ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA)

of

COMMERCIAL BIOGAS PLANT

in

Shivam Jaivik Khad Tatha Urja Pvt. Ltd,

Janakitola,

Jagarnathpur Rural Municipality

Parsa

Submitted To:

Shivam Jaivik Khad Tatha Urja Pvt. Ltd Janakitola, Jagarnathpur, Parsa	**Bioenergy Sub Component** **Alternative Energy Promotion Center, Kathmandu**

Prepared and Submitted By:

Innovative and Sustainable Technology Solution Pvt. Ltd.

Sankhamul, Kathmandu

October 2024

ACRONYMS AND ABBREVIATIONS

AD	Anaerobic Digester
AEPC	Alternative Energy Promotion Center
AVR	Automatic Voltage Regulation
BOD	Biological Oxygen Demand
CBG	Compressed Bio Gas
COD	Chemical Oxygen Demand
CHP	Combined Heat And Power
CSTR	Continuously Stirred Tank Reactor
DAG	Disadvantaged Group
DM	Dry Matter
DN	Diameter Nominal
DSCR	Debt Service Coverage Ratio
EIA	Environmental Impact Assessment
EPA	Environment Protection Act
EPR	Environment Protection Regulation
ESIA	Environment And Social Impact Assessment
ESP	Standby Power Rating
GPR	Guaranteed Performance Requirement
HP	Horse Power
HRT	Hydraulic Retention Time
INR	Indian Rupees
IRR	Internal Rate Of Return
ISTS	Innovative And Sustainable Technology Solutions
KVA	Kilo Volt Ampere
KW	Kilo Watt
KWH	Kilo Watt Hour
LCC	Local Control Center
MCC	Motor Control Centre
NEA	Nepal Electricity Authority
NOPAT	Net Operating Profit After Tax
NPV	Net Project Value
NRREP	National Rural And Renewable Energy Programme
NTFP	Non Timber Forest Product
PAT	Profit After Tax
PBT	Profit Before Tax
PCC	Portland Cement Concrete
PH	Potential of Hydrogen
PLC	Programme Logistic Control
PM	Particulate Matter

PRP	Prime Power
PVC	Polyvinyl Chloride
PVDF	PolyvinylideneDifluoride
RCC	Reinforced Cement Concrete
SLS	Solid Liquid Separate
SME	Small And Medium Enterprises
SREP	Scaling-up Renewable Energy Program
TPD	Tons Per Day
UV	Ultra Violet
VAT	Value Added Tax
VSS	Volatile Suspended Solids
WB	World Bank
ZOI	Zone of Influence

कार्यकारी सारांश

यस परियोजनाको उद्देश्य ६० TPD ठूलो आकारको बायोग्यास प्लान्ट निर्माण गर्नु हो जसले दैनिक करिब टन अर्गानिक फोहोर प्रयोग गर्ने र दैनिक ११२० केजी स्वच्छ प्राकृतिक ग्यास (बायो-सीएनजी) र १३.५ मेट्रिक टन कच्चा मल उत्पादन गर्ने छ। ।

प्रस्तावित बायोग्यास प्लान्ट जगरनाथपुर गाउँपालिका–३ पर्सामा निर्माण गरिने भएको छ। प्रस्तावित बायोग्यास प्लान्टले गाईको गोबर, पोल्ट्री फार्म, होटेलहरु बाट संकलन गरियक कुहिने फोहर र प्रेस मडलाई फिडस्टकको रूपमा प्रयोग गर्नेछ। यस परियोजनाबाट उपलब्ध सब्सट्रेट ६० टन/दिन बाट दैनिक २८०० घनमिटर कच्चा बायोग्यास उत्पादन गरिनेछ । उत्पादन भएको ११२० केजी प्रति दिन कम्प्रेस्ड बायोग्यासलाई बायो-सीएनजीको रूपमा बोतलमा राखेर नजिकका व्यवसायिक उद्योग तथा होटलहरूमा आपूर्ति गरिनेछ। तेसै गरि परियोजनाबाट उपउत्पादनको रूपमा कुल परिष्कृत ९.५ टन कम्पोष्ट मल उत्पादन गरिनेछ।

परियोजनाको कार्यान्वयनका लागि निर्माण गतिविधिहरूबाट निस्कने सम्भावित प्रदूषणहरू निर्माण सामग्रीहरूबाट हुने प्रदूषण, तरल पदार्थ, निर्माण सामग्री बोक्ने सवारी साधनबाट उत्सर्जन गर्ने ग्यास, धूलो र कणहरू आकलन गरियका छन्। त्यसैगरी सञ्चालनको क्रममा प्रशोधित फोहोरलाई पोस्ट-डाईजेस्टेट स्लरीको डिवॉटरिङ पछि, वर्षायाममा कच्चा फिडस्टकबाट जमिनको पानीमा हुने प्रदुषण, फोहोर संकलन र ढुवानीसँग सम्बन्धित समस्या, डाईजेसन पछिको स्लरी व्यवस्थापन, गन्ध, आवाज, ढल व्यवस्थापन र प्लान्ट सञ्चालन कर्मचारीहरुको स्वास्थ्य सम्बन्धी समस्याहरुको लागि न्यूनीकरण उपाय व्यवस्था गरिएको छ। नकारात्मक प्रभावहरूका बाबजुद पनि परियोजनाको कार्यान्वयनबाट सकारात्मक प्रभावहरू पार्ने आकलन गरियका छन। स्थानीयलाई रोजगारीको अवसर, स्थानीयको सीप विकास र स्थानीय अर्थतन्त्रमा बृद्धि निर्माण चरणका केही परिकल्पना गरिएको लाभदायक प्रभावहरू हुन् । त्यसैगरी नवीकरणीय उर्जाको प्रर्वद्धन, स्थानीयलाई रोजगारीको अवसर, स्थानीयको सीप विकास उप-आयोजनाको सञ्चालन चरणमा हुने केही लाभकारी प्रभावहरू हुन् ।

यद्यपि, यस ESIA प्रतिवेदनमा प्रस्तावित न्यूनीकरण उपायहरूलाई कडाईका साथ पालना गरेर माथिको अनुमानित सम्भावित नकारात्मक प्रभावहरूलाई कम गर्न सकिन्छ। निर्माण तथा सञ्चालन चरणमा प्रयोग हुने सबै सवारी साधन र मेसिनरीहरू

वन तथा वातावरण मन्त्रालयले तोकेको उत्सर्जन मापदण्ड अनुरूप हुनुपर्छ, वर्षायाममा चुवावटबाट बच्न स्टकपाइलहरू छोपिएको हुनुपर्छ, एग्रीगेटहरू मिसाउने र धुने कार्य तोकिएको क्षेत्रमा गर्नुपर्छ, स्लरी र डिकेन्टेड फोहोरको सीधा निकासीबाट रोक्नु पर्ने । यसका साथै निर्माण र सञ्चालन दुवै चरणमा सबै कामदारले हेल्मेट, सेफ्टी ज्याकेट, पञ्जा, जुत्ता जस्ता सुरक्षात्मक उपकरण लगाउनु पर्ने । दुर्घटना र रोगबाट बच्नका लागि कर्मचारीहरूलाई उचित तालिम प्रदान गर्नु पर्ने । तसर्थ, वातावरण र सामाजिक दृष्टिकोणबाट, यस प्रतिवेदनमा प्रस्तावित न्यूनीकरणका उपायहरू सही तरिकाले पालना गरिएमा, यस परियोजनाले वातावरण र सामाजिक नकारात्मक प्रभाव पार्ने देखिदैन ।

EXECUTIVE SUMMARY

The Environmental and Social Impact Assessment (ESIA) for Commercial biogas plant of Shivam Jaivik Khad Tatha Urja Pvt. Ltd is being carried out at the land of the proponent which lies on ward no. 3 of Jagarnathpur Rural Municipality, Parsa. The proposed biogas plant will use 60 tons of organic waste from commercial sectors such as poultry farm, cattle farms, sugar industry, hotels, etc. for co-feeding.The proposed biogas plant is expected to produce 2800 m^3/Day of biogas each day and subsequently 1120 kg/Day of refined bio CNG which will be filled in cylinders and supplied to hotels, and industries. Also 9.5 tons of organic manure will be produced each day which will be processed and packaged and sold to the market

The project is located in Jagarnathpur Rural Municipality, ward no. 3 in the land of the proponent. The total area of the project site is 14,800 .00 m^2 (2 Bigha and 4 Kathha). Prior to the commencement of the project, an environmental and social impact assessment (ESIA) is conducted to look at the physical, biological, social, cultural, and economic aspects. Various impacts were discovered during the study's construction and operation phase. The defined impacts can be reduced by implementing the mitigation strategies outlined in this study. The subproject would have far less negative environmental consequences if additional mitigation steps specified in this ESA are implemented. Compliance steps, as well as an environmental monitoring plan, institutional arrangements for grievance management, and occupational health and safety measures, are all listed in the study.

The potential pollutants resulting from implementation of the proposed project during construction phase are construction spills, mucks, washout liquid wastes, gaseous emission, dust, suspended particle whereas potential impacts that are found during operation phase are processed wastewater after dewatering of post-digestate slurry, leaching of raw feedstock into groundwater during rainy season, post-digestate slurry management, odor, noise, drainage management and matter concerning with health of operational staffs. Despite the project's negative consequences, there are some benefits, including municipal waste management, local job opportunities, local skill growth, fertilizer production, and the promotion of renewable energy, to name a few.

As a result, biogas and slurry for agricultural use are expected to be generated as a result of the project. This project will help with urban waste management by reducing the danger of leaching, flies, and vector-borne disease, as well as waste flooding during the rainy season and foul odor after decomposition. The biogas produced will be used as an alternative to LPGs and fuelwood and will be compressed in cylinders and sold and distributed to hotels and industries, while the fertilizer produced will be sold at subsidized rates to the general public. As a result, both the proponent and the local communities tend to benefit from the plan.

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1. INTRODUCTION

1.1 Project Description and Location

Shivam Jaivik Khad tatha Urja Pvt. Ltd. is located at Janakitola of Parsa district, Madesh Province who is the proponent for this project. The proponent aims to build a biogas plant at ward no. 3 of Jagarnath Rural Municipality at its land with total area of approx. 14800.00m^2 (2 Bigha and 4 Kathha). The project site is located at 27°8'51.81" N and 84°42' 7.74" E. the proposed biogas plant will use the wastes coming from cattle farm, poultry, sugar industry, hotels, etc. to produce the gas and sell it to nearest hotels and industries. The objective of the project is to prepare a holistic, integrated, sustainable, environment friendly and executable Commercial Biogas Plants which is in line with objective of the Alternative Energy Promotion Center (AEPC), under Nepal- Private Sector Led Mini Grid Energy Access Project (MGEAP).

The Detail Project Report has proposed for the installation of 5000 m^3 biogas digester. The digester of proposed biogas plant is based on CSTR, (continuously stirred tank reactor) mesophilic fitted with Otto power cycle and double membrane gas holder. With 65 tons of waste, it is estimated that 2800 m^3 of biogas will be produced each day and subsequently 1120 kg/Day of refined bio CNG will be produced which will be filled in cylinders and supplied to hotels, and industries. Also 9.5 TPD of organic manure will be produced each day which will be processed and packaged and sold to the market

The DPR study revealed that the production of biogas and fertilizer from the project is feasible on all terms, the availability of biomass substrates, or the financial indicators like NPV, IRR and Payback Period. The main sources of biomass substrates for the biogas project are cow dung, poultry litter, food waste, and agro waste (paddy/maize). For the current biogas production capacity of the project, the resource availability is readily available. Moreover, the perception of the market towards the products is found to be extremely positive owing to its local manufacturing base. A standby generator in case of failure of the original generator has also been proposed to ensure continuous power generation.

The project also falls under Category "B" as the rapid assessment checklist shows that the project is unlikely to cause significant adverse impact. This Environmental and Social Impact Assessment (ESIA) is prepared to address possible environmental and social impacts from construction and operation of digester and its components

1.2 Project Location and Accessibility

The project will be built in the land of the proponent, located at ward no. 3 of Jagarnathpur Rural municipality. It lies in the Terai belt having flat lands. Geographically, it lies at 27° 8' 55.71"N and 84°42' 5.32"E . An earthen road lies 8m from the project site

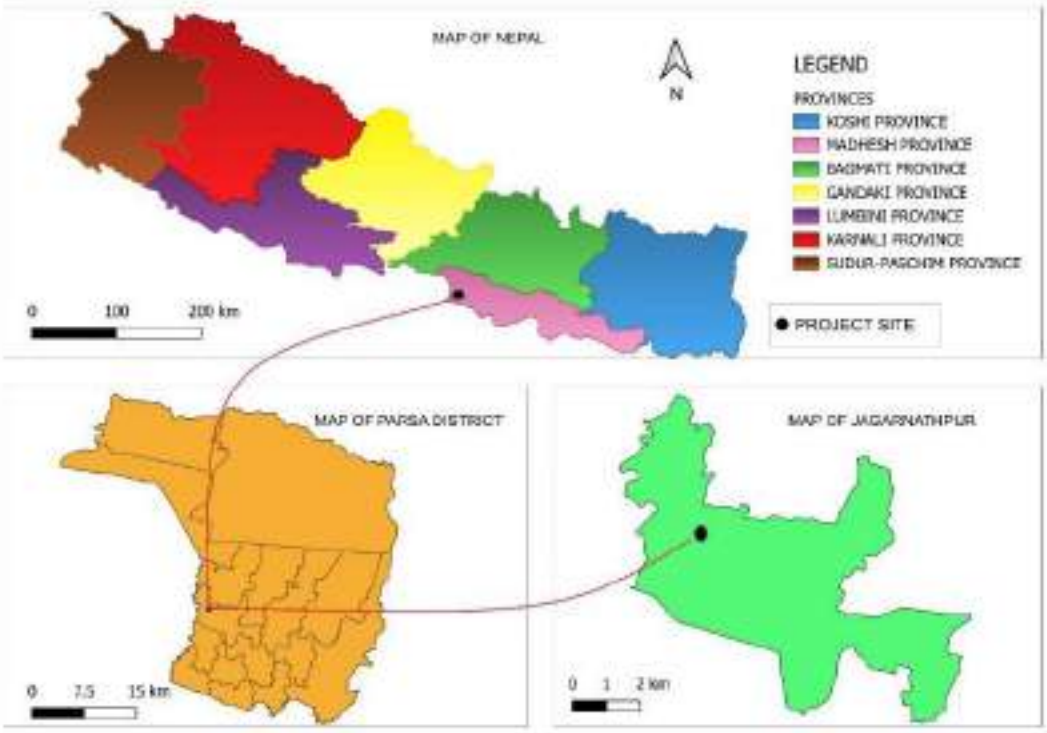


Figure 1 GIS map showing political map of project site

Figure 2 GIS map of Jagarnath rural municipality

Figure 3 Google map of project site

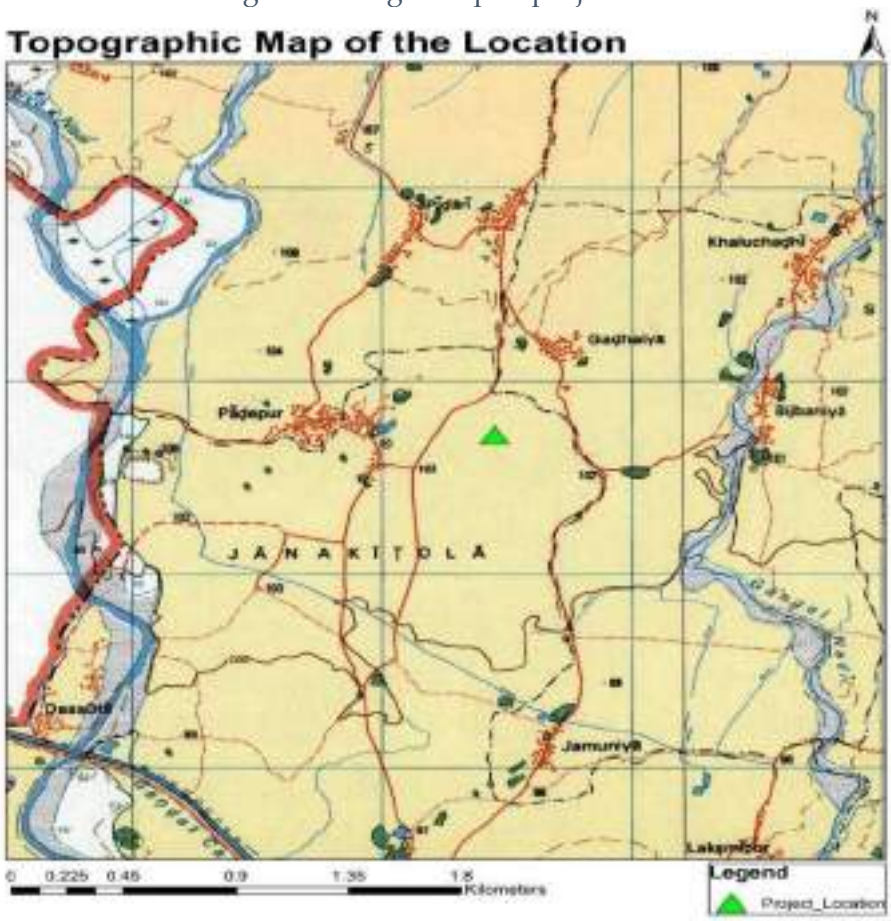


Figure 4 Topographical map of location

1.3 Salient Features

Name of project	: Commercial Biogas Plant Shivam Jaivik Khad Tatha Urja Pvt. Ltd
Location	: Jaganathpur Rural Municipality-3,Janakitola, Parsa, Nepal
Project Site	: Shivam Jaivik Khad Tatha Urja Pvt. Ltd
Province	: Madesh
Estimated Waste:	
Design for the Waste	: 60.00 Tons/ day
Proposed Technology	: Continuous Stirred-Tank Reactor (CSTR)
Plant Capacity	: 60 Tons/Day (Mix Substrate)
Expected Quantity Of Biogas Gas	: 2800 m3/Day
Estimated Refined Bio CNG	:1120 kg/Day
Organic Fertilizer	:13.5 MT/day
Refined Organic Fertilizer	:9.5 MT/day
Water Required	:60000 Liter/day(15000 Liter/Day Recycled)
Size of Digester	: 5000 m^3
Geographical Coordinates:	
Latitude/Longitude	: 27° 8' 55.71"N 84°42' 5.32"E
Altitude	:100 m
Land Area [Approx. Project Site]	: 14,800 m^2
Estimated Financial & Financial Indicators: NRs.	
Project Cost with Vat	211,244,737.17
Project Cost	186,942,245.28
Equity	41,127,294.00
Loan	71,038,053.00
Subsidy	74,776,898.00
Return On Investment	14%(5^{th} Year)

Net Present Value	154,397,621.05
BCR	1.73
IRR	18.88%
Payback Period(Year)	6.55

1.4 The Proponent

The Proponent of this project is Shivam Jaivik Khad tatha Urja Pvt. Ltd. **Shivam Jaivik Khad tatha Urja Pvt. Ltd**is a private limited company registered in office of the company registrar Nepal. The company was established in Mangsir 17, 2077.

