Segment - 02

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 Satkhira Paurashava, Satkhira

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

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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 Satkhira Paurashava"**.

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.

SECTION - 2: 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 Satkhira (Satkhira Paurashava, Assasuni and Shyamnagar) District was carried out. 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:

- Satkhira Paurashava ward no.8 generates approximately 2.0 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 and plastics, 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 0.28 acre 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 **ward no. 8 of Satkhira Paurashava,** ensuring the safe, efficient, and environmentally sound management of all categories of municipal solid waste generated within the **ward no. 8 of 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 **Satkhira Paurashava**.
- Undertake geotechnical, hydrogeological and environmental investigations of the proposed site at Binnerpota, Satkhira 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 Satkhira Paurashava (Mayor, Conservancy Inspector, Sanitary Inspector, Executive Engineer), WaterAid, Rupantar (local partners), the Department of Environment, and relevant officials.
- 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 necessary construction supervision guidelines - **Task IV, V & VI**	Day 35-Day 45

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**

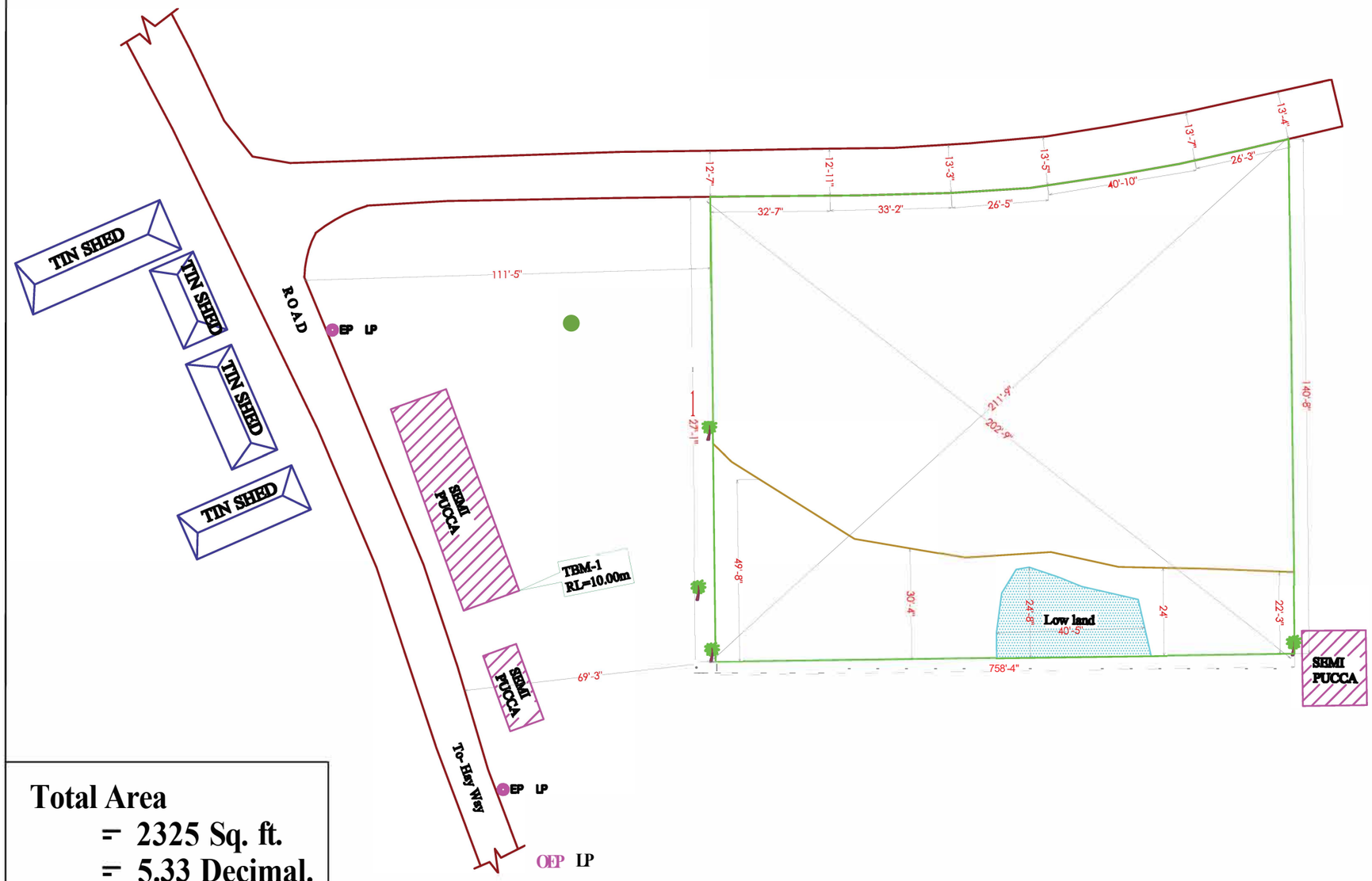
4B. Legal Document

Please attach all updated legal documents mentioned below:

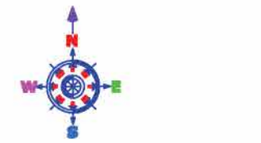
- Copy of Trade License
- Copy of TIN certificate
- Copy of BIN certificate
- Copy of PSR (last tax return submission acknowledgement slip) and
- Bank Detail or Copy of Cheque Leaf

ANNEX – I: DIGITAL SURVEY-SATKHIRA SWM PLANT

DIGITAL AREA SURVEY BY THE TOTAL STATION
TOPOGRAPHICAL EXTING MAP



Total Area
= 2325 Sq. ft.
= 5.33 Decimal.



8Feat 4Faat OFaat 8Feet

SCALE IN FEET

LEGEND:

Contour Line
Pond /Ditch
Pucca Building
Semipucca Building
Culvert

CLIENT:

SURVEYED BY

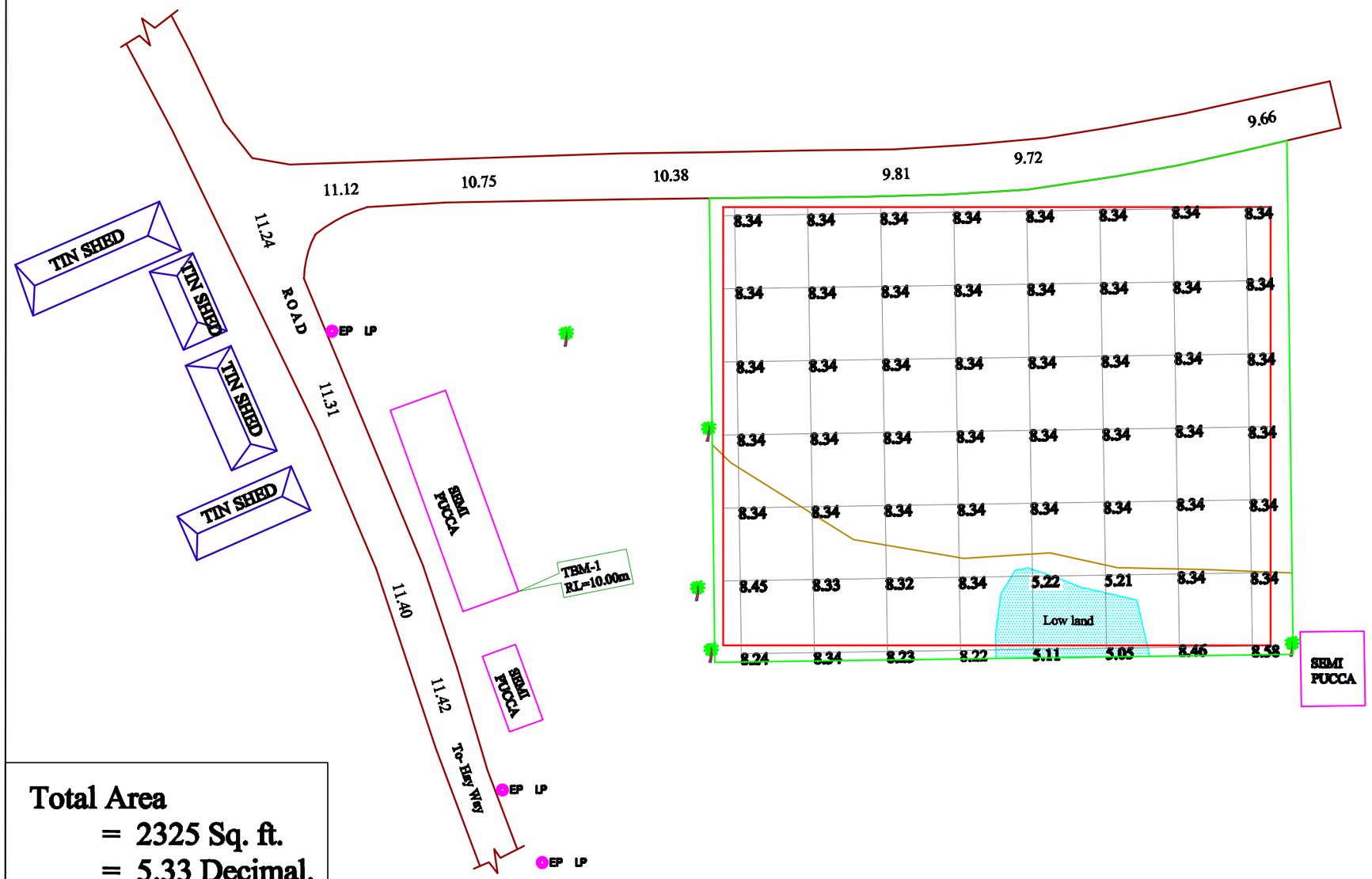
Md. Abd Salam.
InEngr.(SIn8y)
B.S.c In (CM).
Mob: 01888-835355

ID & Location:

004:Mpac project
Upazi]a :- Shatlcbua Sadar,
Dic1rict:- Shatlcbua.

Total Area
= 20604.60 Sq. ft.
= 47.301 Decimal.
= 28.617 Katha

DIGITAL AREA SURVEY BY THE TOTAL STATION
PRPOPOISED & LEVEL MAP



Total Area
= 2325 Sq. ft.
= 5.33 Decimal.

N
W E
S

8Feet 4Feet 0Feet 8Feet

SCALE IN FEET

LEGEND:

- Property Limit
- Boundary wall
- Proposed Limit
- Pucca Road
- Drain (DR)
- Brick Road
- Earthen Road
- River/Khal
- Contour Line
- Pond /Ditch
- Pucca Building
- Semipucca Building
- Tin Shed
- BH — Bore Hole / Graveyard
- EP LP — Electric /Light Pole
- MH/ TP — Man/ Telephone Pole
- TW — Tube Well
- motor / Culvert
- ST SW — Septic tank (ST) Sluiceveal (SW)
- GPS Position
- Tree
- 0.00 — Spot Level
- TBM

CLIENT:

.....

SURVEYED BY

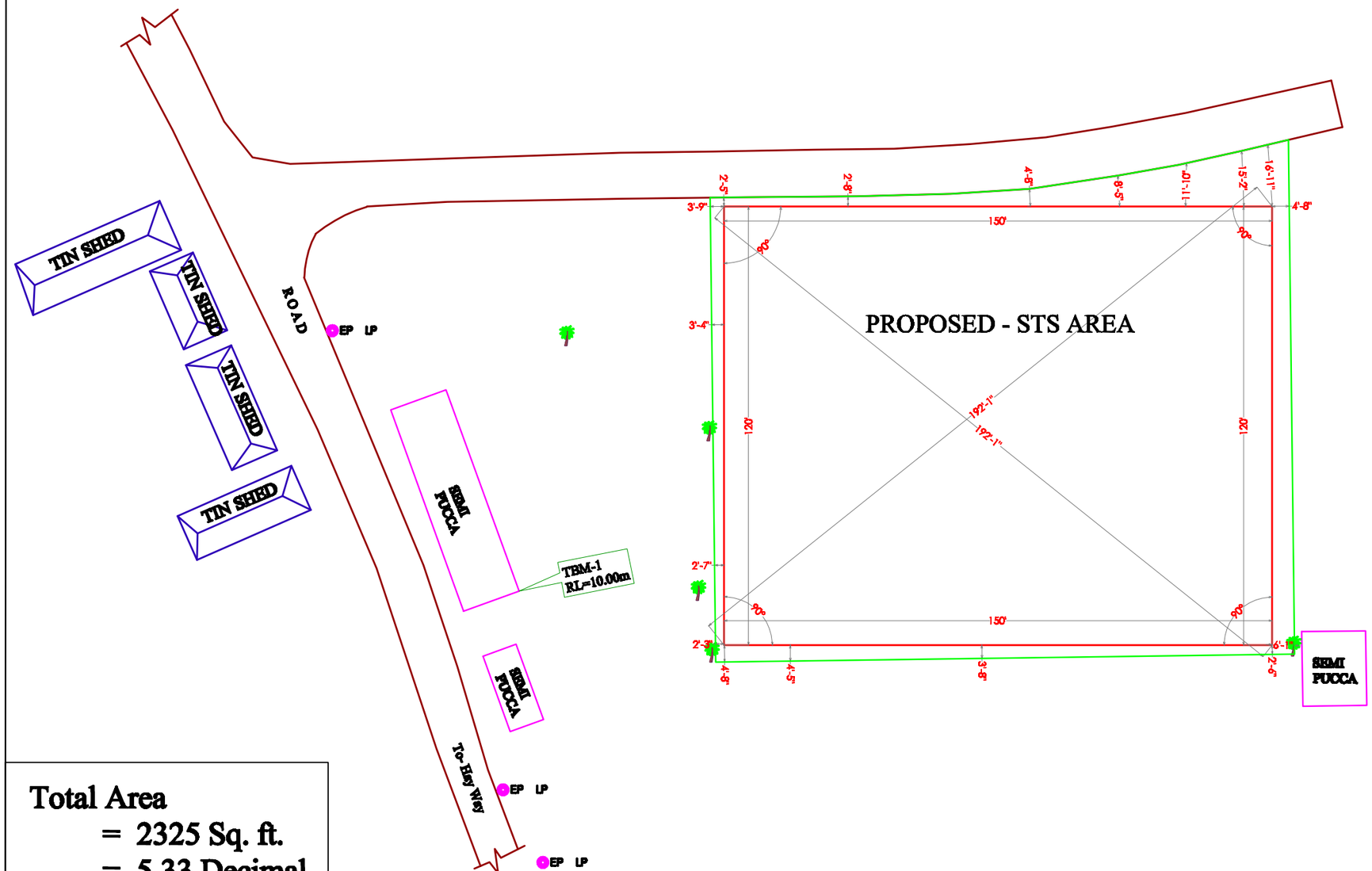
Md. Abdul Salam.
Diploma in Engr.(Survey)
B.S.c in (Civil).
Mob: 01868-835355

ID & Location:

GO4Mpac project
Upazila :- Shatkhira Sadar,
Dictrict:- Shatkhira.

Total Area
= 20604.60 Sq. ft.
= 47.301 Decimal.
= 28.617 Katha

DIGITAL AREA SURVEY BY THE TOTAL STATION
PRPOPOISED & DIMENSION MAP



Total Area
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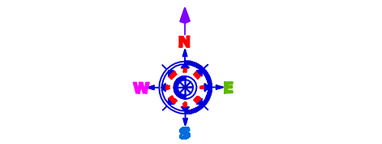

8Feet 4Feet 0Feet 8Feet

SCALE IN FEET

LEGEND:

- Property Limit
- Boundary wall
- Proposed Limit
- Pucca Road
- Drain (DR)
- Brick Road
- Earthen Road
- River/Khal
- Contour Line
- Pond /Ditch
- Pucca Building
- Semipucca Building
- Tin Shed
- BH — Bore Hole / Graveyard
- EP LP — Electric /Light Pole
- MH/ TP — Man/ Telephone Pole
- TW — Tube Well
- motor / Culvert
- ST SW — Septic tank (ST) Shallowwell (SW)
- GPS Position
- Tree
- 0.00 — Spot Level
- TBM

CLIENT:

.....

SURVEYED BY

Md. Abdul Salam.
Diploma in Engr.(Survey)
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Mob: 01868-835355

ID & Location:

GO4Mpac project
Upazila :- Shatkhira Sadar,
Dictrict:- Shatkhira.

Total Area
= 20604.60 Sq. ft.
= 47.301 Decimal.
= 28.617 Katha

ANNEX – II: G4I_FINAL REPORT_SWM_SATKHIRA PAURASHAVA

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: Satkhira Paurashava Study Report
Document Type	Final Report
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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, Satkhira Paurashava Dumping Place

Document history

Version	Date	Author	Contribution	Review	Evolution/ Changes
1	30.01.25	Sinha Mahira Sultana, Mehnaz Sultana	Sagor Ghosh, Abir Ahmed Labib, Afidah Hashemi Mimma, Saima Alam Trisha		
2	16.02.25	Sinha Mahira Sultana, Mehnaz Sultana	Sagor Ghosh		
3	16.03.25	Sinha Mahira Sultana, Mehnaz Sultana	Sagor Ghosh		
4	20.05.25	Sinha Mahira Sultana	Sagor Ghosh		

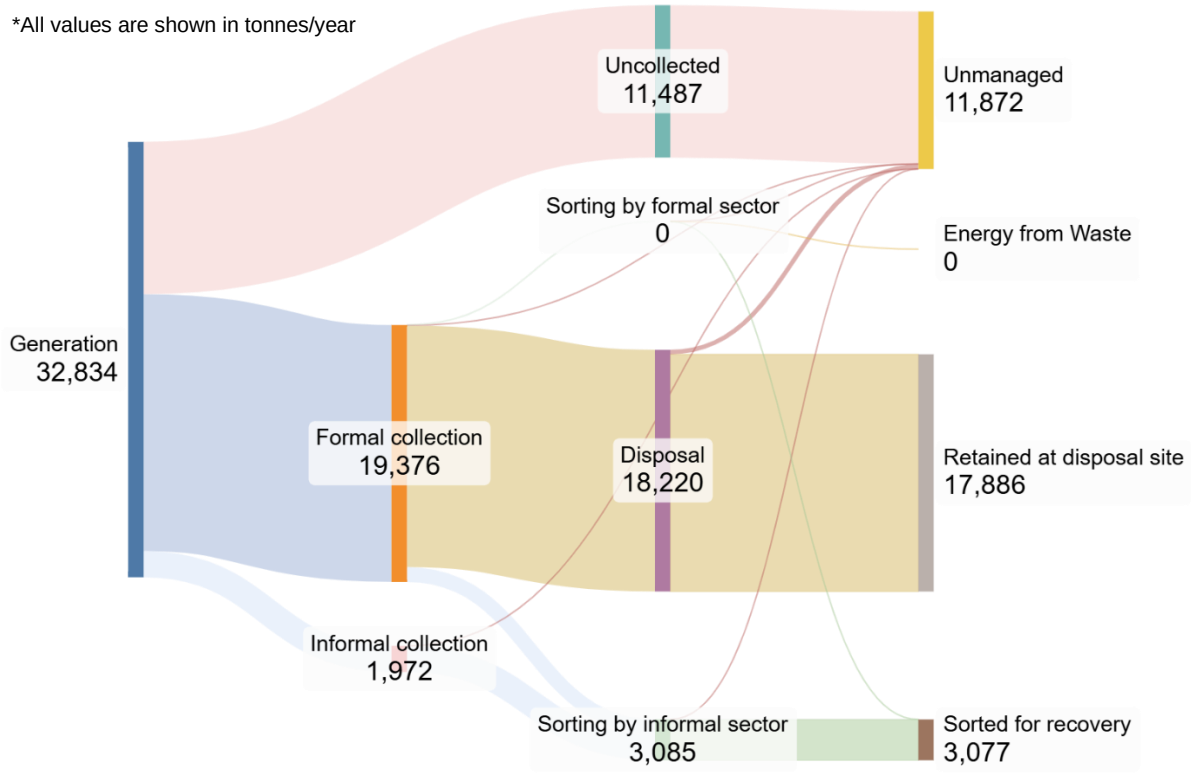
Intended Audience:

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 Satkhira Paurashava, with the overarching objective of developing sustainable and inclusive waste management solutions. The study aimed to identify the nature and volume of waste, evaluate infrastructure and operational challenges, and explore practical models for managing organic, inorganic, and plastic waste under climate-vulnerable conditions.

