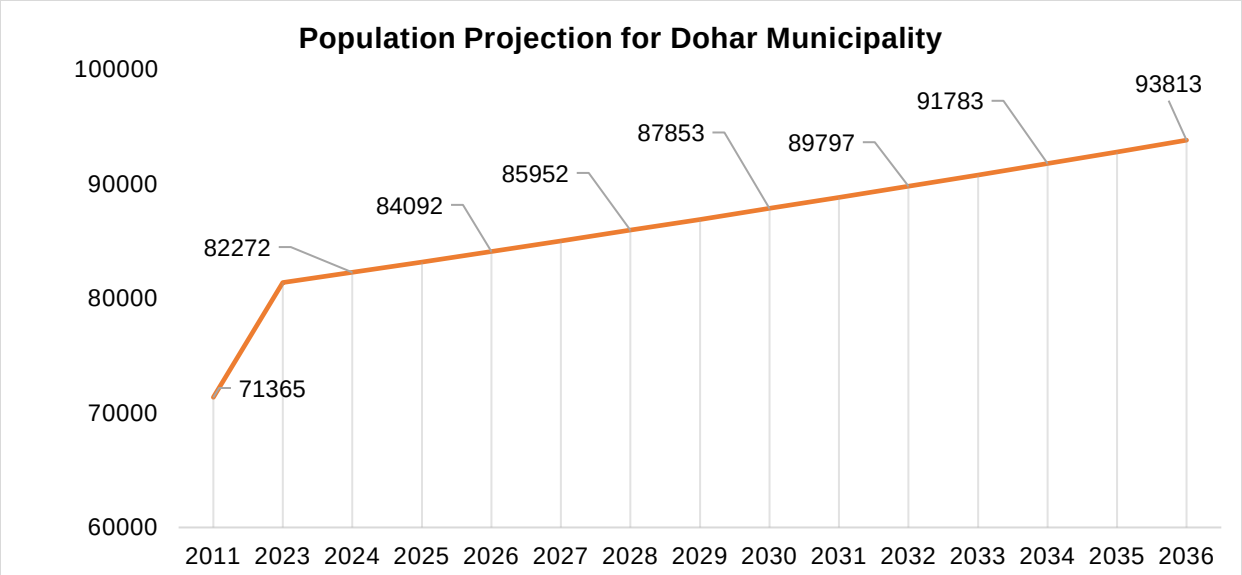


Figure 2-4: Population Projection for Dohar Municipality

The population for the census 2011 of the study area has been reflected in the following Map for the understanding of the population and its location.

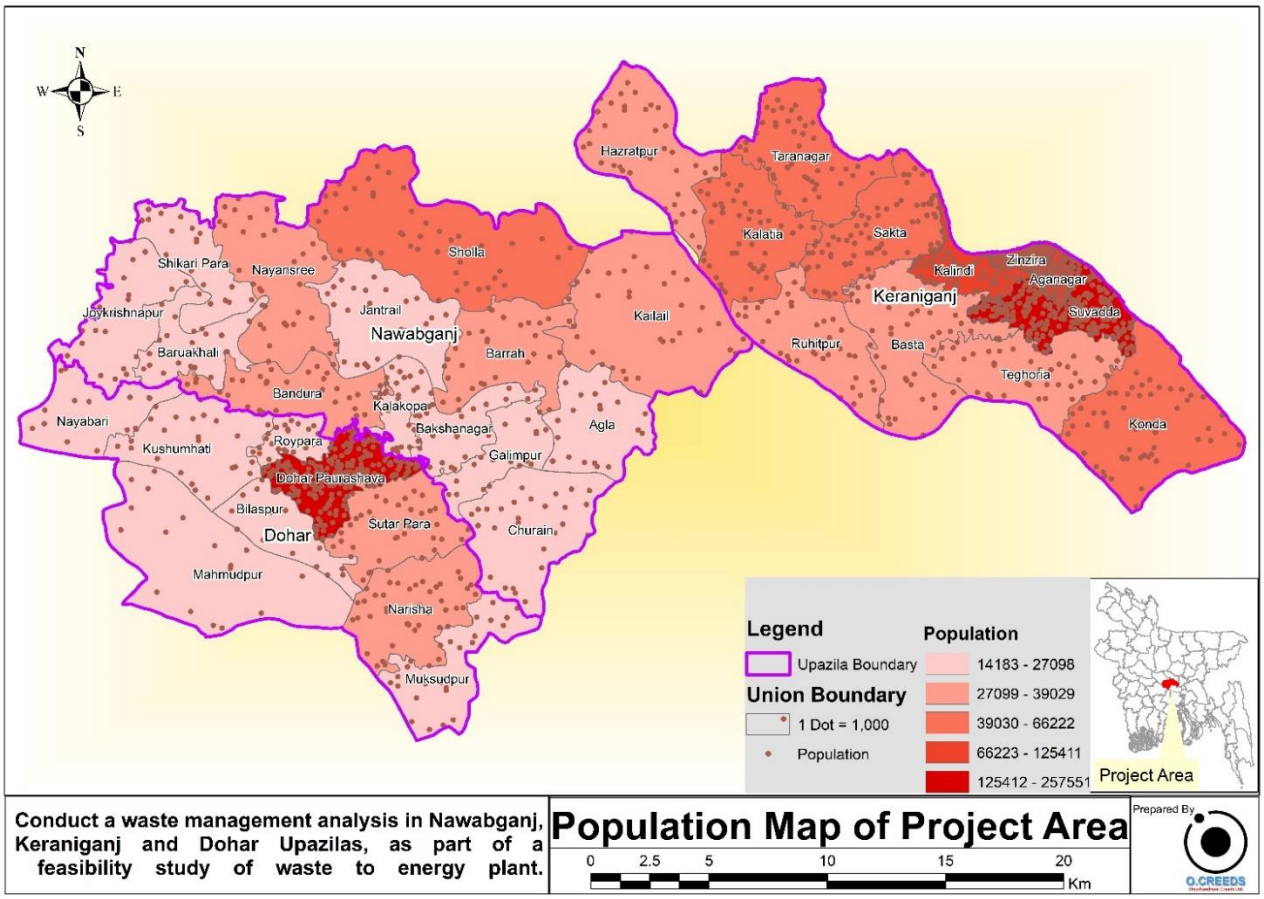


Figure 2-5: Population Map of Project Area

Rainfall of the study area:

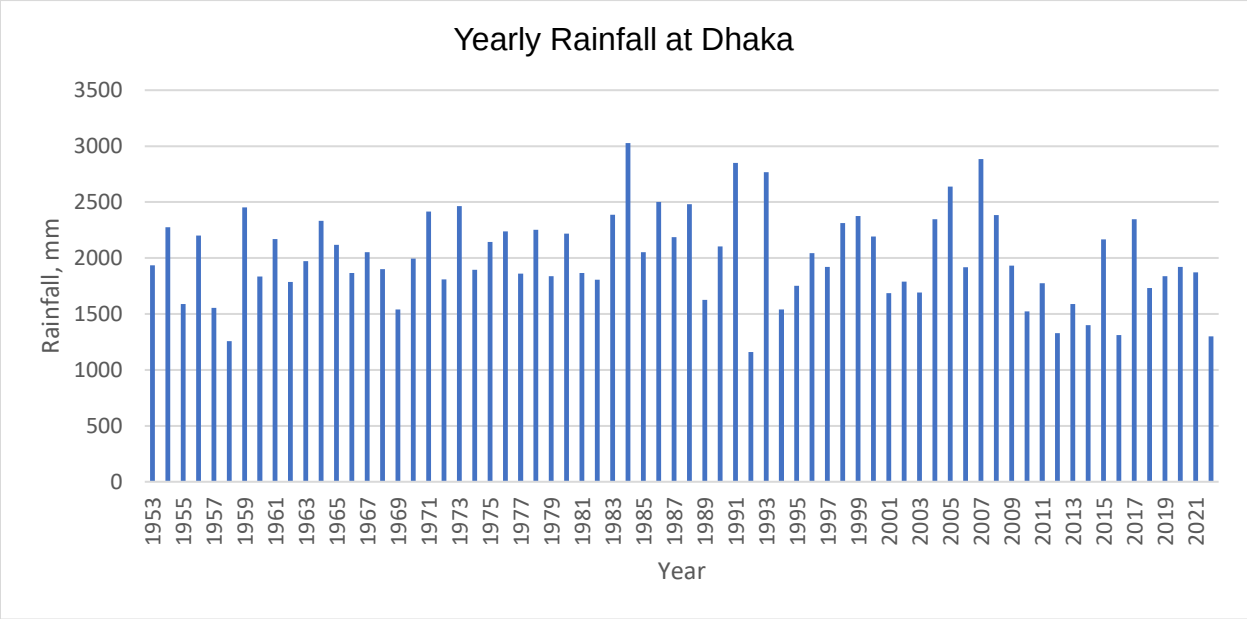


Figure 2-6: Yearly Rainfall at Dhaka

The project area is located in Dhaka District and we collected rainfall data of 1953 to 2021 from Bangladesh Agriculture Research Council (BARC). Rainfall data was collected from rainfall station (ID 11111), Dhaka. In Dhaka district, the average yearly rainfall is fluctuated but average rainfall is 1800 to 2000 millimeters.

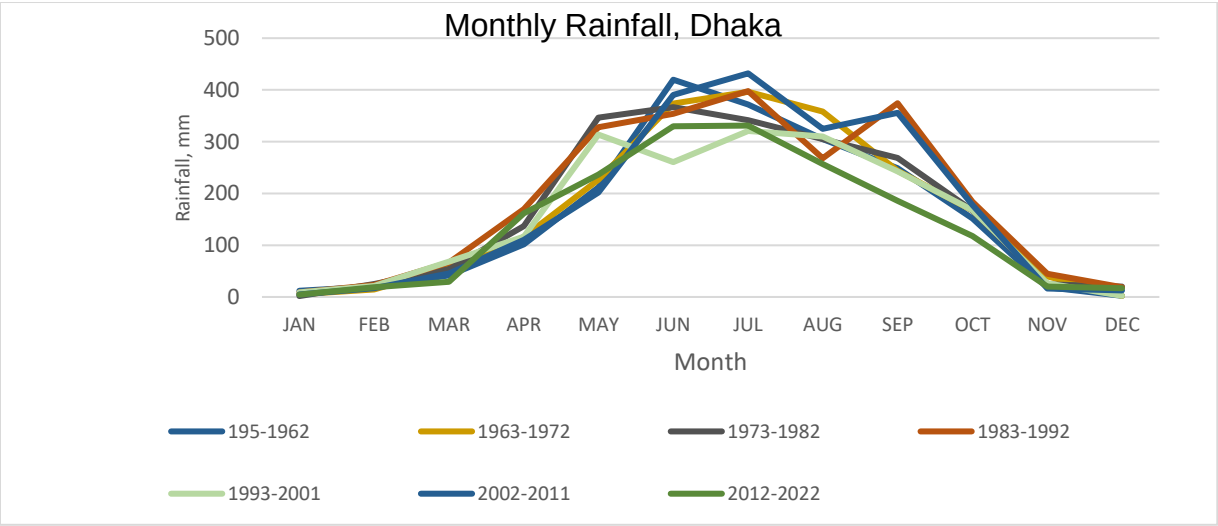


Figure 2-7:Rainfall Distribution, Yearly and Monthly

Rainfall in Dhaka district in general starts from March and continuing up to November. Maximum rainfall has been happening from June to September where mid-June to mid-July is highest rainfall, above 300 mm in a month.

2.2 Current scenario of the waste management system

2.2.1 Estimation of waste generation

a) Household Waste Generation and its Physical Composition

The household survey was performed from 20 August 2023 to 27 September 2023. In two Upazilas, Keraniganj, Nawabganj, and one Municipality Dohar municipality, 1800 households were assessed during that period.

The sample size of Households was determined by the Cochran formula, and it was 1144.79 samples.

$$n_0 = \frac{Z^2 pq}{e^2} \qquad n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Where:

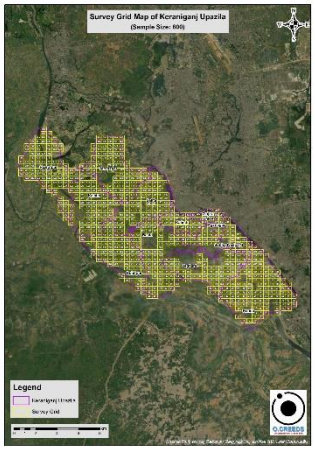
- n is the sample number
- e is the desired level of precision (i.e. the margin of error),
- p is the (estimated) proportion of the population which has the attribute in question,
- q is 1 – p. The z-value is found in a Z table

For more accuracy, the sample size of Households is determined, in the following table

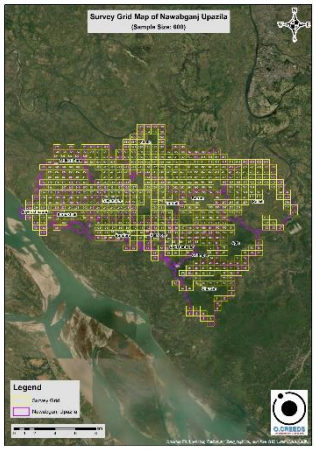
Upazila/municipality	Total Population, 2023	Calculated Sample Size	Finalized Sample Size
Dohar Municipality	82,272	384	400
Keraniganj Upazila	9,15,762	385	800
Nawabganj Upazila	3,67,535	384	600
Total		1153	1800

Table 2-1: Estimated sample size

Though we need 1153 sample size, but based on population size, we finalized sample 400 for Dohar municipality, 800 for Keraniganj and 600 for Nawabganj for more accuracy. The sample was distributed equally and focused on all areas properly under a Grid Map, below



Keraniganj Upazila



Nawabganj Upazila

Dohar Municipality

In order to collect one day's worth of total solid waste with composition, polybags were provided to households. Additionally, the household questionnaire was completed with the help of the respondents, mostly the house owners. Every household's days' worth of waste was collected throughout the study. The survey team weighed the waste once it had been collected, and then entered the results in the KOBO survey form. The average waste generation rate has been determined and multiplied by the total population for two Upazilas and one Municipality after the household waste volume and percentage of composition have been obtained.

i) Household waste generation rate with composition for Keraniganj Upazila

According to the 814 Households survey using Polythene bags, the average composition of waste is shown below in the table. The waste generation rate is 0.310 kg/person/day, where the average family size is 4.5 members According to the 2011 Census, Keraniganj has 794360 people which has been projected 905798 populations for 2023 according to the Figure 2-2.

Type of waste	Percentage
Organic	88%
Plastic	6.3%
Paper	2.5%
Medical	0.8%
Glass	0.5%
Textile	0.4%
Electronic	0.3%
Wood	0.2%
Metal	0.2%
Others	0.8%
Total	100%

Everyday Waste generation = 0.310 kg/person/day x total population

ii) Household waste generation rate with composition for Nawabganj Upazila

Type of waste	Percentage
Organic	89%
Plastic	5.3%
Paper	2.6%
Medical	0.8%
Glass	0.5%
Textile	0.4%
Electronic	0.3%
Wood	0.2%
Metal	0.1%
Others	0.8%
Total	100%

The waste generation rate is 0.226 kg/person/day

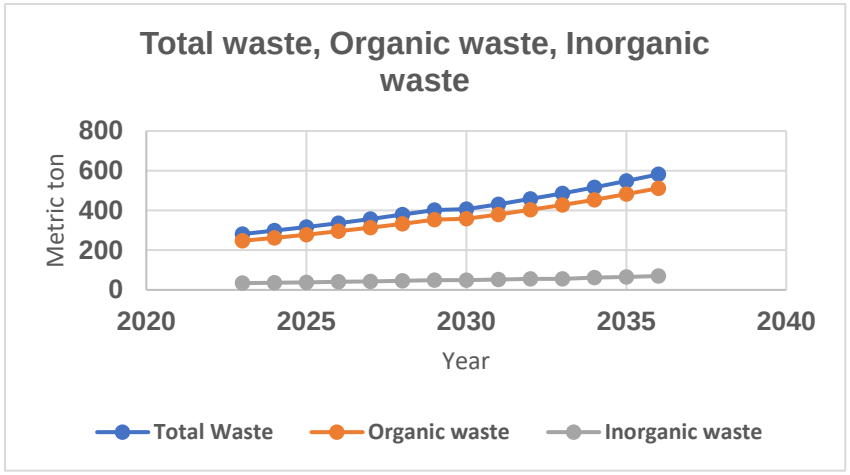
iii) Household waste generation rate with composition for Dohar Municipality

Type of waste	Percentage
Organic	86%
Plastic	6.1%
Paper	3.7%
Medical	0.8%
Glass	0.6%
Textile	0.6%
Electronic	0.3%
Wood	0.4%
Metal	0.7%
Others	0.8%
Total	100%

The waste generation rate is 0.5 kg/person/day

Year	Total waste	Organic	Plastic	Paper	Medical	Glass	Textile	Electronic	Wood	Metal	Others
2023	281	247.10	17.69	7.02	2.25	1.40	1.12	0.84	0.56	0.56	2.25
2024	298	262.31	18.78	7.45	2.38	1.49	1.19	0.89	0.60	0.60	2.38
2025	316	278.46	19.93	7.91	2.53	1.58	1.27	0.95	0.63	0.63	2.53
2026	336	295.59	21.16	8.40	2.69	1.68	1.34	1.01	0.67	0.67	2.69
2027	357	313.79	22.46	8.91	2.85	1.78	1.43	1.07	0.71	0.71	2.85
2028	379	333.10	23.85	9.46	3.03	1.89	1.51	1.14	0.76	0.76	3.03
2029	402	353.60	25.31	10.05	3.21	2.01	1.61	1.21	0.80	0.80	3.21
2030	406	357.49	25.59	10.16	3.25	2.03	1.62	1.22	0.81	0.81	3.25
2031	431	379.50	27.17	10.78	3.45	2.16	1.72	1.29	0.86	0.86	3.45
2032	458	402.86	28.84	11.44	3.66	2.29	1.83	1.37	0.92	0.92	3.66
2033	486	427.65	26.94	12.15	3.89	2.43	1.94	1.46	0.97	0.97	3.89
2034	516	453.97	32.50	12.90	4.13	2.58	2.06	1.55	1.03	1.03	4.13
2035	548	481.92	34.50	13.69	4.38	2.74	2.19	1.64	1.10	1.10	4.38
2036	581	511.58	36.62	14.53	4.65	2.91	2.33	1.74	1.16	1.16	4.65

Table 2-2: Household Waste Generation, Metric ton for Every Day with Physical Composition Keraniganj Upazila



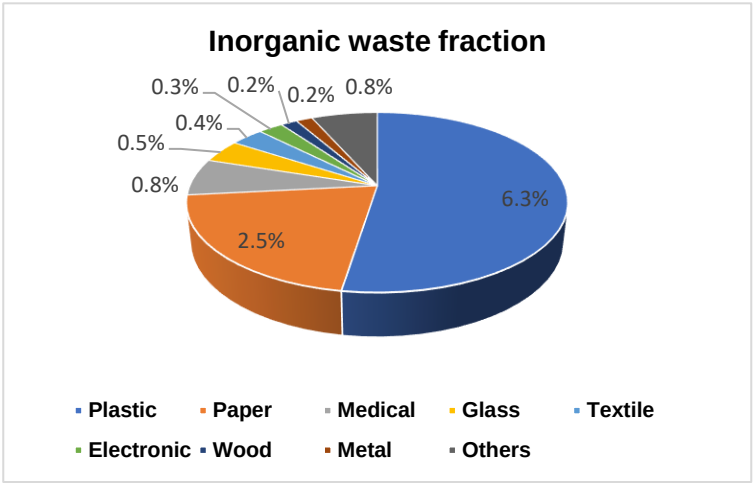
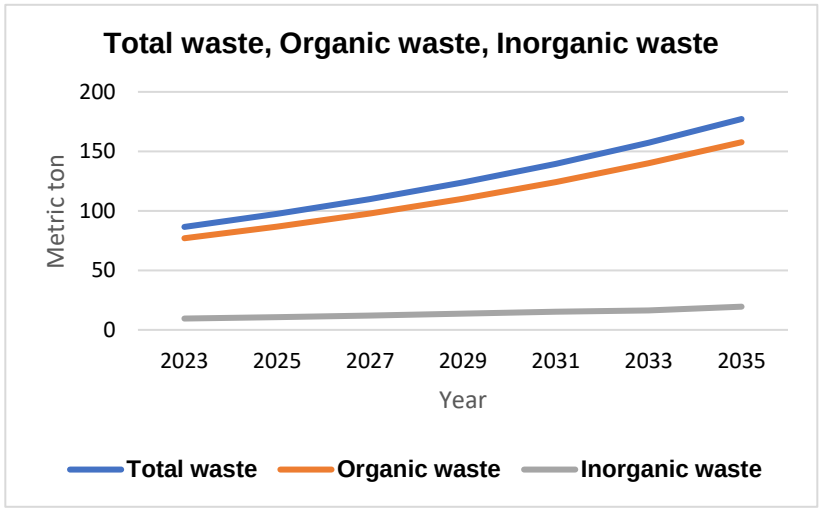


Figure 2-8: Physical Composition of Household Waste Generation Keraniganj Upazila

Year	Total waste	Organic	Plastic	Paper	Medical	Glass	Textile	Electronic	Wood	Metal	Others
2023	87	77.01	4.59	2.25	0.69	0.43	0.35	0.26	0.17	0.09	0.69
2024	92	81.75	4.87	2.39	0.73	0.46	0.37	0.28	0.18	0.09	0.73
2025	98	86.78	5.17	2.54	0.78	0.49	0.39	0.29	0.20	0.10	0.78
2026	104	92.12	5.49	2.69	0.83	0.52	0.41	0.31	0.21	0.10	0.83
2027	110	97.79	5.82	2.86	0.88	0.55	0.44	0.33	0.22	0.11	0.88
2028	117	103.81	6.18	3.03	0.93	0.58	0.47	0.35	0.23	0.12	0.93
2029	124	110.20	6.56	3.22	0.99	0.62	0.50	0.37	0.25	0.12	0.99
2030	131	116.98	6.97	3.42	1.05	0.66	0.53	0.39	0.26	0.13	1.05
2031	140	124.18	7.40	3.63	1.12	0.70	0.56	0.42	0.28	0.14	1.12
2032	148	131.83	7.85	3.85	1.18	0.74	0.59	0.44	0.30	0.15	1.18
2033	157	139.94	7.42	4.09	1.26	0.79	0.63	0.47	0.31	0.16	1.26
2034	167	148.55	8.85	4.34	1.34	0.83	0.67	0.50	0.33	0.17	1.34
2035	177	157.70	9.39	4.61	1.42	0.89	0.71	0.53	0.35	0.18	1.42
2036	188	167.40	9.97	4.89	1.50	0.94	0.75	0.56	0.38	0.19	1.50

Table 2-3: Household Waste Generation, Metric ton for Every Day with Physical Composition



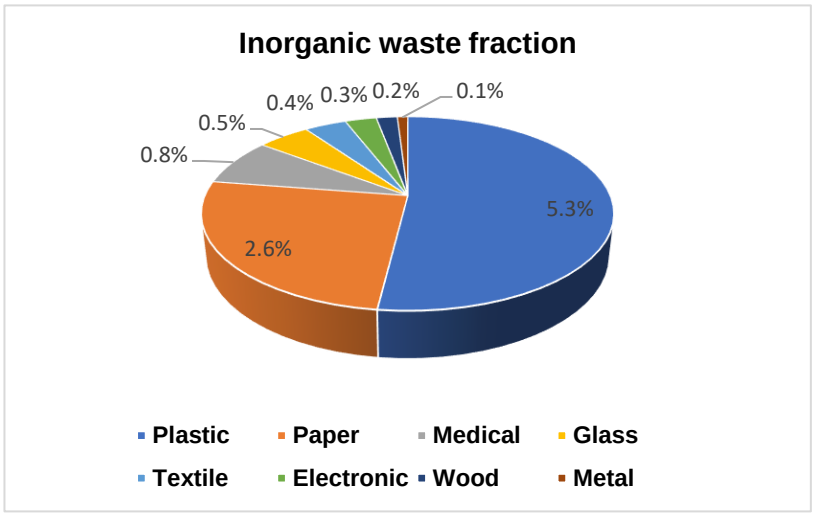
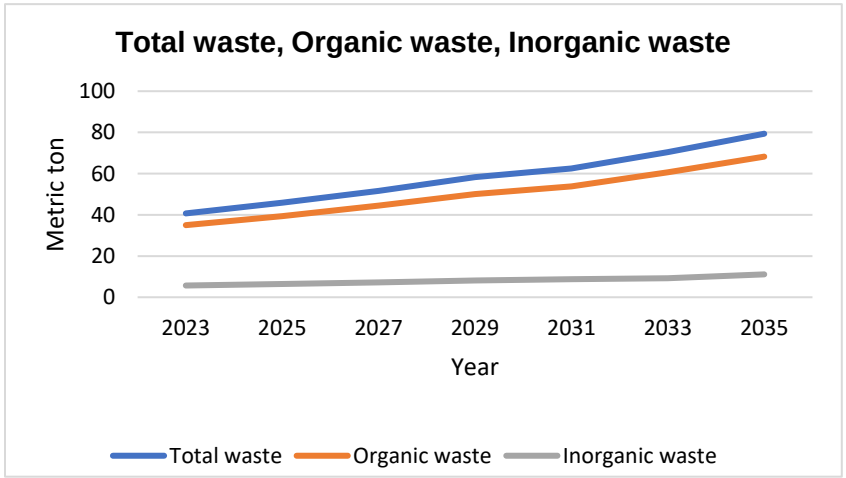


Figure 2-9: Physical Composition of Household Waste Generation Nawabganj Upazila

Year	Total waste	Organic	Plastic	Paper	Medical	Glass	Textile	Electronic	Wood	Metal	Others
2023	41	34.99	2.48	1.51	0.33	0.24	0.24	0.12	0.16	0.28	0.33
2024	43	37.15	2.63	1.60	0.35	0.26	0.26	0.13	0.17	0.30	0.35
2025	46	39.43	2.80	1.70	0.37	0.28	0.28	0.14	0.18	0.32	0.37
2026	49	41.86	2.97	1.80	0.39	0.29	0.29	0.15	0.19	0.34	0.39
2027	52	44.44	3.15	1.91	0.41	0.31	0.31	0.16	0.21	0.36	0.41
2028	55	47.17	3.35	2.03	0.44	0.33	0.33	0.16	0.22	0.38	0.44
2029	58	50.07	3.55	2.15	0.47	0.35	0.35	0.17	0.23	0.41	0.47
2030	59	50.62	3.59	2.18	0.47	0.35	0.35	0.18	0.24	0.41	0.47
2031	62	53.74	3.81	2.31	0.50	0.37	0.37	0.19	0.25	0.44	0.50
2032	66	57.05	4.05	2.45	0.53	0.40	0.40	0.20	0.27	0.46	0.53
2033	70	60.56	3.69	2.61	0.56	0.42	0.42	0.21	0.28	0.49	0.56
2034	75	64.29	4.56	2.77	0.60	0.45	0.45	0.22	0.30	0.52	0.60
2035	79	68.24	4.84	2.94	0.63	0.48	0.48	0.24	0.32	0.56	0.63
2036	84	72.44	5.14	3.12	0.67	0.51	0.51	0.25	0.34	0.59	0.67

Table 2-4: Household Waste Generation, Metric ton for Every Day with Physical Composition



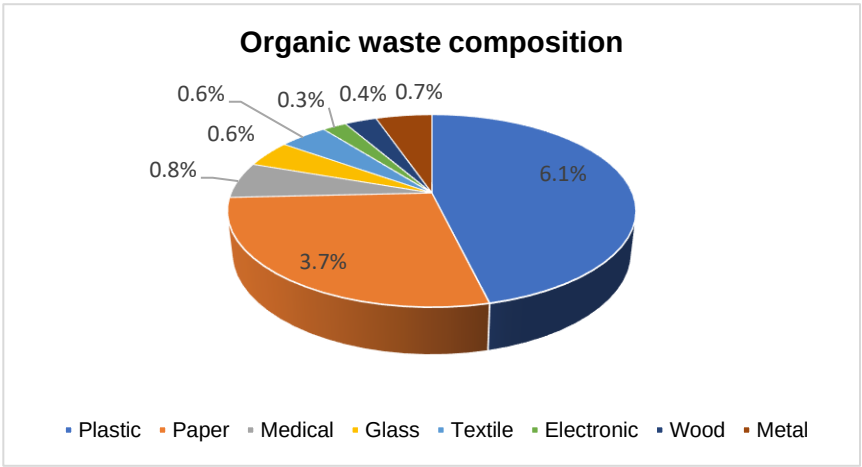


Figure 2-10: Physical Composition of Household Waste Generation Dohar Municipality

b) Kitchen Market Waste Generation and its Physical Composition

The kitchen market survey was conducted in two Upazilas, Keraniganj, Nawabganj, and Dohar municipality. A total of 53 kitchen markets in the study area where 23 kitchen markets are in Keraniganj Upazila, 21 kitchen markets are in Nawabganj Upazila and 9 kitchen markets are in Dohar municipality. 12 sample size out of 53 kitchen market was taken for the survey. During the survey, a structured questionnaire and KOBO software-based tool were used. Respondents are cleaner and members of the market committee jointly.

The figure below represents the calculated total waste in metric tons per day, generated by kitchen markets in Keraniganj and Nawabganj Upazila and Dohar Municipality which indicates higher generation in Keraniganj (41.72 Metric Ton) as there are the number of kitchen markets are more than others. As Dohar municipality's area is less that's why its kitchen market's number is only 9.

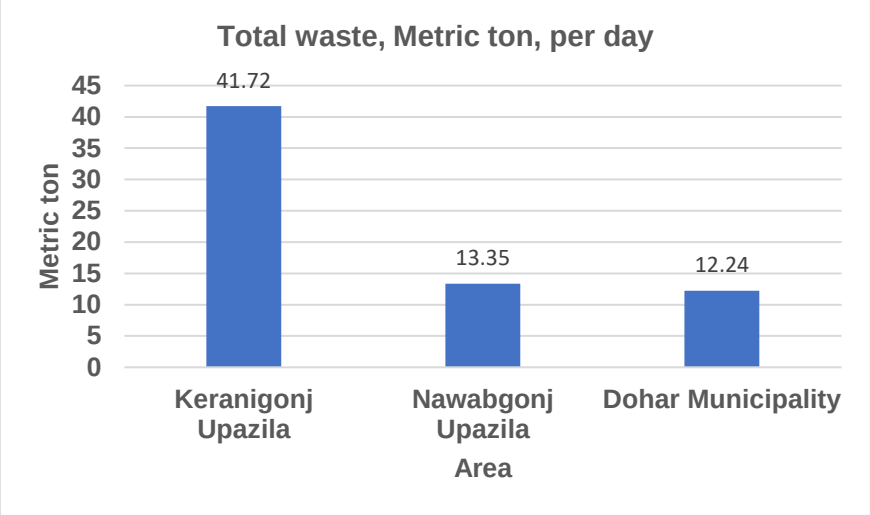
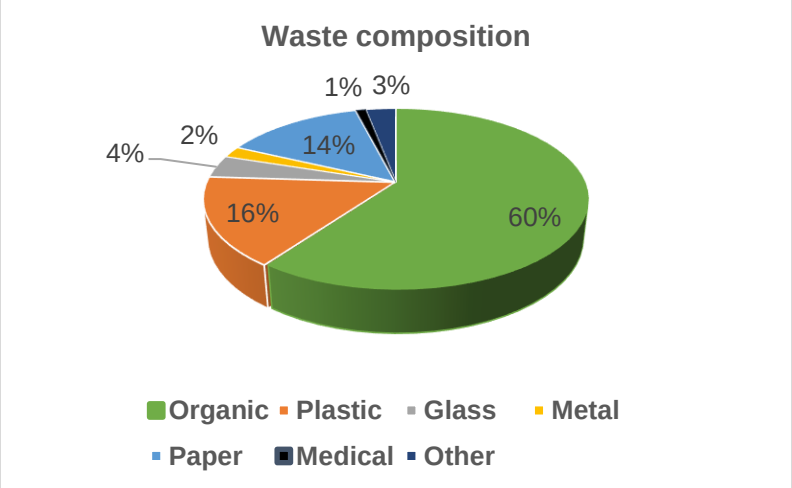


Figure 2-11: Kitchen Market Waste Generation

The physical waste composition of the kitchen market is in the below chart.



53 kitchen markets of Keraniganj Upazila, Nawabganj Upazila and Dohar municipality have been generating 67.31 Metric tons (MT) of waste every day. Among every day's 67.31 Metric tons of waste, 40.27 MT is organic waste, 10.89 MT is plastic, 9.6 MT is paper, 2.7 MT is glass, 1.28 MT is metal, 0.67 MT is medical and other waste is 1.89 MT

Figure 2-12: Physical Composition of Kitchen Market Waste

c) General Market Waste Generation and its Physical Composition

The general market survey was conducted in two Upazilas, Keraniganj, Nawabganj, and Dohar municipality. A total of 32 general markets are in the study area. 8 sample size out of 32 general markets was taken for the survey. During the survey, a structured questionnaire and KOBO software-based tool were used by the team of the survey. Respondents are cleaner and members of the market committee jointly.

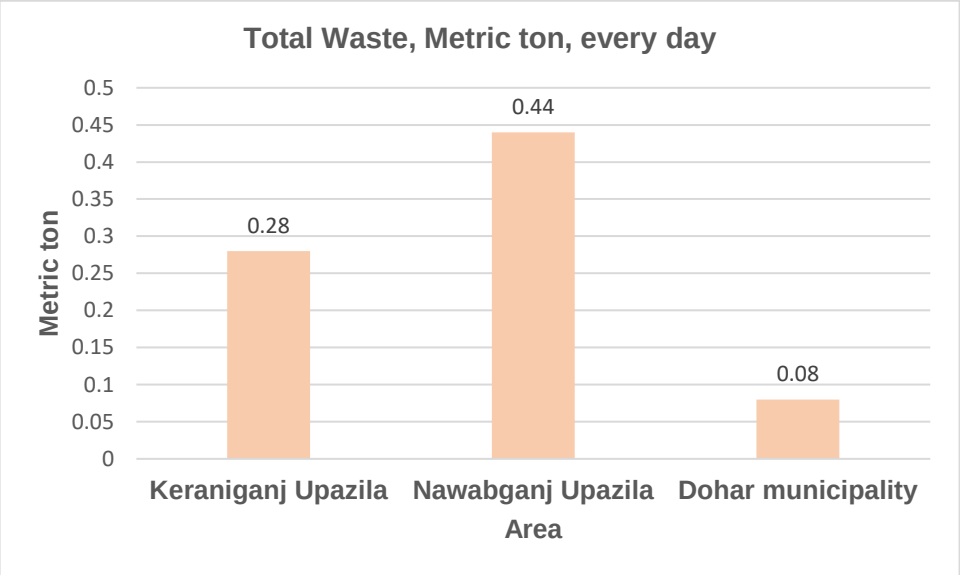


Figure 2-13: General Market Waste Generation

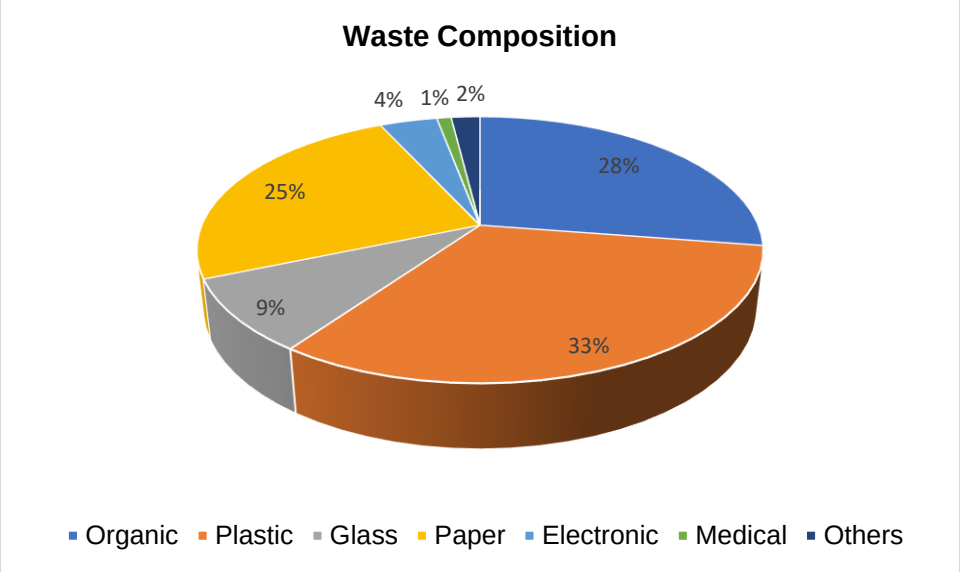


Figure 2-14: Kitchen Market Waste Composition

32 general markets of Keraniganj Upazila, Nawabganj Upazila and Dohar municipality have been generating 0.8 Metric tons (MT) of waste every day. Among every day's 0.8 MT of waste, 0.22 MT is organic waste, 0.261 MT is plastic, 0.2 MT is paper, 0.07 MT is glass, 0.03 MT is electronic, 0.005 MT is medical and other waste is 0.014 MT.

d) Restaurant Waste Generation and Its Physical Composition

The restaurant survey was conducted in two Upazilas, Keraniganj, Nawabganj, and Dohar municipality. A total of 40 restaurants are in the study area.12 sample size out 40 restaurants were taken for the survey. During the survey, a structured questionnaire and KOBO software-based tool were used by the team of the survey.

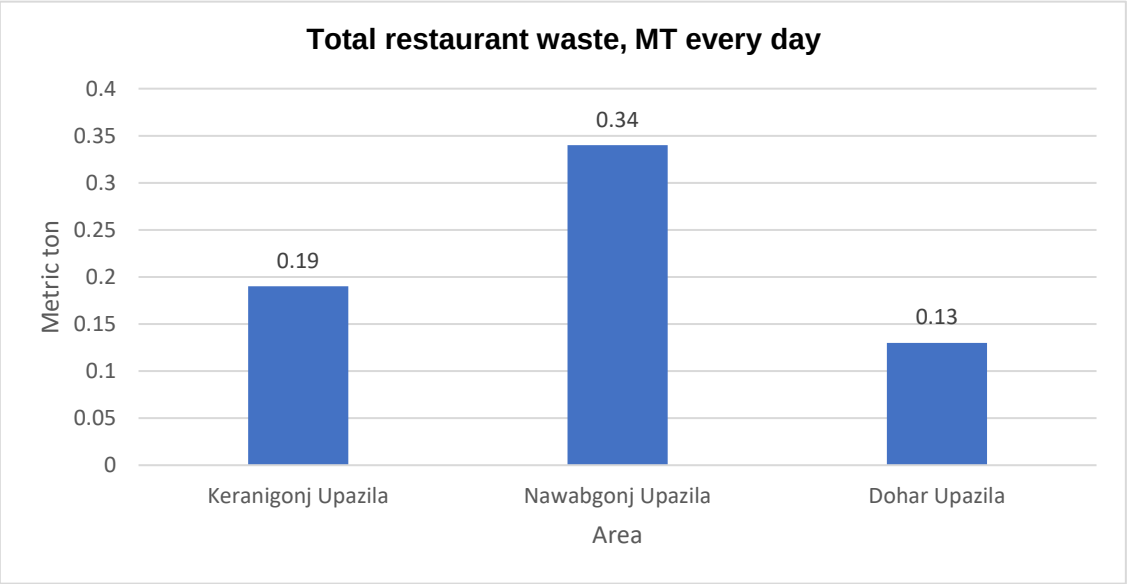


Figure 2-15: Restaurant Waste Generation

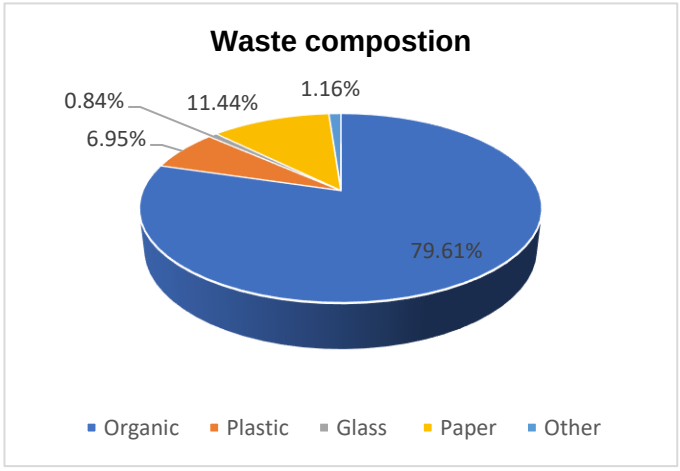


Figure 2-16: Restaurant Waste Composition

40 restaurants of Keraniganj Upazila, Nawabganj Upazila and Dohar municipality have been generating 0.66 Metric tons (MT) of waste every day. Among every day's 0.66 Metric tons of waste, 0.525 MT is organic waste, 0.046 MT is plastic, 0.076 MT is paper, glass is 0.006 MT and other waste is 0.007 MT.

f) Hospital/Clinic's Waste Generation and its Physical Composition

The hospital survey was conducted in two Upazilas, Keraniganj, Nawabganj, and Dohar municipality. A total of 169 hospitals, clinics and diagnostic centres are in the study area.12 sample size out of 169 hospitals, clinics and diagnostic centres (5% sample size) were taken for the survey. During the survey, a structured questionnaire and KOBO software-based tool were used by the team of the survey.