Please see Company Registration Certificates and PAN Application submission confirmation in the Appendices A.
Name and address of the proponent is:

Name of organization	**Shivam Jaivik Khad Tatha Urja Pvt. Ltd**
Activity	**Biogas Plant Construction**
Address	**Jaganathpur Rural Municipality-3, Janakitola, Parsa, Nepal**
Contact name	**Ashok Kumar Yadav, Dilip Sharma**
Contact number	**9855036664,9855023153**
Email address	**shivamjktu@gmail.com**

1.5 The Consultant

Innovative and Sustainable Technology Solutions Pvt. Ltd (ISTS) is the consultant for Detail Project Report (DPR) for Commercial Project through Anaerobic Digestion (Biogas) Technology at **Shivam Jaivik Khad Tatha Urja Pvt. Ltd**.
ISTS is registered under Company Registrar on 2070 initially known as B and B Multipurpose Company Private Limited. ISTS has been working on Detail Feasibility Study, Design, Installation and monitoring of different Renewable Energy Technologies like Micro Hydro, Biogas Plants, Solar Plants and Biomass technologies. ISTS has successfully conducted Detail Feasibility Study of number of commercial and institutional biogas projects. ISTS has done DFS of Commercial Biogas Plants, Micro Hydro and Solar Plants. ISTS has also competed IEE of different biogas projects
Name and address of the consultant is:
Innovative and Sustainable Technology Solutions Pvt. Ltd (ISTS)
Main Office Center Office

Dipayal Silgadhi Muncipality-7 Sankhamul, Kathmandu
Phone: 094-440462 Phone: 01-4782766
E-Mail: istsnepal@gmail.com
The details of company registration are attached in Annex A-1of this report.

1.6 Objective of ESIA

The objectives of ESIA are as follows:

- To identify the main environmental and social issues/impacts related to construction and operation of biogas plant to its existing bio-methanation plant.
- To describe and predict the extent of potential impacts on physical, biological and socio-economic environment (based on both field inspections and desk research).
- To identify pragmatic mitigation measures to avoid, minimize or compensate the predicted impacts.
- To define monitoring and management systems which are applicable and suitable in the project area.
- To define the institutional framework required for the execution of monitoring and management programs.
- To integrate environmental and social considerations into project planning, design and costing. Allow proponent, designers, implementing agencies and funding agencies to address environmental and social issues in a timely and cost-effective manner during the pre-feasibility stage.
- Organize meaningful consultations with the concerned stakeholders including affected people/parties if any, along with the local levels and involve them, in the all phases of the project (planning, designing and implementing stage).

1.7 Study Methodology

The ESIA was undertaken considering Environment Management Framework (EMF) and Social Management Framework (SMF) of MGEAP, EPA/EPR and National EIA Guidelines 1993.

1.7.1 Desk Review

Relevant information for the study was collected through extensive review of literature and all pertinent relevant documents like Plans, Policies, legislation, guidelines, environmental acts, international policies and conventions, environmental standards and district profiles and municipality profiles were reviewed, and detail attached in **Annex A-6**. The following steps were followed during the desk review:

a) Collection and review of secondary information from various sources

Secondary information was collected through published and unpublished reports and interpretation of maps and photographs. During the ESIA report preparation, study

team met, discussed and interacted with concerned staff of the Government of Nepal, Jagarnathpur Rural Municipality, in the province headquarter, community-based organization member and knowledgeable key persons of surrounding areas.

b) **Delineation of the geographical boundary of the influence area on the topographical map**

During the ESIA report preparation, the influence area has been drawn on the topographical map and Google Earth Map according to Direct Impact Zone (100 m) and Indirect Impact Zone (500 m) from the proposed project site.

c) Preparation of project specific checklist

A checklist was prepared to collect physical, biological, socio-economic and cultural environment related information in the field. This checklist was based on National IEE Guideline-1993 and attached in Annex A-2.

1.7.2 Field Based Study

Field survey comprised of project site visit, which took place from 6th to 9th March 2024 for consultation with community, site inspection and observation a team comprising Environmentalist, Engineer and Sociologist. During the field visit, site specific data was collected by visiting the sites where the large biogas will be installed. The following tools were used for the collection of primary data.

- To conduct consultation with the local people, informal interaction and discussion was carried out on 7th March, 2024 at Ward office of Ward no 3 of Jagarnathpur Rural Municipality with concerned government officials, which includes Ward Chairperson, Ward members, Environmental Officers, general public and other knowledgeable persons. It was done to collect biological, socio-economic and cultural environment related information.
- Topographical map - It was used to show environmental features on the map during project site survey.
- Walkover survey- The survey was carried out at installation site to study the environmental impacts

Physical Environment and Cultural Environment: Checklist and matrix were used to collect site-specific information about the physical environment of the project area. The checklist and questionnaire are attached in Annex A-2. Information collected during the field visit includes land use pattern, land stability, topography, geology, drainage characteristics, climate, rainfall and available infrastructures near changed project structures. Topographical map, site observation and site-specific photography have been presented. Physical infrastructures that are likely to be affected due to large biogas installation have been identified and appropriate mitigation measures have been proposed.

Biological Environment: The proposed construction activity will be confined within the existing project boundary and found that the project construction and operation activity won't require cutting of trees. Documentation has been done as baseline information on local vegetation, wildlife in the project site including mammals, birds, and fishes known in the study area. Documentation of vegetation status, endangered plants, and NTFPs have been recorded and likely impact upon has been identified and presented in the ESIA report. Site visit, interaction with community and photograph etc. has been taken for the record.

Socio-Economic Environment and Natural Environment

Information on socio-economic and cultural features of the project area including population, ethnic composition, literacy, language, health service etc. has been collected. Similarly, cultural and religious sites, sources of energy, infrastructures, market centre etc. has been collected through visit, site survey. The general socio-economical information of the Jagarnath Rural Municipality was extracted from village profile of Jagarnathpur rural municipality 2075. The socio-economic information of the direct impact zone was collected through a public consultation in the presence of Ward Chairperson. Meeting minutes are attached in **Annex A-3.**

1.7.3 Impact Assessment

After the complete documentation of baseline environmental and social data of the project area, each of the environmental and social parameters were examined against the project activities in the different stages of project development using various methods and tools. Then the impacts were categorized as direct and indirect. Each of the direct and indirect impacts was further evaluated in terms of their extent as site specific, local or regional. Each of these was further analyzed in terms of duration as short-term, medium-term and long-term. The magnitude of each of the impact is then evaluated based on the National Environmental Assessment Guideline (1993).

1.7.4 Project Impact Area Delineation

The project affected areas are classified into direct and indirect impact area based on scale, nature and location of the sub-project.

Direct Impact Area (DIA): The direct impact area includes the area of 100m radius from the project site, where direct activity during construction and operation takes place. It includes areas where the construction work will be done. In this area environmental components might be affected by the project activities. The project area is proposed at Janakitola, ward no. 3 of Jagarnathpur Rural Municipality. As per the assessment, there are not any households within the 100m radius in DI area. This area experiences site specific impacts. The environmental impacts of this area could not be avoided but its effect could be minimized or compensated by taking relevant measures.

Indirect Impact Area (IIA): The indirect impact area includes the area of 500 m radius from the project site, where indirect activity during construction and operation takes place. Indirect impact area includes all the areas that will have indirect impacts by construction and operation activities which can be mitigated or minimized and mostly the activities of construction workers. This area includes 79 households and covers Gadhaiya village. The physical, socio-economic, cultural and biological environment of this area will experience minimal impacts.

Figure 5 Google map showing direct and indirect impact zones

Zone of Influence (ZOI): The **Zone of Influence** extends beyond both the direct and indirect impact areas, considering broader and more diffuse impacts that can extend further due to various environmental, social, and economic factors. For the project, the ZOI includes Jirabhawani Rural Municipality, Paterasugauli Rural Municipality, Dhobini Rural Municipality, and Pokhariya Municipality, where raw materials for the biogas plant will be collected. Additionally, Birgunj Municipality is part of the ZOI, as the gas and fertilizer produced will be sold there. The roadways used for these activities will include the Gandak Nahar Sadak (Janki Tola to Thori) and the Birgunj Dry Port to Thori Hulaki Sadak.

2. PLANT DESIGN AND TECHNOLOGY

2.1 Description of the Technology

The proposed technology is Continuous Stirred-Tank Reactor. Anaerobic co-digestion of many different substrates has achieved the most success when utilizing a Continuous Stirred-Tank Reactor (CSTR). This is the most popular, and proven technology worldwide. CSTR systems are very large, heated insulated tanks,

constructed of metal or concrete. The digester of proposed biogas plant is based on CSTR, (continuously stirred tank reactor) mesophilic fitted with double membrane gas holder. The CSTR is a proven digester design consisting of an above-ground tank with a Flexible Double membrane roof. Biogas is collected at the top of the tank and is pumped to a separate gas holder. Digestate is removed from the base of the digester tank. The major components of the plants are:

- Mixing Tank
- Digester Tank with mixing and heating system
- Fertilizer Tank
- Biogas Up gradation Unit
- Electric Control Panels
- Solid Liquid Separate

From the available feedstock, the sizing of biogas plant has been done. With reference to CSTR Technology, the recommended size is found to be 2800 m^3 daily gas productions. The digester technology and final size will be defined during DFS Stage. Anaerobic co-digestion of many different substrates has achieved the most success when utilizing a Continuous Stirred-Tank Reactor (CSTR). This is the most popular, and proven technology worldwide. It is our recommendation that the most effective and flexible technology for the digestion project is a CSTR system. The major components will be the mixing tank, digester tank, fertilizer tank, Organic and Inorganic Waste Separator, Solid Liquid Separator, Purification unit, Biogas Pipeline and control units, Electric Control Panel.

The details of technology are attached in Annex A-4.

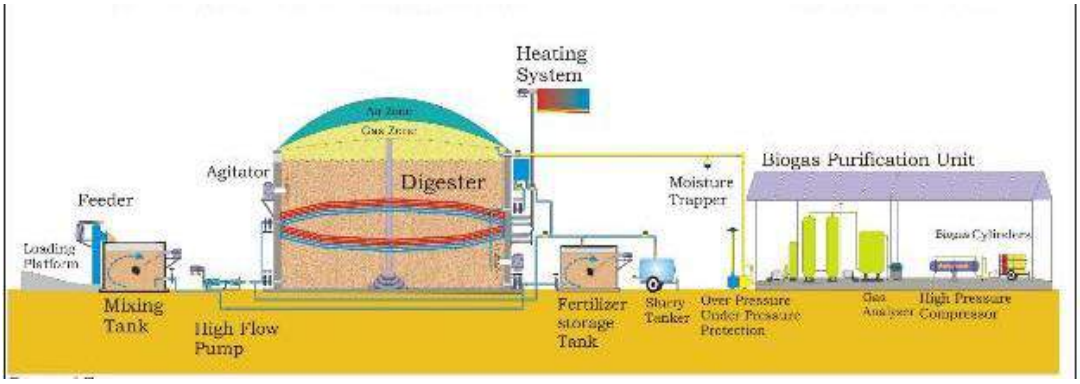


Figure 6 Schematic Diagram of Biogas Plant

2.2 Process Design

The figure below shows the process flow diagram of the plant.

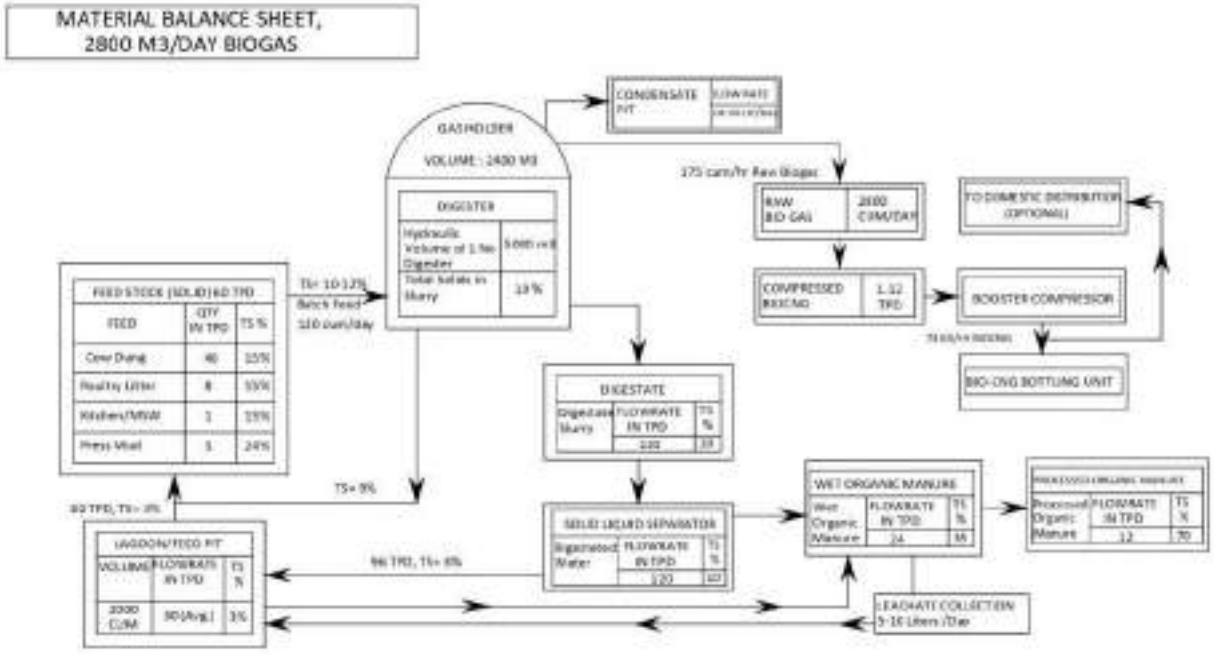


Figure 7 Project flow diagram

The parameters considered for the design is given in below table

Design and sizing criteria for all process units are listed in table below:

Table 1 Parameters considered for plant design

Digester feed (m3/day)	HRT (days)	Total digester Volume (m3)	Biogas plant volume (m3)
140	30	4200	5000
Mass loading to digester (wet)		140000.0	kg solids/day
% DS		21	no water added
Digester feed %DS		10.0%	
Dilution water required		60000	l/day
OLR		2.64	kg VS/(m3 * day)
C:N ratio		18.3	
VS destruction		20.0	
Digester Slurry mass dry		60%	kg solids/day
Digester Slurry Mass wet		7362.0	kg/day

Digester Slurry DS%	140000	%DS
VS load (kg/day)	VS dest (kg/day)	
11096.0	6657.0	
Compost DS%	70.0%	%DS
Compost production	17500	kg/day

Table 2 Design Criteria

Waste	Fed Waste
Poultry Waste (Kg/Day)	8,000.00
Cow Dung (Kg/Day)	46,000.00
Press Mud (Kg/Day)	5,000.00
Organic Waste (Kg/Day)	1,000.00
	60,000.00

2.3 Large Biogas Project Requirements

2.3.1 Construction materials

The various construction materials are needed during construction period. The construction materials like concrete, cement, sand etc. will be required for construction of civil structures like sumps; foundation of digester and decantation tank etc. The main digester will be constructed with pre-fabricated mild steel (MS) structure. These materials will be acquired from local market as well as from abroad.

2.3.2 Water Requirement

The projected site owns the water sources, so there will be no issues and no conflicts. The nearby river in this area includes Gangol Nadi which is 700m east prom the project site and Uriya Nadi which is about 1.65 km west from the project site. There is a boring in the site, from water can be extracted sustainably. Therefore, water requirement will be met through the water source present within the premises of the site.

2.3.3 Land Requirement

The total land required for the development of various components of the subproject is 5,255 m², as outlined in Table 3. However, the developer has arranged approximately 14,800 m² of land to accommodate ancillary facilities. The proposed site for the subproject is situated on private land owned by Ashok Yadav, a board member of Shivam Jaibik Khad Tatha Urja Pvt. Ltd. The company has leased the land from Ashok Yadav at a rate of Rs. 2,500 per katha per year (refer to Annex 12). The site is located in Janakitola, Ward No. 3, Jagarnathpur Rural Municipality, Parsa District. The land requirement for the main components are:-

Table 3 Land required for main components

S.N	Components	Area	Remark
1	Digester	1200 m^2	
2	Panel and Control room	105 m^2	
3	PSA shed (Compressor, purification unit, filling area, empty & fill cylinder storage area)	500 m^2	
4	Press mud and Raw material mixing plateform	800 m^2	
5	Fertilizer packing, godown and fertilizer drying yard	1200 m^2	
6	Dewatering Plateform	550 m^2	
7	Slurry Lagoon	500 m^2	
8	Slurry and Feeding Pit	400 m^2	
Total		5,255 m^2	

The layout of the land of the plant site are presented in Annex A-5.

2.3.4 Work Force Requirement

During the construction phase of the project, it is estimated that about 25- 30 person of unskilled and skilled human resource will be required. 6 months of construction time is estimated for the construction activities for installation of biogas plant. The project has the strategy to give priority to local people for unskilled labor requirement. The sub-project will ensure that no child labor and forced labor are used in the construction site.

The sub-project requires about 21 skilled and semiskilled workers during operation phase. While employing workers, the preference will be given to local according to their qualification, skill and interest. Except for the skilled human resource, all the semiskilled and unskilled workers will be employed from the surrounding vicinity of the sub-project area.

2.3.5 Energy Requirement

Fossil fuel energy (Gasoline) and electrical energy will be used during the construction phase. National grid electricity will be used for meeting electrical demand. Diesel will be used for vehicular transportation of construction materials and operating generators as and when required. The labors at the camp will use own bio-methane energy for cooking and heating purpose.

2.4 Potential Pollutants/Emission Resulting from Implementation of the Proposal

Different types of wastes and pollutants are assumed to be produced during the construction and operation phase of the proposed project. Different nature of wastes produced during the construction phase and operation phase are discussed in Table 2-2.

Table 4 Potential pollutants/emissions resulting from implementation of the project

Pollutant Category	**Pollutants/Emissions**	**Sources**
Construction Phase		

Solid Waste	Muck/Spoil	Excavation and civil construction work for foundation of digester
	Food wastes, polythene, papers etc.	Construction Workforce
Liquid and Semi-Liquid Wastes	Wash out Liquid Wastes	Aggregate Washing, Wash outs from concrete
	spent grease, lubricants, spills and leaked petroleum	Vehicles and Generators
Gaseous Emission	Dust, CO_2, CO, NOx, SO_2 and suspended particulate matter	Various excavation processes, crushing and mixing activities, vehicles and diesel generator
Operation Phase		
Solid Waste	Polythene, packaging bags (additional to existing waste generation)	Packaging of manure
Liquid and Semi-Liquid Wastes	Process wastewater after dewatering of post digestive slurry (additional to existing waste generation)	Biogas production and post-digestive decantation, washing and cleaning
Gaseous Emission	CO/CO_2, NOx and SO_2 and suspended particulate matter (less gaseous emission than existing scenario due to replacement of Diesel Generator by biogas electricity)	Combustion of fossil fuels (Operation of Diesel Generator) – less hours will be required after commencement of project
Noise Pollution	Noise level from biogas generator and vehicle movements, pumps	Transportation vehicles, components of plant
Odor Pollution	Foul odor	Pre-storage of biodegradable raw materials, storage in effluent lagoon

3. DESCRIPTION OF EXISTING ENVIRONMENTAL CONDITION

This section describes the existing environmental condition of the project area based on the site-specific information gathered through primary and secondary sources of information. The existing environment related to physical, biological, socio economic and cultural environment are described below.