A mixed-method approach was used, combining 160 household surveys, 2 Focus Group Discussions, 4 Key Informant Interviews, field observation, and laboratory analysis. Waste composition was assessed using color-coded bags for organic and inorganic streams. Additional data was collected through drone visuals, GIS mapping, and water testing from the vicinity of the Binerpota dumping ground. Institutional waste handling, market-level disposal patterns, and sanitation practices were also documented.

The findings indicate that Satkhira Paurashava generates approximately 27–28 tonnes of waste per day, of which only 17–18 tonnes are collected through formal systems. Organic waste makes up the largest share, accounting for 74–81% of household waste. This includes food scraps, market waste, and agricultural residues. However, there are no composting facilities or source segregation mechanisms to manage this organic load efficiently.

Plastic waste constitutes around 11–12% of the total waste stream, but is primarily handled by informal waste collectors without protective gear or legal recognition. There is no structured plastic recovery system in place, although the Binerpota plastic shredding plant holds potential for scaling up. Inorganic waste—including metals, glass, and paper—is rarely sorted or recycled, and is often openly dumped or burned, especially in market and service areas. The

report proposes establishing Material Recovery Facilities (MRFs), pilot composting units, and incentive-based waste segregation schemes to address these gaps.

According to the Waste Flow Diagram (WFD), out of 32,834 tonnes of waste generated annually in Satkhira Paurashava, 11,487 tonnes remain uncollected. Formal collection accounts for 19,376 tonnes, while informal collection contributes 1,972 tonnes. No waste is sorted by the formal sector, and there is no waste-to-energy processing. Of the total waste, 18,220 tonnes are disposed of, and 17,886 tonnes are retained at disposal sites. Informal sector efforts manage to sort 3,085 tonnes, of which 3,077 tonnes are recovered, while 11,872 tonnes of waste remain unmanaged.

Key challenges include the absence of waste segregation at the source, lack of functional composting or recycling infrastructure, insufficient vehicle fleets, and unprotected landfill operations at Binerpota. Additionally, workers lack PPE, and the paurashava faces limitations in technical capacity, institutional coordination, and funding. Solutions proposed include the establishment of transfer stations, daily landfill covering protocols, community waste monitoring, and private sector engagement in composting and plastic recycling.

In conclusion, the report recommends an integrated model combining infrastructure development, PPP-based recycling and composting ventures, and inclusive governance. Ten potential SWM intervention sites have been identified across various wards for waste bin installation, drainage improvement, and shredding plant development. With coordinated implementation, Satkhira Paurashava can move toward a circular, climate-resilient waste management system that benefits both people and the environment.

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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

Satkhira Paurashava is located in the Satkhira District under Khulna Division in the southwestern coastal region of Bangladesh. Satkhira District is part of the Ganges Delta and covers an area of approximately 3,858.33 square kilometers. It lies between 21°36' and 22°54' north latitude and 88°54' and 89°20' east longitude. The district shares borders with Jessore and Khulna to the east, the Sundarbans mangrove forest and the Bay of Bengal to the south, and West Bengal, India, to the west.

Satkhira Paurashava, an urban unit, has 36,313 households with a population of 138,397. The male-female ratio stands at 50.4% and 49.6%, respectively. The average household size is 3.68, and it records the highest literacy rate at 86.41%, indicating strong access to education and urban amenities.

Satkhira Paurashava serves as an urban center within the district, playing a crucial role in local governance, trade, and public services. The region is characterized by low-lying terrain, extensive river networks, and high salinity levels, which influence its waste management challenges and overall environmental sustainability.

Satkhira experiences a tropical monsoon climate, with three distinct seasons: pre-monsoon (summer), monsoon, and winter. During April and May, temperatures can rise to 40°C (104°F), while in the cooler months of December and January, average temperatures remain around 12-15°C (54-59°F).

The district receives an average annual rainfall of 1,800–2,500 mm (71–98 inches), with the monsoon season (June to October) contributing the majority of precipitation. Due to its proximity to the Bay of Bengal, the region experiences high humidity throughout the year, often exceeding 85% during peak monsoon months.

Satkhira is highly vulnerable to climate-induced hazards, which significantly impact waste management, sanitation infrastructure, and public health.

Cyclones and Storm Surges: Being part of the coastal region, Satkhira frequently faces tropical cyclones and tidal surges, leading to waste dispersion, contamination of water sources, and infrastructure damage. Storms such as Cyclone Amphan (2020) and Cyclone Sidr (2007) caused severe disruptions in urban services, including solid waste management.

Salinity Intrusion: Due to rising sea levels and reduced freshwater inflows from upstream rivers, salinity levels in soil and water bodies have increased, making land and water resources unsuitable for many traditional uses. This affects waste decomposition rates and landfill stability, requiring specialized management solutions.

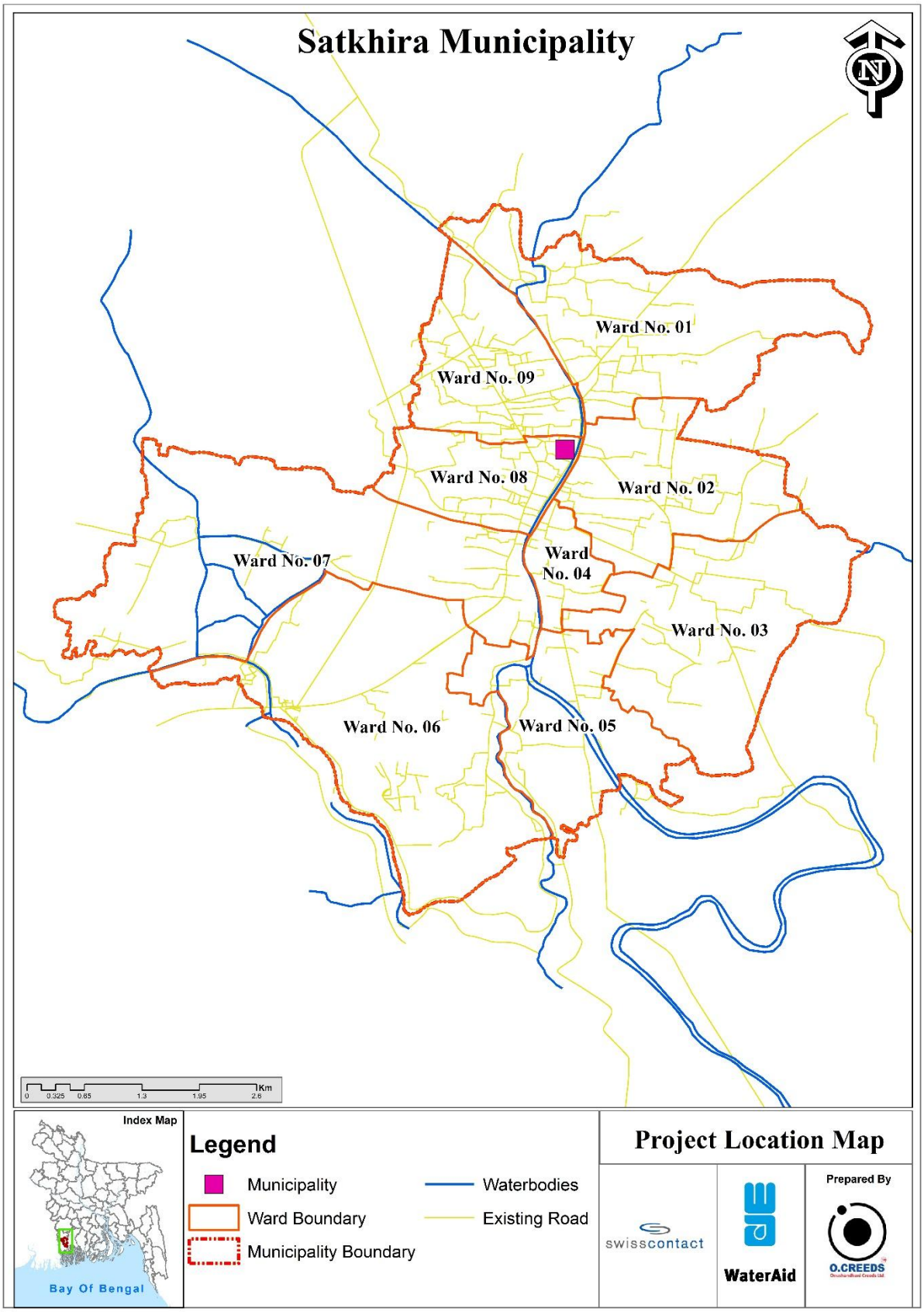

Figure 1-1:Study Area Map

1.5 Methodology

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

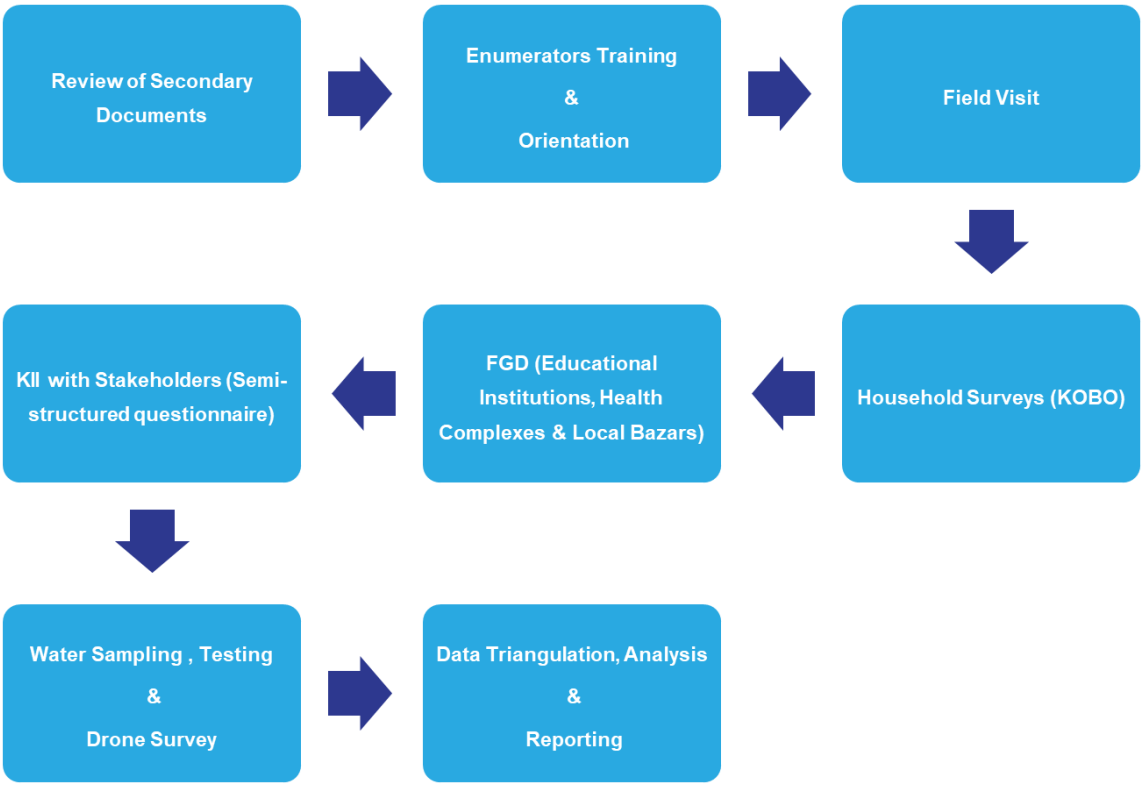

Figure 1-2: Methodology

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.

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 150 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
Satkhira Paurashava	160	2	4

Table 1.1 presents the overall survey coverage conducted in Satkhira Paurashava. A total of 160 household surveys (HH) were conducted, accompanied by 2 Focus Group Discussions (FGDs) and 4 Key Informant Interviews (KIIs). This mixed-method approach provided diverse insights into the solid waste management practices and challenges in the municipality.

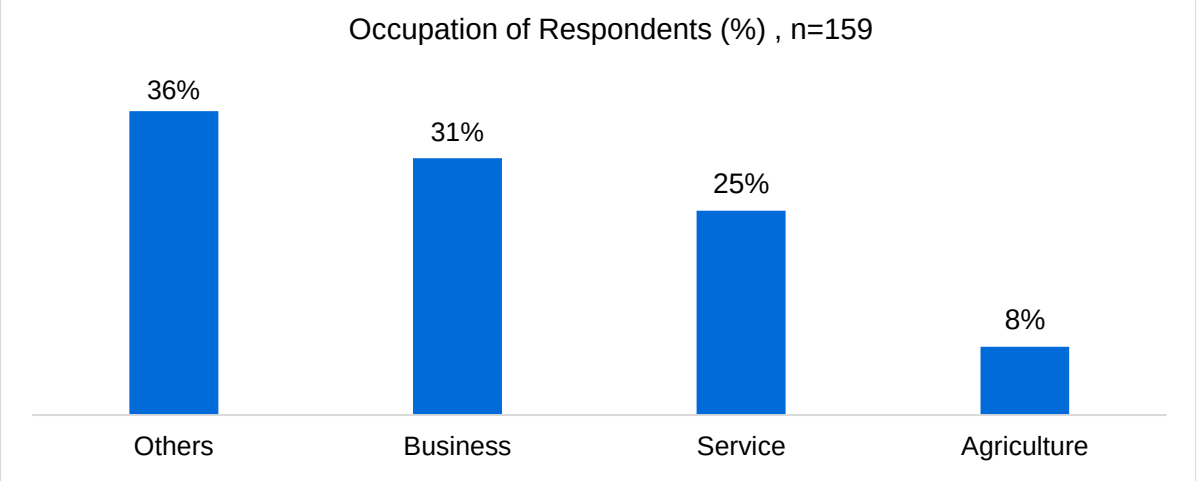

Figure 1-3: **Source of Income**

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

Figure 1-2: illustrates the occupational distribution of the respondents (n=159). The majority, 38%, are engaged in various informal sectors categorised under 'Others' (e.g., drivers, teachers, day labourers, tailors, fishermen, unemployed, retired). 31% are involved in business, 25% are in service, and 8% are involved in agriculture. This variation reflects the economic diversity within Satkhira Paurashava.

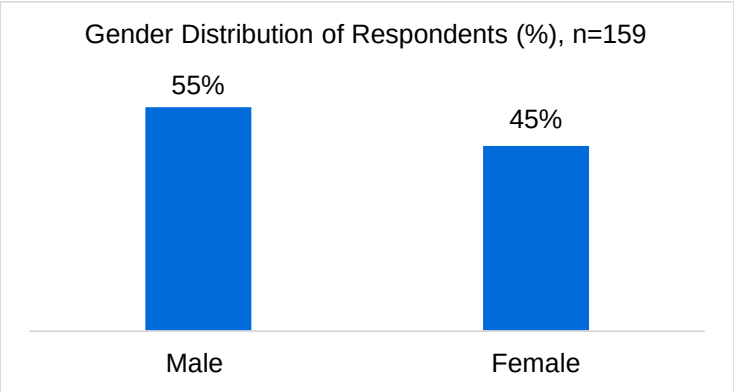

Figure 1-3 shows the gender-wise distribution of the respondents. 55% of the respondents were male, while 45% were female, indicating balanced participation in the household surveys across gender lines.

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

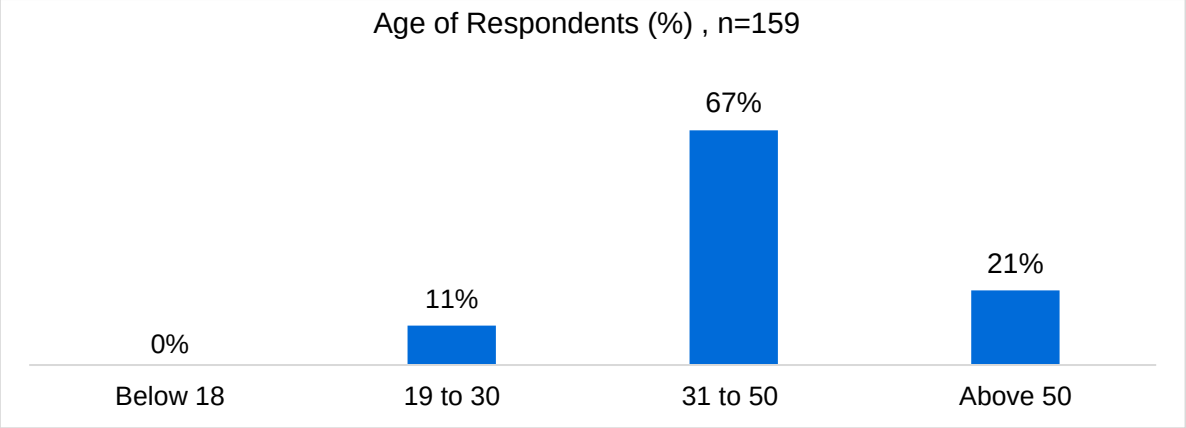

Figure 1-5: **Age Distribution of Respondents**

Figure 1-4: depicts the age profile of the respondents. The largest group, 67%, falls within the 31 to 50 years age range, followed by 21% above 50 years, and 11% aged 19 to 30. No respondents were recorded from the below 18 years category, suggesting that most responses came from adults with active roles in household and community-level waste management activities.