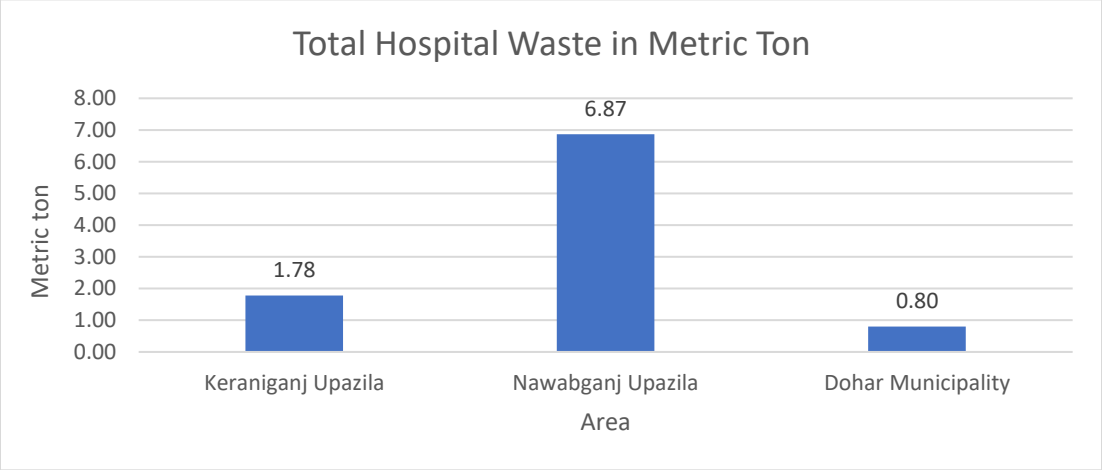


Figure 2-17: Hospital/Clinic's Waste Generation

Total Hospital Waste per day

169 hospitals, clinics of Keraniganj Upazila, Nawabganj Upazila and Dohar municipality have been generating an average 9.45 Metric tons (MT) of waste every day. Among every day's 9.5 Metric tons of waste, 6.058 MT is general waste (food waste-organic), 2.028 MT is pathological, 0.630 MT is sharp waste, 0.543 MT is infectious waste, 0.111 MT is chemical, 0.079 MT is radioactive waste. The waste composition is shown in the pie-chart.

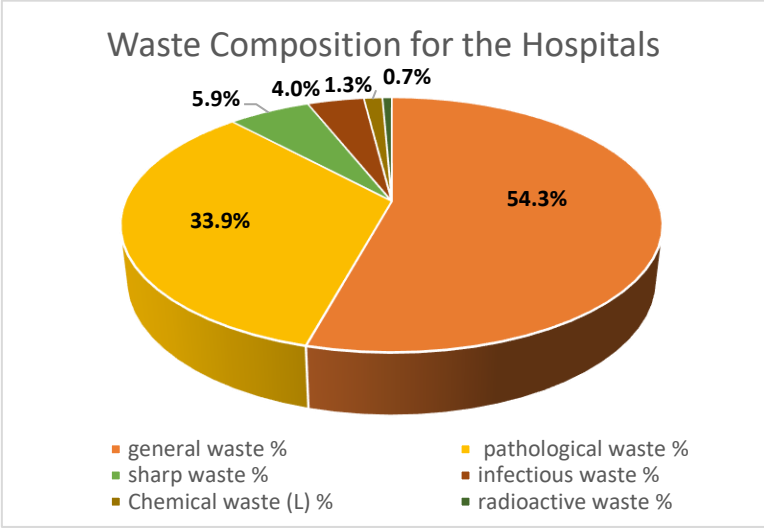


Figure 2-18: Hospital Waste Composition

g) Institutional Waste Generation and its Physical Composition

The institutional survey was conducted in two Upazilas, Keraniganj, Nawabganj, and Dohar municipality. A total of 2097 institutions consisting of educational institutions, government offices, cattle farms, poultry farms etc are in the study area. 80 sample size out of 2097 institutions were taken for the survey. During the survey, a structured questionnaire and KOBO software-based tool were used by the team of the survey.

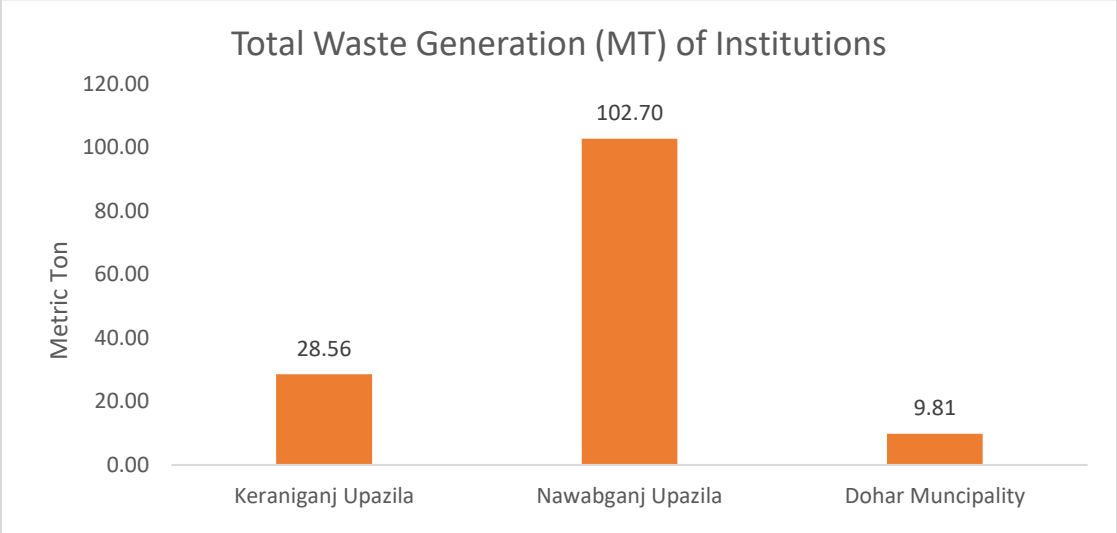


Figure 2-19: Institutional Waste Generation

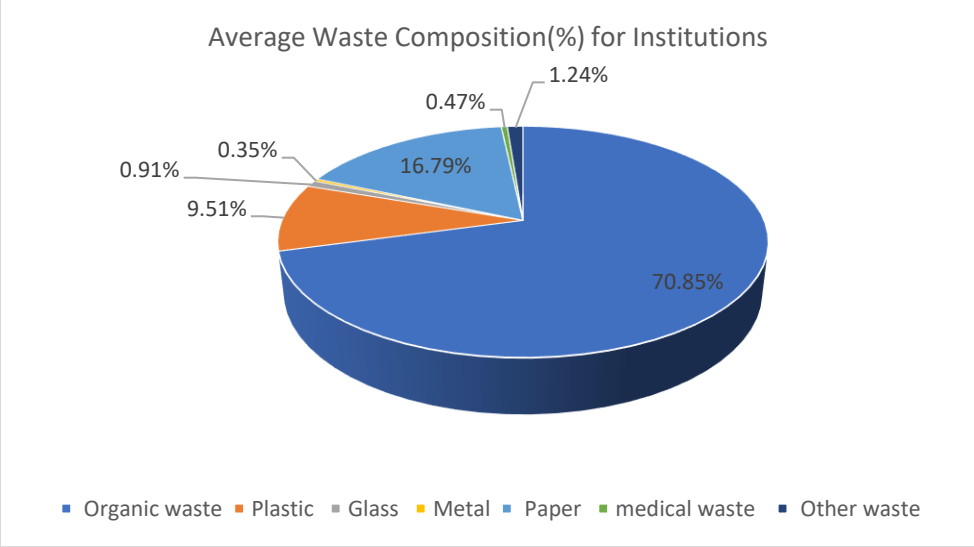


Figure 2-20: Institutional Waste Composition

The 2097 institutions of Keraniganj Upazila, Nawabganj Upazila and Dohar municipality have been generating 47.02 Metric tons (MT) of waste every day. Among every day's 47.02 Metric tons of waste, 37.61 MT is general waste (organic), 3.24 MT is plastic, 0.29 MT is glass waste, 0.31 MT is metal waste, 5.08 MT is paper, 0.28 MT is medical waste. And 0.26 MT is other waste.

h) Industrial waste generation and its composition

The industry survey was conducted in two Upazilas, Keraniganj, Nawabganj, and Dohar municipality. A total of 3070 garment industries are in the Keraniganj, others area there is no textile. 139 sample size out of 3070 garments were taken for the survey. During the survey, a structured questionnaire and KOBO software-based tool were used by the team of the survey. Respondents are cleaner and members of the market committee jointly.

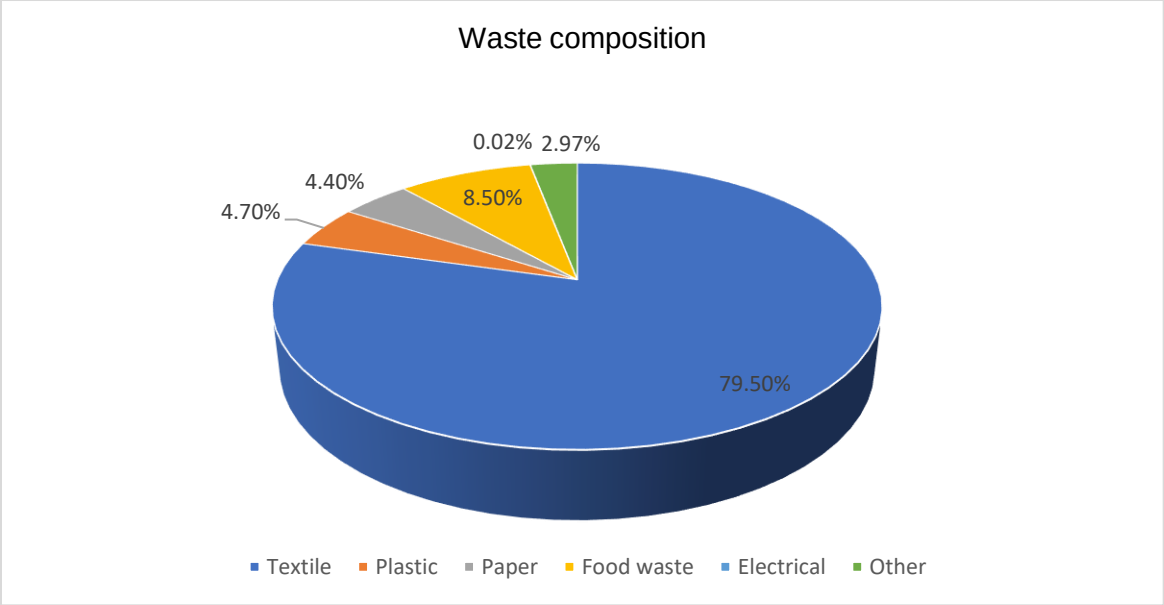
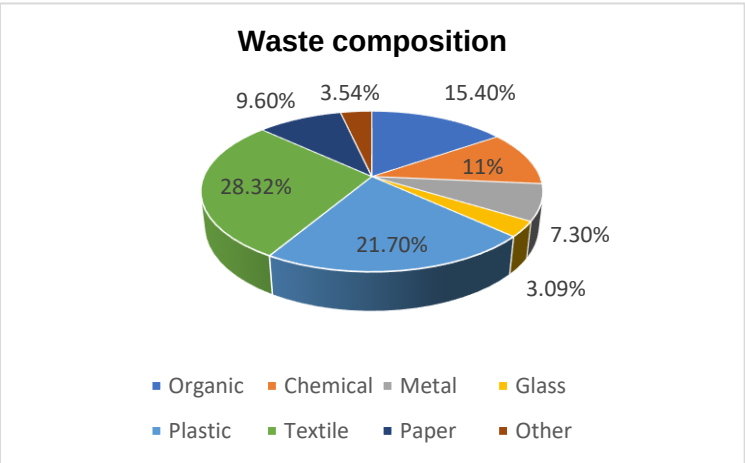


Figure 2-21: Industrial Waste Generation

39.91 Metric tons (MT) of waste are generated every day. Among every day's 39.91 Metric tons of waste, 31.72 MT is textile, 1.87 MT is plastic, 1.75 MT is paper, 3.39 MT is food and general waste. 0.008 is electrical waste and 1.18 MT is other waste.

Besides, garments there are other 50 industries like plastic, chemical and iron factories in Keraniganj, Nawabganj and Dohar Upazilas. 18 samples were carried out.



0.625 Metric tons (MT) of waste are generated every day. Among every day's 0.625 Metric tons of waste, 0.177 MT is textile, 0.136 MT is plastic, 0.06 MT is paper, 0.096 MT is food and general waste. 0.019 MT is glass waste, metal is 0.046 MT, chemical waste is 0.069 MT and 0.022 MT is other waste.

Figure 2-22: Industrial Waste Composition

i) Total Waste Generation and Composition of Keraniganj and Nawabganj Upazila and Dohar Municipality

Area	Source of waste	Total	Organic	Plastic	Paper	Medical	Glass	Textile	Electric	Wood	Metal	Others
Nawabganj	HH	87	77.01	4.59	2.25	0.69	0.43	0.35	0.26	0.17	0.09	0.69
Dohar		41	34.99	2.58	1.51	0.33	0.24	0.24	0.12	0.16	0.28	0.33
Keraniganj		281	247.1	17.69	7.02	2.25	1.4	1.12	0.84	0.56	0.56	2.25
Nawabganj	General Market	0.44	0.15	0.13	0.11	0	0.02	0	0.02	0	0	0
Dohar		0.08	0.02	0.04	0.02	0	0	0	0	0	0	0
Keraniganj		0.28	0.05	0.09	0.07	0.005	0.04	0	0.01	0	0	0.14
Nawabganj	Kitchen Market	13.35	9.12	1.33	0.89	0.67	0	0	0	0	0.67	0.67
Dohar		12.24	6.12	1.22	2.45	0	0.61	0	0	0	0.61	1.22
Keraniganj		41.72	25.03	8.34	6.26	0	2.09	0	0	0	0	0
Nawabganj	Restaurant	0.34	0.27	0.02	0.0374	0	0.009	0	0	0	0	0
Dohar		0.13	0.111	0.008	0.014	0	0	0	0	0	0	0.0007
Keraniganj		0.19	0.143	0.016	0.003	0	0	0	0	0	0	0.006
Nawabganj	Hospital	6.87	4.4			2.4						
Dohar		0.8	0.6			0.28						
Keraniganj		1.78	1			0.61						
Nawabganj	Institutional	102.7	92.064	4.536	3.851	0.749	0.642		0.000		0.856	0.000
Dohar		9.81	7.506	0.893	1.011	0.049	0.196		0.000		0.000	0.147
Keraniganj		28.56	13.256	4.284	10.374	0.051	0.029		0.000		0.060	0.634
Total		**628.29**	**518.9397**	**45.76701**	**35.86997**	**8.084306**	**5.70566**	**1.71**	**1.25**	**0.89**	**3.125791**	**6.08796**

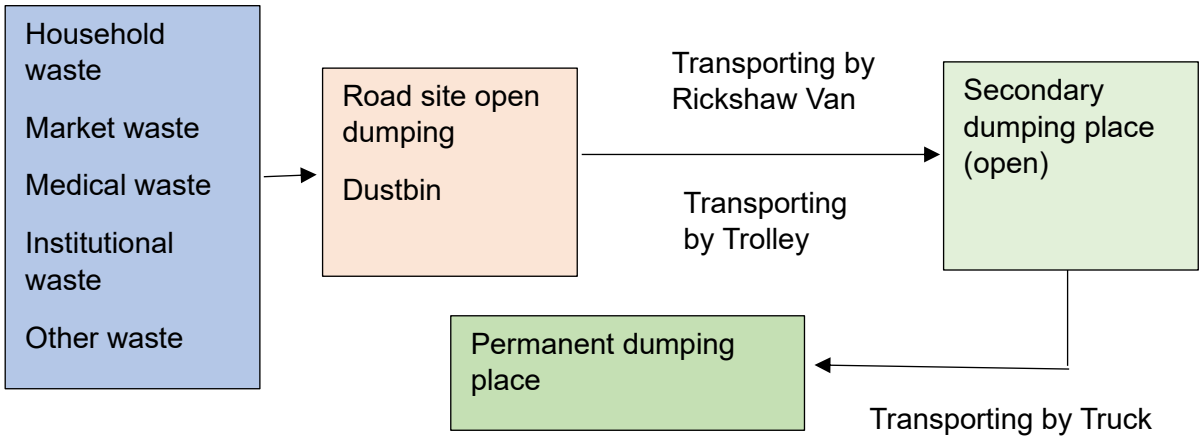
Table 2-5 Total Waste with The Composition of Household, General Market, Kitchen Market, Restaurant, Institutional and Hospital Every Day's Waste Generation (Metric Ton)

Every day, Industrial waste has been generating 39.91 Metric tons (MT). Among every day's 39.91 Metric tons of waste, 31.72 MT is textile, mainly clips waste/Garments cloth which is being sold to make it as cloth cotton for pillows, beds etc.

2.3 Waste collection and its transportation

Dohar municipality:

Dohar Municipality's waste collectors collect primary waste from road sides, open dumping and dustbins where households, kitchen markets, shopping malls, offices and institutions' waste are generally dumped. Street waste and small amounts of medical waste also has been disposed of their roadside dumping. Hospital authority separately burn their hazard medical waste and only non-hazard like food waste from hospital has been dumped road site. From there, waste collectors pick up the waste and transport it to secondary dumping sites by Rickshaw Vans and trolleys. Waste collectors collect waste from wards 1,2,3,4,5,6 and 7 regularly. And other Wards 8 and 9 are not collected regularly but 2days in a week they are collecting waste from there. From secondary dumping, waste cleaners transport the waste to final dumping places. There are some street vendors who collect recyclable materials like plastic, metal and glass. During interaction with the Executive Engineer and Conservancy Inspector, we learned the waste collection and transport system of this Municipality which has been shown in the following flow diagram.



During Focus Group Discussions with the waste cleaner, Rickshaw-Van driver, Truck driver and other staff we came to inform that there are 30 staff (master roll) under the conservancy section. Among 30 staff, one is conservancy inspector, and 1 is the waste collector team leader, others are cleaners and drivers. The municipality has 3 waste collector trucks whose capacity is 3 M.ton each. 8 Rickshaw Vans and 4 trolleys. During that Focus Group Discussion, The quantity of waste they generally collect and transport every day and its transporting system including the dumping site were discussed. Through this discussion, we know the volume of daily waste collection and transportation, is in the below table:

Vehicle Type	Number	Capacity (MT)/Per Vehicle	Total Trip Per Day	Total Waste Collection (MT/Day)
Rickshaw Van	**8**	**0.35**	**40**	**14**
Trolley	**4**	**0.04**	**64**	**2.56**
			Total	**16.56**

In Dohar Municipality every day has been generating 64.06 MT of waste and transporting 16.56 MT which is 26% of the total generated waste.

During our physical observation, we captured pictures of Dohar Municipality's waste collection, transportation and dumping to the final dumping place, Chok Dighir Par in the following:

Figure 2-26: Rickshaw-Van for collecting waste from Primary to Secondary dustbin

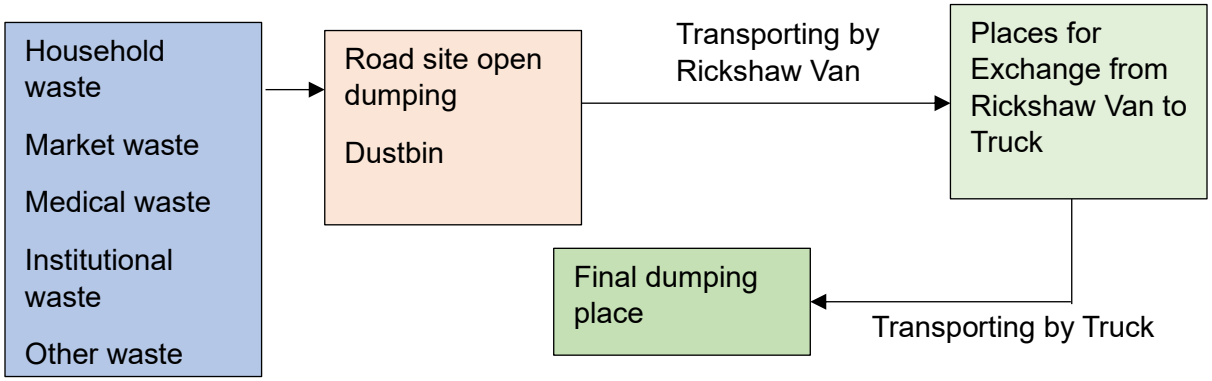
Figure 2-26: Secondary dumping place

Figure 2-26: Truck for collecting waste from Secondary dustbin to Final dumping place

Figure 2-26: Permanent Dumping Place

Keraniganj Upazila:

In Keraniganj Upazila, we found there are private sectors that collect primary waste from households, kitchen markets, general markets, shopping malls, offices, and small amounts of medical waste by Rickshaw Van. After being full of Rickshaw-Van with waste, the drivers and cleaners carry it to the Aganagar, Zinjira, and Kalindi. From these three places collected waste by Rickshaw-Van has been transferred to the truck directly. After being full fill the truck (3 tons) with waste, this truck transports this waste to the final dumping place- Shuvadda dumping site (Ratan's Khamar).



During Focus Group Discussions with the waste cleaner, Rickshaw-Van driver, Truck driver and other person concerned we came to inform that there are 4 waste collector trucks whose capacity 3 MT ton each and 72 Rickshaw Vans. During that Focus Group Discussion, how much waste they are generally collecting and transporting every day and its transporting system including the dumping site were discussed. Through this discussion, we know the volume of daily waste collection and transportation, is in the below table:

Vehicle Type	Number	Capacity (Metric Tons)/Per Vehicle	Total Trip Per Day	Total Waste Collection (MT/Day)
Rickshaw Van	40	0.5	120	72
			Total	60

Table 2-6: Vehicle Type and Capacity for Primary to Secondary Waste Transportation (Aganagar)

Vehicle Type	Number	Capacity (Tons)/Per Vehicle	Total Trip Per Day	Total Waste Collection (T/Day)
Rickshaw Van	20	0.5	40	20
			Total	20

Table 2-7: Vehicle Type and Capacity for Primary to Secondary Waste Transportation (Zinjira)

Vehicle Type	Number	Capacity (Tons)/Per Vehicle	Total Trip Per Day	Total Waste Collection (T/Day)
Rickshaw Van	12	0.5	24	12.
			Total	12

Table 2-8: Vehicle Type and Capacity for Primary to Secondary Waste Transportation (Kalindi)

In Keraniganj Upazila every day has been generating 353.53 MT of waste and transporting 92 MT which is 26% of the total generated waste. Rest of waste has been dumping in low land area, water body beside of their house and establishment. Some recyclable materials like plastic, metal, glass and paper have been sold to street vendor.

During our physical observation, we captured pictures of Nawabganj Upazila waste collection, transportation and dumping to the final dumping place, Suvodda in the following:

Figure 2-28: Primary Waste Collection by Rickshaw Van

Figure 2-28: Exchange Waste from Rickshaw Van to Truck

Figure 2-29: Permanent dumping place, Shuvadda Dumping site

Nawabganj

In Nawabganj Upazila, the waste collection system is very poor. There is no truck, only two Rickshaw-Vans, privately owned collect the waste of some households and market waste and transport it to the final dumping place at Shapkhali. During Focus Group discussions with this private sector, we calculated every day's collected waste and transportation, which is in the below table.

Vehicle Type	Number	Capacity (Tons)/Per Vehicle	Total Trip Per Day	Total Waste Collection (T/Day)
Rickshaw Van	2	0.2	6	1.2
Total				1.2

Table 2-9: Vehicle Type and Capacity for Primary to Secondary Waste Transportation (Nawabganj)

In Nawabganj Upazila, a daily waste generation of 210.7 MT is observed, with 1.2 MT (0.6% of the total waste) being transported elsewhere. The majority of the waste is disposed of in low-lying areas, water bodies, and adjacent to residences and establishments. Additionally, recyclable materials such as plastic, metal, glass, and paper are sold to street vendors as part of the local waste management practices.

2.4 Evaluation of Dumping Sites

The evaluation of dumping sites involved a comprehensive approach, combining physical inspections, interactions with relevant individuals through structured questionnaires, and drone surveys. Our findings indicate the existence of three final dumping places in Keraniganj Upazila, Nawabganj Upazila, and Dohar Municipality, as illustrated in the accompanying map. In Keraniganj and Nawabganj Upazila, no secondary dumping places were identified, while in Dohar Municipality, two secondary dumping places were located. Despite the absence of secondary dumping places in Keraniganj, three specific areas were identified where waste is transferred from Rickshaw-Van to Truck.

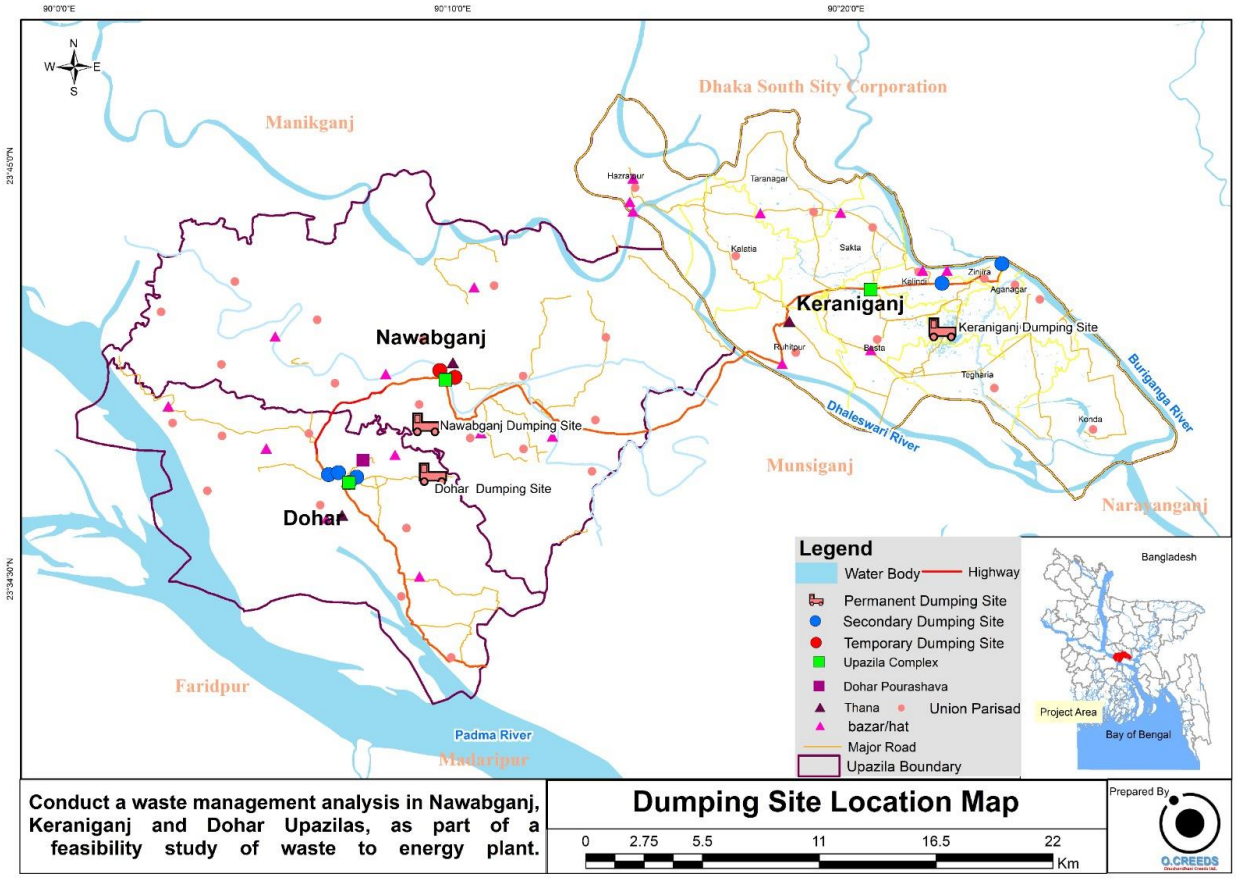


Figure 2-30: Combined Dumping Site Map

Dohar Municipality

The final dumping place, Chok Dighir Par is situated in Dohar Municipality very closed to Nawabganj and it started in 2008. The dumping place is open without a brick wall boundary but has a marking with RCC pillars and wire. The dumping place area is 1 Acre (100 decimals). The landowner of the dumping place is the government.

The dumping place has convenient road access, and roughly one-fifth of its area is covered by waste, with a modest height of 1 to 2 feet above the road level. Waste pickers gather approximately 10 to 12 kilograms of recycled materials daily from this site.

Through interactions with the conservancy inspector and the Executive Engineer of the municipality, coupled with physical observations and a drone survey, the daily composition of recycled materials collected is as follows: plastic waste constitutes 60%, glass waste 5%, metal waste 15%, cloth waste 3%, paper waste 17%, and there is an additional category for other waste.

. Vehicle Type	Number	Capacity (Metric Tons)/Per Vehicle	Total Trip Per Day	Total Waste Collection (MT/Day)
Truck	3	3	5	15
Total				**15**

Table: 2-10: Waste transporting by trucks from secondary to final dumping site

Figure 2-31: Formal Dumping Site of Dohar Municipality

Keraniganj

There is one dumping place in Keraniganj, which is located at Suvadda Union in Keraniganj Upazila. Basically, there is a road passing through the water body where collected waste by truck has been dumped on both sides of this road since 2011. Almost 20 -25 kg of recycled materials waste pickers collect from dumping places every day. Among the recycled material collected (weight by kg/gm) every day, there are plastic waste 55%, glass waste 5%, Metal waste 10%, cloth waste 5%, and Paper waste 24% other waste there are medical waste 1%.

Vehicle Type	Number	Capacity (MT)/Per Vehicle	Total Trip Per Day	Total Waste Collection (MT/Day)
Truck	4	3	30	90
Total				**90**

Table: 2-11: Vehicle Type and Capacity for Secondary to Formal Dumping Site Waste Transportation (Keraniganj)

Figure 2-32:Formal Dumping Site of Keraniganj Upazila

During our field observation, drone survey and map analysis, we found there is a small-width road passing through the water body were collected waste of Keraniganj Upazila has been dumped on both sides of this road posing a great threat to water and its eco-system, finally environmental degradation has been happening acutely there.

Nawabganj

There is one dumping place in Nawabganj located at Shapkhali. The dumping Place is open without a boundary. The dumping place area is 2 Acres. The landowner of the dumping place is the government. Road connection facilities are available here. No recycled materials waste pickers are collected from dumping this place.

Figure 2-33: Formal Dumping Site of Nawabganj Upazila

2.5 Proposed Site for Waste to Energy (WtE) plant

Following the consultation meetings in the three upazilas, Keraniganj, Nawabganj, and Dohar, a proposal has been put forth to establish a Waste-to-Energy (WtE) plant in the Suvaddya Union of Keraniganj. The coordinates of the proposed site are 23°40’59.53” N and 90°22’40.66” E.

The selected site has electricity and road connectivity. There is a 12 ft wide road with brick soling. However, it is situated in a low-lying area. Thus, it requires road and land development.

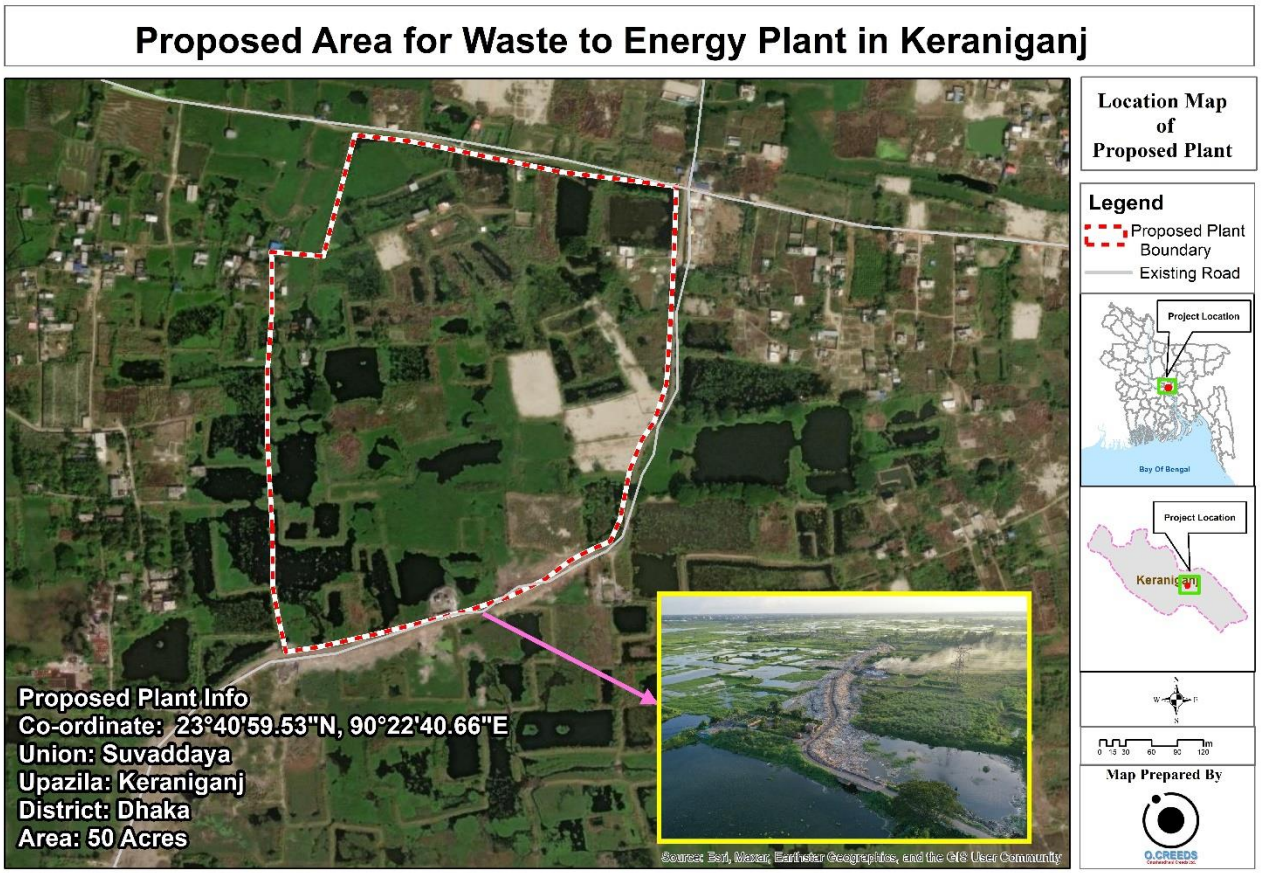


Figure 2-34: Proposed Area for Waste to Energy Plant in Keraniganj

Presently, the land proposed for the Waste-to-Energy (WtE) plant is government-owned, categorized as "Khas Land." Utilizing this land for the WtE facility would involve legal procedures, but no financial cost for land acquisition.

***Note**: Khas land is an important source of livelihood for extremely poor people. The term "khas" originates from a Persian word. Khas means government owned land. Khas land refers to those land under direct control and management of the government. (https://www.daily-sun.com/printversion/details/54239*

Chapter 3 : Laboratory Test and Result

To determine the appropriate technology for waste-to-energy conversion, laboratory tests were conducted on waste samples obtained from dumping sites and secondary transfer stations (STS). The objective was to gather information on various parameters such as moisture content, fixed carbon, volatile matter, ash, carbon, hydrogen, nitrogen, sulfur, oxygen, chlorine, and gross calorific value of the waste.

In Bangladesh, the current rainfall pattern extends until September, marked by brief yet intense rain episodes. Concurrently, a substantial portion of the waste in this region contains wet substances throughout the year. As a result, the seasonal changes are not greatly reflected in the waste samples. While August would have been the ideal month for wet season sampling, practical constraints led to the selection of October and November instead, with October representing the late monsoon period. For the dry season, February was chosen, considering the absence of rainfall during this period.

No.	Sample No.	Upazila	Area Name
1	W01171023	Keraniganj	Suvadda Dumping Site (FDS)
2	W02171023		Baspatti Aganagar (TDS)
3	W03171023		Jinjira-Shuvadha Dumping Site (TDS)
4	W04171023	Nawabganj	Shapkhali Dumping Site (FDS)
5	W05171023	Dohar	Chakdighi par Dumping Site (FDS)
6	W06171023		Ratan Chattar (TDS)
7	W01031123	Keraniganj	Suvadda Dumping Site (FDS)
8	W02031123		Baspatti Aganagar (TDS)
9	W03031123		Jinjira-Shuvadha Dumping Site (TDS)
10	W04031123	Nawabganj	Shapkhali Dumping Site (FDS)
11	W05031123	Dohar	Chakdighi par Dumping Site (FDS)
12	W06031123		Ratan Chattar (TDS)
13	W01170224	Keraniganj	Suvadda Dumping Site (FDS)
14	W02170224		Baspatti Aganagar (TDS)
15	W03170224		Jinjira-Shuvadha Dumping Site (TDS)
16	W04170224	Nawabganj	Shapkhali Dumping Site (FDS)
17	W05170224	Dohar	Chakdighi par Dumping Site (FDS)
18	W06170224		Ratan Chattar (TDS)

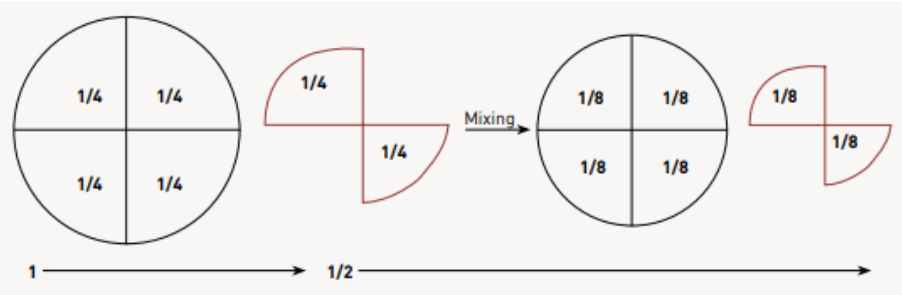
**FDS=Formal Dumping Site; TDS= Temporary Dumping Site*

Table 3-1: Waste Sample Collection Location

On October 18, 2023, O. Creeds Ltd collected samples from six locations for testing at the laboratory of Bangladesh University of Engineering and Technology (BUET). Subsequently, on November 4, 2023, another set of six samples was collected from the same locations for testing the same parameters at BUET's lab. These locations comprised three places in Keraniganj Upazila (1 final dumping site + 2 STSs), one place in Nawabganj Upazila (1 final dumping site), and two places in Dohar Municipality (1 final dumping site + 1 STS).

Additionally, sample testing was conducted on February 17, 2024, to represent waste samples during the dry season. During the dry season, only the moisture content and gross calorific value of the waste samples were tested. This testing aimed to facilitate a comparison with the corresponding parameters measured during the wet season.

3.1 During sample collection, following procedure was adopted (Obtain a desire sample)



$$100KG \rightarrow 50KG \rightarrow 25KG \rightarrow 12.5KG \rightarrow 6.25KG \rightarrow 3.12KG \rightarrow 1.5 \approx 2KG$$

Sampling Method:

- 100 kg of waste was collected from multiple trucks/Rickshaw Vans (not more than 3 vehicles).
- The 100 kg of waste was mixed by shovel and spade for at least 5 minutes.
- Measured the weight of the sample.
- If there are any bigger size of waste, we found (> 30 cm) then cut it into smaller pieces and mixed the waste for at least 5 minutes again to get a representative waste sample.

Then the sample was placed as a uniform heap. The heap was divided into four portions using straight lines perpendicular to each other. Waste from opposing corners of the divided heap was removed to leave half of the original sample. The remaining portions were again thoroughly mixed, and the quartering process were repeated until a desired size was obtained (approximately 1.5 kg to 2 kg). The last remaining opposing fractions of waste were mixed and collected in a zipper bag, and one more zipper bag was used for its protection. The zipper bag was airtight. The samples were kept in ice box to minimize biochemical activities and were sent to BUET's laboratory accredited by Bangladesh Accreditation Board for further analysis of test parameters mentioned at above.