3.1 Physical and Cultural Environment

3.1.1 Physiography and Topography

The proposed project site lies in Jagarnathpur rural municipality of Parsa district. It lies in the western part of the Parsa district. The proposed location for plant is situated

at Janakitola, ward no. 3 of Jagarnathpur rural municipality of parsa district, having coordinates 27° 8' 55.71"N 84°42' 5.32"E .
The rural municipality is extended from 27°5'40''N to 27°11'31''N and from 84°40'19''E to 84°46'56''E with a total area of 45.29 sq. km at an altitude ranging from 85 to 925m. The rural municipality is bordered by six local level, namely Sakhuwa Prasauni in the east, Paterwa Sugauli rural municipality in the north-east, India in the west, Pokhariya municipality, Kalikamai rural municipality and Dhobini rural municipality in the south and Jirabhawani rural municipality in the north. The total area of the rural municipality is 45.29 sq. km. which is 3.34 percentage of total area of Parsa district. The rural municipality was formed in 2073 B.S. by combing seven VDCs. The rural municipality consists of six administrative wards. The Jaganathpur rural municipality is considered as flat terai region. Temperate and tropical type of climate prevail in this region.

Geology and Soil Type

Geographically the subproject is situated at latitude 27° 8' 55.71"N and longitude 84°42' 5.32"E and 85m above sea level. The project location is 27.3 km far from the district's headquater Birgunj and has good transportation links. The project is located in the Terai plain (northward extension of Indo-Gangetic plain).The proposed location is flat land of area of 14,800 m² without any disturbance for direct solar radiation. Hence, the location is viable for big biogas plant construction. The project district, Parsa has predominantly alluvial and clay fertile soil, which is loose, and unconsolidated soil type.

Climate

The proposed plant site lies in the Parsa district. Parsa is 99m above sea level. The climate here is mild, and generally warm and temperate. The summers here have a good deal of rainfall, while the winters have very little. This climate is considered to be **(**Cwa) according to the Köppen-Geiger climate classification. The Koppen Geiger climate[1] classification is the empirical classification based on the vegetation. This classification aims to define the climatic boundaries as per the vegetation zones (biomes) which was developed by climatologist Wladimir Koppen. Climatic type Cwa in Koppen Geiger climate classification refers to the monsoon influence results in a modified humid subtropical climate (Cwa) that has a clearly defined dry winter. The temperature here averages 23.7 °C | 74.7 °F. The annual rainfall is 1890 mm | 55.2 inch. Precipitation is the lowest in November, with an average of 5 mm | 0.2 inch. Most of the precipitation here falls in July, averaging 401 mm | 15.8 inch. At an average temperature of 29.4 °C | 84.9 °F, May is the hottest month of the year. January is the coldest month, with temperatures averaging 14.7 °C | 58.5 °F.Between the driest and wettest months, the difference in precipitation is 396 mm | 16 inch. Throughout the year, temperatures vary by 14.7 °C | 58.4 °F.

[1] https://www.britannica.com/science/Koppen-climate-classification (Köppen climate classification)

Table5 Climatology data of Parsa district

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	14.7 °C (58.5) °F	17.8 °C (64.1) °F	22.8 °C (73.1) °F	27.9 °C (82.1) °F	29.4 °C (84.9) °F	29.3 °C (84.8) °F	27.5 °C (81.6) °F	27.4 °C (81.3) °F	26.6 °C (79.9) °F	24.2 °C (75.5) °F	20.5 °C (68.9) °F	16.5 °C (61.7) °F
Min. Temperature °C (°F)	9.2 °C (48.5) °F	11.6 °C (52.9) °F	15.3 °C (59.6) °F	20.2 °C (68.4) °F	23.5 °C (74.3) °F	25.3 °C (77.6) °F	25.2 °C (77.4) °F	25.1 °C (77.1) °F	23.9 °C (75) °F	19.8 °C (67.6) °F	15.2 °C (59.3) °F	11.2 °C (52.2) °F
Max. Temperature °C (°F)	20.6 °C (69.1) °F	24.2 °C (75.5) °F	30 °C (86) °F	35 °C (94.9) °F	35 °C (95) °F	33.4 °C (92.2) °F	30.3 °C (86.6) °F	30.3 °C (86.6) °F	29.9 °C (85.8) °F	28.8 °C (83.9) °F	26.1 °C (79) °F	22.2 °C (71.9) °F
Precipitation / Rainfall mm (in)	18 (0.7)	24 (0.9)	13 (0.5)	15 (0.6)	57 (2.2)	254 (10)	401 (15.8)	363 (14.3)	198 (7.8)	43 (1.7)	5 (0.2)	11 (0.4)

Source: en.climate-data.org

Drainage and Hydrology

The rural municipality covers 1.77 percentage of the area with lakes or ponds. Similarly, the rural municipality is also composed of wetlands.Source of water present in the locality is boring water. Sustainable quantity of water is available. The boring water source is available within the premises of the proposed plant site. There is no any forest area within periphery of 3 km from sub-project.

In most of the dry season, it is difficult to see water in the stream. People use deep boring, tube well and hand pump to extract water from underground.

Land Use

The rural municipality lies in the Parsa district. It has total area of 45.29 sq.km. The rural municipality is known for agriculture due to its fertile lands. The land use pattern of the rural municipality is dominated by agricultural land which covers 94.33% of the total area, followed by riverbank (3.33%), lakes or ponds (1.77%), Grazing land (0.33%), wetlands (0.11%), gardens (0.08%) and unused land of 0.05%.The different land uses pattern and its percentage coverage is presented in Table 4.

Table 6 Land use pattern of the rural municipality

Jagarnathpur Rural municipality			
S.N.	Land Use Pattern	Area (sq.km)	Percentage
1	Agricultural Land	42.72	94.33
2	Unused land	0.02	0.05
3	Garden	0.04	0.08
4	Grazing land	0.16	0.33
5	Riverbank	1.51	3.33
6	Lakes or ponds	0.80	1.77
7	Wetlands	0.05	0.11
	Total	45.29	100

Source: village profile of Jagarnathpur rural municipality, 2075

Air Quality, Water Quality and Noise Levels

There are no instrumentally monitored baseline data on air quality. The project vicinity is devoid of any industrial activities and thus the quality of air was found to be good. Considering the local anthropogenic sources of air pollutants is vehicular movement, dust re-suspension into ambient air from graveled access road.

The proponent has not been found discharging any effluent into nearby river. River water is not used for drinking purpose by human.

Regarding the noise pollution, the main noise emitting sources within project boundary are operation of diesel generator and other machinery and vehicular operation. The intensity of sound was found to be 55db in the projected area.

3.2 Biological Environment

The project development area doesn't lie in any National Parks, Wildlife Sanctuary, Reserve, Buffer zone or any other legally protected area listed by the Government of Nepal for the conservation of critical and sensitive ecology or habitat of vegetation and wildlife. The proposed project is covers land area of 14,800.00 m^2. The area is covered with agricultural field. The vegetation found in the district are stated below:

3.2.1 Vegetation and Forest (Please specify the distance of the nearest forest from the project location and detail the presence of these specific species, rather than providing a general inventory of plants and animals at the district level.)

The project site is located in the Terai plain surrounded by the agricultural land. The dense forest area is in Parsa National Park which is 8 Km radial distance from the project site in the northern direction. The plant species found in the project site are Sugarcane, (*Saccharum officinarum*), Papaya *(Carica papaya),* and Banana (*Musa paradisicia*)

Some vegetation found in the district were Sissau *(Delbergia sissoo)*, Simal*(Bombax ceiba)*, Khayar (*Acacia catechu*), Sal (*Shorea robusta)*, Mango,, Bar *(Ficusbengalensis)*, Peepal *(Ficus religiosa),* Bhalayo *(Semecarpus anacardium),* Jackfruit, Jamun, Mouwa, bambooetc. Medicinal herbs found in this region are Gumma, Pudina, Tulasi, Aloe Vera, Tejapat, Harro, Taal Mishri, Bahera, etc. similarly, Non timber trees in this area are Sugar Cane, Kurilo, Kaulo, Amala, Ban Lasun, Chiraito, Setak Chini etc.

The proponent has proposed to install large biogas within the well demarcated land, hence no issues for the construction and running the project for overall management. To install the large biogas project, no trees are needed to be cut and no vegetation are needed to be destroyed.

3.2.2 Wildlife

Some wildlife observed in this region are Indian giant squirrels (Ratufa Indica), Common grey mongoose (Herpestesedwardsi), Jackals (Cannes aurous), monkey (Macaca mulatta), etc.

3.2.3 Birds

Major bird species reported are Battai (Turnix suscitator), Bhangera (Passer (Cacomantis merulinus), Parewa (Columba livia), Dhukur (Streptopelia chinensis), Dangre (Acriotherus tristis) and Kauwa (Corvus splendens).

3.2.4 Herpeto Fauna

Some of the Herpeto fauna found in the river area and project vicinity are King Cobra (Ophiophagus Hannah), Oriental rat snake (Ptyas mucosa) and Common krait (Bungarus caeruleus)..

3.2.5 Fish Species

The major fish species in these areas are: bighead carp (Aristichthys nobilis), silver carp (Hypophthalmichthys molitrix), grass carp (Ctenopharyngodon idella), common carp (Cyprinus carpio carpio), and rohu (Labeo rohita

3.3 Socio-economic Environment

3.3.1 Project District and Rural Municipality

The proposed project site lies in Jagarnathpur rural municipality of Parsa district. Parsa district consists of one metropolitan city, 3 municipalities and 10 rural municipalities, 14 local levels in total. Jagarnathpur rural municipality is one of the rural municipality of the district which lies in the western part of the Parsa district. The rural municipality is bordered by six local levels, namely Sakhuwa Prasauni in the east, Paterwa Sugauli rural municipality in the north-east, India in the west, Pokhariya municipality, Kalikamai rural municipality and Dhobini rural municipality in the south and Jirabhawani rural municipality in the north. The total area of Jagarnathpur rural municipality is 45.29 sq. km., which is 3.34 percentage of total area of Parsa district.

This rural municipality was formed in 2073 B.S. by combing seven VDCs, namely, Janaki Tole, Ghoddaud Pipra, Jagarnathpur Sira, Pidariguthi, Auraha and Mashihani. The rural municipality consists of six administrative wards. The office of this rural

3.3.2 Demography

According to national census 2078, the total population of Parsa district is 6,01,017 where 48% are female and 52% are male. The average household size is 6.29 which is 1.3 times the figure is Nepal: 4.89 and male per female is 108.21 which is 20% more than that of Nepal i.e. 94.16

Similarly, as per national census 2078, the total population of the rural municipality is 32,649. The most populated ward is ward no 5 which consists of 6551 populations while the ward no. 3 consists of least population of 4072 members. The population density of the district is 713.35 per square kilometer which is much higher than the national average density of 180 per square kilometer. The average household size is 5.85 person and sex ratio is 105.15. The demographic distribution according to sex, population density and age distribution of population in Jagarnathpur Rural

Municipality are listed in Table 6, Table 7 and Table 8 respectively. The demographic distribution of Parsa district is shown in table 9

Table 7 Population of rural municipality

Ward no.	Household no.	Population			Average Household size	Sex ratio
		Male	Female	Total		
1	1036	3081	2872	5953	5.75	107.28
2	850	2571	2358	4929	5.80	109.03
3	725	1994	2078	4072	5.62	95.96
4	950	2806	2760	5566	5.86	101.67
5	1033	3427	3124	6551	6.34	109.70
6	988	2855	2723	5578	5.65	104.85
Total	11,164	16734	15915	32649	5.75	107.28

Source: Central Bureau of Statistic (CBS), 2078

Table 8 Population density according to ward

WARD NO.	POPULATION DESCRIPTION		AREA DESCRIPTION		DENSITY (PER SQ. KM)
	Population	Percentage	Area (sq.km)	Percentage	
1	4540	16.19	8.01	17.69	566.78
2	5093	18.16	6.84	15.1	744.59
3	4163	14.85	4.65	10.27	895.27
4	5891	21.01	13.03	28.77	452.11
5	5546	19.78	4.3	9.49	1289.77
6	2805	10.00	8.46	18.68	333.56
Total	28038	100	45.29	100	713.35

Source: Central Bureau of Statistic(CBS), 2078

Table 9 Population distribution according to age group

Ward no	Population according to age group (years)															
	Below 5		6-14		15-18		19-24		25-49		50-59		60-69		70 and above	
	male	female	male	female	male	female	male	female	male	female	male	female	male	female	male	female
1	327	271	605	508	230	143	749	671	224	164	174	115	137	102	75	45
2	353	294	658	641	220	185	834	786	207	169	170	133	128	117	113	85

3	283	290	507	414	244	187	690	444	200	135	151	93	115	84	64	62
4	322	253	835	615	297	208	1109	933	268	179	229	153	170	131	118	68
5	489	383	645	544	240	178	918	821	249	203	199	154	185	164	110	64
6	196	141	353	249	133	87	499	447	148	101	112	62	66	77	81	53
total	1970	1632	3606	2971	1364	988	4799	4302	1296	951	1035	790	801	675	561	377

Source: Source: Central Bureau of Statistic (CBS), 2078

Table 10 Population data of parsa district

District	Household	Average Household	Population		Male per Female
			Male	Female	
Parsa	654,471	5.79	338,362 (51.7%)	316,109 (48.3%)	106.99

Source: Central Bureau of Statistic (CBS), 2078

3.3.3 Caste/Ethnicity

The caste and ethnicity distribution table of the Jagarnathpur rural municipalities shows the mixed settlement, which has majority of population from Terai indigenous group followed by Terai others, muslim and Terai Dalit. Similarly, Parsa district records highest number of musalmans than other castes. The list of caste and ethnic distribution of the rural municipality and that of Parsa district is shown in the table below.

Table 11 Caste distribution in the rural Municipality

Ward no	Description of caste										
	Mountain Chhetri/ Bramhin	Terai Chhetri/Bramhin	Mountain Indigenous	Terai Indigenous	Mountain Dalit	Terai Dalit	Muslim	Mountain others	Terai others	Not mentioned	Total
1	230	165	125	1225	8	1290	2125	40	725	20	5953
2	38	71	3	2234	1	828	1213	0	525	16	4929
3	4	7	0	10	3	640	1651	7	1748	2	4072
4	0	27	6	3808	5	783	762	0	1	174	5566
5	10	181	3	577	13	150	194	0	5408	15	6551
6	25	98	7	4695	151	158	255	23	9	157	5578
Total	307	549	144	12549	181	3849	6200	70	8416	384	32649
Percentage	0.94	1.68	0.44	38.44	0.55	11.79	18.99	0.21	25.78	1.18	100.00

Source: Central Bureau of Statistic (CBS), 2078

Table 12 Caste distribution of Parsa district

Castes	Parsa	
Musalman	17.2	16.8
Kurmi	8.9	9.1
Tharu	6.9	7.1
Yadav	6.8	6.5
Kanu	6.2	6.4
Chamar/Harijan/Ram	5.1	5.1
Teli	4.4	4.5
Dusadh/Pasawan/Pasi	2.8	2.8
Koiri/Kushwaha	2.5	2.6
Baraee	1.9	2

Source: Central Bureau of Statistic (CBS), 2078

3.3.4 Religion

About 72.5% of people follow Hinduism in the rural municipality. It is then followed by Islam and Buddhism. In the district 83.1% follows Hinduism, wheras 14.5% follow Islam. The distribution of population according to religion is given below

Table13 Population distribution according to religion in rural municipality

Ward no	Population distribution according to religion						
	Hinduism	Buddhism	Islam	Christianity	Kirat	Not mentioned	Total
1	3201	17	2653	13	2	67	5953
2	3640	15	1234	12	7	21	4929
3	2542	6	1509	0	0	15	4072
4	3519	15	1493	2	0	537	5566
5	4913	47	1553	17	0	21	6551
6	2927	143	2132	165	19	192	5578
Total	20742	243	10574	209	28	853	32649

Source: Central Bureau of Statistic (CBS), 2078

Table14 Population by religion

Religion	Parsa	
Hindu	83.1%	499,438
Islam	14.5%	87,033
Buddism	1.7%	10,069
Kirat	0.4%	2,571
Others	0.2%	882
Christianity	0.1%	753
Sikhism	0%	130
Jainism	0%	116
Prakriti	0%	24
Bahai	0%	1
Bon	0%	0

Source: Central Bureau of Statistic (CBS), 2078

Cultural and Religious Sites

The main festivals celebrated in this region are Rakshya bandhan, Krishna Janmastami, JItiya, Karmadharma, Dashain, Tihar, Chhath, Ekadashi Parwa, Sorha Sombar, Karthik Puja, Maghe Sakranti, Holi, Chaite Dashain, Chaite Chhath, etc. Ramjanaki Mandir is the famous temple of this rural municipality. Deruwa mai mandir is at 300m east to the project site

3.3.5 Mother Tongue

Bhojpuri is spoken by majority of the population both in the district and in this rural municipality which is about 98.04% of total population in rural municipality. The distribution of population according to mother tongue in the rural municipality is enlisted in Table 14 and that of the district in table 15.

Table 15 Population distribution according to mother tongue

SN	Mother Tongue	Population		
		Total	**Male**	**Female**
1	Nepali	188	103	85
2	Maithili	18	11	7
3	Bhojpuri	32012	16423	15589
4	Tharu	308	142	166
5	Urdu	101	49	52
6	Hindi	10	1	9
7	Others	12	5	7
	All MTongues	32649	16734	15915

Source: Central Bureau of Statistic(CBS), 2078

Table 16 Language spoken in Parsa district

Language	Population in Percentage		
	Both Sexes	Male	Female
Bhojpuri	84.7	85.2	84.2
Nepali	4.8	4.7	4.9
Tharu	3.8	3.6	4
Urdu	2.1	2	2.1
Tamang	1.2	1.2	1.3
Maithili	1.1	1.05	1.08
Hindi	0.5	0.5	0.5
Nepalbhasha (Newari)	0.5	0.4	0.5
Marwadi	0.4	0.4	0.4

Source: Central Bureau of Statistic(CBS), 2078

3.3.6 Literacy and Education

In the Parsa district 43.8% female and 66.7% male can both read and write whereas 2.9% of both male and female can only read. Similarly,the literacy rate of the rural municipality is 54.97%. The literacy rate of male in the area is 63.63% which is higher than that of female (46.32%). The literacy status of the Jagarnathpur rural municipality is shown in Table 16 below and that of Parsa district in table 17.