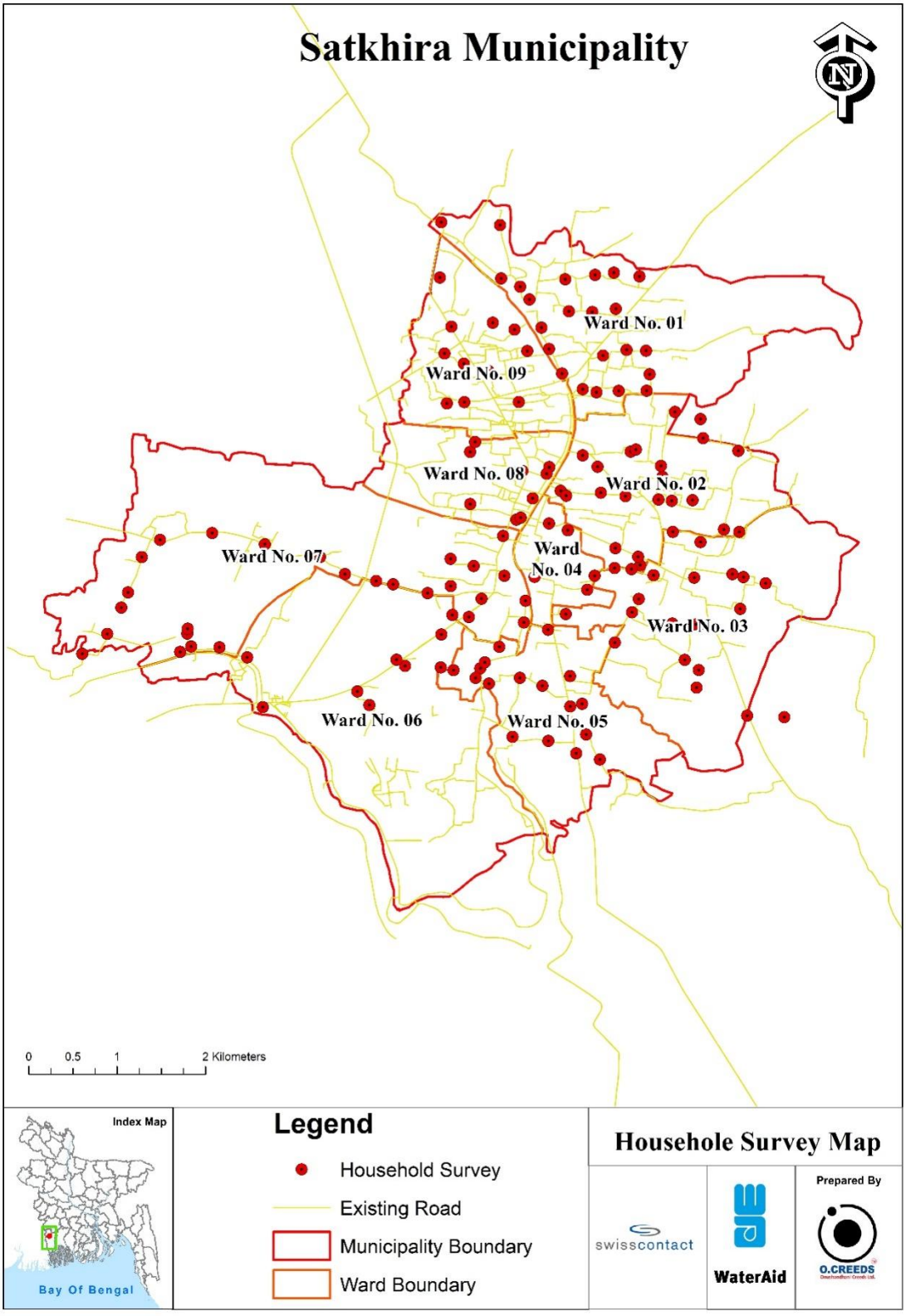

Figure 1-6: **Household Survey Map**

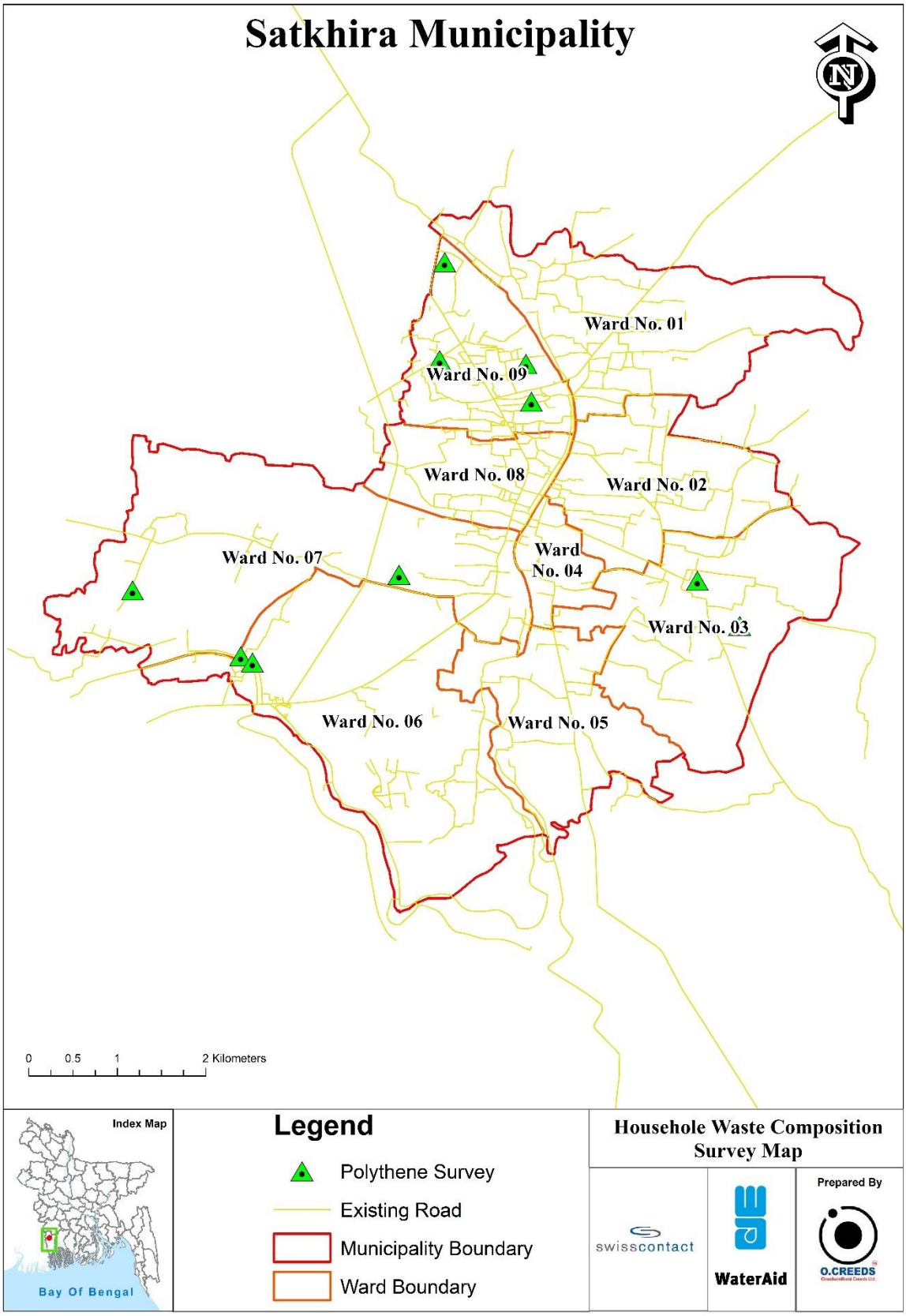

Figure 1-7: **Household Waste Composition Survey Map**

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

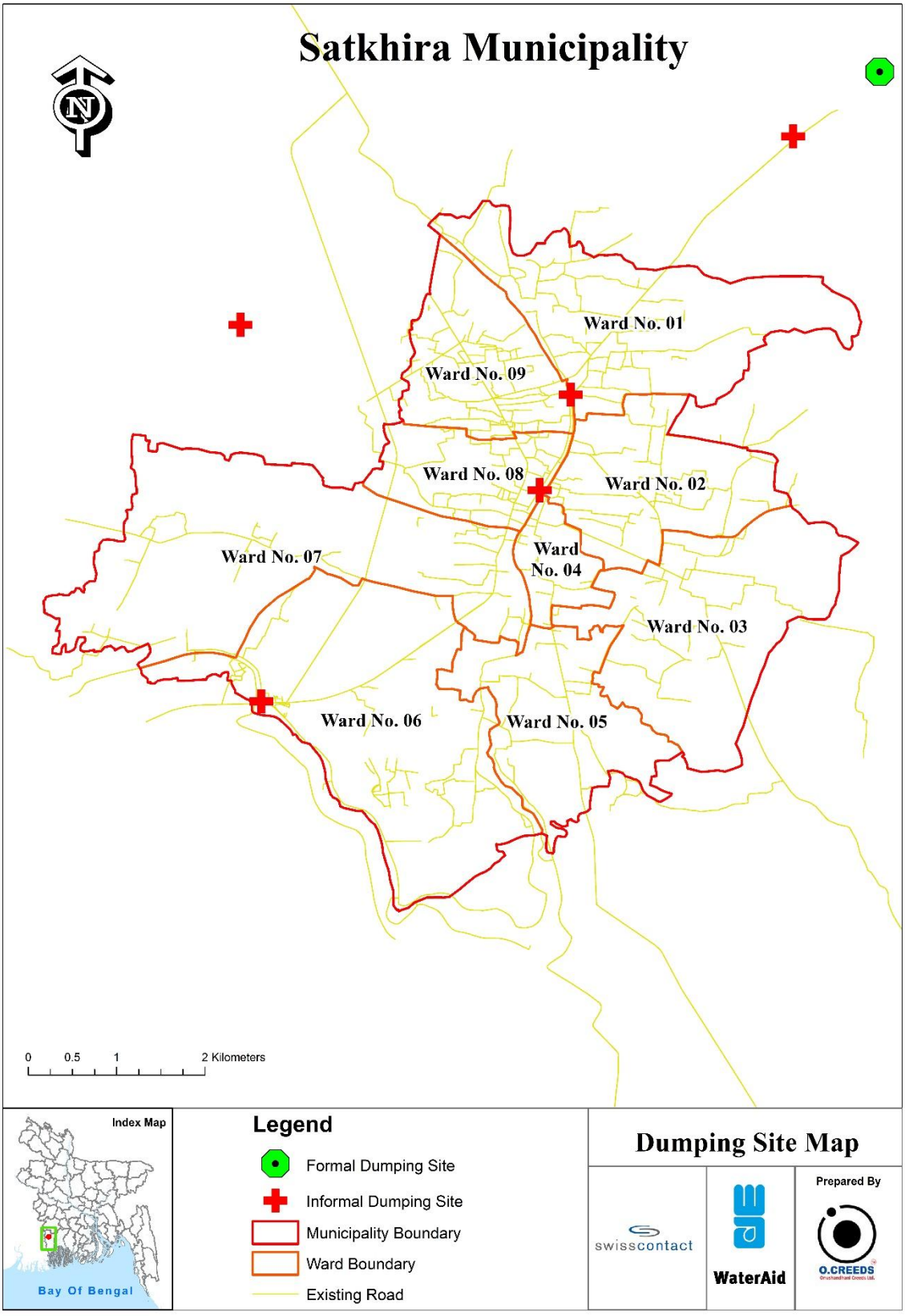

Figure 1-9: **Disposal Site Map**

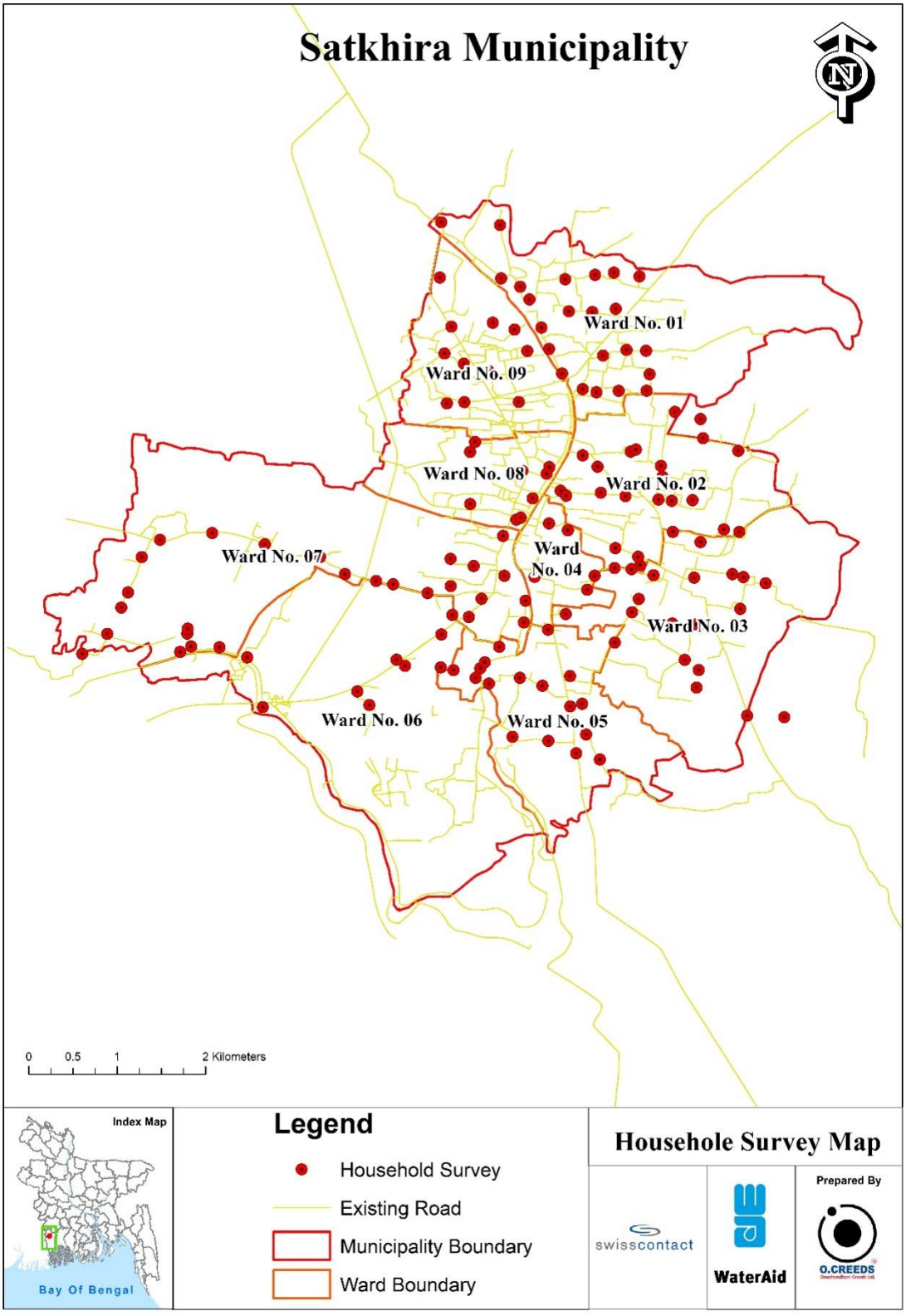

Figure 1-10: **Household Survey Map**

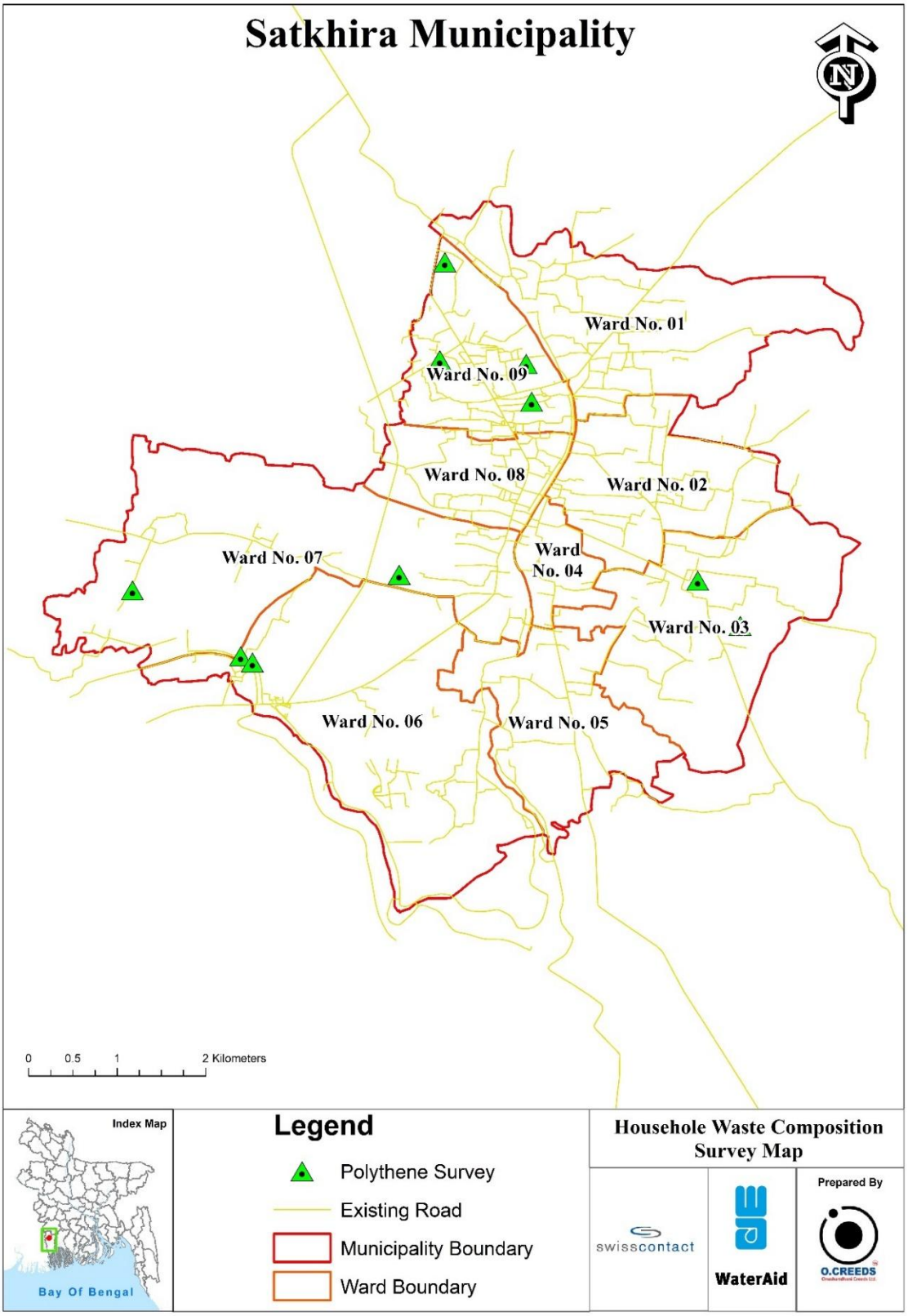

Figure 1-11: **Household Waste Composition Survey Map**

Figure 1-12: **Water Sampling Location Map**

Figure 1-13: **Disposal Site 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. NATIONAL LEGAL AND INSTITUTIONAL CONTEXT OF SOLID WASTE MANAGEMENT

This chapter presents an overview of the waste generation context in Satkhira Paurashava through household surveys, water quality assessments, and analysis of sector-specific waste streams. The objective is to assess the volume and composition of residential waste, evaluate waste generation patterns across different sectors such as fisheries, agriculture, livestock, business, and service, and examine the quality of water impacted by poor waste disposal practices. Findings from the household survey are used to understand daily waste generation and household waste composition. Additionally, laboratory test results provide insights into water pollution levels, while sectoral analysis identifies seasonal and occupational waste variations across the municipality.