Figure 3-1:Above pictures were taken during sample collection for lab test

3.2 Waste Density Analysis from Sample Collection:

Sl.	Unit	Value	Remarks
1	π (Pi)	3.1416	Constant
2	r (radius)	0.165 m	Radius of Bucket
3	h (height)	0.353 m	Height of Bucket

Sl.	Unit	Value
1	m(mass)	11.45 kg
2	v (volume)	0.03018 m^3

Volume, V = $\pi r^2 h$ = 0.03018 m^3
Density of waste, ρ =m/v = 379.390 kgm^{-3}

Figure 3-2:Above pictures were taken during sample weight for lab test

3.3 Analysis Results of Waste Sample Supplied

Date	Sample No.	Moisture (wt%)	Fixed Carbon (wt%)	Volatile Matter (wt%)	Ash Content (wt%)	Carbon (wt%)	Hydrogen (wt%)	Nitrogen (wt%)	Sulphur (wt%)	Oxygen (wt%)	Chlorine (wt%)	Gross Calorific Value (kcal/kg)
18 October, 2023	W01171023	59.70	3.28	57.37	39.40	27.9	3.64	1.73	Nil	27.37	0.51	3091
	W02171023	61.55	3.60	43.98	52.40	28.17	3.58	3.24	Nil	12.59	0.48	2708
	W03171023	63.57	4.29	49.74	46.00	31.04	3.92	1.51	Nil	17.57	0.39	2643
	W04171023	62.61	12.37	66.45	21.20	40.97	5.70	2.30	Nil	29.85	0.52	4072
	W05171023	78.17	9.99	72.69	17.30	48.38	6.99	2.22	Nil	25.08	0.61	4304
	W06171023	65.05	1.27	65.06	33.67	32.91	4.46	2.56	Nil	26.40	0.50	3249
4 November 2023	W01031123	87.54	4.72	69.74	25.54	39.79	5.6	2.9	Nil	25.43	0.75	3463
	W02031123	78.85	12.79	70.62	16.69	47.17	6.35	2.88	Nil	26.31	0.71	4063
	W03031123	67.18	9.13	64.56	26.32	35.07	4.52	2.7	Nil	30.86	0.54	3057
	W04031123	62.24	3.54	66.29	30.18	37.35	5.07	2.7	Nil	24.07	0.62	3107
	W05031123	73.89	9.67	69.86	20.47	45.22	6.54	3.29	Nil	23.69	0.79	3664
	W06031123	67.18	3.27	57.02	39.71	31.24	4.05	1.13	Nil	23.54	0.32	2248
17 February 2024	W01170224	75.59	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	3977
	W02170224	65.78	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	3615
	W03170224	70.60	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	3501
	W04170224	60.80	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	3903
	W05170224	70.22	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	3799
	W06170224	62.54	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	Not Tested	3142

Table 3-2: Analysis Results of Waste Sample

The table represents laboratory results for 18 waste samples collected across three upazilas during October, November, and February. At Suvadda Dumping Site (FDS), the highest recorded moisture content was 87.5% in November, contrasting with the lowest of 59.70% in the same location in October. During the dry period of February, the moisture content ranges from 62.54% - 75.59%. Despite fluctuations, the average moisture content across all locations remains at 68.5%.

Similarly, Chakdighi Par Dumping Site (FDS) demonstrated the highest gross calorific value of 4304 kcal/kg in October, while Ratan Chattar (TDS) exhibited the lowest at 2248 kcal/kg in November. During the dry period of February, the gross calorific value ranges from 3142 kcal/kg – 3977 kcal/kg. Despite these variations, the average gross calorific value across all locations is maintained at 3423 kcal/kg.

The changing nature of waste composition over time highlights the need for further exploration into the factors influencing these variations. These insights are crucial for making informed decisions in waste management and resource recovery. Following the study's methodology, FICHTNER, an international consulting firm, will analyze the lab test results to choose the right technology for waste-to-energy conversion.

- The laboratory test results and waste collection photographs are attached in Annex 9.1.

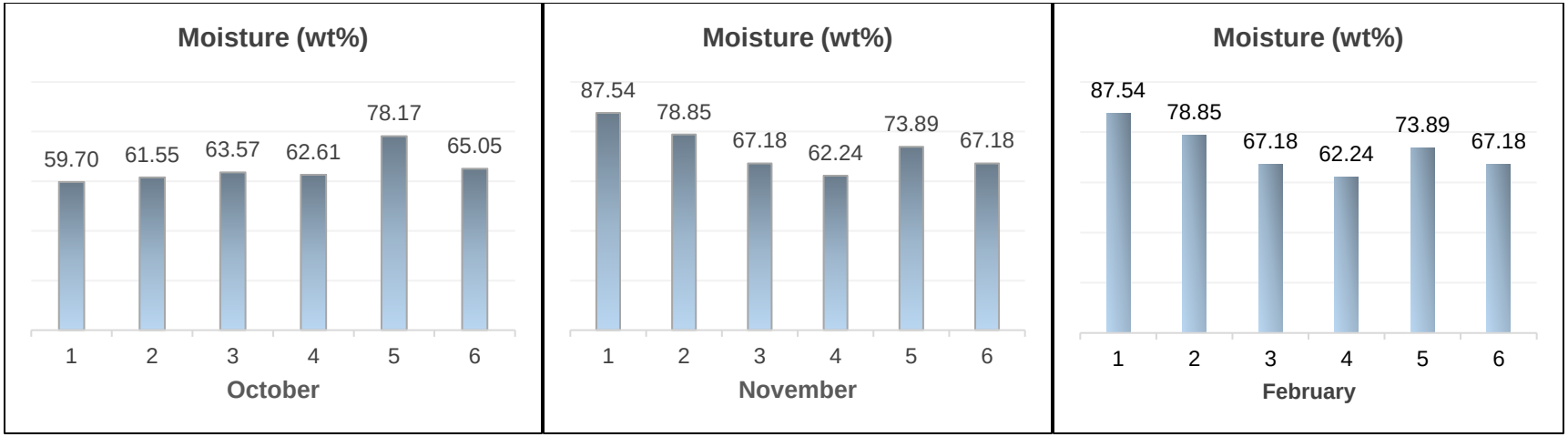


Figure 3-3: Moisture Content of Sample During October, November and February

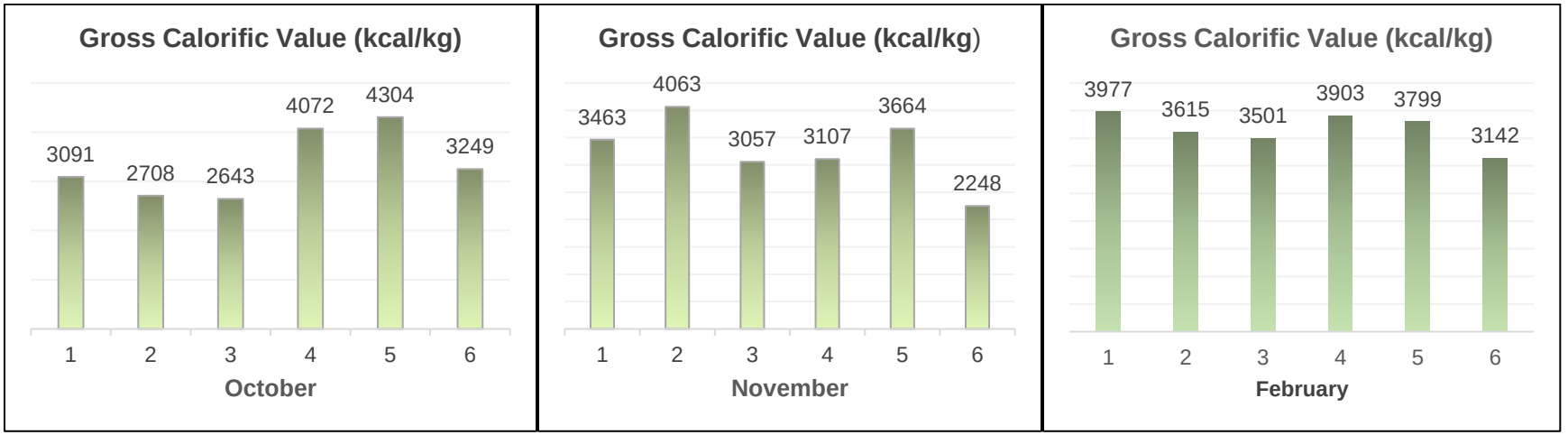


Figure 3-4: Gross Calorific Value of Sample During October, November and February

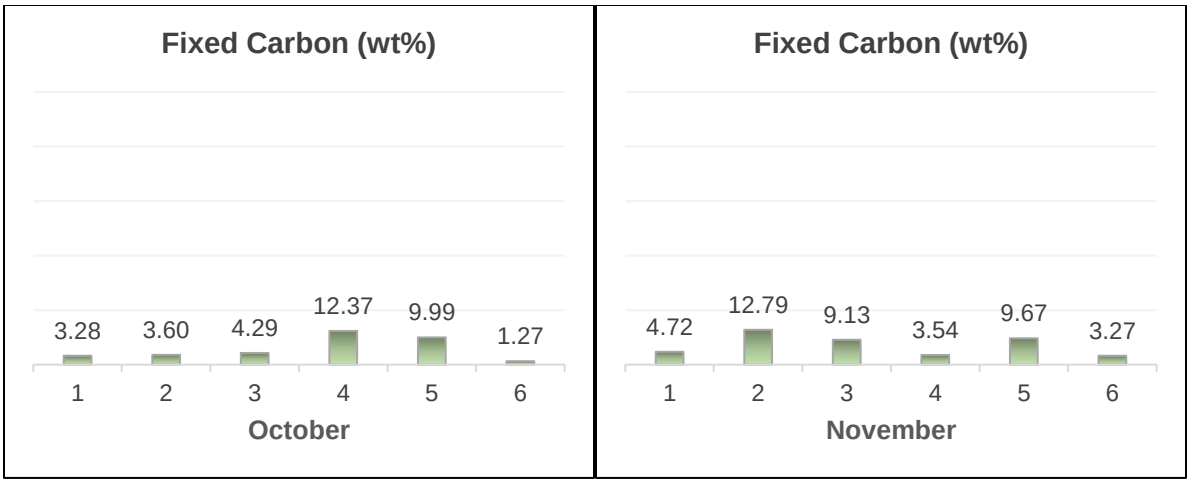


Figure 3-5: Fixed Carbon in Sample During October and November

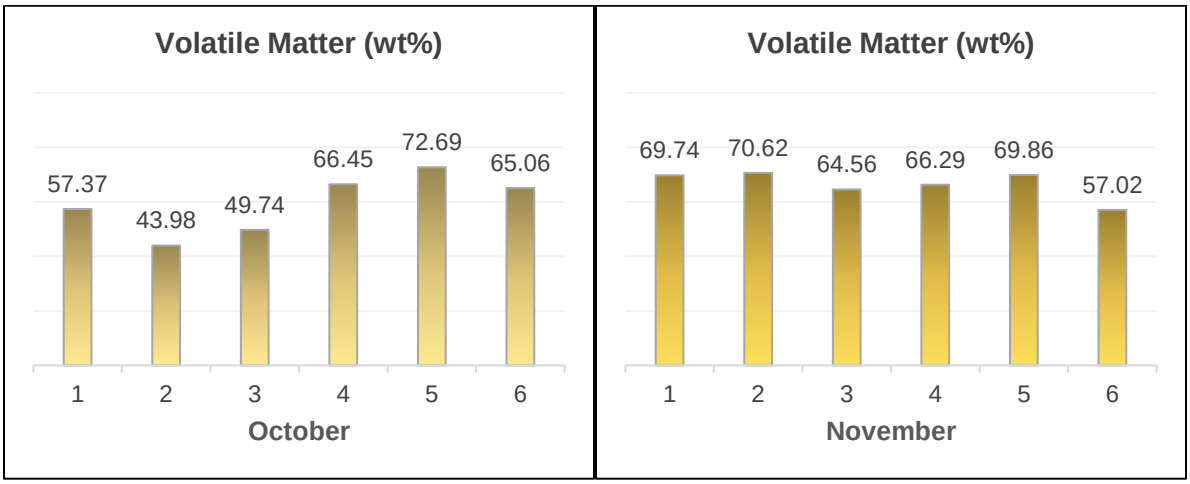


Figure 3-6: Volatile Matter in Sample During October and November

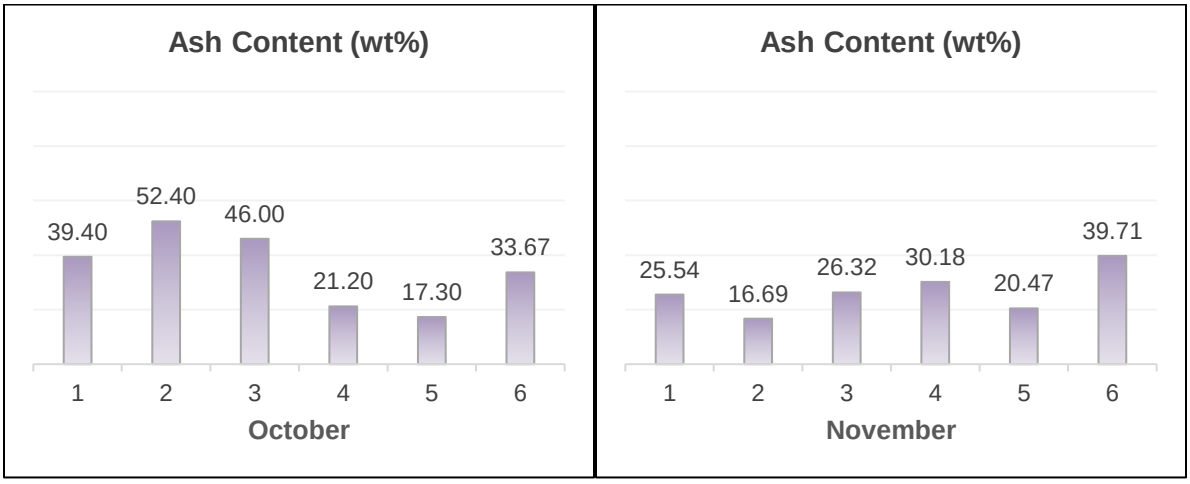


Figure 3-7: Ash Content of Sample During October and November

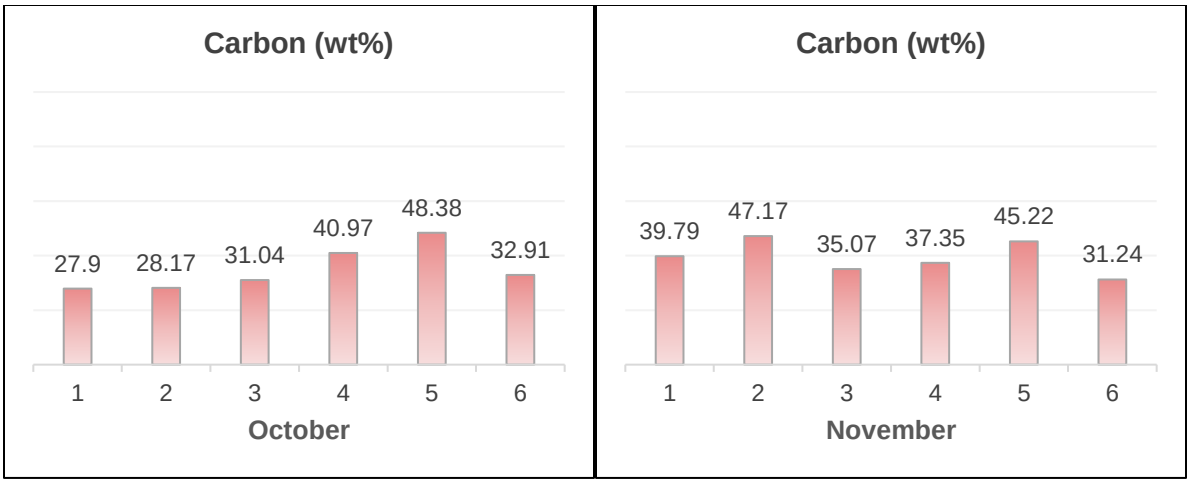


Figure 3-8: Carbon Content of Sample During October and November

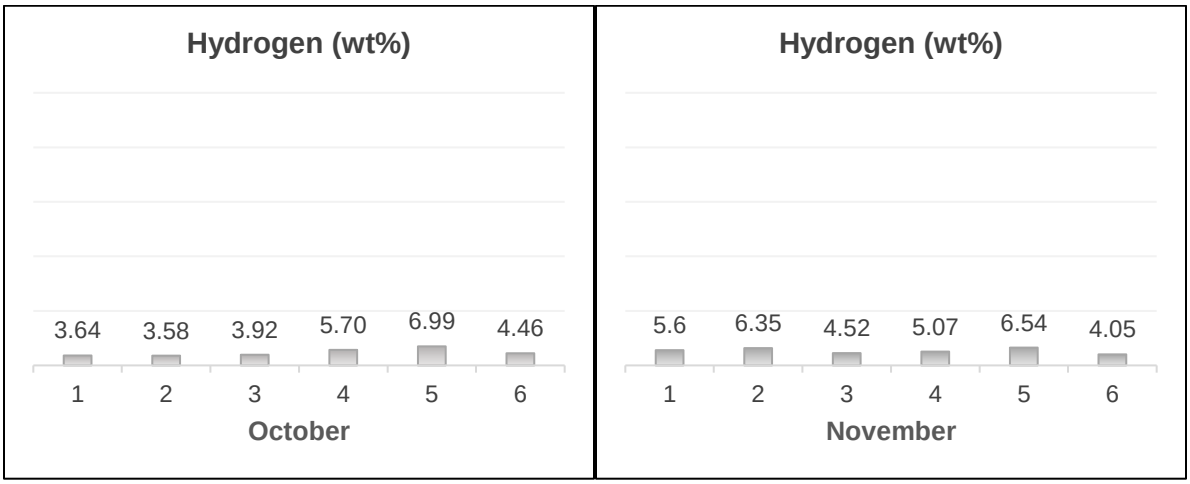


Figure 3-9: Hydrogen Content of Sample During October and November

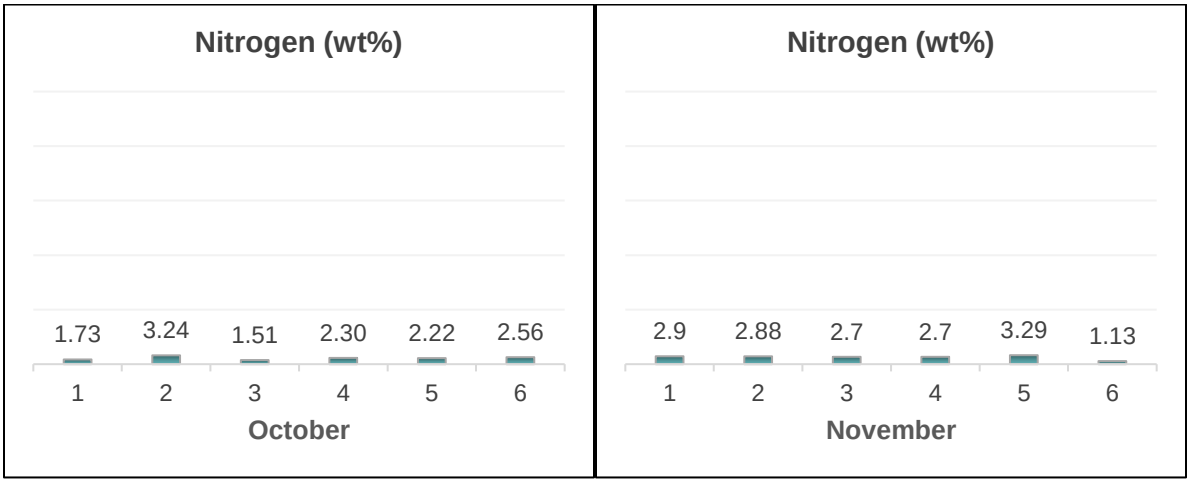


Figure 3-10: Nitrogen Content of Sample During October and November

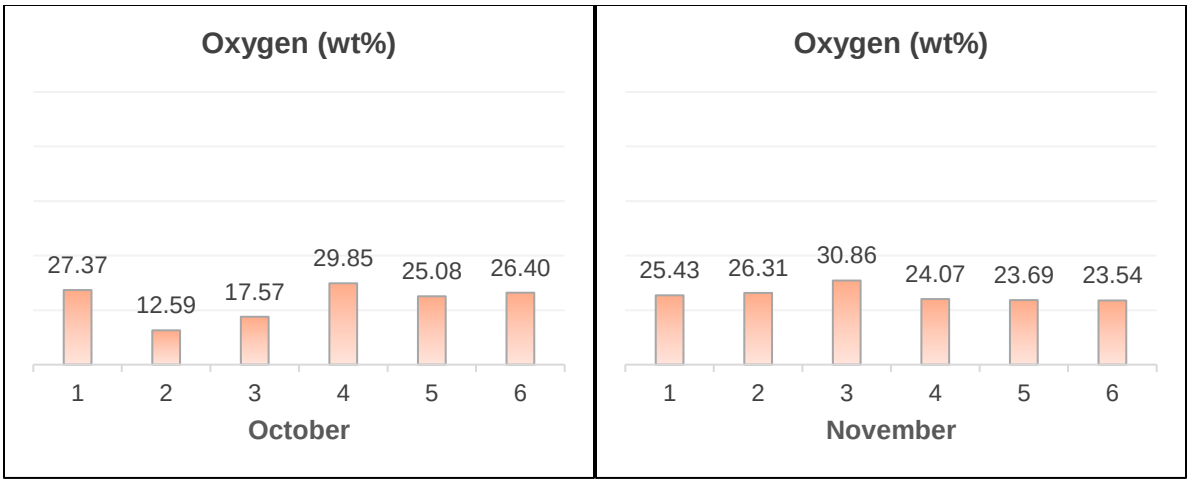


Figure 3-11: Oxygen Content of Sample During October and November

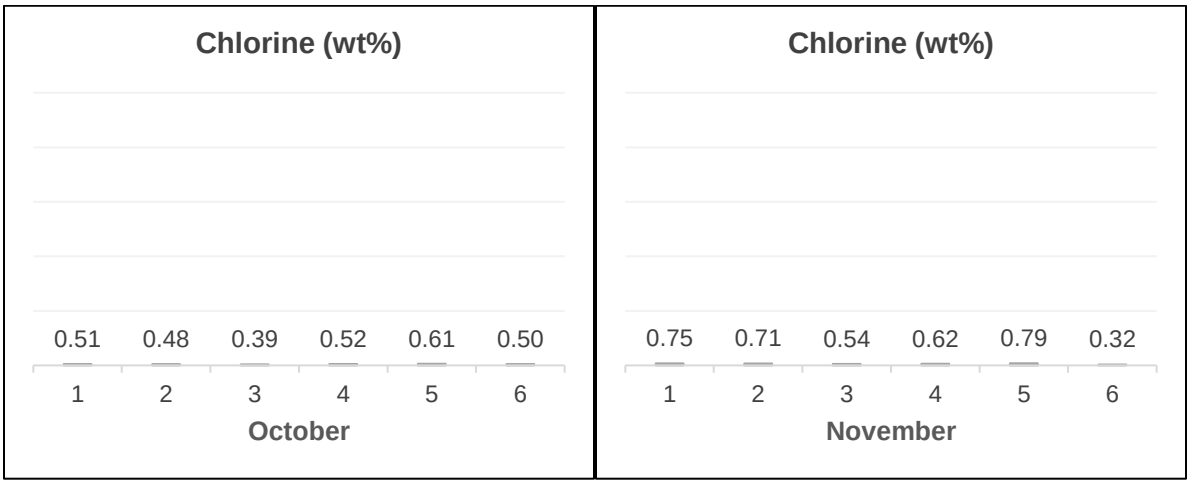


Figure 3-12: Chlorine Content of Sample During October and November

3.4 Waste Composition Analysis Average (waste composition was analyzed physically during sample collection at dumping places and STSs)

No.	Duration	Sample No.	Organic Matters including food &fruit wastes	Paper & Paper Products	Metals	Glass	Wood	Garden Waste (Tree trimming & straw)	Textile (Clothes)	Stone, Ceramic, Sand & Debris	Plastic& Polythene	Aluminum	Rubber	Hazardous (Household)	Medical Waste	Total weight by Percentage
1	October 2023	W01171023	86.92	1.1.85	0.05	0.20	0	0	2.40	0	8.49	0	0	0	0.10	100
2		W02171023	94.62	1.24	0	0.68	0	0	0	0	3.47	0	0	0	0.01	100
3		W03171023	76.92	1.98	1.94	2.56	0	0	5.70	0	9.27	0	0	0	0.99	100
4		W04171023	77.71	0	0	2.01	0	0.88	1.51	0	14.16	0	0	0	3.72	100
5		W05171023	81.58	2.67	3.75	0.19	1.58	0	9.99	0	0	0	0	0	0.24	100
6		W06171023	73.13	7.30	0.5	1.00	0	0	2.90	0	14.22	0	0.65	0	0.18	100
7	November 2023	W01031123	97.08	0.20	0	0	0	0	0.20	0	2.43	0	0	0	0.10	100
8		W02031123	89.92	1.04	0	0	0	0	1.14	0	7.81	0	0	0	0.10	100
9		W03031123	74.91	3.66	0	1.56	0	0	3.38	0	13.09	0	0	0	0.40	100
10		W04031123	80.84	2.71	0.56	4.41	0	0	2.85	0.93	6.45	0	0	0	1.51	100
11		W05031123	82.88	4.13	0.68	0.86	0	0	2.46	0	7.44	0	0.67	0	0.86	100
12		W06031123	73.13	7.30	0.50	1.00	0	0	2.90	0	14.22	0	0.65	0	0.18	100
13	February 2024	W01170224	92.00	3.00	0.10	0.50	0	0	0.5.0	0	3.60	0	0	0	0.30	100
14		W02170224	88.00	5.00	1	1	0	0	0	0	5.00	0	0	0	1.00	100
15		W03170224	79.45	3.50	0	0	0	0	1.62	0	9.88	0	0	5.56	0	100
16		W04170224	71.39	3.01	0	2.35	0	0	1.36	0	21.205	0	0	0	0.685	100
17		W05170224	69.71	4.02	0.32	2.02	0.00	0.00	7.26	0.00	13.37	0.00	0.00	0.00	3.28	100
18		W06170224	75.03	4.98	0.37	1.11	0.00	0.00	4.28	0.00	12.80	0.00	0.00	0.00	1.43	100
Average			**81.40**	**3.28**	**0.54**	**1.19**	**0.09**	**0.05**	**2.80**	**0.05**	**9.27**	**0.00**	**0.11**	**0.31**	**0.84**	**100**

Table 3-3: Waste Composition Analysis Data Average

The waste composition analysis across the three upazilas reveals distinct categories representing various materials in the samples. These categories encompass Organic Matters (including food and fruit wastes), Paper and Paper Products, Metals, Glass, Wood, Garden Waste (Tree trimming and straw), Textile (Clothes), Stone, Ceramic, Sand, and Debris, Plastic and Polythene, Aluminum, Rubber, Hazardous (Household), and Medical Waste.

Upon meticulous collection, segregation, and weighing of the samples in each category, the average percentage values provide insights into the prevailing waste composition in the studied areas. Notably, Organic Matters dominate the waste, constituting 81.40% of the composition. Following closely are Plastic and Polythene (9.27%), Textile (Clothes) (2.80%), and Paper and Paper Products (3.28%).

Conversely, Aluminum registers the lowest presence at 0.00%, highlighting its minimal contribution to the overall waste composition. The remaining categories contribute as follows: Glass (1.19%), Wood (0.09%), Garden Waste (Tree trimming and straw) (0.05%), Stone, Ceramic, Sand, and Debris (0.05%), Rubber (0.11%), Hazardous (Household) (0.31%), and Medical Waste (0.84%).

This breakdown facilitates a nuanced understanding of the predominant and marginal materials, guiding potential waste management strategies and resource allocation based on the specific composition patterns observed in the three upazilas.

Figure 3-13: Sample weight for lab test

Chapter 4 : Review of Previous Projects Regarding Waste to Energy and Circular Economy

Renewable energy in Bangladesh is basically a solar and cow dung-based biogas plant that has been scaling up across the country through individual, private and public initiatives.

Waste-to-energy is not a new technology all over the world but in Bangladesh there is no waste-to-energy plant yet. Initiatives from the Bangladesh government have been taken to set up the waste-to-energy plant by using municipal waste, one is at Amin Bazar under Dhaka North City Corporation and another in Narayangonj City Corporation (Source: BPDB's website)

Figure 4-1: Interaction about WtE inititative, now abandoned

Though a small waste-to-energy initiative was set up at Zinjira Union under Keraniganj Upazila in Dhaka district it was abandoned at the beginning because a low volume of waste had been collected for that plant. During the interaction with Keraniganj Upazila Parishad and Zinjira Union Parishad we came to know It was built by the initiatives of the BPDB.

Though waste-to-energy plants in Bangladesh are yet not found to operate, solid waste to the circular economy such as compost plants are constructed in many areas in Bangladesh by the government and non-government organizations.

The Local Government Engineering Department (LGED) of Bangladesh government has constructed the compost and biogas plant based on urban solid waste at Jessore municipality. This compost and biogas plant was designed by Waste Concern Consultants Ltd in collaboration with Hifab (a Swedish consulting firm) and it has been operating since 2016.

During physical observation of the compost plant and interaction with the Jessore municipality and compost plant operator following findings were captured.

Observed and interacted with workers about waste separation, the functionality of mechanical device

Waste separation technology does not work properly because of the huge quantity thin polyethene

The Box for composting does not work properly,

In the Maturation chamber, we find out there are some polythene

Figure 4-2 Compost plant in Jessore Municipality

Its compost production level is low. The biogas facility is not operating. Only one-third of the Composting Boxes are operating. Waste separation is the cause of failure because plastic and polythene interfere with the biological processes at biogas and composting facilities. People don't separate their waste at the source, which is the main barrier for composting and biogas plants. As a result, the biologically based biogas plant is shut down, and compost plant production is declining.

The Department of Environment (DoE) of Bangladesh has constructed compost plants to manage municipal waste at Rangpur and Mymensingh. These compost plants were designed by Waste Concern Ltd. In the beginning, all compost plants were operated by entrepreneurs and it was in full swing. During our physical observation, we found the compost plants at Rangpur and Mymensingh are abandoned. In interaction with the Mymensingh Municipality and Rangpur City Corporation, we came to know the causes of failure, and these are: this type of plant is not profitable because the operation cost is high. Why operation cost is high? that is waste separation is a great problem as waste is mixed with different types of thin polyethene. On the other hand, the market value of compost is not good to make it as profitable.

Tools for the plant is abandoned

The Composting Box for the plant is empty, no waste there

The Composting plant is abandoned

Figure 4-3 Compost plant in Mymensingh and Rangpur

Involvement of NGOs

- **Practical Action**

Practical Action Bangladesh is an international Non-profit, Non-governmental organization based in the UK. In Bangladesh, they have been working with urban waste management including faecal sludge management along with other interventions. Practical Action in collaboration with Faridpur municipality they have constructed a compost plant and faecal sludge management both are now operating. In addition, Practical Action Bangladesh took the initiative to construct the biogas plant (wet fermentation) with municipal waste and they constructed such type of plant at Gaibandha municipality in 2012. During the interaction with the Gaibandha municipality, local people, local NGO-Shinomul Mohila Samitee once operated this plant and Practical Action, we came to know that at the beginning this plant could supply cooking gas to 30 houses by pipeline. Municipality employees collect waste and waste from 1,003 residents of the municipality in exchange for Tk 40 per month in service fees, and they then dispose of it at the plant site to make biogas and manure. For Tk 600 a month, the municipality's entrepreneur (Shinomul Mohila Samitee) provides gas for cooking for five hours a day to 30 residential homes. During our field observation, we found this plant is completely abandoned which was operated only for 6 years (2012 to 2018). Why abandoned? Multiple reasons they replied- waste separation, thin polyethylene separation were challenges, poor management, withdrawal of grant funds from Practical Action etc.

- **WaterAid Bangladesh**

Two co-composting facilities have been built by the international NGO WaterAid Bangladesh and its partners-municipality and local NGOs in the municipalities of Shakipur under Tangail district and Saidpur under Nilphamari district. Here, treating the faecal sludge is the major goal, and to do so, they use municipal solid waste, particularly kitchen waste. When the co-compost plant locations were visited, both plants were still operational. These facilities are operational as a result of WaterAid's current financial support for their operation, which includes municipalities and NGOs. Because of financial assistance from NGOs, waste separation at the plant can be done easily and rightly.

Solid waste is to be separated manually

Underground composting box with cutting and rolling facilities

Composting for more aeration

Figure 4-4 Project of WaterAid Bangladesh in Shakipur and Saidpur municipality

Chapter 5 : Review of the Country's Policy, Strategy, and 8th Five-Year Plan

5.1 Nation-wide 3R Strategy

The principle of reducing waste, reusing and recycling resources and products is often called the "3Rs."

• Reducing means choosing to use items with care to reduce the amount of waste generated.

• Reusing involves the repeated use of items or parts of items which still have usable aspects.

• Recycling means the use of waste itself as resources. Waste minimization can be achieved in an efficient way by focusing primarily on the first of the 3Rs, "reduce," followed by "reuse" and then "recycle." The waste hierarchy refers to the "3Rs" i.e., reduce, reuse and recycle, which classify waste management strategies according to their desirability. The 3Rs are meant to be a hierarchy, in order of importance. The waste hierarchy has taken many forms over the past decade, but the basic concept has remained the cornerstone of most waste minimization strategies. The aim of the waste hierarchy is to extract the maximum practical benefits from products and to generate the minimum amount of waste.

The concept of minimizing waste impacts in terms of quantity or ill-effects, by reducing quantity of wastes, reusing the waste products with simple treatments and recycling the wastes by using it as resources to produce same or modified products is usually referred to as "3R". All in all, the 3Rs individually or collectively saves fresh resources exploitation, add value to the already exploited resources and very importantly minimizes the waste quantity and its ill effects. Waste minimization efficiency is stated to be better achieved applying 3Rs in a hierarchical order- Reduce, Reuse and Recycle.

GUIDING PRINCIPLES of 3R Strategy

The following principles are the core of the National 3R Strategy. The principles are based on well-established urban environmental management and service rendering norms and in line with key strategies and policies of Bangladesh.

- **Waste is a Resource**

Under this definition, traditionally 'valueless' streams of waste can be considered resources for a new tier of the economy. They can be recovered (or prevented from being lost) through greater efficiency and management at every stage of production and consumption.

- **Source Separation of Waste**

Separation of waste at source is of paramount importance in 3Rs initiative. However, recently it is observed that recyclables with economic value such as wastepaper, plastic, broken glass, metal etc., is not segregated and is thrown on the streets by people along with domestic/trade/institutional waste. By throwing such recyclable materials on the streets or into a common dustbin, the quality of recyclable materials deteriorates as it gets soiled by wet waste which is often contains even contaminated and hazardous waste. Without waste separation the composition of wastes will not be known and planning, designing and implementation of waste

management systems is not possible. Waste separation therefore is a key activity in any successful 3R initiative.

- **Selection of Appropriate and Affordable Technology**

Development and transfer of environmentally sound technologies for waste management and the 3Rs that are applicable in the context of the prevailing socioeconomic and climatic condition of the country through collaboration among stakeholders such as national governments, local governments, private sectors (including inter-industrial collaboration), consumers, manufactures, informal sectors and research bodies should be promoted.

- **Technology should be Emission Reducing**

Inefficient and dirty technology should be avoided and replaced by efficient and less Green House Gas (GHG) emitting technologies. A carbon project refers to a business initiative that receives funding because of the cut emission of GHGs (greenhouse gases) that will result.

- **Cleaner Production**

Cleaner production is the continual effort to prevent pollution; reduce the use of energy, water and material resources; and minimize waste in the production process. It involves rethinking products, product components and production processes to achieve sustainable production.

- **Product-Life Extension**

The concepts of product–life extension and the service economy go beyond all other industrial ecology approaches to closing the loop in industrial or consumer systems.

- **Substance, Product, or Technology**

To address resource efficiency, not only overarching legislation but also separate laws for specific products are needed. For each of these laws, it is necessary to set recycling targets, as well as roles and cost-sharing among relevant parties.

- **Industrial Symbiosis and By-Product Exchange**

The concept of industrial symbiosis, a key field of study and practice of industrial ecology, is based on this process of exchange and collaboration between or among firms, where one facility's waste (energy, water or materials) becomes another facility's feedstock.

- **Polluters Pay Principle and Take-Back Provisions**

Promote the polluter pays principle to make the party responsible for producing pollution responsible for paying for the damage done to the natural environment. The Polluter Pays Principle (PPP) is an environmental policy principle, which requires that the costs of pollution be borne by those who cause it.

- **Green Purchasing**

The selection and acquisition of such products and services that most effectively minimize negative environmental impacts over their life cycle is required to promote the procurement of Eco-Friendly Goods/Products (EFP) and services by the state and other entities.

- **Environmental Management System (EMS)**

Resource efficiency in a business or company can be significantly improved by establishing an Environmental Management System (EMS) with challenging and comprehensive objectives, effective indicators, and structures assuring rapid learning and response.

- **Public-Private Partnership**

Collaboration between public bodies, such as local authorities or central government, and private companies are referred to as a Public-Private Partnership (PPP). Because of the increasing cost of service and deteriorating standard of service rendered by the official workforce for various reasons, the element of public-private partnership is being introduced as recommended by numerous studies of the problem.

- **Collaboration with Scientific Research Bodies**

Collaboration with research bodies is very important to promote 3R. Scientific research institutes have the facilities and expertise to conduct research on appropriate technologies to promote recycling and recovery of waste. Once the technology is piloted and tested by the research and scientific bodies and proven for industrial-scale application, mass-scale production can be done by the private and public sectors.

- **Correspondence between Service Received and Payment Made**

For most urban services citizens receive, there is a direct correspondence between service received and payment made for it. Unfortunately, such correspondence is absent in the case of waste collection and disposal.

- **Supporting Informal Sector**

In Bangladesh, many waste pickers earn their livelihood from waste picking from the streets, dust bins and waste dumps. It is estimated that these waste pickers pick up many recyclables with economic value in the urban areas and pass it on to the recycling industries through 2-4 levels of intermediaries.

- **Gender Sensitive Approach**

A gender-sensitive approach and a clear commitment to gender equity and the empowerment of women are critical in the support of new initiatives in urban services and environmental protection; attention to gender can increase management effectiveness, avoid costly mistakes, and ensure equitable access to livelihoods, resources or benefits which makes available.

5.2 Country's Renewable Energy policy

The Renewable Energy Policy, 2008 of Bangladesh has been developed by the Power Division with multiple objectives related to RE implementation. The policy has laid the foundation of a

broader aim to increase and promote the utilization of RE in the local domain and helped the nation to increase its renewable energy.

Objectives

• Upgrade 'Renewable Energy Policy, 2008' to increase renewable energy contribution in the national power generation mix

• Promote appropriate, efficient and environment-friendly technology for the development of renewable energy

Country's 8th Five-Year Plan (2020-2025):

The Government is committed to building facilities for the treatment of waste. This can be complemented with tax rebates and financial incentives for the production of environmentally friendly products, including energy-efficient appliances, recycled materials, sustainable products etc. The Government will also be committed to establishing waste-based power plants which will produce electricity from solid waste and create economic incentives for both municipalities and private-sector waste management companies.

Introduction of Extended Producer Responsibility (EPR) Policy in Plastic Management: The uses of disposable plastic are increasing due to its low cost and multipurpose uses. Right now more than 10% of total mixed solid waste contains plastic. However, only 40% of total plastic is recycled and remaining 40% is used for landfill/dumped and 20% is dumped in to the water body.

Relevant rules, guidelines need to be functional, where collection, reduction, and recycling targets should be fixed. An exclusive fee system and percentage of product recyclability, proportion of recycled material in products should be established for betterment of the environment. 8th five-year plan will focus on the managing plastic pollution through EPR principle.

Improved Waste Management and Introduction of Circular Economy: Waste can be utilized as resource. It also considered as a great source of environmental pollution if not properly managed.

Improved waste management includes proper collection, segregation for reuse, recycles and environmentally sound disposal. Capacity building of concerned stakeholders, public awareness, strengthening monitoring and enforcement would be favorable for the improvement. In addition, relevant rules, guidelines should be put in place for better implementation. A circular economy approach would be an appropriate solution to this problem, which allows the materials constantly flow around a 'closed loop' system, rather than being used once and then discarded. Circular economy confirms the best use of recyclable items, which would result us several benefits such as resource efficiency, less waste generation, less landfill. Eventually, introducing circular economy for recyclable goods such as paper, metal, glass and plastic would create an employment opportunity if the business model ran sustainably. Government support such as capacity building, incentives, and creating a market through bridging the supply and demand might be required for initiating recycling, waste to compost/biogas as well as energy projects. 8th Five-Year Plan will focus on the fruitful application of improved waste management and the introduction of a circular economy for sustainable use of resources.

