Segment - 01

Request for Proposal (RFP)

Hiring a Consultant (s) / Consulting Firm(s) for Environmental Initial Assessment (EIA), Plan of Implementation, Detailed Design and Cost Estimation of an Integrated Solid Waste Management (ISWM) Facility for Dhamoirhat Paurashava, Naogaon

GO4IMPact Programme

Improved Climate Resilient Public Service Delivery through Local Government Institutions in Water and Solid Waste Management

Proposal submission deadline: 06 October 2026

Interested Team of Consultant/Consulting Firm(s)/Consultant(s) are requested to submit a technical and a financial proposal through email at WaterAid-Tender-TA@wateraid.org

The focal person for this assignment is Kazi Rashed Hyder, Technical Specialist (RashedHyder@wateraid.org)

Swisscontact Bangladesh
House 28, Road 43
Gulshan 2, Dhaka 1212
Tel: +88 02 988 26 63

WaterAid Bangladesh
House 97/B, Road 25, Block A
Banani, Dhaka 1213
Tel: +88 02 58815757

Contents

SECTION – 1 : INFORMATION TO BIDDERS

1. Introduction

1.1 All interested and eligible consultant (s)/consulting/research firm(s) with required qualifications and experience can submit their study proposal.

1.2 Costs of preparing the proposal and attending the pre-bid/ negotiation meeting, if provisioned, are not reimbursable.

1.3 Consultant(s) are expected to follow highest ethical standard in their participation in the bidding process; and refrain from influencing the internal section process of WaterAid Bangladesh.

1.4 Any attempt of undue influence on the evaluation and selection process will lead to cancellation of the proposal from the subsequent process.

1.5 Any misrepresentation of facts including the facts on professional /institutional capacity will also lead to cancellation of the proposal.

1.6 WaterAid Bangladesh reserves the right to amend and modify this RFP document. Also, to select the company / agency/ individual for providing selected goods and services cited in section 2 (article 4) as deliverables of this RFP, either for the entire content of the proposal or a part thereof.

2. Clarification and amendment of RFP documents

2.1 At any time before the receipt of proposals, WaterAid Bangladesh may for any reason, whether at its own initiative or in response to a clarification requested by an invited organisation, amend the RFP. Any amendment shall be issued in writing and shall be posted and will be binding. WaterAid Bangladesh may at its discretion extend the deadline for the submission of proposals.

3. Preparation of Technical and Financial Proposal

3.1 Consultants are requested to submit their proposal written in English (**font – Arial, Size -11**). Proposal must remain valid for a minimum of 90 days after submission.

3.2 The technical proposal from a team of companies'/agencies/ Vendor/Service Provider must give particular attention to the following:

- Appreciation of the Terms of Reference (TOR)
- Detailed workplan and methodology to address the objectives of the assignment
- CVs of the team leader and key resource person(s) of the consulting firm(s)
- Relevant experience and credibility to undertake the given assignment

3.3 The financial proposal from the Team of Consultant (s) /Firm/Agency/Consortium(s) are expected to take into account the requirements for accomplishing the deliverables specified in the section-2 (article-4) and conditions outlined in the RFP documents. The Consultant is expected to provide justified budget to be consistent with technical proposals.

3.4 Provide a justified financial proposal consistent with the technical proposal which clearly mentions item wise summary of cost for the assignment with detail breakdown following the provided template (section 4). The budget must include applicable AIT; however, VAT should be mentioned separately at the bottom on total budgeted amount.

3.5 WaterAid Bangladesh will deduct VAT and Tax at source according to the GoB rules and deposit the said amount to government treasury.

4. Submission of Proposals

4.1. The original proposal (technical and financial) should be submitted electronically to the email address WaterAid-Tender-TA@wateraid.org with the subject line: **"Proposal for EIA, Plan, Design and Cost Estimation of ISWM for Dhamoirhat, Naogaon"**.

4.2. Proposals submitted to any other e-mail account except the above will not be accepted.

4.3. Proposals submitted after the deadline of **06 October 2026, on or before 23:59 PM** will be treated as disqualified.

4.4. Two different files (PDF) should be generated for technical proposal and financial proposal. However, both files should be submitted into one zip folder with a cover letter. Please name the zip folder after your consulting firm.

4.5. The technical proposal should not exceed 40 pages.
The financial proposal should not exceed 5 pages.
CVs should not exceed 10 pages per Consultant/Expert.
Organisational/individual profile should not exceed 10 pages.

5. Proposal Evaluation

5.1 The evaluation committee will evaluate the proposals in relation to the RFP and the TOR and applying the set evaluation criteria and point system specified herein. Each responsive proposal will be given score. Proposal(s) will be rejected at this stage if it does not respond to important aspects of the TOR.

5.2 The final selection will be done following a Quality and Cost Based (QCBS) method. This will be done by applying a weight of 70% and 30% respectively to the technical and financial proposal respectively. However, the financial evaluation will be made only for the technically qualified bidders.

i. Technical Proposal: **70**
   - Proposal with detailed methodology: 30
   - Composition of the team: 15
   - Relevant work experience: 15
   - Work plan and overall quality of proposal: 10

Following the evaluation of the technical proposals, bidders who achieve more than 80% of the total points will qualify for

further assessment based on financial submissions. Among the technically qualified bidders, preference will be given to the lowest financial bid.

ii. Financial proposal with a detailed breakdown: **30**

5.3 WaterAid reserves the right to accept and reject any proposal without assigning any reason or whatsoever and may decide to go for re-advertisement without going further down the process.

5.4 Once the proposals are evaluated, WaterAid may enter negotiation, if required, with one or more consultant / consulting firm for final selection.

5.5 If negotiations fail, WaterAid Bangladesh may invite the consultant with next highest score to negotiate a contract or go for re-advertisement with fresh Requests for Proposals (RFP).

6. Presentation and Negotiation

6.1 Once the proposals are evaluated, only the shortlisted consultant/agency/ research firm will be contract for next process for presentation or further clarifications. However, if no communication is made with any bidder within 60 days, the proposal will be considered as unsuccessful.

6.2 WaterAid Bangladesh may enter negotiation with one or more bidders before final selection. If negotiations fail, WaterAid Bangladesh will then invite those organisations /individuals whose proposals received the next highest score. If none of the invited proposals led to an agreement, a new RFP will be called upon.

6.3 The presentation and negotiations may include a discussion on the proposed methodology, workplan, staffing, costing, or any suggestions made by the bid participating organisation(s) to improve the terms of reference.

6.4 WaterAid Bangladesh and the contracted organisation/ group of individuals may revise the RFP which should be incorporated final contract document.

7. Notification of Award

7.1 The selected consultant/consulting firm is expected to sign an agreement with WaterAid within a week of communication of selection decision and before commencing the work.

8. Penalty clause

8.1 The consultant/ agency/ research firm(s) is expected to deliver required outputs within the stipulated timeframe maintaining the quality. If for any reason, the consultant/ consulting/ research firm(s) fails to deliver required deliverables within stipulated time, the consultant (s) / consulting/ research firm(s) needs to inform WaterAid intime with valid and acceptable explanation in written. Failing to this may evoke penalty clause at the rate of 0.5% for each day of delay.

9. Confidentiality

9.1 Information relating to evaluation of proposals and recommendations concerning awards will not be disclosed to the organisations who submitted the proposals or to other persons not officially concerned with the process, until the winner has been notified with award of the contract.

10. Focal person 10.1 Kazi Rashed Hyder
Technical Specialist, GO4IMPact, WaterAid Bangladesh
Can be reached directly at: RashedHyder@wateraid.org)

SECTION II TERMS OF REFERENCE

1. Background

Bangladesh faces mounting challenges in delivering climate-resilient water and solid waste management (SWM) services, particularly in secondary towns and municipalities (Paurashavas). In this context, the Embassy of Switzerland in Bangladesh is financing the "GO4IMPact" programme — Improved Climate Resilient Public Service Delivery through Local Government Institutions in Water and Solid Waste Management — implemented jointly by WaterAid Bangladesh and Swisscontact.

As a part of the GO4IMPact programme, a Scoping Study (Annexures) on Solid Waste Management for Naogaon (Dhamoirhat and Niamatpur) District was carried out, including a study report for Dhamoirhat Paurashava. The study assessed waste generation patterns, composition, collection and disposal practices, stakeholder dynamics, climate vulnerabilities, and proposed a roadmap for sustainable and inclusive waste management. Key findings relevant to this assignment include:

- Dhamoirhat Paurashava generates approximately 3–3.5 tons of solid waste per day which enter the environment (land, water bodies, drains, or some are burnt).
- Waste composition is dominated by organic waste (≈55%) and plastics (≈35%), with smaller shares of paper, metal, glass, medical, hazardous, butcher and construction waste.
- The Paurashava currently has no engineered landfill, or composting facility, or Material Recovery Facility (MRF) and associated treatment facilities like leachate management and waste segregation mechanism.
- The study recommends an integrated model combining source segregation, decentralized composting, plastic recovery and recycling linkages, a Material Recovery Facility, an engineered sanitary landfill with leachate management, supported by climate-resilient infrastructure given the area's exposure to heatwaves (>40°C), drought, and erratic/uneven rainfall.
- According to a government circulation, the municipality has allocated land of about 1.05 Acre (App.) as land fill site. As the municipality has a specified landfill site and scoping study recommended for suitable waste management systems, **WaterAid Bangladesh now intend to engage a qualified individual consultant or consulting firm to translate these findings into a fully engineered, climate-resilient, and financially costed Integrated Solid Waste Management (ISWM) facility to be built and commissioned.**
- The scoping study and the topographic survey (provided in the Annexures) serve as the basis for the design assignment outlined in this ToR.

2. Objectives

2.1 Overall Objective

To undertake the design, detailed estimation, costing, and technical support for the construction of a climate-resilient and sustainable Integrated Solid Waste Management (ISWM) facility for **Dhamoirhat Paurashava**, ensuring the safe, efficient, and environmentally sound management of all categories of municipal solid waste generated within the Paurashava, including organic waste, plastics, paper, metals and glass, in compliance with the Solid Waste Management Rules 2021, Environmental Conservation Rules 2023, and other applicable national standards and regulations.

2.2 Specific Objectives

- Design the facility for a minimum planning horizon of 15–20 years, based on the waste generation, composition, and projected waste quantities provided in the GO4IMPact scoping study for Dhamoirhat Paurashava.
- Undertake geotechnical, hydrogeological and environmental investigations of the proposed site at Shahapur (Jahanpur, Dhamoirhat) and confirm its technical viability, and environmental suitability.
- Prepare an Environmental Impact Assessment (EIA) report as per ECR, 2023.
- Select appropriate, climate-resilient and cost-effective technologies for waste segregation, composting, plastic/dry-recyclable recovery, leachate management and whatever required including proper management of source to final use of wastes
- Prepare a detailed engineering design and complete set of drawings for all required infrastructures including 3D, 2D and detailed sections (as necessary)
- Prepare a package-wise, detailed cost estimate and Bill of Quantities (BOQ) separately for the full facilities such as earth work, super structure etc.
- Prepare package wise tender-ready technical specifications, drawings and bidding documents with BOQ and support for contractor procurement.

3. Scope of Work

The scope under each task is described below:

Task I: Inception, Data Review and Stakeholder Consultation

- Review the GO4IMPact scoping study national SWM legal framework (SWM Rules 2021, Environmental Conservation Act 1995 & Rules 2023, and the Topographic Survey Report.
- Conduct inception consultations with Dhamoirhat Paurashava (Mayor, Conservancy Inspector, Sanitary Inspector, Executive Engineer), WaterAid, ESDO (local partners), the Department of Environment, and relevant Upazila Parishad.
- Submit an Inception Report with a detailed work plan, methodology and updated schedule.

Task II: Site Investigation and Land Suitability Assessment

- Visit the site and collect geotechnical and hydrological information from Secondary Data.
- Assess flood, drought, heatwave and erratic-rainfall exposure of the site.
- Prepare EIA report as per Environmental Conservation Rules 2023.
- Earthwork for land development with cost estimation

Task III: Technology Selection and draft Design

- Evaluate and recommend technology options
- Prepare a conceptual master plan/site layout.

- Draft Detailed Engineering Design of all components with full drawing sets including construction workflow

Task IV: Detailed Engineering Design and cost estimation

The Consultant shall prepare package wise distribution of construction work - full detailed engineering design, drawings (architectural, civil/structural, electro-mechanical, plumbing/sanitary) and technical specifications for all infrastructure components, detailed estimation and BoQ following both current market price as well as LGED Rates Schedule to be provided as per package. The packages may be the following but are not limited:

a. Land development
b. Engineered Sanitary Landfill Cell(s) including land filling and soil stability
c. Leachate Management System
d. Material Recovery Facility (MRF) / Appropriate waste management facility
e. Composting Facility
f. Weighbridge and Gate House
g. Internal Roads and Stormwater Drainage
h. Administrative room & Utilities
i. Green Buffer / Plantation Belt
j. Vehicle Parking & Maintenance Shed

Task V: Tender Document Preparation and Procurement Support

- Prepare package wise tender-ready drawings, technical specifications, BOQ, draft contract conditions and evaluation criteria for civil works contractor procurement as per WaterAid/partner NGO`s procurement guidelines, as applicable.

Task VI: Construction and Quality Assurance

- Prepare technical guidelines for construction monitoring for site engineers to oversee construction of all components.
- Provide existing quality control guidelines of all works as per BNBC 2020
- Provide guidelines to maintain occupational health & safety plan during construction.
- Provide guidelines for testing and commissioning of leachate treatment, weighbridge, and any electro-mechanical equipment.

4. Deliverables

#	Deliverable	Indicative Timing (start from contract signing)
D1	Inception Report (work plan, methodology, updated schedule)- **Task I**	Day1 – Day 6
D2	Site Investigation and earthwork for land development with cost estimation. EIA report as per ECR 2023 – **Task II**	Day 7-Day 20
D3	Prepare a conceptual master plan/site layout. Draft Detailed Engineering Design of all components with full drawing sets including construction workflow - **Task III**	Day 20 -Day 25
D4	Detailed final design, drawings, package-wise, detailed cost estimation, BOQ and complete tender documents with	Day 35-Day 45

	necessary construction supervision guidelines - **Task IV, V & VI**	

5. Duration & Timeline

The assignment is expected to be completed within 45 days from the date of contract signing, maybe extended depending on situations. The assignment is to be accomplished within 45 days unless there are valid reasons for extension and approved by the authority.

6. Mode of payment

Payment will be made in four instalments through BFTN/Account Payee Cheque to the agency/consultant on submission of invoice. In case of any changes in the deliverables, payment will be made at actual based on the type and quantity of content delivered. All invoice to be submit to WaterAid Bangladesh and certified by the respective personnel.

SL #	Milestone	% of Contract Value	Deliverable
1	Submission & approval of Inception Report	20%	D1
2	Completion of Site Investigation and earthwork for land development with cost estimation. EIA report as per ECR 2023	25%	D2
4	Submission & approval of Draft Detailed Engineering Design Report (all components) with full drawing set	25%	D3
4	Submission & approval of Cost Estimate, Final Design and Tender Documents including all soft copies in a separate pen drive. Tender documents to be prepared and submitted segment wise	30%	D4

7. Competency of the Consultant / Consulting Firm

- Legally registered engineering/environmental consulting firm or individual in Bangladesh with a valid trade licence, VAT, TIN, BIN and, experienced working with LGED/DPHE or equivalent authority will be preferred
- Must have a group of expertise experience in-
  - Minimum 10–15 years of professional experience, with an MSc in Civil or Environmental Engineering, including experience in infrastructure design and at least three completed solid waste management facility design projects.
  - in integrated municipal SWM;
  - landfill design;
  - MRF/recycling facilities;
  - composting/organic waste treatment;
  - leachate management;
  - environmental/social safeguards;
  - preparation of BOQ and tender documents;
  - working with local governments institutions

8. Reporting Requirements

The Consultant The consultant will report to Kazi Rashed Hyder, Technical Specialist, GO4IMPact, email: RashedHyder@wateraid.org and shall submit all reports in both hard copy (2 sets) and electronic format (editable source files and PDF) to WaterAid Bangladesh. All

drawings (2D& 3D) shall be submitted in AutoCAD (.dwg) as soft copy and PDF format at appropriate scales, and the cost estimate/BOQ shall be submitted in editable spreadsheet format.

SECTION – 3 PROPOSAL SUBMISSION TEMPLATE

3A. Forwarding letter format

3B. Suitability for the Assignment

3C. Understanding of the Assignment

3D. Implementation Strategy

3E. Team Composition

3F. Relevant Experience

3G. Company Profile

3I. Ethical Practice

3A. FORWARDING LETTER FORMAT

(Please use letterhead pad)

[*Location, Date*]

To

The Country Director

WaterAid Bangladesh

House 97/B, Road 25, Block A

Banani, Dhaka 1213

Dear Sir:

We the undersigned are offering to provide the following assignment in accordance with your Request for Proposal (RFP) dated [*Date*] on "[Subject]".

We are hereby submitting our proposal, which includes this Technical Proposal, and a Financial Proposal.

If negotiations are held during the period of validity of the proposal, i.e., before [*Date*] we undertake to negotiate on the basis of the proposed staff. Our proposal is binding upon us and subject to the modifications resulting from contract negotiations.

We understand you are not bound to accept any proposal you receive.

Yours sincerely,

Authorised Signature:

Name:

Title:

Name of Organisation:

Address:

Technical Proposal

3B. Suitability for the Assignment

(please mention competencies of your organization that strongly support for this assignment in maximum one-page)

3C. Understanding of the Assignment

(please provide one-page concept note on over all understanding of the assignment)

3D. Implementation Strategy

- **Methodology**

(please describe about the methodology/approach to be adopted or applied to collect, analysis, evaluate the data)

- **Deliverables**

(please specify the major deliverable to be achieve from the study)

- **Work Plan**

(please provide detail work plan with work chart)

3E. Team Composition

(please provide short BIO of the proposed key team members in below format)

- CV of Proposed Key Team Members

Name	
Role of this Assignment	
Academic Background	
Professional Summary	*(a brief overview summarizing your expertise for the proposed position. Mention your years of experience, key sectors, and expertise for the proposed position)*
Professional Experience	*(please mention your last five relevant experiences for the proposed position; it can be either narratives or tabular format)* *Professional Experiences should include the following:* *- Name of the organization and job title* *- Duration* *- Key responsibilities*
Publications	*(please mention maximum five relevant publications and provide accessible links to the output. In the case of a confidential project report, share the link to the executive summary of the report)*

3F. Relevant Experience

(relevant services carried out in the last three tears That best illustrate qualifications)

Using the format below, please provide maximum 10 examples for which your organisation, either individually as a corporate entity or as one of the major companies within an association, was legally contracted.

Name of the assignment	Digital link (if available)	Completion date	Client name with contact details

3G. Company Profile

(Please attach portfolio and other relevant documents maximum)

3H. Ethical Practice

(please specify, Safeguarding, Health & Safety)

SECTION 4. FINANCIAL PROPOSAL SUBMISSION FORM)

4A. Summary of budget/costs, including narratives

(*The financial budget summery should be prepare in line with below guidance*)

- A separate forwarding letter for financial proposal may or may not be submit.
- Budget for the assignment should be broken down into individual items covering all logistical, travel, accommodation, staff, equipment and other costs.
- The financial proposal should clearly identify, item wise cost for the assignment with necessary details. ***The budget must be including applicable AIT; however, VAT can be mentioned separately at the bottom on total budgeted amount***. WaterAid Bangladesh shall be deduct VAT and Tax at source as per government rules.
- Apart from the activities mentioned in this RFP, the consultant is expected to list any other/additional services WaterAid shall be receiving under this agreement.

Calculation Format (please maintain below format for your financial budgeting)

Name of item/deliverables	Unit Price	Total Price
Component -01	xxxxx	xxxxxxxx
a.		
b.		
c. (please add more rows as required)		
Component -02	xxxxx	xxxxxxxx
a.		
b.		
c. *(please add more rows as required)*		
Component -03	xxxxx	xxxxxxxx
a.		
b.		
c. *(please add more rows as required)*		
Component -04	xxxxx	xxxxxxxx
a.		
b.		
c. *(please add more rows as required)*		
Component -05	xxxxx	xxxxxxxx
a.		
b.		
c. *(please add more rows as required)*		
Sub-Total (including AIT)	**xxxxx**	**xxxxxxxx**
Applicable VAT 15%	xxxxx	xxxxxxxx
Gross Total	**xxxxx**	**xxxxxxxx**

4B. Legal Document

Please attach all updated legal documents mentioned below:

- Copy of Trade License
- Copy of TIN certificate
- Copy of BIN certificate
- Copy of PSR (last tax return submission acknowledgement slip) and
- Bank Detail or Copy of Cheque Leaf

Annex -I . LAND FILL SURVEY REPORT_DHAMOIRHAT

DIGITAL TOPOGRAPHIC SURVEY REPORT

Name of Project:

Digital Topographic Survey For "Proposed Dhamoirhat Pourashava Dumping Station " Land Area at Shahapur, Jahanpur, Dhamoirhat.