Table17 Literacy rate of the rural municipality

Ward no.	Literacy rate		
	Male	Female	Total
1	55.30	35.96	45.93
2	57.77	35.85	46.81
3	82.74	79.64	79.69
4	63.35	47.17	55.29
5	59.87	40.58	50.22
6	62.72	41.74	52.23
Total	63.63	46.32	54.97

Source: Central Bureau of Statistic (CBS), 2078

Table 18 Literacy of Parsa district

Sex	Parsa	
Can Read and Write: Female	43.8%	111,632
Can Read and Write: Male	66.7%	183,615
Not Literate: Female	53.1%	135,268
Not Literate: Male	30.3%	83,412
Can Read: Female	2.9%	7,485

Sex	Parsa	
Can Read: Male	2.9%	7,868
Not Stated: Female	0.2%	379
Not Stated: Male	0.1%	273

Source: Central Bureau of Statistic(CBS), 2078

3.3.7 Status of population with disability

Out of various types of disabilities, physical disabilities prevails the most in the rural municipality. Ward no.1 has the highest disability population of 35. The district has about 1% disabled people. The disability status of the rural municipality is shown in the table 18 and that of district in table 19

Table 19 Disabilities population in the rural municipality

Ward no	Disability types								
	No disability	Physical disability	Intellectual disability	Visual disability	Hearing Disability	Vocal Disability	Mental Disability	Not mentioned	Total
1	3334	20	4	5	3	0	3	1171	4540
2	4181	14	1	0	3	3	0	891	5093
3	4126	14	2	0	5	0	0	16	4163
4	3697	8	1	2	0	0	0	2183	5891
5	5495	11	0	2	1	2	0	35	5546
6	2728	3	1	1	2	0	1	69	2805
total	23561	70	9	10	14	5	4	4365	28038
Percentage	84.03	0.25	0.03	0.04	0.05	0.02	0.01	15.57	100

Source: Central Bureau of Statistic(CBS), 2078

Table 20 Disability population on the district

Population by disability type	Number
Blind/low vision	
Female	801
Male	914
Deaf/hard of hearing	
Female	280
Male	315
Deaf-Blind	
Female	40
Male	64
Intellectual disable	
Female	63
Male	86

Mental disable	
Female	156
Male	283
Multiple disable	
Female	165
Male	210
No disability	
Female	285758
Male	305846
Physical	
Female	789
Male	1344
Speech problem	
Female	245
Male	410

Source: Central Bureau of Statistic (CBS), 2078

3.3.8 Source of Drinking Water

Out of 5117 households in the rural municipality, 4576 households (89.43%) uses tube well/hand pump as the source of drinking water whereas 359 households uses Tap/piped water as source of drinking water.In the Parsa district tube well is the most common source of drinking water which is 81%, followed by piped tap which is 14.4%.From different sources, the source of drinking water in the households as per ward in the rural municipality is in the table 21 and district in table 22

Table 21 Drinking water source in different households

Ward no	Drinking water source per household						
	House tap water	Public Tap water	Deep Boring	Hand Pump	Covered Well	Others	Total
1	215	54	1	614	0	5	889
2	61	20	0	921	1	1	1004
3	2	0	0	635	0	1	638
4	80	94	1	900	0	0	1075
5	1	1	0	858	0	2	862
6	0	0	0	648	1	0	649
Total	359	169	2	4576	2	9	5117
Percentage	7.02	3.30	0.04	89.41	0.04	0.18	100

Source: Central Bureau of Statistic(CBS), 2078

Table 22 Households by drinking water source

Source	Parsa (Households)	
Tube Well	81%	77,392
Piped Tap	14.4%	13,715
Sprout Water	1.3%	1,241
Others	1.3%	1,203
Not Stated	1.1%	1,082
Uncovered Well	0.5%	461
Covered Well	0.3%	297
River or Stream	0.1%	125

Source: Central Bureau of Statistic (CBS), 2078

3.3.9 Energy use for cooking

According to municipal household survey 2074, about 97.54% of household use firewood for cooking purpose in the rural municipality. Other source of energy for cooking include LPG, which is utilized by 1.93% households. Similarly, 11 households utilize kerosene and 15 household uses other source of energy for cooking. Similarly, in the district also, firewood is the main source of cooking which covers about 65.8% of total households. The utilization of different source of energy per household for cooking in the rural municipality is given in table 23 and that of district in table 24

Table 23 Household utilizing different source of energy for cooking

Ward no	Household utilizing different source of energy					
	Firewood	Kerosene	L.P. Gas	Cow dung	Others	Total
1	839	2	45	1	2	889
2	989	3	9	0	3	1004
3	628	1	7	0	2	638
4	1056	1	15	0	3	1075
5	856	1	0	0	5	862
6	623	3	23	0	0	649
Total	4991	11	99	1	15	5117
Percentage	97.54	0.21	1.93	0.02	0.29	100

Source: Central Bureau of Statistic(CBS), 2078

Table 24 Households by main type of cooking fuel

Column	Parsa (Households)	
Wood	65.8%	62,805
LPG	15.7%	14,970
Cow Dung	15.7%	14,994
Biogas	0.3%	258
Kerosene	1.1%	1,067
Electricity	0%	34
Others	0.3%	265
Not Stated	1.2%	1,123

Source: Central Bureau of Statistic (CBS), 2078

3.3.10 Energy use for Lightening

Electricity, Kerosene, Solar are the source of energy both for the district and rural municipality for the purpose of lightening. 94.51% of household use electricity for lightening while 4.96% use kerosene in rural municipality. Similarly, in the district about 72.2% uses electricity and 24% depend on kerosene. The usage of different energy source for lightening is given in table 25 and table 26

Table 25 Household using different source of energy for lightening

Ward number	Household using different source of energy for lightening				
	Electricity	**Kerosene**	**Solar**	**Others**	**Total**
1	772	105	8	4	889
2	944	50	8	2	1004
3	611	26	1	0	638
4	1009	64	0	2	1075
5	859	2	0	1	862
6	641	7	0	1	649
Total	4836	254	17	10	5117
Percentage	94.51	4.96	0.33	0.20	100

Source: Central Bureau of Statistic (CBS), 2078

Table 26 Households by main type of lighting fuel

Column	Parsa (Households)	
Electricity	72.2%	69,000
Kerosene	24%	22,959
Solar	2.1%	1,962
Not Stated	1.2%	1,118
Others	0.3%	308
Biogas	0.2%	169

Source: Central Bureau of Statistic (CBS), 2078

Industries and Trades

There are no industries within the municipality, and the primary occupation of the residents is agriculture, which yields an annual production of 1,038 metric tons of crops.

Livestock and Poultry

The municipality has 8 dairy farms and 12 poultry farms. In addition to these, many households also engage in small-scale livestock and poultry farming, contributing to the local food supply and supplementing their income.

Socio economic information of direct impact area.

There are no any households within direct impact zone i.e. within 100m radius.

Socio economic information of indirect impact area.

The indirect impact area includes the area of 500 m radius from the project site, where indirect activity during construction and operation takes place. This area includes 79 households and covers Gadhaiya village.

a. There are 79 houses in Gadhaiya village.
b. In this village 70 houses of Yadav ethnicity, 3 houses of Giri ethnicity and 6 houses of Dalit ethnicity.
c. Approximate 60 percent people are educated.
d. Average yearly income of each family is approximate two lakh.
e. There are 10 tractors in this village, No any another large vehicle in this village.
f. 94 percent families depend on agriculture and 6 percent on Job.
g. 18 percent families are using LPG for cooking and 82 percent families are using wood, charcoal.
h. There is electricity line of Nepal government.
i. 3 disable person in whole village.
j. 4 house head is single women (widow)

4. Review of Plans/Polices/Legislations and Guidelines

Government of Nepal (GoN) has adopted various policies, acts, regulations and guidelines to ensure the integration of development with the environmental conservation. In addition, for implementation of SREP large biogas projects, EMF and SMF are prepared for guiding overall safeguard implementation. The ESIA will be guided by the requirements and provisions of the following acts, rules and guidelines as applicable. The descriptions are provided in Annex A-6.

The Constitution of Nepal

1. Plans and Policies

a. National Environment Policy, 2076
b. National Forest Policy, 2076
c. National Transport Policy, 2058
d. Fifteenth Plan (2076/77-2080/81)
e. Climate change policy 2019 AD
f. Renewable Energy Subsidy Policy, 2073
g. National Energy Crisis Reduction and Electricity Development Concept Paper, 2072

2. Acts

a. Environment Protection Act, 2076
b. Environmental Protection Act of Bagmati Province, 2077 B.S.
c. Local Government Operation Act, 2074
d. Labor Act, 2074
e. Land Acquisition Act, 2039
f. The industrial Act,2039
g. Child Labor (Prohibition and Regulation Act, 2056)
h. Soil and Water resource conservation Act, 2039
i. Solid Waste Management Act, 2068
j. Water Resource Act, 2049
k. Forest Act, 2076

3. Rules

a. Environment Protection Rules, 2077
b. Solid waste Management Rules, 2070
c. Labor Regulations, 2075

4. Guidelines and Criteria

a. National EIA Guidelines, 2050
b. EIA Guidelines related to forest sector, 2052
c. Environment Friendly Local Governance Framework, 2070
d. Other Directives related to forest
e. National Ambient Air Quality Standard, 2059
f. Noise Level Standard of Nepal, 2069
g. Generic Standard for discharging industrial effluent in inland surface water, 2058

h. National Diesel Generator Emission Standard, 2068

5. International Policies, Convention and Treaty Agreement

a. Convention on Biodiversity, 1992

UN Framework Convention on Climate Change 1992

b. World Bank Safeguard Policy (OP 4.10Indigenous Peoples)
c. World Bank Safeguard Policy (OP 4.11 Physical Cultural Resources)
d. World Bank Safeguard Policy (OP 4.12 Involuntary Resettlement)

5. IMPACT ASSESSMENT

This section provides the predicted impact of the implementation of the proposal on surrounding environment and community (both beneficial and adverse) without mitigation scenario. Every development project comes with some adverse impact along with its community benefit. The main purpose of conducting environmental and social assessment is to enhance the beneficial impacts and to reduce potential adverse impacts. This section distinctly categorizes the envisaged beneficial impacts as well as adverse impacts in the subsequent subsections. The adverse impacts are categorized into physical, chemical, biological and socio-economic environment and assessed with extent, magnitude and duration of the predicted impacts.

5.1 Beneficial Impacts

5.1.1 Construction Phase

a. Employment Opportunity to Locals

The construction period of the project is six months. The number of workforce will vary during civil construction work and installation of necessary equipment that require average 25-30 skilled and unskilled human resources during construction phase. The technology provider will supply the skilled human source while unskilled human resource requirement will be fulfilled from the local area. This will increase the employment opportunities to locals. *The impact is direct, have a medium level of magnitude with local extent and short term in nature.*

b. Skill Development of Locals and improvement in livelihood

After involvement of local people in the project during construction period, the unskilled labor will get chance to improve themselves and help them to get skill and capacity for construction procedure, fabrications and installation of equipment. Their skilled knowledge will help them to get jobs in future. Apart of those, retail shops and restaurants will be benefitted with their daily income by selling foods and other items to the workers during construction period. *The impact is direct, have a low level of magnitude with local extent and short term in nature.*

5.1.2 Operation Phase

c. Reduction in Greenhouse Gas Emission

Methane is released from poultry manure and unsustainable management ofwastes from poultry, cattle farm, sugar industry, which contributes in greenhouse gas emission and is 28 times more potent than CO_2. The implementation of project uses such biodegradable wastes as input and produce usable gas which will directly help in reducing emission of GHG into atmosphere. *The impact is direct, have a medium level of magnitude with regional level extent and long term in nature. The impact is significant.*

d. Sustainable Waste Management

The project will utilize the large amount of poultry, cattle farm, sugar industry and hotels waste to operate the large biogas plant. This helps industry to manage the

organic waste as well as it helps to clean the environment without disposing in landfill site which otherwise could have created unwanted flies and vectors borne disease, bacteria and odor pollution in the nearby environment. The project will convert the waste into biogas and fertilizer. *The impact is direct, have a medium level of magnitude with regional level extent and long term in nature. The impact is significant.*

e. Employment Opportunity

During the operation phase, for regular cleaning, garbage disposal, and protection of the biogas plant, locals will be hired. This will also help for the support of their dependents. *The impact is direct, have a medium level of magnitude with local extent and long term in nature. The impact is significant.*

f. Skill Development of Locals

During the operation period, the locals involved will get to learn the skills and techniques required to run and manage the plant. This will help them to build their capacity and can use their learned skills to apply in similar projects. *The impact is direct, have a low level of magnitude with local extent and short term in nature.*

g. Availability of Organic Fertilizer& CNG

The biogas and the fertilizer will be available of the locals in competitive cost which can support to increase agriculture production and dependency of imported fertilizer. Similarly, CNG gas will be available for the commercial entities. *The impact is direct, have a medium level of magnitude with regional extent and long term in nature. The impact is significant.*

5.2 Adverse Issues

5.2.1 Construction Phase

5.2.1.1 Physical Environment

a. Change in land use

The proposed land of the sub-project is agricultural land and it is owned by one of board member of the developer (Annex: 12). The Land 5,255 m2 will be used for the construction of the proposed biogas plant. Apart from this land, the subproject is not using any land parcels of the community people for the development of subproject. In addition the land is not currently being used by any other parties besides the landowner and it has been left fallow for the purpose implementing the bio gas subproject. Furthermore, as the subproject is not using the agricultural land from the community members, it will not affect the livelihood of the local people.

The construction work shall be carried out with no loss of trees and greenery measures will be undertaken around the sub-project site. Therefore, *the envisaged impact is direct, low magnitude, site-specific and long term.*

b. Issues related with Air

The construction activities such as operation of vehicles to transport the construction materials, excavation, mixing of aggregates generate dust, smoke involve emission of

CO_2, dusts, and other harmful gases. However, the air pollution is less likely to affect the local people as there is no settlement in the direct impact zone of 100m radius and nearest settlement is in the indirect impact zone of 500m radius away from the project site. Such activities will only continue until the construction work completes, thus the envisaged impact can be considered *as direct, site-specific in nature, low in magnitude and short term in duration.*

c. Issues Related with Water

Percolation of wastewater generated from washing of construction materials, spillage of lubricants, grease, petroleum fuels and percolation of black and grey water generated from construction camp could pollute the groundwater. The local people depending on groundwater source for running various domestic purposes can also get affected from such activities. However, there does not seem much construction activities as most of the construction components are prefabricated so the predicted impact on water sources can be considered *as direct, low in magnitude, local in nature and short term.*

d. Issues related with Soil Pollution

Another impact that could result from construction activities is depletion of soil quality. The construction materials such as cement contain certain level of chemicals which when mixed with soil can deplete its fertility over the time. Besides, haphazard disposal of construction debris can cause formation of muddy ditches during rainy season which would possibly hinder the staff members and local passersby to walk comfortably. Other chemicals like grease and petroleum fuel if spilled will also reduce fertility of soil in the project site. The envisaged impact is direct, *site specific, low in magnitude, and short term in duration.*

e. Increase in Noise Level due to Construction Activities

The operations of different machineries during the construction period like excavators, movement of vehicles generate noise in the project site and around project vicinity. However, the locals would not be significantly affected since the nearest settlement is away from direct impact zone of 100 m radius. But the increase in noise is likely to impact construction workers. The envisaged impact is direct, *low in magnitude, site-specific in nature and short term.*

f. Issues Related with Spoil Disposal and Stockpiling of Construction Materials

It is likely to have construction debris and stockpiles of construction materials in any construction activities. But haphazard disposal of such materials causes disturbance in aesthetic beauty of the surrounding area and besides, percolated water from these construction materials during rainy season can reach agricultural field. In addition, such activities can also reduce soil fertility, increase in dust during windy season and formation of mud during rainy season. However, the project is small scale and most of the components are prefabricated. So only small quantity of construction material is required and only small quantity of construction debris will be generated which would not cause significant impact in the sub-project vicinity. Hence, the envisaged

impact can be considered direct, low in magnitude, site-specific in nature and short term.

g. Traffic Management

While transporting the construction materials to the project site, there may be the possibility of traffic congestion in the road as the transportation vehicles are quite bigger than other types of vehicles. These vehicles could take up much space in the road creating trouble to other people using the same route. The foreseen *impact is direct, low, local and short term in duration.*

5.2.1.2 Biological Environment

The project development area doesn't lie in any National Parks, Wildlife Sanctuary, Reserve, Buffer zone or any other legally protected area listed by the Government of Nepal for the conservation of critical and sensitive ecology or habitat of vegetation.

The proposed project is located at the land of the developer which occupies 14,800.00 m^2 of land area. The area is covered with agricultural field. Few fruit bearing trees such as mango, banana and papaya can also be found in the project site vicinity, however; the project will not require felling down of any trees. Therefore, *the impact on vegetation is not envisaged.*

5.2.1.3 Socio-economic Environment

a. Occupational Safety and Health of Workers

During the construction phase, the construction work force is expected to be exposed to a number of construction related health hazards. The construction fugitive emissions, noise, and physical injury are some of the occupational health issues for construction workforce. Moreover, work in height, confined space and hazardous environment are other potential threats to workers. Besides that, communicable diseases may increased risks to the workers. The envisaged impact is direct, *high in magnitude, site-specific in nature and medium term.*

b. Pressure on Utilities and Infrastructure

The construction activities generally cause pressure on community water supply system, increase in solid waste generation due to increase in construction workforce etc. Since the project construction period is 6 months and construction workers are in limited numbers, there will be very negligible pressure on utilities from community. Moreover, the project has its own water source, which is sufficient for entire project period so there will be no any community water supply source used by the subproject. Hence, *the impact is not envisaged*.

c. Health and Sanitation Related Issues In and Around Sub-Project Site

During the construction phase, the workers are exposed to various kind of machineries which if mishandled can cause injuries. In addition, nearby locals especially children can also meet an accident around the project area. The envisaged *impact is direct, moderate, local and short -term.*

d. Trespassing and Nuisance to Nearby Community

The construction workforce can sometime intrude into nearby community and cause annoyance among the residents. Such activities can create opposition and conflict from the community side. However, the construction workforce will reside inside the project premises, which has completely barricaded with wall and they will be mandated not to create any conflict in the community, the envisaged impact will be indirect,*low, site-specific and short term.*

e. Conflict and Grievance management

The installation of biogas plant will be a new concept to the surrounding village. Therefore, to avoid the conflict, villagers need to be well informed about the positive effect of biogas.

a) Though biogas/methane gas is highly flammable, and a naked flame can easily catch fire if leaked, there will be a safety measure present like fire extinguisher nearby the subproject place.
b) They should be aware about positive effect brought about by biogas plant which will help to manage the poultry organic waste by preventing leaching to ground-water causing contamination, prevent inland degradation, prevent flies and different disease vectors, will prevent flood away of the organic waste in rainy seasons, disease prevention and prevent foul smell coming from the poultry waste.
c) Involuntary Land Acquisition and Displacement Issue: The proponent has its own land and has full ownership. Hence there won't be any problem in land ownership.
d) Labor Influx and associated impacts in the local community: Due to the development of the project, the area will become a center of attraction to many people of the surrounding vicinity. The labor influx during construction phase is estimated to be around 750 person days, which is lower to cause significant community disturbances. Hence, the impact caused by influx of labors to local community is negligible.

