Terms of Reference (ToR)

Preparation of Detailed Feasibility Studies (DFS) on Waste-to-Energy (WTE) Projects (Bio Gas plants) in Selected Western Municipalities (Cluster 2)

1. Introduction:

The World Bank has been supporting the development of Nepal's large scale biogas sector for more than a decade. Through its flagship initiatives, including the Scaling Up Renewable Energy Program and the Nepal Private Sector Led Mini Grid Program, the World Bank is supporting Alternative Energy Promotion Centre (AEPC) in Nepal and has facilitated the development of over twenty-two municipal and industrial waste to energy plants across the country. These investments have contributed to strengthening Nepal's renewable energy portfolio, reducing methane emissions from unmanaged waste streams, and demonstrating viable public private partnership models for waste to energy infrastructure.

The Green Climate Fund (GCF) has approved a concept note submitted by the Alternative Energy Promotion Centre (AEPC) to support the promotion of large-scale biogas and waste-to-energy systems in Nepal. A full funding proposal is now being prepared for submission to the GCF. To support this initiative, detailed feasibility studies (DFS) are required for 12 municipalities in Nepal. One DFS will be supported by the Food and Agriculture Organization (FAO), while the World Bank will support the DFS for the remaining 11 municipal sub-projects.

Towards the objective of developing Nepal's large scale waste to energy sector AEPC has identified additional eleven municipalities for development of large-scale waste to energy plants which would be supported under a newly proposed Green Climate Fund (GCF) funded project. Building on this long-standing engagement, the World Bank intends to continue its assistance for the sector through support for preparation of detailed feasibility studies for these additional waste to energy projects. This assistance is aimed at generating high quality technical, financial, environmental, and institutional analyses required to formulate a robust GCF Full Funding Proposal. The studies will also help establish a consistent pipeline of bankable waste to energy projects that can

attract climate finance, mobilize private sector participation, and enhance municipal service delivery.

From a broader sectoral perspective, this collaboration reinforces the strategic alignment between the Government of Nepal, AEPC, the World Bank, and the GCF in advancing low emission, climate resilient urban infrastructure. By strengthening analytical foundations, clarifying investment pathways, and supporting municipalities to transition toward sustainable waste management systems, the initiative is expected to contribute to national climate targets, reduce environmental burdens, and catalyze scalable waste to energy solutions across Nepal.

In line with this plan, AEPC aims to prepare Detailed Feasibility Studies covering eleven (11) municipalities. The DFSs will form the core evidence base for:

- *Strengthening the climate rationale and adaptation outcomes;*
- *Demonstrating financial additionality and concessionality justification;*
- *Structuring a Results-Based Payment (RBP) mechanism;*
- *Addressing ESS and gender requirements; and*
- *Ensuring replicable, sustainable, and scalable WTE models within AEPC's accreditation scope.*
- *Identification of long- term off-takers and potential off-*
- *take agreements of waste to energy*

The DFS will be developed in line with the GCF endorsed concept note, AEPC Feasibility Study Guidelines for Municipal Solid Waste plants and the World Bank supported Mini Grid Energy Access Project and relevant national environmental and safeguard frameworks.

2. Background:

Urban waste management has become a critical environmental and climate challenge in Nepal. With rapid urbanization and limited landfill capacity, municipalities are struggling to handle increasing volumes of organic solid waste. This waste contributes significantly to methane emissions, which account for roughly 11–15% of national GHG emissions from the waste sector. Despite proven success of rural biogas systems, municipal-scale waste-to-energy (WTE) solutions remain underdeveloped due to fragmented institutional arrangements, limited private sector participation, and inadequate financial and technical capacity at local levels.

The proposed GCF-funded project aims to address these barriers by promoting **municipal-scale WTE systems** that convert organic waste into biogas and renewable

energy, while strengthening local governance, PPP modalities, and resilience co-benefits.