3.1 Residential Waste

This subsection focuses on understanding the quantity and types of waste generated at the household level and by key occupational sectors such as agriculture, fisheries, service, business, and livestock. The objective is to identify waste composition patterns to support effective planning for waste segregation and treatment strategies.

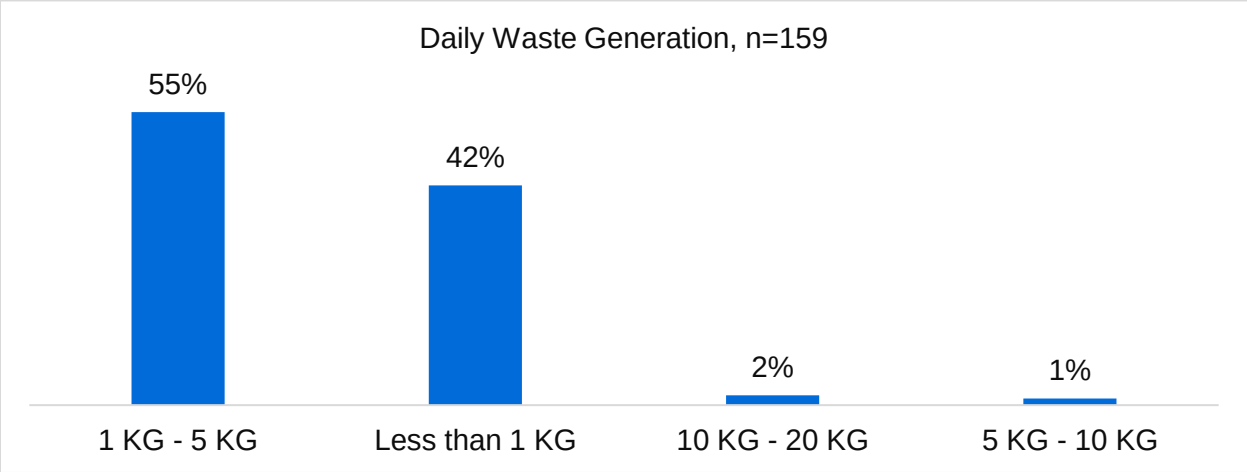

Figure 3:1: **Total Waste Generation**

Figure 3-1 shows the daily waste generation of surveyed households in Satkhira Paurashava. It reveals that 55% of households generate between 1 to 5 kg of waste daily, which is the most common range. 42% of households generate less than 1 kg, while 2% generate between 10 to 20 kg, and 1% generate between 5 to 10 kg. The data shows that waste generation in most households falls within the lower to moderate range.

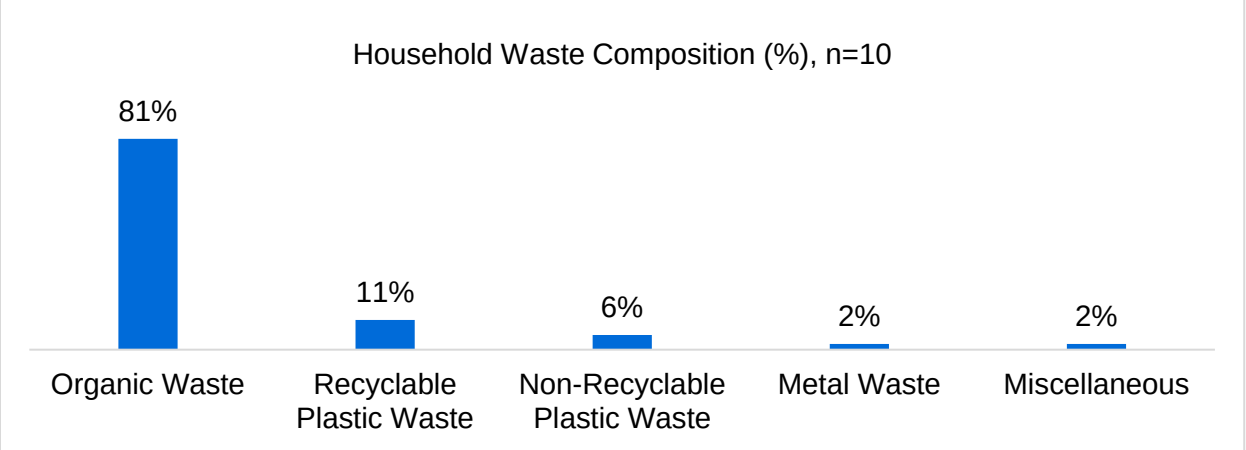

Figure 3:2: **Household Waste Composition**

Note: Miscellaneous denotes glass, tire, and waste fragments

Figure 3-2 shows the composition of household waste generated in Satkhira Paurashava. Organic waste accounts for 81%, making it the predominant waste category in the household sector. Recyclable plastic waste makes up 11%, followed by non-recyclable plastic waste at 6%. Additionally, metal waste and miscellaneous waste each account for 2% of the total household waste composition.

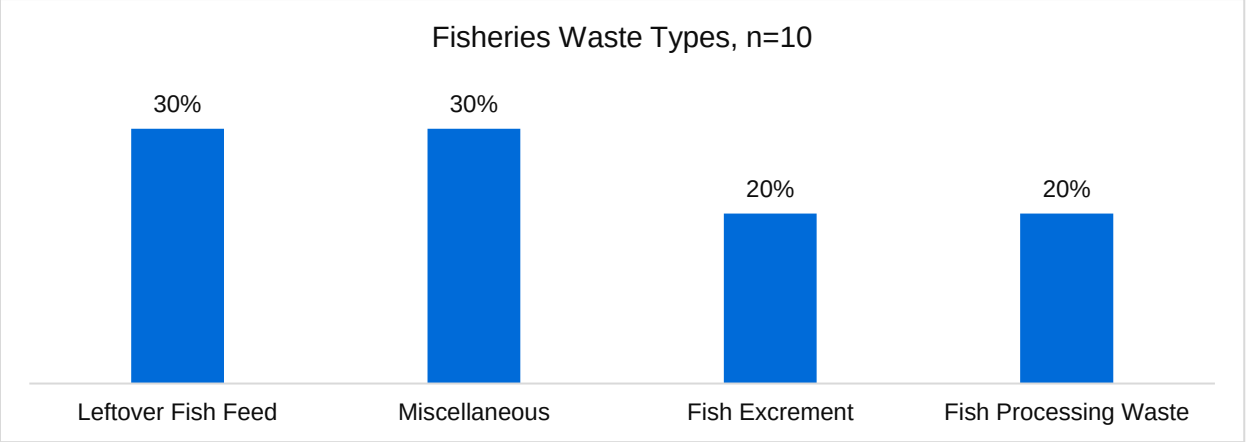

Figure 3:3: **Fisheries Waste Types**

Note: Others denote Fish Carcass, Liquid Water waste.

Figure 3-3 shows the types of waste generated from the fisheries sector. Leftover fish feed constitutes 30%, and miscellaneous waste also accounts for 30%. Fish excrement makes up 20%, while fish processing waste also accounts for 20%. The data represents a broad distribution of waste types associated with fish production and handling activities.

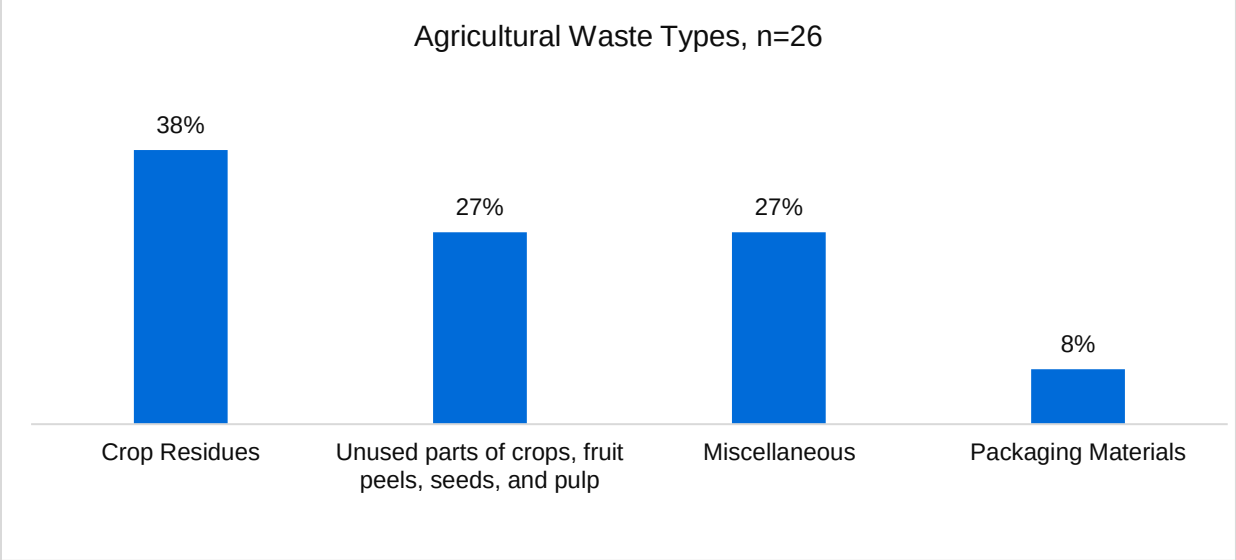

Figure 3:4: Agricultural Waste Types

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

Figure 3-4 shows the types of waste generated from the agricultural sector. Crop residues make up 38%, followed by unused parts of crops, fruit peels, seeds, and pulp at 27%. Miscellaneous waste also contributes 27%, while packaging materials make up 8% of the total agricultural waste.

Figure 3:5: Livestock Waste Types

Note: Other denotes animal carcass, debris

Figure 3-5 shows the waste types generated in the livestock sector. Livestock fecal sludge comprises the largest portion at 66%, while animal food waste makes up 31%. Miscellaneous waste accounts for 3%, making it the smallest contributor in this category.

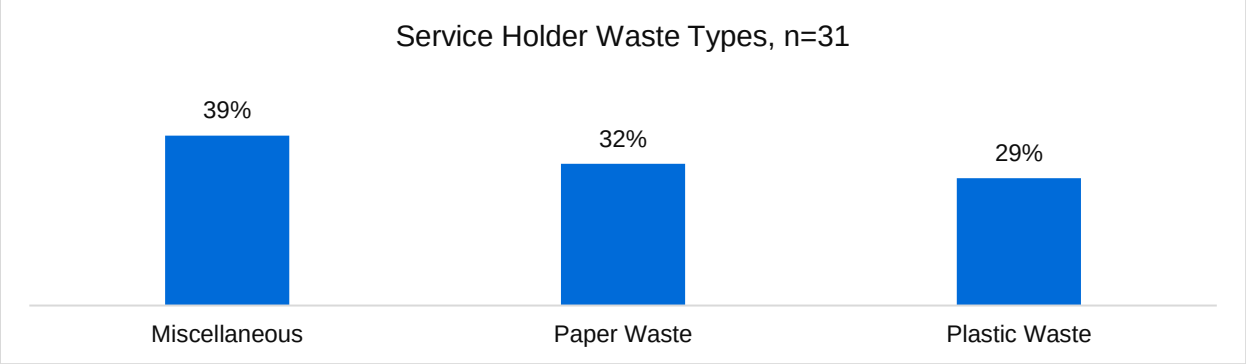

Figure 3:6 Service Holder Waste Types

Note: Other denotes glass, tires

Figure 3-6 shows the types of waste generated by service holders in Satkhira Paurashava. Miscellaneous waste makes up 38%, followed by paper waste at 32%, and plastic waste at 29%. These figures represent the distribution of waste types commonly associated with service-related activities.

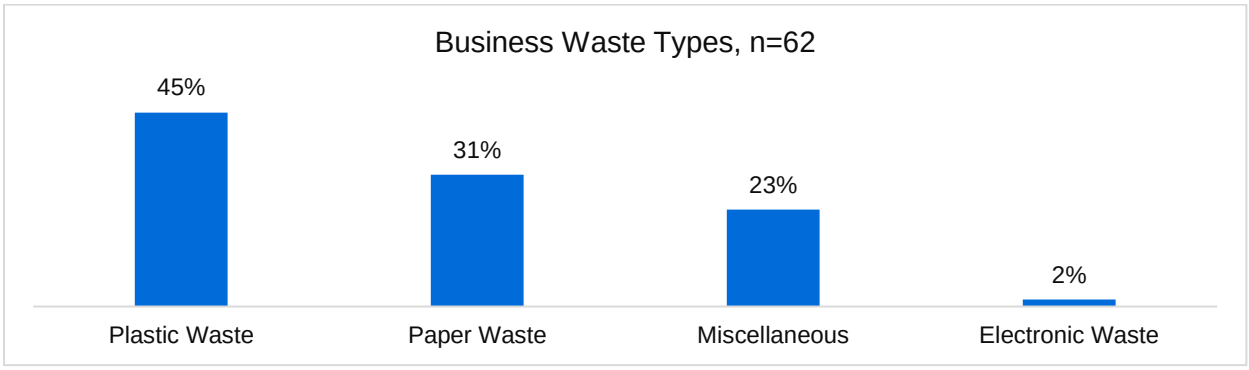

Figure 3:7: **Business Waste Types**

Note: Other denotes tires, old furniture wood

Figure 3-7 shows the types of waste generated from business activities. Plastic waste is the highest at 45%, followed by paper waste at 31%. Miscellaneous waste accounts for 23%, while electronic waste represents 2% of the total waste from the business sector.

3.2 Water Quality Test

Water sample was collected from the water body beside the Binir Pota dumping site at Satkhira Paurashava. Some of the waste from the disposal site 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. Since Satkhira is particularly prone to flooding

and other climate-extreme events, waste materials and leachate can easily overflow into the water body. The water sample was tested at the laboratory of the Department of Public Health Engineering (DPHE).

Table 3:1: Water Quality Test Results

Sl.#	Water Quality Parameters	Bangladesh Standard	Concentration Present	Unit	Analysis Method	LOQ
1	Chemical Oxygen Demand (COD)	4	4	mg/L	CRM	4
2	Dissolved Oxygen (DO)	6	6.1	mg/L	Multimeter	-
3	Nitrogen (Nitrate)	10	1.6	mg/L	UVS	0.1
4	Total Dissolved Solid (TDS)	1000	2250	mg/L	Multimeter	-
5	Total Suspended Solid (TSS)	10	3	mg/L	Gravimetric Method	-

Chemical Oxygen Demand (COD) was measured at 4 mg/L, which meets the Bangladesh Standard but suggests moderate organic pollution. Dissolved Oxygen (DO) was found to be 6.10 mg/L, slightly above the standard, indicating relatively stable oxygen levels in the water.

The Nitrate (NO_3) concentration was significantly lower than the permissible limit at 1.6 mg/L (against a standard of 10 mg/L), suggesting minimal agricultural runoff contamination. However, Total Dissolved Solids (TDS) were recorded at 2250 mg/L, far exceeding the permissible limit of 1000 mg/L, indicating potential salinity intrusion or industrial discharge. The Total Suspended Solids (TSS) level was 3 mg/L, which is within acceptable limits, signifying low sediment load in the sampled water.

The results suggest that high TDS levels could pose risks to drinking water safety, and further investigation into salinity sources, industrial effluents, or groundwater contamination is recommended to mitigate potential health and environmental impacts.

3.3 Waste Generation Patterns in the Paurashava

Waste generation in Satkhira Paurashava follows a dynamic pattern influenced by population density, commercial activities, and seasonal variations. The total daily waste generation is estimated to be 27-28 tonnes, of which approximately 17-18 tonnes are collected, leaving nearly 10 tonnes of waste uncollected each day. This uncollected waste accumulates in open spaces, drainage systems, and roadsides, exacerbating environmental and health hazards.

3.3.1 Seasonal and Sectoral Waste Variations

Waste generation fluctuates across different seasons, with higher waste production during the summer months. This is primarily due to increased agricultural activity and market waste surges. Waste composition also varies based on the contributing sectors. Significant waste sources include:

i. Agricultural Sector: A major contributor to organic waste, particularly during harvesting seasons.

ii. Kitchen Markets (Haat Bazaars): Generate around 4 tonnes of waste per day, consisting largely of vegetable peels, spoiled food, and packaging materials.

iii. Small Businesses: Contribute approximately 2 tonnes of waste per day, mainly consisting of plastic, paper, and other non-biodegradable materials.

iv. Electronic Waste: Although minimal, around 0.002 tonnes of e-waste is discarded daily, adding to the complexity of waste management.

3.3.2 Waste Composition in Satkhira Paurashava

The majority of the waste generated in Satkhira Paurashava is organic waste, accounting for approximately 70% of the total waste. Organic waste includes food scraps, biodegradable market waste, and agricultural residues. The remaining 30% consists of recyclables such as plastic, glass, metals, paper, and hazardous waste. However, no formal waste segregation system exists, leading to the mixing of organic and inorganic waste, which reduces the efficiency of recycling and composting efforts.

3.4 Waste Flow Diagram

Figure 3-9 shows the Waste Flow Diagram for Satkhira 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.