Land Schedul:

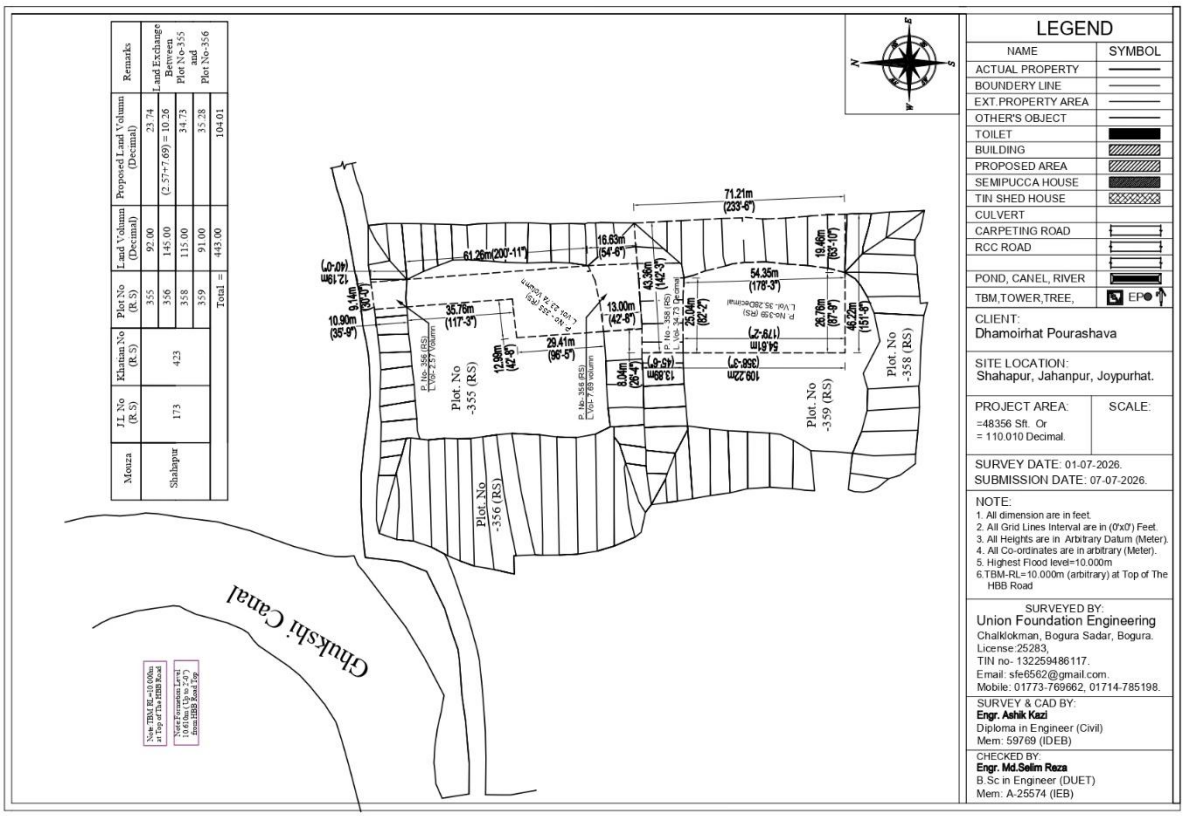
Mouza	J.L No (R.S)	Khatian No (R.S)	Plot No (R.S)	Land Volumn (Decimal)	Proposed Land Volumn (Decimal)	Remarks
Shahapur	173	423	355	92.00	23.74	Land Exchange Between Plot No-355 and Plot No-356
			356	145.00	(2.57+7.69) = 10.26	
			358	115.00	34.73	
			359	91.00	35.28	
			Total =	443.00	104.01	

Date of Survey:

01 July 2026.

Surveyed By:

Union Foundation Engineering
Chalklokman, Bogura Sadar, Bogura.
License:25283,
TIN no- 132259486117.
Email: sfe6562@gmail.com.
Mobile: 01773-769662, 01714-785198.



Mouza	J.L No (R.S)	Khatian No (R.S)	Plot No (R.S)	Land Volumn (Decimal)	Proposed Land Volumn (Decimal)	Remarks
Shahapur	173	423	355	92.00	23.74	Land Exchange Between Plot No-355 and 358
			356	145.00	(2.57+7.69) = 10.26	
			358	115.00	34.73	
			359	91.00	35.28	Plot No-356
			Total =	443.00	104.01	

LEGEND

NAME	SYMBOL
ACTUAL PROPERTY	
BOUNDERY LINE	
EXT.PROPERTY AREA	
OTHER'S OBJECT	
TOILET	
BUILDING	
PROPOSED AREA	
SEMIPUCCA HOUSE	
TIN SHED HOUSE	
CULVERT	
CARPETING ROAD	
RCC ROAD	
POND, CANEL, RIVER	
TBM,TOWER,TREE,	EP

CLIENT:
Dhamoirhat Pourashava

SITE LOCATION:
Shahapur, Jahanpur, Joypurhat.

PROJECT AREA:	SCALE:
=48356 Sft. Or = 110.010 Decimal.	

SURVEY DATE: 01-07-2026.
SUBMISSION DATE: 07-07-2026.

NOTE:
1. All dimension are in feet.
2. All Grid Lines Interval are in (0'x0') Feet.
3. All Heights are in Arbitrary Datum (Meter).
4. All Co-ordinates are in arbitrary (Meter).
5. Highest Flood level=10.000m
6.TBM-RL=10.000m (arbitrary) at Top of The HBB Road

SURVEYED BY:
Union Foundation Engineering
Chalklokman, Bogura Sadar, Bogura.
License:25283,
TIN no- 132259486117.
Email: sfe6562@gmail.com.
Mobile: 01773-769662, 01714-785198.

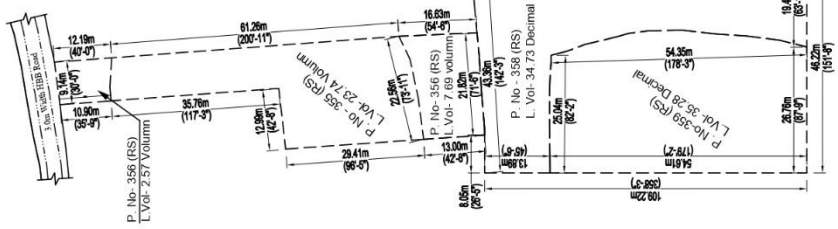
SURVEY & CAD BY:
Engr. Ashik Kazi
Diploma in Engineer (Civil)
Mem: 59769 (IDEB)

CHECKED BY:
Engr. Md.Selim Reza
B.Sc in Engineer (DUET)
Mem: A-25574 (IEB)

Mouza	J.L No (R.S)	Khatian No (R.S)	Plot No (R.S)	Land Volumn (Decimal)	Proposed Land Volumn (Decimal)	Remarks
Shahapur	173	423	355	92.00	23.74	Land Exchange Between Plot No-355 and Plot No-356
			356	145.00	(2.57+7.69)= 10.26	
			358	115.00	34.73	
			359	91.00	35.28	
			Total =	443.00	104.01	

Note-TBM RL=10.000m at Top of The HBB Road

Note-Formation Level 10.61.0m (Up to 2'-10") from HBB Road Top



LEGEND

NAME	SYMBOL
ACTUAL PROPERTY	
BOUNDERY LINE	
EXT.PROPERTY AREA	
OTHER'S OBJECT	
TOILET	
BUILDING	
PROPOSED AREA	
SEMIPUCCA HOUSE	
TIN SHED HOUSE	
CULVERT	
CARPETING ROAD	
RCC ROAD	
POND, CANEL, RIVER	
TBM,TOWER,TREE,	EP

CLIENT:
Dhamoirhat Pourashava

SITE LOCATION:
Shahapur, Jahanpur, Joypurhat.

PROJECT AREA:
=48356 Sft. Or
= 110.010 Decimal.

SCALE:

SURVEY DATE: 01-07-2026.
SUBMISSION DATE: 07-07-2026.

NOTE:
1. All dimension are in feet.
2. All Grid Lines Interval are in (0'x0') Feet.
3. All Heights are in Arbitrary Datum (Meter).
4. All Co-ordinates are in arbitrary (Meter).
5. Highest Flood level=10.000m
6.TBM-RL=10.000m (arbitrary) at Top of The HBB Road

SURVEYED BY:
Union Foundation Engineering
Chalklokman, Bogura Sadar, Bogura.
License:25283,
TIN no- 13225948611 7.
Email: sfe6562@gmail.com.
Mobile: 01773-769662, 01714-785198.

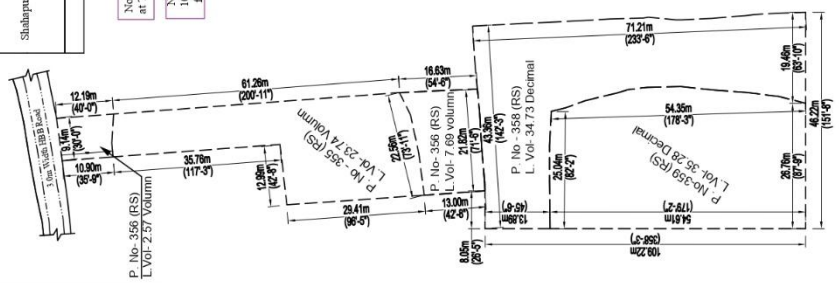
SURVEY & CAD BY:
Engr. Ashik Kazi
Diploma in Engineer (Civil)
Mem: 59769 (IDEB)

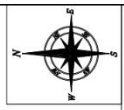
CHECKED BY:
Engr. Md.Selim Reza
B.Sc in Engineer (DUET)
Mem: A-25574 (IEB)

Monza	J.L No (R.S)	Khatian No (R.S)	Plot No (R.S)	Land Volumn (Decimal)	Proposed Land Volumn (Decimal)	Remarks
Shahapur	173	423	355	92.00	23.74	Land Exchange Between Plot No-355 and Plot No-356
			356	145.00	(2.57+7.69) = 10.26	
			358	115.00	34.73	
			359	91.00	35.28	
			Total =	443.00	104.01	

Note-TBM RL=10.000m at Top of The HBB Road

Note-Foundation Level 10.610m (Up to 2'-0") from HBB Road Top





LEGEND

NAME	SYMBOL
ACTUAL PROPERTY	
BOUNDERY LINE	
EXT.PROPERTY AREA	
OTHER'S OBJECT	
TOILET	
BUILDING	
PROPOSED AREA	
SEMIPUCCA HOUSE	
TIN SHED HOUSE	
CULVERT	
CARPETING ROAD	
RCC ROAD	
POND, CANEL, RIVER	
TBM,TOWER,TREE,	EP

CLIENT:
Dhamoirhat Pourashava

SITE LOCATION:
Shahapur, Jahanpur, Joypurhat.

PROJECT AREA:
=48356 Sft. Or
= 110.010 Decimal.

SCALE:

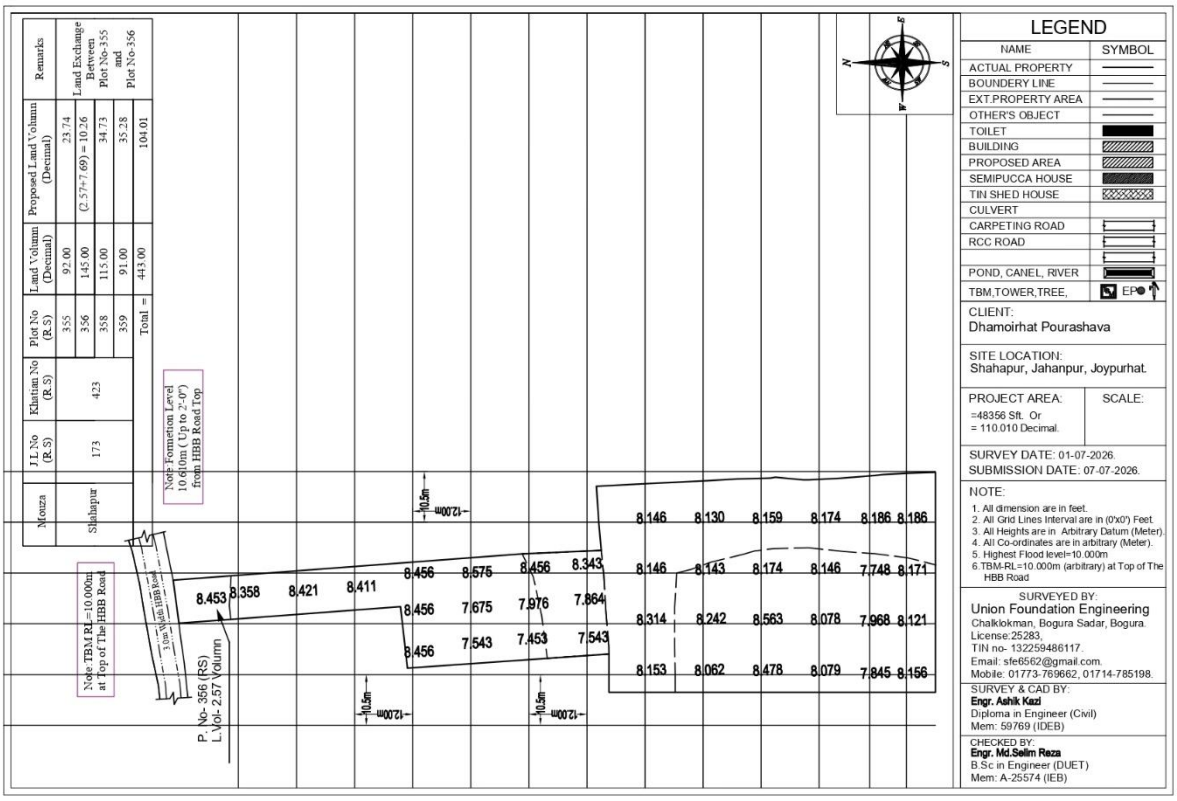
SURVEY DATE: 01-07-2026.
SUBMISSION DATE: 07-07-2026.

NOTE:
1. All dimension are in feet.
2. All Grid Lines Interval are in (0'x0') Feet.
3. All Heights are in Arbitrary Datum (Meter).
4. All Co-ordinates are in arbitrary (Meter).
5. Highest Flood level=10.000m
6.TBM-RL=10.000m (arbitrary) at Top of The HBB Road

SURVEYED BY:
Union Foundation Engineering
Chalklokman, Bogura Sadar, Bogura.
License:25283,
TIN no- 132259486117.
Email: sfe6562@gmail.com.
Mobile: 01773-769662, 01714-785198.

SURVEY & CAD BY:
Engr. Ashik Kazi
Diploma in Engineer (Civil)
Mem: 59789 (IDEB)

CHECKED BY:
Engr. Md.Selim Reza
B.Sc in Engineer (DUET)
Mem: A-25574 (IEB)



LEGEND

NAME	SYMBOL
ACTUAL PROPERTY	
BOUNDERY LINE	
EXT.PROPERTY AREA	
OTHER'S OBJECT	
TOILET	
BUILDING	
PROPOSED AREA	
SEMIPUCCA HOUSE	
TIN SHED HOUSE	
CULVERT	
CARPETING ROAD	
RCC ROAD	
POND, CANEL, RIVER	
TBM,TOWER,TREE,	EP

CLIENT:
Dhamoirhat Pourashava

SITE LOCATION:
Shahapur, Jahanpur, Joypurhat.

PROJECT AREA:
=48356 Sft. Or
= 110.010 Decimal.

SCALE:

SURVEY DATE: 01-07-2026.
SUBMISSION DATE: 07-07-2026.

NOTE:
1. All dimension are in feet.
2. All Grid Lines Interval are in (0'x0') Feet.
3. All Heights are in Arbitrary Datum (Meter).
4. All Co-ordinates are in arbitrary (Meter).
5. Highest Flood level=10.000m
6.TBM-RL=10.000m (arbitrary) at Top of The HBB Road

SURVEYED BY:
Union Foundation Engineering
Chalklokman, Bogura Sadar, Bogura.
License:25283,
TIN no- 132259486117.
Email: sfe6562@gmail.com.
Mobile: 01773-769662, 01714-785198.

SURVEY & CAD BY:
Engr. Ashik Kazi
Diploma in Engineer (Civil)
Mem: 59769 (IDEB)

CHECKED BY:
Engr. Md.Selim Reza
B.Sc in Engineer (DUET)
Mem: A-25574 (IEB)

Multi-sectoral Scoping Study on Solid Waste Management for Naogaon and Satkhira Districts

GO4IMPact Programme
Dhaka, May 2025

GO4IMPact

Improved Climate Resilient Public Service Delivery through Local Government Institutions in Water and Solid Waste Management

Funded by

সুইজারল্যান্ডের সহায়তায়

Implemented by

swisscontact WaterAid

Document details

Document Title	Multi-sectoral Scoping Study on Solid Waste Management for Naogaon and Satkhira Districts: Dhamoirhat Paurashava Study Report
Document Type	Final Report
Version	4
Date	13.05.2025
Author(s)	Sinha Mahira Sultana, Mehnaz Sultana
Contribution(s)	Sagor Ghosh, Abir Ahmed Labib, Afidah Hashemi Mimma, Saima Alam Trisha, Melina Khanal
Coordination	Md. Shahadat Hossain, Md. Atiqur Rahman Mollick
Revision	Sinha Mahira Sultana

Photos on cover:

O. Creeds Ltd. 2025, Hat khola bazar, Bhatgram, Dhamoirhat Paurashava

সুইজারল্যান্ডের সহায়তায়

swisscontact

WaterAid

Document history

Version	Date	Author	Contribution	Review	Evolution/ Changes
1	20.01.25	Sinha Mahira Sultana, Mehnaz Sultana,	Sagor Ghosh, Abir Ahmed Labib, Afidah Hashemi Mimma, Saima Alam Trisha		
2	13.02.25	Sinha Mahira Sultana, Mehnaz Sultana,	Sagor Ghosh		
3	16.03.25	Sinha Mahira Sultana, Mehnaz Sultana,	Sagor Ghosh		
4	13.05.25	Sinha Mahira Sultana	Sagor Ghosh		

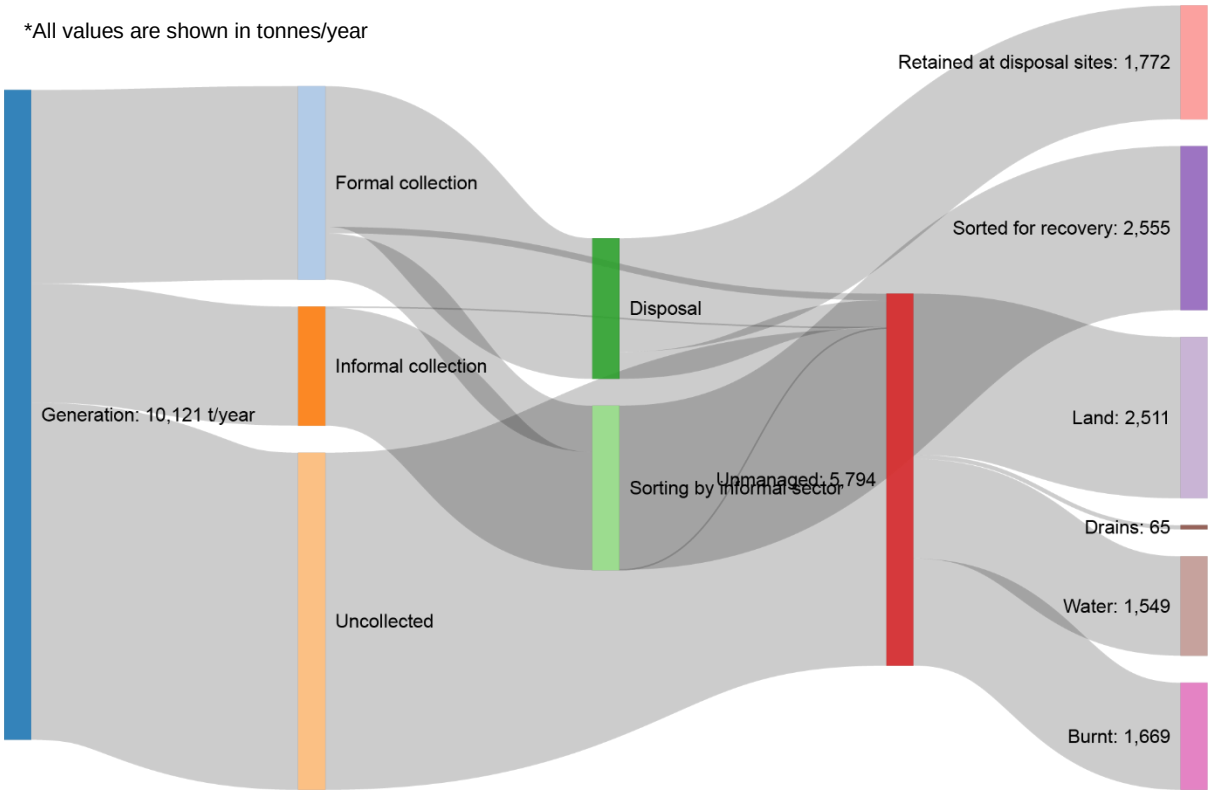
Intended Audience:

The key audience of the Guideline on Monitoring, Evaluation and Learning (MEL) is the GO4IMPact Programme team including local partners (Rupantar & ESDO), Operations, and Technical Assistances where applicable

List of abbreviations

NAME	DESCRIPTION
BDT	Bangladeshi Taka
DPHE	Department of Public Health Engineering
ESDO	Environment and Social Development Organization
FGD	Focus Group Discussion
GESI	Gender Equality and Social Inclusion
GHG	Greenhouse Gas
KII	Key Informant Interview
MEL	Monitoring, Evaluation, and Learning
MSW	Municipal Solid Waste
NDC	Nationally Determined Contribution
PPE	Personal Protective Equipment
STS	Secondary Transfer Station
SWM	Solid Waste Management

EXECUTIVE SUMMARY



This study was undertaken to assess the current status of solid waste generation, composition, management practices, and stakeholder perceptions across various unions and marketplaces in Dhamoirhat Paurashava, with the overarching objective of developing sustainable and inclusive waste management solutions. The study specifically aimed to identify the nature and volume of waste, understand waste management challenges, and explore sustainable models for organic, inorganic, and plastic waste management.