Chapter 6 : Proposal of Solid Waste Management Framework

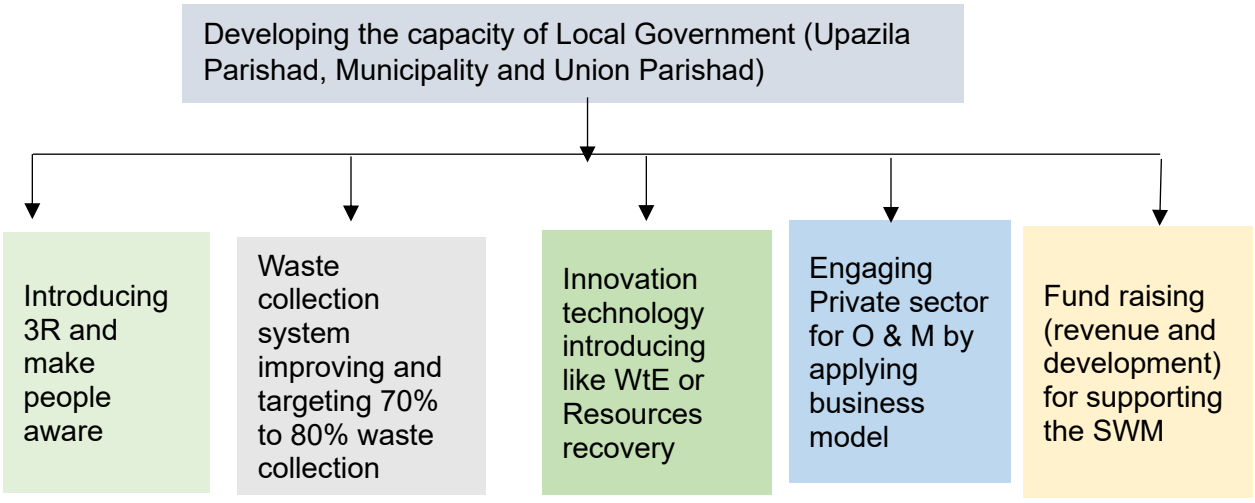
In this feasibility study, an analysis reveals that only 26% of the total waste (excluding industrial waste) in Keraniganj Upazila and Dohar Municipality is collected at the primary level using Rickshaw Vans. For the secondary level, trucks are employed to transport this waste to the dumping site. However, the waste collection percentage is significantly lower in Nawabganj Upazila, standing at a mere 0.6%.

The responsibility for managing municipal waste within its jurisdiction lies with Dohar Municipality, as per the Municipality Act 2009. To fulfill this responsibility, the municipality has established a human resources structure under the conservancy section, supported by a fleet of vehicles. Conversely, Upazila Parishad provides support to Union Parishads, which, under the Local Government (Union) Act 2009, receive lower priority for solid waste management. Consequently, Nawabganj Upazila Parishad and its Union Parishads tend to neglect solid waste management. In contrast, Keraniganj has adopted a different approach, with 26% of the total waste (excluding industrial waste) being collected through private sector engagement, supported by the provision of trucks and Rickshaw Vans.

The current solid waste management system faces challenges due to the limited use of trucks for collecting primary waste. Narrow roads necessitate the use of Rickshaw Vans, slower-moving vehicles, resulting in a poor waste collection rate. Illegal dumping is prevalent near water bodies and roadsides due to the inadequate waste collection rate, coupled with a lack of public awareness about environmental pollution and its consequences. The absence of a robust regulatory system exacerbates these challenges.

Of particular concern is the final dumping place, especially in Keraniganj, where waste is dumped at the roadside and mixed with water bodies, contributing to environmental degradation. The scarcity of land in Keraniganj is a critical issue, given its high value due to its proximity to Dhaka city.

Considering the challenges and aligning with the National 3R strategy, Renewable Energy Policy, 8th Five Year Plan, and Perspective Plan 2041, the Solid Waste Management Framework is proposed as follows:



Chapter 7 : Recommendation

The Solid Waste Management Rules, 2021 sets out the procedures for collecting, transporting, and disposing of solid waste. The laws reflect the government's willingness to make waste management system more sustainable by waste to energy and compost. In 2012, 3R strategy—reduce, reuse, and recycle for better waste management developed. Both Solid Waste Management Rules-2021 and 3R strategy guide the local government institution (municipality and Upazila) on how to waste to energy and waste to compost plant.

Aiming to improve the waste collection and transport system considering the issues raised during the feasibility survey, the local government should encourage households and waste generators to dispose of their waste at a fixed time when the vehicle is at their side. In these cases, such vehicles can be introduced to avoid secondary dumping places and waste transferring from rickshaw van to the truck. The local government can try to update their waste management policies to ensure more efficient operation and maintenance of the entire system.

As it has been seen people dump their waste at the roadside where there is no temporary dustbin as a result a nuisance environment has been created for passersby, shopkeepers and street people, such type of dustbin can be placed there which will help to increase the waste volume for collection and decreasing the environmental pollution as well. RCC-made permanent dumping is not user-friendly because it cannot be moved if needed. When people's behavior has been changing regarding waste dumping gradually these types of dustbins are to be replaced to another place

Dumping place and introducing innovation technology:

For reducing the dumping places and overcoming the land crises for dumping, Waste to Energy (WtE) is the best solution if it is feasible. To enhance the feasibility of Waste-to-Energy (WtE), it is necessary to increase the combustion materials. Therefore, waste collection should be

increased to 70%-80%. During waste management, municipal solid waste and hazardous waste should be handled separately as much as possible

Proposed Waste to Energy (WtE) Plant Site:

Following deliberations in the three upazilas—Keraniganj, Nawabganj, and Dohar—a proposal has emerged to establish a Waste-to-Energy (WtE) plant in the Suvaddya Union of Keraniganj. The chosen location offers existing electricity and water supply infrastructure, although a gas supply network is currently absent. Moreover, the site benefits from excellent road connectivity, ensuring minimal disturbance to residents and passers-by. Crucially, the site is immune to flooding. It's crucial to emphasize that the proposed site in the Suvaddya Union of Keraniganj presently does not serve as a dumping ground for waste.

Assessing the physical characteristics of the suggested site in the Suvaddya Union of Keraniganj, it features brick soling with additional available space. While there is no immediate land crisis, it's important to acknowledge that the site is located in a low-lying area, necessitating land development efforts.

Currently, the land earmarked for the Waste-to-Energy (WtE) plant is under government ownership and falls under the category of "Khas Land." Implementing the WtE facility on this land would involve legal procedures, yet it would not incur any financial cost for land acquisition.

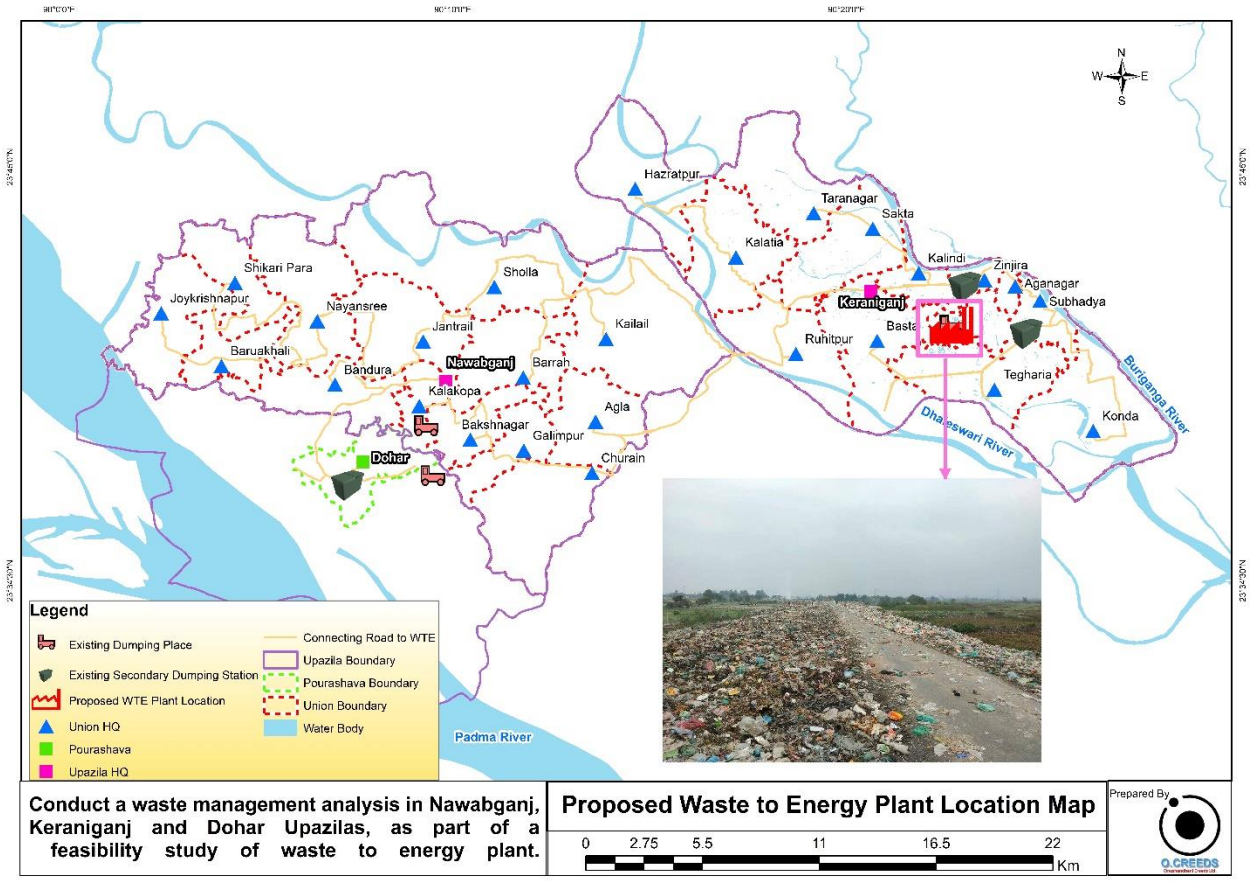


Figure 7-1: Proposed WtE Plant Location

To increase solid waste collection targeting 40% to 60% (250 MT to 380 MT each day), considering the proposed WtE plant site at Keraniganj the following is recommended.

ii) The establishment of a Secondary Waste Collection Station or Secondary Waste Transfer Station (STS) is mandated in at least one location within each union of Keraniganj Upazila and Nawabganj Upazila.

iii) To comprehensively cover the entire area, it is proposed to set up three STS within Dohar Municipality.

iv) Waste generated from primary sources such as households, kitchen markets, general markets, institutions, hospitals, and industries is to be systematically collected by the private sector, facilitated by entrepreneurs. This collection process will involve the utilization of both human-driven rickshaw vans and engine-driven vehicles. Visual representations of such vehicles are provided below for reference.

Figure 7-2: **Human driven Rickshaw Van**

Figure 7-3: **Engine driven vehicle (1-1.5 MT)**

v) Waste collection from primary sources is to be conducted directly. In cases where a dustbin is deemed necessary, the utilization of portable dustbins is recommended. These dustbins should be designed with two compartments or two separate units to facilitate the segregation of organic and inorganic waste. While achieving 100% waste separation through this method may not be feasible, it serves the purpose of reducing the burden and cost associated with waste separation in the event that the Waste-to-Energy (WtE) plant employs a biological process

vi) The transportation of solid waste directly from primary sources to the WtE plant site can be efficiently executed using engine-driven vehicles, eliminating the need for Secondary Waste Transfer Stations (STS).

vii) To convey solid waste from STS to the WtE plant, the use of specialized vehicles, such as the one depicted below, is recommended. These vehicles are designed to facilitate the seamless transportation of solid waste, ensuring an effective and streamlined process from the transfer stations to the WtE plant.

Based on the survey findings, the current waste generation in Keraniganj Upazila is 354 MT daily, while Nawabganj Upazila generates 203 MT, and Dohar Municipality produces 65 MT of waste on a daily basis. To achieve effective waste collection rates of 70% (248 MT) for Keraniganj Upazila, 20% (42 MT) for Nawabganj Upazila, and 90% (58 MT) for Dohar Municipality—amounting to a cumulative waste collection of 348 MT, the following vehicle support recommendations are outlined in the table below.

Table 7-1: Proposed Waste Collection for Keraniganj

Union	Approximate Waste generation per day (MT)	Road distance between Union HQ to Proposed WtE Plant Site, Keraniganj (km)	No. of Rickshaw Vans Required for 70% Waste collection	No. of Trucks Required for Waste Transportation from STS to WtE Plant
Subhadya	45	11	10	10 Trucks (3 Tons)
Aganagar	40	13	10	
Zinzira	40	15	10	
Kalindi	25	18	5	
Sakta	25	22	5	
Taranagar	25	26	5	
Hazratpur	20	35	5	
Kalatia	25	29	5	
Ruhitpur	20	27	5	
Basta	25	5	5	
Konda	40	20	10	
Tegharia	25	7	5	
Total	**355**		**80**	**10**
Existing			**60**	**4**
Additional Required			**20**	**6**

Table 7-2: Proposed Waste Collection for Nawabganj

Union	Approximate Waste generation per day (MT	Road distance between Union HQ to Proposed WtE Plant Site, Keraniganj (km)	No. of Rickshaw Vans Required for 20% Waste collection	No. of Trucks Required for Waste Transportation from STS to WtE Plant
Agla	10	38	3	3 Trucks
Churain	10	41	3	
Galimpur	14	43	4	
Baskshnagar	13	46	3	
Kailail	14	42	4	
Sholla	10	48	3	
Barrah	12	46	3	
Jantrail	16	52	4	
Kalakopa	40	51	5	
Bandura	12	59	3	
Nayansree	12	61	3	
Baruakhali	10	71	3	
Shikari Para	8	78	3	
Jaykrisnapur	12	74	3	
Total	**203**		**51**	
Existing			**2**	0
Additional Required			**49**	3

Table 7-3: Proposed Waste Collection for Dohar

Area	Approximate Waste generation per day (MT	Road distance between Union HQ to Proposed WtE Plant Site, Keraniganj (km)	No. of Rickshaw Vans Required for 90% Waste collection	No. of Trucks Required for Waste Transportation from STS to WtE Plant
Dohar Municipality	65	66	40	3 Trucks
Existing			8	1
Additional Required			**32**	**2**

Nearby Substations:

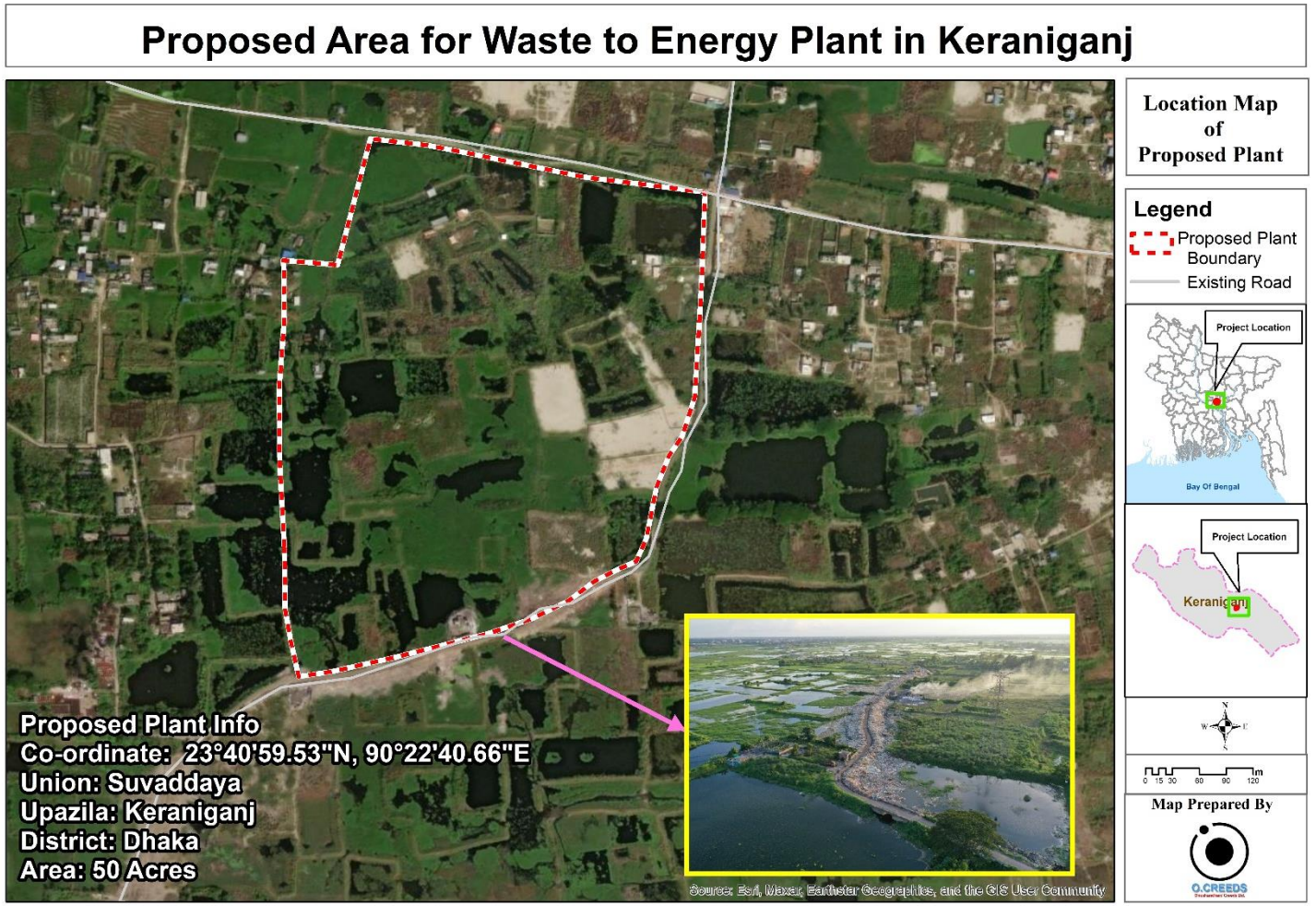


Figure 7-4: Nearby Substations

If a waste to energy plant is established, the energy produced will have to be transmitted to a substation. There are two existing substations in the nearby area. One is located 6 km away from the proposed site and the other is 2.5 km away. Another substation is being constructed 4 km from the proposed plant site.

Figure 7-5: Substation Situated 2.5 km from Proposed Site

Figure 7-6: Substation Situated 6 km from Proposed Site

Chapter 8 : Conclusion

In the designated study areas, a daily waste generation of 628.29 MT is observed, with a predominant 82.58% being organic matter. The waste composition breakdown indicates plastic at 7.35%, paper at 5.72%, glass at 0.9%, metal at 0.5%, electric and electronics at 0.2%, wood at 0.14%, medical waste at 1.3%, textile at 0.3%, and other types of waste at 1.01%. Limited road capacity hinders efficient waste collection, resulting in a suboptimal 26% collection rate for non-industrial waste using rickshaw vans. Improper waste disposal near water bodies and roadsides poses environmental risks, exacerbated by land scarcity in Keraniganj.

Addressing these challenges requires an efficient transportation system, community awareness campaigns, and optimization of waste collection management, offering potential resources for waste-to-energy plants.

Laboratory tests at Suvadda Dumping Site (FDS) reveal moisture content fluctuations from 87.5% in November to 59.70% in October, with a February dry period maintaining an average of 68.5%. Similarly, at Chakdighi Par Dumping Site (FDS), the highest gross calorific value was 4304 kcal/kg in October, while Ratan Chattar (TDS) exhibited the lowest at 2248 kcal/kg in November. February's dry period sees fluctuations between 3142 kcal/kg and 3977 kcal/kg, with an average of 3423 kcal/kg across all locations.

Upon conducting the final field visit and comprehensive laboratory tests on the collected samples, it was found that there is not a significant disparity in the moisture content between the dry and wet seasons. The analysis indicates a consistency in the composition of waste materials during both periods. Therefore, it can be concluded that the weight of waste collected is not notably affected by moisture content variations between the seasons. While challenges in waste collection may arise during the rainy season due to logistical difficulties, the moisture content itself does not contribute substantially to any significant tonnage differences.

According to FICHTNER's assessment, 1 MW of power can be generated from 106 MT of waste daily, with 2 to 3 MW requiring at least 300 MT of waste input. The proposed waste collection and transportation plan aims to collect 348 MT daily, including 70% for Keraniganj Upazila, 20% for Nawabganj Upazila, and 90% for Dohar Municipality. This involves additional vehicles and a workforce expansion.

The total daily waste production is 628.29 MT, excluding industrial waste. Dohar Municipality transports 26% of its generated 64.06 MT, Keraniganj Upazila transports 26% of its 353.53 MT, while Nawabganj Upazila transports 0.6% of its 210.7 MT.

Consultations with private sectors and municipal officials, along with an analysis of existing capacities, informed the proposed waste collection and transportation plan. This plan includes additional rickshaw vans and trucks for each area, aiming to achieve more effective waste collection rates. Finally, 39.9 MT of industrial waste is generated daily, with 31.72 MT of textile waste directed to the recycling market, while the remaining 8.18 MT is considered general waste, not included in the 628.89 MT figure.

Chapter 9 : Annexure

9.1 LAB TEST RESULTS

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BRTC Date: October 18, 2023
BRTC No: 1103-03520/ChE/2023-24

1103-03520/ChE/2023-24

Requested by:
Engr. Md. Shahadat Hossain
Managing Director & CEO
Onushandhani Creeds Ltd.

Client's Reference:
Ref: Client's Letter
Date: October 18, 2023

Sampling done by: ☐ ChE Department ■ The Client
Date of Sampling: N/A

Sample received: ■ Sealed ☐ Unsealed
Date of Testing: October 21- November 15, 2023

Table 1: Analysis Results of Waste Sample Supplied by Onushandhani Creeds Ltd (wet and dry basis).

SN	Test Parameters	Unit	Results			Methods Used
			W01171023	W02171023	W03171023	
1	Moisture, wb	wt%	62.61	78.17	65.05	ASTM E 790
2	Fixed Carbon, db		12.37	9.99	1.27	ASTM D 7582
3	Volatile matter, db		66.45	72.69	65.06	ASTM E 897
4	Ash content, db		21.20	17.30	33.67	ASTM E 830
5	Carbon, db		40.97	48.38	32.91	ASTM E777
6	Hydrogen, db		5.70	6.99	4.46	ASTM E777
7	Nitrogen, db		2.30	2.22	2.56	ASTM E 778
8	Sulphur, db		Nil	Nil	Nil	ASTM E 775
9	Oxygen, db		29.85	25.08	26.40	ASTM E 870
10	Chlorine, db		0.52	0.61	0.50	ASTM E 776
11	Gross calorific value, db	kcal/kg	4072	4304	3249	ASTM E 711

wb: wet basis, db: dry basis

Tests Supervised by:

22.11.2023

Dr. Kazi Bayzid Kabir
Professor
Department of Chemical Engineering, BUET

22/11/23

Dr. Kawnish Kirtania
Associate Professor
Department of Chemical Engineering, BUET

Countersigned by:

22/11/23

Dr. Shoeb Ahmed
BRTC Secretary & Professor
Department of Chemical Engineering, BUET

BUET Dhaka-1000

Disclaimer: Test was performed as per the samples were supplied (where applicable) and valid for exact identical samples. Wherever applicable, ChE department/BRTC BUET is not responsible for any error/omission occurred during the sampling by the client.

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Date of Testing: October 21- November 15, 2023

Table 1: Analysis Results of Waste Sample Supplied by Onushandhani Creeds Ltd (wet and dry basis).

SN	Test Parameters	Unit	Results			Methods Used
			W04171023	W05171023	W06171023	
1	Moisture, wb	wt%	59.70	61.55	63.57	ASTM E 790
2	Fixed Carbon, db		3.28	3.60	4.29	ASTM D 7582
3	Volatile matter, db		57.37	43.98	49.74	ASTM E 897
4	Ash content, db		39.40	52.40	46.0	ASTM E 830
5	Carbon, db		27.90	28.17	31.04	ASTM E 777
6	Hydrogen, db		3.64	3.58	3.92	ASTM E 777
7	Nitrogen, db		1.73	3.24	1.51	ASTM E 778
8	Sulphur, db		Nil	Nil	Nil	ASTM E 775
9	Oxygen, db		27.37	12.59	17.57	ASTM E 870
10	Chlorine, db		0.51	0.48	0.39	ASTM E 776
11	Gross calorific value, db	kcal/kg	3091	2708	2643	ASTM E 711

wb: wet basis, db: dry basis

Tests Supervised by:

22.11.2023

Dr. Kazi Bayzid Kabir
Professor
Department of Chemical Engineering, BUET

22/11/23

Dr. Kawnish Kirtania
Associate Professor
Department of Chemical Engineering, BUET

Countersigned by:

22/11/23

Dr. Shoeb Ahmed
BRTC Secretary & Professor
Department of Chemical Engineering, BUET

Disclaimer: Test was performed as per the samples were supplied (where applicable) and valid for exactly identical samples. Wherever applicable, ChE department/BRTC BUET is not responsible for any error/omission occurred during the sampling by the client.

Department of Chemical Engineering
Bangladesh University of Engineering and Technology (BUET)
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PABX: +880-2-55167100, 55167228-57 / 7535, 7326 Email: brtccochebuet@gmail.com

BRTC Date: November 4, 2023
BRTC No: 1103-04719/ChE/2023-24

1103-04719/ChE/2023-24

Requested by:
Engr. Md. Shahadat Hossain
Managing Director & CEO
ONUSHANDHANI CREEDS LTD.

Client's Reference:
Ref: Client's Letter
Date: November 4, 2023

Sampling done by: ☐ChE Department ■ The Client
Date of Sampling: N/A

Sample received: ■Sealed ☐ Unsealed
Date of Testing: November 5-21, 2023

Table 1: Analysis Results of Waste Sample Supplied by Onushandhani Creeds Ltd(wet and dry basis).

SN	Test Parameters	Unit	Results			Methods Used
			W01031123	W02031123	W03031123	
1	Moisture, wb	wt%	87.54	78.85	67.18	ASTM E 790
2	Fixed Carbon, db		4.72	12.79	9.13	ASTM D 7582
3	Volatile matter, db		69.74	70.62	64.56	ASTM E 897
4	Ash content, db		25.54	16.69	26.32	ASTM E830
5	Carbon, db		39.79	47.17	35.07	ASTM E777
6	Hydrogen, db		5.60	6.35	4.52	ASTM E777
7	Nitrogen, db		2.90	2.88	2.70	ASTM E 778
8	Sulphur, db		Nil	Nil	Nil	ASTM E 775
9	Oxygen, db		25.43	26.31	30.86	ASTM E 870
10	Chlorine, db		0.75	0.71	0.54	ASTM E 776
11	Gross calorific value,db	kcal/kg	3463	4063	3057	ASTM E711

wb: wet basis, db: dry basis

Tests Supervised by:

22.11.2023

Dr. Kazi Bayzid Kabir
Professor
Department of Chemical
Engineering, BUET

22/11/23

Dr. Kawnish Kirtania
Associate Professor
Department of Chemical
Engineering, BUET

Countersigned by:

22/11/23

Dr. Shoeb Ahmed
BRTC Secretary & Professor
Department of Chemical
Engineering, BUET

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Department of Chemical Engineering

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BRTC Date: November 4, 2023
BRTC No: 1103-04719/ChE/2023-24

1103-04719/ChE/2023-24

Requested by:
Engr. Md. Shahadat Hossain
Managing Director & CEO
ONUSHANDHANI CREEDS LTD.

Client's Reference:
Ref: Client's Letter
Date: November 4, 2023

Sampling done by: ☐ChE Department■ The Client
Date of Sampling: N/A

Sample received: ■Sealed ☐ Unsealed
Date of Testing: November 5-21, 2023

Table 1: Analysis Results of Waste Sample Supplied by Onushandhani Creeds Ltd(wet and dry basis).

SN	Test Parameters	Unit	Results			Methods Used
			W04031123	W05031123	W06031123	
1	Moisture, wb	wt%	62.24	73.89	67.18	ASTM E 790
2	Fixed Carbon, db		3.54	9.67	3.27	ASTM D 7582
3	Volatile matter, db		66.29	69.86	57.02	ASTM E 897
4	Ash content, db		30.18	20.47	39.71	ASTM E830
5	Carbon, db		37.35	45.22	31.24	ASTM E777
6	Hydrogen, db		5.07	6.54	4.05	ASTM E777
7	Nitrogen, db		2.70	3.29	1.13	ASTM E 778
8	Sulphur, db		Nil	Nil	Nil	ASTM E 775
9	Oxygen, db		24.07	23.69	23.54	ASTM E 870
10	Chlorine, db		0.62	0.79	0.32	ASTM E 776
11	Gross calorific value, db	kcal/kg	3107	3664	2248	ASTM E711

wb: wet basis, db: dry basis

Tests Supervised by:

22.11.2023

Dr. Kazi Bayzid Kabir
Professor
Department of Chemical
Engineering, BUET

22/11/23

Dr. Kawnish Kirtania
Associate Professor
Department of Chemical
Engineering, BUET

Countersigned by:

22/11/23

Dr. Shoeb Ahmed
BRTC Secretary & Professor
Department of Chemical
Engineering, BUET

Department of Chemical Engineering, Bangladesh University of Engineering & Technology BUET-1000

Disclaimer: Test was performed as per the samples were supplied (where applicable) and valid for exactly identical samples. Where applicable, ChE department/BRTC BUET is not responsible for any error/omission occurred during the sampling by the client.

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BRTC Date: 18 February, 2024
BRTC No: 1103-14582/ChE/23-24

1103-14582/ChE/23-24

Requested by:
Engr. Md. Shahadat Hossain
Managing Director
ONUSHANDHANI CREEDS LTD.

Client's Reference:
Ref: Client's Letter
Date: 18 February, 2024

Sampling done by: ☐ChE Department■ The Client
Date of Sampling: N/A

Sample received: ■Sealed ☐ Unsealed
Date of Testing: February 19-26, 2024

Project Name: "Conduct a Waste Management Analysis in Nawabganj, Keraniganj and Dohar Upazilas as a Part of Feasibility Study of Waste to Energy Plant".

Table 1: Analysis Results of Waste Sample Supplied by Onushandhani Creeds Ltd.

SN	Sample ID	Test Parameter			
		Moisture Content		Gross Calorific Value (db*)	
		Unit	Result	Unit	Result
1	W01170224	%(w/w)	75.59	Kcal/kg	3976.50
2	W02170224		65.78		3614.79
3	W03170224		70.60		3500.71
4	W04170224		60.80		3902.67
5	W05170224		70.22		3798.70
6	W06170224		62.54		3142.36

*db=dry basis

Tests Supervised by:

02/03/24

Dr. Kawnish Kirtania
Associate Professor
Department of Chemical Engineering, BUET

02.03.24

Zarin Tasnim Juthi
Lecturer
Department of Chemical Engineering, BUET

Countersigned by:

02/03/24

Dr. Shoeb Ahmed
BRTC Secretary&Professor
Department of Chemical Engineering, BUET

BUET Dhaka-1000

Disclaimer: Test was performed as per the samples were supplied (where applicable) and valid for exactly identical samples. Wherever applicable, ChE department/BRTC BUET is not responsible for any error/omission occurred during the sampling by the client.

9.2 Stakeholder Meetings

Report on Stakeholders Engagement Meeting in Keraniganj Upazila

Project Name: Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant

Date: Tuesday, 8 August, 2023

Time: 3:00 -4:00 PM (BDT)

Place: Conference Room, Keraniganj Upazila Parishad

Participants:

GIZ:

1. Abul Kalam Razib, Energy Advisor, Policy Advisory for Promoting Energy Efficiency and Renewable Energy (PAP), GIZ BD
2. Tamara-E-Tabasuum, Monitoring & Evaluation Specialist, GIZ BD
3. Md.Tanvir Masud, Energy Advisor, Policy Advisory for Promoting Energy Efficiency and Renewable Energy (PAP), GIZ BD

Keraniganj Upazila:

4. Shahin Ahmed, Chairman,Keraniganj Upazila Parishad
5. Moniza Khatun,Assistant Commissioner(Land), Keraniganj
6. Mst. Alo Begum, Upazila Vice Chairman
7. Freedom Fighter Hazi Abdul Ali, Chairman, Ruhitpur Union Parishad
8. Md. Mosarof Hosen, Chairman, Taranagar Union Parishad
9. Muhammad Saidur Rahman Chowdhary, Chairman, Konda Union Parishad
10. Alhajj Lat Mia, Chairman, Taghoria Union Parishad
11. Md. Jahangir Shah, Chairman, Aganagar Union Parishad
12. Md. Sakur Hosen, Chairman, Zinzira Union Parishad
13. Md. Anwar Hosen, Chairman, Hazratpur Union Parishad
14. Md. Emdad Hosen, Secretary, Hazratpur Union Parishad
15. Abdul Motaleb, Secretary, Kalatia Union Parishad
16. Md. Sultan Mahmud, Secretary, Taranagar Union Parishad
17. Md. Bashir Ahmed, Secretary, Kalindi Union Parishad
18. Gogan Chandra Das, Secretary, Basta Union Parishad
19. Nahid Hossain, Secretary, Zinzira Union Parishad
20. Mir Abdul Barek, Secretary, Union Parishad
21. Prakash Chandra Sarkar, Secretary, Konda Union Parishad
22. Md. Kalimullah, Secretary, Teghoria Union Parishad
23. Roni Mia, Aganagar Union Parishad
24. Md. Shawkat Ali, Shuvadda Union Parishad
25. MD. Abdul Goni, Sakta Union Parishad
26. Md, Sahabuddin, Member, Ward-7, Basta Union Parishad
27. MD. Roman, Member, Ward-5, Basta Union Parishad

28. Md. Ali Kashem, Member, Ward-6, Union Parishad
29. Md. Muntasir Rahman Milon, Member, Ward-4, Shuvadda Union Parishad
30. Salahuddin Liton, Social Worker, Keraniganj
31. Md. Abdul Gafar, Social Worker
32. Kazi Mahmudullah, Upazila Enginner, Keraniganj
33. Md. Abdul Barek, V.P. Keraniganj Model Thana Awami League
34. Dr. Mahbub Murshed, Medical Officier, Keraniganj Health Complex
35. Md. Sahabuddin, SAE, DPHE
36. Shahinur Islam, Upazila Sanitary & Food Inspector
37. Md. Tofayl Ahmad, Aps of Chairman, Keraniganj Upazila Parishad
38. Md. Shahedul Islam Mamun, C.A, Keraniganj Upazila Parishad
39. Md. Abul Kalam, Principal, Hamidur Rahman School & College,Keraniganj
40. Md. Shadin Sheikh, President, Keraniganj Garments' Somitte
41. Md. Muslim Dhali, Secretary, Keraniganj Garments' Somitte
42. Md. Selim, Representative, BSCIC, Keraniganj
43. Md. Rakibul Islam,Personal Photographer, Chairman, Keraniganj

O.creeds Ltd.:

44. Md. Zahid Hossain, Team Leader
45. Md. Fazlul Haque, Social Expert
46. Md. Jawadul Kabir Showdha, Enumerator
47. Md. Momtaz Uddin (Mamun), Enumerator
48. Md. Riaz Hossain, Enumerator

**10. Alhajj Lat Mia, Chairman, Taghoria Union Parishad signed twice that why in the Attendance Sheet of Keraniganj Stakeholders Engagement Meeting is 49*

Key points of discussion & decisions are given below:

Report on Stakeholders Engagement Meeting in Keraniganj Upazila for documentation of explanation of the methods of mobilization for the project to the stakeholders; getting the scope of participation from them and finalizing and informing the field visit plan in their concern areas under Project Titled- " "FEASIBILITY STUDY OF WASTE TO ENERGY PLANT PROJECT IN KERANIGANJ, NAWABGANJ, AND DOHAR UPAZILA" and discussing, upcoming challenges, ways to overcome those as well as further opportunities in solid waste management sector in Keraniganj Upazila.

Sl. No.	Name of the Activity	Key points of discussions	Decisions
1.	**Introductory session of Stakeholder Meet in Keraniganj Upazila**	Onushandhani Creeds (O.creeds) Ltd. and GIZ Expert team explained on: a) Project Background b) Reconnaissance Survey details c) Project next plan	Keraniganj Upazila officials appreciate and welcome the effort of GIZ & O.creeds Ltd. to the preparation of the WtE Project under BPDB.
	Present the current scenario of the Project	Onushandhani Creeds (O.creeds) Ltd. and GIZ Expert team presented and opened the discussion on: a) Clarifying the discussion agenda among the stakeholders (Field mobilization plan, data collection process, segmentation of waste etc.) b) Getting suggestions for finding the best possible way of establishing of Project work, especially mobilization to collect data c) Specifying the project activities to the stakeholders, such as-providing motivation for waste segregation during the survey period and follow-up waste management from waste collection to the final disposal site. d) Achieving the project goals, especially to collect accurate data from the survey	All the decision is defined in the discussion session
	Discussion on the Stakeholder advise	a) Upazila Engineer, Keraniganj; He expressed that Keraniganj has different scenarios in the context of waste, there are mainly two types of waste generated from Keraniganj; one is household waste & other is sewerage waste which includes industrial, garment and domestic waste. He requested to make a proper plan to collect and treat the waste. Furthermore, he shared his bitter experience in Tekerhat E-bazar, Rajoir Bandar project which also deals with waste to energy. Due to a lack of a details plan and the non-cooperation of stakeholders, the project has failed. b) Taranagar Union Chairman requested to separate the waste into different categories and review the previous feasibility study.	

Sl. No.	Name of the Activity	Key points of discussions	Decisions
		c) Konda Union Chairman shared his experience visiting the Jashore Waste Treatment Plant; its positive and negative sides. He strongly focuses on waste segregation at the primary level. d) Zinzira Union Chairman wanted to implement this project as soon as possible as his union residents are suffering from waste. a) Representative of BSCIC, Keraniganj shared the unplanned situation of BSCIC. Currently, there is no dumping place in it. So, he demanded a dumping place through this project and requested to raise public awareness. Lastly, he wanted this project a success. b) President of the Garments' Somittee expressed that fabric and polythene wastes are mainly produced by garments. If these wastes are collected properly, there will be a 15-20-ton waste collection from the garments. He also demanded a dumping place for the garment's waste and assured full cooperation from his side. Upazila Chairman said that he knew all details of this project as he was engaged in the previous feasibility study as well as this project from the first day. He wanted his Keraniganj Upazila neat and clean. He expressed that all his Upazila Officials are eager to help the feasibility study team and requested to implement the project quickly.	
	Concluding remarks and next plan	O.Creeds will initiate the survey in August and September 2023 at Keraniganj along with Nawabganj and Dohar with the support of BPDB and GIZ.	