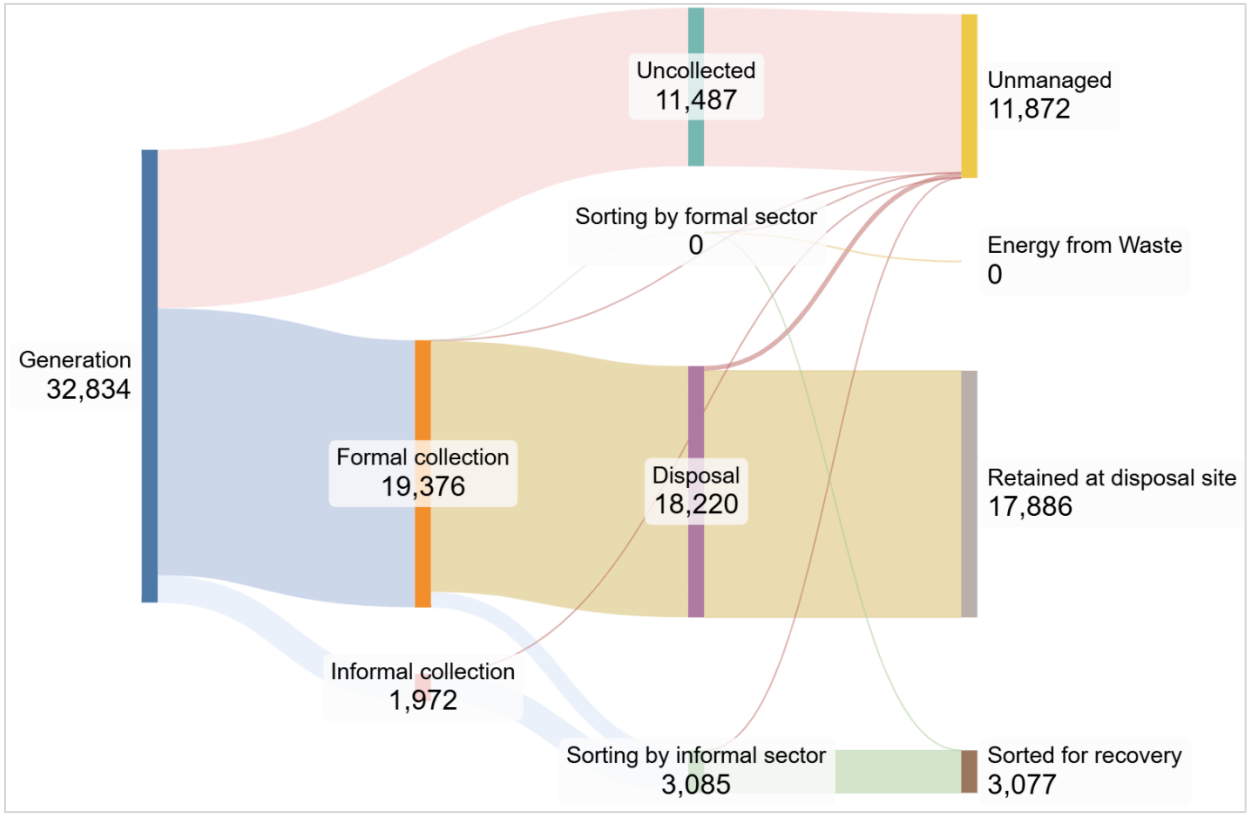

Figure 3-8: **Waste Flow Diagram (WFD) for Satkhira Paurashava (tonnes/year)**

The waste flow diagram of Satkhira Paurashava shows that a total of 32,834 tonnes of waste is generated. Out of this, 11,487 tonnes remain uncollected and 19,376 tonnes are collected through formal systems. Informal collection accounts for 1,972 tonnes. None of the waste is sorted by the formal sector, and no waste is processed for energy recovery. Of the collected waste, 18,220 tonnes are disposed of, and 17,886 tonnes are retained at the disposal site. Informal sorting handles 3,085 tonnes, from which 3,077 tonnes are sorted for recovery. The total amount of unmanaged waste is 11,872 tonnes.

4. STAKEHOLDER ANALYSIS AND DYNAMICS

Satkhira Paurashava's solid waste management (SWM) system involves multiple stakeholders responsible for waste collection, transportation, and disposal. Effective waste governance requires coordination between municipal authorities, private entities, non-governmental organizations (NGOs), community members, and waste workers. However, the lack of proper collaboration and resource allocation presents significant challenges to achieving an efficient and sustainable waste management system.

4.1 Municipal Authorities

The Executive Engineer and Sanitary Inspector oversee waste management operations, ensuring collection efficiency and landfill maintenance. Their responsibilities include infrastructure development, budgeting, and policy enforcement. However, limited financial resources and manpower shortages prevent the paurashava from establishing a structured waste disposal system. Waste segregation at source remains absent due to a lack of regulatory enforcement and community participation. The paurashava also struggles with logistical inefficiencies, as waste collection services are limited to only a few wards, leaving large areas underserved.

4.2 Waste Workers and Collection Staff

The paurashava employs 113 waste workers, including 98 males and 15 females. These workers are responsible for collecting and transporting waste across the paurashava. However, they lack Personal Protective Equipment (PPE) such as boots, gloves, aprons, and masks, increasing their risk of exposure to hazardous waste and vector-borne diseases. Moreover, their wages remain low, and there is no structured training or capacity-building program to improve their efficiency and safety. Many workers rely on informal waste collection practices, further contributing to health and environmental hazards.

4.3 Disposal Site Operator

The Choyghoria Mor landfill serves as the primary waste disposal site in Satkhira Paurashava, receiving approximately 27-28 tonnes of waste daily, of which 17-18 tonnes are collected, leaving 10 tonnes uncollected. The site lacks proper waste management infrastructure, including leachate control, proper covering mechanisms, and waste segregation facilities. Due to poor landfill management, untreated waste spreads to surrounding areas, creating air, soil, and water pollution. The landfill also faces climate-related risks such as flooding and storm surges, which further degrade its operational effectiveness.

4.4 NGOs and External Stakeholders

Several non-governmental organizations (NGOs) have been involved in awareness campaigns, financial aid, and technical support related to waste management in Satkhira. Organizations such as Rupantor conduct community engagement programs to educate residents on proper waste disposal practices. However, their role in actual waste collection and processing is limited.

Additionally, there is no formalized collaboration framework between the paurashava and NGOs to scale up their impact on waste governance.

4.5 Community Involvement and Challenges

The role of community members is critical in ensuring the success of waste management initiatives. However, in Satkhira Paurashava, community engagement in waste segregation, collection, and responsible disposal remains low. Households primarily dispose of waste through informal dumping, as waste collection services are only available in a few wards. The lack of public awareness and incentives for proper waste disposal exacerbates the issue. Market vendors, business owners, and industrial sectors also contribute to excessive waste generation without following standardized waste disposal practices.

Another challenge is seasonal waste variations, where increased agricultural and festival-related waste remains uncollected for extended periods. During religious and cultural events, waste accumulation in public spaces rises significantly, overwhelming the existing collection infrastructure. The absence of a community-driven waste monitoring system makes it difficult for authorities to track and address these seasonal waste surges effectively.

4.6 Private Sector and Informal Waste Collectors

Currently, private companies and informal waste pickers play an important role in recycling and resource recovery. However, there is no structured integration of private sector involvement in municipal waste collection services. Many waste pickers operate independently, sorting plastic, metal, and glass from mixed waste and selling it to recycling vendors. Although these efforts contribute to waste reduction, the lack of safety measures and proper regulation poses health risks for waste pickers. Additionally, without formalized waste value chain integration, the potential for resource recovery and sustainable waste management remains unfulfilled.

4.7 Coordination Between Stakeholders

One of the biggest gaps in Satkhira's waste management system is the lack of coordinated efforts between municipal authorities, private waste collectors, NGOs, and the local community. The current system operates in a fragmented manner, where different stakeholders work in isolation rather than as part of a cohesive waste governance framework.

To address these issues, better policy implementation, investment in waste infrastructure, and structured collaboration between stakeholders are necessary. A Public-Private Partnership (PPP) model could significantly enhance waste collection efficiency, resource recovery, and sustainable disposal practices. Moreover, establishing incentive programs for community waste segregation and worker safety regulations will play a crucial role in transforming Satkhira's waste management system into a more sustainable and resilient model.

5. EXPLORING WASTE MANAGEMENT FEASIBILITY

This chapter presents a detailed assessment of current waste management behaviors, practices, and conditions in Satkhira Paurashava, based on household survey findings. It highlights where waste is usually kept by households, sector-specific waste management practices, willingness to pay for services, and physical observations related to waste containers, sanitation facilities, and awareness levels. The objective of this section is to understand existing practices and identify potential areas for system improvement.

5.1 Household Waste Management Practices

This section outlines waste handling practices across households, fisheries, agriculture, livestock, and business sectors. It also includes community perceptions on service affordability and conditions observed during field visits.

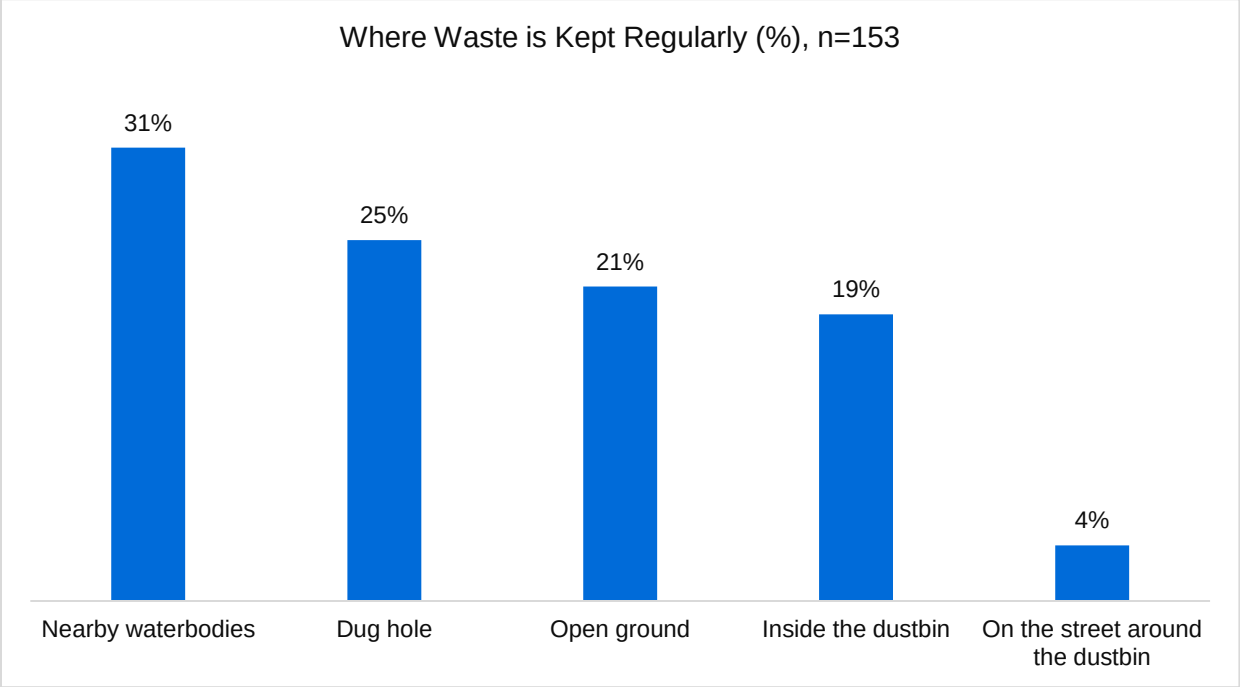

Figure 5-1: Where Garbage is Kept Regularly

Figure 5-1 shows the locations where waste is most commonly kept by households. The majority of respondents (31%) reported storing their waste near waterbodies. This is followed by 25% who dispose waste in dug holes and 21% who leave it on open ground. A smaller proportion of respondents (19%) reported placing waste inside the dustbin, while only 4% reported keeping waste on the street around the dustbin.

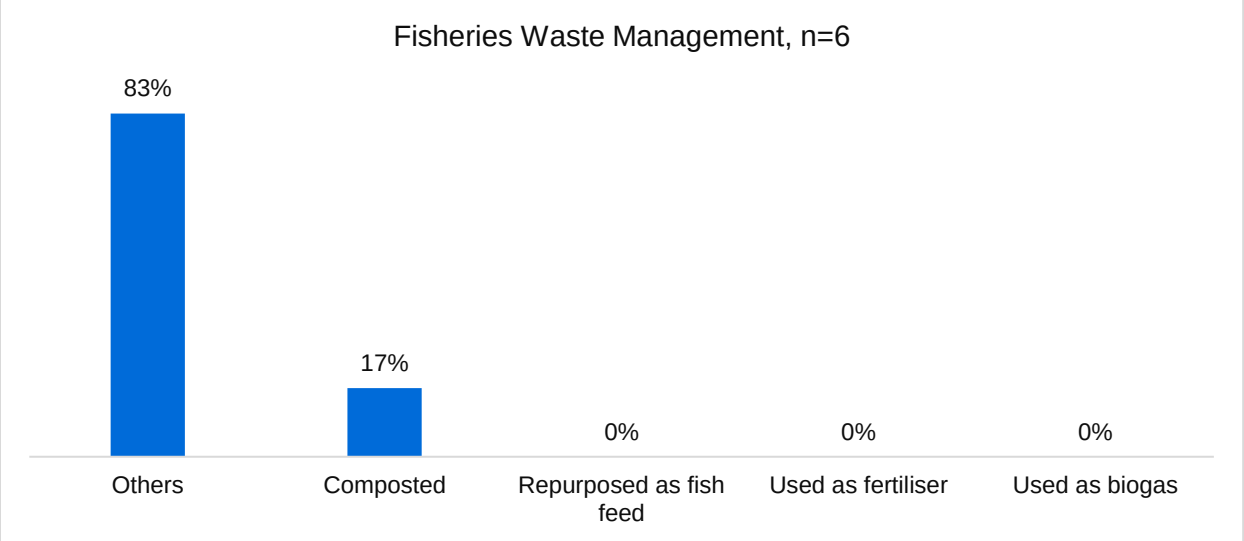

Figure 5-2: Fisheries Waste Management

Note: Other denotes burying under soil

Figure 5-2 presents waste management practices in fisheries. The majority of fisheries waste (83%) is categorized as 'Others'. Only 17% of respondents reported managing their fisheries waste through composting. No responses were recorded under repurposing as fish feed, use as fertilizer, or use as biogas.

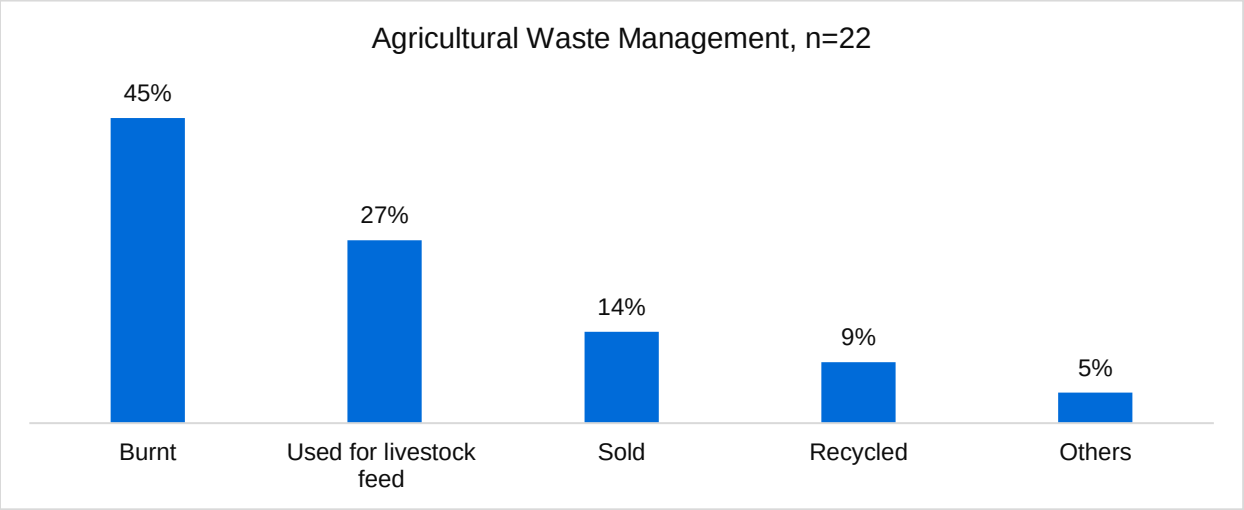

Figure 5-3: Agricultural Waste Management

Note: Other denotes dump in Road side/ open place

Figure 5-3 displays how agricultural waste is managed. The most common method reported is burning, accounting for 45% of responses. Additionally, 27% of agricultural waste is used for livestock feed. Other methods include selling (14%), recycling (9%), and other unspecified methods (5%).

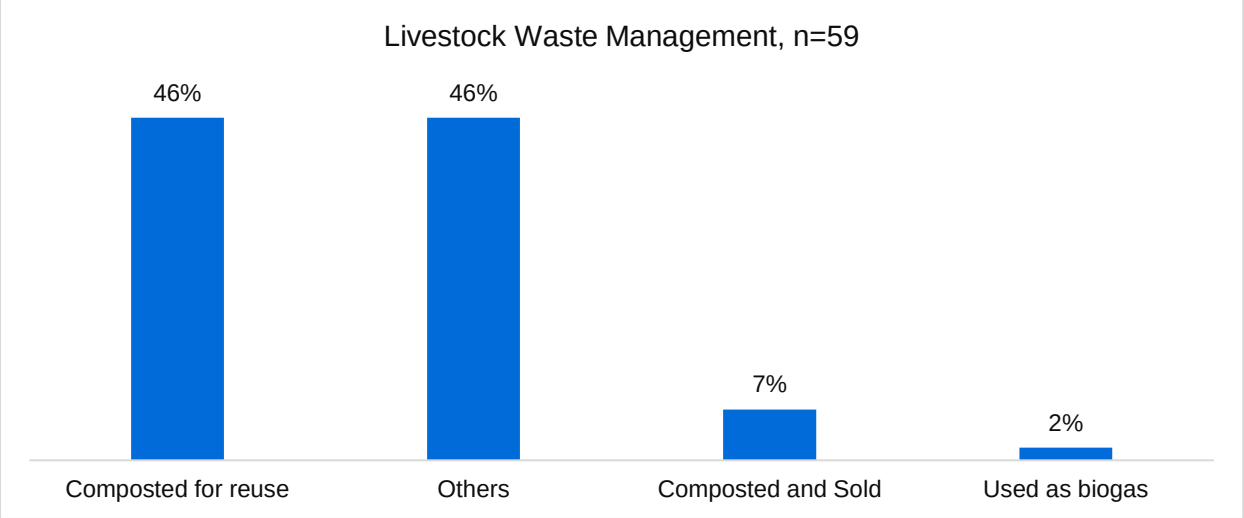

Figure 5-4: Livestock Waste Management

Note: Other denotes dumped in digging place

Figure 5-4 depicts livestock waste management practices. Equal proportions of respondents (48%) reported composting livestock waste for reuse and managing it through 'Others'. Additionally, 7% reported composting and selling the waste, while 2% reported using livestock waste as biogas.