A mixed-method approach was adopted for data collection, combining household surveys, Focus Group Discussions, and Key Informant Interviews. Data was gathered from unions, marketplaces, educational institutions, and healthcare facilities, using semi-structured tools and observational checklists to capture qualitative insights and quantitative estimates.

The study found that Dhamoirhat Paurashava generates approximately 3 to 3.5 tons of solid waste daily. Organic waste accounts for about 55 percent of total waste. While small-scale composting exists in some agricultural households, no formal composting system is in place. The study recommends establishing decentralized composting units at the ward or market level to convert organic waste into useful compost and reduce environmental burden.

Plastic waste makes up around 35 percent of total waste. Most plastic is collected and sold informally, without a structured recovery chain or linkage to recycling facilities. Establishing a formal plastic collection and recycling system, including partnerships with regional hubs, could support pollution reduction and generate livelihood opportunities.

Inorganic waste, including paper, metal, and glass, is generated in smaller quantities and is mostly unmanaged due to the lack of waste segregation systems. A Material Recovery Facility (MRF) is proposed to streamline sorting and improve resource recovery from this waste stream.

According to the Waste Flow Diagram (WFD), Dhamoirhat Paurashava produces 10,121 tonnes of waste annually. Of this, 2,555 tonnes are collected formally, 1,772 tonnes through informal systems, and 5,794 tonnes remain uncollected. From the collected waste, 2,555 tonnes are sorted for recovery, while 1,772 tonnes are retained at disposal sites. An estimated 5,794 tonnes of uncollected waste directly enters the environment—2,511 tonnes are dumped on land, 1,669 tonnes are burned, 1,549 tonnes enter water bodies, and 65 tonnes flow into drains.

Key challenges include lack of a structured waste collection system, insufficient infrastructure such as landfills and composting units, lack of source segregation, poor public awareness, and limited financial resources. The study proposes infrastructure development, including covered disposal sites, composting facilities, and drainage improvements. It also recommends behavior change campaigns, capacity-building for waste workers, and technology support for sustainable operations.

The proposed model promotes segregation at source, decentralized waste treatment (composting and recycling), tariff-based cost recovery, and active community engagement. Business models are suggested around compost marketing, plastic recovery, and potential biogas production. Collaborations among municipalities, NGOs, and the private sector are encouraged to implement scalable solutions that align with climate resilience and inclusive service delivery.

In conclusion, the findings highlight that a structured and inclusive waste management approach in Dhamoirhat Paurashava can enhance environmental health, create local economic opportunities, and build resilience to climate-related disruptions if the recommended actions are implemented effectively.

Table of contents

List of Figures:

List of Tables:

1. INTRODUCTION

1.1 Background

Bangladesh has achieved significant economic growth and poverty reduction but faces major challenges in water and solid waste management and climate change adaptation. As the seventh most climate-vulnerable nation, it deals with rising sea levels, salinization, groundwater depletion, biodiversity loss, and frequent floods. These impacts heavily affect rural areas, where local governments (Municipalities, Upazilas, and Union Parishads) are crucial in providing climate- resilient services.

Despite these challenges, the Government of Bangladesh (GoB) is committed to decentralization and local governance. It aims to enhance local governments' capacities to address climate change and deliver essential services. In this context, the Embassy of Switzerland in Bangladesh has launched the "GO4IMPact" program, implemented by WaterAid and Swisscontact, to improve climate-resilient public service delivery in water and solid waste management. The program aligns with GoB's commitment to the Sustainable Development Goals (SDGs) and climate action, promoting systemic, adaptive, and participatory approaches.

The Bangladesh National 3R Strategy views waste as a valuable resource, with municipalities primarily responsible for urban solid waste management. However, they face challenges such as inadequate infrastructure, skilled labor, financial resources, and public awareness. Private sector involvement is essential to address these issues by providing expertise, investment, infrastructure, and promoting behavioral changes in waste management.

WaterAid plans to commission a study on waste generation patterns and recycling potential in Satkhira and Naogaon, areas highly vulnerable to climate change. This study will focus on various stakeholders, including households, agriculture, food processing, fisheries, small businesses, and healthcare facilities, to identify resource recovery options and enhance sustainable waste management practices.

1.2 Objectives

The primary aim of the "GO4IMPact" program is to enhance local democracy and ensure equitable, climate-resilient public service delivery in water and solid waste management. Within this framework, the specific objective of this scoping study is to evaluate and investigate solid waste management conditions, practices, and opportunities in Satkhira and Naogaon Districts, focusing on 2 Municipalities, 4 Upazilas, and 39 Union Parishads.

1.3 Scope of Works

The scope of work for the study is outlined as follows.

❖ **Review of existing regulations and practices**

- Review the existing acts, policies, strategies, rules, and guidelines related to solid waste management to identify the relevant clauses applicable to Municipalities, Upazilas, and Union Parishads.
- Evaluate the current solid waste management practices in the selected project locations identify strengths, weaknesses, opportunities and threat (SWOT).

- Identify gaps in solid waste management service provision by the Municipalities, Upazilas, and Union Parishads by comparing them with existing acts, policies, strategies, rules, and guidelines related to solid waste management.
- Identify the primary policy implementation challenges and issues encountered by the Municipalities, Upazilas, and Union Parishads in managing their solid waste, encompassing climate change aspects, social, economic, and logistical factors.
- Assess respective Municipalities, Upazilas, and Union Parishads existing plans and identify the progress so far with recommendations and/suggestions on future plans for efficient execution.
- Identification of successful SWM initiatives (such as plans, models, infrastructures etc.) undertaken within project locations with the purpose of replication.
- Listing of effective SWM initiatives of the Municipalities, Upazilas, and Union Parishads (such as plans, models, infrastructures etc) across the across the country with the purpose of having a shortlist to integrate a mentor – mentee programme.

❖ **Assessment of waste streams, patterns, and quantities in project area**

A comprehensive assessment on waste generation patterns and recycling potentiality among various waste generators, including

- Households,
- Agricultural sectors,
- Live stocks,
- Food processing industries,
- Fisheries,
- Faecal sludge/waste,
- Bazar,
- Small businesses, and
- Healthcare facilities,
- Electronic waste

❖ **Stakeholder analysis and dynamics**

Perform detailed stakeholder analysis of key actors, such as household surveys, government entities, Municipalities, Upazilas, and Union Parishads, private sector actors including business, commercial entities, and local entrepreneurs, formal and informal sector.

❖ **Exploring Waste Management Feasibility**

- Evaluate the feasibility of waste collection from sources such as household collection; and assess community willingness to pay for this service in the Municipalities, Upazilas, and Union Parishads.
- Assess the knowledge and practice level of the citizens regarding source segregation of the waste
- Identify barriers and challenges hindering effective waste management and recycling efforts for each stakeholder category, including regulatory constraints, lack of awareness, infrastructure limitations, and economic factors including adequate financing.

❖ **Survey and evaluation of operation practices, models, and infrastructures**

- Identify existing SWM infrastructure available to each stakeholder category, including, vehicles, recycling facilities, collection points, processing plants and landfills
- Investigate current waste operation practices by different stakeholders, including collection, segregation, transportation, treatment, and disposal methods.
- Identify formal and informal solid waste management practice and process.

❖ **Resilience of SWM practices and infrastructures to climate extreme events**

- Identify how the climate extreme events impact the SWM infrastructures and its operation in the area.
- Identify measures to mitigate the impact of climate extreme events on SWM in the area.
- Identify how SWM in the area can that contribute Bangladesh NDC (2021) targets (reduction of Green House Gas emissions).

❖ **Identification of Waste Value Chain, recycling & Business Models suitable for the programme area**

- Identification of existing waste management scenario and engagement of formal, informal, public, and private sector business.
- Explore the waste value chain of the most prominent waste streams identified in the section 2 in each of the municipalities and unions of the project target areas.
- Evaluate the potential for recycling different types of waste materials generated by each stakeholder category based on factors such as market demand, technological feasibility, and economic viability.
- Exploring the financial viability for waste management business in the area.

❖ **Assessment of SWM and Gender Equality and Social Inclusion (GESI)**

- Assess gender dynamics and identify disparities in SWM access and resources based on gender and marginalized populations.
- Assess the working conditions of solid waste management workers including social, health and safety aspects.

❖ **Recommendations for Intervention:**

Based on the findings of the study, we will provide feedback based on the existing practices as well as exploring the market linkage and develop an action plan (quick wins / low hanging fruits) to improve waste management practices and enhance recycling efforts across various stakeholder categories.

1.4 Study Area

The study area selected for this research is Dhamoirhat Paurashava, located in Dhamoirhat Upazila of Naogaon District, under the Rajshahi Division of Bangladesh. It is a municipal administrative unit serving as the urban and administrative center of the upazila. The total area of Dhamoirhat Paurashava is 11.16 sq. km.

Dhamoirhat Paurashava is bordered by Dhamoirhat Union to the south, Omar Union to the west, Khelna Union to the north, and Isabpur Union to the east. These surrounding rural unions play an influential role in shaping the waste generation and disposal dynamics of the Paurashava, as waste flows and service boundaries often overlap.

According to BBS 2022, in Dhamoirhat Paurashava, there are 4,649 households with a total population of 17,456, comprising 50.3% males and 49.7% females. The average household size is 3.68, and the literacy rate stands at 78.03%, which is relatively higher compared to other rural upazilas. In Dhamoirhat Paurashava, an urbanized unit within the upazila, there are 18 educational institutions and 3 hats and bazaars.

Climate and Environmental Context

Dhamoirhat Paurashava experiences a tropical monsoon climate, with three distinct seasons: pre-monsoon (summer), monsoon, and winter. April and May are typically the hottest months, with temperatures reaching up to 40°C (104°F), while December and January are the coolest, averaging around 12°C (54°F).

The average annual rainfall ranges between 1,500–2,000 mm, most of which occurs during the June–September monsoon season, often causing drainage challenges and waterlogging in low-lying areas. Relative humidity remains high, especially in the monsoon months, often exceeding 80%.

Climate and Environmental Vulnerabilities

Dhamoirhat Paurashava is exposed to several climate-induced vulnerabilities that impact both public health and waste management systems:

Droughts: Being located in the northwestern region of the country, the area frequently experiences water scarcity during the dry season, which affects sanitation and cleaning operations.

Localized Flooding: Although not classified as a major flood-prone zone, the municipality experiences localized waterlogging and minor flooding in certain areas during intense rainfall, especially near drainage outlets and low-lying roads.

Soil Degradation: Continuous cultivation in surrounding agricultural areas and poor irrigation practices contribute to soil fertility loss, which in turn affects the broader environmental sustainability of the region.

Extreme and Erratic Rainfall Patterns: In recent years, Dhamoirhat has been experiencing increasingly irregular and uneven rainfall distribution, with sudden short-duration, high-intensity rainfall events. These patterns result in unpredictable water accumulation, disrupt municipal waste operations, and strain the drainage capacity of the Paurashava.

1.5 Methodology

The methodology of the study is outlined in the flow diagram below.

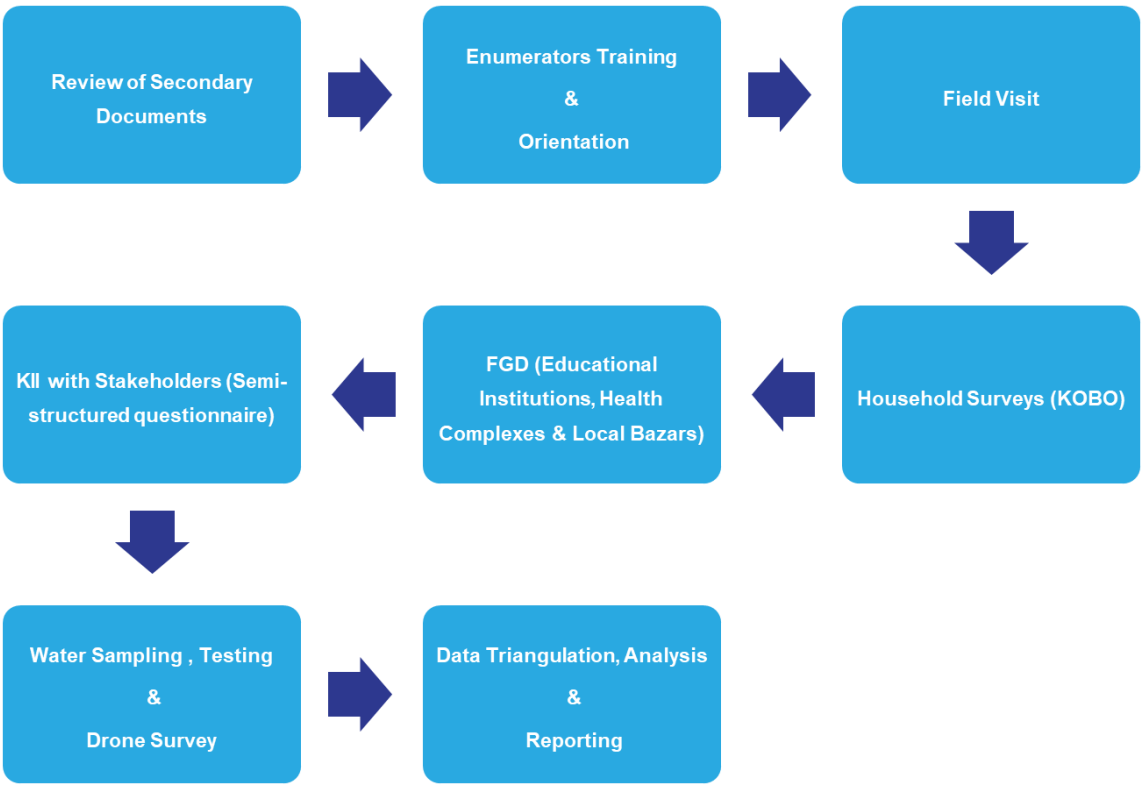


Figure 1-1: Methodology

The methodology follows a structured, multi-step approach to data collection and analysis for waste and water management assessment. It begins with a review of secondary documents to establish a baseline understanding. Following this, enumerators are trained and oriented before conducting field visits to collect primary data.

The data collection process includes household surveys using KOBO Toolbox, focus group discussions (FGDs) with educational institutions, health complexes, and local markets, and key informant interviews (KIIs) with stakeholders using semi-structured questionnaires. Additional data is gathered through water sampling, testing, and drone surveys for spatial and environmental analysis.

Finally, all collected data undergoes triangulation, analysis, and reporting to ensure accuracy, identify trends, and develop actionable recommendations for improved waste and water management in the study area.

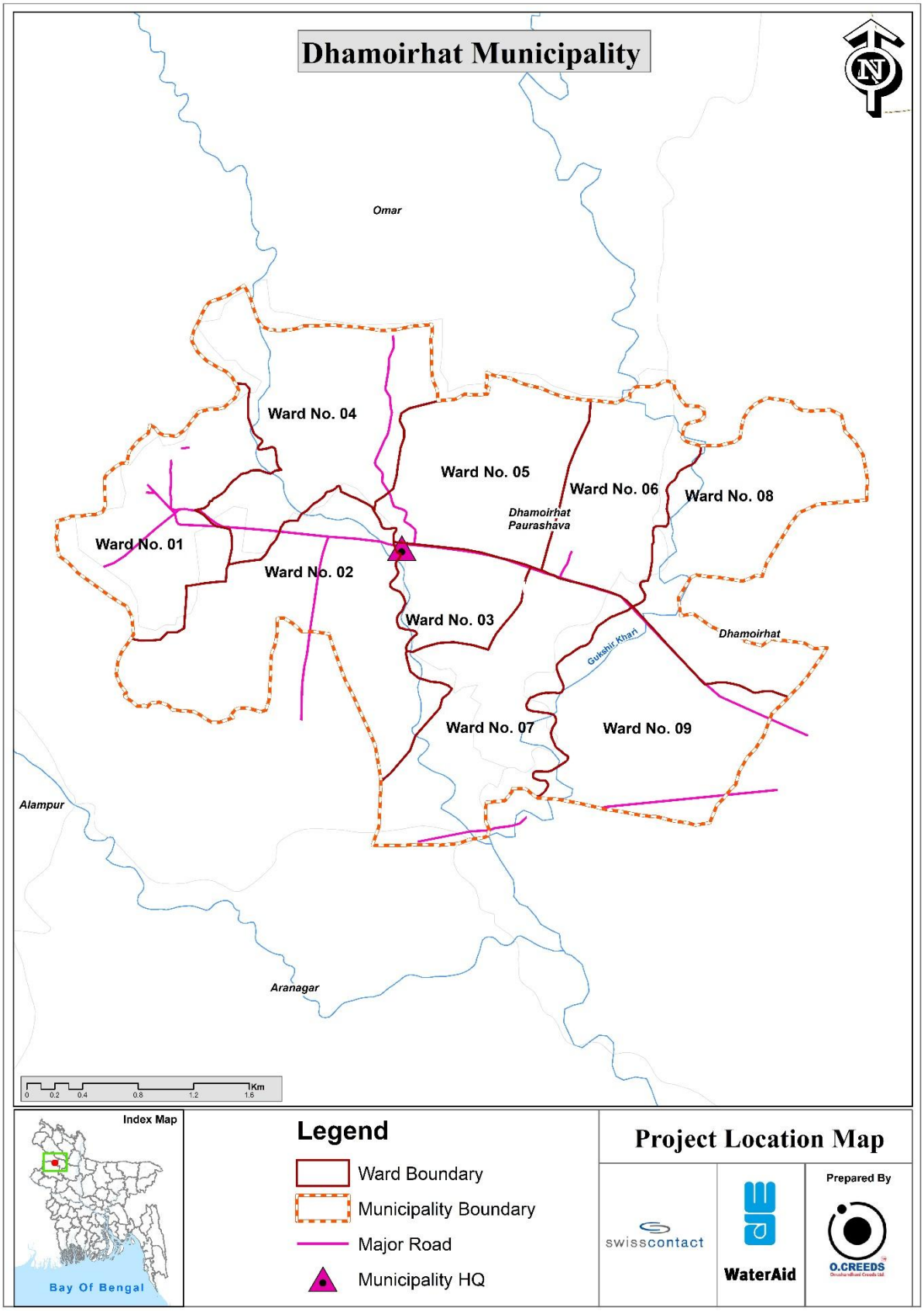


Figure 1:2:Study Area Map

1.6 Survey Profile

A semi-structured questionnaire was developed to collect household data on waste management practices. Information on current waste composition and management practices was gathered from 90 households. Kobo toolbox was used for the survey.

10 households were selected by a random sampling method and provided with blue and black cloth bags to keep their organic and inorganic waste separated. This survey was used to determine the waste composition of household waste.

Table 1.1: Survey Profile

Area	HH	FGD	KII
Dhamoirhat Paurashava	90	2	5

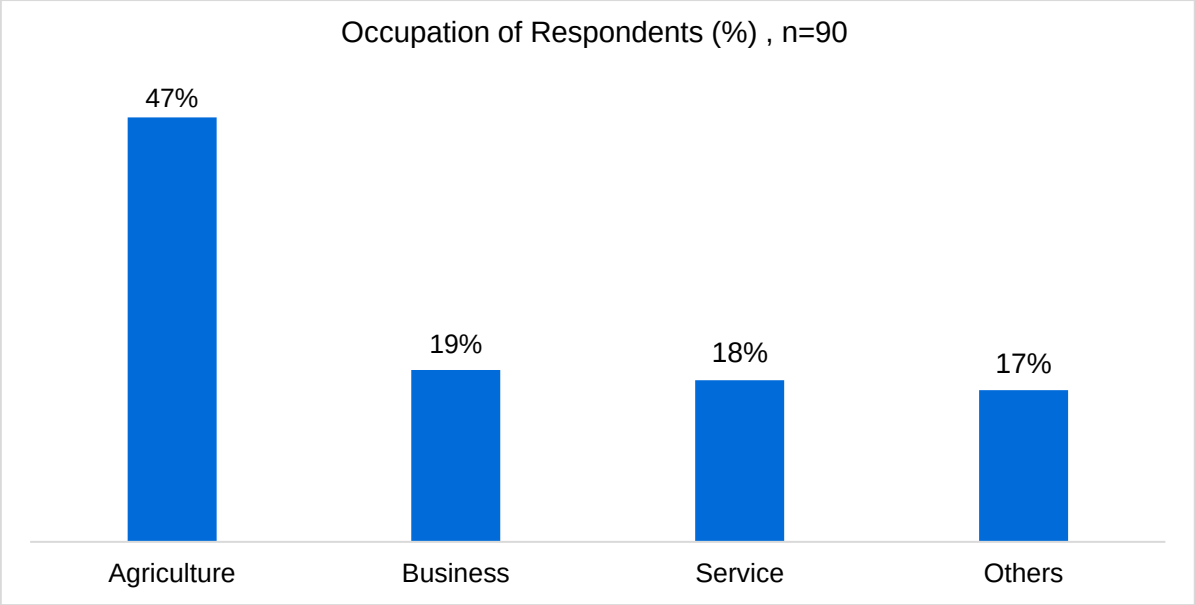
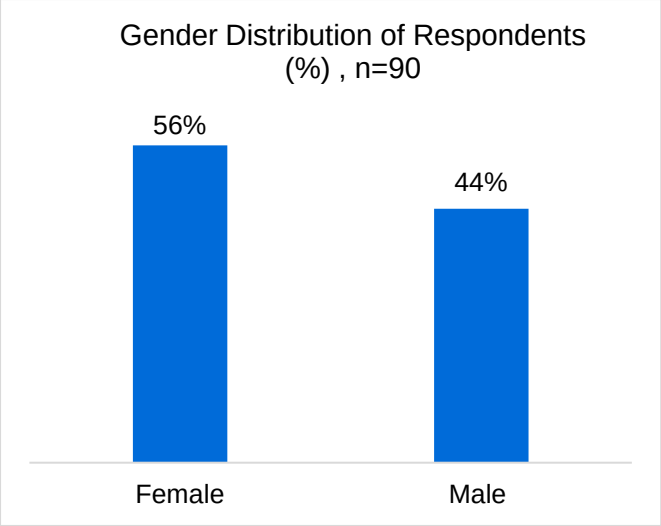


Figure 1:3: **Source of Income**

Note: Others denote driver, teacher, day labourer, remittance, tailor, teacher, fisherman, unemployed, retired

The majority of respondents, 47%, are engaged in agriculture, reflecting the area's primary economic activity. This is followed by 19% involved in business and 18% working in the service sector, indicating a significant presence of secondary and tertiary activities. A smaller proportion, 17%, falls under the category of others, which includes roles like drivers and day laborers.



