



Alternative Energy Promotion Centre, Nepal

Ministry of Science, Technology and Environment, Government of Nepal

COMMERCIAL BIOGAS PLANT FEASIBILITY STUDY REPORT FORMAT



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Contact details

Name of organisation	
Activity	
Address	
Contact name	
Contact number	
Email address	



COMMERCIAL BIOGAS PLANT – FEASIBILITY STUDY REPORT

1. INTRODUCTION

1.1 Executive summary



1.2 Scope of the project

What is the goal of the project?

Where is the project being implemented?

What are the end uses of biogas and slurry?

What are the project limitations?

What type of digester will be installed? Single or multiple stage?

1.3 Aims

1.3.1 Aim of the study and specific objectives:

What is the aim of the study?

What are the specific objectives of the study?



1.3.2 Aims and objectives for different stakeholders

Stakeholder	Objective



2. INVENTORY OF CURRENT FRAMEWORK CONDITIONS

2.1 Data collection

2.1.1 Climate:

Climate (please describe area climate briefly)	
Maximum yearly temperature	
Minimum yearly temperature	

2.1.2 Seasonality:

Does the substrate availability vary seasonally? Please describe how.

How will seasonal variation affect the performance of the biogas plant? Can seasonal variation be compensated?

What is the organisation's projected growth? How will it affect substrate availability?



2.1.3 Natural resources:

Define source of water:

Hand pump	Well	River	Boring	Natural sources
				X

Define sustainable quantity of water available:

Q water (m ³ /day)	
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Owner of water source? Could it be an issue? Has it been a cause of conflict in the past?	
What is the distance between the biogas plant and the water source?	
What are the organisation's priorities for water usage? Please define	
Are the potential locations for the digester in a sun-heated area?	

2.1.4 Geology and location:

What is the community location? Please define GPS location below:

N	
E	
Altitude (m)	



Are there good transport links to the location?	
Distance to nearest market?	

Note 1: If biogas or electricity is to be sold to the local community or nearby business, please fill in the following table and show the landmarks in the map below:

Distance to the local community	
Distance to nearby business/industry (1)	
Distance to nearby business/industry (2)	
Distance to nearby business/industry (3)	

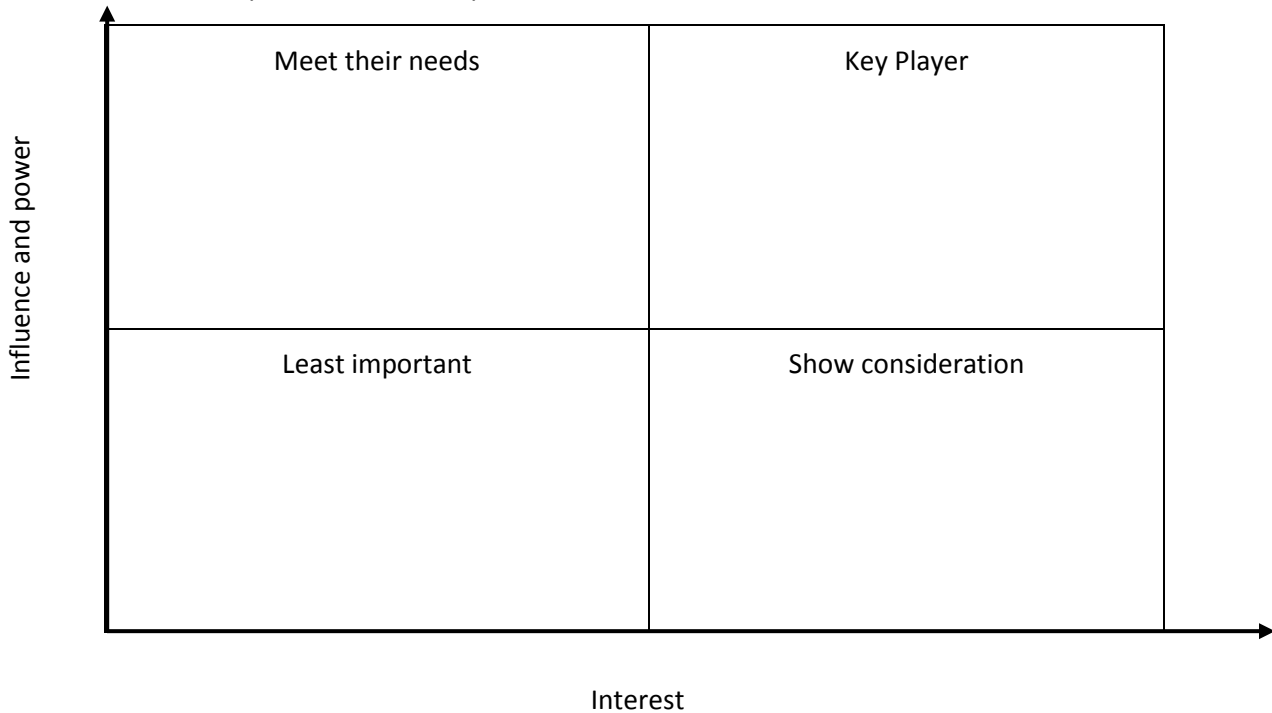
Please include a map of the area where the plant will be installed (a googlemaps image would suffice) and a brief description of access to transport links and local community or business if it applies (see Note 1 above):