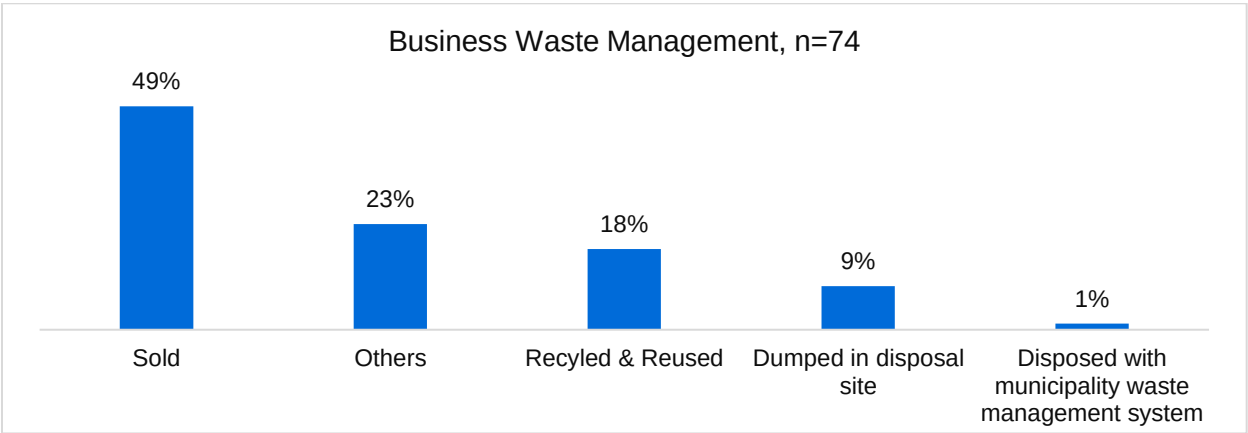

Figure 5-5: Business Waste Management

Note: Other denotes dumped in abandoned place

Figure 5-5 shows that business waste is primarily sold, with 49% of respondents following this practice. Another 23% of business waste is managed under the category 'Others'. Additionally, 18% of the waste is recycled and reused, 9% is dumped in disposal sites, and 1% is disposed through the municipality waste management system.

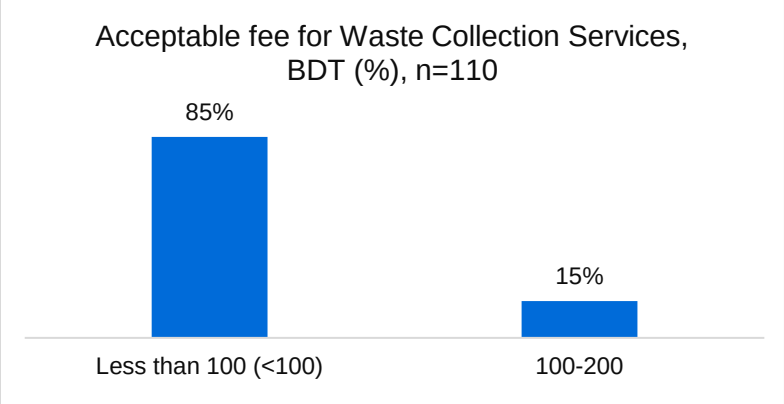

Figure 5-7 illustrates respondents' willingness to pay for waste collection services. A large majority (85%) indicated willingness to pay less than BDT 100, while 15% were willing to pay between BDT 100 and BDT 200.

Figure 5-6: Acceptable fee for Waste Collection Services, BDT

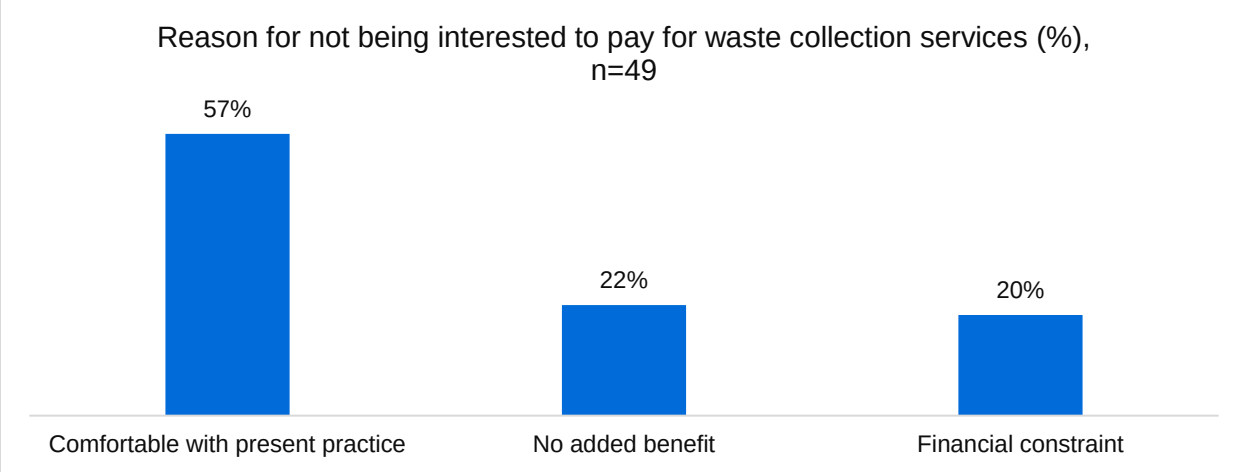

Figure 5-7: Reason of Not Being Interested in Waste Collection Service

Figure 5-8 displays reasons for not being interested in paying for waste collection services. The most commonly cited reason was being comfortable with the present practice (57%), followed by the perception of no added benefit (22%) and financial constraint (20%).

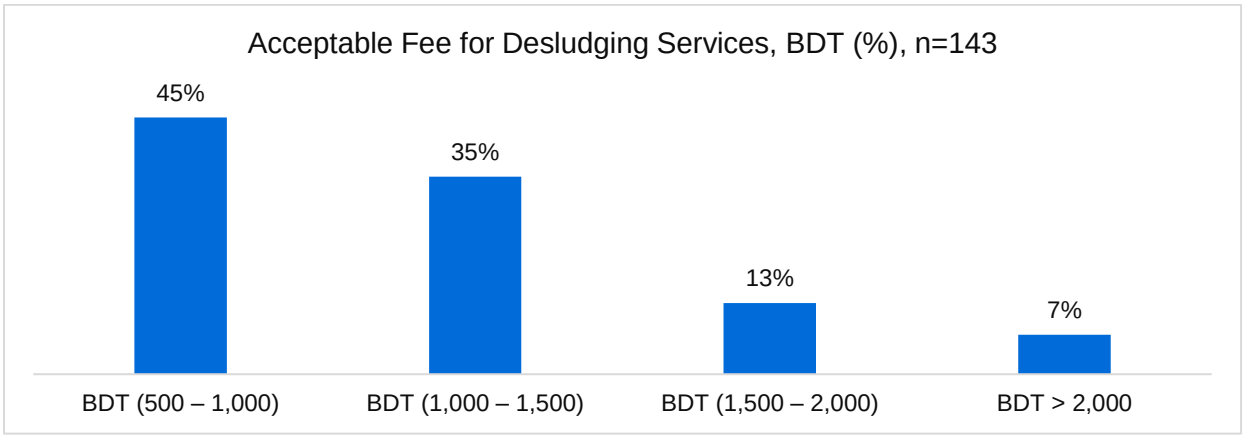

Figure 5-8: **Acceptable Fee for Desludging Services, BDT**

Figure 5-9 outlines the range of acceptable fees for desludging services. Among respondents, 45% were willing to pay BDT 500–1,000, 35% preferred BDT 1,000–1,500, 13% agreed to pay BDT 1,500–2,000, and 7% were willing to pay more than BDT 2,000.

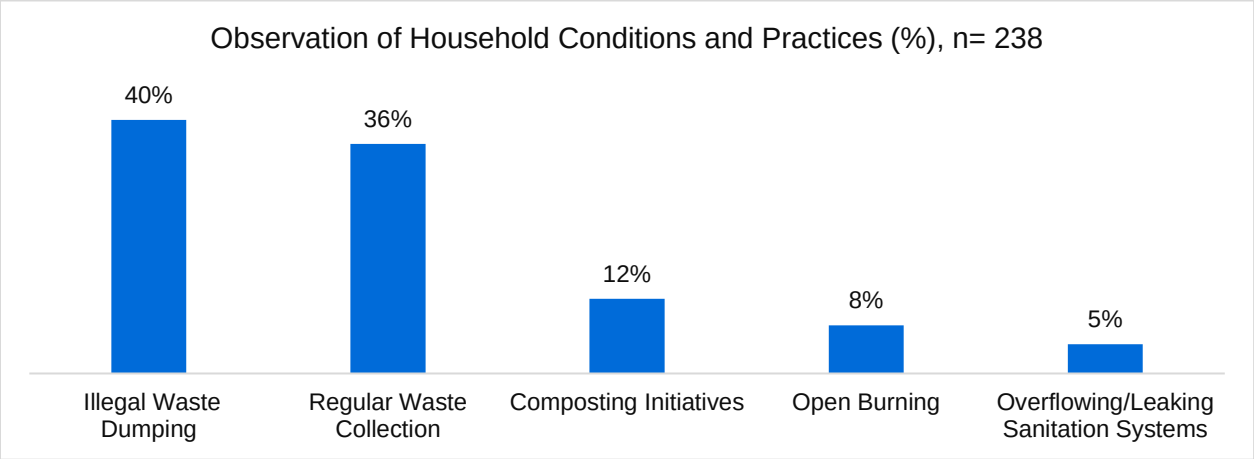

Figure 5:9: **Observation of Household Conditions and Practices**

Figure 5-10 summarizes the observed conditions and practices in households. Illegal waste dumping was observed in 40% of households, while regular waste collection was seen in 36%. Composting initiatives were observed in 12% of households, open burning in 8%, and overflowing or leaking sanitation systems in 5%.

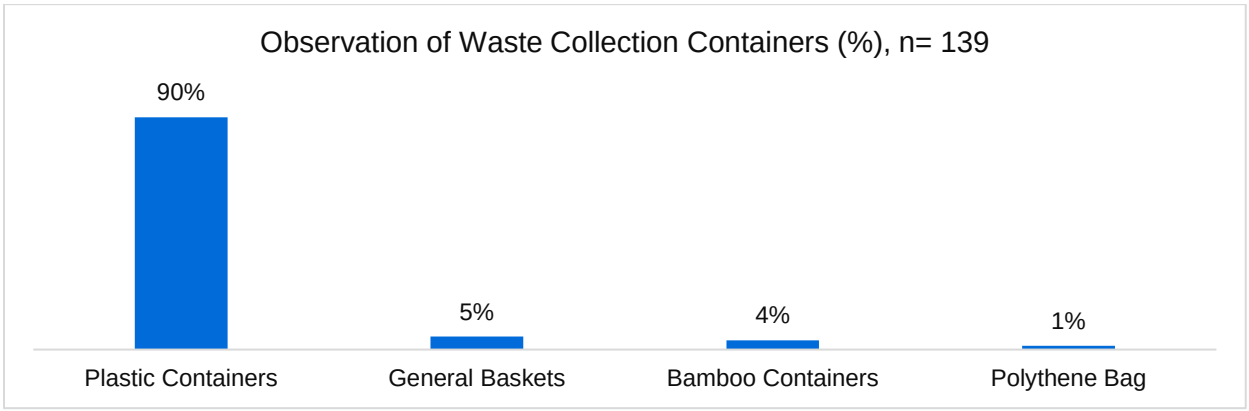

Figure 5:10: **Observation of Waste Collection Containers**

Figure 5-11 indicates that plastic containers are the most widely used type of waste collection container, used by 90% of households. Other types include general baskets (5%), bamboo containers (4%), and polythene bags (1%).

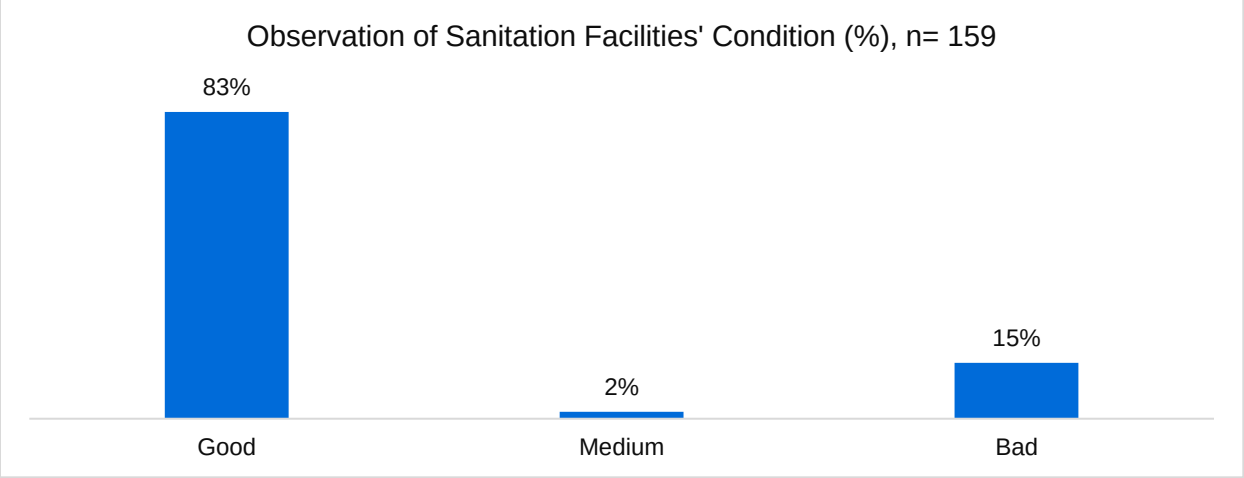

Figure 5:11: **Observation of Sanitation Facilities' Condition**

Figure 5-12 highlights that 83% of sanitation facilities were observed to be in good condition. Only 2% were recorded as being in medium condition, while 15% were found to be in bad condition.

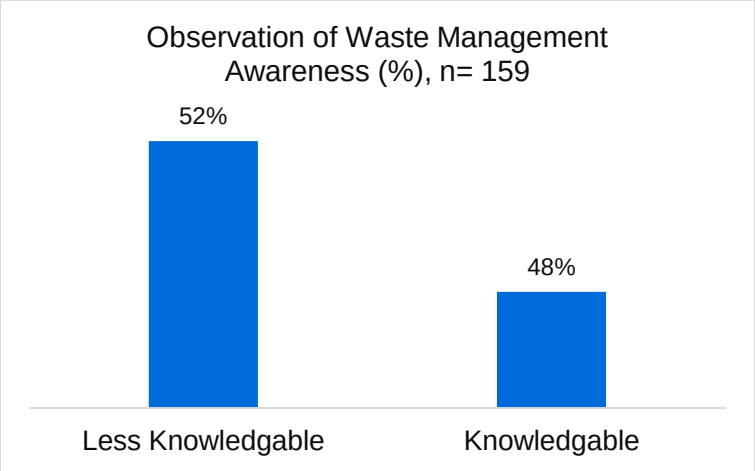

Figure 5-13 presents the level of waste management awareness among respondents. It shows that 52% of the respondents were observed to be less knowledgeable about waste management practices.

48% of them were considered knowledgeable.

Figure 5:12: **Observation of Sanitation Facilities' Condition**

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 chapter presents findings from field surveys aimed at evaluating the existing waste management practices, service models, and supporting infrastructure in Satkhira Paurashava. The objective is to understand the operational systems in place for waste containment, transportation, desludging, and overall sanitation service delivery. Key highlights from household surveys are presented to illustrate how waste is handled at the grassroots level, alongside insights into the challenges faced by residents in accessing adequate waste management infrastructure. These insights help identify gaps in service provision and areas for strategic improvement.

6.1 Household Survey: Key Highlights of Operation Practices

The household survey was conducted to understand the key operational practices associated with solid waste handling, containment, transportation, and sanitation services in Satkhira Paurashava. The objective was to assess how residents manage waste at the household level, what systems they use for containment and disposal, and their engagement with desludging services. The survey provides crucial insights into gaps in infrastructure and service delivery, and helps inform future interventions and planning.

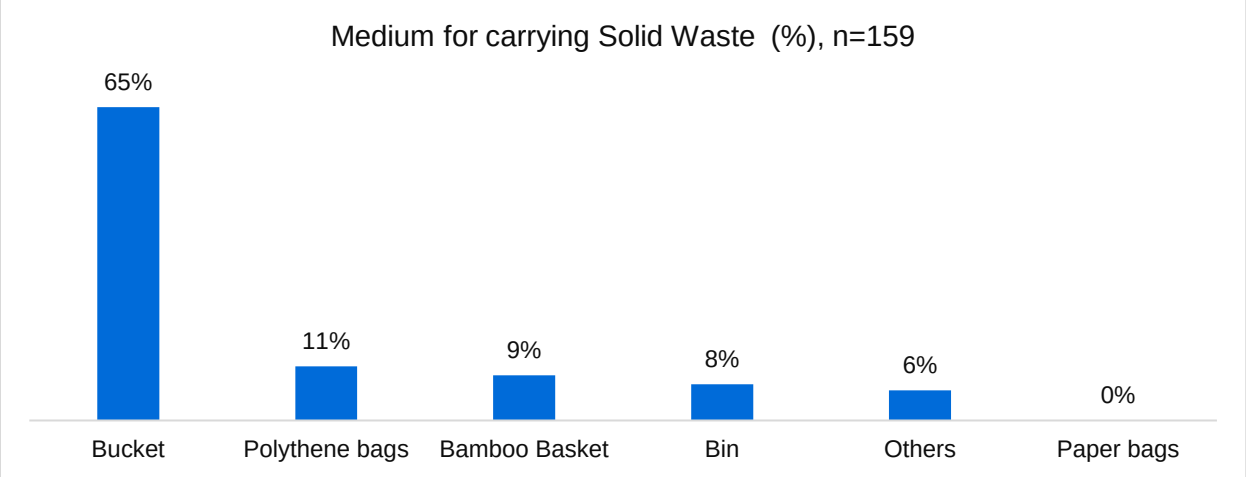

Figure 6-1: Medium for carrying Solid Waste

Figure 6-1 shows the most common mediums used for carrying solid waste by households. A majority of respondents (65%) use buckets to carry waste, followed by 11% using polythene bags. Bamboo baskets and general baskets are used by 9% and 8% of respondents respectively, while 6% reported using other materials. A negligible percentage use paper bags. These data reflect the predominance of buckets as the standard waste-carrying medium in most households.