The majority of respondents were female (56%), while male respondents accounted for 44%.

This distribution highlights a balanced participation in the household survey.

Figure 1:4: **Gender Distribution of Survey Respondents**

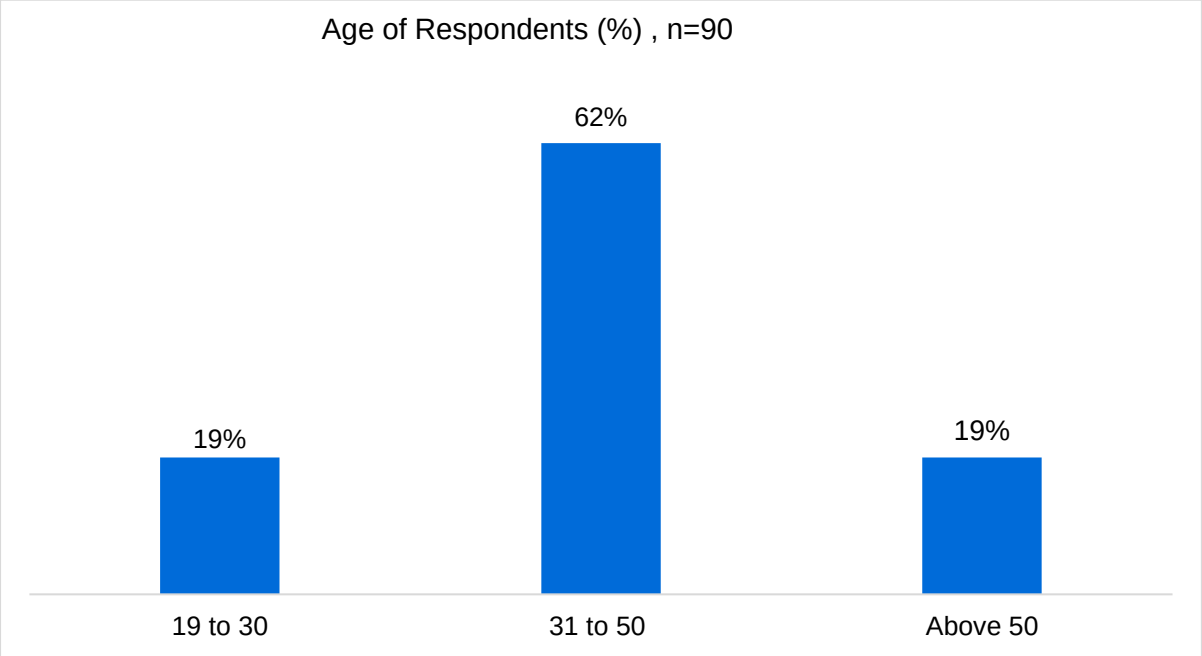


Figure 1:5: **Age Distribution of Respondents**

Most respondents (62%) fall within the 31 to 50 age group, followed by 19% aged above 50. Only 19% of the respondents were aged between 19 to 30 years, indicating that the data is primarily based on responses from middle-aged and older individuals.

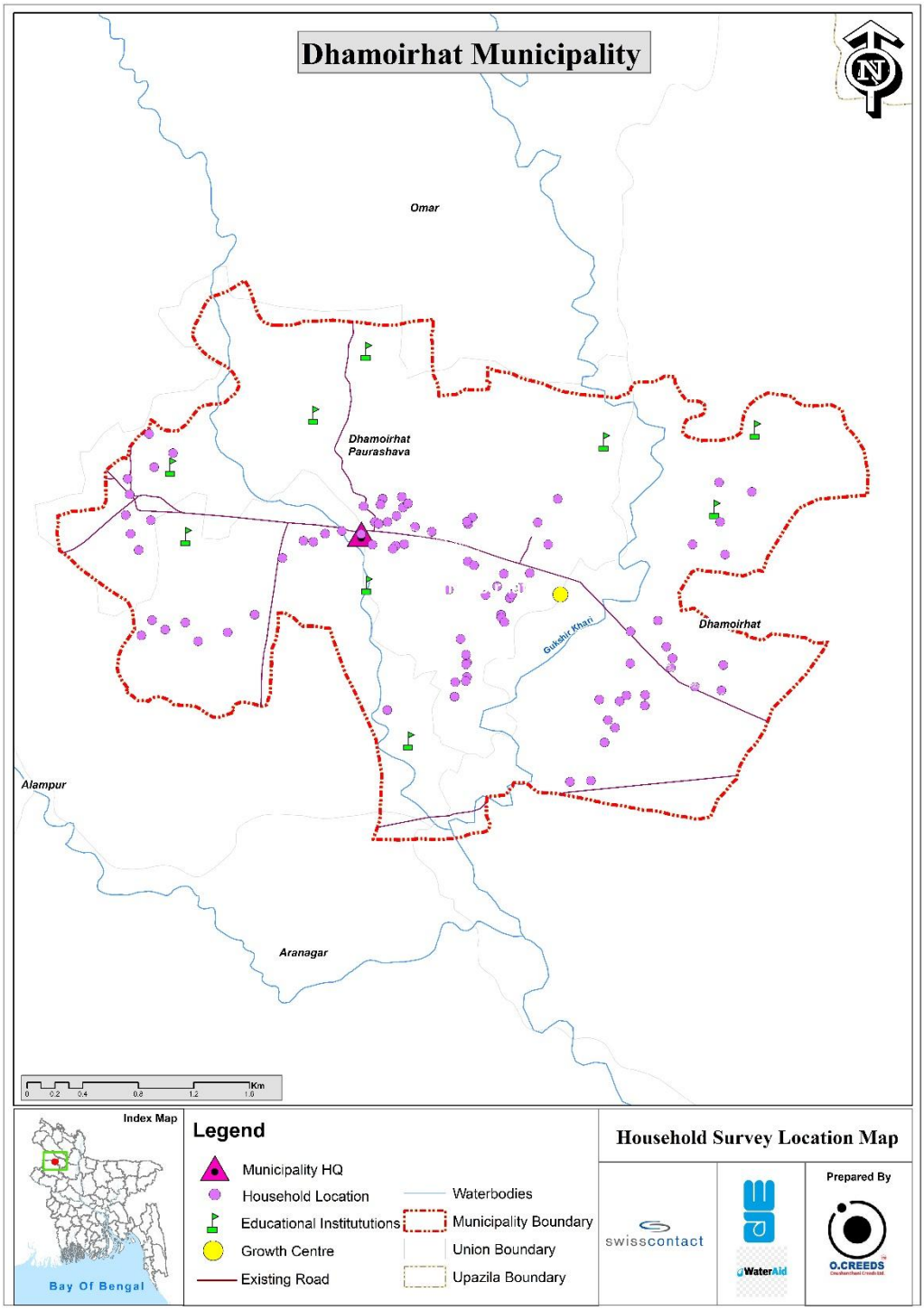


Figure 1-6: **Household Survey Map**

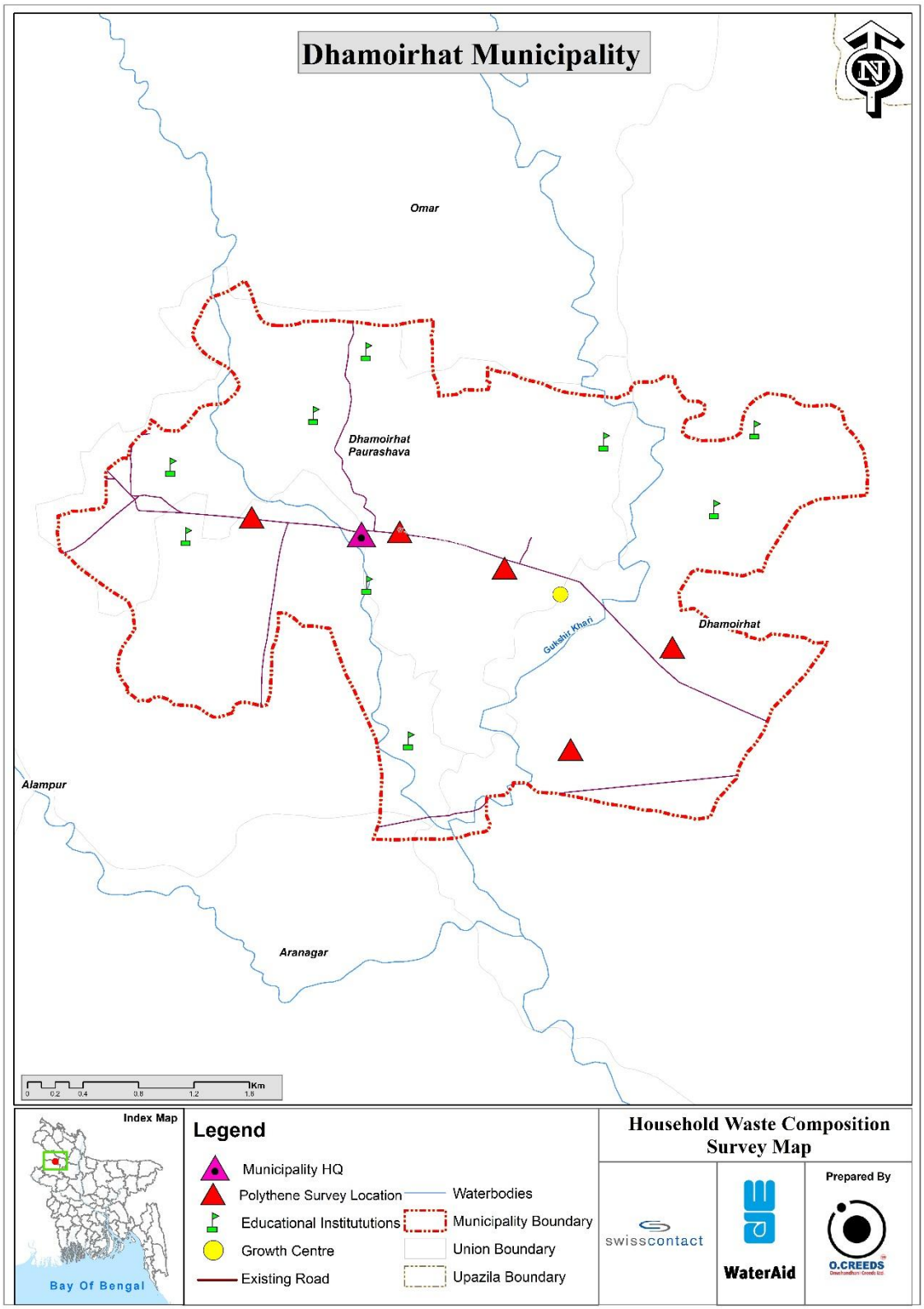


Figure 1-7: **Household Waste Composition Survey Map**

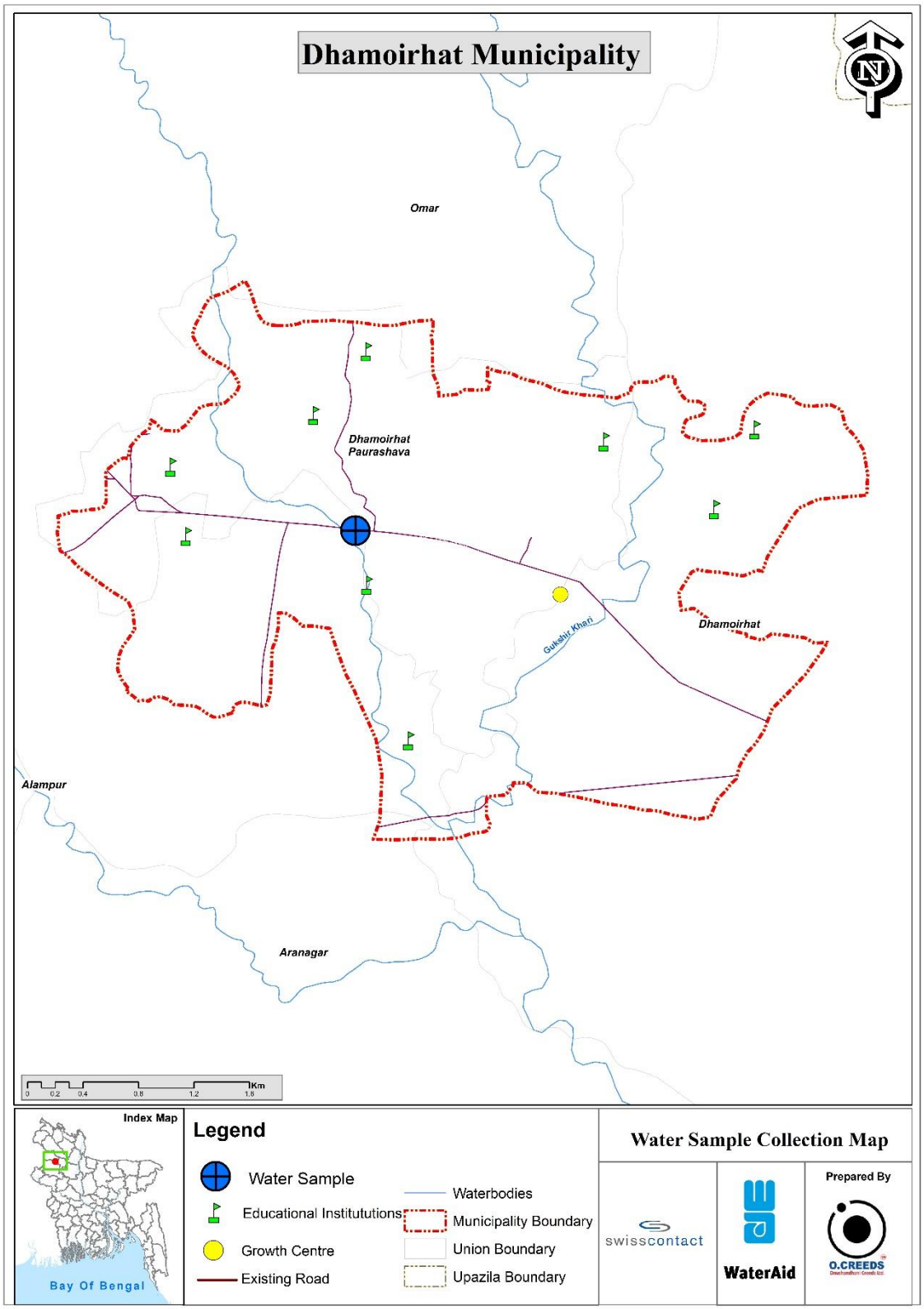


Figure 1-8: **Water Sampling Location Map**

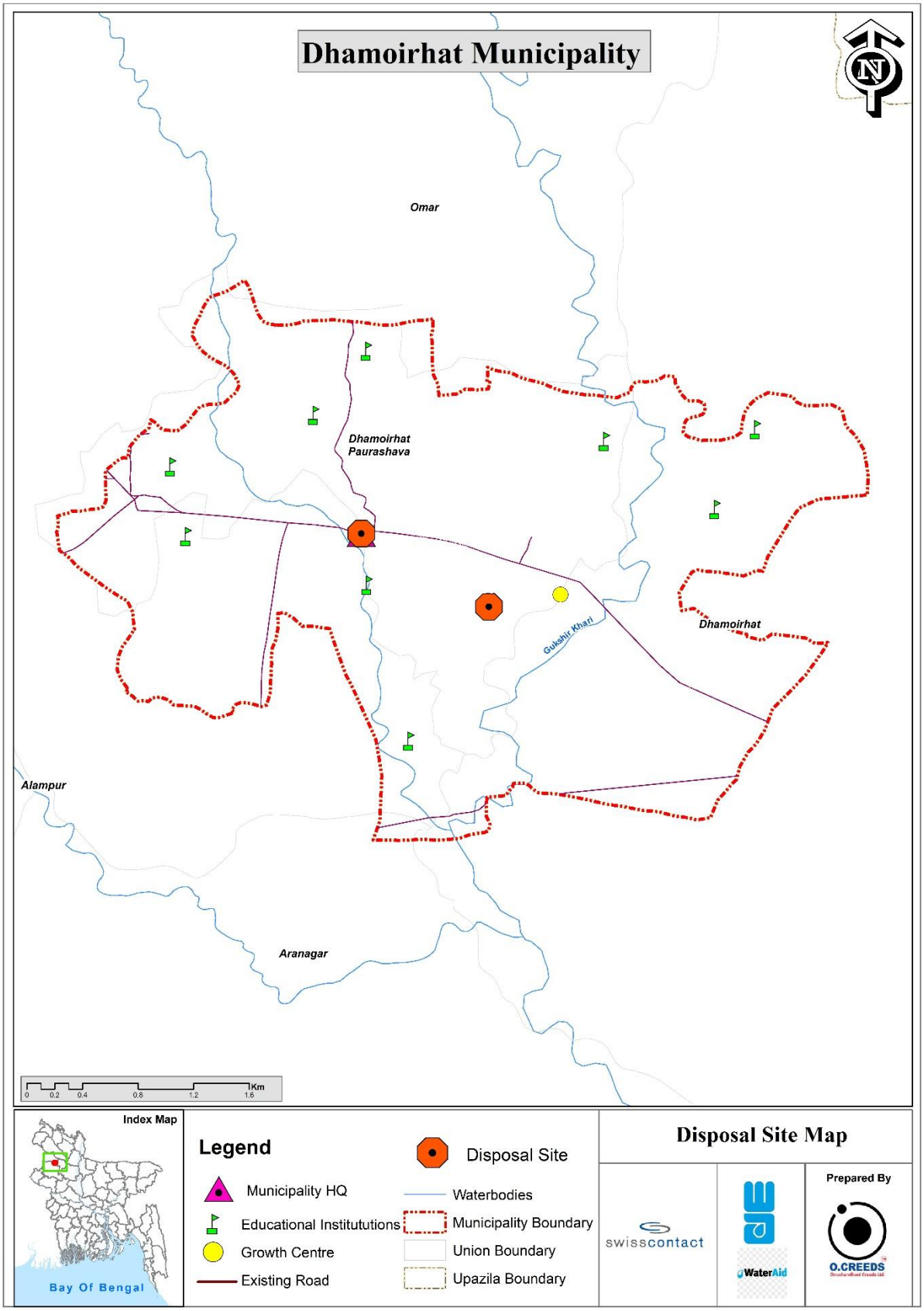


Figure 1-9: **Disposal Site Map**

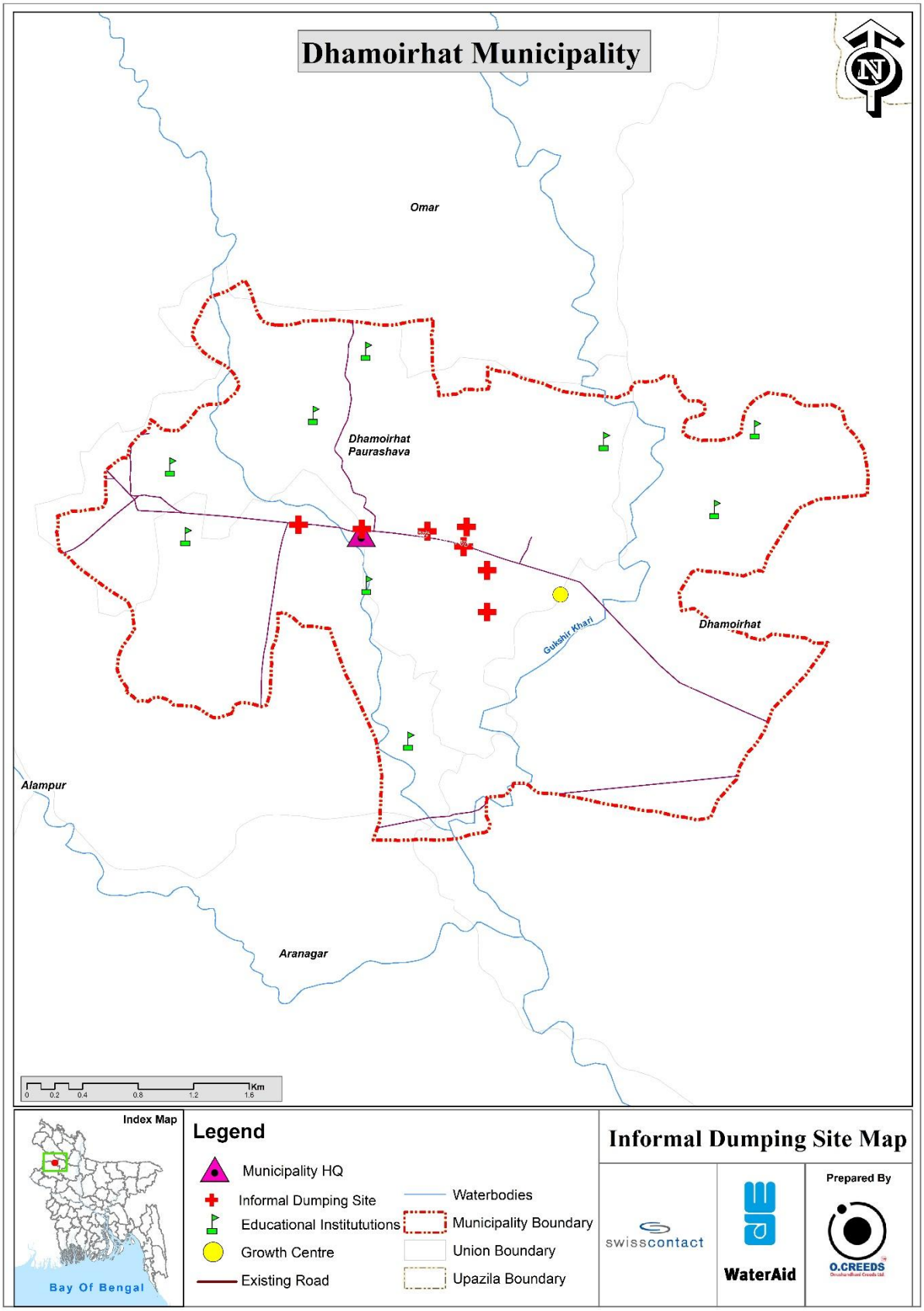


Figure 1-10: **Informal Waste Dump Locations Map**

2. NATIONAL LEGAL AND INSTITUTIONAL CONTEXT OF SOLID WASTE MANAGEMENT

This section highlights some of the important national legal and institutional policies related to waste management and the environment.