2.1.5 Human background:

Who are the main authorities in the area? What is their interest in the biogas plant?
What is the plan to meet their requirements?

Please place the relevant parties in the stakeholder matrix below:



Are there any religious, cultural or social barriers to the implementation of a biogas plant? If so, what are these and how can they be overcome?



2.2 Legislative framework

2.2.1 Legal framework and permit requirements

Which legal bodies need to be asked for permission or should be involved in the development of the project?

Is there a plan to support this type of projects?

Are planning permissions required? Has the local authority been approached?

Is there a land-lease agreement in place? How long for? Is land owned by the organisation?

Have there been examples in the past where similar projects have been implemented and could they be helpful?

2.2.2 Past examples, lessons learned.

Has there been any renewable energy projects in the past carried out in the same location? Did the previous projects succeed? If not, what are the lessons that could be learned?



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2.3 Economic framework

If intending to sell electricity to the nearby community, the following question needs to be answered, otherwise please skip: What is the average income of the community?

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Economic activity assessment (please only complete those below which apply to the project).

Number and distance to nearby farmers that could be potential fertilizer consumers?	
Current fertilizer price?	
Current price of electricity - commercial (NPR/kWh)?	
Current price of electricity - residential (NPR/kWh)?	
Current price of LPG cylinder?	
Current price of kerosene?	
Current price of diesel?	
Current price of wood?	
Current price of briquettes?	
Current price of charcoal?	

Based on the assessment above, an estimate of affordable biogas, electricity and fertilizer rates should be provided:

Fertilizer price from biogas plant?	
Cost of electricity from biogas plant? (NPR/kWh)	
Cost of biogas for cooking? (NPR/month)	

How will the existing economic activities be affected by the biogas plant?

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Based on the assessment above, an estimate of affordable biogas, electricity and fertilizer rates should be provided:

Fertilizer price from biogas plant?	
Cost of electricity from biogas plant? (NPR/kWh)	
Cost of biogas for cooking? (NPR/month)	

2.4 Energy

First please answer the following questions to determine what information is required.

Is biogas for self-consumption only?		
Is electricity for self-consumption only?		
Is the organization planning on selling electricity to the local community?		
Is the organization planning on selling biogas to the local community?		
Is the organization planning on selling electricity to the local businesses/industries?		
Is the organization planning on selling biogas to the local businesses/industries?		

2.4.1 Thermal energy consumption

2.4.1.1 Self-consumption:

Fuel	Daily	Monthly	Average cost (monthly)	Average collection time
Electricity (h)				
LPG Gas (cylinder)				
Kerosene (l)				
Wood (kg)				
Charcoal (kg)				
Dung (kg)				
Briquettes				



2.4.1.2 Community (only required if biogas sold to the nearby community):

Number of people to be supplied to in the local community	
Number of households	
Average number of people per household	
Average number of meals per day per household	

Fuels used for cooking (average per household, only required if biogas sold to the nearby community):

Fuel	Daily	Monthly	Average cost (monthly)	Average collection time
Electricity (h)				
LPG Gas (cylinder)				
Kerosene (l)				
Wood (kg)				
Charcoal (kg)				
Dung (kg)				
Briquettes				

2.4.1.3 Nearby industries/businesses (only required if biogas sold to the nearby industries):

Industry/business to be supplied to (1)	
Distance from biogas plant	
Current fuel used for heating/industrial purposes (please specify purpose of use as well as quantity)	
Cost of current fuel used for heating/industrial purposes	