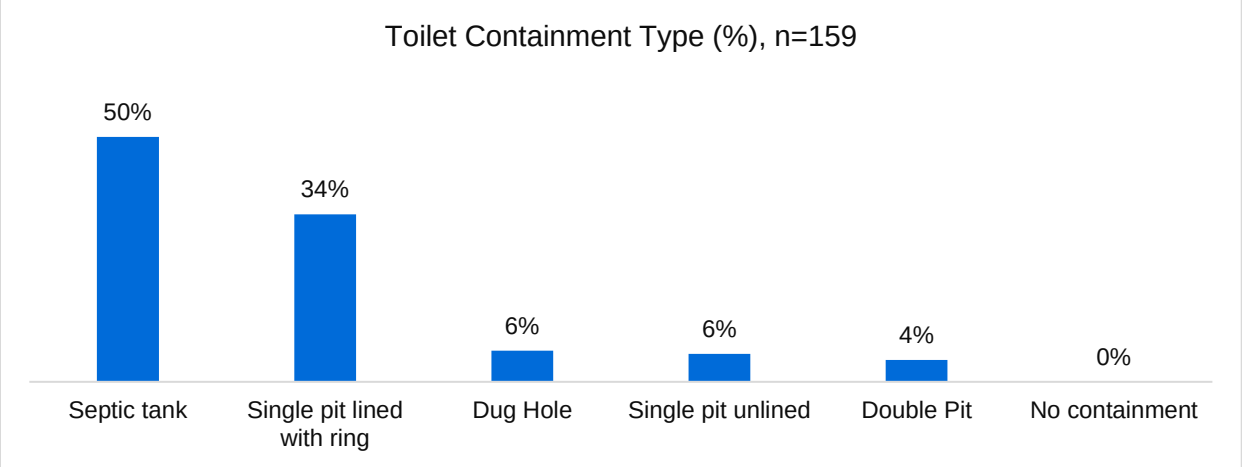

Figure 6-2: Containment Type

Figure 6-2 presents the types of toilet containment systems in place. Septic tanks are the most common, used by 50% of households, followed by single pit lined toilets at 34%. Other systems include dug holes (6%), single pit unlined (6%), and double pit (4%). No households reported having no containment system. The data indicate a strong reliance on septic systems but also highlight the presence of basic containment technologies in a significant portion of the population.

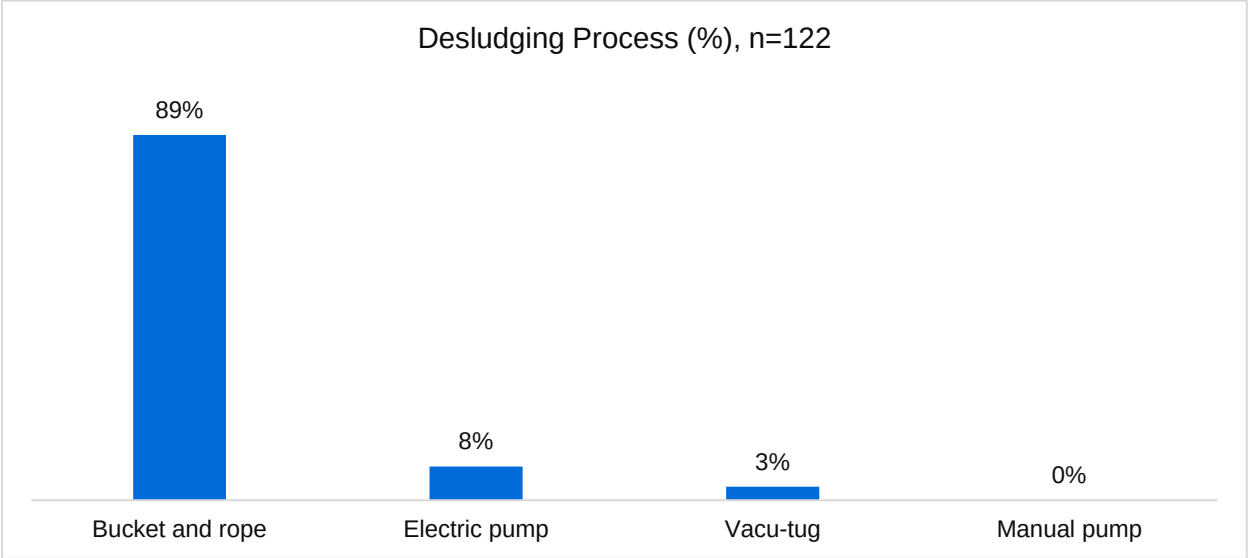

Figure 6-3: Desludging Process

Figure 6-3 depicts the method used for desludging toilets. A large proportion (88%) use a bucket and rope system, while 8% rely on electric pumps. Only 3% use vacutugs, and no respondents reported using manual pumps. This points to the prevalence of manual and semi-manual methods for desludging in the absence of mechanized infrastructure.

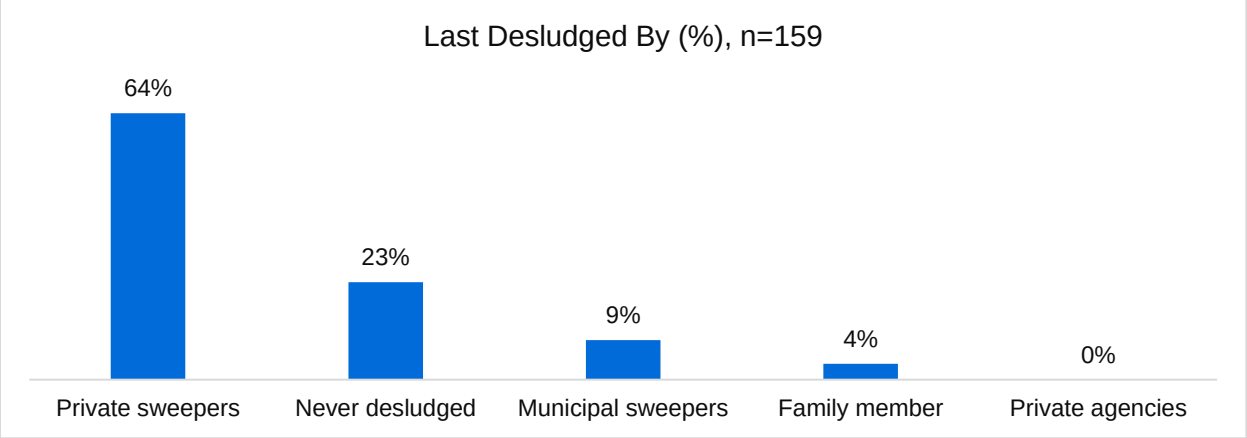

Figure 6-4: Last Desludger

Figure 6-4 illustrates who last performed desludging services for the households. Most households (64%) relied on private sweepers, 25% reported the toilet was newly constructed and not yet desludged, 5% used municipal sweepers, 4% used family members, and only 2% used private agencies. The dominance of private sweepers highlights the informal nature of desludging services.

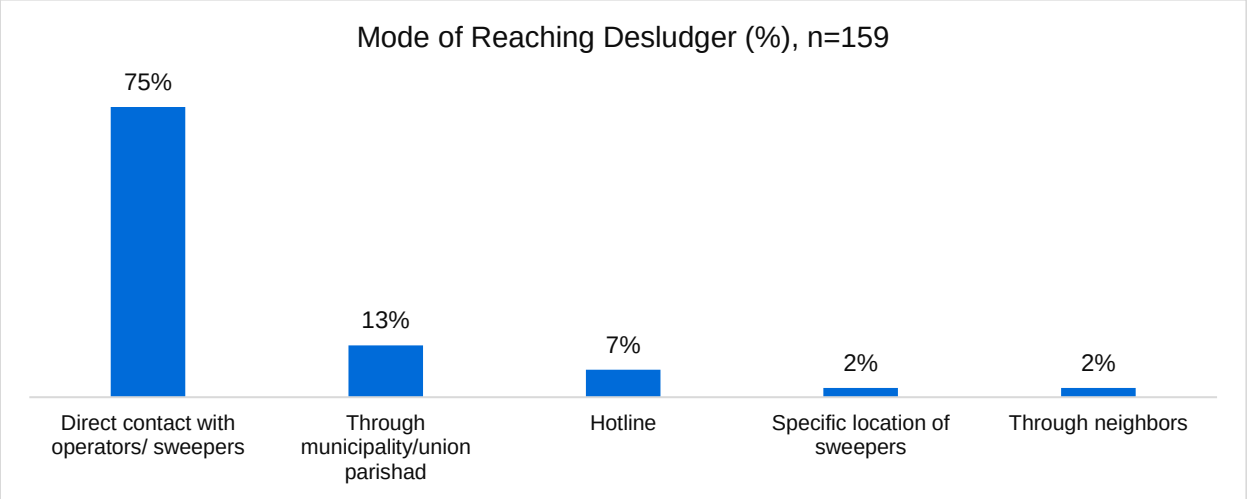

Figure 6-5: Mode of Reaching Operators/Sweepers

Figure 6-5 shows how households reached out to desludging service providers. The majority (75%) directly contacted the sweepers or operators, 13% did so through municipal vans, 7% via hotlines, 2% through separate institutional processes, and 2% through neighbours. These data show a strong reliance on informal or direct contact methods over formal institutional channels.

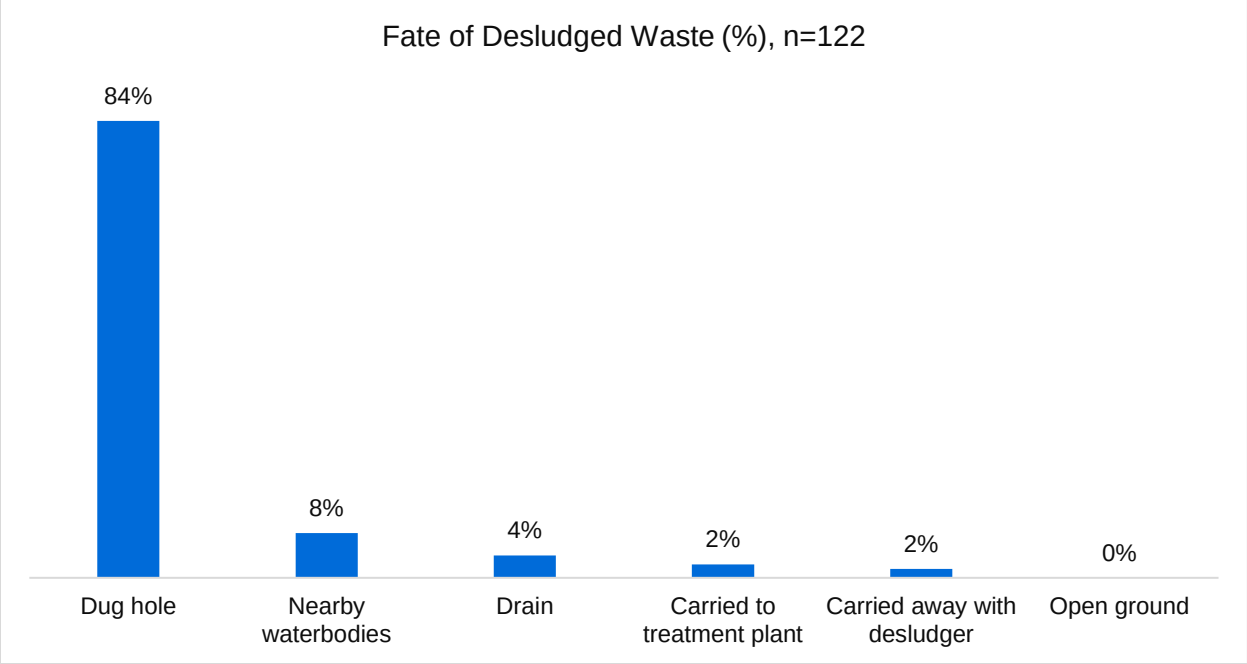

Figure 6-6: Fate of Desludged Waste

Figure 6-6 highlights the disposal destinations of desludged waste. The largest share (84%) reported that waste is dumped into dug holes. Other destinations include nearby water bodies (8%), drains (4%), and treatment plants or disposal sites (2%). A small portion reported carrying waste away with desludgers (2%), while no respondents mentioned open ground dumping. The lack of structured disposal systems is evident from this data.

6.2 Operational Practices in the Paurashava

This section discusses the operational practices within the Paurashava, the workers, vehicles and waste disposal facilities.

6.2.1 Workforce Overview

Satkhira Paurashava employs 113 waste workers, consisting of 98 males and 15 females. These workers play a crucial role in waste collection, transportation, and disposal. However, they lack access to essential Personal Protective Equipment (PPE) such as boots, gloves, aprons, and masks, exposing them to occupational hazards and health risks.

The paurashava must address these safety and hygiene concerns by ensuring workers have access to PPE and proper waste handling training. Improving working conditions will contribute to better waste management efficiency and the health and well-being of workers.

Table 6:1 Workforce Details

Category	Number of Workers	PPE Availability	PPE Needs
Male	98	N/A	Boots, Gloves, Apron, Mask
Female	15	N/A	Boots, Gloves, Apron, Mask
Total	**113**	**N/A**	**Boots, Gloves, Apron, Mask**

6.2.2 Vehicle and Equipment Insights

The paurashava operates 8-9 vans, but none of them are currently functional. Waste collection is mainly carried out using two trucks and two Nosimon vehicles. However, the existing fleet is insufficient to cover all wards, leading to waste accumulation in unserved areas.

Additionally, four vehicles lack operational fitness, frequently causing breakdowns and inefficiencies in waste transportation. To enhance waste collection, at least four additional trucks are required to meet operational demands and ensure proper waste removal services across the paurashava.

Table 6:2 Vehicle Fleet Details

Vehicle Type	Number Available	Functional Vehicles	Non-Functional Vehicles	Additional Required
Vans	9-Aug	0	9-Aug	N/A
Trucks	2	2	0	4
Nosimon	2	2	0	N/A

Table 6:3 Equipment Availability

Equipment Type	Availability Status	Issues Identified
PPE (Boots, Gloves, Aprons, Masks)	Not available for most workers	High occupational hazards
Waste Collection Bins	Limited in high-density areas	Overflow and irregular disposal
Waste Sorting Units	Absent	No structured segregation system

6.2.3 Current Waste Collection and Transportation System

Waste collection in Satkhira Paurashava relies on two trucks and two Nosimon vehicles. Due to inadequate resources, waste accumulates in several areas, particularly in wards without regular collection services. Collection occurs once or twice daily in densely populated areas, while other locations receive irregular or no collection services. Uncollected waste amounts to 10 tonnes per day, contributing to illegal dumping and environmental hazards.

The absence of a structured waste collection schedule results in inefficiencies and inconsistent service delivery. To improve waste collection efficiency, expanding the vehicle fleet, employing additional waste workers, and implementing a structured collection schedule are essential measures.

6.2.4 Waste Processing and Disposal Practices

Satkhira Paurashava currently lacks incineration and composting facilities. As a result, waste is directly dumped at Biner Pota, where 70% of the total waste consists of organic material.

The absence of waste treatment facilities creates significant environmental and public health concerns, as unprocessed waste generates methane emissions, air pollution, and vector-borne diseases.

Additionally, the lack of proper landfill management results in uncontrolled waste spread, leading to contamination of nearby land and water bodies. There is an urgent need to establish waste processing facilities such as composting centers, recycling units, and controlled landfills to improve waste treatment efficiency.

6.2.5 Challenges in Waste Disposal

The paurashava faces several challenges related to waste disposal and landfill management, including:

Leachate Contamination – The landfill lacks a leachate collection system, causing waste liquids to seep into the soil, leading to groundwater contamination and environmental hazards.

Seasonal Variations – Waste accumulation increases during peak seasons, especially when agricultural and market waste volumes surge. The paurashava lacks adaptive collection strategies to address seasonal waste fluctuations.

Lack of Proper Covering – Waste at Biner Pota is only covered weekly, allowing odor, pest infestations, and airborne disease risks to escalate.

Limited Waste Segregation – There is no formal waste segregation at the source, leading to mixed waste disposal, which hinders recycling and composting initiatives.

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

The current solid waste management practices and infrastructure in Satkhira Paurashava face challenges in adapting to climate-extreme events, such as cyclones, floods and saltwater intrusion. While improvements are needed, existing systems have potential and can be enhanced with targeted investments in infrastructure, institutional capacity, and community engagement. Strengthening these areas will help build resilience and improve waste management practices under changing climate conditions.

7.1 Climate Extreme Events in Satkhira Paurashava

Satkhira is a coastal district prone to climate-induced disasters, including cyclones, flooding, tidal surges, and salinity intrusion. These extreme weather events significantly impact waste management infrastructure and services, making it challenging to ensure effective solid waste collection, transportation, and disposal.

7.1.1 Cyclones and Storm Surges

Satkhira frequently experiences severe cyclonic storms, including Cyclone Amphan (2020), Cyclone Fani (2019), and Cyclone Sidr (2007), which caused significant disruptions in municipal services. Cyclones bring heavy rainfall, strong winds, and storm surges, leading to widespread damage to roads, drainage systems, and municipal waste collection infrastructure.

During cyclones, waste is dispersed into water bodies and streets, blocking drainage systems and exacerbating urban flooding. The lack of secure waste containment facilities further worsens the problem, as uncollected waste is washed into rivers and canals, causing water contamination and public health risks.

7.1.2 Heavy Monsoon Rainfall and Flooding

Satkhira receives high annual rainfall ranging between 1,800-2,500 mm (71-98 inches), with the monsoon season (June to October) contributing the majority of precipitation. Prolonged heavy rains overwhelm drainage networks, resulting in waterlogging and urban flooding.

During floods, waste collection services are severely disrupted, as trucks and rickshaw vans cannot operate in submerged areas. As a result, residents are forced to dispose of waste in open drains, roadsides, and vacant lands, creating unsanitary conditions and increased pollution levels.

The Biner Pota landfill site, which serves as the primary waste disposal site, becomes unstable during floods, leading to leachate leakage and the spread of untreated waste into surrounding areas. This further exacerbates soil and water contamination.

7.1.3 Salinity Intrusion and Groundwater Contamination

Due to its coastal location and rising sea levels, Satkhira experiences salinity intrusion in both soil and groundwater sources. This issue worsens during the dry season when freshwater availability decreases. Salinity exposure affects landfill stability, accelerating the decomposition of organic waste and increasing toxic leachate formation.