2.1 Bangladesh SWM rules and regulations

The City/Paurashava Act (2009), National Environmental Policy (2018), Environment Conservation Act (1995), Environment Conservation Rules (1997), Environmental Conservation Rules (2023), and National 3R Strategy for Waste Management (2010) are the primary guidelines used for SWM in Bangladesh. Recently, SWM Rules (2021) has been approved under the environment conservation act by the Ministry of Environment, Forest and Climate Change. Currently, there is no specific guideline approved by the local government regarding SWM.

Regulatory Documents	Approving agency
• Local Govt. (City Corporation' Pourashava) Acts. 2009 Amended 2011- • Environmental Conservation Act 1995	• The Parliament • The Parliament
• Environmental Conservation Rules 2023 • Medical Waste Management • Solid Waste Management Rules, 2021	• DoE, MoEFCC • DoE, MoEFCC • DoE, MoEFCC
• National Policy for Safe Water Supple and Sanitation, 1998 • Environment Policy, 2018	• LGD, MOLGRDC • DoE, MoEFCC
• National 3R Strategy for Waste Management, 2010 • National Strategy for Water Supply and Sanitation.	• LGD, MOLGRDC • LGD, MOLGRDC
• 8th Five Year • Plan Perspective Plan for Bangladesh 2021-2041	• Planning commission, Ministry of Planning • Planning commission, Ministry of Planning

2.2 Environmental Conservation Act, 1995

This Act is provided for environmental conservation, environmental quality and control, and pollution mitigation. It authorizes the Department of Environment (DoE) to take necessary measures and publish guidelines to control, abate, and mitigate environmental pollution to improve the environment.

2.3 Bio-Medical Waste Management Rules, 2008

The rules apply to waste management facilities and operators involved in medical waste transportation, treatment, and disposal. Institutions engaged in collecting, transporting, and

storing must obtain authorization permits from DoE. The rules have classified medical waste classes with detailed guidelines to operationalize segregation.

2.4 Local Govt. (City Corporation/ Paurashava) Acts, 2009 Amended 2011

This Act guides ULBs to be responsible for SWM, including collection and disposal of waste from all the roads, drains, structures, and areas under their jurisdiction. ULBs are to arrange to place waste collection containers or other types of bins at different locations and inform the occupiers of houses, structures, and spaces to dump wastes into these containers or bins.

2.5 National Environment Policy, 2018

Considering the environmental challenges, biodiversity conservation, and management, the government adopted this policy to develop the overall environmental conservation management of the country with recommendations for the 3R approach and sanitary landfill and waste to biogas.

2.6 Solid Waste Management Rules, 2021

It is focused on necessary detailing across the SWM value chain from waste collection to final disposal. It narrates how waste should be segregated, collected and treated by ULBs. Most importantly, the rules state that the ULBs will have to collect house-to-house waste either by their employees or by engaging contractors. It emphasizes landfill site selection criteria and also provides instructions regarding the treatment of waste including standards for aerobic and anaerobic digestion, and energy recovery. It recommends free delivery of organic waste to the private sector for recycling and resource recovery.

2.7 National 3R Strategy for Waste Management, 2010

The main features of the strategy are: (a) prioritizing waste avoidance/reduction over recycling and recycling over all other forms of environmentally sound disposal; **(b)** reusing non-avoidable waste as far as possible; **(c)** promoting environment-friendly raw materials; **(d)** maintaining hazardous content in the waste at the lowest possible level; **(e)** guaranteeing an environmentally sound residual waste treatment and disposal as a fundamental prerequisite for human existence, environmental conservation, and protecting biodiversity; **(f)** public awareness campaigns for the segregation of waste at source; and **(g)** following a regional landfill approach.

2.8 National Strategy for Water Supply and Sanitation, 2021

The strategy addresses strengthening sector governance, emphasizing resource recovery and recycling (instead of disposal) to improve urban sanitation. The recommendations include, among others; **(a)** improving SWM based on the principles of 3R; **(b)** establishing a coordination mechanism between line ministries and institutions; **(c)** ensuring development, implementation and continuation of social mobilization campaign; (d) developing an inventory, pollution scenario and conducting solid waste mapping; and **(e)** establishment of Integrated Waste Treatment Facility at least in 50 percent of Pourashavas by 2025.

2.9 Bangladesh's Nationally Determined Contributions (2021):

It focuses on improved municipal waste management, ensuring the 3R principle. Actions to be achieved by 2030 include establishing an incineration plant in 3 cities, establishing wastewater treatment plants in several cities, and expanding regional Integrated Landfill and Resource Recovery facilities in other cities.

2.10 Environmental Conservation Rules, 2023

These rules provide guidelines for: **(a)** categorization of industries and development projects, including multi-storied buildings based on actual and anticipated pollution load; **(b)** requirement for undertaking Environmental Assessment and Plan; **(c)** procedure for obtaining environmental clearance certificate; **(d)** environmental quality standards for ambient air, surface water, groundwater, drinking water, emissions, noise, and vehicular exhausts. Landfilling of solid wastes by industries, households, and commercial institutions is categorized as Red Category. Undertaking any landfill project for waste disposal will need an environmental clearance certificate from DoE. Incineration is also classified as Red Category, while composting is categorized as Green Category.

2.11 8th Five Year Plan

The recommendations include: **(a)** complete solution should consist of an integrated waste management system that provides a transfer station, compost plant, biogas plant, and controlled landfill cell; **(b)** treating SWM C as a system as it is tied to many problems such as waterlogging, GHG emissions, and water and land pollution; **(c)** awareness building; and **(d)** promoting composting and biogas to electricity.

2.12 Perspective Plan for Bangladesh 2021-2041

It emphasizes: (a) private participation in disposal of solid waste; **(b)** adequate capacity development of the ULBs, including the reformation of their organogram to plan, guide, and monitor SWM; and **(c)** cost recovery mechanism for urban services including SWM.

3. ASSESSMENT OF WASTE STREAMS, PATTERNS AND QUANTITIES IN PROJECT AREA

3.1 Residential Waste

A household survey was conducted across Dhamoirhat Paurashava to assess the volume, types, and patterns of domestic waste generation. The total number of households surveyed was 90. The objective of this survey was to understand daily waste generation behaviour, composition of household waste, and to identify potential waste management needs. The graphs presented in this section illustrate the volume of household waste generated per day and the overall composition of household waste.

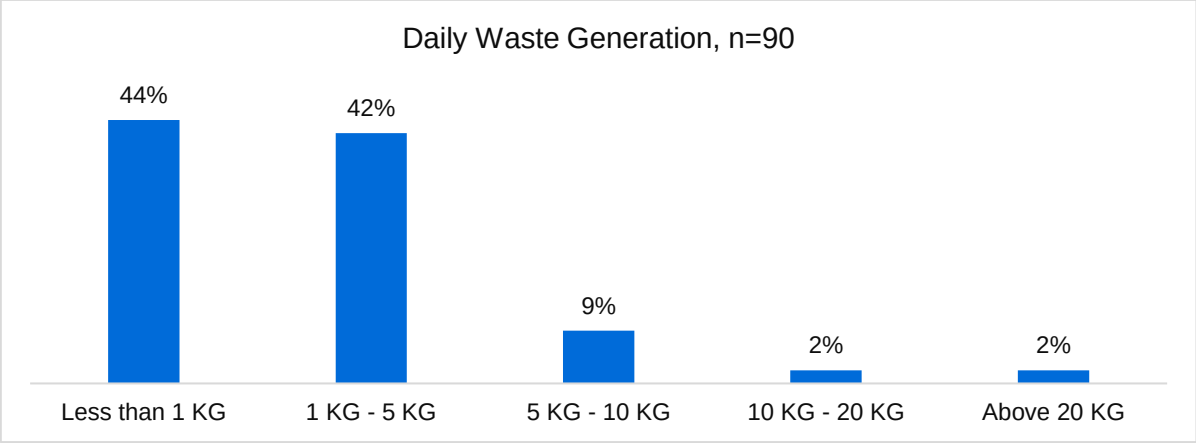


Figure 1:1: **Daily Household Waste Composition in Dhamoirhat Paurashava**

Figure 1.1 shows the daily waste generation across surveyed households. The majority of households (44%) produce less than 1 kilogram of waste daily, followed by 42% who generate 1 to 5 kilograms. A smaller portion generates 5 to 10 kilograms (9%), while 2% and 3% generate 10–20 kilograms and above 20 kilograms, respectively. These findings suggest that most households produce manageable amounts of waste, which can be effectively addressed through localized waste management systems.

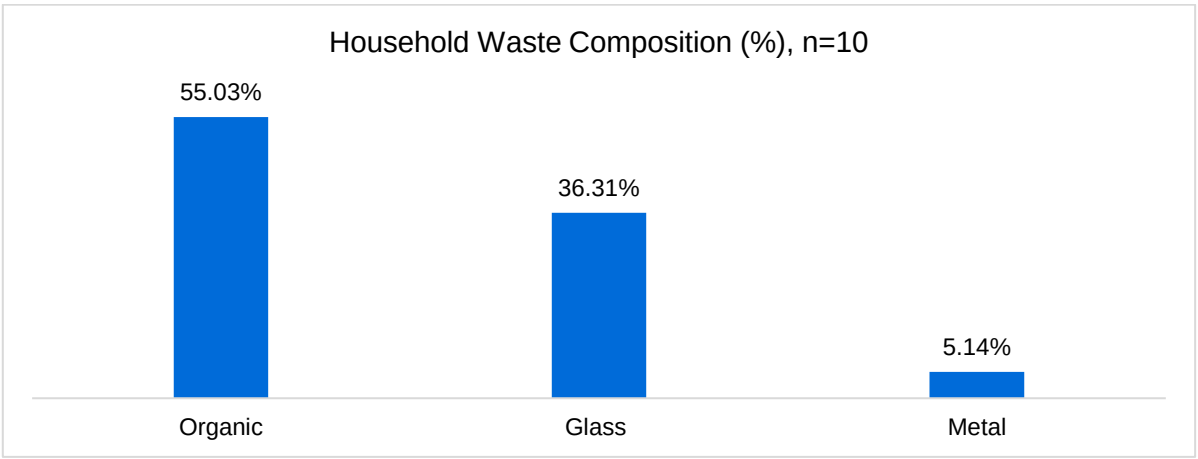


Figure 1:2: **Household Waste Composition**

The composition of household waste indicates that organic waste accounts for 55.03%, followed by glass waste at 36.31%, and metal at 5.14%. This data emphasizes the potential of organic waste recovery practices, such as composting, to reduce the overall waste load.

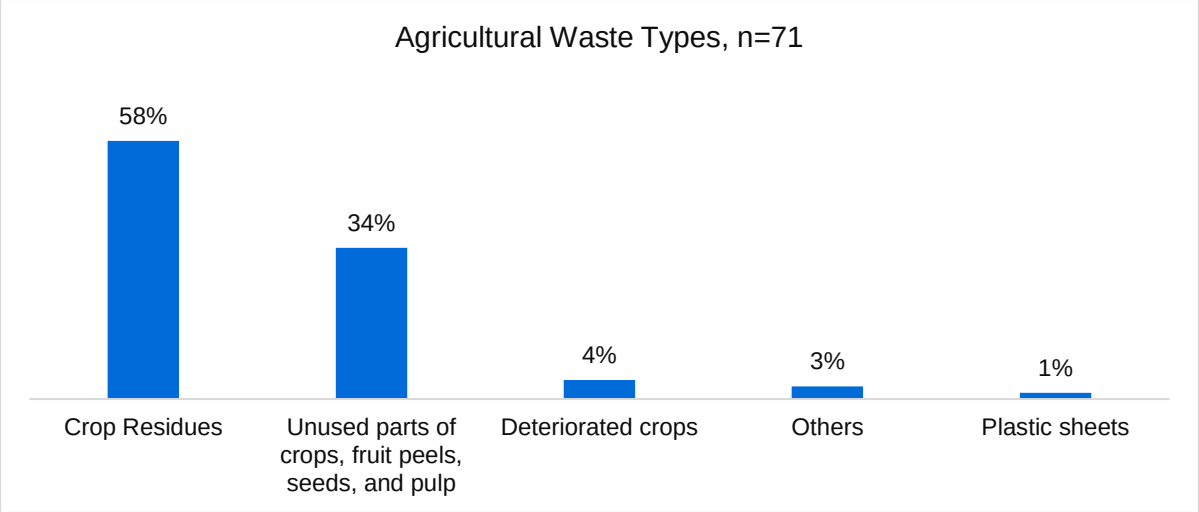


Figure 1:3: **Agricultural Waste Types**

Note: Others denote pesticide used bottle, glass, burnt remains

Respondents were asked about agricultural waste produced at the household level. The majority (58%) reported crop residues such as corn stalks, coconut coir, straw, husks, and wood chips. Unused parts of fruits, peels, seeds, and pulp accounted for 34%. Deteriorated crops (4%), miscellaneous waste (3%), and plastic sheets used for agricultural activities (1%) were also identified (Figure 1:3). These wastes include both biodegradable and non-biodegradable materials and present opportunities for composting and recycling interventions.

Figure 1:4: **Livestock Waste Types**

Note: Other denotes animal carcass, debris

Figure 1.4 highlights the types of waste generated from livestock-rearing households. Livestock fecal sludge accounts for 58%, followed by animal food waste at 39%, while other waste types make up 3%. These findings are essential for designing appropriate sanitation and waste handling systems related to livestock management. None of the respondents own fisheries, which suggests that this region does not specialize in fish culture or fisheries businesses.

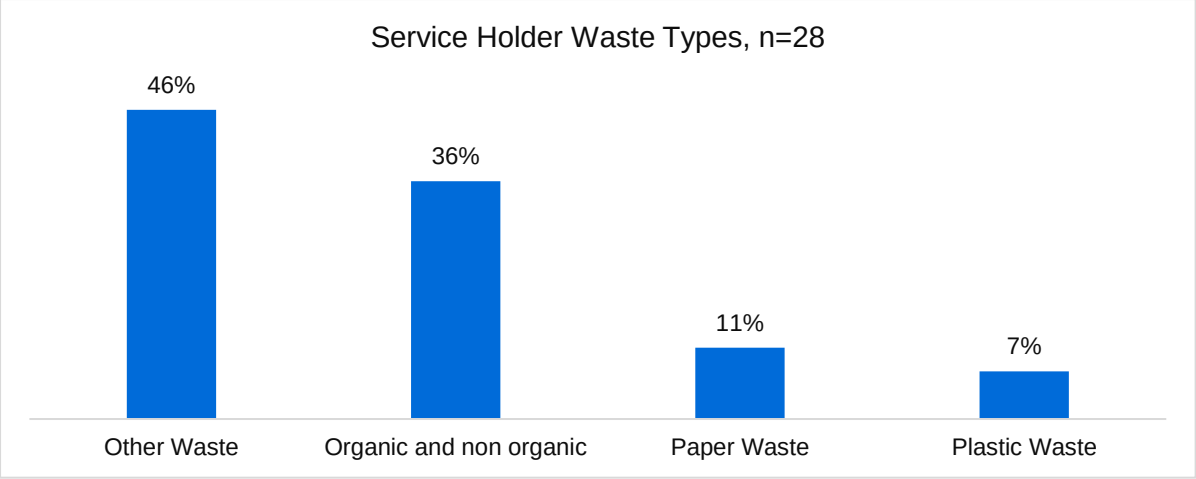


Figure 1:5 Service Holder Waste Types

Note: Other denotes glass, tires

Figure 1:5 illustrates waste generated by service holders (e.g., shops, offices, small businesses) was categorized during the survey. Miscellaneous waste types (46%) dominate, followed by organic and non-organic mixed waste (36%). Paper waste (11%) and plastic waste (7%) are also present, indicating a varied but low-volume waste stream that still requires structured collection and segregation strategies.

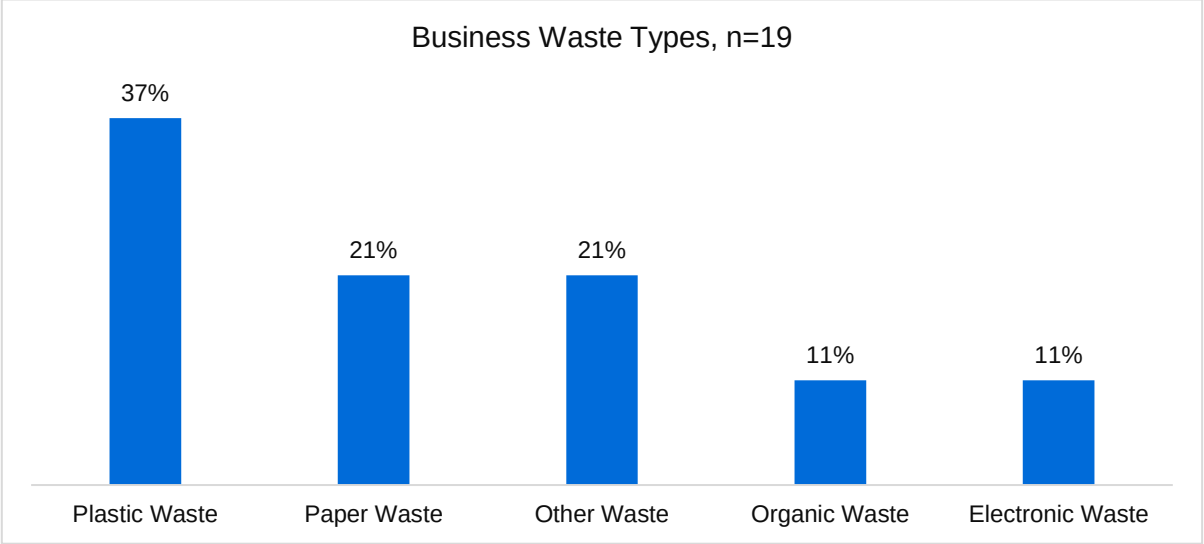


Figure 1:6: **Business Owner Waste Types**

Note: Other denotes tires, old furniture wood

Figure 1:6 presents the types of waste generated by business owners. Plastic waste leads at 37%, followed by paper waste (21%), other waste types (21%), organic waste (11%), and electronic waste (11%). This reflects a need for targeted interventions such as e-waste recovery and recyclable segregation from commercial establishments

3.2 Water Quality Test

Water sample was collected from the lake beside Dhamoirhat Paurashava office building. This location was chosen since is openly dumped near the paurashava office area. Some of this

waste finds its way into the lake and causes contamination. Such contamination could pose health risks to local residents who rely on the water and causing environmental harm. Aquatic life including plants, fish and microorganisms living within the water body may also be at risk.

Serial	Water Quality Parameters	Bangladesh Standard	Concentration Present	Unit
1	Chemical Oxygen Demand (COD)	4	48	mg/L
2	Dissolved Oxygen (DO)	6	5.1	mg/L
3	Nitrogen (Nitrate)	10	1.6	mg/L
4	Total Dissolved Solid (TDS)	1000	165	mg/L
5	Total Suspended Solid (TSS)	10	5	mg/L

Note: BOD was not tested since the sample had to be sent to the DPHE Dhaka lab within 24 hours, which was not feasible at the time of survey.

The Chemical Oxygen Demand (COD) is significantly higher than the Bangladesh standard of 4.0 mg/L, with a concentration of 48.0 mg/L. This indicates high organic pollutant levels in the water.

The Dissolved Oxygen (DO) is slightly below the standard (6.0 mg/L) at 5.10 mg/L, suggesting limited oxygen availability.

The Nitrate concentration (1.6 mg/L) is well within the acceptable limit (10.0 mg/L), posing no immediate concern.

The Total Dissolved Solids (TDS) (165 mg/L) and Total Suspended Solids (TSS) (5.0 mg/L) are also within the permissible range, indicating moderate water quality with respect to these parameters.

3.3 Waste Generation Patterns in the Paurashava

The Conservancy Inspector highlighted that Dhammohirat Paurashava generates approximately 3 to 3.5 tons of solid waste daily. The composition of this waste includes 3 tons of organic waste, 200 kg of plastic, 5 kg of metal, 100 kg of hazardous waste, 100 kg of butcher waste, 90 kg of construction waste, and 5 kg of medical waste.