Biogas equivalent required for heating (m3/day)	
Current fuel required for cooking	
Cost of current fuel used for heating	
Biogas equivalent required for cooking (m3/day)	
Industry/business to be supplied to (2)	
Distance from biogas plant	
Current fuel used for heating/industrial purposes (please specify purpose of use as well as quantity)	
Cost of current fuel used for heating/industrial purposes	
Biogas equivalent required for heating (m3/day)	
Current fuel required for cooking	
Cost of current fuel used for heating	
Biogas equivalent required for cooking (m3/day)	
Industry/business to be supplied to (3) (please specify purpose of use as well as quantity)	
Distance from biogas plant	
Current fuel used for heating/industrial purposes	
Cost of current fuel used for heating/industrial purposes	
Biogas equivalent required for heating (m3/day)	
Current fuel required for cooking	
Cost of current fuel used for heating	
Biogas equivalent required for cooking (m3/day)	



2.4.2 Electricity consumption:

In this section the FS shall describe the current electricity consumption of the institution or community.

Electricity demand for community or institutional purposes:

	Application	House/businesses/institution of use	No of units	Rating of each unit (W)	Hours run per day(h/day)	Current oil consumption for electricity generation (l/day)	Distance to biogas generator (m)	Cost per unit (Rs/kWh)	Electricity/month (kWh/month)
1	Lighting								
2	Heating/Cooling								
3	Water pumping								
4	Diesel generator for load shedding								
5	Productive use (please specify)								...
6	Other (please specify)								...
7	Other (please specify)								
...	...								
...	...								



2.5 Financial and Investment Assessment

The organisation conducting the FS shall describe how the project will be financed:

Total Investment required	
Government Support (NPR/m3)	
Government Support (NPR/kWh)	
Total Government Support	
Debt/equity/Government Support ratio	
Public Private Partnership details	
Foreign Investment contribution/Development partners (such as NGOs, iNGOs, international organisations, etc)	

Is the organisation willing to take a loan to finance the gap? How will this be repaid? Please provide a brief description.

Bill of Quantity and Estimates of Cost



3. ASSESSMENT OF FEASIBILITY

3.1 Organisational capability:

The purpose of this section is to determine the capability of the organisation for managing and operating the biogas plant.

3.1.1 Staffing and Operations

Who and how will be operating the plant?

What is the management structure and who owns the plant once commissioned? Will it be formalised and transparent?

Have the responsibilities of the managers and operators been clearly defined? How will they be regulated and accountability enforced?

If selling electricity to the grid, how will tariff collection be enforced?



How will income of the plant will be utilised?

What are the training requirements? When and how will these be done?

3.2 Location:

Is the location easy to access for construction?	
Is the location easy to access for routine operation?	
Is the biogas plant close to consumer points/generator?	
Is there an easy biogas or electricity route to consumer points?	
Are ground conditions favourable for building a biogas plant?	
Is the plant far enough from water courses?	
Is there enough area to build the biogas plant and associated process units (pretreatment, composting, etc)?	
Is the plant in a sun-heated area?	
Have photographs been provided?	

Please illustrate the answers to the above questions with the following:

Detailed description of the location below and how the questions above are addressed