List of Selected Municipalities
The DFSs will be prepared for the following municipalities, as mentioned below:

Cluster 2 (Western, 5 Local Levels)

1. Pokhara, Kaski, Population 513,504
2. Butwal, Rupandehi, Population 194,335
3. Tulsipur, Dang, Population 179,755
4. Nepalgunj, Banke, Population 164,444
5. Bhimdutta, Kanchanpur, Population 122,320

3. Objectives:

3.1 Overall Objective
To conduct a comprehensive feasibility study for the selected municipal waste-to-energy systems under Cluster 1(Eastern with 6 local levels) that demonstrate technical viability, financial soundness, environmental and social sustainability, and alignment with GCF's climate action investment criteria.

3.2 Specific Objectives
- Technical Feasibility: Determine the biogas generation potential, technology design, and process engineering suitable for each municipality.
- Climate Rationale: Establish climate mitigation and adaptation benefits using robust data, observed trends, and vulnerability assessments.
- Financial and Economic Analysis: Assess project economics, justify GCF concessional finance, and prepare financial models including long term off-taker analysis, RBP and co-financing structures.
- Environmental and Social Safeguards: Undertake environmental and social screening, IEE/ESMF preparation, gender and social inclusion analysis, SEAH and IPPF frameworks.
- Institutional and Legal Assessment: Define roles of AEPC, municipalities, and private partners under PPP arrangements and within AEPC's accreditation scope.

- Risk and Market Analysis: Identify market, technical, operational, and institutional risks with mitigation strategies.
- Replication and Scale-up: Propose a replicable WTE investment model and sustainability roadmap consistent with GCF's paradigm-shift criteria.

4. Scope of the Task:

The consultant shall carry out a comprehensive feasibility study for this cluster of selected municipalities covering the following key components:

A. Baseline and Data Collection

- Quantify municipal solid waste generation, collection, and disposal practices.
- Conduct waste characterization studies to determine organic content.
- Assess seasonality, climate, water availability, geology, and population trends affecting waste quantity and quality.
- Map existing waste collection systems, landfill sites, and transport routes.

B. Technical Assessment

- Assess substrate supply chain and organic waste availability.
- Evaluate digestion technology options (wet/dry, batch/continuous, mesophilic/thermophilic) and select the most appropriate system.
- Develop process flow diagrams, sizing calculations, and system layouts (including 3D layout, PFD, and SLD).
- Assess construction feasibility, required area, and access logistics.
- Evaluate potential energy output (biogas, electricity, heat) and by-product utilization (bio-slurry, compost).

C. Institutional and Organizational Assessment

- Review existing municipal structures for waste management.
- Propose operational and management arrangements for plant ownership, operation, and maintenance.
- Identify capacity-building and training needs for municipal and plant personnel.
- Identify long term offtakers of waste to energy

D. Financial and Market Analysis

- Prepare cost estimates and Bill of Quantities (BoQ).
- Conduct financial modeling including CAPEX, O&M, IRR, NPV, and payback analysis.
- Identify potential financing sources (public-private, municipal funds, carbon finance, etc.).

- Conduct market assessment for electricity, biogas, and fertilizer sales.

E. Environmental and Social Safeguards

- Conduct *Initial Environmental Examination (IEE)* following national EIA regulations.
- Undertake *Environmental and Social Screening* as per AEPC's requirement.
- Identify gender and social inclusion considerations.
- Recommend environmental management and mitigation measures.

F. Risk Assessment

- Identify potential technical, financial, regulatory, environmental, and social risks.
- Assess the likelihood and impact of each risk.
- Propose mitigation and contingency strategies.

G. Recommendations and Implementation Plan

- Recommend the most feasible technology and project model.
- Propose project implementation schedule and phasing.
- Provide a roadmap for next steps including financing, permitting, and partnership models.

H. Stakeholder Consultations / Workshops

Effective stakeholder consultation/workshop with the involvement of key stakeholders of each municipality and AEPC need to be conducted. The cost of the consultation/workshop will be managed by the selected consultant.