On an annual basis, the paurashava generates 45 to 50 tons of waste, with peak waste generation observed during the monsoon months of June and July, as well as the Bangla months of Boishakh, Joishtho, Kartik, and Agrahayon. The increase in waste is primarily attributed to the rise in population and housing developments in the area.

The Sanitary Inspector noted that waste generated specifically from sanitation facilities amounts to 1 to 1.5 tons daily. Similar to general waste trends, the increase in sanitary waste is linked to the paurashava's growing population and expanding housing infrastructure. However, there is no separate budget allocated for its management.

According to the Executive Engineer, organic waste constitutes the majority of the paurashava’s waste. The rise in organic and other waste is a direct result of urbanization and population growth in the area.

The Disposal Site Operator reported that there are four trucks, each with a capacity of 2.5 tons. Waste contributions vary across sectors, with kitchen markets and small businesses contributing 40% each, agricultural sectors 10%, and other sources the remaining 10%. The operator also emphasized seasonal peaks, with higher waste volumes recorded during Eid and Puja celebrations.

The waste workers participating in the Focus Group Discussion (FGD) explained that 40% of the waste they collect is plastic, 5% is cloth, and 45% comprises other items that are separated for resale.

3.4 Waste Flow Diagram

Figure 3-9 shows the Waste Flow Diagram for Dhamoirhat Paurashava, based on the findings of this study. This flow illustrates how waste moves through collection, sorting, and disposal systems in the upazila, with final outcomes distributed across both managed sites and environmental exposure points.

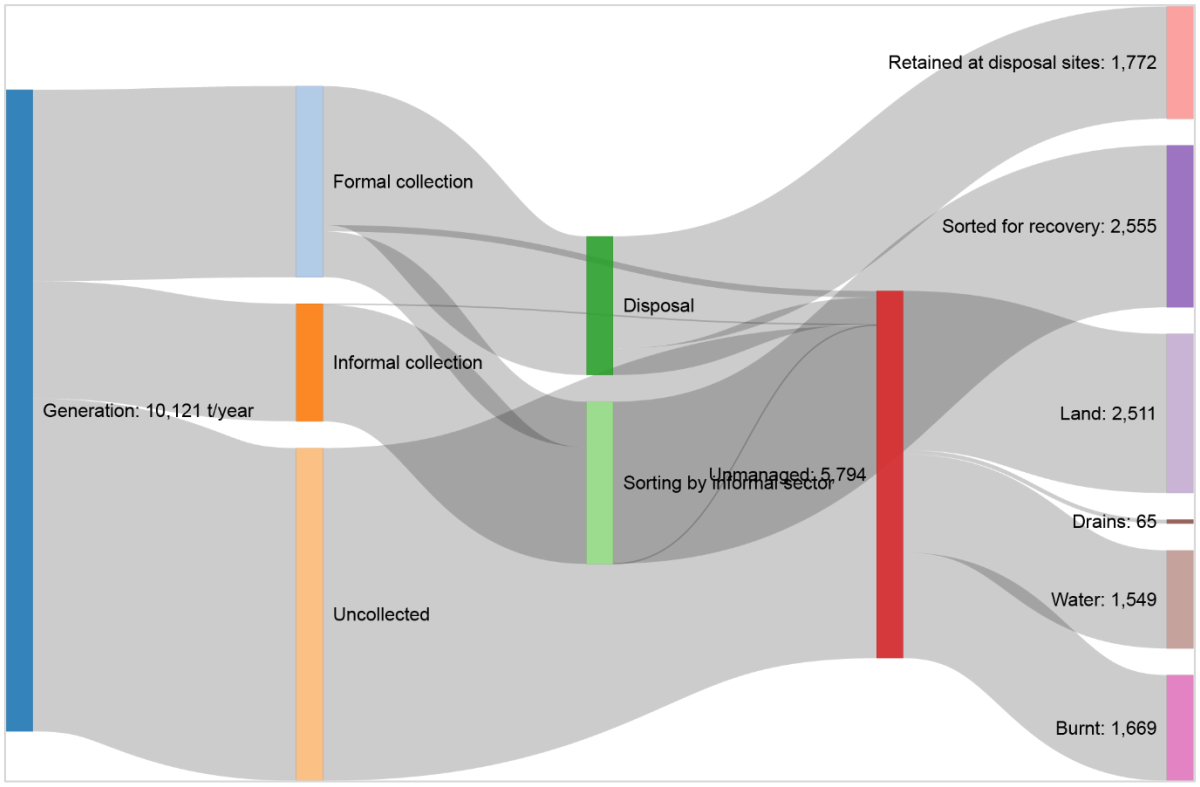


Figure 1-7: **Waste Flow Diagram (WFD) for Dhamoirhat Paurashava (tonnes/year)**

The Waste Flow Diagram (WFD) for Dhamoirhat Paurashava shows that a total of 10,121 tonnes of waste are generated annually. Out of this, 2,555 tonnes per year are formally collected, 1,772 tonnes are collected through informal systems, and 5,794 tonnes remain uncollected. From the total collected waste, 2,555 tonnes are sorted for recovery, while 1,772 tonnes are retained at disposal sites. Additionally, 2,555 tonnes pass through sorting by the informal sector.

A total of 5,794 tonnes of waste remains unmanaged and directly enter the environment. Of this, 2,511 tonnes end up on land, 1,549 tonnes enter water bodies, 1,669 tonnes are burnt, and 65 tonnes are disposed of into drains.

4. STAKEHOLDER ANALYSIS AND DYNAMICS

Effective waste management in Dhammohirat Paurashava involves multiple stakeholders who play critical roles in the generation, collection, disposal, and overall management of waste. The stakeholders' responsibilities, challenges, and dynamics are outlined below based on insights from the FGDs, KIIs, and the involvement of external organizations such as ESDO.

4.1 Conservancy Inspector

The Conservancy Inspector reported that the estimated daily waste generation in Dhamoirhat Paurashava is around 3 to 3.5 tons. The waste composition includes 3 tons of organic waste, 200 kg of plastic, 5 kg of metal, 100 kg of hazardous waste, 100 kg of butcher waste, 90 kg of construction waste, and 5 kg of medical waste.

The Inspector emphasised several key challenges, including lack of a dedicated budget, absence of a waste collection tariff system, and low public awareness regarding waste management. The municipality has two vans and two trucks, all of which are in operation and used daily. Despite this, there is a notable shortage of manpower, with 15 male workers currently employed and no female staff. Although protective gear (aprons, gloves, masks, and boots) is distributed, its regular use is limited.

There are no landfill facilities, no composting or recycling units, and no leachate management systems in place. Waste segregation at source is also absent, and community-level engagement remains minimal.

4.2 Sanitary Inspector

The Sanitary Inspector reported that 1 to 1.5 tons of sanitary waste is generated daily from sanitation facilities within the Paurashava. There is no separate budget allocated for managing sanitary waste, and no collection tariff or fee system in place.

The Inspector noted that there have not been any significant system updates or improvements in recent years. The absence of a structured waste management approach, coupled with financial limitations and infrastructural constraints, continues to hinder progress in managing sanitary waste effectively.

4.3 Executive Engineer

The Executive Engineer highlighted financial limitations as a primary barrier to improving waste infrastructure in Dhamoirhat Paurashava. The municipality lacks the resources required to adopt modern waste management technologies or expand existing infrastructure. Key challenges include absence of formal landfill facilities, no leachate treatment systems, and lack of waste segregation mechanisms.

The Engineer also emphasised that increasing waste volumes due to housing and population growth have added pressure to an already strained system. Without increased budget allocation and structural development, it is difficult to manage this growing burden.

4.4 Disposal Site Operator

The Disposal Site Operator shared that there are four trucks in the municipality, with a capacity of 2.5 tons each, but they are not used to their full capacity. The main waste types include

organic waste, plastic, medical waste, and paper. Waste levels rise significantly during Eid and Puja festivals.

Plastic materials are extracted and sold by disposal site workers as a means of income generation. The site implements daily covering of waste to reduce odor and prevent the spread of germs, particularly during monsoon. However, there are no structured landfill facilities, no recycling or composting systems, and no leachate management systems at the site.

4.5 Waste Workers

Waste workers are responsible for collecting and transporting waste from different wards of the Paurashava. During FGDs, workers reported that they manually separate items for resale, including 40% plastic, 5% cloth items, and 45% other materials.

They identified challenges such as inadequate transportation facilities, lack of manpower, and absence of formal employment structures. Workers suggested the need for better social awareness, structured financial systems, and increased workforce recruitment to improve waste management practices in the municipality.

4.6 External Stakeholders

Non-governmental organizations (NGOs) can play a crucial role in strengthening waste management systems by collaborating with local authorities, private sector actors, and other NGOs. These partnerships can support initiatives such as recycling programs, public awareness campaigns, capacity-building training, and technology adoption.

An example of such engagement is ESDO (Environment and Social Development Organization), an NGO that is currently active in promoting sustainable waste management practices in the region.

5. EXPLORING WASTE MANAGEMENT FEASIBILITY

5.1 Household Waste Management Practices

This section presents findings from the household survey conducted to assess how waste is currently managed at the household level in Dhamoirhat Paurashava. The objective was to understand common disposal methods, agricultural and livestock waste handling practices, and business waste behaviour. The section also explores community perceptions and willingness to adopt improved waste management services, including payments for waste collection and desludging.

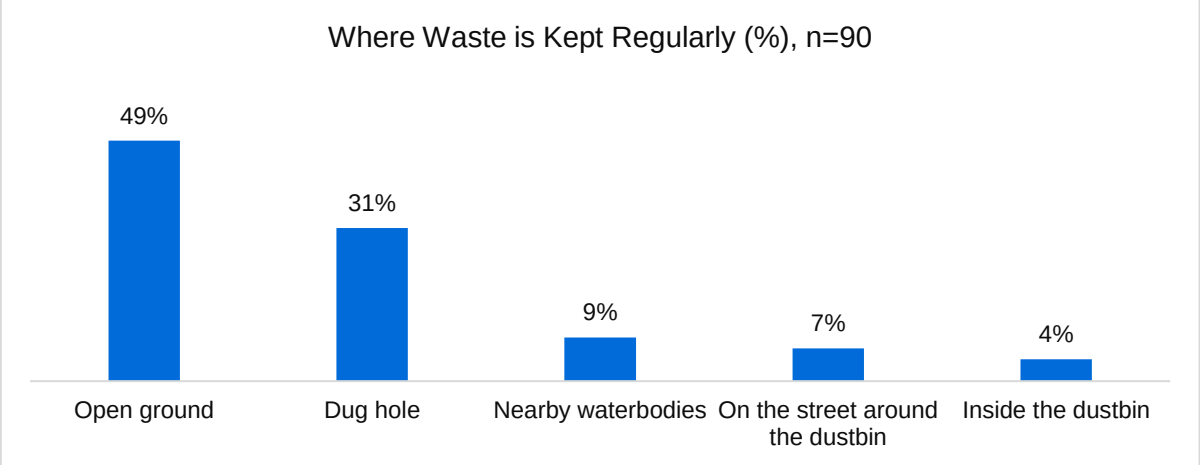


Figure 5:1: Where Garbage is Kept Regularly

As per household survey, only 9% of respondents have access to a nearby dustbin, while 91% lack this facility. The most common disposal method, used by 49%, is dumping waste in open ground, reflecting the absence of structured waste management systems. Additionally, 31% use dug holes, 9% dispose of waste in waterbodies, 7% discard waste near dustbins, and only 4% use proper dustbins (Figure 5:1).

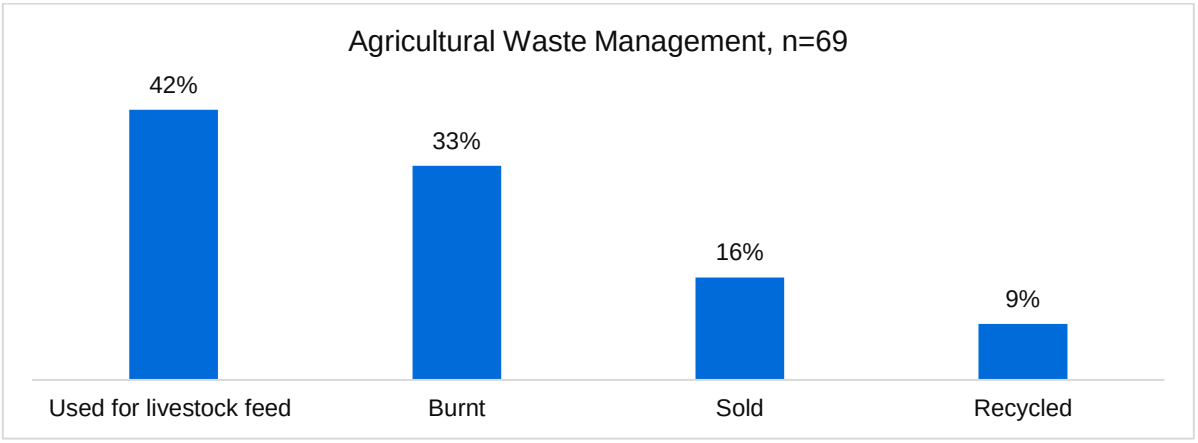


Figure 5:2: **Agricultural Waste Management**

Figure 5:2 shows agricultural waste is primarily managed by using it as livestock feed (42%), followed by burning (33%), selling (16%), and recycling (9%). These practices show that while some agricultural waste is repurposed or monetized, others are managed in unsustainable ways, such as open burning, which requires attention in future waste management planning.

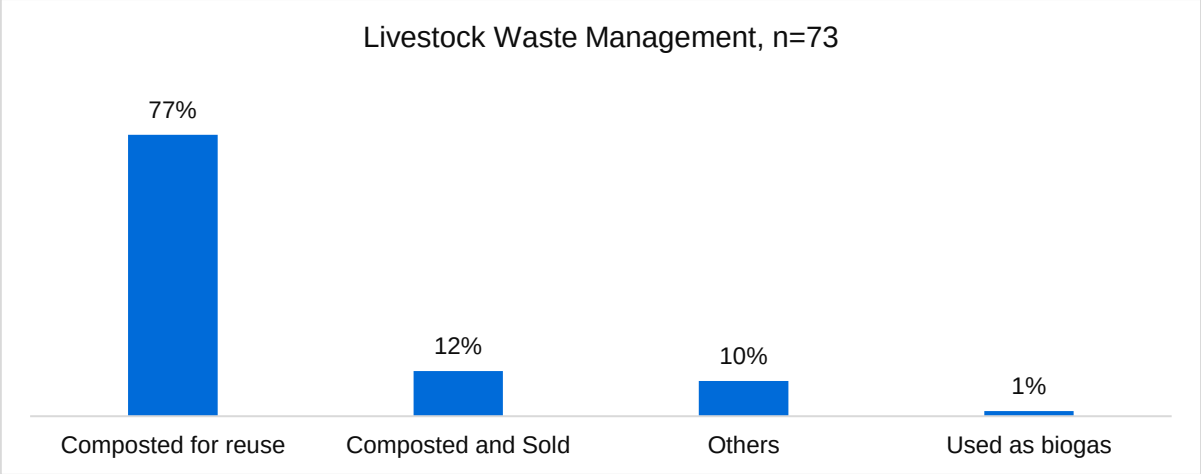


Figure 5:3: **Livestock Waste Management**

Note: Other denotes dumped in digging place

Livestock waste is predominantly composted for reuse (77%), followed by composted and sold (12%). Other practices include biogas generation (1%) and unspecified methods (10%). These findings suggest a strong potential for integrating composting into formal waste recovery systems.

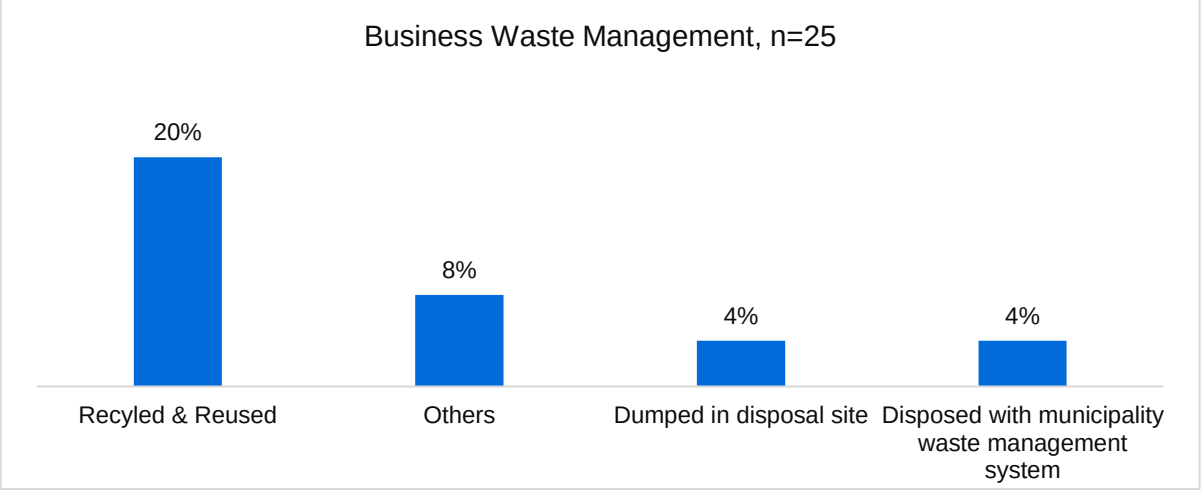
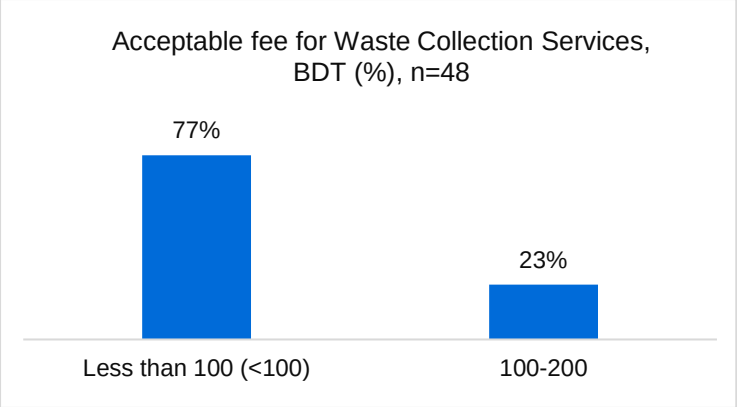


Figure 5:4: **Business Waste Management**

Note: Other denotes dumped in abandoned place

Among business entities, 20% of waste is reused or recycled, while 8% is miscellaneous waste. Only 4% dispose waste through municipal systems, and another 4% discard it in disposal sites. This highlights a low level of formal service engagement and a need to introduce structured collection systems for commercial establishments.



A majority (77%) of households are willing to pay BDT 100–200 per month for waste collection services. Only 23% prefer to pay less than BDT 100, indicating that a moderate payment model may be acceptable to most households if services are made reliable and accessible.

Figure 5:5: Willing to spend for waste collection Service

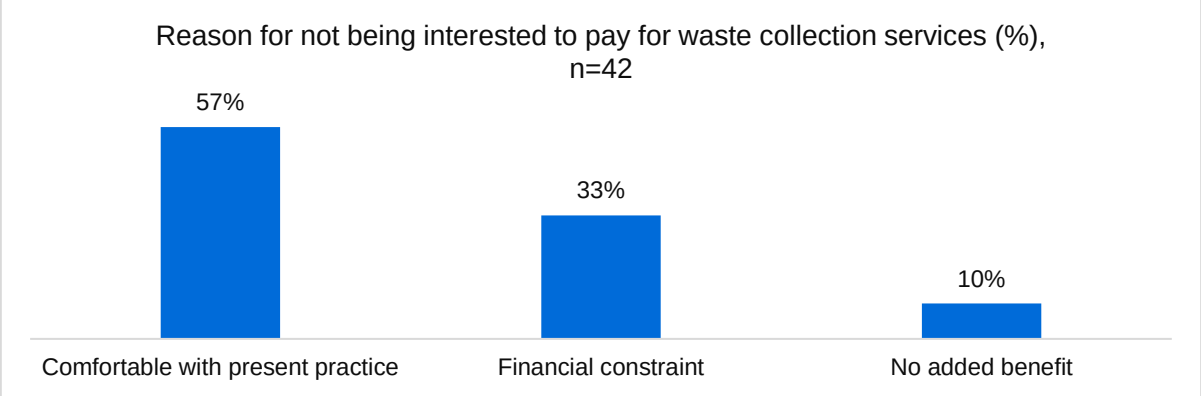


Figure 5:6: Reason of Not Being Interested in Waste Collection Service

Among households unwilling to pay for waste collection, 57% stated satisfaction with existing practices, 33% cited financial constraints, and 10% said they see no added benefit. This highlights the need to address affordability and emphasize the value of formal waste collection services in awareness efforts (Figure 5:6).