Saline conditions also damage waste collection vehicles and infrastructure, corroding metal parts, storage containers, and drainage pipes. This results in higher maintenance costs and operational inefficiencies for municipal waste management services.

7.1.4 Extreme Heatwaves and Waste Decomposition

Satkhira experiences extreme summer temperatures exceeding 40°C (104°F) in April and May. High temperatures accelerate the decomposition of organic waste, increasing odor issues and pest infestations. The lack of proper waste covering at the landfill site exacerbates the release of methane gas, contributing to air pollution and greenhouse gas emissions.

7.2 Challenges in Waste Management Due to Climate-Extreme Events

7.2.1 Disruptions in Waste Collection and Transportation

Some disruptions in the waste collection and transportation of Satkhira Paurashava that are caused by climate-extreme events are outline below.

i. Flooding and waterlogging prevent trucks and rickshaw vans from collecting waste, forcing residents to dump waste in drains, rivers, and roadside areas.

ii. Cyclonic storms cause damage to waste collection vehicles, leading to prolonged service disruptions.

iii. Extreme heat accelerates the decay of waste in collection points, leading to higher health risks for waste workers due to exposure to biohazards.

7.2.2 Landfill Vulnerability and Contamination

The following are some of the vulnerabilities and contamination caused by climate-extreme events.

i. The Biner Pota landfill lacks a leachate collection system, resulting in the seepage of hazardous waste liquids into groundwater sources.

ii. Unsecured landfill waste is dispersed by storm surges and high winds, increasing environmental contamination.

iii. Salinity intrusion weakens landfill containment, accelerating degradation and making waste treatment processes ineffective.

7.2.3 Public Health and Environmental Hazards

The following are some of the public health and environmental hazards due to the improper waste management caused by climate-extreme events.

i. Uncollected waste mixes with floodwaters, leading to vector-borne diseases such as dengue, cholera, and typhoid.

ii. Poor drainage due to plastic and organic waste blockage worsens urban flooding, affecting low-income communities the most.

iii. Burning of uncollected waste increases air pollution, worsening respiratory illnesses, especially among vulnerable populations.

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

This chapter discusses the current waste value chain in Satkhira Paurashava and possible initiatives that can be taken to improve the entire waste management system, while generating revenue, recycling, and well as involving NGO support.

8.1 Waste Value Chain in Satkhira Paurashava

The waste value chain in Satkhira Paurashava is characterized by a linear disposal system, where most waste is collected, transported, and dumped without structured segregation or recycling. The absence of an integrated waste management system leads to high landfill dependency, environmental pollution, and missed economic opportunities.

Key components of the waste value chain include waste generation, collection, sorting, processing, and final disposal. Currently, informal waste pickers and small-scale recyclers play a major role in extracting valuable materials such as plastic, metal, and paper, but there is no organized system to support waste recovery at scale.

Strengthening the waste value chain requires investments in waste segregation infrastructure, improved collection efficiency, and the establishment of material recovery facilities (MRFs). Additionally, the paurashava should focus on integrating informal waste collectors into the formal economy, providing them with legal recognition, financial incentives, and access to better working conditions.

8.2 Recycling and Business Model Opportunities

The two most prominent categories of waste identified are plastics and organic matter. Thus, it goes without saying that major focus is needed in managing these two categories of waste, while also incorporating models to handle other types of waste along the value chain.

8.2.1 Plastic Waste Recovery and Recycling

Plastic waste recycling in Satkhira Paurashava is currently informal, with waste collectors manually separating plastics for resale. Approximately 70% of plastic waste is recyclable, yet there is no structured collection system to efficiently integrate with major recycling plants.

Challenges in plastic waste management include unregulated informal sector participation, lack of waste sorting at the source, and limited access to plastic processing facilities. Due to these constraints, a significant portion of plastic waste ends up in landfills or is burned in open spaces, contributing to air pollution and environmental degradation.

To improve plastic waste recovery, the paurashava should consider collaborating with recycling industries, introducing incentive-based plastic buyback programs, and investing in plastic shredding and repurposing units to create recycled products such as tiles, road materials, and

eco-friendly packaging. Establishing community-based collection points could also facilitate better waste segregation at the source and reduce contamination of recyclable plastics.

8.2.2 Organic Waste and Composting Potential

Despite 74% of municipal waste being organic, no composting facilities exist in Satkhira Paurashava. The high proportion of organic waste presents a major opportunity for developing composting and biogas generation projects, which could reduce landfill dependency and create alternative revenue streams.

Organic waste from markets, food vendors, and agricultural produce can be processed into compost for agricultural use or converted into biogas for energy generation. However, key barriers include the lack of a structured composting facility, absence of waste segregation at the source, and limited funding for composting infrastructure.

To address these challenges, the paurashava could initiate pilot composting projects in key markets and urban centers, encouraging local farmers to utilize compost as a soil enhancer. Additionally, collaborations with NGOs and private investors can help establish a waste-to-energy framework, where organic waste is used to generate biogas for municipal or industrial use.

8.2.3 Private Sector Opportunities in Waste Management

The private sector has a significant role in strengthening waste management operations through investment, innovation, and technology-driven solutions. A public-private partnership (PPP) model could introduce modern waste collection, sorting, and recycling services, improving overall efficiency.

Currently, the lack of capital investment remains a major barrier to establishing a structured waste-to-energy or composting system. However, financial incentives and policy reforms could encourage private enterprises to participate in waste recovery efforts. Some potential business models include:

- Franchise-Based Waste Collection Services – Allowing private companies to manage door-to-door waste collection in designated zones, improving efficiency.
- Material Recovery Facilities (MRFs) – Establishing centralized MRFs where plastics, paper, and metals are sorted and processed for resale.
- Composting and Biogas Enterprises – Encouraging agricultural entrepreneurs to invest in compost production and energy companies to explore biogas generation from organic waste.
- Incentivized Recycling Programs – Implementing cash-back or rewards programs for households and businesses that participate in waste segregation and plastic recycling.

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 Satkhira Paurashava. Despite efforts to address these issues, challenges persist in ensuring equitable participation and opportunities for women and people with disabilities. This chapter explores the existing dynamics and highlights areas for improvement.

9.1 Gender Roles in Waste Collection

Women play a limited role in waste management in Satkhira Paurashava, primarily engaging in street sweeping, cleaning, and secondary waste collection. However, they are rarely involved in waste transportation, landfill operations, or managerial positions within the waste sector. This gender disparity is due to traditional social norms, lack of skill-based training, and limited access to financial resources. Expanding opportunities for women in SWM through capacity-building programs and micro-enterprise development could enhance their inclusion. The paurashava should focus on:

- Providing skill-based training for women in waste segregation, recycling, and composting techniques.
- Encouraging female participation in leadership roles within municipal waste management committees.
- Creating financial support schemes for women-led waste collection enterprises.
- Ensuring workplace safety and gender-sensitive policies for female waste workers.

Case studies from other municipalities suggest that women-led recycling initiatives and community-based waste programs have resulted in higher efficiency, increased household participation, and better waste segregation practices.

9.2 Disability Inclusion in Waste Management

There are no structured efforts to integrate persons with disabilities into SWM activities in Satkhira Paurashava. Waste management jobs are often physically demanding, and no accommodations have been made to provide alternative roles or assistive infrastructure.

To promote disability inclusion, the paurashava should focus on:

- Creating accessible employment opportunities in waste sorting, data entry for waste tracking systems, and recycling initiatives.
- Providing vocational training for persons with disabilities in waste-related industries such as plastic repurposing, compost production, and repair of recyclable materials.
- Ensuring workplace accessibility by adapting municipal waste facilities to accommodate workers with disabilities.

10. RECOMMENDATIONS FOR INTERVENTION

To address the identified challenges in waste management within Satkhira Paurashava, the following interventions are proposed.

10.1 Infrastructure Development

Establishing a waste transfer station will significantly improve waste collection efficiency by allowing temporary storage and better-organized transportation to disposal sites. Currently, uncollected waste is often dumped in open spaces, leading to environmental and health hazards. A well-structured transfer station will help streamline waste movement, particularly during peak waste periods.

Upgrading the Biner Pota landfill is crucial to ensuring sustainable waste management. The landfill requires proper leachate control systems to prevent hazardous waste liquids from contaminating groundwater. Additionally, implementing waste covering mechanisms will help control odor, prevent pest infestations, and reduce waste dispersion during extreme weather conditions.

Developing composting and recycling facilities is essential for reducing landfill dependency. Establishing composting units will allow organic waste to be processed into nutrient-rich compost, benefiting agriculture and reducing methane emissions. Furthermore, introducing Material Recovery Facilities (MRFs) will facilitate the sorting and recycling of plastics, metals, and paper, minimizing waste accumulation and promoting a circular economy.

10.2 Capacity Building and Public Awareness

Training waste workers on safe handling practices is necessary to improve workplace safety and operational efficiency. Providing Personal Protective Equipment (PPE) such as gloves, boots, and masks will protect workers from exposure to hazardous materials, while regular health and safety training sessions will ensure they adopt best practices in waste collection and disposal.

Community awareness programs on waste segregation can play a crucial role in improving household waste management practices. Conducting public campaigns will encourage residents to separate their waste into organic, recyclable, and hazardous categories. Additionally, introducing school and market-based education programs will raise awareness about responsible waste disposal, fostering a culture of environmental responsibility from an early age.

Stronger NGO and private sector involvement is needed to enhance recycling and composting initiatives. Collaborating with organizations specializing in sustainable waste management will help introduce innovative solutions, such as door-to-door recycling programs, composting workshops, and incentive-based participation schemes. These partnerships can also provide additional funding and technical expertise to improve waste management infrastructure.

10.3 Policy and Financial Improvements

Implementing structured financial planning will ensure sustainable funding for waste management operations. Developing a budgeted financial model will help allocate resources for waste collection, processing, and infrastructure improvements. Additionally, introducing waste collection fees for businesses and institutions will provide a steady revenue stream to support municipal waste services and ensure long-term sustainability.

Encouraging private sector investment in waste management will help modernize recycling, composting, and waste-to-energy initiatives. Establishing Public-Private Partnerships (PPPs) will attract investors interested in funding waste treatment plants and innovative disposal solutions. Moreover, offering tax incentives and subsidies for businesses that adopt sustainable waste practices will encourage greater participation in environmentally responsible waste management.

Introducing community-based waste incentives will promote responsible waste disposal at the household level. Implementing reward-based segregation programs will encourage residents to participate in waste sorting and recycling. Providing discounts on municipal services for communities that engage in sustainable waste practices can further incentivize responsible waste management behavior.

10.4 Addressing Operational Challenges in Waste Disposal

Satkhira Paurashava faces multiple challenges in waste disposal and landfill management, including leachate contamination, seasonal waste variations, inadequate waste covering, and limited segregation.

The Biner Pota landfill currently lacks a leachate collection system, allowing harmful waste liquids to seep into the soil, contaminating groundwater and posing serious environmental hazards. Installing a leachate treatment system is necessary to prevent toxic waste infiltration and ensure safer waste disposal.

Seasonal waste fluctuations, particularly during peak agricultural and market waste periods, overwhelm waste collection services, leading to increased illegal dumping. Introducing adaptive waste collection schedules and increasing vehicle availability during high-waste periods will help address this issue and prevent accumulation.

Proper landfill covering is a significant concern, as waste at Biner Pota is only covered weekly, resulting in odor, pest infestations, and airborne disease risks. Implementing daily waste covering protocols and installing protective waste barriers will minimize exposure, improving sanitation conditions at the landfill.

Waste segregation remains a critical gap in Satkhira's waste management system, as there is no formal policy requiring households or businesses to separate waste at the source. This lack of segregation hinders recycling and composting initiatives, leading to increased landfill dependency. Developing a structured waste segregation policy and setting up designated waste collection bins for organic, recyclable, and hazardous waste will significantly improve waste processing efficiency.

10.5 Climate Adaptation and Resilience Strategies

Implementing flood-resilient waste management infrastructure will improve waste collection efficiency during extreme weather conditions. Elevating waste storage facilities in flood-prone areas will prevent waste contamination during waterlogging. Additionally, designing waste transport routes that avoid waterlogged streets will ensure continuous collection services, even during heavy monsoons.

Establishing emergency waste collection protocols will help mitigate disruptions caused by climate disasters. Setting up temporary waste storage sites during cyclones and floods will prevent waste overflow in urban areas. Additionally, deploying rapid response waste collection teams post-disaster will help restore sanitation services efficiently.

Promoting waste-to-energy solutions will contribute to long-term sustainability by reducing landfill waste while generating renewable energy. Converting organic waste into biogas will provide an alternative energy source for municipal operations and local industries. Encouraging plastic-to-fuel initiatives will help manage non-biodegradable waste effectively while reducing dependence on fossil fuels.

10.6 Potential SWM Sites and Proposed Activities

As part of the efforts to strengthen solid waste management in Satkhira Paurashava, several potential sites have been identified across different wards for infrastructure development and service improvement. The focus of these planned interventions is to enhance waste collection, disposal efficiency, and environmental hygiene through targeted actions such as waste bin installation, drainage system improvement, and development of waste processing infrastructure

Table 6.4: Proposed Potential SWM Intervention Sites and Activities

Potential SWM Sites Upazila: (Satkhira Municipality) Satkhira Sadar, District: Satkhira			
SL	**Ward**	**Potential Site**	**Planned/Proposed Activities**
1	1 No. ward	Katia town bazar	Waste bin installation/ Improving drainage system
2	4 No. ward	Borobazar	Waste bin installation
3	7 No. ward	Itagacha bazar	Waste bin installation
4	9 No. ward	Kadomtola bazar	Waste bin installation
5	All wards (except-8)	Pransayor khal	Waterbody clean up & management
6	2 No. ward	Razzak park, Rajarbagan college campus	Waste bin installation
7		Binerpota waste dumping point	Improvement management (building necessary infrastructure)

8		Binerpota plastic shredding plant	establishing necessary infrastructure like segregation chamber, WASH block
9		Satkhira municipality	Providing waste collection van/ Installation of concrete dustbin at different areas
10	8 no. ward	DC office compound	Waste bin installation
		Adjacent area of DC office	Waste bin installation

In Ward 1, the proposed activity at Katia Town Bazar includes waste bin installation along with drainage system improvements to support proper waste disposal and reduce clogging issues. Similarly, Borobazar in Ward 4, Itagacha Bazar in Ward 7, and Kadomtola Bazar in Ward 9 are recommended for waste bin installation.

For a broader environmental intervention, Pransayor Khal, which covers all wards except Ward 8, has been identified for waterbody clean-up and management. This initiative aims to prevent the dumping of waste into natural water channels.

In Ward 2, Razzak Park and Rajarbagan College Campus are selected for waste bin installation, focusing on public spaces where waste accumulation is common.

The Binerpota waste dumping point, located near the municipal jurisdiction, has been proposed for infrastructure improvement and necessary facility development to better manage waste accumulation at the site. Additionally, the Binerpota plastic shredding plant may be upgraded with segregation chambers, WASH blocks, and related infrastructure to improve plastic waste processing capacity.

The plan includes providing a waste collection van and installing concrete dustbins at multiple locations across Satkhira Paurashava to ensure better waste coverage. Furthermore, the DC office compound and its adjacent area in Ward 8 have also been listed for waste bin installation to enhance waste management in government premises.

These proposed interventions are expected to fill critical gaps in the current waste management system of Satkhira Paurashava by improving collection efficiency, ensuring proper waste disposal, and promoting better hygiene across both public and institutional spaces.

11. CONCLUSION

The solid waste management system in Satkhira Paurashava remains challenged by limited infrastructure, fragmented service coverage, high organic waste content, and weak coordination among stakeholders. This study, grounded in 160 household surveys, key informant interviews, FGDs, laboratory analyses, and observational assessments, offers a comprehensive understanding of these gaps and outlines pathways toward building a more resilient and sustainable system.

The municipality currently generates approximately 27–28 tonnes of waste per day, of which only 17–18 tonnes are collected. This leaves 9–10 tonnes of waste uncollected daily, leading to widespread illegal dumping, clogged drains, and public health risks. Organic waste dominates the waste stream, constituting 74–81% of household waste. Despite this potential, there are no formal composting facilities or initiatives for community-scale biogas production, and waste is rarely segregated at the source, limiting its reuse or treatment options.

Plastic waste, accounting for around 11–12% of total generation, remains underutilized as a resource. Informal waste pickers play a key role in plastic recovery, but without formal infrastructure, recognition, or safety provisions. The Binerpota Plastic Shredding Plant is a critical node in the plastic waste value chain, but remains underdeveloped, with no formal Material Recovery Facility (MRF) in operation. An estimated two tonnes of recyclable material are left unrecovered every day. Meanwhile, inorganic waste—including metals, paper, and mixed market refuse—continues to be openly dumped or burned, especially in commercial and institutional areas, exacerbating air pollution and soil degradation.

Infrastructure deficiencies persist across the board. None of the municipality's eight to nine vans are operational, and current waste collection relies only on two trucks and two Nosimons, which are inadequate for covering all nine wards. Waste workers, numbering 113 including 15 women, operate without access to PPE or structured training, increasing occupational risks and reducing efficiency. Water bodies such as Pransayor Khal remain polluted from unmanaged waste dumping, while the Binerpota dumping site lacks leachate control and safe access routes, making it highly vulnerable to seasonal flooding and long-term environmental degradation.

To address these interlinked challenges, a multi-pronged approach is required. Infrastructure development should prioritize the establishment of waste transfer stations, improved road access, and climate-resilient landfill boundaries. Composting units in market zones and door-to-door source segregation with color-coded bins can dramatically improve organic waste recovery. Plastic waste management should shift from informal recovery to a structured, municipality-supported system that includes buyback models, local recycling partnerships, and value-added plastic processing. There is a need to unlock green business opportunities through compost marketing, plastic-based enterprises, and biogas ventures to ensure financial sustainability and circularity.

Social inclusion and behavioral change must also be embedded in system design. Women waste workers and informal collectors need to be formally recognized and equipped with safety gear, credit access, and legal protections. Persons with disabilities should be included in back-end processes like administrative roles or sorting tasks. Awareness campaigns and training programs

for households, markets, and institutions are necessary to instill good practices and long-term cooperation.

Ten priority sites across Wards 1, 2, 4, 7, 8, and 9, as well as municipal hubs such as the Binerpota facility and DC office compound, have been identified for immediate interventions. These include the installation of dustbins, drainage improvements, site upgrades, and service expansion. With adequate policy support, public-private partnerships, and community participation, Satkhira Paurashava has the opportunity to transition from a vulnerable, overstretched system to a resilient, inclusive, and circular solid waste management model. This transition is not only urgent but entirely feasible.