I. Hydrological Survey (Only if required)

The consulting firm shall be required to carry out a hydrological survey of the proposed site where the location identified by the municipality for the waste to energy project is situated in proximity to a riverbank. In such cases, the consulting firm shall submit a hydrological survey report to AEPC, prepared in accordance with applicable standards and guidelines.

5. Duration of the Assignment:

The study shall be completed within **five (5) months** from the date of contract signing. A detailed timeline of activities including inception, data collection, draft reporting, and final submission shall be finalized in consultation with AEPC and concerned municipalities.

6. Deliverables:

Stage	Deliverable	Description	Timeline
1	**Inception Report**	Methodology, work plan, and preliminary site assessment	Within 3 weeks
2	**Draft Feasibility Report**	Including technical design, financial analysis, IEE, and safeguards	Within 3 months
3	**Final DFS Report**	Revised based on AEPC/municipality feedback, with all appendices and drawings	Within 5 months

Submission Requirements:

- Draft: 1 hard copy + 1 electronic copy
- Final: 3 hard copies + 1 electronic copy

8. Type of Contract and Mode of Payment

8.1 Type of Contract:

The contract will be Lump-sum and payment will be made as per milestone mentioned in the mode of payment.

8.2 Mode of Payment:

- **First Installment:** Maximum 20% upon submission and acceptance of the Inception Report.
- **Second Installment:** Maximum 60% upon submission and acceptance of Draft DFS.
- **Final Payment:** Remaining of the contract amount upon submission and acceptance of Final DFS

9. Human Resource Requirements for each cluster

Position	Qualification	Experience
Key Experts		

Team Leader/WTE Specialist	Master's in Energy/Environment/Engineering/Economics	≥10 years in renewable energy project design and feasibility
Climate and Environmental Expert	Master's in Environmental Science/Engineering	≥5 years in environmental assessment
Social & Gender Expert	Master's in Sociology/Social Science	≥5 years in social safeguard and inclusion studies
Field Engineer	Master's in Engineering/Energy/Environment	≥3 years, preferably with biogas experience
Financial and PPP Analyst	MBA or equivalent	≥5 years in financial modeling and business planning
GIS / Waste Data Analyst	Master's in Geomatics or equivalent	≥5 years in relevant field
Hydrological Expert (If required)	Masters in Hydrology, Water Resources Engineering or Environmental Engineering	≥5 years in relevant field
Non-Key Staffs		
Waste Enumerators	Bachelor's in Engineering or Environment	≥2 years in data collection and field survey
Support/Admin Staff	Bachelor's in any discipline	≥1 year in administrative support

All team members must provide signed CVs and commitment letters.

10. Required Documents from Consultant

- Cover letter for submission of Expression of Interest (EoI), need to indicate clearly about the applied cluster of the proposed task
- Firm/Company Registration Certificate (with updated renewed)
- VAT/PAN Certificate
- Tax Clearance Certificate of FY 2081/82 or Evidence of Income Tax Return or Evidence of Time extension for Income Tax Return for FY 2081/82
- Power of Attorney for authorized signatory
- Self-declaration of eligibility

- Profile of Key Human Resources (During EoI Stage) and Signed CVs of proposed experts (During RFP Stage only)
- Documents to demonstrate:
    - General work experience within the last 10 years
    - Specific work experience within the last 10 years
    - Technical and Managerial capacity of the Consulting Firm

11. Reporting and Coordination:

The consultant shall work closely with AEPC's technical division and designated municipal focal points. AEPC will provide guidance, approve methodologies, and review draft outputs. Regular progress meetings will be held to ensure alignment and quality assurance.

12. Consultant Selection Method:

A Consultant for each cluster will be selected in accordance with the **Consultants Qualifications-based Selection (CQS)** method set out in the prevailing Procurement Regulations of the World Bank.