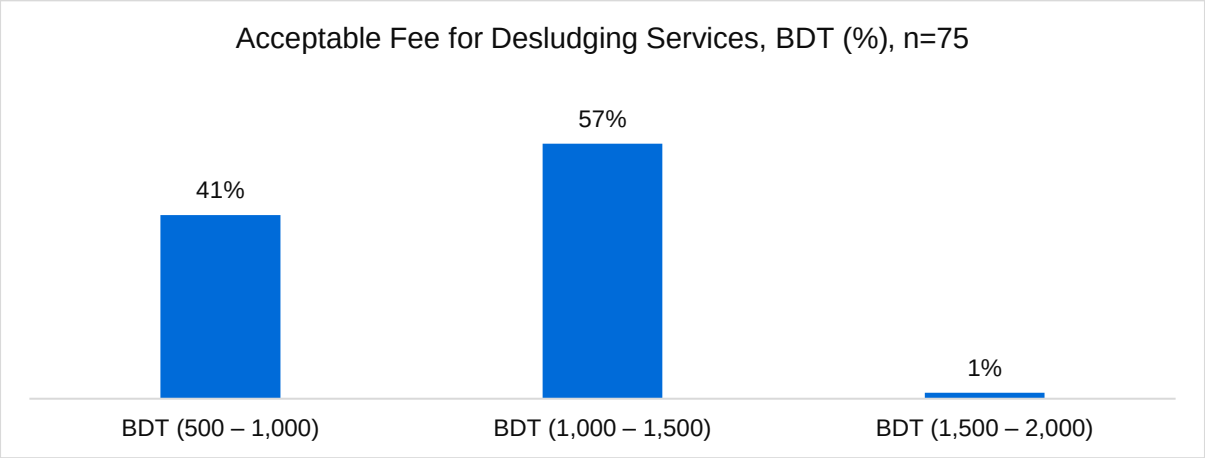


Figure 5:7: **Willingness to pay per desludging**

As shown in Figure 5:7, a significant portion of households expressed readiness to pay for desludging services. 57% are willing to pay BDT 1,000–1,500, while 41% prefer BDT 500–

1,000, and only 1% are open to paying BDT 1,500–2,000. These figures suggest a good level of willingness, though cost considerations remain crucial for adoption.

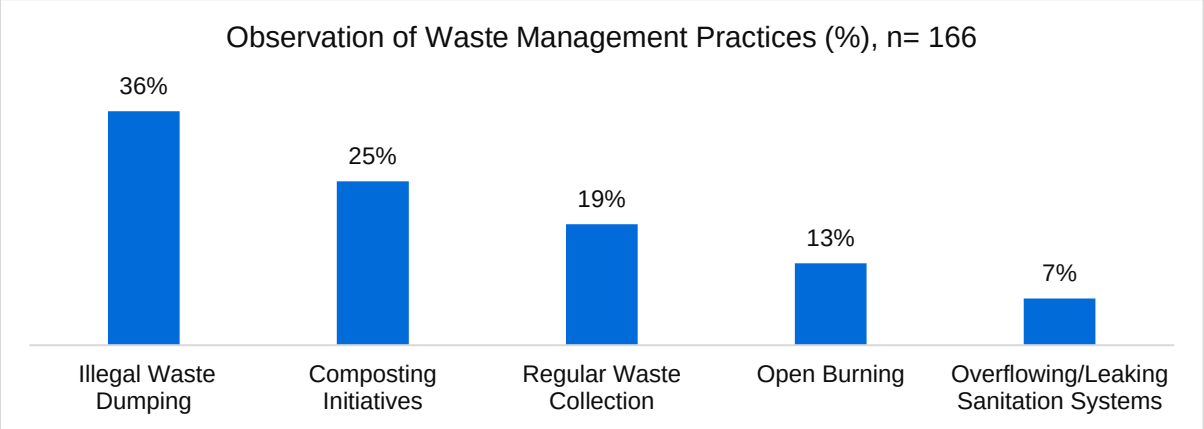


Figure 5:8: **Observation of Waste Management Practices**

This figure reflects field observations on common waste management practices in the study area. Illegal waste dumping was observed in 36% of locations, indicating poor enforcement and weak infrastructure. Composting initiatives were observed in 25% of areas, while regular waste collection was seen in only 19%, underscoring gaps in service coverage. Open burning (13%) and overflowing or leaking sanitation systems (7%) also highlight unsafe practices that pose environmental and public health concerns.

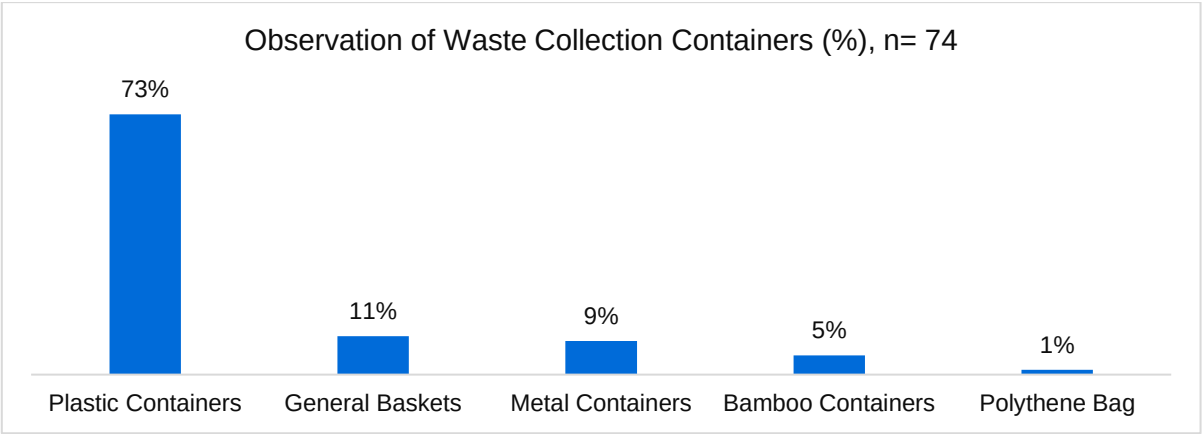


Figure 5:9: **Observation of Waste Collection Containers**

The most common type of waste collection container observed was plastic containers (73%), followed by general baskets (11%), metal containers (9%), and bamboo containers (5%). Polythene bags (1%) were rarely used. This distribution suggests a heavy reliance on low-cost plastic containers, with limited use of durable or sustainable alternatives for waste storage and transport.

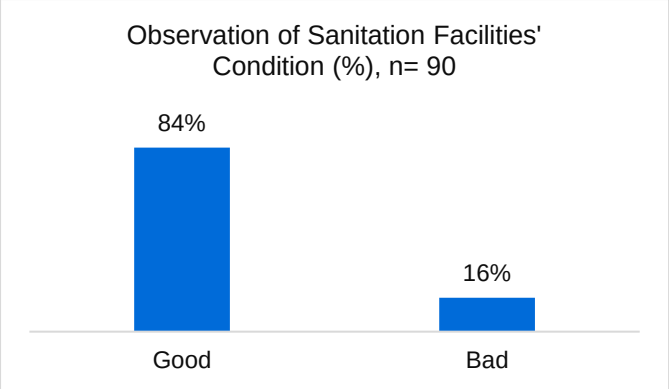


Figure 5:10: **Observation of Sanitation Facilities' Condition**

The condition of sanitation facilities was found to be mostly satisfactory, with 84% classified as good, while 16% were in poor condition. This indicates that although basic infrastructure is in place in most households or institutions, a portion still requires upgrading or maintenance to meet hygiene standards.

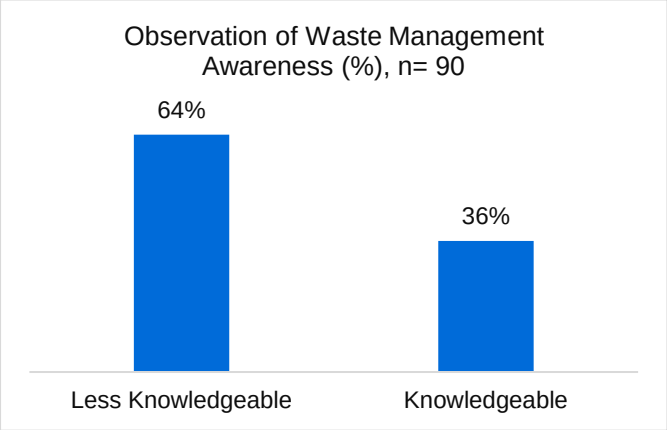


Figure 5:11: **Observation of Waste Management Awareness**

Observation-based assessment of public awareness levels reveals that 64% of individuals were classified as less knowledgeable, while only 36% demonstrated awareness about proper waste management practices. This reflects a substantial knowledge gap in the community and highlights the need for targeted awareness-raising campaigns and behavior change initiatives.

Note: Knowledgeable implies the residents are aware of waste management practices and are trying to follow the proper methods of waste management. Less knowledgeable implies the residents have a basic idea, but they lack proper practice or initiatives.

6. SURVEY AND EVALUATION OF OPERATION PRACTICES, MODELS AND INFRASTRUCTURES

This section presents the findings from the household survey conducted in Dhamoirhat Paurashava to assess existing solid waste management operational practices, containment systems, desluging processes, and infrastructure access. The survey covered households to understand how people manage solid and liquid waste, the mediums used for collection and disposal, and stakeholder interaction with service providers. The section explores key highlights of waste handling, containment types, desludging practices, and communication channels between households and waste management operators.

6.1 Household Survey: Key Highlights of Operation Practices

This section highlights key operational practices derived from household surveys conducted across Dhamoirhat Paurashava. The survey aimed to assess how households manage solid waste, sanitation containment types, desludging practices, communication with sanitation service providers, and waste treatment methods. The purpose was to identify practical gaps in infrastructure use, community behavior, and access to services for designing suitable interventions.

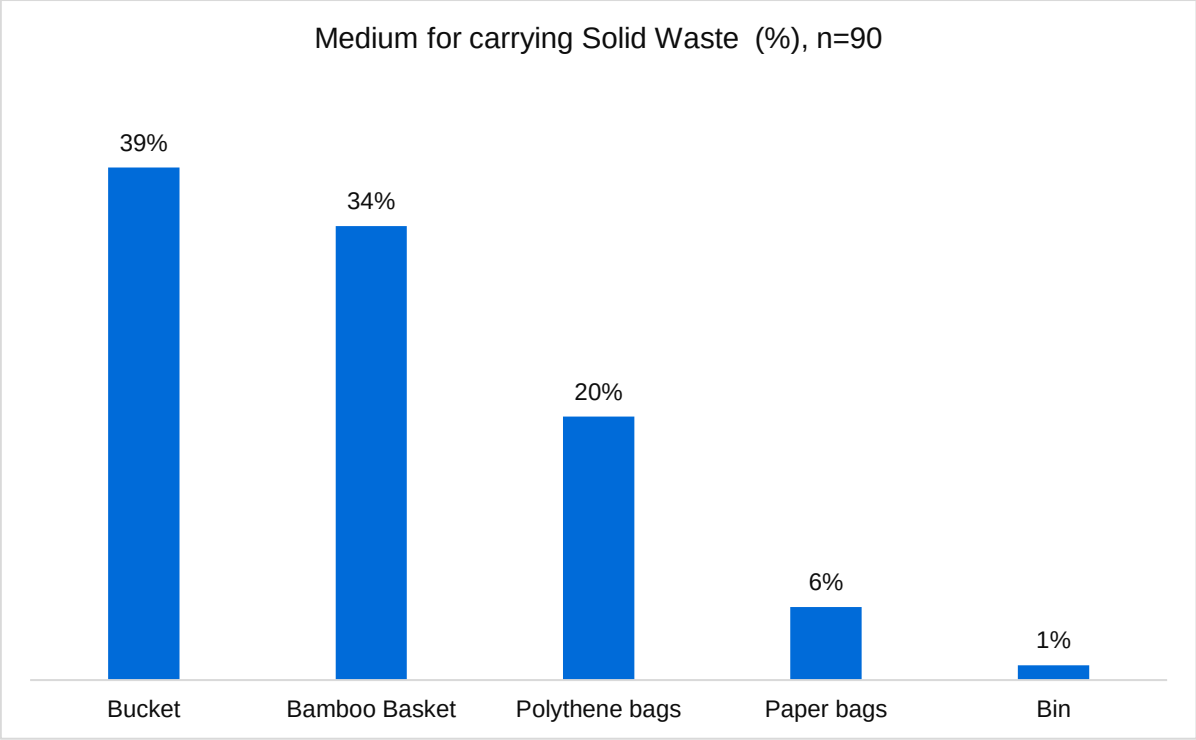


Figure 6-1: Medium for carry Solid Waste

It is illustrated in Figure 6:1 that the majority of households use buckets (39%) and bamboo baskets (34%) to carry solid waste. Polythene bags are used by 20%, while paper bags (6%) and bins (1%) are less common. Although traditional carriers like buckets and baskets are predominant, the notable use of polythene bags highlights continued reliance on environmentally harmful materials.

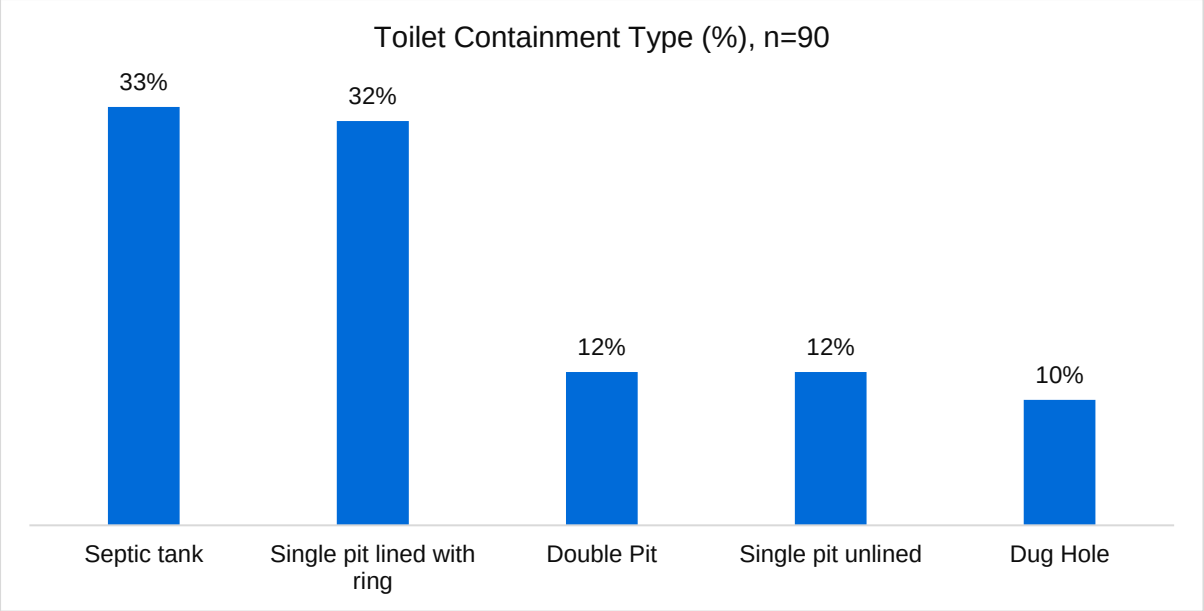


Figure 6-2: Toilet Containment Type

Households primarily use septic tanks (33%) and single pits with lining (32%), indicating a preference for basic but structured containment systems. Double pits (12%), single pits without lining (12%), and dug holes (10%) are also used, showing that a significant portion of the population still lacks access to improved sanitation infrastructure.

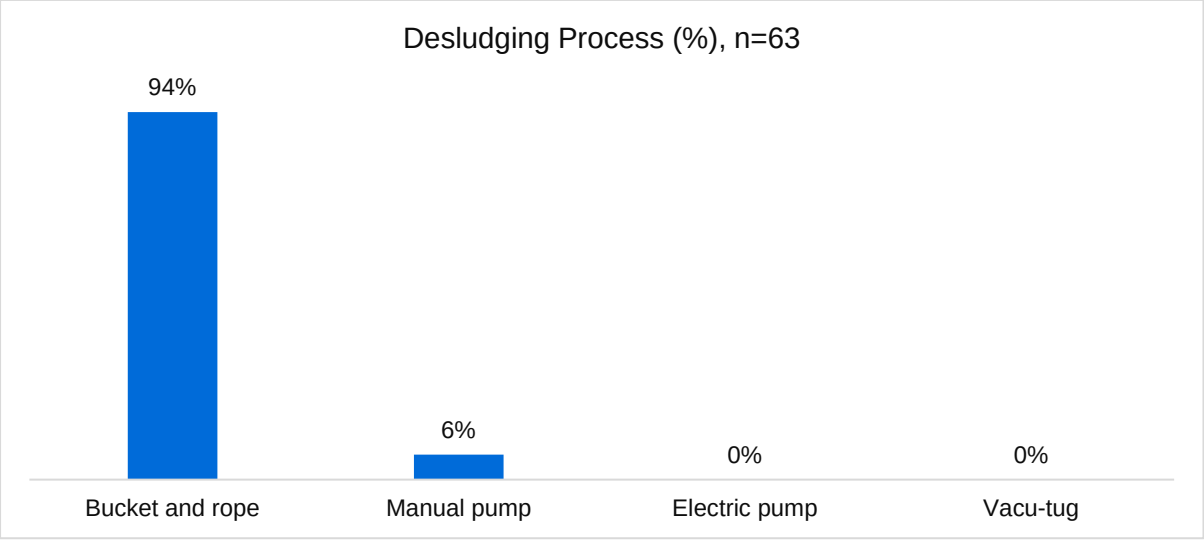


Figure 6-3: Desludging Process

A large majority (94%) of households use bucket and rope for desludging, while only 6% use manual pumps. There is no use of electric pumps or vacutugs, revealing limited adoption of modern desludging technologies and a heavy dependence on manual methods.

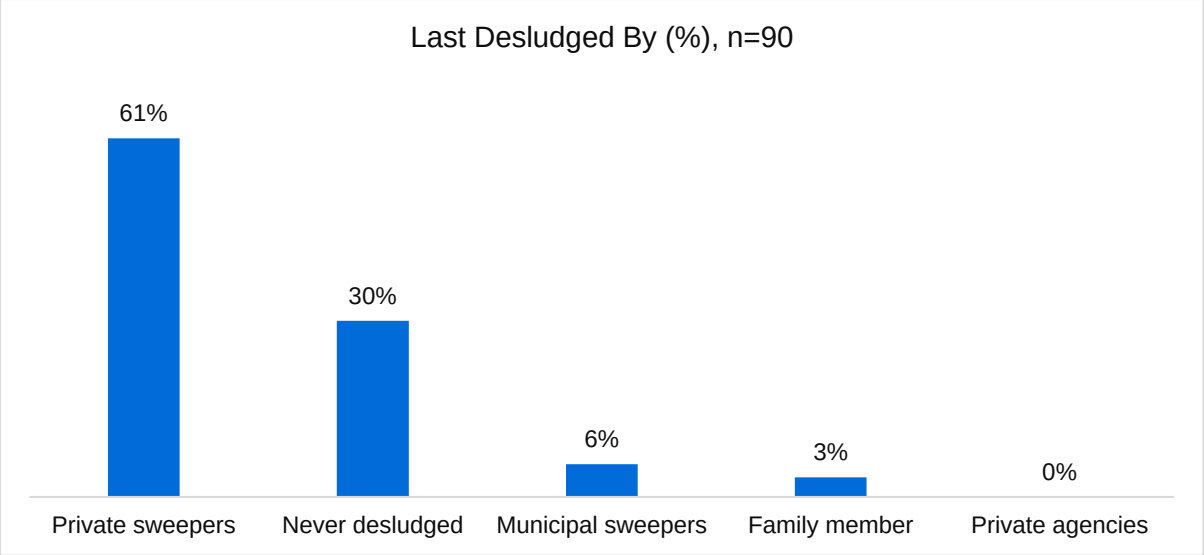


Figure 6-4: Last Desludger

Private sweepers conduct desludging for 61% of households, highlighting their critical role in informal sanitation services. 30% have never desludged, suggesting potential hygiene risks. Only 6% use municipal sweepers, and 3% rely on family members, while no one reported using private agencies, pointing to a gap in formal service availability.

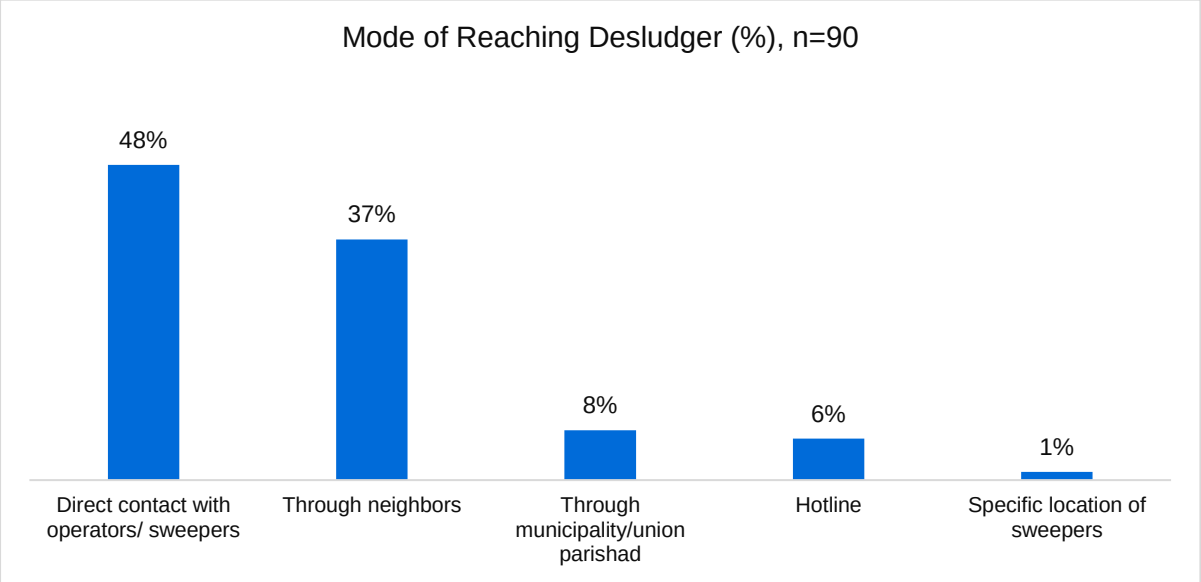
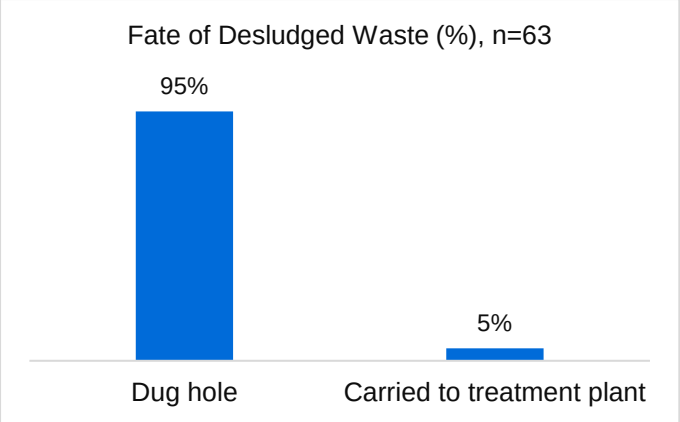


Figure 6-5: Mode of Reaching Desludger

Nearly 48% contact desludging operators directly, while 37% reach out via neighbours. 10% access services via hotlines, and only 1% use location-based service information. This shows informal, interpersonal communication is the most common access mode, with limited structured information flow.