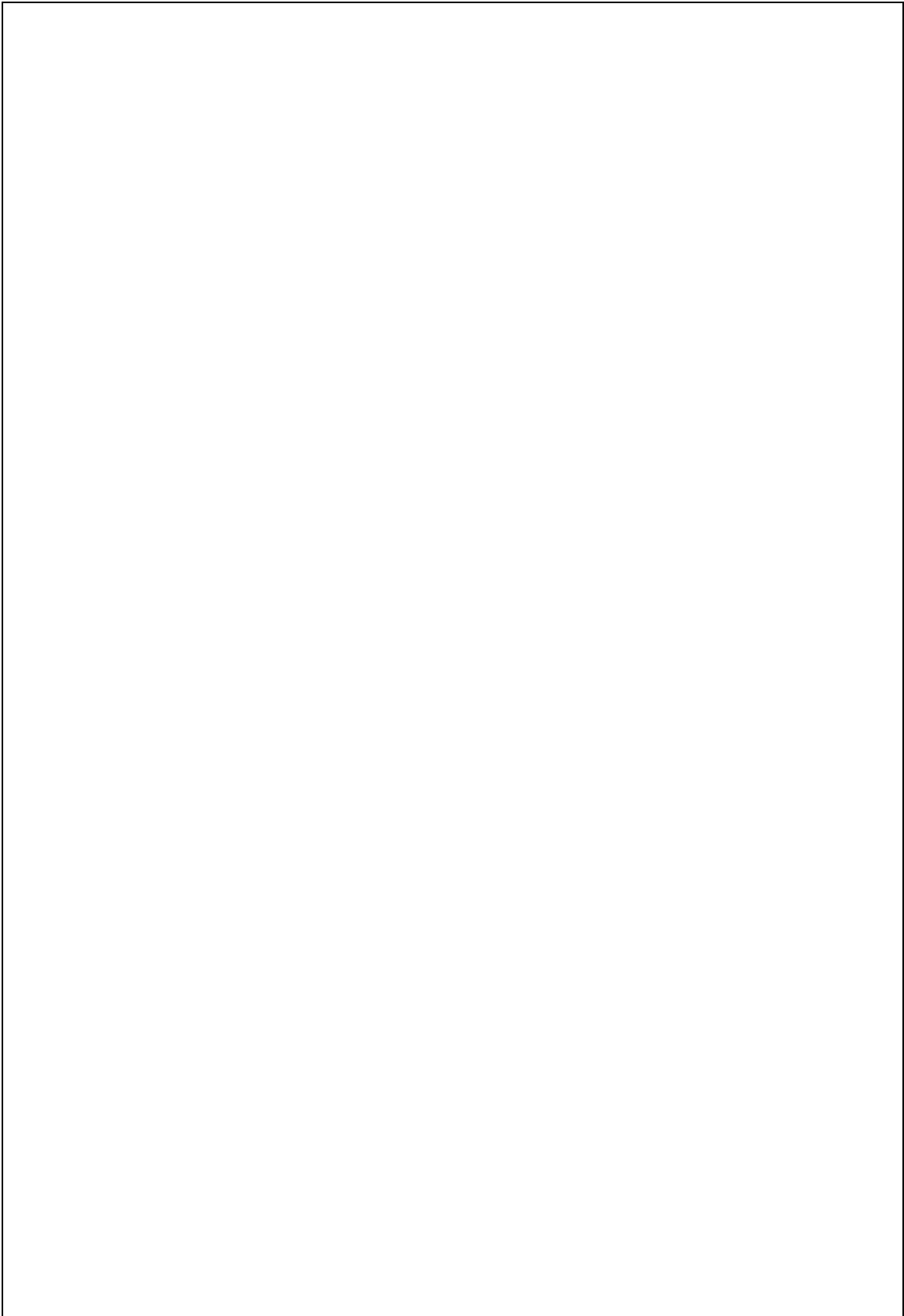
Photographs of the site for the various elements of the plant (feed and slurry chamber, any pre-treatment units if required, location of feedstock relative to biogas plant, biogas plant, pipeline route, compost pits, water trap, electrical transmission lines, etc), indicating, in the



photographs, where these elements are and reasoning for each particular location. In addition, please indicate rough site measurements in the photographs confirming adequacy of site selection:

Site layout schematics showing indicative services plan and dimensions of the area available and biogas plant.







3.3 Technical

3.3.1 Substrate supply chain:

Please only fill in those questions related to the project.

Nature of the organisation and location	
Population of the organisation	
Toilets to be connected to biogas plant? (If answer is No, please skip next 5 questions)	
Toilet condition (pit system, septic and soak pit system, temporary, long term).	
Toilet waste management system (flushed toilets, drainage system, septic and soak pit system, dumped, pit)	
Total no of toilet users/day	
Urine production (l/day)	
Excreta production (l/day)	
Is kitchen waste to be fed to the digester? If No then skip next question.	
Kitchen waste (kg/day)	
Poultry farm waste? If No then skip next 3 questions	
Number of small chicken?	
Number of medium size chicken?	
Number of big chicken	



Cattle farm waste? If no then skip next 4 questions	
Number of big cows?	
Number of medium size cows?	
Number of small cows?	
Number of calves?	
Pig farm? If No then skip next 3 question.	
No of big pigs?	
No of medium size pigs?	
No of small pigs?	
Other (please specify)	

Inhibition potential:



3.3.2 Process design:

—Type of biogas plant and justification for the selection of that technology.

- Technological option chosen: wet vs dry digestion, methane end use utilisation, multi-stage vs single stage digestion, operating temperature, continuous vs batch, etc).

Type of digestion		T	
Stage		Continuous/batch	

- Design and sizing criteria for all project processes. Biogas yield rate, electricity production rate, slurry production rates, thermal energy production rate. Operational parameters such as feed rate, pressure, temperature, biogas production, expected VS destruction, hydraulic retention time, water requirements for dilution, feed dry solids, pH, etc.