During the field visit, such social conflict issues were well discussed in presence of Ward Chairperson, Ward members, Environmental Officers, public and other knowledgeable persons. If any grievances arise the mishandling could invite social demonstration, opposition and conflict. Hence, they have taken responsibility to well manage the conflict if anything is raised. The envisaged impact will be indirect, *moderate, local and long term.*

5.2.2 Operation Phase

5.2.2.1 Physical Environment

a. Issues Related with Management of raw materials storage and post digestate organic waste

The by-product generated from the anaerobic digestion to produce biogas is organic waste. They are mostly semi solid slurry and liquid slurry, generally known as digestate. These digestate have high BOD, nitrogen content and can contaminate land and water if not managed properly. Besides the digested, the storage of organic poultry waste in large amount can also create nuisance. If these poultry waste feeds are not stored in a proper roofed place with sealed ground, leaching of such substrate can possibly contaminate groundwater especially during rainy season. The project has to build the storage place for post digested effluent. The envisaged impact is direct, moderate, site-specific to local in nature and long term.

b. Impact associated with collection and transportation of waste

The biogas plant will be using substrates from poultry, cattle farm, sugar industry and hotels collected from nearby areas to produce biogas. These substrates are organic waste (green masses, and poultry waste).It may create foul odor during transportation, dropping of wastes, vehicular emission. The envisaged *impact is direct, local, short term and moderate in magnitude*

c. Issues related to odor during storage of raw material and slurry production

The raw materials to be used for biogas production are organic waste. Open storage of such large amount of substrate could cause foul odor in the project area and would attract flies and vector diseases. Similarly, haphazard disposal of digestate and absence of proper composting will also create foul smell. The foul odor might possibly impact the surrounding vicinity at the nearest settlement. So the receptors of impact are apparently the in-house staff. The envisaged impact *is direct, moderate, site-specific in nature and long term.*

d. Issues Related to Over Extraction of Ground Water for Meeting Demand

The water required to operate the plant is 65 m3/day. However, only 40 m3 of fresh water will be used for dilution purpose as the remaining volume will be sourced in from recirculation of separated slurry water. Similarly, the project site is mostly agricultural open land and has greater availability of groundwater recharge zone so the extraction of groundwater will not impact significantly on groundwater depletion. Hence, *the envisaged impact is direct, low in magnitude, local and long term*

e. Management of Wastewater from Digested Slurry

The digested slurry produced from anaerobic digestion will be used as compost and also sold in the market as fertilizer. The digested slurry will be separated into liquid and solid through Screw Press Separator. The semi-solid slurry will be further dried to make compost while liquid slurry will be recirculated for operation of plant and remaining liquid slurry is proposed to be used in the owner's farm itself. However, if

the liquid effluent is directly discharged to the near water body, it would increase BOD, TS and turbidity of the receiving water. Therefore, the envisaged *impact is direct,moderate, site-specific to local in extent and long term.*

f. Impact of spilled chemicals from gas cleaning facilities

Biogas contains CO_2, H_2S, and moisture along with methane production at about 35%-45%. Especially, H_2S and moistures are necessary to remove so as to prevent the equipment from corroding and to prevent impact on biogas generator. The technology proposed to remove H_2S is Ferrous and biogenic scrubbing. This technology will not produce any chemical waste during the process however regeneration of ferrous element is needed periodically. Hence, issue related with spilled chemicals is not envisaged.

g. Increase in noise from plant operation

The noise is generated from various components to operate the plant such as agitators, pumps, substrate and feed loaders. Such operational activity can increase surrounding noise level greater than 85 dB and can cause temporary hearing loss, annoyance among the working staff if exposed for long time. In this regard, the envisaged *impact is direct, low in magnitude, site-specific in nature and long term.*

h. Gas leakage and Fire Hazard

The biogas/methane gas is highly flammable and a naked flame can easily catch fire if leaked. This will cause loss of life and property. Moreover, emission of methane gas in atmosphere will contribute in greenhouse gas emission, which is almost 28 times more potent than carbon-dioxide on heating up our planet. However, the fire extinguisher can prevent such situation. In this regard, the envisaged *impact is direct, moderate in magnitude, site-specific to local and long term.*

i. Issues with drainage management

Proper management of drainage is necessary in order to channel rainwater without causing any damage to substrate storage area. If the drainage is not available, wash-off of such organic waste can percolate into groundwater and nearby rivers which will have effects on water quality. Similarly, the drainage is necessary to manage wastewater generated from cleaning the plant units and to channelize the liquid effluent after decantation to avoid contamination of nearby water bodies and groundwater as these wastes are highly pathogenic. *The envisaged impact is direct, low, site-specific and long*

5.2.2.2 Biological Environment

a. Maintenance and Protection of greenery in the Sub-Project Area

There will not be any nuisance to the biological environment as the biogas plant will be installed in a well demarcated land area. Instead, plantation of trees will be done to maintain the greenery in the sub-project area**.**

5.2.2.3 Socio-economic Environment

a. Occupational health and safety

During the operation period, the workers are required to handle organic waste materials and slurry. Due to this, they are prone to get infected from various diseases. They are also exposed to noise from operation of plant. Prolong exposure to such activities without proper care of safety measures taken can affect their health in long run. Besides, they can also be injured due to mishandling of machineries and fire hazard. Communicable disease (COVID-19) risks are another risks in this recent situation and the workers can be at high risks if PPEs are not used and social distancing is not maintained. *The envisaged impact is direct, high, site-specific and long term.*

b. Issues related with health and sanitation in and around project site

The operation of biogas plant consists of handling waste like cow dung which might be pathogenic to some extent. Haphazard disposal and improper management can cause increase in vector borne diseases and can spread out to nearby community which could create agitation among the locals and oppose the project. The envisaged impact is high, site-specific and long term. Similarly, if machineries, dome, plant surroundings are not cleaned from time to time during operation phase, if there's no proper management of toilets and safe drinking water, employees and locals may get health problems. *The envisaged impact is direct, high, site-specific and long term.*

c. Conflict and grievances management

The project should always be prepared for the management of conflict and grievance management, as the mishandling of such grievances could invite social demonstration, opposition and conflict. *However, the envisaged impact is considered as indirect, moderate, site-specific to local and long term.*

d. Impacts on IPS and vulnerable communities

The settlement of a community is found nearly 100 m away from the project area, due to which, the impact is negligible. Hence, no impact is envisaged in this regard.

e. Inflow of People in the Project Area

There will be 12 full time staffs during the operation phase. Similarly, due to unique nature of renewable energy industry, different people from diverse society may also visit the sub-project site. This may hinder the local culture and traditional activities of the local people which might create misunderstandings and conflict. . However, since only few numbers of workers will be employed for the plant operation and management. *Therefore, the envisaged impact is considered to be direct, site specific ,low and long term*.

f. Issues related Sexual Exploitation Abuse and Sexual Harassment (SEA/SH)

The influx of labor in the sub-project area during the construction phase could poses a risk related to sexual exploitation and abuse/sexual harassment (SEA/SH). The interaction between workers and community members could lead to increased risks of GBV in the local communities. Additionally, there may be incidents of gender-based violence (GBV), sexual exploitation, and harassment among workers, sub-project staff, and local people. Therefore, effective and timely mitigation measures must be implemented to address and mitigate the potential risks of SEA/SH and abusive behaviors between sub-project-related staff and the local population. *The impact will be direct in nature, high in magnitude, local in extent and short term in duration*.

g. **Gender discrimination and child labour**

Male and female workers may be paid unequally for the same or similar works. Similarly, contractor may select male and female workers for selective works rather than the capacity of individual workers. Such gender discrimination on works and pay scale may create dispute at workplace and hindrance on progress of works. Similarly, there is probability of using children in the subproject as cheap construction labour. *The impact will be indirect in nature, moderate in magnitude, site specific in extent and short term in duration*.

i) Stakeholder Engagement and information disclosure

Stakeholder engagement and information disclosure is very important for the successful implementation of the proposed subproject. Avoiding or evading the stakeholders on proposed subproject activities may hamper the progress and sustainability of the subproject. Likewise, if information regarding the subproject is not shared with concerned stakeholders and locals, it can also create problem in subproject implementation and sustainability. *The impact will be indirect in nature, moderate in magnitude, local in extent and long term in duration.*

Impact Assessment Matrix

Table 27 Impact assessment

S.N	Environmental Issues	Impacts	Direct / Indirect Impact	Extent	Duration	Magnitude	Significance
	A. Beneficial Impacts						
A.1	**Construction Phase**						
A.1.1	*Employment Opportunity to Locals*	Unskilled human resource will be full filled from local area	D	L(20)	ST (5)	Mo (20)	**45 Significant**
	Skill Development of Local and improvement in livelihood	Unskilled labor will get skill and capacity. Retails shop and restaurants will get business.	D	L(20)	ST (5)	Lo (10)	**35 insignificant**
A.2	Operation Phase						
A.2.1	*Employment Opportunity to Locals*	Locals will be hired for regular jobs.	D	L(20)	LT (20)	Mo (20)	**60 Significant**
A.2.2	*Skill Development of Local*	Locals will learn skills and build their capacity.	D	L(20)	LT (20)	Lo (10)	**50 Significant**
A.2.3	*Sustainable Waste Management*	Manage organic waste, prevent from disposing in landfill.	D	L(20)	LT (20)	Mo (20)	**60 Significant**
A.2.4	*Availability of organic Fertilizer and CNG*	Organic Fertilizer and Bio CNG will be produced	D	R(60)	LT (20)	Mo (20)	**100 Significant**
A.2.	*Reduction in Greenhouse Gas Emission*	Biodegradable waste will be converted to useful gas.	D	R(60)	LT (20)	Mo (20)	**100 Significant**

	B. Adverse Issues/Impacts						
B.1	**Construction Phase**						
B.1.1	***Physical Environment***						
B.1.1.1	Change in Land use	Residual impact, existing agricultural land will be converted in project structures	D	S (10)	LT (20)	Lo (10)	**40 Insignificant**
B.1.1.2	Issues related with air	Emission of dust, smoke, CO_2 and other harmful gases through vehicular movement, excavation and related construction activities	D	S (10)	ST (5)	Lo (10)	**25 Insignificant**
B.1.1.3	Issues related with water	• Pollution of groundwater through percolation of wash water from construction materials, spillage of lubricants • Formation of muddy ditches during rainy season	D	L (20)	ST (5)	Lo (10)	**35 Insignificant**
B.1.1.4	Issues related with soil pollution	Degradation in soil fertility due to haphazard disposal of construction spoils, stockpiles and spillage of lubricants	D	S (10)	ST (5)	Lo (10)	**25 Insignificant**
B.1.1.5	Increase in noise level due to construction activities	Increase in noise from operation of machineries, excavation and vehicular activities	D	S (10)	ST (5)	Lo (10)	**25 Insignificant**

B.1.1.6	Issues related with spoil disposal and stockpiling of construction materials	• Degradation in aesthetic beauty • Percolation of chemical content in waste water from construction material into agricultural land • Loss of soil fertility • Formation of muddy ditches during rainy season	D	S (10)	ST (5)	Lo (10)	**25 Insignificant**
B.1.1.7	Traffic management	Traffic congestion on access road while transporting construction materials	D	L (20)	ST (5)	Lo (10)	**35 Insignificant**
B.1.2	***Biological Environment***						
B.1.2.1	Loss of Vegetation	No need to fell down any trees (Impact not envisaged)	-	-	-	-	**-**
B.1.3	***Socio-economic and Cultural Environment***						
B.1.3.1	Occupational health and safety of worker	Exposure to fugitive emission, noise and risk of physical injury and communicable disease (COVID-19) risk, Health risks associated with poor labor camp, unsafe water and unhygienic condition, due to influx of outside and migrant laborers. Inadequate living space for laborers	D	S (10)	MT (10)	H (60)	**80 Very Significant**
B.1.3.2	Pressure on utilities and infrastructure	Due to shorter construction period and limited construction workers, the impact is not envisaged	-	-	-	-	**-**

B.1.3.3	Trespassing and nuisance to nearby community	• Intrusion of workforce to nearby community • Intrusion of unauthorized personnel at construction site • Annoyance and conflict between construction workforce and community	ID	S (10)	ST (5)	Lo (10)	**25 Insignificant**
B.1.3.4	Health and Sanitation Related Issues In and Around Sub-Project Site	• Injuries to workers while handling machineries • Community children getting into accidents	D	L (20)	ST (5)	Mo (20)	**45 Significant**
B.1.3.5	Conflict and grievances management	Conflict and grievances related with improper management of construction materials, aesthetic degradation, conflicts	ID	L (20)	LT (20)	Mo (20)	**60 Significant**
C.1	**Operation Phase**						
C.1.1	***Physical Environment***						
C.1.1.1	Issues related with management of raw materials storage and post digestate waste	Contamination of land and water sources if leaching of raw materials into underground water due to its improper storage system	D	L (20)	LT (20)	Mo (20)	**60 Significant**
C.1.1.2	Impact associated with collection and transportation of Waste	• Foul smell along the transportation route • Possibility of dropping the waste on road • Vehicular emission	D	L (20)	ST (5)	Mo (20)	**45 Significant**

C.1.1.3	Issue related to odor during storage of raw materials and slurry production	Increase in flies and vector disease due to improper raw material storage system and haphazard disposal of post digestate	D	S (10)	LT (20)	Mo (20)	**50 Significant**
C.1.1.4	Impact of spilled chemicals from gas cleaning facilities	The project will adopt ferrous and biogenic scrubbing, so no impact is envisaged	-	-	-	-	**-**
C.1.1.5	Increase in noise from plant operation	• Increase in noise due to operation of biogas plant components. • Temporary hearing loss, annoyance among the staff due to prolonged exposure	D	S (10)	LT (20)	Lo (10)	**40 Insignificant**
C.1.1.6	Gas leakage and fire hazard	• Methane gas being highly flammable can cause fire hazard; loss of property and life • Contribution to GHG emission due to leakage	D	L (20)	LT (20)	Mo (20)	**60 Significant**
C.1.1.7	Issues with drainage management	• Percolation of wash-off water of organic feedstock and post digestate into groundwater and nearby river • Alter in water quality parameter	D	S (10)	LT (20)	Lo (10)	**40 Insignificant**
C.1.1.8	Over Extraction of Groundwater	• About 65m^3/day of water is required for dilution purpose out of which only 40m^3 of	D	L (20)	LT (20)	Lo (10)	**50 Significant**

		fresh water will be extracted from underground and remaining will be covered through separated water from slurry. • Excessive use of underground could lower the water table and could cause impact on availability of water in the locality that depends on underground water.					
C.1.1.9	Management of Wastewater from Digested Slurry	• Increase in BOD, turbidity and TS of nearby water body if discharged directly into it • Groundwater pollution	D	L (20)	LT (20)	Mo (20)	**60** **Significant**
C.1.2	***Biological environment***						
C.1.2.1	Maintenance and Protection of greenery in sub-project area.	Although no trees will be required to cut down during construction phase, greenery will be maintained.	-	-	-	-	-
C.1.3	***Socioeconomic and Cultural Environment***						
C.1.3.1	Occupational health and safety	Physical injury to staffs Prone to catch disease from organic waste handling, COVID-19 pandemic	D	S (10)	LT (20)	H (60)	**90** **Very Significant**

C.1.3.2	Issues related with health and sanitation in and around project site	Spread of vector borne disease among the 3 HHs in the direct impact area and staffs due to improper management of organic waste, toilets, drinking water.	D	S (20)	LT (20)	H (60)	**90** **Very Significant**
C.1.3.3	Conflict and grievances management	Conflict and grievances with aesthetics, odor, noise, haphazard disposal of digestate from local residents resulting opposition and conflict	ID	L (20)	LT (20)	Mo (20)	**60** **Significant**
C.1.1.4	**Inflow of People in Project Area**	**Increase in quarrel and debates among workforce and community**	**D**	**S (10)**	**LT (20)**	**Lo (10)**	**40** **Insignificant**
C.1.1.5	***Issues related Sexual Exploitation Abuse and Sexual Harassment***	***Sexual Exploitation Abuse and Sexual Harassment***	**ID**	**L (20)**	**ST (5)**	**Lo (10)**	**35** **Insignificant**
C.1.1.6	**Gender discrimination and child labour**	Pay Parity in gender,child as cheap labour	ID	S(10)	ST(5)	Mo(20)	**35** **Insignificant**
C.1.1.7	***Impacts on IPS and vulnerable communities***						

C.1.1.8	Stakeholder Engagement and information disclosure	Avoiding stakeholders, not sharing information to locals	ID	L (20)	LT (20)	Mo (20)	**60 Significant**

Note: *D= Direct; ID = Indirect, S= Site specific; L = Local, R = Regional; ST= short term, NA = Not Applicable of No impact, MT = Medium Term, LT = Long Term; Lo = Low, Mo = Moderate, H = High*

Impact Weightage Criteria, National EIA Guidelines (1993)

TABLE 28 Impact weightage criteria, national eia guidelines (1993)

Magnitude		**Extent**		**Duration**	
High (H)	60	Regional (R)	60	Long Term (LT)	20
Moderate (Mo)	20	Local (L)	20	Medium Term (MT)	10
Low (Lo)	10	Site Specific (S)	10	Short Term (ST)	5

Using this system, the maximum score is 140 points and the minimum 25

Significance of Impact

Total Score: *Upto 44: Insignificant 45-74: Significant*

Greater than 75: Very Significant

6. ENVIRONMENTAL AND SOCIAL IMPACT MITIGATION

This section of the report has prescribed the practical and cost-effective mitigation measures to avoid, minimize and compensate the effects of adverse impacts to acceptable level. The project proponent ensures to implement these measures during the construction and operation of the project.

6.1 Mitigation Measures

In order to reduce or prevent the likely environmental impacts identified in previous section, Table 5-1 presents prescribed environmental mitigation measures and their estimated mitigation costs.

Table 29 Mitigating Measures

S.N	Environmental Impacts	Mitigation Measures	Time of Action	Mitigation Cost (NRs.)	Responsibility
A. Construction Phase					
A.1 Physical Environment					
A.1.1	• Change in land use	• Minimum land disturbance will be made while sub-project construction. Greenery will be maintained	During Construction Phase	20,000.00	Sub-project Developer
A.1.2	• Emission of dust, smoke, CO_2 and other harmful gases through vehicular movement, excavation and related construction activities	• All vehicles and machineries used in construction work shall be in compliance with emission standard set for vehicles and machineries by MoFE • Regular maintenance of vehicles and machineries • Regular spray of water in the construction site and access road • Cover stockpiled construction materials with tarpaulin	During Construction Phase		Sub-project Developer/Contractor
A.1.3	• Pollution of groundwater through percolation of wash water from construction materials, spillage of lubricants	• Mixing and washing of aggregates should be done in designated area or Temporary construction of silt trap or sedimentation tank to collect washed off of aggregates. • Storage of spent oil and greases in containers and its safe disposal	During Construction phase	-	Sub-project Developer/Contractor

		• Provision of proper drainage system			
	• Formation of muddy ditches during rainy season	• Provision of proper drainage system • Using construction spoils to fill up low land area, ditches and land development work	During Construction phase	-	
A.1.4	• Degradation in soil fertility due to haphazard disposal of construction spoils, stockpiles and spillage of lubricants	• Stockpiling the materials in designated place within the construction site • Storage of spent oil ,lubricant and greases in containers and its safe disposal • Using construction spoils to fill up low land area, ditches and land development work	During Construction Phase		Sub-project Developer/Contractor
A.1.5	• Increase in noise from operation of machineries, excavation and vehicular activities	• Provision of low sound emitting machineries • Regular maintenance of vehicles and machines • Prohibition of construction activities in night time and early morning	During Construction Phase	-	Sub-project Developer/Contractor

A.1.6	• Degradation in aesthetic beauty • Percolation of wash water from construction material into agricultural land and groundwater • Formation of muddy ditches during rainy season	• Stockpiling of construction materials and spoil in designated area within construction site • Compaction of spoil • Covering of stockpiles to avoid washout during rainy season • Provision of appropriate drainage to avoid muddy surface formation	During Construction phase		Sub-project Developer/Contractor
A.1.7	• Traffic congestion on road while transporting construction materials	• Avoid transporting construction material during rush hour • Avoid stockpiling of construction materials in access road. • Prepare Traffic Management Plan	During Construction phase		Sub-project Developer/Contractor
A.2 Biological Environment					
A.2.1	Vegetation Loss	No vegetation will be removed.	-	-	**-**
A.3 Socio-economic Environment					
A.3.1	• Exposure to fugitive emission, noise and risk of physical injury	• Provision of personnel protective equipment (PPE) like helmets, masks, safety jacket, gloves, safety boots and safety harness to construction workers	During Construction Phase	Included in construction cost	Sub-project Developer/Contractor