Participants of Stakeholders Engagement Meeting in Keraniganj Upazila

Report on Stakeholders Engagement Meeting in Nawabganj Upazila

Project Name: Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant

Date: Wednesday, 16 August, 2023

Time: 3:00 -4:00 PM (BDT)

Place: Conference room,Nawabganj Upazila Parishad

Participants:

GIZ:

1. Abul Kalam Razib, Energy Advisor, Policy Advisory for Promoting Energy Efficiency and Renewable Energy (PAP), GIZ BD
2. Md.Tanvir Masud, Energy Advisor, Policy Advisory for Promoting Energy Efficiency and Renewable Energy (PAP), GIZ BD
3. Faisal Mahmud Khan,GIZ BD

Keraniganj Upazila:

4. Nasir Uddin Ahmed Jheelu, Chairman, Nawabganj Upazila Parishad
5. Dr. Md. Shahidul Islam, UH&FPO, Nawabganj Upazila Health Complex
6. Mohammad Arifur Rahman, Upazila Vice Chairman
7. Md.Ibrahim Khalil, Chairman, Kalakopa Union Parishad
8. Md. Mizanur Rahman Bhuyian, Chairman, Sholla Union Parishad
9. Reshma Akter, Chairman, Joykrishnapur Union Parishad
10. Md. Polash Chowdhury, Chairman, Nayansree Union Parishad
11. Azizur Rahman Bhuiyan, Chairman, Galimpur Union Parishad
12. Alimur Rahman Khan, Chairman, Shikaripara Union Parishad
13. Md. Abdul Wadud, Chairman, Bakshanagar Union Parishad
14. Shirin Chowdhury, Chairman, Agla Union Parishad
15. A.K.M. Moniruzzaman, Chairman, Jantrail Union Parishad
16. Bashir Ahmed, Chairman, Kailail Union Parishad
17. M.A.Bari Babul, Chairman, Baruakhali Union Parishad
18. MD.Mostafa Kamal, Secretary, Galimpur Union Parishad
19. Biraj Kumar Chakraborty, Secretary,Sholla Union Parishad
20. Motiul Alam,Secretary, Baruakhali Union Parishad
21. Md.Golam Mostafa, Secretary, Jantrail Union Parishad.
22. Md.Azizul Islam, Kalakopa Union Parishad
23. Md.Babul Hossain, Kailail Union Parishad
24. Md.Afzal Hossain, Barrah Union Parishad
25. Rabeya Akter, Nayansree Union Parishad
26. Md.Dalil Uddin, Bandura Union Parishad

27. Alamgir, Worker, Social Organization
28. Dr.Farhana Jahan, Officer, Upazila Livestock, Nawabganj
29. Md. Abdul Ahad Khan, SAE, LGED, Nawabganj
30. Sabbir, C.A, Nawabganj Upazila Parishad
31. Maksud Chowdhary, Headmaster, H.K High School, Nawabganj
32. Md.Abdus Salam, President, Clinic Malik Samittee
33. Mahsudur Rahman, Secretary, Jelu Parishad Market
34. Raj Kumar Mondal, Managing Director, Holy care Hospital
35. Fayez Al Mamun, Founder, Mukti Clinic
36. Abdul Awal, Newlife Clinic, Nawabganj
37. Md. Joynal Abedin, President, Nawabganj Bazar
38. Abul Kalam, Secretary, Nawabganj Bazar
39. Kalipada Halder, Convener, Bandura Bazar Committee
40. Shibly Dewan, Secretary, Bandura Bazar Committee
41. Md. Farhad Kabir, President, Bagmara Bazar Somittee
42. Md. Shahinuzaman Shahin, Journalist, Desher Kantho
43. Md. Mamun Sheikh, Nawabganj Upazila
44. Sheikh Md Rezaul Islam, Office Assistant, Nawabganj Upazila

O.creeds Ltd.:

45. Md.Shahadat Hossain, Waste Management Expert
46. Md.Atiqur Rahman, Environment Expert
47. Md. Fazlul Haque, Social Expert
48. Md. Jawadul Kabir Showdha, Enumerator
49. Md.Riaz Hossain, Enumerator
50. Md.Momtaj Uddin, Enumerator

Key points of discussions & decisions are given below:

Report on Stakeholders Engagement Meeting in Nawabganj Upazila for documentation of explanation of the methods of mobilization for the project to the stakeholders; getting the scope of participation from them and finalizing and informing the field visit plan in their concern areas under Project Titled- "Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant" and discussing, upcoming challenges, ways to overcome those as well as further opportunities in solid waste management sector in Nawabganj Upazila.

Sl. No.	Name of the Activity	Key points of discussions	Decisions
1.	**Introductory session of Stakeholder Meet in Keraniganj Upazila**	Onushandhani Creeds (O.creeds) Ltd. and GIZ Expert team explained on: a) Project Background b) Survey details c) Project next plan	Nawabganj Upazila officials appreciate and welcome the effort of GIZ & O.creeds Ltd. to prepare the WtE Project under BPDB.
	Present the current scenario of the Project	Onushandhani Creeds (O.creeds) Ltd. and GIZ Expert team presented and opened the discussion on: • Clarifying the discussion agenda among the stakeholders (Field mobilization plan, data collection process, segmentation of waste etc) • Getting suggestions for finding the best possible way of establishment of Project work, especially mobilization to collect data. • Specifying the project activities to the stakeholders, such as-providing motivation for waste segregation during survey period and follow up waste management from waste collection to final disposal site. • Achieving the project goals, especially to collect accurate data from survey.	All the decision is defined in the discussion session
	Discussion on the Stakeholder advise	a. Upazila Chairman, Nawabganj; He expressed that Nawabganj has not been any proper waste management system. All the wastes are thrown into either roadside vacant places or the adjacent Ishamoti River. This Ishamoti River is polluted by waste and garbage. Wastage cannot be thrown out into the river. The problem can be solved if this project can be implemented. He highlighted the mismanagement of Bazar and Hospital waste as a major source of Ishamoti and	

Sl. No.	Name of the Activity	Key points of discussions	Decisions
		tolal Nawabgnaj worst scenario, plus he requested all the stakeholders to come forward for support the Conduction a waste management analysis in Nawabganj, Upazila, as part of a feasibility study of waste to energy plant by BPDB, GIZ and O.Creeds Ltd. b. Tanvir Masud, Energy Advisor of GIZ said that a study was done at Keraniganj in the year of 2014-2015. The cost of per unit electricity was 42 TK. For this reason, the project was not implemented with high electricity production costs. But today's situation is different. We have been told by Government High Officials that waste management should be done first. In this project, the national consultant O.Creeds Ltd. will do the survey part and the International Consultant FICHTNER will select the proper technology according to the survey data. c. Md. Shahadat Hossain, Waste Management Expert said that about the details of Survey plan. He shared their experiences over 10-12 years in this Solid Waste Management Sector and upholds the issues of Developed World practice in regards Modern Waste Management. He was seeking each Stakeholders attention to make it a successful waste management analysis in Nawabganj, Upazila, as part of a feasibility study that can help to feasible implementation of energy from waste project. d. The Upazila Vice Chairman, Mohammad Arifur Rahman, focused the issue of Commercial viability of the current project and requesting all the Stakeholders to support the survey team as well the Project. e. Member of Bazar Committee sharded the current waste situation. There are a few	

Sl. No.	Name of the Activity	Key points of discussions	Decisions
		waste storage Dums in Bazar but most people don't use it. They throw the waste into the river. We must come forward to solve the issue collaboratively. f. Other Stakeholders also address the urge in development of Upazila Waste Management they are eg. Upazila Livestock officer, SAE of DPHE, Engineer of LGED, Hospital & Clinic representative, and Teacher, Journalist as well.	
	Concluding remarks and next plan	O.Creeds will initiate the survey in August and September 2023 at Nawabganj along with Keraniganj and Dohar with the support of BPDB and GIZ.	

Participants of Stakeholders Engagement Meeting in Nawabganj Upazila

Report on Stakeholders Engagement Meeting in Dohar Pourashava

Project Name: Feasibility study of Waste to energy plant project in Keraniganj, Dohar and Nawabganj Upazila.
Date: Thursday, 10 August, 2023
Time: 10:30 -11:30 AM (BDT)
Place: Dohar Municipality Building, Dohar.

Participants:

GIZ:

1. Md Jan E Alam, GIZ BD
2. Abul Kalam Razib, Energy Advisor, Policy Advisory for Promoting Energy Efficiency and Renewable Energy (PAP)
3. Shahbina Nahid Labib, GIZ BD

Dohar Pourashava:

4. Alamgir Hossain, Chairman, Dohar Upazila Parishad
5. Md. Almas Uddin, Mayor, Dohar Pourashava
6. Md. Shawkat Hossen, Councilor, Ward-2
7. Abdus Salam Shukur, Councilor, Ward-3
8. Papel Mahmud Nizam, Councilor, Ward-4
9. Md.Wasim, Councilor,Ward-5
10. Md. Humayun Kabir, Councilor, Ward-6
11. Md. Udoy Hossain, Councilor, Ward-7
12. Md.Zafar Iqbal,Councilor,Ward-8
13. Mohammad Murad, Councilor, Ward-9
14. Israt Jahan Banani, Councilor, Reserved Female Seat, Ward-1,2,3
15. Srity Akter, Councilor, Reserved Female Seat, Ward-4,5,6
16. Farida Yesmin, Councilor, Reserved Female Seat, Ward-7,8,9
17. Nasrin Jahan, Pouro Nirbahi Officer, Dohar Pourashava
18. M M Mamunur Rashid, Executive Engineer, Dohar Pourashava
19. Md.Shoriful Islam, Assistant Engineer, Dohar Pourashava
20. Abdus Salam, Sub-assistant Engineer (Civil), Dohar Pourashva
21. Beauty Akter, Sub-assistant Engineer (Civil), Dohar Pourashva
22. Md. Lutfar Rahman, Account Officer, Dohar Pourashva
23. Rokunuzzam, Conservancy Inspector, Dohar Pourashva
24. Md. Abul Kalam, Vaccinator, Dohar Pourashava
25. Md. Sohel Rana, Office Assistant, Dohar Pourashva
26. Kulsum Begum, Principal of Begum Ayesha Pilot Girls High School & College
27. S.M. Khaleque, Headmaster of Joypara Govt. Pilot High School
28. Md. Abul Hashem, President, Joypara Govt. Pilot High School
29. Md.Safiqul, President, Clinic Association
30. Md.Anwar Hossain, Sanitary Inspector, Upazila Health Complex, Dohar
31. Manik Mahmud, President, Joypara Market
32. Md.Nuru Molla, Secretary, Joypara Market

33. Md. Julhas Uddin, Secretary, Joypara East Market

O.creeds Ltd.:

34. Md. Shahadat Hossain, Waste Management Expert
35. Ahasanul Hoque, Data Analyst
36. Md. Fazlul Haque, Social Expert
37. Md. Momtaz Uddin (Mamun), Enumerator
38. Md. Riaz Hossain, Enumerator
39. Md. Jawadul Kabir Showdha, Enumerator
40. Md. Shariar Seam, Enumerator

Key points of discussions & decisions are given below:

Report on Stakeholders Engagement Meeting in Dohar Pourashava for documentation of E-explanation of the methods of mobilization for the project to the stakeholders; getting the scope of participation from them and finalizing and informing the field visit plan in their concern areas under Project Titled- " "FEASIBILITY STUDY OF WASTE TO ENERGY PLANT PROJECT IN KERANIGANJ, NAWABGANJ, AND DOHAR UPAZILA" and discussing, upcoming challenges, ways to overcome those as well as further opportunities in solid waste management sector in Dohar Pourashava.

Sl. No.	Name of the Activity	Key points of discussions	Decisions
1			
	Introductory session of Stakeholder Meet in Dohar Pourashava	Onushandhani Creeds (O.creeds) Ltd. and GIZ Expert team explained on: a) Project Background b) Reconnaissance Survey details c) Project next plan	Dohar Municipality and Upazila officials appreciate and welcome the effort of GIZ & O.creeds Ltd. to preparation of the WtE Project under BPDB.
	Present the current scenario of the Project	Onushandhani Creeds (O.creeds) Ltd. and GIZ Expert team presented and opened the discussion on: a) Clarifying the discussion agenda among the stakeholders (Field mobilization plan, data collection process, segmentation of waste etc) b) Getting suggestions for finding the best possible way of establishment of Project work, especially mobilization to collect data. c) Specifying the project activities to the stakeholders, such as-providing motivation for waste segregation during survey period and follow up waste management from waste collection to final disposal site. d) Achieving the project goals, especially to collect accurate data from survey.	All the decision is defined in the discussion session

Sl. No.	Name of the Activity	Key points of discussions	Decisions
	Discussion on the Stakeholder advise	a) President of the Joypara market expressed that waste become a disaster and curse for Dohar Pourashava. Odour and nuisance in the market area, especially under the bridge are becoming alarming pollution issue now a days. He conveyed the gratitude to the concerned organizations and authorities for the waste to energy initiative. b) Secretary, Joypara market requested to share the schedule of data collection so that they can cooperate accordingly. c) President, Clinic Association shared that "clinical waste becoming a major issue. This waste is different than the normal, surgical waste need extra management. So, requesting to address this major issue." d) Principal of Begum Ayesha Pilot Girls High School & College shared to the meeting that in her school the wastes are being buried under soil in school premises since there is no waste collection facilities from the schools. e) Headmaster of Joypara Govt. Pilot High School shared the view that Waste are different in types, converting waste to energy is good thing. The plant should be established in Dohar. It will not only generate energy but also keep the environment clean to make Dohar more liveable. f) Councillors' views were like Plastic, Paper and HH waste are generated in Dohar Pourashava. Every day 5–10-ton waste is being collected. If this project is successfully implemented, approx. 10-20-ton waste can be collected. And lastly, the feasibility team will receive total cooperation from them. g) Executive Engineer, Pourashava has request to add the Dohar Upazila area and assure full cooperation from his side. h) Mayor of Dohar Paurashava welcomed GIZ and O.CREEDS and thanked to BPDB, the minister and member of parliament for taking the WtE initiative. He mentioned	

Sl. No.	Name of the Activity	Key points of discussions	Decisions
		that the waste are being stored in different primary points in paurashava and upazila. GIZ-O.Creeds team will get the highest level of cooperation. i) Upazila Chairman welcomed the great initiative and thanks to all the authorities, BPDB, GIZ and O. Creeds. He urged to take thees message that they will cooperate in this feasibility assessment and thereafter. He requested to consider the full Dohar Upazila not only Paurashava, Dohar Upazila consit of 1 pourashava & 8 Unions containing 81 wards.	
	Concluding remarks and next plan	O.Creeds will initiate the survey in August and September 2023 at Dohar along with Keraniganj and Nawabganj with the support of BPDB and GIZ.	

Participants of Stakeholders Engagement Meeting in Dohar Pourashava

9.3 Questionnaire Forms of Surveys, KIIs, and FGDs

Kobo Format

Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plan (Household Survey)

1. Date and Time (তারিখ এবং সময়)

yyyy-mm-dd _____ hh:mm _____

2. Co-ordinate (কো অর্ডিনেট)

latitude (x.y °)

longitude (x.y °)

altitude (m)

accuracy (m)

Grid Number

3. Name of the respondent (উত্তরদাতার নাম:)

4. Address Details (ঠিকানার বিশদ বিবরণ:)

4a. Holding / House no. (হোল্ডিং / হাউস নম্বর:)

4b. Flat no. (ফ্ল্যাট নম্বর:)

4c. Moholla / Goli / Village (মহল্লা/গলি/গ্রাম:)

4d. Ward no. (ওয়ার্ড নং:)

4e. Post Office (ডাক ঘর:)

4f. Postal Code (পোস্ট কোড:)

4g. Upazila (উপজেলা:)

4h. District (জেলা:)

5. Sex (লিঙ্গ:)

- ◯ Male (পুরুষ)
- ◯ Female (মহিলা)
- ◯ Third Gender (তৃতীয় লিঙ্গ)

6. Age (বয়স:)

7. Marital Status (বৈবাহিক অবস্থা:)

- ◯ Married (বিবাহিত)
- ◯ Single (একক)
- ◯ Separated (বিচ্ছিন্ন)

8. Occupation (পেশা:)

- ☐ Government job (সরকারি চাকুরি)
- ☐ Private job (প্রাইভেট চাকুরি)
- ☐ Business (ব্যবসা)
- ☐ Self-employed (স্বনির্ভর)
- ☐ Agriculture (কৃষি)
- ☐ Laborer (শ্রমজীবী)
- ☐ Housewife (গৃহিণী)
- ☐ Unemployed (বেকার)
- ☐ Remittance (রেমিটেন্স)

9. Number of inhabitants in this household (পরিবারের সদস্য সংখ্যা:)

10. Status of the residential house (আবাসিক বাড়ির অবস্থা:)

- ◯ Pucca (পাকা)
- ◯ Semi-Pucca (আধা-পাকা)
- ◯ Katcha (কাচা)
- ◯ Jhupri (ঝুপড়ি)
- ◯ Tinshed (টিনশেড)

11. Highest Academic Status of the household member (পরিবারের সদস্যের সর্বোচ্চ একাডেমিক অবস্থা:)

- ◯ Illiterate (অশিক্ষিত)
- ◯ Primary School (প্রাথমিক বিদ্যালয় পর্যন্ত)
- ◯ SSC (মাধ্যমিক স্কুল সার্টিফিকেট)
- ◯ HSC (উচ্চমাধ্যমিক স্কুল সার্টিফিকেট)
- ◯ Graduate (স্নাতক)
- ◯ Masters and above (মাস্টার্স এবং তার উপরে)

12. Income Status of the Family (পরিবারের আয়ের অবস্থা:)

- ◯ Lower Income (Monthly Income less than 9,000.00 Taka) (নিম্ন মাসিক আয় ৯,০০০.০০ টাকার কম)
- ◯ Lower Middle Income (Monthly Income from 9,000.00 Taka to 35,000.00 Taka) (নিম্ন মধ্যম মাসিক আয় ৯,০০০.০০ টাকা থেকে ৩৫,০০০.০০ টাকা পর্যন্ত)
- ◯ Upper Middle Income (Monthly Income from 35,000.00 Taka to 110,000.00 Taka) (উচ্চ মধ্যম মাসিক আয় ৩৫,০০০.০০ টাকা থেকে ১,১০,০০০.০০ টাকা পর্যন্ত)
- ◯ High Income (Monthly Income is more than 110,000.00 Taka) (উচ্চ মাসিক আয় ১,১০,০০০.০০ টাকার বেশি)

13. Who is responsible for disposing of the waste from this household? (পরিবারের বর্জ্য অপসারণ করার দায়িত্ব কার?)

- ◯ The head male member of the household (পরিবারের প্রধান পুরুষ সদস্যের)
- ◯ Housewife (গৃহিণী)
- ◯ House maid (বাড়ির কাজের মেয়ে)
- ◯ Young male or female members (তরুণ পুরুষ বা মহিলা সদস্য)
- ◯ Children (শিশুদের)
- ◯ Mixed (মিশ্র)

14. How is the waste stored in this household? (পরিবারের বর্জ্য কিভাবে জমা করা হয়?)

- ◯ Bin or bucket (বিন বা বালতি)
- ◯ Plastic bags (প্লাস্টিকের ব্যাগ)
- ◯ Paper or other type of bag (কাগজ বা অন্য ধরনের ব্যাগ)
- ◯ Others (অন্যান্য)

Others (অন্যান্য)

15. How much waste is generated daily in this household?: ..... kg (এই পরিবারে প্রতিদিন কত কেজি বর্জ্য তৈরি হয়?)

16. What is the composition of the waste generated by this household on the surveyed day? (সমীক্ষার দিনে এই পরিবারের দ্বারা উৎপন্ন বর্জ্যের গঠন কি?)

16a. Amount of Organic waste .....% of total waste (by weight) (জৈব বর্জ্যের পরিমাণ .....% মোট বর্জ্যের শতকরা হার (ওজন অনুসারে))

16b. Amount of Plastic .....% of total waste (by weight) (প্লাস্টিকের পরিমাণ .....% মোট বর্জ্যের শতকরা হার (ওজন অনুসারে))

16c. Amount of Glass .....% of total waste (by weight) (কাচের পরিমাণ .....% মোট বর্জ্যের শতকরা হার (ওজন অনুসারে))

16d. Amount of Metal .....% of total waste (by weight) (ধাতুর পরিমাণ .....% মোট বর্জ্যের শতকরা হার (ওজন অনুসারে))

16e. Amount of Paper and packaging.....% of total waste (by weight) (কাগজ এবং প্যাকেজিংয়ের পরিমাণ .....% মোট বর্জ্যের শতকরা হার (ওজন অনুসারে))

16f. Electrical and Electronic waste .....% of total waste (by weight) (বৈদ্যুতিক এবং ইলেকট্রনিক বর্জ্য ..... % মোট বর্জ্যের শতকরা হার (ওজন অনুসারে))

16g. Medicine and medical waste .....% of total waste (by weight) (ওষুধ এবং চিকিৎসা বর্জ্য .....% মোট বর্জ্যের শতকরা হার (ওজন অনুসারে))

16h. Amount of Fabric and textile waste....% of total waste (by weight)(ফ্যাব্রিক এবং টেক্সটাইল বর্জ্য....মোট বর্জ্যের%(ওজন অনুসারে))

16i. Amount of Wooden and furniture waste....% of total waste (by weight)(কাঠের এবং আসবাবপত্রের বর্জ্য....মোট বর্জ্যের%(ওজন অনুসারে))

16j. Amount of Other waste .....% of total waste (by weight) (অন্যান্য বর্জ্যের পরিমাণ ..... মোট বর্জ্যের শতকরা হার (ওজন অনুসারে))

17. On which day does this household generate the highest amount of waste? (কোন দিনে এই পরিবারটি সর্বাধিক পরিমাণ বর্জ্য তৈরি করে?)

- ◯ Friday (শুক্রবার)
- ◯ Saturday (শনিবার)
- ◯ Sunday (রবিবার)
- ◯ Monday (সোমবার)
- ◯ Tuesday (মঙ্গলবার)
- ◯ Wednesday (বুধবার)
- ◯ Thursday (বৃহস্পতিবার)

18. Which day does this household generate the lowest amount of waste? (কোন দিন এই পরিবারটি সর্বনিম্ন পরিমাণ বর্জ্য উৎপন্ন করে?)

- ◯ Friday (শুক্রবার)
- ◯ Saturday (শনিবার)
- ◯ Sunday (রবিবার)
- ◯ Monday (সোমবার)
- ◯ Tuesday (মঙ্গলবার)
- ◯ Wednesday (বুধবার)
- ◯ Thursday (বৃহস্পতিবার)

19. Is this household enrolled in any primary waste collection services? (এই পরিবারটি কি কোন প্রাথমিক বর্জ্য সংগ্রহের পরিসেবায় নথিভুক্ত?)

- ◯ Yes (হ্যাঁ)
- ◯ No (না)

20. From where does the primary waste collection service provider collect waste from this household? (প্রাথমিক বর্জ্য সংগ্রহ পরিসেবা প্রদানকারী কোথা থেকে এই পরিবারের বর্জ্য সংগ্রহ করে?)

- ◯ Doorstep (ঘরের সামনে থেকে)
- ◯ Ground level of the building (বাসার নিচ তালা থেকে)
- ◯ Outside of the building (ভবনের বাইরে থেকে)

21. How does the primary waste collection service provider collect waste from this household? (প্রাথমিক বর্জ্য সংগ্রহ পরিসেবা প্রদানকারী কীভাবে এই পরিবার থেকে বর্জ্য সংগ্রহ করে?)

- ◯ Rickshaw van service (রিকশা ভ্যান সার্ভিস)
- ◯ Hand driven trolley (হাতে চালিত ট্রলি)
- ◯ Bucket (বালতি)
- ◯ Others (অন্যান্য)

22. What is the monthly fee for the current primary waste collection service? (বর্তমান প্রাথমিক বর্জ্য সংগ্রহ পরিসেবার জন্য মাসিক ফি কত?)

- 0-50 Taka (০-৫০ টাকা)
- 51-100 Taka (৫১-১০০ টাকা)
- 101 Taka - 200 Taka (১০১ টাকা - ২০০ টাকা)
- More than 200 Taka (২০০ টাকার বেশি)

23. If the household is not subscribed to any primary waste collection service, how is the waste disposed of from this household? (যদি পরিবারটি কোনও প্রাথমিক বর্জ্য সংগ্রহ পরিসেবার সদস্য না হয়ে থাকে, তাহলে এই পরিবারের বর্জ্য কীভাবে অপসারণ করা হয়?)

- Dispose of waste to the street side (রাস্তার পাশে বর্জ্য ফেলে)
- Throwing waste intorivers/canals/ water bodies /lowlands, etc. (নদী/খাল/জলাশয়/নিচু জমি ইত্যাদিতে বর্জ্য নিক্ষেপ করে।)
- Dispose of waste in spaces between two buildings (দুটি বিল্ডিংয়ের মধ্যবর্তী স্থানে বর্জ্য ফেলে)
- Dispose of waste in playgrounds/ open spaces/ mosques/ markets/ other public places (খেলার মাঠ/খোলা জায়গা/ মসজিদ/বাজার/অন্যান্য পাবলিক প্লেসে বর্জ্য ফেলে)
- Dispose of waste in dustbin/ container/ mini or secondary transfer station/ etc. (ডাস্টবিন/কন্টেইনার/মিনি বা সেকেন্ডারি ট্রান্সফার স্টেশন/ইত্যাদিতে বর্জ্য ফেলে।)
- Other places (অন্যান্য জায়গা)

24. If the household is not subscribed to any primary waste collection service, when is the waste disposed of from this household? (যদি পরিবারটি কোনও প্রাথমিক বর্জ্য সংগ্রহ পরিসেবার সদস্য না হয়ে থাকে, তাহলে এই পরিবারের বর্জ্য কখন অপসারণ করা হয়?)

- 12:00 pm to 06:00 pm (দুপুর ১২:০০ টা থেকে সন্ধ্যা ০৬:০০ টা পর্যন্ত)
- 06:00 pm to 12:00 am (সন্ধ্যা ০৬:০০ টা থেকে রাত ১২:০০ টা পর্যন্ত)
- 12:00 am to 06:00 am (রাত ১২:০০ টা থেকে সকাল ০৬:০০ টা পর্যন্ত)
- 06:00 am to 12:00 pm (সকাল ০৬:০০ টা থেকে দুপুর ১২:০০ টা পর্যন্ত

25. The household stores the amount of waste for the purpose of selling and reusing, both by themselves and others, rather than disposing of it. (এই পরিবার নিজেদের বা অন্যদের দ্বারা বিক্রয় এবং পুনঃ ব্যবহারের জন্য বর্জ্য জমা করে কি?)

25a. PET and other Plastic waste..... Kg/month (পিইটি এবং অন্যান্য প্লাস্টিক বর্জ্য..... কেজি/ মাস)

_____

25b. Electrical and Electronic waste ..... Kg/month (বৈদ্যুতিক এবং ইলেকট্রনিক বর্জ্য ..... কেজি/মাস)

_____

25c. Paper and packaging waste ..... Kg/month (কাগজ এবং প্যাকেজিং বর্জ্য ..... কেজি/মাস)

_____

25d. Fabric and Textile waste ..... Kg/month (কাপড় এবং টেক্সটাইল বর্জ্য ..... কেজি/মাস)

_____

25e, Metal waste ..... Kg/month (ধাতব বর্জ্য ..... কেজি/মাস)

_____

25f. Glass and ceramic waste ..... Kg/month (গ্লাস এবং সিরামিক বর্জ্য ..... কেজি/মাস)

_____

25g. Wooden and furniture waste..... Kg/month (কাঠের এবং আসবাবপত্রের বর্জ্য..... কেজি/মাস)

_____

26. Name of the Surveyor (সার্ভেয়ারের নাম:)

_____

Hospital Survey

Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant (Hospital Waste Generation)

1. Date and Time (তারিখ এবং সময়)

yyyy-mm-dd _____ hh:mm _____

2. GPS Coordinate (কো অর্ডিনেট)

latitude (x.y °)

longitude (x.y °)

altitude (m)

accuracy (m)

3. Name of Hospital: (হাসপাতালের নাম:)

4. Type of Hospital (হাসপাতালের ধরন)

- [ ] Medical College Hospital (মেডিকেল কলেজ হাসপাতাল)
- [ ] General Hospital (জেনারেল হসপিটাল)
- [ ] Clinic (ক্লিনিক)
- [ ] Diagnostic Centre (ডায়াগনস্টিক সেন্টার)
- [ ] Others (অন্যান্য)

Others (অন্যান্য)

5. How many beds are in this hospital? (এই হাসপাতালে শয্যা সংখ্যা কত?)

6. Occupancy rate: (হাসপাতালে ভর্তির হার:)

_____

7. Patient category: (রোগীর বিভাগ:)

- ◯ In Patient (আভ্যন্তরীণ বিভাগ)
- ◯ Out Patient (বহির্বিভাগ বিভাগ)
- ◯ Both (উভয় বিভাগ)

8. Address Details (ঠিকানার বিশদ বিবরণ:)

8a. Holding / House no.: (হোল্ডিং / হাউস নম্বর:)

_____

8b. Floor no.: (ফ্ল্যাট নম্বর:)

_____

8c. Moholla / Goli / Village: (মহল্লা/গলি/গ্রাম:)

_____

8d. Ward no.: (ওয়ার্ড নং:)

_____

8e. Post Office: (ডাক ঘর:)

_____

8f. Postal Code: (পোস্ট অফিসের নাম্বার:)

_____

8g. Upazila: (উপজেলা:)

_____

8h. District: (জেলা:)

_____

8i. Name of the respondent: (উত্তরদাতার নাম:)

_____

8j. Designation: (পদবী)

_____

9. Sex: (লিঙ্গ:)

- ◯ Male (পুরুষ)
- ◯ Female (নারী)
- ◯ Third Gender (তৃতীয় লিঙ্গ)

10. Age (বয়স)

_____

11. What is the total number of employees? (মোট কর্মীর সংখ্যা কত?)

_____

12. How many people visit this hospital every day on average? (প্রতিদিন গড়ে কতজন লোক এই হাসপাতালে আসেন?)

_____

13. What is the daily amount of general waste generated? (দৈনিক কত কেজি সাধারণ বর্জ্য উৎপন্ন হয়?)

_____

14. What is the daily amount of pathological waste generated? (প্রতিদিন কত কেজি প্যাথলজিক্যাল বর্জ্য উৎপন্ন হয় ?)

_____

15. What is the daily amount of sharp waste generated? (দৈনিক কত কেজি ধারালো বর্জ্য উৎপন্ন হয়?)

_____

16. What is the daily amount of infectious waste generated? (সংক্রামক বর্জ্যের দৈনিক পরিমাণ কত কেজি?)

_____

17. What is the daily amount of chemical waste generated? (দৈনিক কত কেজি রাসায়নিক বর্জ্য উৎপন্ন হয়?)

_____

18. What is the daily amount of radioactive waste generated--------kg? (দৈনিক কি পরিমাণ তেজস্ক্রিয় বর্জ্য উৎপন্ন হয়?)

_____

19. What is the present waste management system in the hospital? (হাসপাতালের বর্তমান বর্জ্য ব্যবস্থাপনার ধরন কেমন?)

_____

20. Are there different color-coded covered waste bins for different types of waste? (ভিন্ন ভিন্ন রঙের আবর্জনার বিন আছে কি?)

- ◯ Yes (হ্যাঁ)
- ◯ No (না)

21. Is the waste produced purified/treated? (উৎপন্ন বর্জ্যের পরিশোধন/ট্রিটমেন্ট করা হয় কি?)

- ◯ Yes
- ◯ No

22. Is there any leakage of hazardous waste during the collection and transportation frm the source to the designated clinical waste treatment Centre? (বিপজ্জনক বর্জ্যের উৎস থেকে সংগ্রহ এবং নির্ধারিত ক্লিনিকাল বর্জ্য শোধনাগারে পরিবহনের সময় কোন প্রকার লিকেজ বা নিঃসরন হয় কি?

- ◯ Yes (হ্যাঁ)
- ◯ No (না)

23. Which category is exposed to the environment at what amount..... kg? (কোন শ্রেণীটি কত পরিমাণে পরিবেশের সংস্পর্শে আসে..... কেজি?)

Pathological (প্যাথলজিক্যাল)

_____

Sharps (শার্পস)

_____

Infectious (সংক্রামক)

_____

Chemical (রাসায়নিক)

_____

Radioactive (তেজস্ক্রিয়)

_____

24. Name of the Surveyor: (সার্ভেয়ারের নাম:)

_____

Industrial Survey

Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant (Industrial Waste Generation)

1. Date and Time (তারিখ এবং সময়)

yyyy-mm-dd _____ hh:mm _____

2. GPS Coordinate (কো অর্ডিনেট)

_____

latitude (x.y °)

_____

longitude (x.y °)

_____

altitude (m)

_____

accuracy (m)

_____

3. Name of Industry: (শিল্প/কল কারখানার নামঃ)

_____

4. Type of Industry: (শিল্প/কল কারখানার ধরন:)

- [ ] Textile (টেক্সটাইল)
- [ ] Rice mill (রাইস মিল)
- [ ] Flour mill (আটার কল / মিল)
- [ ] Jute mill (জুট মিল)
- [ ] Plastic (প্লাস্টিক)
- [ ] Saw mill (স মিল)
- [ ] Furniture (আসবাবপত্র তৈরীর কারখানা)
- [ ] Bakery (বেকারী)
- [ ] Salt Processing (লবন প্রক্রিয়াজাতকরন কারখানা)
- [ ] Agro Farm (কৃষি খামার)
- [ ] Brick Kiln (ইট খোলা)
- [ ] Others (অন্যান্য)

Others (অন্যান্য)

5. Address Details (ঠিকানার বিশদ বিবরণ:)

5a. Holding / House no.: (হোল্ডিং / হাউস নম্বর:)

5b. Flat no.: (ফ্ল্যাট নম্বর:)

5c. Mohalla / Goli / Village: (মহল্লা/গলি/গ্রাম:)

5d. Ward no.: (ওয়ার্ড নং:)

5e. Post Office: (ডাক ঘর:)

5f. Postal Code: (পোস্ট অফিসের কোড:)

5g. Upazila: (উপজেলা:)

5h. District: (জেলা:)

5i. Name of the respondent: (উত্তরদাতার নাম:)

_____

5j. Designation: (পদবী)

_____

6. Sex: (লিঙ্গ:)

- ◯ Male (পুরুষ)
- ◯ Female (মহিলা)
- ◯ Third Gender (তৃতীয় লিঙ্গ)

7. Age (বয়স)

_____

8. What is the total number of employees? (মোট লোকবলের সংখ্যা কত?)

_____

9. What kind of waste does this facility produce? (এখানে কি ধরনের বর্জ্য তৈরী হয়?)

- ☐ General Waste (সাধারন বর্জ্য)
- ☐ Chemical Waste (রাসায়নিক বর্জ্য)
- ☐ Metal Waste (ধাতব বর্জ্য)
- ☐ Electrical & Electronic Waste (বৈদ্যুতিক ও ইলেকট্রনিক বর্জ্য)
- ☐ Glass Waste (কাঁচ বর্জ্য)
- ☐ Plastic Waste (প্লাষ্টিক বর্জ্য)
- ☐ Wood Waste (কাঠ বর্জ্য)
- ☐ Textile Waste (টেক্সটাইল বর্জ্য)
- ☐ Fuel Waste (জ্বালানী বর্জ্য)
- ☐ Packaging Waste (প্যাকেজিং বর্জ্য)
- ☐ Biological Waste (জৈব বর্জ্য)
- ☐ Others (অন্যান্য)

Others (অন্যান্য)

_____

10. How much waste does this facility generate on a daily basis? ..... ton (এ কারখানাটি দৈনিক কি পরিমাণ বর্জ্য তৈরি করে?) .....টন

_____

11. What is the daily amount of general waste (food waste, tissue, personal used paper, plastic bag, etc.) generated? .....Kg (দৈনিক কি পরিমাণ সাধারণ বর্জ্য (খাদ্য বর্জ্য, টিস্যু, ব্যক্তিগত ব্যবহৃত কাগজ, প্লাস্টিকের ব্যাগ ইত্যাদি) উৎপন্ন হয়..... (কেজি))

_____

12. What is the daily amount of chemical waste generated? .....Kg (দৈনিক কত রাসায়নিক বর্জ্য উৎপন্ন হয়? .....কেজি)

_____

13. What is the daily amount of metallic waste generated? .....Kg (দৈনিক কি পরিমাণ ধাতব বর্জ্য উৎপন্ন হয়? .....কেজি)

_____

14. What is the daily amount of electrical and electronic waste generated? .....Kg (দৈনিক কি পরিমাণ বৈদ্যুতিক এবং ইলেকট্রনিক বর্জ্য উৎপন্ন হয়? .....কেজি)

_____

15. What is the daily amount of glass waste (industrial) generated? .....Kg (দৈনিক কি পরিমাণ কাচের বর্জ্য (শিল্প) উৎপন্ন হয়? .....কেজি)

_____

16. What is the daily amount of plastic (industrial) generated? .....Kg (দৈনিক কি পরিমাণ প্লাস্টিক বর্জ্য (শিল্প) উৎপন্ন হয়? .....কেজি)

_____

17. What is the daily amount of textile waste (industrial) generated? .....Kg (দৈনিক কি পরিমাণ টেক্সটাইল বর্জ্য (শিল্প) উৎপন্ন হয়? .....কেজি)

_____

18. What is the daily amount of waste fuel (industrial) generated? .....Kg (দৈনিক কি পরিমাণ জ্বালানী বর্জ্য (শিল্প) উৎপন্ন হয়? .....কেজি)

_____

19. What is the daily amount of packaging waste (industrial) generated? .....Kg (দৈনিক কি পরিমাণ প্যাকেজিং বর্জ্য (শিল্প) উৎপন্ন হয়? .....কেজি)

_____

20. What is the daily amount of biological / organic waste (industrial) generated? .....Kg (দৈনিক কি পরিমাণ জৈবিক/জৈব বর্জ্য (শিল্প) উৎপন্ন হয়? .....কেজি)

_____

21. What is the daily amount of other waste (industrial) generated? .....Kg (অন্যান্য বর্জ্যের (শিল্প) দৈনিক পরিমাণ কত? .....কেজি)

_____

22. What is the present waste management system in this facility? (এই কারখানার বর্তমান বর্জ্য ব্যবস্থাপনা কেমন?)

_____

23. How hazardous waste is managed in this facility? (এই কারখানায় কীভাবে বিপজ্জনক বর্জ্য ব্যবস্থাপনা করা হয়?)

_____

24. Name of the Surveyor: (সার্ভেয়ারের নাম:)

_____

Kitchen Survey Questionnaires

Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plan(Kitchen Market Waste Generation)

1. Date and Time (তারিখ এবং সময়)

yyyy-mm-dd _____ hh:mm _____

2. GPS Coordinate (কো অর্ডিনেট)

_____

latitude (x.y °)

_____

longitude (x.y °)

_____

altitude (m)

_____

accuracy (m)

_____

3. Kitchen Market Name: (বাজারের নাম:)

_____

4. General Information (সাধারণ তথ্য)

4a. Name of the respondent: (উত্তরদাতার নাম:)

_____

4b. Business Address: (ব্যবসা ঠিকানা)

_____

4c. Shop no.: (দোকান নম্বর)

_____

4d. Ward no.: (ওয়ার্ড নং:)

_____

4e. Post Office: (ডাক ঘর:)

_____

4f. Postal Code: (পোস্টাল কোড নাম্বার:)

_____

4g. Upazila: (উপজেলা:)

_____

4i. District: (জেলা:)

_____

5. Sex: (লিঙ্গ:)

- ◯ Male
- ◯ Female
- ◯ Third Gender

6. Age (বয়স)

_____

7. Marital Status: (বৈবাহিক অবস্থা)

- ◯ Married
- ◯ Single
- ◯ Separated
- ◯ Occupation

8. Occupation: (পেশা)

- ◯ Shop in Built Market
- ◯ Shop in Tin Shed Market
- ◯ Indivisual Shed
- ◯ Open Shop
- ◯ Shop on van
- ◯ Others

9. Shop Status: (দোকানের অবস্থা)

- ◯ Shop in Built Market
- ◯ Shop in Tin Shed Market
- ◯ Indivisual Shed
- ◯ Open Shop
- ◯ Shop on van
- ◯ Others

Others

_____

10. Type of Shop: (দোকানের ধরন)

- ◯ Wholesale (পাইকারি)
- ◯ Retail (খুচরা)
- ◯ Both Wholesale and Retail (পাইকারি এবং খুচরা উভয়ই)
- ◯ Godown (গোডাউন)
- ◯ Others

Others

_____

11. Shop type: (দোকানের ধরন)

- ◯ Vegetables
- ◯ Pharmacy
- ◯ Meat
- ◯ Grocery
- ◯ Fish
- ◯ Poultry
- ◯ Cosmetics
- ◯ Laundry
- ◯ Alcohol
- ◯ Shoes
- ◯ Restaurant
- ◯ Spice
- ◯ Shoes
- ◯ Clothes
- ◯ Utensil
- ◯ Electronics
- ◯ Ceramics
- ◯ Hardware
- ◯ Construction materials
- ◯ Others

Others

_____

12. On average, what quantity and type of waste does your shop generate each day? (আপনার দোকান প্রতিদিন কি পরিমাণ এবং ধরনের বর্জ্য তৈরি করে?)

12a. Quantity .....Kg

_____

I. Amount of Organic waste .....% of total waste (by weight)

_____

II. Amount of Plastic .....% of total waste (by weight)

_____

III. Amount of Glass .....% of total waste (by weight)

_____

IV. Amount of Metal .....% of total waste (by weight)

_____

V. Amount of Paper and packaging.....% of total waste (by weight)

_____

VI. Electrical and Electronic waste .....% of total waste (by weight)

_____

VII. Medicine and medical waste .....% of total waste (by weight)

_____

VIII. Amount of Other waste .....% of total waste (by weight)

_____

13. On which day does your shop generate the highest amount of waste? (কোন দিনে আপনার দোকানে সর্বাধিক পরিমাণ বর্জ্য উৎপন্ন হয়?)

- ◯ Friday
- ◯ Saturday
- ◯ Saturday
- ◯ Monday
- ◯ Tuesday
- ◯ Wednesday
- ◯ Thursday

14. On which day does your shop generate the lowest amount of waste? (কোন দিনে আপনার দোকান সর্বনিম্ন পরিমাণ বর্জ্য উৎপন্ন করে?)