Size and volume of the biogas plant (including biogas storage), and description of other main unit processes for pre and post treatment (settlement, shredding, etc) and engine rating estimate if used for electricity generation.

- Process flow diagram (this is a schematic diagram showing all the main streams and their composition– i.e., mass and volume flowrate and dry solids, quantity of different feeds, etc) and main process parameters such as temperature or pressure. This shall include main process units:



3.3.3 Construction aspects:

Is there enough area and depth to build the plant?

Site plan drawing schematics, including borderline of the construction area:

Are ground conditions favourable to build the plant? Will underground water affect the biogas plant?

3.3.4 By-product use:

Each option should be assessed on its potential for the production and distribution of fertilizer or any other by-products from the plant.



3.4 Financial, commercial assessment and market study

3.4.1 Financial analysis

Costs and revenue

Capital investment costs (biogas plant and ancillaries)		
Construction labour costs		
Leasing costs (if required)		
Operational and maintenance costs	Labour	
	Water	
	Food for animals	
	Replacement parts	
Revenue streams	Connection tariff to biogas grid	
	Connection tariff to electricity grid	
	Biogas monthly fees	
	Fertilizer sales	
	Cooking fuel savings	
	Electricity savings	
	Chemical fertilizer savings	
	Diesel and other savings	
Other		
Other		
Other		



- Cash flow analysis
- Loan repayment period and assumed interest rate
- Key financial indicators: NPV, payback period, IRR.
- Other legal requirements from the developer:
 - Photograph and citizenship of the developer
 - Certificate of registration (renewal) and PAN
 - Tax receipts
 - Audit report of previous fiscal year.

Please provide a brief explanation of why the project is feasible or otherwise accounting for the findings from above.



3.4.2 Market study

Is there a market for the biogas products? Please describe briefly:

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3.5 Environmental and Social Impact:

3.5.1 Social Impact

SOCIAL MANAGEMENT FRAMEWORK SCREENING CHECKLIST

1. Title of the Sub project:			
1.1 Site Locality:			
1.2 Sub project activities:			
1.3 Contact Details:			
2. Impact on specific assets due to project intervention			
2.1 What are the asset(s) that would be affected due to Subproject Interventions? <input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Land <input type="checkbox"/> Physical Structure (dwelling or commercial) <input type="checkbox"/> Community Resources <input type="checkbox"/> Natural Resources (Water bodies/ Forest/ Public Pond) <input type="checkbox"/> Others (please specify)		
2.1.1 Land	Currently Owned	Private	Public
	Total Area		
	Land use		



	Additional requirement	Private	Public
	Total Area		
	Land use		
	Permanent/temporary		
	Land Procurement	<input type="checkbox"/> Voluntary Donation <input type="checkbox"/> Direct Purchase	<input type="checkbox"/> Voluntary Donation <input type="checkbox"/> Land Acquisition
	Presence of <input type="checkbox"/> Squatter/ <input type="checkbox"/> Encroacher/ <input type="checkbox"/> Leaseholder in Private/Public land: <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, <ul style="list-style-type: none"> • Total number of affected families: • Possibility of physical displacement: 		
Procurement Procedure for additional land:			
2.1.2 Physical Structures (Specify Private (P), Squatter (S), Encroacher (E), Leaseholder (L) etc)		Private	Public
	Houses to be resettled:		
	Community resources:		
	Commercial/ business structures:		
2.1.3 Is there any Community Resource Properties resources that might be affected due to project intervention?	Community Resource Property	No. of beneficiary households	



<input type="checkbox"/> Yes <input type="checkbox"/> No		
2.1.4 Is there any natural resources that might be affected due to project intervention? <input type="checkbox"/> Yes <input type="checkbox"/> No	Natural Resource	Dependent households
3. Impact in Livelihood		
<input type="checkbox"/> Yes <input type="checkbox"/> No (Specify Private (P), Squatter (S), Encroacher (E), Leaseholder (L) etc)	Impact	No. of families
	<input type="checkbox"/> Loss of shelter and housing structure <input type="checkbox"/> Loss of income source <input type="checkbox"/> Loss of grazing field <input type="checkbox"/> Loss of agricultural land <input type="checkbox"/> Others	
4. Impact on Trees and Crops		
4.1 Vegetation clearance <input type="checkbox"/> Private Land <input type="checkbox"/> Governmental Forest <input type="checkbox"/> Community Forest	Tentative number of trees to be felled: <ul style="list-style-type: none"> • Tree size _____ • Pole size _____ 	
4.2 Agricultural Crop/Fruit bearing trees loss (Specify Private (P), Squatter (S), Encroacher (E), Leaseholder (L) etc)	Agricultural Land	Horticulture (Fruits)
5. Vulnerable Groups		
5.1 Area there Vulnerable Groups (Adibasi/Janajati/Dalit/Women headed households residing within or adjacent to project site?	If yes, does project intervention affect these groups? <input type="checkbox"/> Land <input type="checkbox"/> Physical Structure	