		• Provision of first aid kits • Adequate lighting and safety signal devices be installed for work safety. • Adequate warning signs and safety barriers will be provided for work safety • Prepare Occupational Health and Safety Plan and Emergency Preparedness and Response Plan, maintain social distancing, and follow guidelines of Nepal Government considering challenges posed by communicable disease to control possible spread of diseases among the construction workers and between the workers and host community.			
A.3.2	• Injuries to workers while handling machineries • Community children caught in accidents • Transmission of communicable diseases	• Provision of PPE and Safety Aid boxes • Provision of well barricade wall in construction site • Provision of security personnel • Emergency preparedness plan, Occupational Health and Safety Plan considering disease of highly contagious nature	During construction phase	50,000.00	Sub-project Developer/Contractor

		• Community Health and Safety Plan (Prepared by trained staff appointed by proponent) • Provision of community health and safety plan • Rehabilitation of existing infrastructures (roads, public and private properties) if affected by subproject related activities • The subproject site will be barricaded to avoid the trespass of unauthorized person in subproject site • Sprinkle the water on the road that passes through community to control the dust while transporting material to the subproject site • Awareness and orientation to construction workers to respect locals • Provision of reporting mechanism if any incidents occurs			

A.3.3	• Intrusion of workforce to nearby community • Intrusion of unauthorized personnel at construction site • Annoyance and conflict between construction workers and community	• Awareness and orientation to construction workers to respect locals and the risks posed by diseases highly contagious nature. • Provision of barricading the subproject site • Code of conduct for workforce will be prepared and implemented • Periodic free, prior and informed consultation with community • Prepare Community Health and Safety Plan • Prepare Labor Management Plan • Provision of proper record of labor, well maintained registration sheet with personal details as well as emergency contact details (native and migrant worker) • Make restriction of entry of children in construction area • Construction workers will be trained in job hazards, emergency procedures and in	During Construction Phase	**Included in construction cost**	Sub-project Developer/Contractor

		any other relevant safety measures.			
A.3.4	• Conflict and grievances: There is no land acquisition issues since the poultry has its own land but due to flies and vector borne diseases and foul smell in the project site, it has to be dealt with little bit sensitively with locals to avoid the situation.	• Grievance redress Committee (GRC) at subproject level will be established • Management of record keeping system of the grievance received at field level • Suggestion box will be place at the entrance of subproject premises to receive the suggestions and complaints from community people. • Appoint ESS Focal Prson for handling grievances under Grievance Redress Mechanism • Periodic consultations with locals to provide them project updates and make them aware of benefits of biogas plants as a supportive role in removing the poultry waste and foul smell efficiently. • Instruct construction company to proceed construction work in compliance to ESIA report • Establish subproject specific Grievance Redress Mechanism	During Construction Phase and operation Phase	NRs. 100,000	Sub-project Developer

	Impact associated with gender and SEA/SH • Contractors, project employee and the workforce could discriminate against women and vulnerable groups • The contractor could pay differently to the male and female worker for the same work • The exploitation of children in the construction work	• Code of Conduct (CoC) including SEA/SH for subproject staff will be implemented • Appoint SEA/SH Focal person for handling grievances related to SEA/SH • Orientation of SEA/SH and gender based violence to the staff and workers of sub pojects • The use of child labour in subproject construction will be strongly prohibited (Record keeping of labour with identity card showing age will be maintained) • Both women and men and people of excluded groups will be given equal opportunity for employment and no gender discrimination will be done in terms of wages for the same or similar works.			
• **B. Operation Phase**					
• **B.1 Physical Environment**					
B.1.1	• Contamination of land and water sources • Leaching of raw feedstock into groundwater during rainy season due to improper storage system	• Avoid direct discharge of slurry and decanted liquid waste into nearby water bodies and agricultural field	During Post Construction/ Operation Phase	Included in project cost	Sub-project Developer

	• Alter in water quality parameter	• Storing the raw materials in roofed unit with impermeable base • Provision of decantation unit with sealing of base for settling solid and liquid slurry and use of slurry to make compost			
B.1.2	• Increase in flies and vector disease due to improper storage system of feedstock poultry waste and haphazard disposal of post digestate	• Storing of feedstock(OW) and post digestate in designated area • Covering of feedstock and post digestate • Regular cleaning around the decantation unit and feedstock storage area	During operation phase	50,000.00	Sub-project Developer
B.1.3	• Methane gas being highly flammable can cause fire hazard; loss of property and life • Contribution of GHG emission	• Avoid naked flame near the plant • Provision of good and reliable fire extinguisher and emergency fire-fighting water storage • Designation of assembly location for workers in case of occurrence of firing • Regular checking of leakage in plant	During Operation Phase	150,000.00	Sub-project Developer
B.1.4	• Percolation of wash-off water of organic feedstock and post digestate into groundwater and nearby rivers	• Provision of proper storm water drainage channel • Storing post digestate and feedstock in designated area	During Operation Phase	-	Sub-project Developer

	• Alter in water quality parameter				
B.1.5	• Increase in BOD, turbidity and TS of nearby water body if discharged directly into it • Groundwater pollution	• Provision of proper drainage system • Prohibition of direct disposal into nearby agricultural field and water body	During Operation Phase	-	Sub-project Developer
B.1.6	• Foul smell along the transportation route • Possibility of dropping the waste on road • Vehicular emission	• Proper covering of feedstock while transporting • Proper compaction of feedstock to avoid dropping • Use of vehicles complying Vehicle Mass Emission Standard, 2069	During Operation Phase	100,000.00	Sub-project Developer
B.1.3	• Excessive use of underground could lower the water table and could cause impact on availability of water in the locality that depends on underground water.	• Extraction of groundwater as required quantity only. If required, extraction permit shall be collected from municipality.	During operation phase	-	Sub-project Developer
B. 2	• Biological Environment				
B.2.1	• Maintenance and protection of greenery in the sub-project periphery	• Avoid throwing of waste generated by the workers in vegetated land. • A strict rule for workforce not to degrade nearby greenery.	During operation phase	Operation costs, gardening and cleaning workforce would be hired.	Sub-project Developer

		• Maintenance of garden in the subproject area.			
B. 3	• Socio-economic and Cultural Environment				
B.3.1	• Physical injury to staff • Prone to catch disease due to handling of organic waste and highly contagious diseases.	• Workers shall be provided with personal protective equipment (PPE) like helmet, safety boots, safety jacket, gloves and masks • Provision of First Aid Kit • Staffs shall undergo a regular medical checkup and should be administered necessary vaccines, such as prescribed by a medical doctor • Proper orientation and training should be provided to the staff on safety so that accidents and disease can be avoided • Provision of necessary safety cautions, signposts and instructions at construction site as well as near moving machineries • Prepare Occupational Health and Safety Plan and Emergency Preparedness and Response Plan, considering the highly contagious diseases and orient workers on responsible behavior amid the crisis.	During Operation Phase	100,000.00	Sub-project Developer

		• Provision of proper record of labor, well maintained registration sheet with personal details as well as emergency contact details (native and migrant worker)			
B.3.2	• Spread of vector borne disease around the community and staffs due to improper management of organic waste • Opposition from community against the project	• Keeping the unit areas clean with disinfectants • Avoid haphazard disposal of digestate • Awareness and training to staffs regarding sanitation and operation of plant • Prepare Community Health and Safety Plan with focus on communicable disease	During Operation Phase	-	Sub-project Developer
B.3.3	• Conflict and grievances: Though there won't be any land acquisition issues but flies and vector borne diseases and foul smell during operation of biogas may lead to conflict which needs to be dealt with little bit sensitively with locals. But only two HHs are present in the 100 m vicinity.	• Arrangement of handling grievances from community and proceed immediate action thereof, if any. • Regular consultations with locals and some awareness program to nearby villagers and awareness on benefits of biogas plants. • Instruct construction company to proceed construction work in compliance to ESA report • Employment opportunities to the locals.	During Construction Phase and operation Phase		Sub-project Developer

		• Provision of periodic consultation with the nearest community and concerned stakeholders			
B.3.4	• Grievances regarding aesthetics, odor, water and noise pollution from local residents resulting opposition and conflict	• Implement mitigation measures to avoid potential impacts mentioned in B.1, B.2 and B.3 • Establish Grievance Redress Mechanism (GRM) • Arrangement of handling grievances from community and proceed immediate action through Grievance Redress Mechanism • Meeting with locals and awareness program to the nearby settlement regarding the nature of the project • Employment opportunities to the locals	During Operation Phase	150,000.00	**Sub-project Developer**

7. STAKEHOLDER CONSULTATION, COMMUNITY PARTICIPATION AND DISCLOSURE

7.1 Public Consultation

Public Consultations with regard to the sub-project development and operation was accomplished in different forums during the field survey. The relevant issues raised by the locals and concerned stakeholders in such forum was considered in these study.

A stakeholder consultation meeting including government officials and ESA team was carried out on 23th of Falgun 2080 (7th March, 2024) at ward office of Ward no. 3 of Jagarnathpur Rural Municipality in presence of Chairman of the ward- Nagina Raut Ahir, officias of Shivan Jaivik Khad tatha Urja Pvt. Ltd, ward members, environment officer and representative of Innovative and Sustainable Technology Solution (ISTS) Pvt. Ltd. During the meeting, a brief discussion was carried out on construction and operation of biogas plant at Shivan Jaivik Khad tatha Urja Pvt. Ltd. The factors like physical, biological, social impacts and their mitigation measures were discussed briefly. ESA team also met with some local people and consulted with them at the project location.

Major agendas of the meeting were:

1. Information about biogas and the construction of plant
2. Collection of thoughts and suggestions from the stakeholder
3. Miscellaneous

Decisions made during the meeting regarding above-mentioned agendas were:

1. The representative of ISTS Pvt. Ltd. informed about the biogas plant to be constructed at Shivan Jaivik Khad tatha Urja Pvt. Ltd of Ward-3 of Jagarnathpur Rural Municipality under Commercial project. He also briefed about the importance of biogas plant and its uses.
2. Following suggestions were received from the stakeholders for Environmental and Social Assessment (ESA):
   - i) It's good to start a biogas plant in the local area. The employment opportunities for the construction and operation of such plant must be given to the local people if the locals have the required skills and capabilities.
   - ii) During any phase (construction/operation), there should not be any impacts on the environment. If impacts are seen then they should be minimized.
   - iii) During the construction and operation of the biogas plant, if any kind of pollution or foul smell is observed, the poultry itself should be responsible for minimizing the impacts.
   - iv) The compost produced after the operation of the biogas plant must be made available to the local people in subsidized rate.
   - v) Since biogas plant is useful in minimizing the pollution and is beneficial for the environment, other poultry farms and industries must also consider constructing biogas plants.
   - vi) During the construction and operation of the plant, safety and health must be considered.

3. Since the construction and operation of biogas plant at Shivan Jaivik Khad tatha Urja Pvt. Ltd., it seems beneficial in minimizing the environmental impacts, all the stakeholders attending the meeting decided and agreed to help in the construction and operation of the biogas plant.

   During meeting, the issues raised by the public during the consultation meeting were noted, collected and incorporated in report and adequately addressed in mitigation measures. They were consulted for large biogas project in Jagarnathpur Rural Municipality and discussed about different aspects of biogas and environmental aspects. Meeting minute of public consultation is attached in Annex A-3. In the meeting it was agreed to install the large biogas at the land provided by the rural municipality and it was also agreed by company to give the job opportunity preference to them during large biogas installation and similarly, to provide fertilizer produced from the slurry to the local community in subsidized amount. It is also prescribed to establish grievance handling committee where locals can raise and register their grievances, if any, during the construction and operation phase of the project. Such grievances will be forwarded to grievance redress committee at first then to proponent or project management unit, if not resolved.

8. ALTERNATIVE ANALYSIS

In order to ensure the subproject as an environmentally sound, alternative analysis was carried out to choose better alternative from the environmental perspective and without compromising the process flow or production. The aim of alternative analysis is to arrive at a development option, which maximizes the benefits while minimizing the unwanted impacts. While exercising the alternative analysis, the following aspects were taken into account.

8.1 No Project Option

No action option for the proposed project implies non implementation of the proposed extension of subproject as an alternative to LPG gas. The large biogas project is supposed to reduce the large municipal waste (65 TPD) into usable biogas 2100m^3 per day. The efficient use of waste will be beneficial situation for the proponent and in addition that also directly help in conserving environment through risk of leaching, reduce risk of flies and vectors borne diseases, reduce foul smell and protect aesthetic value. Hence, no action option is rejected.

8.2 Design Alternative/Technology

There are several anaerobic digestion technologies to generate biogas from anaerobic digestion. Modified GGC is the native anaerobic digestion technology promoted in Nepal. While, in this project, high efficient CSTR technology with heating is adopted for higher energy yield. Due to prior successfully tested and commissioned of bio-methanation plant, the same technology has been proposed.

8.3 Alternative Resource

The construction materials will be sourced from Nepalese market by competitive bidding process. The project machineries will be imported from India. During operation phase, raw materials are chosen in order to assure the quality aspects as well as economically viable. All the raw materials used will be sourced from the internal market as far as possible.

8.4 Alternative Project Site

The project site's land is owned by the proponent. The proposed land lies in the flat region, so, this region is suitable for the proposed design of the plant. Similarly, the area is very near from the highway. In the context of the transportation, both roadways and airways within the reach of the area. Hence, alternative project site is not required.

8.5 Alternative Time-schedule

The project will be accomplished in day time as the local residents will be affected from sound pollution during the night. For the use of machineries, time schedule from 9am in the morning to 5pm in the evening has been proposed

9. ENVIRONMENTAL MONITORING

9.1 Project Management Responsibility

The implementation of mitigation measures responsibility is entrusted to the project proponent. Because of small nature of project, the monitoring of environmental parameters in the construction and operation period should also be done by the proponent.

9.2 Environmental Standards

The GoN has endorsed few environmental standards on air, water and noise quality. These environmental standards shall be treated as other acts and regulations until GoN enforces standards in the specified sector for the project environmental compliance propose. Considering this, the environmental standards are proposed for proposed subproject construction and operation for compliance which is attached in Annex A-7.

9.3 Environmental Monitoring Plan

The environmental monitoring plan designed for the project has three main objectives;

- To ensure that the subproject baseline conditions were adequately documented such that a comparative assessment of the project baseline before and after the project could be made objectively for impact evaluation
- To ensure that the mitigation commitments to minimize the predicted adverse impacts and maximize the beneficial impacts including the environmental enhancement programs were actually complied and implemented in time and with sincerity by the subproject.
- To verify that the subproject impacts were within the limits of the impact prediction or some unforeseen impacts also occurred during project development and what measures were taken to minimize the unforeseen impacts

As baseline environment of the proposal development area is known and also documented in this report, the proponent itself will carry out compliance and impact monitoring of the sub-project construction and operation sub-period. In addition, to ensure the effective implementation of ESMP, the environmental and social safeguard compliance monitoring will be conducted by the safeguards staffs (E&S) of AEPC/MGEAP will be responsible to carry out monitoring during different stages of the subproject cycle i.e., construction and operation phases. The ESCO will be responsible to prepare monthly progress report and submit it to the AEPC/MGEAP and AEPC will be responsible to prepare quarterly monitoring reports and submit it to the World Bank. The monitoring management plan for baseline, compliance and impact is presented in Table below.

Table 30 Baseline monitoring, construction and operation phase

S.N	Provisions of compliance	Individuals responsible	Methods	Frequency /Time	Monitoring authority	Place	Financial commitment (NRs.)
Prior Construction Phase							
1	• Groundwater quality testing of nearby River	Proponent	Laboratory Analysis	Prior to construction period	AEPC	Sub-project Site	15,000.00
2	• Air Quality (TSP, PM 2.5, PM 10, Methane fraction)	Proponent	Low Volume Sampler, Gas Analyzer	Prior to construction phase	AEPC	Sub-project Site	75,000.00
3	• Noise level monitoring of project location	Proponent	Noise level Meter	Prior to construction period	AEPC	Sub-project Site	10,000.00

Table 31 Compliance monitoring, construction and operation phase

S.N.	Provisions of compliance	Individuals responsible	Methods	Frequency /Time	Monitoring authority	Place	Financial commitment (NRs.)
Construction Phase							
1	• Vehicular emission in compliance with standard set for vehicles and machineries by MoFE • Regular maintenance of vehicles and machineries	Proponent	Site Observation/ records	throughout the construction period	Proponent	Sub-project Site	-

	• Regular spray of water in construction site						
	• Storing of spent oil and greases in containers and designated place	Proponent	Site Observation/ records	During construction period	Proponent	Project Site	-
	• Stockpiling of construction materials in designated place within construction site • Provision of drainage • Using of construction spoils to fill up low land area and ditches	Proponent	Site Observation/ records	During construction period	Proponent	Project Site	-
2	• Provision of low sound emitting machineries • Regular maintenance of vehicles and machines • Prohibition of construction activities in nighttime and early morning	Proponent	Site Observation/ records	During construction period	Proponent	Project Site and nearby community	-
3	• Stockpiling of construction materials and spoil in designated area within construction site • Compaction of spoil • Covering of stockpiles to avoid washout water during rainy season • Provision of appropriate drainage to avoid muddy surface formation	Proponent	Site observation and records	During construction period	proponent	Project site	20,000.00
4	• Provision of personnel protective equipment (PPE) like helmet,	Proponent	Site Observation/ consultation	During construction period	Proponent	Project Site	50,000.00

	safety boots, safety jacket, gloves and masks • Provision of First Aid Kit • Staffs shall undergo a regular medical checkup and should be administered necessary vaccines, such as prescribed by a medical doctor • Prepare Occupational Health and Safety Plan and Emergency Preparedness and Response Plan, considering the highly contagious diseases and orient workers on responsible behavior amid the crisis. • Provision of proper record of labor, well maintained registration sheet with personal details as well as emergency contact details (native and migrant worker)						
5	• Awareness and orientation to construction workers • Provision of barricade • Provision of necessary safety cautions, signposts and instructions at construction site as well as near moving machineries	Proponent	Site Observation/ records	During construction period	Proponent	Project Site	50,000.00

	• Proper orientation and training should be provided to the staff on safety so that accidents and disease can be avoided						
6	Establishment of GRC at subproject level and Record book for registration of grievances at subproject level • Implement Grievance Redress Mechanism • Appoint a staff for handling grievances • Meetings with locals and some awareness program to nearby villagers and awareness on benefits of biogas plants to manage poultry waste efficiently. • Instruct construction company to proceed construction work in compliance to ESA report • Placement of suggestion boxes • Period consultation with relevant stakeholders	Proponent/ Rural Municipality	Site Observation/Records Meetings/ awareness program	During Construction Period	Proponent/ Rural Municipality	Project Site	50,000.00
Operation Phase							

1	• Avoiding direct discharge of slurry and decanted liquid to nearby water bodies • Storage of raw materials in roofed unit with impermeable base • Provision of decantation unit with proper seal of base	Proponent	Site Observation	Before Operation Phase	Proponent	Project Site	-
2	• Proper covering of feedstock while transporting • Proper compaction of feedstock to avoid dropping • Vehicular emission in compliance with emission standards	Rural Municipality	Photographs/ Records	Monthly inspection during Operation Phase	Proponent/ Rural Municipality	Project Site	
3	• Storage of feedstock and post digestate on designated area • Covering of feedstock and post-digestate • Regular cleaning around the decantation unit and feedstock storage area • Sprinkle the road to avoid dust during the trasportation	Proponent	Observation	Before Operation Phase	Proponent	Project Site	50,000.00
4	• Avoidance of naked flame near plant • Provision of fire extinguisher • Scheduled maintenance and testing of gas leakage in plant	Proponent	Observation/ Discussion/Record	Before Operation Phase	Proponent	Project Site	20,000.00

5	• Provision of proper storm water discharge channel • Storing of post digested and feedstock in designated place	Proponent	Site observation	During operation phase	Proponent	Project site	
6	• Provision of personal protective equipment to workers • Provision of first aid kit • Regular check-up of staffs • Proper training to staffs about operating plant and waste handling • Provision of labor registration log with their personal details as well as emergency contact details	Proponent	Observation	During construction Phase	Proponent	Project Site	50,000.00
7	• Cleaning the plant area regularly • Avoidance of haphazard disposal of digested • Awareness and training to staffs regarding sanitation and operation plant	Proponent	Observation/ Discussion/Record	During Operation Phase	Proponent	Project Site	20,000.00
8	• Implement Grievance Redress Mechanism • Arrangement of handling grievances from community and proceed immediate action thereof, if any.	Proponent/ Rural Municipality	Observation/Record/ Discussion with locals	During operation phase	Proponent/ Rural Municipality	Project site	

	• Regular consultations with locals and some awareness program to nearby villagers and awareness on benefits of biogas plants to manage poultry waste efficiently. • Instruct construction company to proceed construction work in compliance to ESA report • Employment opportunities to the locals.						