- ◯ Friday
- ◯ Saturday
- ◯ Saturday
- ◯ Monday
- ◯ Tuesday
- ◯ Wednesday
- ◯ Thursday

15. Are you a member of the Market Management Committee? (আপনি কি বাজার ব্যবস্থাপনা কমিটির সদস্য?)

- ◯ Yes
- ◯ No

15a. How many other shops of the same kind as yours exist? (আপনার মত একই ধরনের আরো কত দোকান আছে?)

_____

15b. What is the total quantity of waste generated by all the shops of a similar type as your each day?....Ton (আপনার প্রতিদিনের মতো একই ধরণের সমস্ত দোকান থেকে মোট কত পরিমাণ বর্জ্য উৎপন্ন হয়?....টন)

_____

15c. Approximately, what is the total quantity of waste generated by this market each day? ..... Ton (আনুমানিক, প্রতিদিন এই বাজার দ্বারা উৎপন্ন বর্জ্যের মোট পরিমাণ কত? ..... টন)

_____

15d. What is the composition of the total waste generated by the market? (বাজার দ্বারা উৎপন্ন মোট বর্জ্যের গঠন কী?)

I. Amount of Organic waste .....% of total waste (by weight)

_____

II. Amount of Plastic .....% of total waste (by weight)

_____

III. Amount of Glass .....% of total waste (by weight)

_____

IV. Amount of Metal .....% of total waste (by weight)

_____

V. Amount of Paper and packaging.....% of total waste (by weight)

_____

VI. Electrical and Electronic waste .....% of total waste (by weight)

_____

VII. Medicine and medical waste .....% of total waste (by weight)

_____

VIII. Amount of Other waste .....% of total waste (by weight)

_____

16. Is there a designated storage area for storing the waste generated by the market? (বাজার দ্বারা উৎপন্ন বর্জ্য সংরক্ষণের জন্য একটি নির্দিষ্ট স্টোরেজ এলাকা আছে কি?)

- ◯ Yes
- ◯ No

16a. If yes

- [ ] Dustbin
- [ ] Waste Container
- [ ] Street side
- [ ] Low land
- [ ] Water body
- [ ] Others

Others

_____

17. Is the waste generated by the market disposed of outside the market or at a distant location? (বাজার দ্বারা সৃষ্ট বর্জ্য কি বাজারের বাইরে বা দূরবর্তী স্থানে ফেলা হয়?)

- ◯ Yes
- ◯ No

17a. If Yes,

Where.....

_____

How far away.....km

_____

How much waste is disposed of.....ton

_____

18. At what time is the maximum amount of waste disposed of? (কোন সময়ে সর্বোচ্চ পরিমাণ বর্জ্য নিষ্পত্তি করা হয়)

- ◯ From 07:00 a.m. to 02:00 p.m.
- ◯ From 05:00 p.m. to 12:00 p.m.
- ◯ Other time.....

Other time.....

_____

19. Is there any waste from sources outside the market that is also stored in the waste storage area? (বাজারের বাইরের উৎস থেকে কি কোনো বর্জ্য আছে যা বর্জ্য সঞ্চয়স্থানেও সংরক্ষণ করা হয়?)

- ◯ Yes
- ◯ No

19a. If yes, The number of waste sources outside the market..... ton (বাজারের বাইরে বর্জ্য উৎসের সংখ্যা..... টন)

_____

20. How often the waste is collected?

- ◯ Daily
- ◯ Once in two days
- ◯ Once in a week
- ◯ Others

Others (অন্যান্য)

_____

21. How is the waste collected from this market? (এই বাজার থেকে কিভাবে বর্জ্য সংগ্রহ করা হয়?)

- ◯ Open Truck
- ◯ Container Truck
- ◯ Rickshaw van
- ◯ Others

Others (অন্যান্য)

_____

22. Name of the Surveyor: (সার্ভেয়ারের নাম:)

_____

Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plan(Kitchen Market Waste Generation)

1. Date and Time (তারিখ এবং সময়)

yyyy-mm-dd _____ hh:mm _____

2. GPS Coordinate (কো অর্ডিনেট)

_____

latitude (x.y °)

_____

longitude (x.y °)

_____

altitude (m)

_____

accuracy (m)

_____

3. Kitchen Market Name: (বাজারের নাম:)

_____

4. General Information (সাধারণ তথ্য)

4a. Name of the respondent: (উত্তরদাতার নাম:)

_____

4b. Business Address: (ব্যবসা ঠিকানা)

_____

4c. Shop no.: (দোকান নম্বর)

_____

4d. Ward no.: (ওয়ার্ড নং:)

_____

4e. Post Office: (ডাক ঘর:)

_____

4f. Postal Code: (পোস্টাল কোড নাম্বার:)

_____

4g. Upazila: (উপজেলা:)

_____

4i. District: (জেলা:)

_____

5. Sex: (লিঙ্গ:)

- ◯ Male
- ◯ Female
- ◯ Third Gender

6. Age (বয়স)

_____

7. Marital Status: (বৈবাহিক অবস্থা)

- ◯ Married
- ◯ Single
- ◯ Separated
- ◯ Occupation

8. Occupation: (পেশা)

- ◯ Shop in Built Market
- ◯ Shop in Tin Shed Market
- ◯ Indivisual Shed
- ◯ Open Shop
- ◯ Shop on van
- ◯ Others

9. Shop Status: (দোকানের অবস্থা)

- ◯ Shop in Built Market
- ◯ Shop in Tin Shed Market
- ◯ Indivisual Shed
- ◯ Open Shop
- ◯ Shop on van
- ◯ Others

Others

_____

10. Type of Shop: (দোকানের ধরন)

- ◯ Wholesale (পাইকারি)
- ◯ Retail (খুচরা)
- ◯ Both Wholesale and Retail (পাইকারি এবং খুচরা উভয়ই)
- ◯ Godown (গোডাউন)
- ◯ Others

Others

_____

11. Shop type: (দোকানের ধরন)

- ◯ Vegetables
- ◯ Pharmacy
- ◯ Meat
- ◯ Grocery
- ◯ Fish
- ◯ Poultry
- ◯ Cosmetics
- ◯ Laundry
- ◯ Alcohol
- ◯ Shoes
- ◯ Restaurant
- ◯ Spice
- ◯ Shoes
- ◯ Clothes
- ◯ Utensil
- ◯ Electronics
- ◯ Ceramics
- ◯ Hardware
- ◯ Construction materials
- ◯ Others

Others

_____

12. On average, what quantity and type of waste does your shop generate each day? (আপনার দোকান প্রতিদিন কি পরিমাণ এবং ধরনের বর্জ্য তৈরি করে?)

12a. Quantity .....Kg

_____

I. Amount of Organic waste .....% of total waste (by weight)

_____

II. Amount of Plastic .....% of total waste (by weight)

_____

III. Amount of Glass .....% of total waste (by weight)

_____

IV. Amount of Metal .....% of total waste (by weight)

_____

V. Amount of Paper and packaging.....% of total waste (by weight)

_____

VI. Electrical and Electronic waste .....% of total waste (by weight)

_____

VII. Medicine and medical waste .....% of total waste (by weight)

_____

VIII. Amount of Other waste .....% of total waste (by weight)

_____

13. On which day does your shop generate the highest amount of waste? (কোন দিনে আপনার দোকানে সর্বাধিক পরিমাণ বর্জ্য উৎপন্ন হয়?)

- ◯ Friday
- ◯ Saturday
- ◯ Saturday
- ◯ Monday
- ◯ Tuesday
- ◯ Wednesday
- ◯ Thursday

14. On which day does your shop generate the lowest amount of waste? (কোন দিনে আপনার দোকান সর্বনিম্ন পরিমাণ বর্জ্য উৎপন্ন করে?)

- ◯ Friday
- ◯ Saturday
- ◯ Saturday
- ◯ Monday
- ◯ Tuesday
- ◯ Wednesday
- ◯ Thursday

15. Are you a member of the Market Management Committee? (আপনি কি বাজার ব্যবস্থাপনা কমিটির সদস্য?)

- ◯ Yes
- ◯ No

15a. How many other shops of the same kind as yours exist? (আপনার মত একই ধরনের আরো কত দোকান আছে?)

_____

15b. What is the total quantity of waste generated by all the shops of a similar type as your each day?....Ton (আপনার প্রতিদিনের মতো একই ধরণের সমস্ত দোকান থেকে মোট কত পরিমাণ বর্জ্য উৎপন্ন হয়?....টন)

_____

15c. Approximately, what is the total quantity of waste generated by this market each day? ..... Ton (আনুমানিক, প্রতিদিন এই বাজার দ্বারা উৎপন্ন বর্জ্যের মোট পরিমাণ কত? ..... টন)

_____

15d. What is the composition of the total waste generated by the market? (বাজার দ্বারা উৎপন্ন মোট বর্জ্যের গঠন কী?)

I. Amount of Organic waste .....% of total waste (by weight)

_____

II. Amount of Plastic .....% of total waste (by weight)

_____

III. Amount of Glass .....% of total waste (by weight)

_____

IV. Amount of Metal .....% of total waste (by weight)

_____

V. Amount of Paper and packaging.....% of total waste (by weight)

_____

VI. Electrical and Electronic waste .....% of total waste (by weight)

_____

VII. Medicine and medical waste .....% of total waste (by weight)

_____

VIII. Amount of Other waste .....% of total waste (by weight)

_____

16. Is there a designated storage area for storing the waste generated by the market? (বাজার দ্বারা উৎপন্ন বর্জ্য সংরক্ষণের জন্য একটি নির্দিষ্ট স্টোরেজ এলাকা আছে কি?)

- ◯ Yes
- ◯ No

16a. If yes

- [ ] Dustbin
- [ ] Waste Container
- [ ] Street side
- [ ] Low land
- [ ] Water body
- [ ] Others

Others

_____

17. Is the waste generated by the market disposed of outside the market or at a distant location? (বাজার দ্বারা সৃষ্ট বর্জ্য কি বাজারের বাইরে বা দূরবর্তী স্থানে ফেলা হয়?)

- ◯ Yes
- ◯ No

17a. If Yes,

Where.....

_____

How far away.....km

_____

How much waste is disposed of.....ton

_____

18. At what time is the maximum amount of waste disposed of? (কোন সময়ে সর্বোচ্চ পরিমাণ বর্জ্য নিষ্পত্তি করা হয়)

- ◯ From 07:00 a.m. to 02:00 p.m.
- ◯ From 05:00 p.m. to 12:00 p.m.
- ◯ Other time.....

Other time.....

_____

19. Is there any waste from sources outside the market that is also stored in the waste storage area? (বাজারের বাইরের উৎস থেকে কি কোনো বর্জ্য আছে যা বর্জ্য সঞ্চয়স্থানেও সংরক্ষণ করা হয়?)

- ◯ Yes
- ◯ No

19a. If yes, The number of waste sources outside the market..... ton (বাজারের বাইরে বর্জ্য উৎসের সংখ্যা..... টন)

_____

20. How often the waste is collected?

- ◯ Daily
- ◯ Once in two days
- ◯ Once in a week
- ◯ Others

Others (অন্যান্য)

_____

21. How is the waste collected from this market? (এই বাজার থেকে কিভাবে বর্জ্য সংগ্রহ করা হয়?)

- ◯ Open Truck
- ◯ Container Truck
- ◯ Rickshaw van
- ◯ Others

Others (অন্যান্য)

_____

22. Name of the Surveyor: (সার্ভেয়ারের নাম:)

_____

KII with Executive Engineer, Dohar

Assignment Name: A Survey on Waste Management Analysis in Nawabganj, Keraniganj and Dohar Upazilas.

Project Name: A Feasibility Study of Waste to Energy Power Plant for Nawabganj, Keraniganj, and Dohar locations in Bangladesh

Key Informant Interview with the Executive Engineer of Dohar Pourashava

Date:	Time:	Location: *Latitude:* *Longitude:*
Name, and designation of Facilitators	**a)** **b)**	
The objective	**a)** Present scenario of Waste Management **b)** Plan for improvement	

সাধারন তথ্যবলি

পৌরসভার নাম:	
উত্তরদাতার নাম (বাংলায়): **(ইংরেজীতে-বড় হাতের অক্ষরে):** **তারিখ:**	**পদবি:** **ইমেইল:** **ফোন নম্বর:**

সিটি প্রোফাইল

১। পৌরসভার শ্রেনী: □ ক □ খ □ গ

২। পৌরসভার সাধারন তথ্যবলী (তথ্যসুত্র / রেফারেন্স উল্লেখ করুন): .....

প্রতিষ্ঠাকাল:

আয়তন: (বর্গ কি.মি)

জনসংখ্যা (২০২২):

পুরুষ: মহিলা:

উচ্চ আয়ের জনগোষ্ঠী (%): ওয়ার্ড সংখ্যা:

মধ্যম আয়ের জনগোষ্ঠী (%):

নিম্ন আয়ের জনগোষ্ঠী (%): শিক্ষা প্রতিষ্ঠানের সংখ্যাঃ

জনসংখ্যা বৃদ্ধির হার: স্বাস্থ্যসেবা প্রতিষ্ঠানের সংখ্যাঃ

খানার সংখ্যা: প্রধান পানির উৎস:

হোল্ডিং সংখ্যা:

৩। পৌরসভায় কি ড্রেনেজ ব্যবস্থা রয়েছে? হ্যাঁ ☐ না ☐

৪। মোট ড্রেনের পরিমান (কি.মি):

৫। **প্রতিটি ওয়ার্ডের জনসংখ্যা:**

	ওয়ার্ড ০১	ওয়ার্ড ০২	ওয়ার্ড ০৩	ওয়ার্ড ০৪	ওয়ার্ড ০৫	ওয়ার্ড ০৬	ওয়ার্ড ০৭	ওয়ার্ড ০৮	ওয়ার্ড ০৯
জনসংখ্যা									

৬। পৌরসভার মাষ্টার প্ল্যান আছে কি? উক্ত মাস্টার প্ল্যানে বর্জ্য ব্যবস্থাপনার দিক-নির্দেশনা কি?

……
……
……
……
……

বর্জ্য ব্যবস্থাপনার তথ্যবলি

১। আপনার পৌর এলাকায় দৈনিক কি পরিমান বর্জ্য উৎপন্ন হয়?

উঃ

২। বছরে কোন সময়গুলোতে স্বাভাবিক গড় পরিমানের চেয়ে বেশি বর্জ্য উৎপন্ন হয়?

ক. ঈদুল ফিতর খ. ঈদুল আযহা গ. দূর্গা পূজা ঘ. গ্রীষ্মকালীন মৌসুমী ফলের সময়

ঙ. শীতকালীন সবজি ও ফলের সময় চ. অন্যান্য

৩। বছরে কোন মাসগুলিতে বেশী বর্জ্য উৎপাদিত হয়? (প্রথম সর্বোচ্চ ক. তে, দ্বিতীয় সর্বোচ্চ খ. তে এবং তৃতীয় সর্বোচ্চ গ. তে লিখুন।)

ক. _____ মাস খ. _____ মাস গ. _____ মাস

৪। সপ্তাহের মধ্য কোন দিনগুলিতে বেশি বর্জ্য উৎপাদিত হয়? (ক্রম অনুসারে লিখুন)

ক. _____ বার খ. _____ বার গ. _____ বার

৫। পৌর এলাকায় উৎপাদিত বর্জ্যের ধরন (শতকরা হারে)

ক. পচনশীল / জৈব বর্জ্য _____ % খ. প্লাস্টিক বর্জ্য _____ %

গ. ধাতব বর্জ্য _____ % ঘ. পেপার এবং প্যাকেজিং বর্জ্য _____ %

ঙ. টেক্সটাইল / ফেব্রিক বর্জ্য _____ % চ. কাঠ ও আসবাবপত্রের বর্জ্য _____ %

ছ. ইলেকট্রিক্যাল ও ইলেকট্রনিক্স বর্জ্য _____ % জ. রাসায়নিক বর্জ্য _____ %

ঝ. অন্যান্য _____ %

৬। পৌর এলাকার কাঁচা বাজার সমূহে মোট উৎপাদিত বর্জ্যের পরিমান কত?

ক. দৈনিক _____ টন খ. মাসিক _____ টন

৭। পৌর এলাকার উৎপাদিত বর্জ্যের বিপরীতে কি পরিমান বর্জ্য সংগ্রহ করা হয়?

ক. পৌরসভার নিজস্ব ব্যবস্থাপনায় দৈনিক সংগ্রহীত বর্জ্যের পরিমান _____ টন

খ. বেসরকারী / NGO / CBO কর্তৃক দৈনিক সংগ্রহীত বর্জ্যের পরিমান _____ টন

৮। কোন ধরনের বর্জ্য পৌরসভা সংগ্রহ, পরিবহন, ও ডাম্পিং করে?

-বাসাবাড়ি/হাসপাতাল/কাঁচাবাজার/মার্কেট/প্রতিষ্টান ইত্যাদি।

৯। সংগ্রহীত বর্জ্যের কি পরিমান নির্ধারিত ডাম্পিং/ ল্যান্ডফিল/ অন্যান্য স্থানে পরিবহন করা হয়?

ক. ডাম্পিং সাইটঃ _____ টন খ. ল্যান্ডফিলঃ _____ টন

গ. মজা পুকুরঃ _____ টন

ঘ. নিম্নভূমিঃ _____ টন ঙ. রাস্তার পাশেঃ _____ টন চ. অন্যান্যঃ _____ টন

১০। পৌরসভা কোন ধরনের যানবাহন ব্যাবহার করে?

ভ্যান: _____টি

ট্রাক: _____টি

১১। পৌরসভায় বর্জ্য ব্যবস্থাপনার কাজে নিযুক্ত জনবলের বিবরনঃ

ক. প্রকৌশলীর সংখ্যাঃ _____ জন

খ. কনজারভেন্সী ইন্সপেক্টরঃ _____ জন

গ. ট্রাক ড্রাইভারঃ _____ জন

ঘ. ট্রাক হেল্পারঃ _____ জন

ঙ. পে লোডার / ল্যান্ডফিল কম্প্যাক্টর / এক্সকাভেটর /অন্যান্য ভারী যন্ত্রপাতির অপারেটরঃ _____ জন

চ.পে লোডার / ল্যান্ডফিল কম্প্যাক্টর / এক্সকাভেটর /অন্যান্য ভারী যন্ত্রপাতির হেল্পারঃ _____ জন

১২। পৌর এলাকায় ক্লিনিক্যাল বর্জ্য ব্যবস্থাপনা

ক. পৌর এলাকায় দৈনিক ক্লিনিক্যাল বর্জ্যের পরিমানঃ_____ টন

খ. কোন প্রতিষ্ঠান / কারা ক্লিনিক্যাল বর্জ্য সংগ্রহ করছেঃ_____

গ. দৈনিক কি পরিমান ক্লিনিক্যাল বর্জ্য সংগ্রহীত হচ্ছেঃ _____ টন

ঘ. সংগ্রহীত ক্লিনিক্যাল বর্জ্য কোথায় এবং কারা পরিশোধন করছেঃ _____

১৩। পৌর এলাকায় দৈনিক শিল্প বর্জ্যের পরিমান কত?

উঃ _____ টন

১৪। ধরন অনুযায়ী শিল্প বর্জ্যের পরিমান?

ক. সাধারন বর্জ্য _____ %

খ. প্লাস্টিক বর্জ্য _____ %

গ. পেপার এবং প্যাকেজিং _____ %

ঘ. টেক্সটাইল / ফেব্রিক বর্জ্য _____ %

ঙ. তরল বর্জ্য _____ %

চ. রাসায়নিক _____ %

১৫। পৌর এলাকায় দৈনিক সংগ্রহীত শিল্প বর্জ্যের পরিমান কত?

উঃ _____ টন

ক. পৌরসভার নিজস্ব ব্যবস্থাপনায় দৈনিক সংগ্রহীত শিল্প বর্জ্যের পরিমান _____ টন

খ. বেসরকারী / NGO / CBO কর্তৃক দৈনিক সংগ্রহীত শিল্প বর্জ্যের পরিমান _____ টন

গ. অন্যান্য প্রতিষ্ঠান কর্তৃক সংগ্রহীত দৈনিক শিল্প বর্জ্যের পরিমানঃ _____ টন

১৬। বর্জ্য ব্যবস্থাপনার উন্নয়নে পৌরসভা কর্তৃপক্ষের পরিকল্পনাঃ

ক. ডাম্পিং সাইট তৈরি করাঃ _____

খ. ল্যান্ডফিল তৈরি করাঃ _____

গ. ইকুইপমেন্ট সংগ্রহ করাঃ _____

ঘ. লোকবল নিয়োগ করাঃ _____

ঙ. সেবার পরিধি বৃদ্ধি করাঃ _____

তথ্যদাতার নাম:.....

পদবী: .....

যোগাযোগের মাধ্যম: .....

স্বাক্ষর:

আপনার মূল্যবান মতামত প্রদানকরার জন্য ধন্যবাদ

KII with Upazila Engineer

Assignment Name: A Survey on Waste Management Analysis in Nawabganj, Keraniganj and Dohar Upazilas.

Project Name: A Feasibility Study of Waste to Energy Power Plant for Nawabganj, Keraniganj, and Dohar locations in Bangladesh

Key Informant Interview with the Upazilla Engineer

Topic	Key Informant Interview with the Upazilla Engineer of Dohar Upazilla	
Date:	Time:	Location: *Latitude:* *Longitude:*
Name, and designation of Facilitators	**a)** **b)**	
The objective	**a)** Present scenario of Waste Management **b)** Plan for improvement	

সাধারন তথ্যসমুহ

উপজেলার নাম:	
উত্তরদাতার নাম (বাংলায়): **(ইংরেজীতে-বড় হাতের অক্ষরে):** **তারিখ:**	**পদবি:** **ইমেইল:** **ফোন নম্বর:**

১। প্রতিটি ইউনিয়নের জনসংখ্যা:

	০১:	০২:	০৩:	০৪:	০৫:	০৬:
জনসংখ্যা						
	০৭:	০৮:	০৯:	১০:	১১:	১২:
জনসংখ্যা						

২। উপজেলায়র মাষ্টার প্ল্যান আছে কি? উক্ত মাস্টার প্ল্যানে বর্জ্য ব্যবস্থাপনার দিক-নির্দেশনা কি?

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বর্জ্য ব্যবস্থাপনার তথ্যাবলী

১। আপনার উপজেলায় দৈনিক কি পরিমান বর্জ্য উৎপন্ন হয়?

উঃ

২। বছরে কোন সময়গুলোতে স্বাভাবিক গড় পরিমানের চেয়ে বেশি বর্জ্য উৎপন্ন হয়?

ক. ঈদুল ফিতর খ. ঈদুল আযহা গ. দূর্গা পূজা ঘ. গ্রীষ্মকালীন মৌসুমী ফলের সময়

ঙ. শীতকালীন সবজি ও ফলের সময় চ. অন্যান্য

৩। বছরে কোন মাসগুলিতে বেশী বর্জ্য উৎপাদিত হয়? (প্রথম সর্বোচ্চ ক. তে, দ্বিতীয় সর্বোচ্চ খ. তে এবং তৃতীয় সর্বোচ্চ গ. তে লিখুন)

ক. _____ মাস খ. _____ মাস গ. _____ মাস

৪। সপ্তাহের মধ্য কোন দিনগুলিতে বেশি বর্জ্য উৎপাদিত হয়? (ক্রম অনুসারে লিখুন)

ক. _____ বার খ. _____ বার গ. _____ বার

৫। উপজেলায় উৎপাদিত বর্জ্যের ধরন (শতকরা হারে)

ক. পচনশীল / জৈব বর্জ্য _____ % খ. প্লাস্টিক বর্জ্য _____ %

গ. ধাতব বর্জ্য _____ % ঘ. পেপার এবং প্যাকেজিং বর্জ্য _____ %

ঙ. টেক্সটাইল / ফেব্রিক বর্জ্য _____ % চ. কাঠ ও আসবাবপত্রের বর্জ্য _____ %

ছ. ইলেকট্রিক্যাল ও ইলেকট্রনিক্স বর্জ্য _____ % জ. রাসায়নিক বর্জ্য _____ %

ঝ. অন্যান্য _____ %

৬। উপজেলায় কয়টি কাঁচা বাজার ও মার্কেট আছে?

উঃ _____টি কাঁচা বাজার ও _____টি মার্কেট

৭। উপজেলার কাঁচা বাজার সমূহে মোট উৎপাদিত বর্জ্যের পরিমান কত?

ক. দৈনিক _____ টন খ. মাসিক _____ টন

৮। উপজেলার উৎপাদিত বর্জ্যের বিপরীতে কি পরিমান বর্জ্য সংগ্রহ করা হয়?

ক. বেসরকারী / NGO / CBO কর্তৃক দৈনিক সংগ্রহীত বর্জ্যের পরিমান _____ টন

৯। উপজেলায় কয়টি ইন্ডাস্ট্রি আছে, ও ধরন?

উঃ সংখ্যাঃ _____টি ও ধরনঃ _____

১০। উপজেলায় কয়টি হাসপাতাল ও ক্লিনিক আছে ও ধরন?

উঃ সংখ্যাঃ _____টি ও ধরনঃ _____

১১। উপজেলার ক্লিনিক্যাল বর্জ্য ব্যবস্থাপনা

ক. উপজেলার দৈনিক ক্লিনিক্যাল বর্জ্যের পরিমানঃ_____ টন

খ. কোন প্রতিষ্ঠান / কারা ক্লিনিক্যাল বর্জ্য সংগ্রহ করছেঃ_____

গ. দৈনিক কি পরিমান ক্লিনিক্যাল বর্জ্য সংগ্রহীত হচ্ছেঃ _____ টন

ঘ. সংগ্রহীত ক্লিনিক্যাল কোথায় এবং কারা পরিশোধন করছেঃ _____

১২। উপজেলার দৈনিক শিল্প বর্জ্যের পরিমান কত?

উঃ _____ টন

ধরন অনুযায়ী শিল্প বর্জ্যের পরিমান

ক. সাধারন বর্জ্য _____ %

খ. প্লাস্টিক বর্জ্য _____ %

গ. পেপার এবং প্যাকেজিং বর্জ্য _____ %

ঘ. টেক্সটাইল / ফেব্রিক বর্জ্য _____ %

ঙ. তরল বর্জ্য _____ %

চ. রাসায়নিক বর্জ্য _____ %

১৩। উপজেলার দৈনিক সংগ্রহীত শিল্প বর্জ্যের পরিমান কত?

উঃ _____ টন

ক. বেসরকারী / NGO / CBO কর্তৃক দৈনিক সংগ্রহীত শিল্প বর্জ্যের পরিমান _____ টন

খ. অন্যান্য প্রতিষ্ঠান কর্তৃক সংগ্রহীত দৈনিক শিল্প বর্জ্যের পরিমানঃ _____ টন

তথ্যদাতার নাম: .....

পদবী: .....

যোগাযোগের মাধ্যম: .....

স্বাক্ষর:

আপনার মূল্যবান মতামত প্রদানকরার জন্য ধন্যবাদ

Institutional Waste Generation Survey

Assignment Name: A Survey on Waste Management Analysis in Nawabganj, Keraniganj and Dohar Upazilas.

Project Name: A Feasibility Study of Waste to Energy Power Plant for Nawabganj, Keraniganj, and Dohar locations in Bangladesh

Name of the Surveyor:

GPS Coordinate: Latitude: Longitude:

Date	/ /
Time	
Name of Surveyor	
Contact Number	

Institution Name			
Business Address			
House/Plot no			
Ward no			
Post Office			
Upazila			
District			
Lat:		**Long:**	

Name of the respondent	
Position	
Contact details	
Type of Institution	☐ School ☐ Mosque ☐ Government Office ☐ Others
Institution type	☐ Pharmacy ☐ Grocery ☐ Cosmetics ☐ Laundry ☐ Shoes ☐ Restaurant ☐ Clothes ☐ Utensil ☐ Electronics ☐ Ceramics ☐ Hardware ☐ Construction materials ☐ Others

1. On average, what quantity and type of waste does your Institution generate each day?

1 (a) Quantity …..……..Kg

1 (b) Type:

I. Amount of Organic waste ……..% of total waste (by weight)
II. Amount of Plastic ……% of total waste (by weight)
III. Amount of Glass ……% of total waste (by weight)
IV. Amount of Metal ……% of total waste (by weight)
V. Amount of Paper and packaging……% of total waste (by weight)
VI. Electrical and Electronic waste ……% of total waste (by weight)
VII. Medicine and medical waste ……% of total waste (by weight)
VIII. Amount of Other waste ……..% of total waste (by weight)

2. On which day does your Institution generate the highest amount of waste?

☐ Friday ☐ Saturday ☐ Sunday ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday

3. On which day does your Institution generate the lowest amount of waste?

☐ Friday ☐ Saturday ☐ Sunday ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday

4. Are you a member of the Any (Institutional) Management Committee? ☐ Yes ☐ No

If yes,

4 (a) How many other Institutions of the same kind as yours exist in the area?

……

4 (b) What is the total quantity of waste generated by all the Institutions of a similar type as each day?

…..…… Ton

4 (c) Approximately, what is the total quantity of waste generated by this area each day?

…..…… Ton

4 (d) What is the composition of the total waste generated by the area?

I. Amount of Organic waste ……..% of total waste (by weight)
II. Amount of Plastic ……% of total waste (by weight)
III. Amount of Glass ……% of total waste (by weight)
IV. Amount of Metal ……% of total waste (by weight)
V. Amount of Paper and packaging……% of total waste (by weight)
VI. Electrical and Electronic waste ……% of total waste (by weight)

VII. Medicine and medical waste ……% of total waste (by weight)
VIII. Amount of Other waste ……..% of total waste (by weight)

5. Is there a designated storage area for storing the waste generated by the area?

☐ Yes ☐ No

If yes,

☐ Dustbin ☐ Waste Container ☐ Street side ☐ Low land ☐Water body

☐ Others

6. Is the waste generated by the area disposed of outside the area or at a distant location?

☐ Yes ☐ No

If yes,
☐ Where……..

☐ How far away……km

☐ How much waste is disposed of……ton

7. At what time is the maximum amount of waste disposed of?

☐ From 07:00 a.m. to 02:00 p.m.

☐ From 05:00 p.m. to 12:00 p.m.

☐ Other time……..

8. Is there any waste from sources outside the area that is also stored in the waste storage area?

If yes,

The number of waste sources outside the area…….. ton

9. How often the waste is collected?

☐ Daily ☐ Once in two days ☐ Once in a week ☐Others

10. How is the waste collected from this area?

☐ Open Truck ☐ Container Truck ☐ Rickshaw van ☐Others

Market Waste Generation Survey

Assignment Name: A Survey on Waste Management Analysis in Nawabganj, Keraniganj and Dohar Upazilas.

Project Name: A Feasibility Study of Waste to Energy Power Plant for Nawabganj, Keraniganj, and Dohar locations in Bangladesh

Date	/ /
Time	
Name of Surveyor	
Contact Number	

Market Place Name			
Business Address			
Shop no			
Ward no			
Post Office			
Upazila			
District			
Lat:		**Long:**	

Name of the respondent	
Position	
Contact details	
Type of Shop	☐ Wholesale ☐ Retail ☐ Both Wholesale and Retail ☐ Godown
Shop type	☐ Pharmacy ☐ Grocery ☐ Cosmetics ☐ Laundry ☐ Shoes ☐ Restaurant ☐ Clothes ☐ Utensil ☐ Electronics ☐ Ceramics ☐ Hardware ☐ Construction materials ☐ Others

1. On average, what quantity and type of waste does your shop generate each day?

1 (a) Quantity …..……..Kg

1 (b) Type:

I. Amount of Organic waste ……..% of total waste (by weight)
II. Amount of Plastic ……% of total waste (by weight)
III. Amount of Glass ……% of total waste (by weight)
IV. Amount of Metal ……% of total waste (by weight)
V. Amount of Paper and packaging……% of total waste (by weight)
VI. Electrical and Electronic waste ……% of total waste (by weight)
VII. Medicine and medical waste ……% of total waste (by weight)
VIII. Amount of Other waste ……..% of total waste (by weight)

2. On which day does your shop generate the highest amount of waste?

☐ Friday ☐ Saturday ☐ Sunday ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday

3. On which day does your shop generate the lowest amount of waste?

☐ Friday ☐ Saturday ☐ Sunday ☐ Monday ☐ Tuesday ☐ Wednesday ☐ Thursday

4. Are you a member of the Market Management Committee? ☐ Yes ☐ No

If yes,

4 (a) How many other shops of the same kind as yours exist?

…….

4 (b) What is the total quantity of waste generated by all the shops of a similar type as each day?

…..…… Ton

4 (c) Approximately, what is the total quantity of waste generated by this market each day?

…..…… Ton

4 (d) What is the composition of the total waste generated by the market?

I. Amount of Organic waste ……..% of total waste (by weight)
II. Amount of Plastic ……% of total waste (by weight)
III. Amount of Glass ……% of total waste (by weight)
IV. Amount of Metal ……% of total waste (by weight)
V. Amount of Paper and packaging……% of total waste (by weight)
VI. Electrical and Electronic waste ……% of total waste (by weight)
VII. Medicine and medical waste ……% of total waste (by weight)
VIII. Amount of Other waste ……..% of total waste (by weight)

5. Is there a designated storage area for storing the waste generated by the market?

☐ Yes ☐ No

If yes,

☐ Dustbin ☐ Waste Container ☐ Street side ☐ Low land ☐Water body

☐ Others

6. Is the waste generated by the market disposed of outside the market or at a distant location?

☐ Yes ☐ No

If yes,
☐ Where……..

☐ How far away……km

☐ How much waste is disposed of……ton

7. At what time is the maximum amount of waste disposed of?

☐ From 07:00 a.m. to 02:00 p.m.

☐ From 05:00 p.m. to 12:00 p.m.

☐ Other time…….

8. Is there any waste from sources outside the market that is also stored in the waste storage area?

If yes,

The number of waste sources outside the market…….. ton

9. How often the waste is collected?

☐ Daily ☐ Once in two days ☐ Once in a week ☐Others

10. How is the waste collected from this market?

☐ Open Truck ☐ Container Truck ☐ Rickshaw van ☐Others

Disposal Site Survey

Assignment Name: A Survey on Waste Management Analysis in Nawabganj, Keraniganj and Dohar Upazilas.

Project Name: Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant.

Part1-Surveyor Details

Date	
Name of Surveyor	
Contact Number	

Part2–Site Details

Disposal Site Name			
Address			
Upazila			
Lat:		**Long:**	

Site Operator in charge	
Position	
Contact details	

SN	Questionnaire	Answer
1	Types of dumping place	• Open dumping place without boundary • Open dumping place with boundary/ partial boundary • Sanitary land field
2	Area of dumping place	----------sq fts/ decimals
3	The landowner of the dumping place and location	
4	What kind of facilities are available here?	• Electricity (220 V/440 V/ 11 KB) • Gas • Water • Road Connection • Others
5	Is there any resources recovery establishment/technology	• Waste to electricity • Waste to compost plant • Others

		(If yes then current functionality, why abandoned, when started and abandoned)
6	How much area of the dumping place is covered by waste?	
7	Is there any caretaker/ sanitation supervisor/ any staff to look after the dumping place? If yes, then a description of where he/she is working at the office in the dumping place or office in the Pourashava/upazila complex?	
8	How is he/she supervising the dumping place?	
9	Is there a weighbridge for assessing how much waste is dumped every day? If not, how they are assessing the waste everyday dumping?	
10	How many numbers of vehicles (trucks with volume and Rickshaw-Van with volume) are dumped every day? Give specification. (Wide, Length and height)	
10. a	When (month) this volume is increased, how much?	
11	Are they maintain a log sheet/ is there any data on how much waste is being dumped there?	
12	From where waste is collected for dumping here (Households, streets, markets, office hospital-clinic, industries, and others with names). Please mention the area	
13	Are there waste pickers (informal/ formal) for collecting recycled materials?	
14	If yes how many waste pickers? Do they wear health and safety protection (PPE)? If yes what type of health protection (PPE)?	
15	How much-recycled materials waste pickers are collected from dumping places every day (kg/day)?	

16	Among the recycled materials collected (weight by Kg/gm) every day –	Plastic ___%, Glass___%, metal ___%, cloth___%, paper___% And others with name %
17	Is there any recycling vendor's shop near the dumping place?	
18	If yes, how much-recycled material with % he buys from waste pickers every day (average)?	
19	Is there any vendor/businessman who collects waste for different purposes like a landfill? If yes how much per month/year, he takes the waste from the dumping place? What types of waste does he take?	
20	Is the dumping place approved/ take clearness from the environment department? If yes what type of clearness?	
21	Is the leachate water of dumping waste polluting the water body? If yes, please mention what types of water body is polluted by leachate.	
22	Is the waste duping/ going from the dumping place to the water body?	
23	Is the dumping place disturbing the Household? If yes, please describe.	
24	Is the dumping place disturbing the passerby and passengers? If yes, please describe	
25	Is waste burning by someone? Why, who and when it is happening, please describe	
26	Burning of waste is widespread/occasional/rare/does not occur (circle one that applies):	
27	Is the site located in an area where floodings and landslides do	

	not/regularly/occasionally (circle one that applies) affect very few/small/large/majority (circle one that applies) of the site?	

Part3–Finish Survey

Check on missing fields	☐ Yes ☐ No	**Check all data input**
I confirm that the data collected in this survey has been recorded fairly and honestly		

Name of Informant: .....

Designation: .....

Contact Number: .....

Signature:.....

KII with Conservancy Officer, Dohar

Assignment Name: A Survey on Waste Management Analysis in Nawabganj, Keraniganj and Dohar Upazilas.

Project Name: A Feasibility Study of Waste to Energy Power Plant for Nawabganj, Keraniganj, and Dohar locations in Bangladesh

Key Informant Interview with the Conservancy Inspector of Dohar Pourashava

Date:	Time:	Location: *Latitude:* *Longitude:*
Name, and designation of Facilitators	**a)** **b)**	
The objective	**a)** Present scenario of Waste Management **b)** Plan for improvement	

পৌরসভার জন্য প্রশ্নাবলী ও তথ্যাদি

১। আপনার পৌর এলাকায় দৈনিক কি পরিমান বর্জ্য উৎপন্ন হয়?

উঃ . . . . . টন

২। বছরে কোন সময়গুলোতে স্বাভাবিক গড় পরিমানের চেয়ে বেশি বর্জ্য উৎপন্ন হয়?

ক. ঈদুল ফিতর খ. ঈদুল আযহা গ. দূর্গা পূজা ঘ. গ্রীষ্মকালীন মৌসুমী ফলের সময়

ঙ. শীতকালীন সবজি ও ফলের সময় চ. অন্যান্য

৩। বছরে কোন মাসগুলিতে বেশী বর্জ্য উৎপাদিত হয়? (প্রথম সর্বোচ্চ ক. তে, দ্বিতীয়সর্বোচ্চ খ. তে এবং তৃতীয় সর্বোচ্চ গ. তে লিখুন।)

ক. _____ মাস খ. _____ মাস গ. _____ মাস

৪। সপ্তাহের মধ্য কোনদিন গুলিতে বেশি বর্জ্য উৎপাদিত হয়? (ক্রম অনুসারে লিখুন)

ক. _____ বার খ. _____ বার গ. _____ বার

৫। পৌর এলাকায় উৎপাদিত বর্জ্যের ধরন (শতকরা হারে)

ক. পচনশীল / জৈব বর্জ্য _____ % খ. প্লাস্টিক বর্জ্য _____ %

গ. ধাতব বর্জ্য _____ % ঘ. পেপার এবং প্যাকেজিং _____ %

ঙ. টেক্সটাইল / ফেব্রিক বর্জ্য _____ % চ. কাঠ ও আসবাবপত্রের বর্জ্য _____ %

ছ. ইলেকট্রিক্যাল ও ইলেকট্রনিক্স _____ % জ. রাসায়নিক _____ %

ঝ. অন্যান্য _____ %

৬। পৌর এলাকায় কয়টি কাঁচা বাজার ও মার্কেট আছে?

উঃ __টি ও __টি

৭। পৌর এলাকার কাঁচা বাজার সমূহে মোট উৎপাদিত বর্জ্যের পরিমান কত?

ক. দৈনিক _____ টন খ. মাসিক _____ টন

৮। পৌর এলাকার উৎপাদিত বর্জ্যের বিপরীতে কি পরিমান বর্জ্য সংগ্রহ করা হয়?

ক. পৌরসভার নিজস্ব ব্যবস্থাপনায় দৈনিক সংগ্রহীত বর্জ্যের পরিমান _____ টন

খ. বেসরকারী / NGO / CBO কর্তৃক দৈনিক সংগ্রহীত বর্জ্যের পরিমান _____ টন

৯। পৌরসভায় কয়টি ইন্ডাস্ট্রি আছে, ও ধরন?

উঃ __টি ও _

১০। পৌরসভায় কয়টি হাসপাতাল ও ক্লিনিক আছে ও ধরন?

উঃ __টি ও _

১১। কোন ধরনের বর্জ্য পৌরসভা সংগ্রহ, পরিবহন, ও ডাম্পিং করে?