<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Income generating activities
5.2 If yes, displacement of these people needed?	
5.3 Is there any way that proposed project may pose any threat to cultural tradition and way of life of vulnerable groups?	
5. Community Benefits from sub-project intervention	
<ul style="list-style-type: none"> • • • • • • 	
6. Perception toward project	
6.1 Community Perception toward project	<input type="checkbox"/> Positive <input type="checkbox"/> Negative

Recommendations



3.5.2 Environmental Impact

ENVIRONMENTAL MANAGEMENT FRAMEWORK SCREENING CHECKLIST

Project Brief

Company Name/ Registration/ Address	
Contact Details (Telephone, Email)	
Technology (type and capacity)	
Implementation approach (approach, schedule, institution involved, and stakeholders)	
Total Project Cost	

Environmental setting of the project locality

2.1 Location		
Location of the project (settlement/ ward/ VDC/ District)		
Adjoining/nearby settlement(s):		
Community facilities (school, playground, etc.):		
Is the project located in forest area or close to forest	Yes	No
If Yes,		
Name of forest		
Management regime		
Does vegetation need to be removed for the project? Give estimate?		
Permission to operate in the forest?		
Is the project located in the protected area or any protected area in	Yes	No



vicinity			
Is yes, please provide details on			
(a) name of PA			
(b) area to be acquired			
(c) distance to PA from the project site			
(d) access from the project to the PA			
2.2 Water sources/ water bodies			
Area there any water sources/ water bodies in and around the project site	Yes	No	
If yes provide details on			
Location/Type			
Use of water			
Potential impact by the project			
2.3 Air pollution			
Number and type of vehicles to be used per day			
Capacity of vehicles			
Condition of the road (asphalted, earthen)			
2.4 Land use			
Land required for the project and type of land use			
Facilities	Required Area	Land use type	Location
(1)			
(2)			



2.4.1 Impact due to land use change			
a) Loss of private land			
b) Loss of agricultural product			
c) Loss of private structures/community structures			
d) Loss of Forest and vegetation			
e) others			
2.5 Waste input for the project			
Define waste (type)			
Quantity of waste			
Location of collection			
Workers involved			
Legal clearance required			
2.6 Technology			
Type			
Capacity			
Components			
Gas production			
Liquid slurry production			
Solid slurry production			
Remarks			
2.7 Waste from the project implementation		Yes	No
Generation of solid waste? If yes,			
Are any wastes required to be stored on-site either for reuse or off-site disposal? If yes,			
Are effluents required to be discharged to a sewer or combined drainage system? If yes,			
2.8 Health and Safety Issues		Yes	No



a. Does project intervention affect health and safety condition?		
b. List out likely health and safety issues during construction period <ul style="list-style-type: none"> • Construction related accidents • Respiratory problem due to dusty environment/vehicular emission • others c. List out likely health and safety issues during implementation period <ul style="list-style-type: none"> • handling of slurry (with pathogens) • Intrusion of slurry into water source and thereby impacting community health (Pathogen contamination) • Accidents associated with firing and explosion • Spreading of diseases due to increased disease vectors, flies, mosquitoes etc. • others 		
2.9 Other observations		
Can vector disease spread to the adjoining settlements?		
Can foul odor affect the adjoining settlement?		
Slurry use (proposed)		

Recommendations



4. RISK ASSESSMENT

Risk	Likelihood	Consequence	Mitigation



5. RECOMMENDATIONS

A large empty rectangular box with a black border, intended for the user to enter their recommendations.



6. APPENDICES

This section is used to provide the detailed data on which the main text of the FS is based, and to provide extra information of interest to the readers of the FS. Items would normally include some of the following. This is a non-exhaustive list:

- Detailed Technical calculations (mandatory)
- Detailed financial and commercial calculations (mandatory)
- Market research findings (mandatory)
- Records of organisation meetings, surveys, feedback from interviews, etc. (mandatory)
- Other