Table32 Impact monitoring, construction and operation phase

S.N.	Monitoring Indicator	Individuals responsible	Methods	Frequency /Time	Monitoring authority	Place	Financial commitment (NRs.)
Construction Phase							
1	Effect on productivity of nearby farmland due to construction waste and percolated water	Proponent	Discussion with local people, visual observation	twice during construction period	Proponent	Nearby farmland	-
2	Increased Noise level	Proponent	Discussion with local people, noise level meter	once during peak construction work	Proponent	Nearby settlement	-
Operation Phase							
1	Aesthetic degradation due to haphazard disposal of organic slurry in nearby water bodies and area	Proponent	Discussion with local people	Twicein a year	Proponent	Nearby settlement/farm land	-
2	Occupational Health and Safety of the staffs/workers	Proponent	Clinical checkup/ Records/interview with staffs/workers	Once in a month	Proponent	Project Site	-
3	Number of grievances received from community	Proponent	Registered file/complains	Every Month	Proponent/ Municipality	Nearby community	-
4	Water Quality	Proponent	Water quality tests of source of water supply	Once during operation period			

			(borewell water)				
5	Air quality	Proponent	Visual inspection	Once during operation period			
6	Increased noise level	Proponent	Discussion with local people, noise level meter	Once during operation period	Proponent	Project site/ Nearby Community	-
7	Methane Leakage	Proponent	Gas Analyzer	Twice in a year	Proponent	Project site	-

Table 33Summary of Environmental Monitoring Cost

Item	**Quantity**	**Rate per month**	**Rate per year (NRs)**	**Total (NRs)**
Construction Phase				
Water Quality Monitoring	-	-	30,000 (Once)	30,000.00
Noise Monitoring	-	-	10,000.00	10,000.00
Operation Phase				
Water Quality Monitoring	-	-	15,000.00 (annual)	15,000.00
Noise Monitoring	-	-	10,000.00 (annual)	10,000.00
Methane Leakage	-	-	15,000.00 (annual)	15,000.00
Human Resource				

Environment and Social Officer (ESS Focal Person)	1	60,000	120,000 (Two month input in each year)	120,000.00
Total				**200,000.00**

10. INSTITUTIONAL ARRANGEMENT AND GRIEVANCE REDRESS MECHANISM

10.1 Project Environmental Management Plan Structure and Stakeholders Responsibility

The Project Environmental Management Framework of the proposed project is prepared to show linkages with different parties to be involved directly or indirectly during the different phases of project development and operation in compliance with the existing Act and Rules.

Overall project environmental and social management is the responsibility of **Proponent** of the proposed subproject. Key stakeholders to be involved for project environmental and social management in the hierarchy order are:

- Alternative Energy Promotion Center (AEPC)/World Bank (WB)/ SREP
- Monitoring Unit of AEPC
- Proponent (through Project Management Unit - PMU)
- Construction Contractor (CC)Representative from Subproject Affected Rural Municipality (SPARMR)

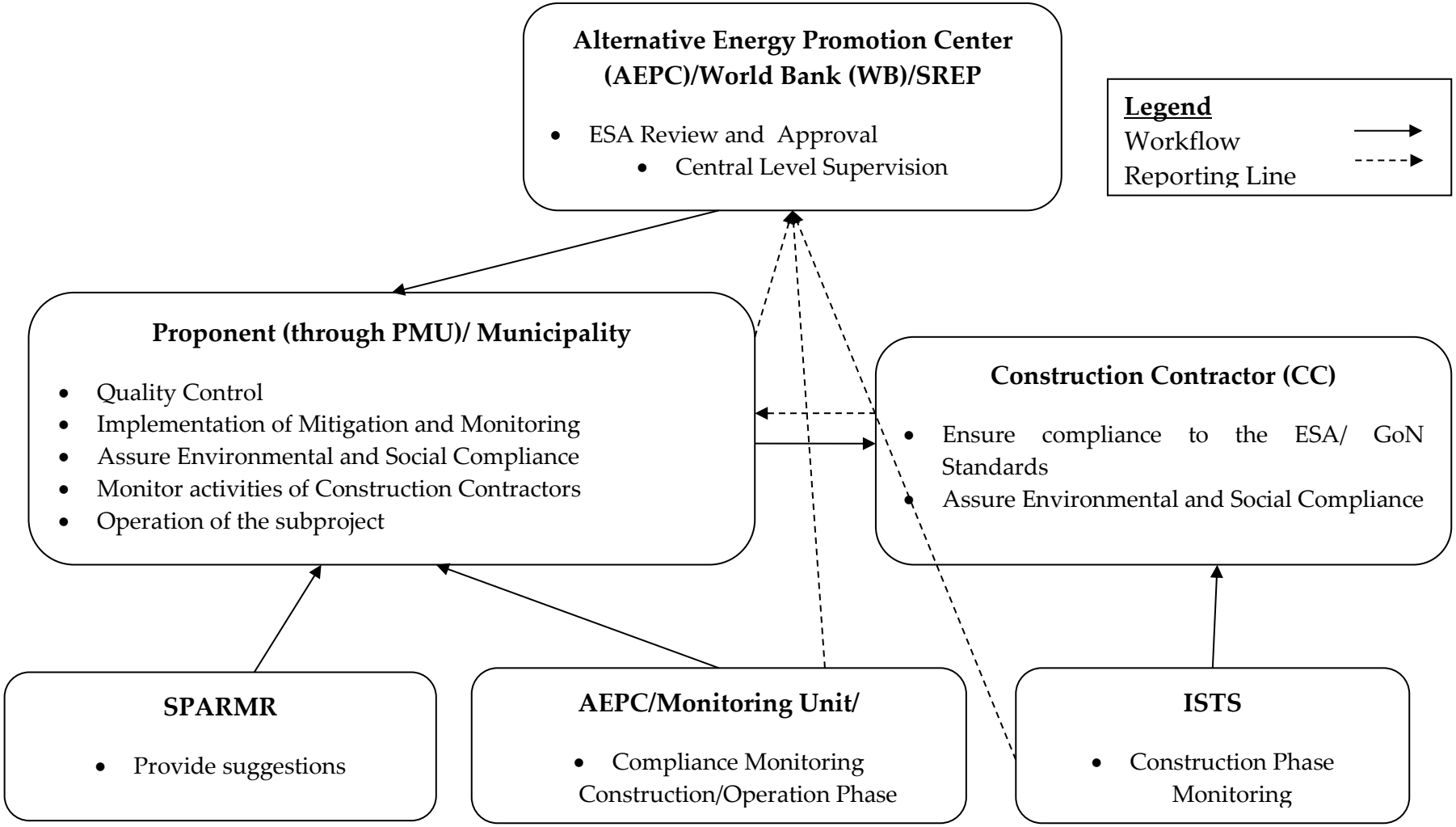


Figure 8 PEM Framework

10.2 Grievance Redress Mechanism

Grievance addressing and feedback is important so as to know what negative impact has been occurred in the community due to the implementation of the project. Such grievances should be taken care in order to avoid conflicts in the society regarding the project. Grievance readdress not only prevents conflicts but will also help the developer to take necessary steps to further improve the plant operation and management system.

As the project location is within the landfill site that is already related with public fear of degradation of their economic land value, flies and vector borne diseases and foul smell. Hence, grievances from the community and nearby inhabitants should be dealt with little bit sensitively to avoid conflict and to ensure smooth running of the project. In case, if any grievances arose, those complains will be assessed by the current Grievance Redress Committee (GRC).

Grievance Redress Mechanism Process

The figure below describes the process that will be used to resolve any grievances related to this project:

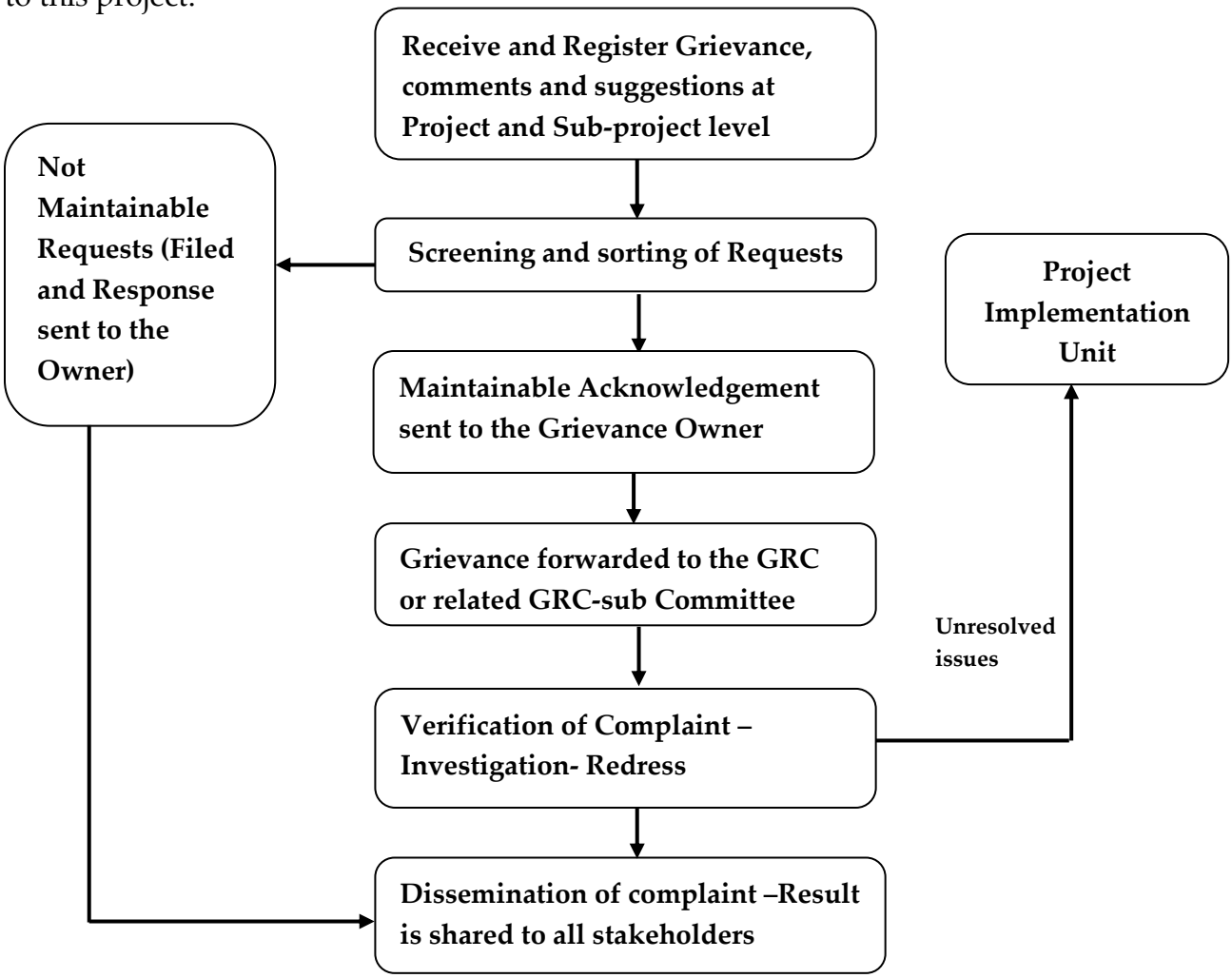


Figure 9 GRM framework

The management team of GRC is listed below:

A. Sub- Project Level Grievance Redress Committee (GRC)

1. Chairperson/ Representative of the ward office/ of respective Municipality and Ward
2. Representative from Project Affected People– Member (2)
3. Representative from local NGO/CBO – Member (1)
4. ESS focal person of the perspective developer/Project manager – Member Secretary
5. Sexual Exploitation Abuse and Sexual Harassment (SEA/SH) Focal Person- Female member

Note: To be ensured that at least one member of the GRC should be female/vulnerable group (Representatives of developers/CSOs/PAP).

The central monitoring may be done by AEPC during the operation phase at any time of the sub-project cycle.

The grievance redress mechanism will be assessed as described below:

- ESS focal person of the developer/Project Manager/Site In-charge will be appointed as the focal person (Member Secretary of project Level GRC) to receive/handle any kind of grievance related to the project. His/her name and contact number will be displayed at the entrance of the project site, so that affected people can have direct access to him/her.
- SEA/SH Focal Person will be female representative from developers/CSOs/PAP of GRC formed at subproject level and she will be responsible to record and handle any kind of grievances related SEA/SH.
- A register will be maintained including the name of grievant, date and time of grievance recorded, issue raised and time frame to redress the received grievance. (format presented in Annex A-6). The register will provide information on how the grievance was resolved.
- A suggestion box will be place at the entrance of the project site as well as in project site premises to collect grievances from employees.
- Grievances can be registered via website: http://www.aepc.gov.np/gform/gform.php
- If the project level GRC will not be able to redress the grievance, it will be forwarded to the national level GRC.
- Grievances received have to be resolved within 3 weeks of receipt of complaint.
- Affected persons have the option of accessing the court of law in case of dissatisfaction with the decision of the GRC.

10.3 Capacity Development and Enhancement Measures

During the construction period, the job priorities will be given to local people with equal opportunities to women as well. The skill development training such as unskilled construction works, scaffolding, casting etc. will be given to the workers so that they are able to use the learned skills in other similar projects and earn their living. The project will require 10 additional skilled and semiskilled workers during operation phase. The priority shall be given to locals for skilled job, if they have required skill and qualifications.

Enhancement Measures: There are no households within 100 m of project location. Gadhaiya villages with around 79 households lies in indirect impact zone i.e. within 500 m. Thus, the following enhancement measures have been proposed to ensure that the project fully respects the dignity, human rights, economies, values and cultures of vulnerable groups, especially women and girls and the IPs.

- Prior to the construction of the project, the representatives of HHs will be consulted to address all the sensitive issues.
- Skill development training such as, driving, mechanics, plumbing, electrician etc. and/or income generation training such as poultry farming, piggery will be offered.
- Priority will be given to the needy families for job opportunities.
- Prior to the project, the people will be consulted if they have any special requirement/demands.

11. COMPANY'S ENVIRONMENTAL HEALTH AND SAFETY PLAN

11.1 Health and Safety Plan

To provide a safe working environment to in-house staffs, visitors and the surrounding settlements, it is very necessary to be fully aware of the safety requirements to avoid accidents from the implementation of biogas plant. These provisions are prepared based on mitigation measures suggested against probable impacts. This plan will be prepared by developer. The following issues are identified and brief safety plans are provided as follow:

a. General House Keeping

- Workers should be given orientation about the safety/emergency preparedness plan during construction and operation phase.
- Security should inform the concerned staff when visitors arrive. The designated staff should guide the visitor.
- Every person who enters the biogas plant premises should display a valid identification card.
- The sub-project area should be regularly cleaned and ensure that all the floors are free from oil spillage and other harmful substances that are flammable.
- No pipe line, power cable shall run across the path ways causing a tripping hazard.

b. Fire Hazard

- Provision of alarm to notify the fire disaster.
- Provision of fire extinguisher, fire hydrant and first aid kit.
- Update contact number of fire brigade and ambulance for accidental cases.

c. Vandalism

- Appointing a day and night security guard.
- Provision of physical and technological barriers such as fences, gates, ID card access.
- Ensure lighting of the premises during nighttime.

d. Leakage Detection

- Regular Monitoring of the gas leakage
- Provide training to handle gas leakage
- Odor

e. Infectious Disease Outbreak

- Effective Vector Control Measures such as regular cleaning in the sub-project site
- Using gloves, masks and other safety equipment while handling organic materials and feedstock.
- Food and Water Safety measures to follow within the project premises.
- In case of an outbreak immediately report to the nearest health authority.

f. Occupational Health and Safety Plan

- Provision of safety equipment such as gloves, masks, safety boots, safety jacket, harness during construction and operation phase.
- Adaptation of directives and guidelines issued by the government and WHO in relation to limiting the spread contagious diseases.
- Provision related to making workers aware of contagious diseases .pandemic and orient them in adopting precautionary measures such as wearing facemask, maintaining social distance, regular hand washing, among other
- Awareness about potential health impacts while handling organic matters to staff.

11.2 Emergency Preparedness Plan

The Emergency Preparedness Plan is prepared in order to take immediate action to minimize the loss. The following section gives protective measures to follow incase hazardous events occur in the sub-project site.

a. During Catastrophe

- Provision of sensor/ alarm to notify the disaster
- Awareness and orientation program with the workers during construction and operation stage in regular basis to discuss about the possible disaster and its evacuation method
- Allocating emergency exit
- Designation of emergency assembly area for evacuation

b. Malfunction of the System

- Regular maintenance of the equipment
- Proper segregation of waste before feeding to inlet
- Employing skilled technicians to operate the plant
- Regular orientation, instruction and guidance to staffs about plant operation

c. Leakage and burst

- Provision of fire alarm, extinguisher and sprinklers
- Project insurance to cover the cost of loss from the event
- Proper orientation and training to staff to operate the plant
- Preparation of emergency exit map and orienting the staffs about it
- Orienting staffs to follow proper safety measures during construction and operation phase.
- Provision of First Aid Kit.
- Regular check-up of staffs during operation phase.
- Maintain registration log of both native and migrant worker with their detail i.e.; name address, nationality, contact number, emergency contact person and their respective numbers, etc.

- Follow Occupation Health and Safety Plan of AEPC during construction period in order to minimizing and managing the risk of spread of communicable disease.

11.3 Gender Action Plan

- Job priority will be based on the qualification irrespective of the gender.
- Ensure female worker's security at work place.
- Provide equal wage to female workers as male workers.
- Special effort will be made to get feedback from women and girls during project cycle.

11.4 Substrate Handling and Slurry Management Plan

- The base, side walls of decanter and storage lagoon will be made waterproof to avoid leaching.
- Regular cleaning of the facility will be done to prevent flies and safety of workers.
- The solid slurry separated from decanter will be dried and sold in the market.
- The liquid will be reused as dilution water in the digester. Remaining liquid slurry will be sold as manure.