-বাসাবাড়ি/হাসপাতাল/কাঁচাবাজার/মার্কেট/প্রতিষ্টান ইত্যাদি।

১২। সংগ্রহীত বর্জ্যের কি পরিমান নির্ধারিত ডাম্পিং/ ল্যান্ডফিল/ অন্যান্য স্থানে পরিবহন হয়?

ক. ডাম্পিং সাইটঃ _____ টন খ. ল্যান্ডফিলঃ _____ টন গ. মজা পুকুরঃ _____ টন

ঘ. নিম্নভূমিঃ _____ টন ঙ. রাস্তার পাশেঃ _____ টন চ. অন্যান্যঃ _____ টন

১৩। পৌরসভা কোন ধরনের যানবাহন ব্যাবহার করে?

ভ্যান: _টি

ট্রাক: _ টি

১৪। পৌরসভায় বর্জ্য ব্যবস্থাপনার কাজে নিযুক্ত জনবলের বিবরনঃ

ক. প্রকৌশলীর সংখ্যাঃ _____ জন

খ. কনজারভেন্সী ইন্সপেক্টরঃ _____ জন

গ. ট্রাক ড্রাইভারঃ _____ জন

ঘ. ট্রাক হেল্পারঃ _____ জন

ঙ. পে লোডার / ল্যান্ডফিল কম্প্যাক্টর / এক্সকাভেটর /অন্যান্য ভারী যন্ত্রপাতির অপারেটরঃ _____ জন

চ.পে লোডার / ল্যান্ডফিল কম্প্যাক্টর / এক্সকাভেটর /অন্যান্য ভারী যন্ত্রপাতির হেল্পারঃ _____ জন

১৫। পৌর এলাকায় ক্লিনিক্যাল বর্জ্য ব্যবস্থাপনা

ক. পৌর এলাকায় দৈনিক ক্লিনিক্যাল বর্জ্যের পরিমানঃ_____

খ. কোন প্রতিষ্ঠান / কারা ক্লিনিক্যাল বর্জ্য সংগ্রহ করছেঃ_____

গ. দৈনিক কি পরিমান ক্লিনিক্যাল বর্জ্য সংগ্রহীত হচ্ছেঃ _____ টন

ঘ. সংগ্রহীত ক্লিনিক্যাল কোথায় এবং কারা পরিশোধন করছেঃ _____

১৬। পৌর এলাকায় দৈনিক শিল্প বর্জ্যের পরিমান কত?

উঃ _____ টন

ধরন অনুযায়ী সাধারন বর্জ্যের পরিমান

ক. সাধারন বর্জ্য _____ %

খ. প্লাস্টিক বর্জ্য _____ %

গ. পেপার এবং প্যাকেজিং _____ %

ঘ. টেক্সটাইল / ফেব্রিক বর্জ্য _____ %

ঙ. তরল বর্জ্য _____ %

চ. রাসায়নিক _____ %

১৭। পৌর এলাকায় দৈনিক সংগ্রহীত শিল্প বর্জ্যের পরিমান কত?

উঃ _____ টন

ক. পৌরসভার নিজস্ব ব্যবস্থাপনায় দৈনিক সংগ্রহীত বর্জ্যের পরিমান _____ টন

খ. বেসরকারী / NGO / CBO কর্তৃক দৈনিক সংগ্রহীত বর্জ্যের পরিমান _____ টন

গ. অন্যান্য প্রতিষ্ঠান কর্তৃক সংগ্রহীত দৈনিক শিল্প বর্জ্যের পরিমানঃ _____ টন

১৮। বর্জ্য ব্যবস্থাপনার উন্নয়নে পৌরসভা কর্তৃপক্ষের পরিকল্পনাঃ

ক. ডাম্পিং / সাইট তৈরি করাঃ _____

খ. ল্যান্ডফিল তৈরি করাঃ _____

গ. ইকুইপমেন্ট সংগ্রহ করাঃ _____

ঘ. লোকবল নিয়োগ করাঃ _____

ঙ. সেবার পরিধি বৃদ্ধি করাঃ _____

১৯। পৌরসভার মাষ্টার প্ল্যান আছে কি? উক্ত মাস্টার প্ল্যানে বর্জ্য ব্যবস্থাপনার দিক-নির্দেশনা কি?

_____

তথ্যদাতার নাম:.....

পদবী:

যোগাযোগের মাধ্যম:

স্বাক্ষর:

আপনার মূল্যবান মতামত প্রদানকরার জন্য ধন্যবাদ

FGD with Waste Collectors

Assignment Name: A Survey on Waste Management Analysis in Nawabganj, Keraniganj and Dohar Upazilas.

Project Name: Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant.

FGD with Waste Collectors

Date:	Time:	Location: *Latitude:* *Longitude:*
Name of Facilitators	a. …. b. ….	
The objective	1. Present practices of Solid Waste Collection and Disposal 2. Suggestions for improvement	

এলাকার বর্জ্য বিষয়ক তথ্যসমূহ:-

১) আপনারা কোথায় থেকে বর্জ্য সংগ্রহ করে তা ডাম্পিং স্থানে অপসারণ করেন?

- বাসা-বাড়ি
- কিচেন বাজার
- শপিং মল
- অফিস
- রাস্তার ধারের ডাস্টবিন
- হাসপাতাল-ক্লিনিক
- শিল্প-কলকারখানা
- অন্যান্য, উল্লেখ করুন

২) আপনারা কখন বর্জ্য সংগ্রহ করে তা ডাম্পিং স্থানে অপসারণ করেন?

- ভোরে (৪ থেকে ৫ টা)
- সকালে (৫ থেকে ৮ টা)
- দুপুরে (১২ টা ৩ টা)

- বিকালে (৪-৫ টা)
- সন্ধ্যায় (৬-৭ টা)
- রাতে (৮টা থেকে-)

৩) আপনারা বর্জ্য সংগ্রহ করে তা ডাম্পিং স্থানে অপসারণ করার জন্য কোন সংস্থা থেকে অনুমোদন নিয়েছেন?

- কোন ধরনের অনুমোদন নেওয়া হয়নি
- পৌরসভা থেকে অনুমোদন নেওয়া হয়েছে
- উপজেলা পরিষদ থেকে অনুমোদন নেওয়া হয়েছে
- ইউনিয়ন পরিষদ থেকে অনুমোদন নেওয়া হয়েছে
- আবাসিক এলাকার সমিতি থেকে অনুমোদন নেওয়া হয়েছে

৪) আপনারা কী ধরনের যানবাহন দিয়ে বর্জ্য সংগ্রহ করে তা ডাম্পিং স্থানে অপসারণ করেন?

- রিক্সা-ভ্যান
- ট্রাক
- অন্যান্য

৫) আপনারা প্রতিদিনে কত বার রিক্সা-ভ্যান ও ট্রাক ব্যবহার করেন? অর্থাৎ কত আয়তন (বর্গফুট) বা কত কেজি/টন বর্জ্য অপসারণ করেন? যেমন: ১ ভ্যান সমান কত কেজি/ বর্গফুট

- রিক্সা-ভ্যান _____ কেজি/ বর্গফুট এবং প্রতি দিনে গড়ে ----বার। সর্বমোট ----------কেজি/টন
- ট্রাক_____ কেজি/ বর্গফুট এবং প্রতি দিনে গড়ে -------বার। সর্বমোট ----------কেজি/টন

৬) বর্জ্য সংগ্রহ করার সময় বা অপসারণের পর আপনাদের পরচ্ছিন্নতা কর্মী কি রি-সাইক্যাল বর্জ্য আলাদা করে বিক্রির জন্য সংগ্রহ করে?

- হ্যাঁ

- না

৭) রি-সাইক্যাল বর্জ্য আলাদা করে বিক্রির জন্য সংগ্রহ করলে। কি কি জিনিস আলাদা করে?

- প্লাস্টিক _____%
- কাঁচ_____ %
- ধাতব_____ %
- কাগজ_____ %
- কাপড়_____ %
- অন্যান্য নামসহ_____%

৮) যে বর্জ্য আপনারা সংগ্রহ করেন তা কোথায় ফেলে দেন?

- পৌরসভা কর্তৃক নির্ধারিত ডাম্পিং স্থানে
- উপজেলা কর্তৃক নির্ধারিত ডাম্পিং স্থানে
- ইউনিয়ন কর্তৃক নির্ধারিত ডাম্পিং স্থানে
- উপরের তিনটি স্থানের বাইরেও নদীর ধারে/ রাস্তার ধারে/ নিচু স্থানে
- কিছু অংশ আগুন দিয়ে পুড়িয়ে

৯) বর্জ্য সংগ্রহ পরিবহন ও অপসারণের জন্য বাড়ি/প্রতিষ্ঠান প্রতি কত টাকা মাসিক সার্ভিস চার্জ নিয়ে থাকেন

- বাড়ি প্রতি মাসিক----------টাকা
- প্রতিষ্ঠান প্রতি মাসিক----------টাকা

১০) বর্জ্য সংগ্রহ পরিবহন ও অপসারণের সময় পরিচ্ছন্নতা কর্মী কি সুরক্ষা পোষাক পরিধান করে?

- হ্যাঁ
- না

১১) আপনি কি আপনার এলাকার সামগ্রিক বর্জ্য ব্যবস্থাপনা নিয়ে সন্তুষ্ট?

- হ্যাঁ

- না হলে কারণসমূহ উল্লেখ করুন

.....
.....

১২) আপনার মতে এলাকার সামগ্রিক বর্জ্য ব্যবস্থাপনার উন্নয়নে প্রধান চ্যালেঞ্জগুলো কী?
(সংক্ষেপে উল্লেখ করুন)

.....
.....

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.....
.....

১৩) আপনার মতে এলাকার সামগ্রিক বর্জ্য ব্যবস্থাপনার উন্নয়নে প্রধান তিনটি করণীয় কী?

.....
.....

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.....

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.....

১৪) আপনার নিজ অবস্থান হতে এলাকার সামগ্রিক বর্জ্য ব্যবস্থাপনার উন্নয়নে আপনার নিজ অবস্থান হতে কি ধরণের সহযোগিতার সুযোগ রয়েছে?

.....

.....

তথ্যদাতার
নাম:.....
পদবী:
যোগাযোগের মাধ্যম:
স্বাক্ষর:

আপনার মূল্যবান মতামত প্রদান করার জন্য ধন্যবাদ

Attendance Sheet for FGD

Event name: FOCUS GROUP DISCUSSION (FGD)

Group name:

Project name: Waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant

Venue:

Date:

Sl.	Name & designation	Institution/ Organization/ Company	Phone number & e-mail	Signature
1				
2				
3				
4				
5				
6				

Photo consent

I agree that O.Creeds Ltd. can take video footage/photos of me during the event for official use/ এই কর্মশালায় আমার ছবি তোলা ও প্রাতিষ্ঠানিক কাজে ব্যবহারের জন্য আমি ও.ক্রিডসকে সম্মতি দিচ্ছি

Sl.	Name & designation	Institution/ Organization/ Company	Phone number & e-mail	Signature
7				
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Photo consent

I agree that O.Creeds Ltd. can take video footage/photos of me during the event for official use/ এই কর্মশালায় আমার ছবি তোলা ও প্রাতিষ্ঠানিক কাজে ব্যবহারের জন্য আমি ও.ক্রিডসকে সম্মতি দিচ্ছি

Sl.	Name & designation	Institution/ Organization/ Company	Phone number & e-mail	Signature
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25				

Photo consent

I agree that O.Creeds Ltd. can take video footage/photos of me during the event for official use/ এই কর্মশালায় আমার ছবি তোলা ও প্রাতিষ্ঠানিক কাজে ব্যবহারের জন্য আমি ও.ক্রিডসকে সম্মতি দিচ্ছি

Sl.	Name & designation	Institution/ Organization/ Company	Phone number & e-mail	Signature
26				
27				
28				
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31				
32				
33				
34				

Photo consent

I agree that O.Creeds Ltd. can take video footage/photos of me during the event for official use/ এই কর্মশালায় আমার ছবি তোলা ও প্রাতিষ্ঠানিক কাজে ব্যবহারের জন্য আমি ও.ক্রিডসকে সম্মতি দিচ্ছি

Sl.	Name & designation	Institution/ Organization/ Company	Phone number & e-mail	Signature
35				
36				
37				
38				
39				
40				

Photo consent

I agree that O.Creeds Ltd. can take video footage/photos of me during the event for official use/ এই কর্মশালায় আমার ছবি তোলা ও প্রাতিষ্ঠানিক কাজে ব্যবহারের জন্য আমি ও.ক্রিডসকে সম্মতি দিচ্ছি

9.4 Photos of Surveys, KIIs and FGDs

Photo from Survey (Nawabganj Upazila)

House Hold Survey Photos

Nawabganj Survey Photos


2023.08.31 11:08


sky
0.500

Dumpsite visit

Secondary Information collection

NAWABGANJ UPAZILA

Department of Agricultural Extension, Nawabganj, Dhaka

Upazila Livestock Office, Dohar Upzila

Upazila Office,Nawabganj Upazila

Upazila Office, Nawabganj Upazila

DOHAR UPAZILA

Upazila Health Complex, Dohar Upazila

Upazila Health Complex, Dohar Upazila

Upazila Office, Dohar

Upazila Office, Dohar

KERANIGANJ UPAZILA

Upazila Livestock Office, Keraniganj

Upazila Health Complex, Keraniganj

Upazila Health Complex, Keraniganj

Upazila Health Complex, Dohar

FGD with Waste Collectors

FGD with waste collector at Keraniganj

FGD with waste collector at Aganagar, Keraniganj

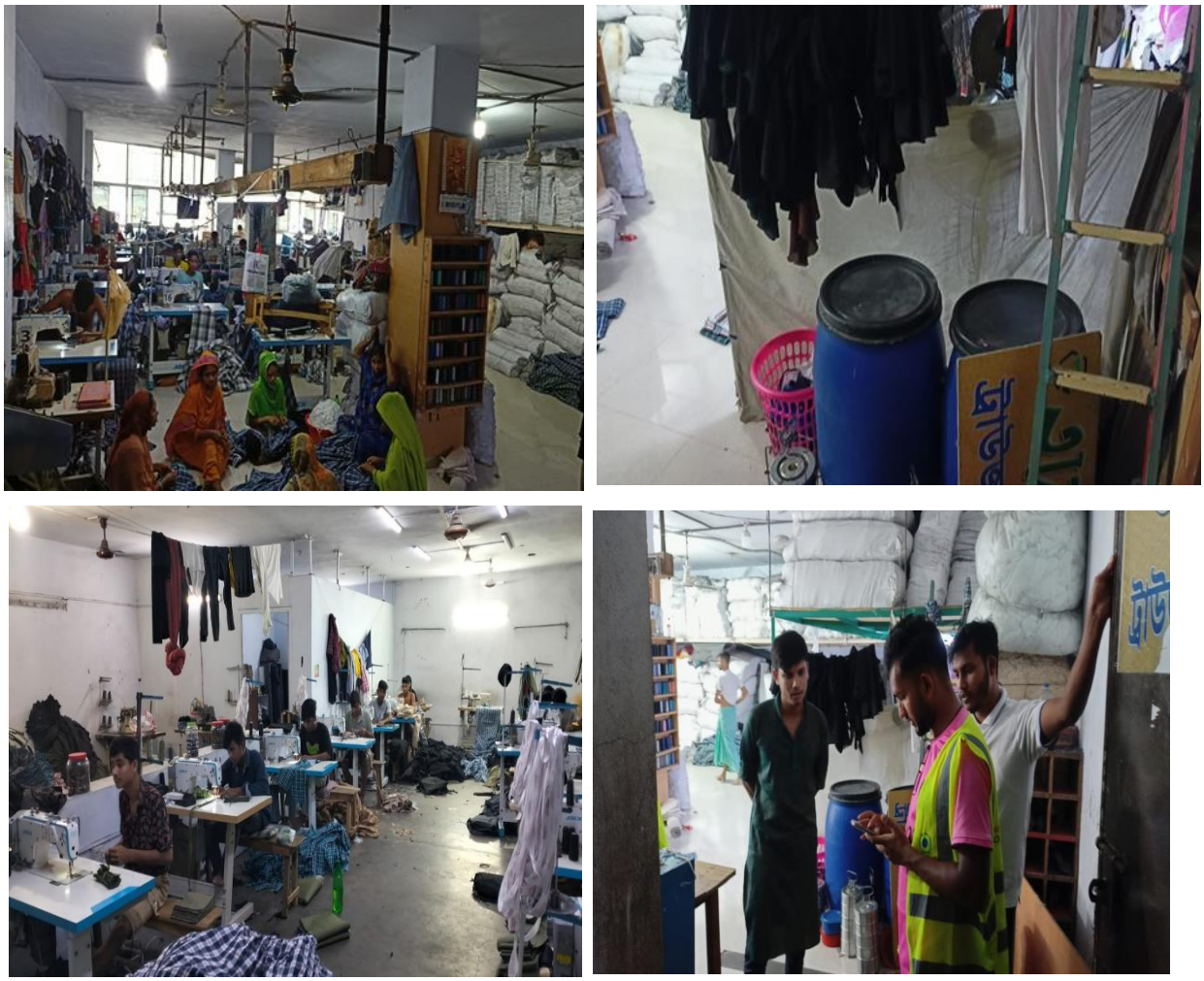
FGD with waste collector at Dohar

FGD with waste collector at Dohar

FGD with waste collectors, Zinzira, Keraniganj

FGD with waste collectors, Nawabganjj

Industry Survey

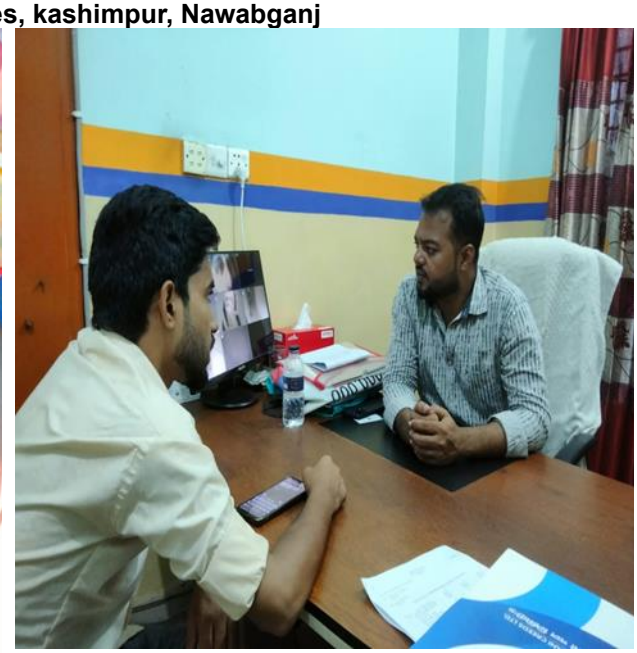


Industry Survey at Takuya Garments, Keraniganj

Industry Survey at Joypara Lungi factory,Dohar

Medical Survey

New life Medical services, kashimpur, Nawabganj



Modern clinic & Diagnostic center, bandura, Nawabganj

Hospital survey, Din Hospital, Kadomtoli, Keraniganj

Kitchen Market

Kitchen market survey Aganagar bazar

Kitchen market survey with vice President Joypara, Dohar bazar somitee

Expert Team Visit

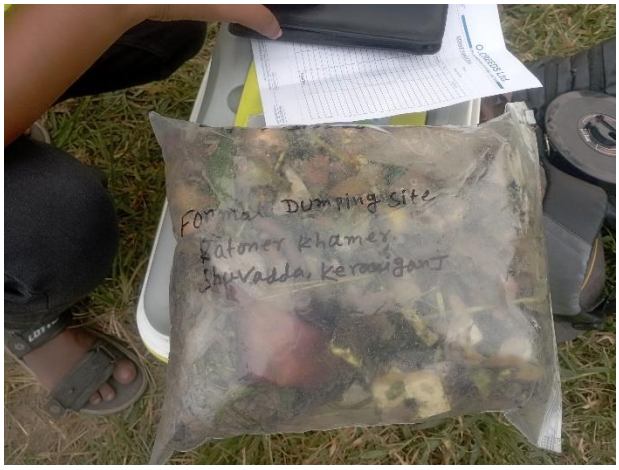
Engagement of Expert Team During Survey and KII

Waste Sample Collection for Lab Analysis

Sample Collection from Baspatti, Aganagar, Keraniganj

Sample Collection from Jinjira Informal Dumping Site, Keraniganj



Sample Collection from Suvadda formal Dumping Site, Keraniganj




Sample Collection from Shapkhali formal Dumping Site, Nawabganj

Sample Collection from Ratan Chattar Informal Dumping Site, Dohar




Sample Collection from Chakdighi Par Formal Dumping Site, Dohar

Expert Team Visit in Sample Collection Area

9.5 Response to the Review Comments

Page	Location	Comments	Response to the comments
EXECUTIVE SUMMARY			
i	4th Paragraph	Please include: Focus Group Discussion (FGD)	It has been included.
i	5th Paragraph	Please state the figure is representative of which data sources? Household generation only or including others?	The source of waste has been clarified.
i	5th Paragraph	Please check units, should this be % instead of MT? If so, it should add up to exactly 100%.	Updated.
i	5th Paragraph	Hazardous waste has to be separately treated. As per current practice, is hazardous waste collected together with MSW?	It is handled separately. Description has been updated.
i	6th Paragraph	Where is the industry waste disposed?	Description of industry waste disposal has been updated.
i	7th Paragraph	26% of ? MT waste generated in Keraniganj and Dohar = ? MT	Description has been clarified.
i	7th Paragraph	Please include the total amount (MT) which are delivered to each dumpsite. This shall be the amount that is expected to be received at the WTE plant based on the current waste management practices.	Included for each location.
i	7th Paragraph	**1.** Please clearly state context. "Only 0.6% of total waste generated in Nawabganj is disposed at the dumpsite"? **2.** 0.6% of ? MT waste generated from Nawabganj = ? MT	Description has been clarified.

Page	Location	Comments	Response to the comments
ii	1st Paragraph	Please indicate each local government structure separately. **1.** Please specify the legal acts, regulations that govern solid waste management in Bangladesh. **2.** Thereafter, describe each local government structure for managing waste. **3**. To clearly define roles within structure. For example, it is not understood what the 'Upazila Parishad' and 'Union parishad' means and its roles. Difference between Upazila and municipality?	The description has been clarified.
ii			
ii			
ii	2nd Paragraph	Chapters of review of previous projects, proposal of solid waste management framework, recommendation missing from Executive Summary	Adjusted.
CHAPTER 2: BASELINE INFORMATION OF THE STUDIED AREAS			
9	Keraniganj Upazila	Typo?	Updated.
9	Nawabganj Upazila	Typo?	Updated.
11	Rainfall of the study area	Please describe context on why is this included and where is the data sourced from?	Explanation and source added.
13	Table 2-1	Why is the final sample size more than 2 times and not for the others?	Explained.
25	Dohar municipality	Hospital waste is treated separately or dumped in the same place?	It is treated separately. Updated.

Page	Location	Comments	Response to the comments
25	Dohar municipality	Is there any recycling taking place?	Yes. It is mentioned now.
27	Keraniganj Upazila (2nd last paragraph)	What happens to the rest of the waste? To include description.	Rest of the waste released into the environment. Description added.
29	1st Paragaph (Nawabganj)	How is the remainder handled?	Rest of the waste released into the environment. Description added.
30	1st Paragaph (Dohar Municipality)	Please confirm if the units is in kg. Appears to be very low.	Yes, it Kg. It is indeed very low.
30	Keraniganj	Please confirm if the units is in kg. Appears to be very low.	Yes, kg.
30	Keraniganj	Please confirm if this should be kg/kg.	Yes, kg.
31	Nawabganj	Appears to be a small area. To confirm if the figure is accurate.	Yes, Not more than 2 acres
CHAPTER 3: LABORATORY TEST AND RESULT			
35	Table 3-2	To specify wet or dry basis	Due to time frame of our study, the lab tests done on 18 October and 4 November both were in late monsoon. Thus, they do not show dry season. For dry season we have to wait up to March which was not possible according to the project time frame

Page	Location	Comments	Response to the comments
35	Table 3-2	Specify basis, as received? dry basis? these two cannot be mixed. Applies to all columns	Due to time frame of our study, the lab tests done on 18 October and 4 November both were in late monsoon. Thus, they do not show dry season. For dry season we have to wait up to March which was not possible according to the project time frame
37	Figure 3-3 to Figure 3-8	The vertical scales on the graph is misleading, for example 12% fixed carbon appear to be graphically similar as 70% volatile matter. Please use scale of 0-100% on y-axis.	Updated.
CHAPTER 4: REVIEW OF PREVIOUS PROJECTS REGARDING WASTE TO ENERGY AND CIRCULAR ECONOMY			
43	3rd Paragraph	Name of plant?	The site does not have a formal name. Locals refer to it using the location name.
43	4th Paragraph	Is there a list of operational compost plants and more information about them?	In Bangladesh, Compost plant from municipal solid waste has not been functioning due to separation of thin polythene
43	1st Paragraph	Who are the consumers or offtakers from the compost plants	Kitchen gardener and nursery
CHAPTER 7: RECOMMENDATION			

Page	Location	Comments	Response to the comments
51	1st Paragraph	Recommendation should also include strategies for local governments / municipalities to restructure their current waste management policy, with priority on maximum and effective coverage of waste collection and disposal.	Recommendation has been added.
51	1st Paragraph	Are there any laws that govern or enforces measures on local governments in regards to waste management?	Relevant policy has been included.
51	3rd Paragraph	To Include separation of municipal solid waste and hazardous waste. important point	Recommendation has been included.
51	4th Paragraph	To adjust language to be more legible	Updated.
CHAPTER 8: CONCLUSION			
52	1st Paragraph	Please check, does not add up to 628MT	The percentages have been corrected.
52	3rd Paragraph	Specify dry basis or wet basis	Due to time frame of our study, the lab tests done on 18 October and 4 November both were in late monsoon. Thus, they do not show dry season. For dry season we have to wait up to March which was not possible according to the project time frame

9.6 Final Site Visit Documents

Assignment Name: A Survey WtE Plant and STS Site Selection in Nawabganj, Keraniganj and Dohar Upazilas

নিয়োগের নাম: নবাবগঞ্জ, কেরানীগঞ্জ এবং দোহার উপজেলায় একটি জরিপ ডব্লিউটিই প্ল্যান্ট এবং এসটিএস সাইট নির্বাচন

Project Name: Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant

প্রকল্পের নাম: নবাবগঞ্জ, কেরানীগঞ্জ এবং দোহার উপজেলায় বর্জ্য থেকে শক্তি কেন্দ্রের সম্ভাব্যতা অধ্যয়নের অংশ হিসেবে বর্জ্য ব্যবস্থাপনা বিশ্লেষণ পরিচালনা করুন

Part1-Surveyor Details (সার্ভেয়ারের বিবরণ)

Date তারিখ	24.01.24
Name of Surveyor সার্ভেয়ারের নাম	Md. Fazlul Haque
Contact Number যোগাযোগের নম্বর	01716201930

Part2–Site Details (সাইটের বিবরন)

Proposed WtE Plant Site Name প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প সাইটের নাম	নটা খোলা ব্রীজের নীচ		
Address ঠিকানা	নটা খোলা (নদীর পাড়)		
Upazila/ Pourashava উপজেলা/ পৌরসভা	দোহার		
Union/ Ward ইউনিয়ন/ ওয়ার্ড	৬ নং		
Local Name of the Area এলাকার স্থানীয় নাম	চর নটা খোলা (চর মীরতলা)		
Lat অক্ষাংশ:	23.617444	Long দ্রাঘিমাংশ:	90.113930

Type of Site সাইটের ধরন	☐ WtE Plant ☑ STS
Authority in charge দায়িত্বে থাকা কর্তৃপক্ষ	মো: [illegible]
Designation পদবী	চেয়ারম্যান
Contact details যোগাযোগের ঠিকানা	01733652742

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SN	Questionnaire	Answer
1	**Type of place** প্রস্তাবিত প্লেসের প্রকারভেদ	• Open dumping place without boundary সীমানা ছাড়াই খোলা প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প প্লেস • Open dumping place with boundary/ partial boundary সীমানা/আংশিক সীমানা সহ খোলা প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প স্থান • Sanitary land field স্যানিটারি ল্যান্ডফিল
2	**Area of place** প্রস্তাবিত প্রকল্প এলাকার আয়তন	২ [illegible]-----sq fts/ decimals বর্গ ফুট/ দশমিক
3	**The landowner of the place and location** প্রস্তাবিত প্রকল্প এলাকা এবং অবস্থানের জমির মালিক	[illegible]
4	**What kind of facilities are available here?** এখানে কি ধরনের সুবিধা পাওয়া যায়?	• Electricity (220 V/440 V/ 11 KB) বিদ্যুৎ • Gas গ্যাস • Water জল • Road Connection সড়ক সংযোগ • Others অন্যান্য
5	**Is there any resources recovery establishment/technology** কোন সম্পদ পুনরুদ্ধার স্থাপন/প্রযুক্তি আছে কি?	• Waste to electricity বিদ্যুতের অপচয় • Waste to compost plant কম্পোস্ট প্লান্টের বর্জ্য • Others অন্যান্য (If yes then current functionality, why abandoned, when started and abandoned) (যদি হ্যাঁ তাহলে বর্তমান কার্যকারিতা, কেন পরিত্যক্ত, কখন শুরু এবং পরিত্যক্ত)
6	**How much area of the place is covered by waste?** প্রস্তাবিত প্রকল্প প্লেসের কত এলাকা বর্জ্য দ্বারা আচ্ছাদিত?	২ [illegible]
7	**Is there any caretaker/ supervisor/ any staff to look after the place?** প্রস্তাবিত প্রকল্প প্লেস দেখাশোনা করার জন্য কি কোন তত্ত্বাবধায়ক/ সুপারভাইজার/ কোন কর্মী আছে?	[illegible]
8	**How is he/she supervising the place?** তিনি কিভাবে প্রস্তাবিত প্রকল্প প্লেস তদারকি করছেন?	—
9	**Is the place approved/ take clearance from the environment department?** প্রস্তাবিত প্রকল্প প্লেসটি কি পরিবেশ অধিদপ্তর থেকে অনুমোদিত/ছাড়পত্র নেওয়া হয়েছে? **If yes what type of clearance?** যদি হ্যাঁ কি ধরনের ছাড়পত্র?	NO

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Assignment Name: A Survey WtE Plant and STS Site Selection in Nawabganj, Keraniganj and Dohar Upazilas

নিয়োগের নাম: নবাবগঞ্জ, কেরানীগঞ্জ এবং দোহার উপজেলায় একটি জরিপ ডব্লিউটিই প্ল্যান্ট এবং এসটিএস সাইট নির্বাচন

Project Name: Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant

প্রকল্পের নাম: নবাবগঞ্জ, কেরানীগঞ্জ এবং দোহার উপজেলায় বর্জ্য থেকে শক্তি কেন্দ্রের সম্ভাব্যতা অধ্যয়নের অংশ হিসেবে বর্জ্য ব্যবস্থাপনা বিশ্লেষণ পরিচালনা করুন

Part1-Surveyor Details (সার্ভেয়ারের বিবরণ)

Date তারিখ	24.01.24
Name of Surveyor সার্ভেয়ারের নাম	Md. Fazlul Haque
Contact Number যোগাযোগের নম্বর	01716201930

Part2–Site Details (সাইটের বিবরন)

Proposed WtE Plant Site Name প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প সাইটের নাম	জয়পাড়া বাজার [illegible] হাট		
Address ঠিকানা	জয়পাড়া ([illegible])		
Upazila/ Pourashava উপজেলা/ পৌরসভা	দোহার		
Union/ Ward ইউনিয়ন/ ওয়ার্ড	৬ নং ওয়ার্ড		
Local Name of the Area এলাকার স্থানীয় নাম	দক্ষিণ জয়পাড়া		
Lat অক্ষাংশ:	23.616865	Long দ্রাঘিমাংশ:	90.147816

Type of Site সাইটের ধরন	☐ WtE Plant ☑ STS
Authority in charge দায়িত্বে থাকা কর্তৃপক্ষ	মো: হুমায়ুন কবীর
Designation পদবী	কাউন্সিলর
Contact details যোগাযোগের ঠিকানা	01733652742

Page 1 | 3

SN	Questionnaire	Answer
1	Type of place প্রস্তাবিত প্লেসের প্রকারভেদ	✓ Open dumping place without boundary সীমানা ছাড়াই খোলা প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প প্লেস • Open dumping place with boundary/ partial boundary সীমানা/আংশিক সীমানা সহ খোলা প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প স্থান • Sanitary land field স্যানিটারি ল্যান্ডফিল
2	Area of place প্রস্তাবিত প্রকল্প এলাকার আয়তন	৩ একর------sq fts/ decimals বর্গ ফুট/ দশমিক
3	The landowner of the place and location প্রস্তাবিত প্রকল্প এলাকা এবং অবস্থানের জমির মালিক	সরকার
4	What kind of facilities are available here? এখানে কি ধরনের সুবিধা পাওয়া যায়?	✓ Electricity (220 V/440 V/ 11 KB) বিদ্যুৎ • Gas গ্যাস ✓ Water জল ✓ Road Connection সড়ক সংযোগ • Others অন্যান্য
5	Is there any resources recovery establishment/technology কোন সম্পদ পুনরুদ্ধার স্থাপন/প্রযুক্তি আছে কি?	NO • Waste to electricity বিদ্যুতের অপচয় • Waste to compost plant কম্পোস্ট প্লান্টের বর্জ্য • Others অন্যান্য (If yes then current functionality, why abandoned, when started and abandoned) (যদি হ্যাঁ তাহলে বর্তমান কার্যকারিতা, কেন পরিত্যক্ত, কখন শুরু এবং পরিত্যক্ত)
6	How much area of the place is covered by waste? প্রস্তাবিত প্রকল্প প্লেসের কত এলাকা বর্জ্য দ্বারা আচ্ছাদিত?	৩ একর
7	Is there any caretaker/ supervisor/ any staff to look after the place? প্রস্তাবিত প্রকল্প প্লেস দেখাশোনা করার জন্য কি কোন তত্ত্বাবধায়ক/ সুপারভাইজার/ কোন কর্মী আছে?	নাই
8	How is he/she supervising the place? তিনি কিভাবে প্রস্তাবিত প্রকল্প প্লেস তদারকি করছেন?	—
9	Is the place approved/ take clearance from the environment department? প্রস্তাবিত প্রকল্প প্লেসটি কি পরিবেশ অধিদপ্তর থেকে অনুমোদিত/ছাড়পত্র নেওয়া হয়েছে? If yes what type of clearance? যদি হ্যাঁ কি ধরনের ছাড়পত্র?	NO

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10	Is the place disturbing the Household nearby? প্রস্তাবিত প্রকল্প প্লেস কি কাছাকাছি পরিবারকে কোনভাবে বিরক্ত করছে? If yes, please describe. যদি হ্যাঁ, বর্ণনা করুন	NO
11	Is the place disturbing the passerby and passengers? প্রস্তাবিত প্রকল্প প্লেস কি পথচারী ও যাত্রীদের বিরক্ত করছে? If yes, please describe যদি হ্যাঁ, বর্ণনা করুন	yes দুর্গন্ধ, যানবাহনে অসুবিধা
12	Is the site located in an area where floodings and landslides do not/regularly/occasionally (circle one that applies) affect very few/small/large/majority (circle one that applies) of the site? সাইটটি কি এমন একটি এলাকায় অবস্থিত যেখানে বন্যা এবং ভূমিধস /নিয়মিত/মাঝে-মাঝে (প্রযোজ্য ঘটনাটি বৃত্ত ভরাট করুন) সাইটের খুব কম/ছোট/বড়/অধিকাংশ (প্রযোজ্য ঘটনাটি বৃত্ত ভরাট করুন) প্রভাবিত করে না?	NO

Part3–Finish Survey (অংশ ৩- সমীক্ষা শেষ করুন)

Check on missing fields অনুপস্থিত ক্ষেত্র পরীক্ষা করুন	☐ Yes ☐ No	Check all data input সমস্ত ডেটা ইনপুট পর্যবেক্ষন করুন
I confirm that the data collected in this survey has been recorded fairly and honestly আমি নিশ্চিত করছি যে এই সমীক্ষায় সংগৃহীত তথ্য ন্যায্য এবং সততার সাথে রেকর্ড করা হয়েছে	yes	

Name of Informant তথ্যদাতার নাম: মোঃ বিপ্লব হোসেন

Designation পদবী: [illegible] (রবনা)

Contact Number যোগাযোগের নম্বর: 01753072297

Signature স্বাক্ষর: মোঃ বিপ্লব হোসেন

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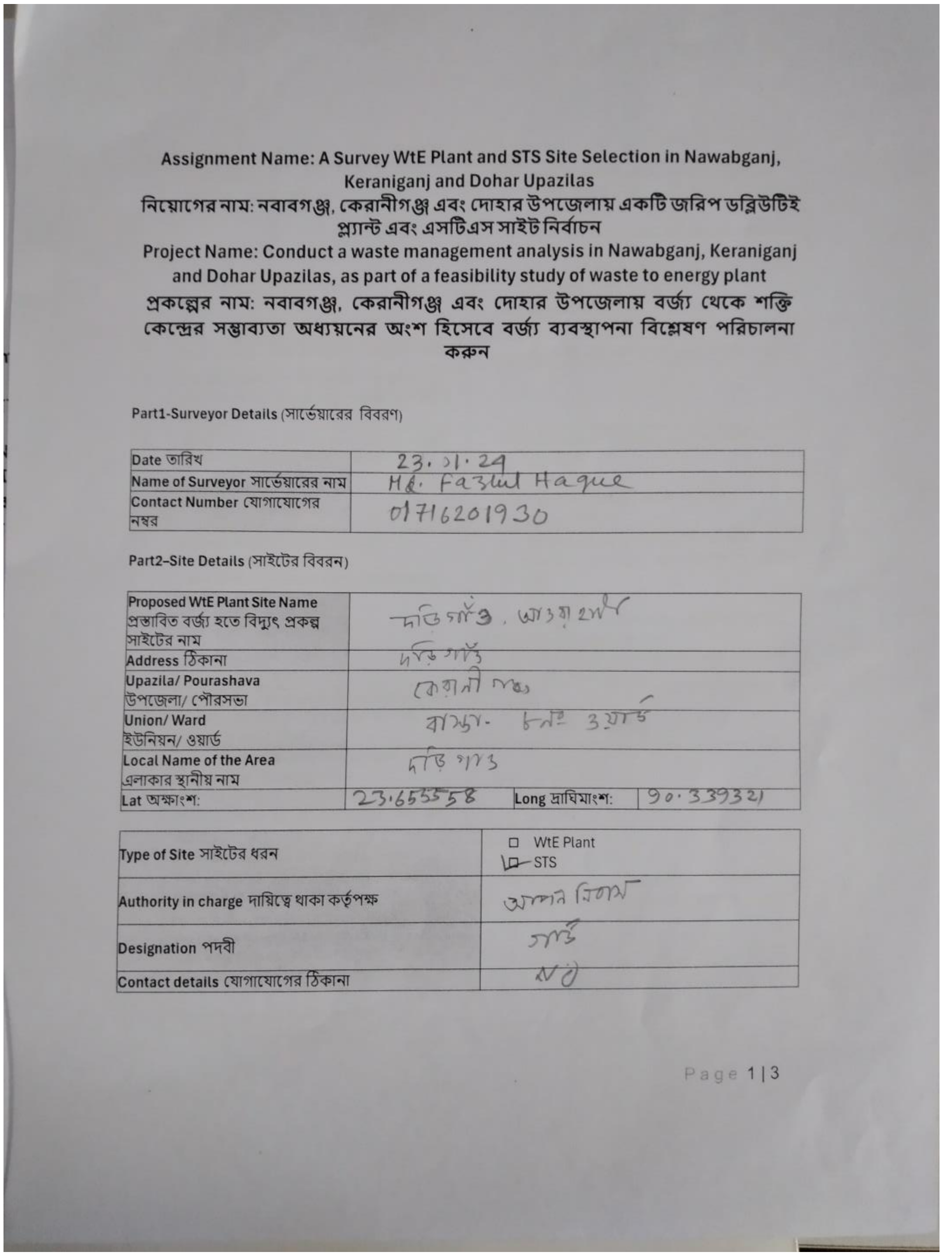

Assignment Name: A Survey WtE Plant and STS Site Selection in Nawabganj, Keraniganj and Dohar Upazilas
নিয়োগের নাম: নবাবগঞ্জ, কেরানীগঞ্জ এবং দোহার উপজেলায় একটি জরিপ ডব্লিউটিই প্ল্যান্ট এবং এসটিএস সাইট নির্বাচন
Project Name: Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant
প্রকল্পের নাম: নবাবগঞ্জ, কেরানীগঞ্জ এবং দোহার উপজেলায় বর্জ্য থেকে শক্তি কেন্দ্রের সম্ভাব্যতা অধ্যয়নের অংশ হিসেবে বর্জ্য ব্যবস্থাপনা বিশ্লেষণ পরিচালনা করুন