A staggering 95% of desludged waste is disposed into dug holes, and only 5% is sent to a treatment plant. This clearly shows the absence of proper waste treatment infrastructure and underscores the need for developing safe, formalized disposal systems.

Figure 6-6: Fate of Desludged Waste

6.2 Operations Practices in the Paurashava

The Conservancy Inspector explained that the Paurashava operates with two vans and two trucks. Although all vehicles are operational and used daily, they are insufficient to meet the increasing demand. While protective gear, such as aprons, masks, gloves, and boots, is provided to workers, it is rarely used due to discomfort or lack of awareness. Waste segregation is not practiced at collection points or disposal sites, further limiting the effectiveness of waste management.

The Sanitary Inspector described a system that has remained largely unchanged in recent years.

The Executive Engineer emphasised the significant gaps in infrastructure. The Paurashava lacks landfills, composting systems, and recycling initiatives. There have been no technological advancements to improve waste management efficiency.

The Disposal Site Operator shared that plastic waste is manually extracted at the disposal site and sold by workers. To minimise odour and the spread of germs, the waste is covered daily, particularly during rainy seasons or challenging weather conditions. However, the lack of landfills and waste segregation systems hampers overall efficiency.

During the FGD, waste workers revealed that all 15 workers involved in waste collection and management are male, and there are no female workers in any roles. This reflects the labour-intensive nature of the work, which may discourage women's participation.

7. RESILIENCE OF WASTE MANAGEMENT PRACTICES AND INFRASTRUCTURES TO CLIMATE EXTREME EVENTS

Dhamoirhat Paurashava experiences climate extreme events, particularly droughts and prolonged heatwaves, which significantly impact the region's environmental conditions and public health. Unlike flood-prone areas, the primary challenges in Dhamoirhat Paurashava stem from high temperatures, arid conditions, and water scarcity, which directly affect solid waste management (SWM) infrastructure, operations, and overall resilience. The ability of existing waste management facilities to withstand these climate challenges remains limited, leading to inefficiencies in collection, processing, and disposal.

7.1 Climate Extreme Events in Dhamoirhat Paurashava

Dhamoirhat Paurashava frequently experiences intense heatwaves, where temperatures exceed 40°C, creating harsh working conditions for waste workers and accelerating waste decomposition. Prolonged dry spells contribute to water shortages, affecting sanitation systems, waste processing units, and the efficiency of organic waste decomposition. Additionally, the urban heat island effect exacerbates the situation, as waste dumps and processing sites retain excessive heat, increasing fire risks and pollution levels. There are also erratic and uneven rainfalls in Dhamoirhat.

7.2 Impact of Climate Extreme Events on Solid Waste Management

The effects of climate extreme events on solid waste management practices and infrastructure in Dhamoirhat Paurashava are outlined in this section.

7.2.1 Increased Pressure on Waste Collection and Transport Infrastructure

The intense heat leads to faster degradation of waste collection equipment and vehicles, making them more prone to breakdowns. Roads in Dhamoirhat Paurashava, particularly in rural areas, lack heat-resistant pavement, which leads to damage due to prolonged exposure to high temperatures. Irregular waste collection occurs as workers face heat stress and dehydration, resulting in delays in waste pickup and accumulation of uncollected waste in open areas.

7.2.2 Vulnerability of Waste Processing Facilities

Dhamoirhat Paurashava lacks climate-resilient waste processing facilities, making existing composting units, sorting stations, and landfills highly susceptible to extreme heat conditions. Composting processes require sufficient moisture levels, but water scarcity disrupts microbial activity, slowing decomposition. Dry composting methods are not widely implemented, causing significant inefficiencies in organic waste management. Furthermore, recycling stations and material recovery facilities suffer from overheating, affecting plastic sorting and paper recovery, as materials become too brittle or lose quality under extreme conditions.

7.2.3 Weak Resilience of Informal Waste Disposal Practices

In many parts of Dhamoirhat Paurashava, informal dumping remains a common practice, with waste being discarded in vacant lands, roadside areas, and open drains. Under extreme heat, these dumping sites become major pollution sources, releasing odors, greenhouse gases, and hazardous airborne particles. Without regulated disposal infrastructure, communities struggle with waste accumulation, heightened disease risks, and poor sanitation conditions.

7.2.4 Impact of Erratic and Uneven Rainfall on Solid Waste Management

Erratic and uneven rainfall presents significant challenges for solid waste management in Dhamoirhat Paurashava. During the monsoon season, open waste dumping sites often overflow, and drainage systems become blocked, leading to the spread of waste into surrounding areas. Waterlogged roads also make it difficult for waste collection vehicles to operate on time, causing delays in regular waste collection. When rainwater mixes with waste, it produces leachate, which can contaminate nearby soil and water sources. Inadequate infrastructure, such as uncovered dumping sites and poorly maintained storage areas, becomes vulnerable to damage during heavy rainfall. These issues reduce the efficiency of waste collection and increase health and environmental risks. Therefore, it is essential to develop climate-resilient waste management infrastructure and include weather-adaptive measures in future planning and operations.

7.3 Addressing Climate Resilience in Solid Waste Management Infrastructure

To enhance waste management resilience against extreme heat and drought conditions, immediate interventions must be implemented. Upgrading waste collection and transport systems by using heat-resistant materials for roads and vehicle components should be done. Introducing shaded collection vehicles and providing cooling stations for workers can improve efficiency.

Investing in climate-resilient waste processing facilities, such as solar-powered composting plants and dry fermentation biogas units, can ensure sustainable organic waste treatment despite water shortages.

Fire prevention measures, including fire-resistant landfill design and waste layering techniques, should be implemented to reduce spontaneous combustion risks in dry waste dumps.

Developing localized material recovery centers with heat-resistant infrastructure can help maintain recycling efficiency, particularly for plastics, metals, and glass.

Improving worker safety through heat protection policies, including rotational shifts, hydration programs, and provision of protective clothing, can enhance workforce sustainability in extreme conditions.

To strengthen climate resilience against erratic and uneven rainfalls, it is important to adopt covered and well-drained waste storage and dumping facilities, improve drainage infrastructure, and integrate weather-adaptive waste management planning into municipal operations.

8. IDENTIFICATION OF WASTE VALUE CHAIN, RECYCLING & BUSINESS MODELS SUITABLE FOR THE PROGRAMME AREA

This section explores potential business models to improve waste management in Dhamoirhat Paurashava.

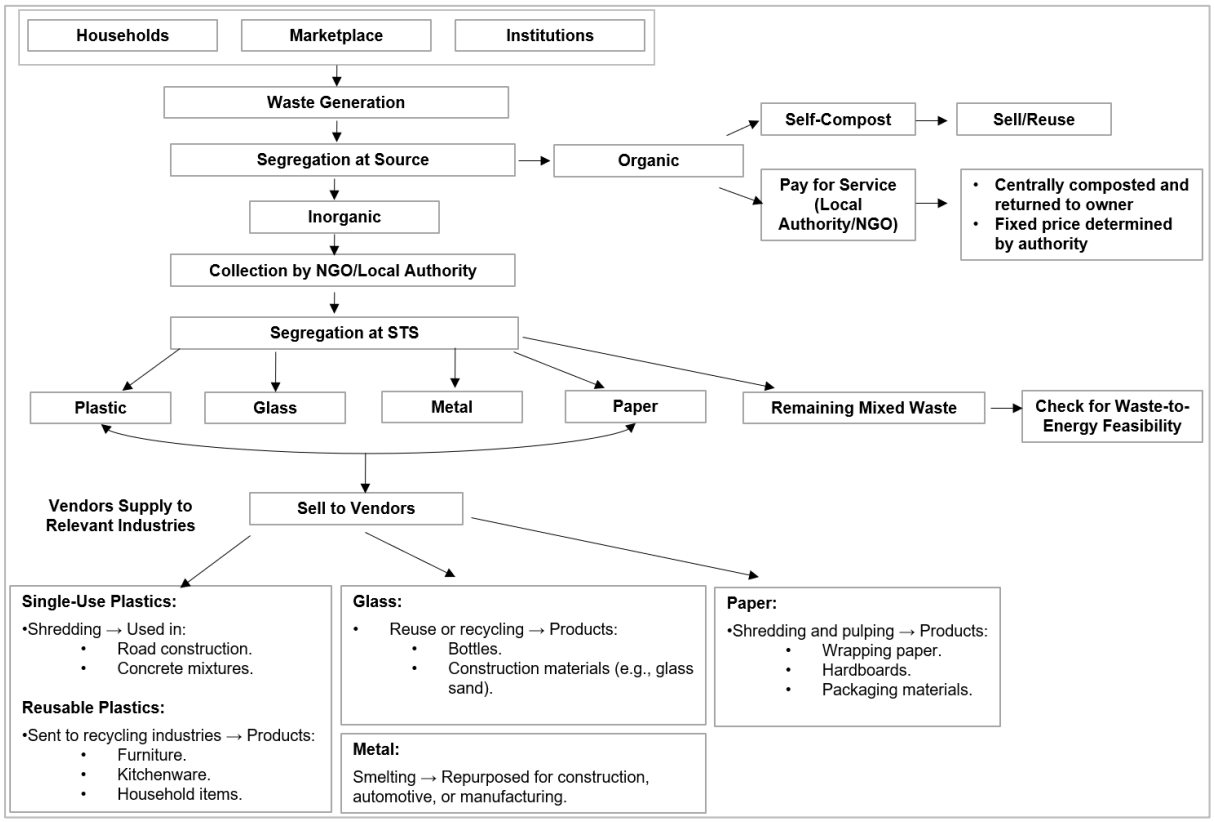


Figure 8-1: Potential Waste Value Chain and Business Model

Proposed Waste Value Chain for Dhamohirat Paurashava

1. **Waste Generation and Collection**

Please mention current waste collection and segregation status. Waste segregation at the source can be introduced at both household and business levels, separation of waste into organic, recyclable, and non-recyclable categories.

The collection system may be improved by using the existing vehicles, such as vans and trucks, more efficiently through the creation of collection routes based on waste types.

Awareness campaigns may be conducted to amplify residents on the importance and methods of proper waste segregation practices.

2. **Sorting and Pre-Processing**

A centralized sorting facility may be established as a local Material Recovery Facility (MRF) where mixed recyclables can be sorted manually or semi-mechanically.

Pre-processing of organic waste can be facilitated by setting up shredders and mixers, preparing it for composting or biogas production.

3. **Processing and Treatment**

Considering Waste to energy approach, a composting plant and small-scale biogas plant for organic waste management can be established, depending on the waste volume and the demand for compost or energy.

Plastic waste can be sold to nearby facilities such as the BSCIC plastic recovery unit in Bogura, and partnerships with private recycling companies may be explored for the recycling of paper and metal waste.

Non-recyclable waste can be disposed of in a properly engineered landfill, while hazardous medical waste may be managed through incineration.

4. **Market Linkages**

Compost can be sold to local farmers or nurseries to promote its use.

Recyclable materials, including plastic, paper, and metals, may be sold to recycling industries.

Partnerships with companies involved in the circular economy may be explored to promote sustainable packaging or construction materials.

5. **Final Disposal**

Currently, Dhamoirhat Upazila does not have a formal landfill site, and waste is primarily disposed of through informal methods such as open dumping, burning, and accumulation in public spaces. In marketplaces, waste is often swept into corners or dumped into nearby low-lying areas. Household and institutional waste is either self-managed or disposed of in local pits without proper containment. There are no existing leachate management systems, and hazardous waste disposal remains a significant challenge.

To improve final waste disposal, a basic landfill with leachate management should be developed to handle non-recyclable and residual waste. Proper containment and disposal of hazardous waste should also be ensured to minimize environmental and health risks.

Additionally, Dhamoirhat Paurashava can collaborate with Dhamoirhat Upazila, Naogaon, Joypurhat, and Bogura to develop centralized waste processing plants. Establishing a regional landfill and resource recovery center could significantly improve waste management efficiency by incorporating waste-to-energy, composting, and recycling facilities.

9. ASSESSMENT ON CROSS CUTTING ISSUES OF SWM AND GENDER EQUALITY AND SOCIAL INCLUSION

Gender roles and social inclusion are critical considerations in the context of waste management in Dhamoirhat Paurashava. Despite efforts to address these issues, challenges persist in ensuring equitable participation and opportunities for women, indigenous communities, and people with disabilities. This chapter explores the existing dynamics and highlights areas for improvement.

9.1 Women's Roles in Waste Management

Women in these wards (Paurashava) primarily contribute to household work and have limited involvement in waste management activities. When they do participate (mostly poor and enthnic community), their roles are restricted to sweeping streets and collecting waste. Women are notably absent from more technical or operational roles, such as driving waste collection vehicles or segregating waste at disposal sites. The lack of formal waste management facilities further exacerbates these limitations, restricting women's ability to access diverse and meaningful roles in the sector.

9.2 Indigenous communities/ethnic minor communities in Waste Management

In Dhamoirhat Paurashava, the Santal community constitutes the most prominent indigenous group. Traditionally engaged in agriculture and labor-intensive work, many members of this community are involved in informal waste management roles, such as sweeping and cleaning, often under poor working conditions. Despite their contribution, ethnic minority groups face systemic marginalisation, limited access to formal employment, and are often excluded from decision-making processes. Women and youth from these communities are particularly underrepresented in structured waste management systems. Inclusive hiring practices, skill development programs, and dignified work opportunities are essential to ensure their active and equitable participation in the waste management sector.

9.3 Disability Inclusion in Waste Management

People with disabilities are rarely seen in waste management roles in Dhamoirhat Paurashava. This exclusion may be attributed to the lack of inclusion frameworks and limited awareness of the potential contributions of individuals with disabilities. There are no formal policies or programs aimed at integrating people with disabilities into solid waste management (SWM).

To promote inclusive participation, specific roles can be introduced that accommodate different physical and cognitive abilities. Tasks that should be inclusive include:

i. Waste Sorting and Recycling – Individuals with disabilities can be involved in sorting recyclable materials such as paper, plastic, and glass at waste processing facilities.

ii. Composting and Organic Waste Processing – People with mild disabilities can participate in supervised composting activities, contributing to organic waste recycling.

iii. Awareness and Education Campaigns – Individuals with disabilities can engage in community outreach and advocacy for waste management awareness.

iv. Administrative and Data Entry Roles – For those with mobility impairments, employment in record-keeping, monitoring waste collection data, and reporting can provide meaningful work opportunities.

v. Handicraft and Upcycling Activities – People with disabilities can participate in upcycling initiatives, creating products from waste materials such as paper, plastics, and fabric.

vi. Facility Maintenance and Monitoring – Individuals with disabilities can be employed in non-physical tasks such as supervising waste collection points and ensuring compliance with waste segregation policies.

10. RECOMMENDATIONS FOR INTERVENTION

To address the identified challenges in waste management within Dhamoirhat Paurashava, the following interventions are proposed:

10.1 Infrastructure Development

A designated landfill with a leachate management system can be established to handle non-recyclable and residual waste, ensuring environmental safety.

Composting and recycling facilities may be constructed to process organic waste and recyclable materials efficiently.

The fleet of waste collection vehicles can be enhanced, introducing smaller vehicles or rickshaw vans to cater to narrow streets and underserved areas.

A centralized sorting facility may be set up to separate waste into organic, recyclable, and non-recyclable categories.

Additionally, a biogas plant can be introduced to convert organic waste into energy. Marketplaces such as Mongol Bari Bazar and high-waste-generating unions like Agra Digun Union produce large volumes of organic waste, making them ideal locations for biogas production. A biogas plant would help reduce methane emissions, provide a renewable energy source for cooking or electricity, and promote sustainable waste disposal. Collaboration with local municipalities, private investors, and NGOs can facilitate the establishment and operation of such a facility.

10.2 Capacity Building and Public Awareness

Training programs for waste workers on safe handling practices and the use of protective gear can be conducted.

Community awareness campaigns may be organized to promote waste segregation at the household and business levels and reduce improper disposal practices.

Schools, local businesses, and community groups can be engaged in awareness activities to foster a culture of responsibility.

10.3 Policy and Financial Systems

A structured tariff system for waste collection services can be introduced, with affordability tiers based on household and business capacities.

Partnerships with NGOs like ESDO and private companies may be developed to finance and support waste management initiatives.

A specific municipal budget for solid waste management can be allocated to ensure consistent funding for operations and improvements.

10.4 Waste Management Practices

Daily waste covering practices at disposal sites can be implemented to minimize odour and germ spread.

A formalized system for plastic recovery and resale may be established to create revenue streams for the paurashava. A monitoring system to track waste collection and processing efficiency can be developed.

10.5 Inclusivity and Gender Equity

Opportunities for women and marginalized groups, such as the ethnic minority communities, can be created to participate in waste management roles.

Gender equity and inclusivity may be prioritized in recruitment and training programs for waste workers.

10.6 Potential SWM Intervention Sites and Activities

Table 10.1 presents a list of strategic locations within Dhamoirhat Municipality identified as potential sites for waste management interventions.

Table 10.1: Potential SWM Intervention Sites and Activities

Potential Sites	Planned Activities
Farshipara hatkhola (1 no ward)	Dustbin installation
Adjacent to Umar UP (2 no word)	Dustbin installation
Amaitar Bazar(2 no ward)	Dustbin installation
Khoyer danga, (6 no ward)	Dustbin installation
Chagolhati, (7 no ward)	Dustbin installation
TNT road (5 no ward)	Dustbin installation
Adjacent to Nimtali Fish and Vegetable Market (7 no ward)	Dustbin installation
Dhamoirhat upazila parishad	Dustbin installation
Adjacent to National Petroleum and filling station	Dustbin installation
Dhamoirhat upazila health complex	Waste reduction through incineration

Dustbin installation has been recommended across multiple areas to improve primary waste collection and reduce indiscriminate dumping. The selected sites include Farshipara Hatkhola (Ward 1), adjacent to Umar Union Parishad (Ward 2), Amaitar Bazar (Ward 2), Khoyer Danga (Ward 6), Chagolhati (Ward 7), TNT Road (Ward 5), and areas adjacent to the Nimtali Fish and Vegetable Market (Ward 7). Institutional locations such as Dhamoirhat Upazila Parishad, the area adjacent to the National Petroleum and Filling Station, and the Dhamoirhat Upazila Health Complex have also been selected for targeted interventions.

While most sites have been proposed for dustbin installation to facilitate proper solid waste disposal, a specialised approach has been suggested for the Dhamoirhat Upazila Health Complex, where waste reduction through incineration is recommended. This reflects the need

for differentiated solutions for institutional waste, particularly healthcare waste, which requires safer disposal methods to prevent environmental and public health hazards. These targeted recommendations aim to establish a decentralised, efficient waste management system in both public and institutional spaces within the municipality.

11. CONCLUSION

The study of solid waste management in Dhamoirhat Paurashava highlights major challenges and opportunities for improvement. The area generates approximately 3 to 3.5 tons of waste per day, comprising 55 percent organic waste, 35 percent plastic waste, and smaller volumes of inorganic materials like paper, metal, and glass.

Despite the high generation of organic waste, there are no formal composting facilities in place. Although a few households and farmers practice composting at small scale, most organic waste remains unmanaged. Establishing decentralized composting units at ward or market level can help reduce environmental impact and produce usable compost for agricultural purposes.

Plastic waste continues to pose a significant problem, with informal recovery and resale being the only existing management route. There is no structured plastic recovery chain, and most recyclable plastic is handled manually without formal systems. Introducing a formal plastic collection and recycling system, with connections to regional hubs, can improve efficiency and generate economic value.

Inorganic waste remains unsorted and largely ends up in general disposal sites. The lack of sorting facilities, such as a Material Recovery Facility (MRF), limits the potential for recycling and resource recovery.

Erratic and uneven rainfall adds another layer of complexity. During heavy rains, waste sites often overflow, roads become waterlogged, and collection services are disrupted. Leachate generation also increases, causing environmental hazards. Building climate-resilient dumping zones, covered storage areas, and improved drainage infrastructure is essential to maintain effective SWM during extreme weather conditions.

The report proposes a sustainable waste management model based on source segregation, recovery-oriented treatment such as composting and recycling, community involvement, and cost-sharing through tariffs. A fee-for-service model can be introduced, with survey results showing that 77 percent of households are willing to pay BDT 100 to 200 per month for improved waste services.

The proposed business model also highlights the role of NGO-private sector partnerships in mobilizing resources, technology, and awareness. NGOs can facilitate collaborations, capacity-building, and engagement with informal waste workers.

In conclusion, Dhamoirhat Paurashava has the potential to transition towards a more sustainable, inclusive, and climate-resilient waste management system if the proposed actions are implemented in coordination with community, institutional, and private sector actors.