Part1-Surveyor Details (সার্ভেয়ারের বিবরণ)

Date তারিখ	23.01.24
Name of Surveyor সার্ভেয়ারের নাম	Md. Fazlul Haque
Contact Number যোগাযোগের নম্বর	01716201930

Part2-Site Details (সাইটের বিবরন)

Proposed WtE Plant Site Name প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প সাইটের নাম	দড়িগাঁও, [illegible]		
Address ঠিকানা	দড়িগাঁও		
Upazila/ Pourashava উপজেলা/ পৌরসভা	কেরানীগঞ্জ		
Union/ Ward ইউনিয়ন/ ওয়ার্ড	বাস্তা. ৮নং ওয়ার্ড		
Local Name of the Area এলাকার স্থানীয় নাম	দড়িগাঁও		
Lat অক্ষাংশ:	23.655558	Long দ্রাঘিমাংশ:	90.339321

Type of Site সাইটের ধরন	☐ WtE Plant ☑ STS
Authority in charge দায়িত্বে থাকা কর্তৃপক্ষ	[illegible]
Designation পদবী	[illegible]
Contact details যোগাযোগের ঠিকানা	NO

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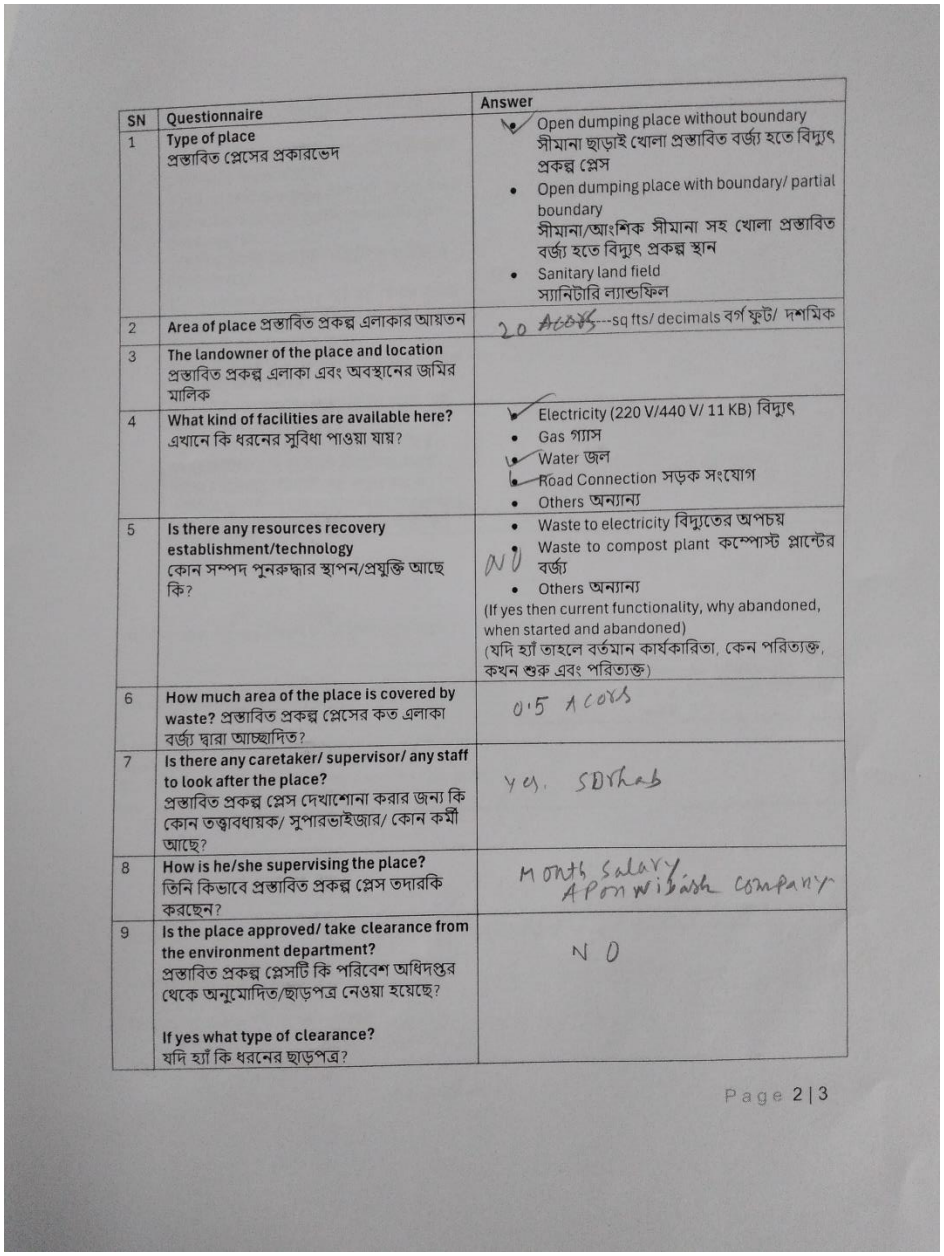

SN	Questionnaire	Answer
1	**Type of place** প্রস্তাবিত প্লেসের প্রকারভেদ	• Open dumping place without boundary সীমানা ছাড়াই খোলা প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প প্লেস • Open dumping place with boundary/ partial boundary সীমানা/আংশিক সীমানা সহ খোলা প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প স্থান • Sanitary land field স্যানিটারি ল্যান্ডফিল
2	**Area of place** প্রস্তাবিত প্রকল্প এলাকার আয়তন	20 ~~Acres~~---sq fts/ decimals বর্গ ফুট/ দশমিক
3	**The landowner of the place and location** প্রস্তাবিত প্রকল্প এলাকা এবং অবস্থানের জমির মালিক	
4	**What kind of facilities are available here?** এখানে কি ধরনের সুবিধা পাওয়া যায়?	• Electricity (220 V/440 V/ 11 KB) বিদ্যুৎ • Gas গ্যাস • Water জল • Road Connection সড়ক সংযোগ • Others অন্যান্য
5	**Is there any resources recovery establishment/technology** কোন সম্পদ পুনরুদ্ধার স্থাপন/প্রযুক্তি আছে কি?	• Waste to electricity বিদ্যুতের অপচয় • Waste to compost plant কম্পোস্ট প্লান্টের বর্জ্য • Others অন্যান্য (If yes then current functionality, why abandoned, when started and abandoned) (যদি হ্যাঁ তাহলে বর্তমান কার্যকারিতা, কেন পরিত্যক্ত, কখন শুরু এবং পরিত্যক্ত)
6	**How much area of the place is covered by waste?** প্রস্তাবিত প্রকল্প প্লেসের কত এলাকা বর্জ্য দ্বারা আচ্ছাদিত?	0.5 Acres
7	**Is there any caretaker/ supervisor/ any staff to look after the place?** প্রস্তাবিত প্রকল্প প্লেস দেখাশোনা করার জন্য কি কোন তত্ত্বাবধায়ক/ সুপারভাইজার/ কোন কর্মী আছে?	Yes. SDYLab
8	**How is he/she supervising the place?** তিনি কিভাবে প্রস্তাবিত প্রকল্প প্লেস তদারকি করছেন?	Month Salary Aponwibash Company
9	**Is the place approved/ take clearance from the environment department?** প্রস্তাবিত প্রকল্প প্লেসটি কি পরিবেশ অধিদপ্তর থেকে অনুমোদিত/ছাড়পত্র নেওয়া হয়েছে? **If yes what type of clearance?** যদি হ্যাঁ কি ধরনের ছাড়পত্র?	N O

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10	**Is the place disturbing the Household nearby?** প্রস্তাবিত প্রকল্প প্লেস কি কাছাকাছি পরিবারকে কোনভাবে বিরক্ত করছে? **If yes, please describe.** যদি হ্যাঁ, বর্ণনা করুন	NO
11	**Is the place disturbing the passerby and passengers?** প্রস্তাবিত প্রকল্প প্লেস কি পথচারী ও যাত্রীদের বিরক্ত করছে? **If yes, please describe** যদি হ্যাঁ, বর্ণনা করুন	NO
12	**Is the site located in an area where floodings and landslides do not/regularly/occasionally (circle one that applies) affect very few/small/large/majority (circle one that applies) of the site?** সাইটটি কি এমন একটি এলাকায় অবস্থিত যেখানে বন্যা এবং ভূমিধস /নিয়মিত/মাঝে-মাঝে (প্রযোজ্য ঘটনাটি বৃত্ত ভরাট করুন) সাইটের খুব কম/ছোট/বড়/অধিকাংশ (প্রযোজ্য ঘটনাটি বৃত্ত ভরাট করুন) প্রভাবিত করে না?	NO

Part3–Finish Survey (অংশ ৩- সমীক্ষা শেষ করুন)

Check on missing fields অনুপস্থিত ক্ষেত্র পরীক্ষা করুন	☐ Yes ☐ No	**Check all data input** সমস্ত ডেটা ইনপুট পর্যবেক্ষন করুন
I confirm that the data collected in this survey has been recorded fairly and honestly আমি নিশ্চিত করছি যে এই সমীক্ষায় সংগৃহীত তথ্য ন্যায্য এবং সততার সাথে রেকর্ড করা হয়েছে	Yes	

Name of Informant তথ্যদাতার নাম: .....

Designation পদবী: .....

Contact Number যোগাযোগের নম্বর: .....

Signature স্বাক্ষর: .....

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Assignment Name: A Survey WtE Plant and STS Site Selection in Nawabganj, Keraniganj and Dohar Upazilas

নিয়োগের নাম: নবাবগঞ্জ, কেরানীগঞ্জ এবং দোহার উপজেলায় একটি জরিপ ডব্লিউটিই প্ল্যান্ট এবং এসটিএস সাইট নির্বাচন

Project Name: Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant

প্রকল্পের নাম: নবাবগঞ্জ, কেরানীগঞ্জ এবং দোহার উপজেলায় বর্জ্য থেকে শক্তি কেন্দ্রের সম্ভাব্যতা অধ্যয়নের অংশ হিসেবে বর্জ্য ব্যবস্থাপনা বিশ্লেষণ পরিচালনা করুন

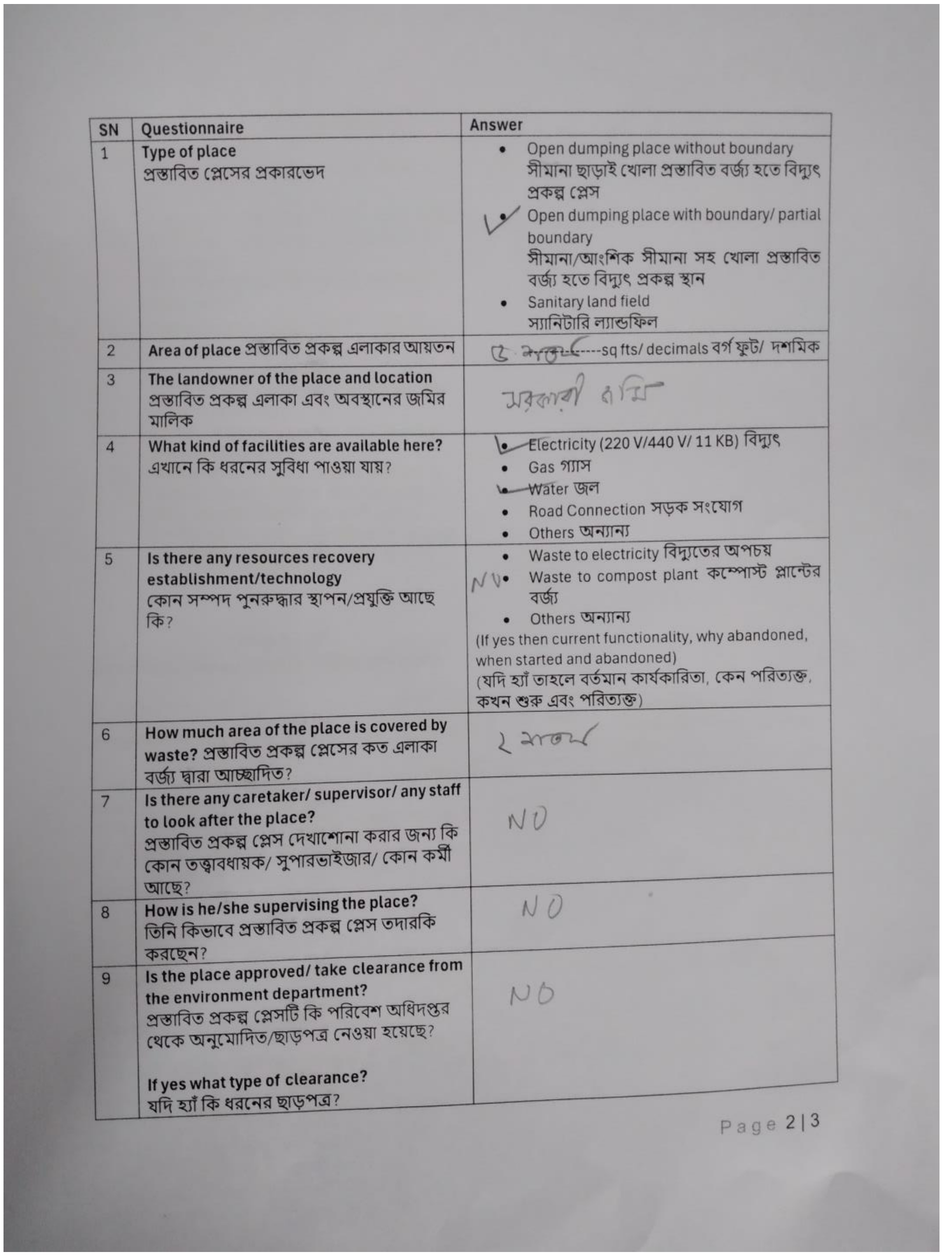
Part1-Surveyor Details (সার্ভেয়ারের বিবরণ)

Date তারিখ	24.01.24
Name of Surveyor সার্ভেয়ারের নাম	Md. Fazlul Haque
Contact Number যোগাযোগের নম্বর	01716201930

Part2–Site Details (সাইটের বিবরন)

Proposed WtE Plant Site Name প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প সাইটের নাম	সমসাময়িক		
Address ঠিকানা	সমসাময়িক		
Upazila/ Pourashava উপজেলা/ পৌরসভা			
Union/ Ward ইউনিয়ন/ ওয়ার্ড	৫নং ৩৮৩		
Local Name of the Area এলাকার স্থানীয় নাম	৫৩ সমসাময়িক		
Lat অক্ষাংশ:	23.663705	**Long** দ্রাঘিমাংশ:	90.157639

Type of Site সাইটের ধরন	☐ WtE Plant ☑ STS
Authority in charge দায়িত্বে থাকা কর্তৃপক্ষ	মো: ইব্রাহিম খলিল
Designation পদবী	চেয়ারম্যান, [illegible] ইউনিয়ন
Contact details যোগাযোগের ঠিকানা	01913043006



SN	Questionnaire	Answer
1	Type of place প্রস্তাবিত প্লেসের প্রকারভেদ	• Open dumping place without boundary সীমানা ছাড়াই খোলা প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প প্লেস ✓ • Open dumping place with boundary/ partial boundary সীমানা/আংশিক সীমানা সহ খোলা প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প স্থান • Sanitary land field স্যানিটারি ল্যান্ডফিল
2	Area of place প্রস্তাবিত প্রকল্প এলাকার আয়তন	৫ শতক----sq fts/ decimals বর্গ ফুট/ দশমিক
3	The landowner of the place and location প্রস্তাবিত প্রকল্প এলাকা এবং অবস্থানের জমির মালিক	সরকারী জমি
4	What kind of facilities are available here? এখানে কি ধরনের সুবিধা পাওয়া যায়?	✓ • Electricity (220 V/440 V/ 11 KB) বিদ্যুৎ • Gas গ্যাস ✓ • Water জল • Road Connection সড়ক সংযোগ • Others অন্যান্য
5	Is there any resources recovery establishment/technology কোন সম্পদ পুনরুদ্ধার স্থাপন/প্রযুক্তি আছে কি?	• Waste to electricity বিদ্যুতের অপচয় NV • Waste to compost plant কম্পোস্ট প্লান্টের বর্জ্য • Others অন্যান্য (If yes then current functionality, why abandoned, when started and abandoned) (যদি হ্যাঁ তাহলে বর্তমান কার্যকারিতা, কেন পরিত্যক্ত, কখন শুরু এবং পরিত্যক্ত)
6	How much area of the place is covered by waste? প্রস্তাবিত প্রকল্প প্লেসের কত এলাকা বর্জ্য দ্বারা আচ্ছাদিত?	২ শতক
7	Is there any caretaker/ supervisor/ any staff to look after the place? প্রস্তাবিত প্রকল্প প্লেস দেখাশোনা করার জন্য কি কোন তত্ত্বাবধায়ক/ সুপারভাইজার/ কোন কর্মী আছে?	NO
8	How is he/she supervising the place? তিনি কিভাবে প্রস্তাবিত প্রকল্প প্লেস তদারকি করছেন?	NO
9	Is the place approved/ take clearance from the environment department? প্রস্তাবিত প্রকল্প প্লেসটি কি পরিবেশ অধিদপ্তর থেকে অনুমোদিত/ছাড়পত্র নেওয়া হয়েছে? If yes what type of clearance? যদি হ্যাঁ কি ধরনের ছাড়পত্র?	NO

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10	**Is the place disturbing the Household nearby?** প্রস্তাবিত প্রকল্প প্লেস কি কাছাকাছি পরিবারকে কোনভাবে বিরক্ত করছে? **If yes, please describe.** যদি হ্যাঁ, বর্ণনা করুন	NO
11	**Is the place disturbing the passerby and passengers?** প্রস্তাবিত প্রকল্প প্লেস কি পথচারী ও যাত্রীদের বিরক্ত করছে? **If yes, please describe** যদি হ্যাঁ, বর্ণনা করুন	NO
12	**Is the site located in an area where floodings and landslides do not/regularly/occasionally (circle one that applies) affect very few/small/large/majority (circle one that applies) of the site?** সাইটটি কি এমন একটি এলাকায় অবস্থিত যেখানে বন্যা এবং ভূমিধস /নিয়মিত/মাঝে-মাঝে (প্রযোজ্য ঘটনাটি বৃত্ত ভরাট করুন) সাইটের খুব কম/ছোট/বড়/অধিকাংশ (প্রযোজ্য ঘটনাটি বৃত্ত ভরাট করুন) প্রভাবিত করে না?	NO

Part3–Finish Survey (অংশ ৩- সমীক্ষা শেষ করুন)

Check on missing fields অনুপস্থিত ক্ষেত্র পরীক্ষা করুন	☐ Yes ☐ No	**Check all data input** সমস্ত ডেটা ইনপুট পর্যবেক্ষন করুন
I confirm that the data collected in this survey has been recorded fairly and honestly আমি নিশ্চিত করছি যে এই সমীক্ষায় সংগৃহীত তথ্য ন্যায্য এবং সততার সাথে রেকর্ড করা হয়েছে	Yes	

Name of Informant তথ্যদাতার নাম: মো: নাসির

Designation পদবী: গ্রাম পুলিশ

Contact Number যোগাযোগের নম্বর: 01406110878

Signature স্বাক্ষর:

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Assignment Name: A Survey WtE Plant and STS Site Selection in Nawabganj, Keraniganj and Dohar Upazilas
নিয়োগের নাম: নবাবগঞ্জ, কেরানীগঞ্জ এবং দোহার উপজেলায় একটি জরিপ ডব্লিউটিই প্ল্যান্ট এবং এসটিএস সাইট নির্বাচন
Project Name: Conduct a waste management analysis in Nawabganj, Keraniganj and Dohar Upazilas, as part of a feasibility study of waste to energy plant
প্রকল্পের নাম: নবাবগঞ্জ, কেরানীগঞ্জ এবং দোহার উপজেলায় বর্জ্য থেকে শক্তি কেন্দ্রের সম্ভাব্যতা অধ্যয়নের অংশ হিসেবে বর্জ্য ব্যবস্থাপনা বিশ্লেষণ পরিচালনা করুন

Part1-Surveyor Details (সার্ভেয়ারের বিবরণ)

Date তারিখ	23.01.24
Name of Surveyor সার্ভেয়ারের নাম	Md. Fazlul Haque
Contact Number যোগাযোগের নম্বর	01716201930

Part2-Site Details (সাইটের বিবরন)

Proposed WtE Plant Site Name প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প সাইটের নাম	ধলেশ্বরী নদী		
Address ঠিকানা	হরি গাঁও		
Upazila/ Pourashava উপজেলা/ পৌরসভা	কেরানীগঞ্জ		
Union/ Ward ইউনিয়ন/ ওয়ার্ড	বাস্তা, ৮নং ওয়ার্ড		
Local Name of the Area এলাকার স্থানীয় নাম	আওরাহাটী		
Lat অক্ষাংশ:	23.651969	Long দ্রাঘিমাংশ:	90.344179

Type of Site সাইটের ধরন	☑ WtE Plant ☐ STS
Authority in charge দায়িত্বে থাকা কর্তৃপক্ষ	মঞ্জুরুল আলম PD
Designation পদবী	Project Director
Contact details যোগাযোগের ঠিকানা	01716599002

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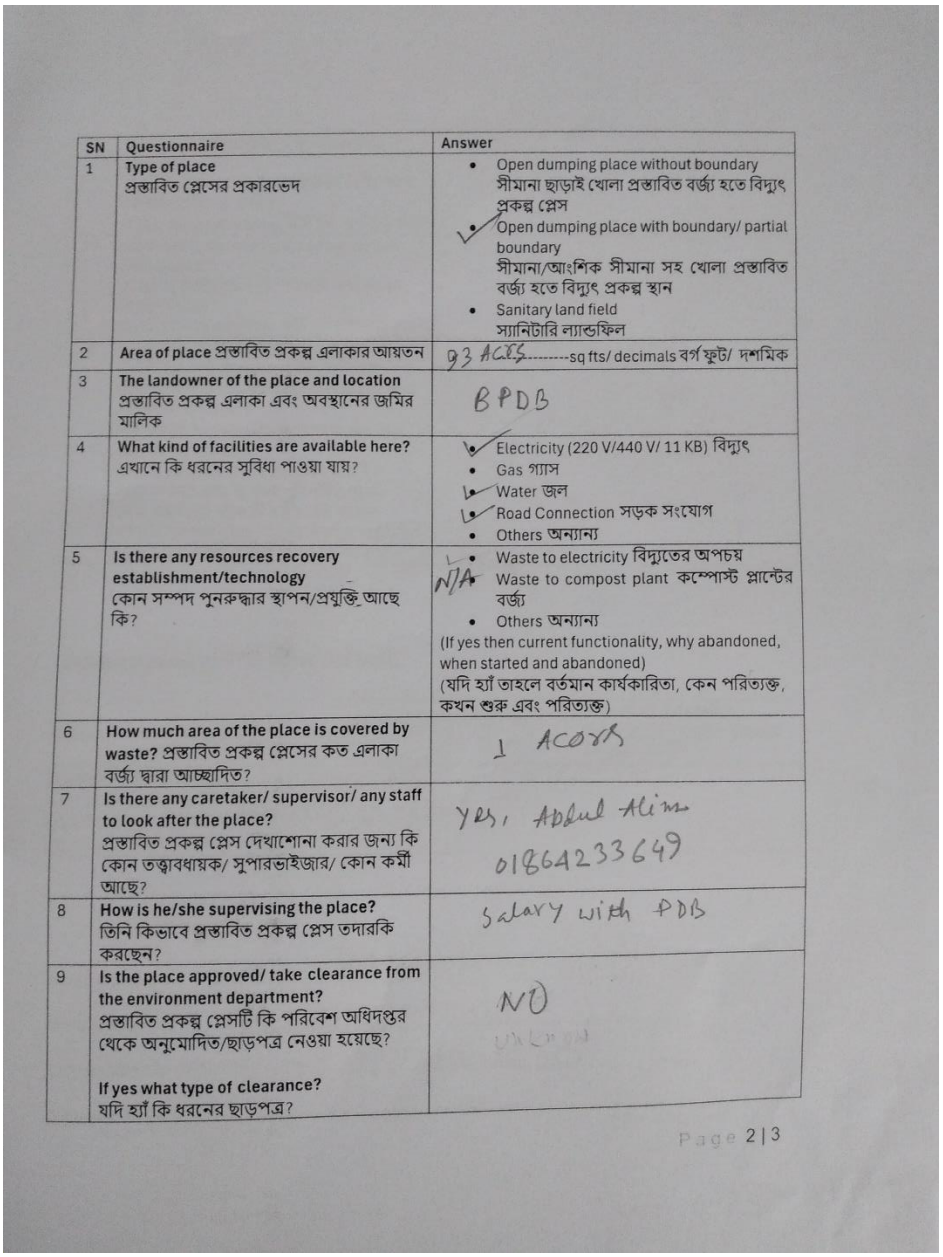

SN	Questionnaire	Answer
1	**Type of place** প্রস্তাবিত প্লেসের প্রকারভেদ	• Open dumping place without boundary সীমানা ছাড়াই খোলা প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প প্লেস • ✓ Open dumping place with boundary/ partial boundary সীমানা/আংশিক সীমানা সহ খোলা প্রস্তাবিত বর্জ্য হতে বিদ্যুৎ প্রকল্প স্থান • Sanitary land field স্যানিটারি ল্যান্ডফিল
2	**Area of place** প্রস্তাবিত প্রকল্প এলাকার আয়তন	93 ACRS.....sq fts/ decimals বর্গ ফুট/ দশমিক
3	**The landowner of the place and location** প্রস্তাবিত প্রকল্প এলাকা এবং অবস্থানের জমির মালিক	BPDB
4	**What kind of facilities are available here?** এখানে কি ধরনের সুবিধা পাওয়া যায়?	• ✓ Electricity (220 V/440 V/ 11 KB) বিদ্যুৎ • Gas গ্যাস • ✓ Water জল • ✓ Road Connection সড়ক সংযোগ • Others অন্যান্য
5	**Is there any resources recovery establishment/technology** কোন সম্পদ পুনরুদ্ধার স্থাপন/প্রযুক্তি আছে কি?	• Waste to electricity বিদ্যুতের অপচয় N/A • Waste to compost plant কম্পোস্ট প্লান্টের বর্জ্য • Others অন্যান্য (If yes then current functionality, why abandoned, when started and abandoned) (যদি হ্যাঁ তাহলে বর্তমান কার্যকারিতা, কেন পরিত্যক্ত, কখন শুরু এবং পরিত্যক্ত)
6	**How much area of the place is covered by waste?** প্রস্তাবিত প্রকল্প প্লেসের কত এলাকা বর্জ্য দ্বারা আচ্ছাদিত?	1 ACORS
7	**Is there any caretaker/ supervisor/ any staff to look after the place?** প্রস্তাবিত প্রকল্প প্লেস দেখাশোনা করার জন্য কি কোন তত্ত্বাবধায়ক/ সুপারভাইজার/ কোন কর্মী আছে?	Yes, Abdul Alim 01864233649
8	**How is he/she supervising the place?** তিনি কিভাবে প্রস্তাবিত প্রকল্প প্লেস তদারকি করছেন?	Salary with PDB
9	**Is the place approved/ take clearance from the environment department?** প্রস্তাবিত প্রকল্প প্লেসটি কি পরিবেশ অধিদপ্তর থেকে অনুমোদিত/ছাড়পত্র নেওয়া হয়েছে? **If yes what type of clearance?** যদি হ্যাঁ কি ধরনের ছাড়পত্র?	NO

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10	**Is the place disturbing the Household nearby?** প্রস্তাবিত প্রকল্প প্লেস কি কাছাকাছি পরিবারকে কোনভাবে বিরক্ত করছে? **If yes, please describe.** যদি হ্যাঁ, বর্ণনা করুন	NO
11	**Is the place disturbing the passerby and passengers?** প্রস্তাবিত প্রকল্প প্লেস কি পথচারী ও যাত্রীদের বিরক্ত করছে? **If yes, please describe** যদি হ্যাঁ, বর্ণনা করুন	NO
12	**Is the site located in an area where floodings and landslides do not/regularly/occasionally (circle one that applies) affect very few/small/large/majority (circle one that applies) of the site?** সাইটটি কি এমন একটি এলাকায় অবস্থিত যেখানে বন্যা এবং ভূমিধস /নিয়মিত/মাঝে-মাঝে (প্রযোজ্য ঘটনাটি বৃত্ত ভরাট করুন) সাইটের খুব কম/ছোট/বড়/অধিকাংশ (প্রযোজ্য ঘটনাটি বৃত্ত ভরাট করুন) প্রভাবিত করে না?	NO

Part3–Finish Survey (অংশ ৩- সমীক্ষা শেষ করুন)

Check on missing fields অনুপস্থিত ক্ষেত্র পরীক্ষা করুন	☐ Yes ☐ No	**Check all data input** সমস্ত ডেটা ইনপুট পর্যবেক্ষন করুন
I confirm that the data collected in this survey has been recorded fairly and honestly আমি নিশ্চিত করছি যে এই সমীক্ষায় সংগৃহীত তথ্য ন্যায্য এবং সততার সাথে রেকর্ড করা হয়েছে	yes	

Name of Informant তথ্যদাতার নাম: [illegible]

Designation পদবী: [illegible]

Contact Number যোগাযোগের নম্বর: 01711801630

Signature স্বাক্ষর: [signature]

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10	**Is the place disturbing the Household nearby?** প্রস্তাবিত প্রকল্প প্লেস কি কাছাকাছি পরিবারকে কোনভাবে বিরক্ত করছে? **If yes, please describe.** যদি হ্যাঁ, বর্ণনা করুন	yes দুর্গন্ধ থাকতে পারে
11	**Is the place disturbing the passerby and passengers?** প্রস্তাবিত প্রকল্প প্লেস কি পথচারী ও যাত্রীদের বিরক্ত করছে? **If yes, please describe** যদি হ্যাঁ, বর্ণনা করুন	দুর্গন্ধ থাকতে পারে।
12	**Is the site located in an area where floodings and landslides do not/regularly/occasionally (circle one that applies) affect very few/small/large/majority (circle one that applies) of the site?** সাইটটি কি এমন একটি এলাকায় অবস্থিত যেখানে বন্যা এবং ভূমিধস /নিয়মিত/মাঝে-মাঝে (প্রযোজ্য ঘটনাটি বৃত্ত ভরাট করুন) সাইটের খুব কম/ছোট/বড়/অধিকাংশ (প্রযোজ্য ঘটনাটি বৃত্ত ভরাট করুন) প্রভাবিত করে না?	বন্যা হয়

Part3–Finish Survey (অংশ ৩- সমীক্ষা শেষ করুন)

Check on missing fields অনুপস্থিত ক্ষেত্র পরীক্ষা করুন	☐ Yes ☐ No	**Check all data input** সমস্ত ডেটা ইনপুট পর্যবেক্ষন করুন
I confirm that the data collected in this survey has been recorded fairly and honestly আমি নিশ্চিত করছি যে এই সমীক্ষায় সংগৃহীত তথ্য ন্যায্য এবং সততার সাথে রেকর্ড করা হয়েছে	Yes	

Name of Informant তথ্যদাতার নাম: মোঃ জাহাঙ্গীর হোসেন

Designation পদবী: চালক

Contact Number যোগাযোগের নম্বর: 01920738612

Signature স্বাক্ষর: .....

9.7 Stakeholder Meeting Minutes

Subject: Minutes of the meeting on the Feasibility Study Report for Waste to Energy Power Plant Considering the Available Waste of Nawabganj, Keraniganj and Dohar Upazilas

Chief Guest : Dr. Syed Masum Ahmed Choudhury, Ministry of Power, Energy and Mineral Resources.
Chairperson : Mr. Nirod Chandra Mondal, Joint Secretary, Renewable Energy, Power Division
Date : 18 January 2024
Place : Bangladesh Power Development Board Conference Hall

The Policy Advisory Programme for Promoting Energy Efficiency and Renewable Energy (PAP) is a project that aims to incorporate binding targets for energy efficiency and renewable energy into policy documents. On the 18th of January, a stakeholder meeting was organized by **GIZ** at the Bangladesh Power Development Board (**BPDB**) Conference Hall. The objective was to create a platform for BPDB to address queries and provide input for the final project report to **O. Creeds Ltd.** and **Fichtner**. The session, attended by **local government officials**, facilitated collaborative discussions.

1. The distinguished presence of **Dr. Syed Masum Ahmed Choudhury** as the chief guest marked a significant aspect of the event. The workshop was Chaired by **Mr. Nirod Chandra Mondal.** Notably, the event saw the participation of officials from O.Creeds Ltd., Fichtner and GIZ.
2. **Mr. Nirod Chandra Mondal** is the National Project Director for PAP and EEGIRE II projects of GIZ Bangladesh.

BPDB TO FITCHNER

The following points were discussed for the role of Fitcher:

1. The meeting discussed Anaerobic Digestion for Waste-to-Energy (WtE) conversion.
2. Clarification points regarding DBO (3/6) were addressed and referred to in the presentation.
3. The Bangladesh Power Development Board (BPDB) is seeking an explanation on Export and Import in Power Purchase Agreements (PPA), as indicated in the Presentation Flow Chart Area.
4. The exploration of the best process for managing inertia in power systems was discussed. Inertia in power systems, referring to the energy stored in large rotating generators and some industrial motors, gives them the tendency to remain rotating.
5. A discussion on exploring other possibilities for energy conversion.
6. A justification is needed for the capital expenditure (KPEX) at $10.7 million.
7. Reasons and consequences of transitioning to an electric city were discussed during the meeting.
8. The meeting highlighted the need for synergy and integration when introducing technology.
9. The meeting discussed incorporating additional technologies for comprehensive solutions.

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BPDB INTERNAL MEETING AFTER MAIN MEETING for O. Creeds

The following points were discussed for the role of O. Creeds Ltd.:

1. The meeting addressed strategies aimed at enhancing existing waste collection practices in Keraniganj, Dohar, and Nawabganj.
2. The report deadline was emphasized during the meeting, and it is set for January 30th of 2024.
3. Discussions focused on enhancing the capability of the Sewage Treatment System (STS) location and the proposed landfill site.
4. The meeting included considerations for increasing the capacity of the proposed waste collection system.
5. Techniques for the segregation of organic waste were discussed in the meeting.
6. Details regarding the proposed land for waste management, including its source and relevant authority, were presented.
7. The meeting considered the inclusion of an incineration plant in the waste management plan.
8. Recommendations for the proposed dumping site and the addition of Sewage Treatment System (STS) were discussed, to be included in a new chapter

BPDB TO ALL

The following points were discussed for all parties:

1. It was well-addressed in the meeting whether the responsibility for the Compost Plant lies with LGED or an NGO.
2. The meeting emphasized the need to prioritize waste separation as a primary concern.
3. The focus of the discussion was on capacity building for large-scale waste collection.
4. The meeting explored the potential of generating 1MW from waste for evacuation purposes.
5. The possibility of gas generation from the collected waste was investigated during the meeting.
6. The meeting delved into the potential for biogas/gas generation within the project.
7. The meeting acknowledged BPDB's emphasis on proper waste management, even if the project initially does not generate electricity, with a subsequent focus on gas generation.

There was a speech by the chief guest, Dr. Syed Masum Ahmed Choudhury, followed by a concluding speech by the chairperson, Mr. Nirod Chandra Mondal.

Stakeholder Consultation Workshop on the Draft Feasibility Study for Waste to Energy Power Plant Considering the Available Waste of Nawabganj, Keraniganj and Dohar Upazillas

Venue: Bijoy Hall, Bidhut Bhaban

Date: January 18, 2024

Sl No	Name	Organization	Email	Signature
1	Md. Zahid Hossain	Expert BPDB	zahid.he@yahoo.com	
2	Md. Shahadat Hossain	SWM Expert, BPDB	shihanbuet@gmail.com	
3	Ahasanul Haque	Expert BPDB	haque.ahasan@gmail.com	
4	Md Atiqur Rahman Siddiqui	Expert of Energy BPDB		
5	Sagor Talukder	Energy Expert BPDB		
6	Dr Matthias Johnsen	Expert Consultant Fichtner GmbH & Co KG	Matthias.Johnsen@fichtner.de	
7	Mohammad Saiful Islam Mazumder	Local Govt. Division	saiful018@yahoo.co.uk	
8	Emrat Jahan	BPDB	emrat.sm@gmail.com	
9	Mahmud Al Monel	SRED A	ad.eecc@sreda.gov.bd	

Photo consent

I agree that GIZ can take video footage/photos of me during the event for official use/ এই কর্মশালায় আমার ছবি তোলা ও প্রাতিষ্ঠানিক কাজে ব্যবহারের জন্য আমি জিআইজেডকে সম্মতি দিচ্ছি

Stakeholder Consultation Workshop on the Draft Feasibility Study for Waste to Energy Power Plant Considering the Available Waste of Nawabganj, Keraniganj and Dohar Upazillas

Venue: Bijoy Hall, Bidhut Bhaban

Date: January 18, 2024

Sl No	Name	Organization	Email	Signature
10	N. M. S. Kabir Director, PPP Cell-1	BPDB	nurkabir@yahoo.com	
11	Q. A. Sharkar Sadique	Power Cell	QASSADIQUE@GMAIL.COM	
12	Md. Rukan Uddin, Director coal Power Generation	BPDB	director.coalpower@yahoo.com	
13	Daisy Pervin Director(SE)	Project Planning BPDB	daisypervin@yahoo.com	Daisy
14	Jahia Nayma Panna Director (SE)	BPDB	jahiapanna@gmail.com	18.01.24
15	Md. Sohel Hossain Siddiqui SE, EAU	BPDB	se.eau@yahoo.com	
16	Engr. Mohammad Abdullah Bhuiyan Dir. (Ad-ch) (SE)	BPDB	mabmanikn@gmail.com	18.01.2024
17	Md. Foridur Rahman Director Audit	BPDB	foridurrahmanbpdb@gmail.com	18.01.2024
18	Engr. Md. Abul Basher Executive Engineer	BPDB	basher.buet@gmail.com	18.01.24
19	Intiaz Ahmed Faridc Executive Engineer	BPDB	intiazaf@yahoo.ca	18/01/24

Photo consent

I agree that GIZ can take video footage/photos of me during the event for official use/ এই কর্মশালায় আমার ছবি তোলা ও প্রাতিষ্ঠানিক কাজে ব্যবহারের জন্য আমি জিআইজেডকে সম্মতি দিচ্ছি

giz

Stakeholder Consultation Workshop on the Draft Feasibility Study for Waste to Energy Power Plant Considering the Available Waste of Nawabganj, Keraniganj and Dohar Upazillas

Venue: Bijoy Hall, Bidhut Bhaban

Date: January 18, 2024

Sl No	Name	Organization	Email	Signature
20	MD. NURUZZAMAN	Dhaka South city corporation	nzaman.273 @gmail.com	
21	Mohammed Sheroyar Jolan	BPDB	sheroyarpdb@yahoo.com	
22	Noomin Nahar	BPDB	noominnipinti@gmail.com	
23	Zihad Bin Mahmud	BPDB	azihad@gmail.com	
24	Ahmed Sharif Enam	GIZ	ahmed.sharif@giz.de	
25	Abdullah Al Mahmud	Legal Expert, E.sen	mahmud.counsel@gmail.com	Mahmud
26	A.B.M Harunur Rashid	E Gen Consultants	haarun.rashid harun.rashid68@Yahoo.com	
27	R.T. Mawlud FCMA	E. gen consultants	rtmawlud@gmail.com	
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Stakeholder Consultation Workshop on the Draft Feasibility Study for Waste to Energy Power Plant Considering the Available Waste of Nawabganj, Keraniganj and Dohar Upazillas

Venue: Bijoy Hall, Bidhut Bhaban

Date: January 18, 2024

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61	MD. Tuslim Uddin	BPDB		
61	MD: Shohag Mollah	BPDB		
63	MD: Mirza Liakat	BPDB		
64	MD: Aziz	BPDB		
65	Md. Abdul Hannan Bhuiya	Power Divion		
66	Mirza Syful Alam.	DO		
67	Robiul Islam	supervisor		
68	Monir	House keeper		
69	Sajid	"		

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72	[illegible]	Power Division		[illegible]
73	SUBOH KAR	GIZ		[illegible]
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9.8 Final Field Visit Photographs

Figure: Proposed STS at Kalindi, Keraniganj

Figure: Proposed STS at Basta, Keraniganj

Figure: Upazila Engineer, Keraniganj

Figure: KII with Chairman, Basta Union Parishad, Keraniganj



Figure: Proposed STS 1, Dohar



Figure: Proposed STS 2, Dohar

Figure: Discussion with Mayor, Dohar Municipality

Figure: Proposed STS, Nawabganj

Figure: Proposed WtE Plant, Keraniganj