11.5 Labor Management Plan

Labor Management Plan describes the requirements for the proposed subproject with regards to labor and working conditions during construction. It aims to ensure the management and control of activities that may pose labor-related risks. Following measures shall be taken by developers to manage labor during construction

- Promote fair and equitable labor practices for the fair treatment, non-discrimination and equal opportunity of workers
- Make sure that there is no child and forced labor during construction and operation phases
- Establish, manage and promote a healthy management-worker relationship
- Protect workers' rights including migrant and third-party workers
- Promote healthy, safe, secure and comfortable accommodation that does not impact negatively on the communities in the surrounding area

12. Conclusion

Shivam Jaivik Khad Tatha Urja Pvt. Ltd. Will be executing this project under Scaling Renewable Energy Program (SREP) by Alternative Energy Promotion Center (AEPC), using a Continuous Stirred-Tank Reactor (CSTR) with a capacity of 5000 m3, producing 1120 m3/Kg (of refined bio CNG gas which gas which can be stored in cylinder and sold and distributed to hotels and industries and slurry will be converted to fertilizer and will be supplied to the nearby communities in a subsidized rates.

The project is conducted at Jagarnathpur rural municipality, Parsa. Prior to the commencement of the project, Environment Assessment Study was carried out considering physical, biological and socio-economic aspect. Different impacts were identified during the study. Both beneficial and adverse impact were taken in to account while carrying out the study. The identified impacts can be mitigated by adopting prescribed mitigation measures in this report. By adopting additional mitigation measures stipulated in this ESIA, the project will have very less negative implications on environment. Compliance measures, environmental monitoring plan, institutional arrangement for grievance management mechanism and occupational health safety measures were also stated in the report.

Impacts during the implementation of the project has been foreseen by the ESIA report. The report and also suggested mitigation measures to minimize or reduce the impacts. The proponent of the project should strictly follow the mitigation measures as prescribed out in this report and if any impacts, not mentioned in this study, if perceived during construction as well as operation phase, shall also be mitigated with proper mitigation measures. The biogas plant is going to be installed at the location area in order to reduce or manage the large organic waste from poultry, cattle farm, sugar industry with capacity of 60 TPD with the aim of generating revenue from waste by producing gas and accessible slurry for use in agriculture fields. It is supposed to minimize the risk of flies and vector-borne disease, as well as waste flooding during the rainy season and foul odor after waste decomposition. Apart from that, if all mitigating steps and compliance monitoring are followed, it is relatively safe and secure. As a result, the project is extremely feasible and can be implemented at the project site.

13. ANNEXES

Annex A-1: Company Registration Certificate

नेपाल सरकार
उद्योग, वाणिज्य तथा आपूर्ति मन्त्रालय
कम्पनी रजिष्ट्रारको कार्यालय
कम्पनी दर्ताको प्रमाण - पत्र

दर्ता नं: २४८८२०/०७७/०७८

श्री शिवम जैविक खाद तथा उर्जा
नामको प्राइभेट लिमिटेड कम्पनी संम्वत् २०७७ साल मंसिर महिना १७ गते रोज ४ मा दर्ता भएको हुनाले कम्पनी ऐन, २०६३ को दफा ५ को उपदफा (१) बमोजिम यो प्रमाण-पत्र दिइएको छ।

मिति: २०७७-०८-१७

स.रजिष्ट्रार

Government of Nepal
Ministry of Industry, Commerce & Supplies
Office of the Company Registrar

सहायक रजिष्ट्रार

Registration No: 248820/077/078

CERTIFICATE OF INCORPORATION OF COMPANY

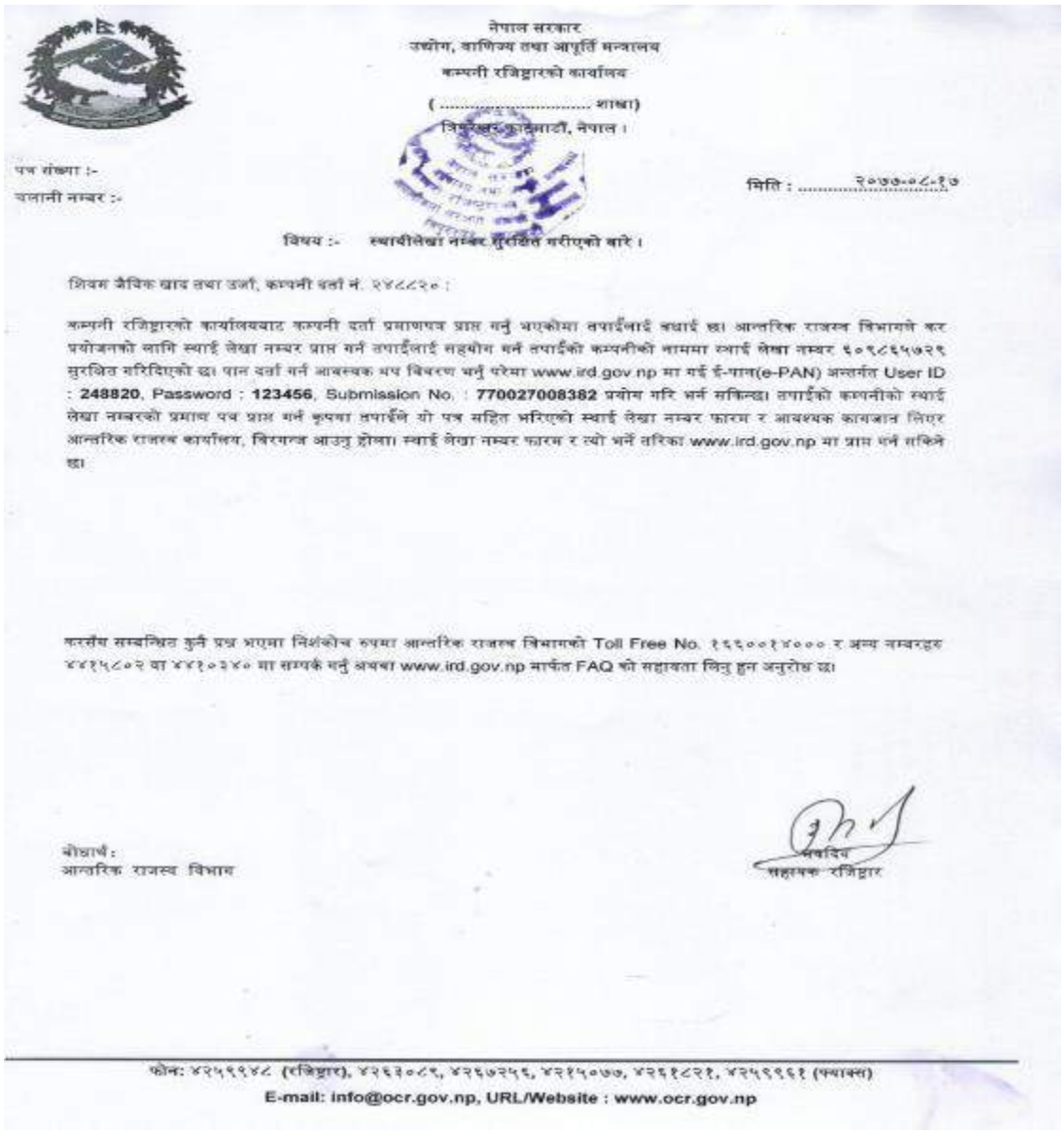
This Certificate of Incorporation has been issued to M/s Shivam Jaivik Khad Tatha Urja Private Limited having incorporated it on the 2 day of December, 2020 pursuant to sub-section (1) of section 5 of the Companies Act, 2006.

Date: 2020-12-02

Asst. Registrar

शर्त कम्पनी संस्थापनलाई मात्र कम्पनीको उद्देश्य कार्यान्वयन गर्न इजाजत प्रदान गरिएको नमानिने हुनाले कानून अनुसार लिनुपर्ने अनुमति सम्बन्धित निकायबाट लिएर मात्र कम्पनीको उद्देश्य अनुसार कारोबार गर्नु पर्नेछ ।

Figure 10 Company registration of proponent



नेपाल सरकार
उद्योग, वाणिज्य तथा आपूर्ति मन्त्रालय
कम्पनी रजिष्ट्रारको कार्यालय
(..... शाखा)
विरेन्द्रनगर, कुलेश्वर, नेपाल ।

पत्र संख्या :-
चलानी नम्बर :-

मिति : २०७७-०८-१७

विषय :- स्थायीलेखा नम्बर सुरक्षित गरीएको बारे ।

शिवम जैविक खाद तथा उर्जा, कम्पनी दर्ता नं. २४८८२० ।

कम्पनी रजिष्ट्रारको कार्यालयबाट कम्पनी दर्ता प्रमाणपत्र प्राप्त गर्नु भएकोमा तपाईंलाई बधाई छ। आन्तरिक राजस्व विभागले कर प्रयोजनको लागि स्थाई लेखा नम्बर प्राप्त गर्न तपाईंलाई सहयोग गर्न तपाईको कम्पनीको नाममा स्थाई लेखा नम्बर ६०९८६५७२९ सुरक्षित गरिदिएको छ। पान दर्ता गर्न आवस्यक थप विवरण भर्नु परेमा www.ird.gov.np मा गई ई-पान(e-PAN) अन्तर्गत User ID : **248820**, Password : **123456**, Submission No. : **770027008382** प्रयोग गरि भर्न सकिन्छ। तपाईको कम्पनीको स्थाई लेखा नम्बरको प्रमाण पत्र प्राप्त गर्न कृपया तपाईले यो पत्र सहित भरिएको स्थाई लेखा नम्बर फारम र आवश्यक कागजात लिएर आन्तरिक राजस्व कार्यालय, विरगन्ज आउनु होला। स्थाई लेखा नम्बर फारम र त्यो भर्ने तरिका www.ird.gov.np मा प्राप्त गर्न सकिने छ।

करसँग सम्बन्धित कुनै प्रश्न भएमा निशंकोच रुपमा आन्तरिक राजस्व विभागको Toll Free No. १६००१४००० र अन्य नम्बरहरु ४४१५८०२ वा ४४१०३४० मा सम्पर्क गर्नु अथवा www.ird.gov.np मार्फत FAQ को सहायता लिनु हुन अनुरोध छ।

बोधार्थ :
आन्तरिक राजस्व विभाग

धनादिय
सहायक रजिष्ट्रार

फोन: ४२५९९४८ (रजिष्ट्रार), ४२६३०८९, ४२६७२५६, ४२१५०७७, ४२६१८२१, ४२५९९६१ (फ्याक्स)
E-mail: info@ocr.gov.np, URL/Website : www.ocr.gov.np

Figure 11 PAN application

Annex A-2: Environmental and Social Screening Checklist

Table34 Environmental and social screening checklist

Potential impact area	Construction phase			Operational phase		
	Adverse effect	No effect	Beneficial effect	Adverse effect	No effect	Beneficial effect
A. Physical condition						
Soil type						
Erosion						
Ground cover						
Deposition (sedimentation, precipitation)						
Slides stability						
Stress-strain (earthquakes)						
Floods						
waste control						
Operational failure						
B. Land Use						
Open space						
Recreational						
Agricultural						
Residential						
Commercial						
Industrial						
C. Water resources						
Quality						
Irrigation						
Drainage						
Ground water						
D. Air quality						
Oxides (sulphur, carbon, nitrogen, methane)						

Particulate matters						
Chemicals						
Odors						
Gases						
E. Public service systems						
Schools						
Police						
Fire protection						
Water and power system						
Sewerage system						
Refuse disposal						
F. Biological conditions						
Wildlife						
Trees, shrubs						
NTFPs						
G. Transportation systems						
Automobiles						
Trucking						
Safety						
Movement						
H. Noise and vibration						
On-site						
Off-site						
I. Aesthetic						
Scenery						
Structures						
J. Community structures						
Relocation						
Mobility						
Services						

Recreation						
Employment						
Housing quality						
Name of Beneficiary VDCs and its population						
K. Other						

Questionnaire for interview, interaction and discussion

1. In your view; what are the major adverse environmental impacts in Physical, Biological and Socio-economic and cultural aspects with the construction and operation of large biogas?

2. What could be the major beneficial impacts with the implementation of the project for Biogas?

3. In your view, what should be done to mitigate the adverse environmental impacts that you have mentioned?

4. Are there any other likely impacts with its implementation?

5. Do you have any suggestions to safeguard social and environmental condition of the project area with its implementation and operation?

6. Is there any possibility of generation of employment opportunities with the construction and operation of biogas?

SOCIAL SCREENING CHECKLIST

<table>
<tr><td colspan="5">1. Title of the Sub project: Commercial () Project through Anaerobic Digestion (Biogas) Technology in Shivam Javik Khad tatha Urja Pvt. Ltd</td></tr>
<tr><td colspan="5">1.1 Site Locality: Jagarnathpur-03, Parsa</td></tr>
<tr><td colspan="5">1.2 Sub project activities: Construction of biogas digester</td></tr>
<tr><td colspan="5">1.3 Contact Details: Jagarnathpur, Parsa, Nepal</td></tr>
<tr><td colspan="5">2. Impact on specific assets due to project intervention</td></tr>
<tr><td>2.1 What are the asset(s) that would be affected due to Subproject Interventions? ☑Yes ☐ No</td><td colspan="4">☑ Land
☐ Physical Structure (dwelling or commercial)
☐ Community Resources
☐ Natural Resources (Water bodies/ Forest/ Public Pond)
☐ Others (please specify)</td></tr>
<tr><td rowspan="10">2.1.1 Land</td><td>Currently Owned</td><td>Private</td><td colspan="2">Public</td></tr>
<tr><td>Total Area</td><td>Institution owned =14889.66m^2</td><td colspan="2"></td></tr>
<tr><td>Land use</td><td>Fallow</td><td colspan="2"></td></tr>
<tr><td>Additional requirement</td><td>Private</td><td colspan="2">Public</td></tr>
<tr><td>Total Area</td><td>-</td><td colspan="2"></td></tr>
<tr><td>Land use</td><td>-</td><td colspan="2"></td></tr>
<tr><td>Permanent/temporary</td><td>-</td><td colspan="2"></td></tr>
<tr><td>Land Procurement</td><td>☑ Voluntary Donation
☑Direct Purchase</td><td colspan="2">☑ Voluntary Donation
☑ Land Acquisition</td></tr>
<tr><td colspan="4">Presence of ☐Squatter/☐Encroacher/☐leaseholder in Private/Public land:
☐Yes ☑ No
If Yes,
• Total number of affected families: X
• Possibility of physical displacement: X</td></tr>
<tr><td colspan="4">Procurement Procedure for additional land: Not required</td></tr>
<tr><td rowspan="4">2.1.2 Physical Structures (Specify Private (P), Squatter (S), Encroacher (E), Leaseholder (L) etc)</td><td></td><td>Private</td><td colspan="2">Public</td></tr>
<tr><td>Houses to be resettled:</td><td>-</td><td colspan="2"></td></tr>
<tr><td>Community resources:</td><td>-</td><td colspan="2"></td></tr>
<tr><td>Commercial/ business structures:</td><td>-</td><td colspan="2"></td></tr>
<tr><td rowspan="2">2.1.3 Is there any Community Resource Properties resources</td><td>Community Resource Property</td><td colspan="3">No. of beneficiary households</td></tr>
<tr><td>X</td><td colspan="3">X</td></tr>
</table>

<table>
<tr><td>that might be affected due to project intervention?
☐Yes ☑ No</td><td>X</td><td>X</td></tr>
<tr><td rowspan="2">2.1.4 Is there any natural resources that might be affected due to project intervention?
☐Yes ☑No</td><td>Natural Resource</td><td>Dependent households</td></tr>
<tr><td>X</td><td>X</td></tr>
<tr><td colspan="3">3. Impact in Livelihood</td></tr>
<tr><td rowspan="2">☐ Yes ☑No
(Specify Private (P), Squatter (S), Encroacher (E), Leaseholder (L) etc)</td><td>Impact</td><td>No. of families</td></tr>
<tr><td>☐Loss of shelter and housing structure
☐Loss of income source
☐Loss of grazing field
☐Loss of agricultural land
☐Others</td><td></td></tr>
<tr><td colspan="3">4. Impact on Trees and Crops</td></tr>
<tr><td>4.1 Vegetation clearance
☐Private Land ☐Governmental Forest ☐Community Forest</td><td colspan="2">Tentative number of trees to be felled:
• Tree size <u>Not Required</u>
• Pole size <u>Not Required</u></td></tr>
<tr><td rowspan="2">4.2 Agricultural Crop/Fruit bearing trees loss
(Specify Private (P), Squatter (S), Encroacher (E), Leaseholder (L) etc)</td><td>Agricultural Land</td><td>Horticulture (Fruits)</td></tr>
<tr><td>X</td><td>X</td></tr>
<tr><td colspan="3">5. Vulnerable Groups</td></tr>
<tr><td>5.1 Area there Vulnerable Groups (Adibasi/Janajati/Dalit/Women headed households residing within or adjacent to project site?
☐Yes ☑No</td><td colspan="2">If Yes, does project intervention affect these groups?
☐ Land
☐ Physical Structure
☐ Income generating activities</td></tr>
<tr><td>5.2If Yes, displacement of these people needed?</td><td colspan="2">-</td></tr>
<tr><td>5.3 Is there any way that proposed project may pose any threat to cultural tradition and way of life of vulnerable groups?</td><td colspan="2">No</td></tr>
<tr><td colspan="3">5. Community Benefits from sub-project intervention</td></tr>
<tr><td colspan="3">• The inhabitants of the ruralmunicipality will get renewable energy and local community get relief from odour due to wastes from poultry, cattle farm, sugar industry.
• And get the fertilizer in the low rate.</td></tr>
<tr><td colspan="3">6. Perception toward project</td></tr>
</table>

6.1 Community Perception toward project	☑Positive ☐ Negative

ENVIRONMENTAL SCREENING CHECKLIST

Project Brief

Company Name/ Registration/ Address	Shivam Jaivik Khad tatha Urja Pvt. Ltd, Janakitola, Jagarnathpur-03, Parsa
Contact Details (Telephone, Email)	Email: Ashok Kumar Yadav,Dilip Sharma Ph: 9855036664,9855023153
Technology (type and capacity)	CSTR Biogas Proposed Plant of capacity 5000m^3
Implementation approach (approach, schedule, institution involved, and stakeholders)	Construction of Biogas plant Institution Involved: AEPC,
Total Project Cost	NRs. 186,942,245.28

Environmental setting of the project locality

2.1 Location			
Location of the project (settlement/ ward/ VDC/ District)	Jagarnathpur-03, Janakitola , Parsa		
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 vicinity		Yes	☑No
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	Gangol Nadi- 700m E and Uriya Nadi-1.65km W		
Use of water			
Potential impact by the project	None as there is no possible intrusion of slurry into the river.		
2.3 Air pollution			
Number and type of vehicles to be used per day	Not required		
Capacity of vehicles	-		
Condition of the road (asphalted, earthen)	-		
2.4 Land use			
Facilities (1) industry Own Land	Required Area 14889.66 m^2	Land use type Fallow	Location Jagarnathpur-03, Parsa
2.4.1 Impact due to land use change a) Loss of private land ……No……. b) Loss of agricultural product ……No…….. c) Loss of private structures/community structures ……No…… d) Loss of Forest and vegetation ……No……. e) others ……No……			
2.5 Waste input for the project			
Define waste (type)	Waste from the municipality		
Quantity of waste	26.46 Tons of waste per day		
Location of collection	Collection chamber through the digester		
Workers involved	Local workers		
Legal clearance required	No		
2.6 Technology			
Type Capacity Components Gas production Feed to digester slurry Feed to digester slurry Remarks	Modified GGC 2047 Model (Further define by DPR) 5000m^3 Mixing ,Digester, Fertilizer Tanks 3200 M^3/day 13500 kg per day		
2.7 Waste from the project implementation		**Yes**	**No**
Generation of solid waste? If Yes, in the form of slurry		Yes	
Are any wastes required to be stored on-site either for reuse or off-site disposal? If Yes,		Yes	

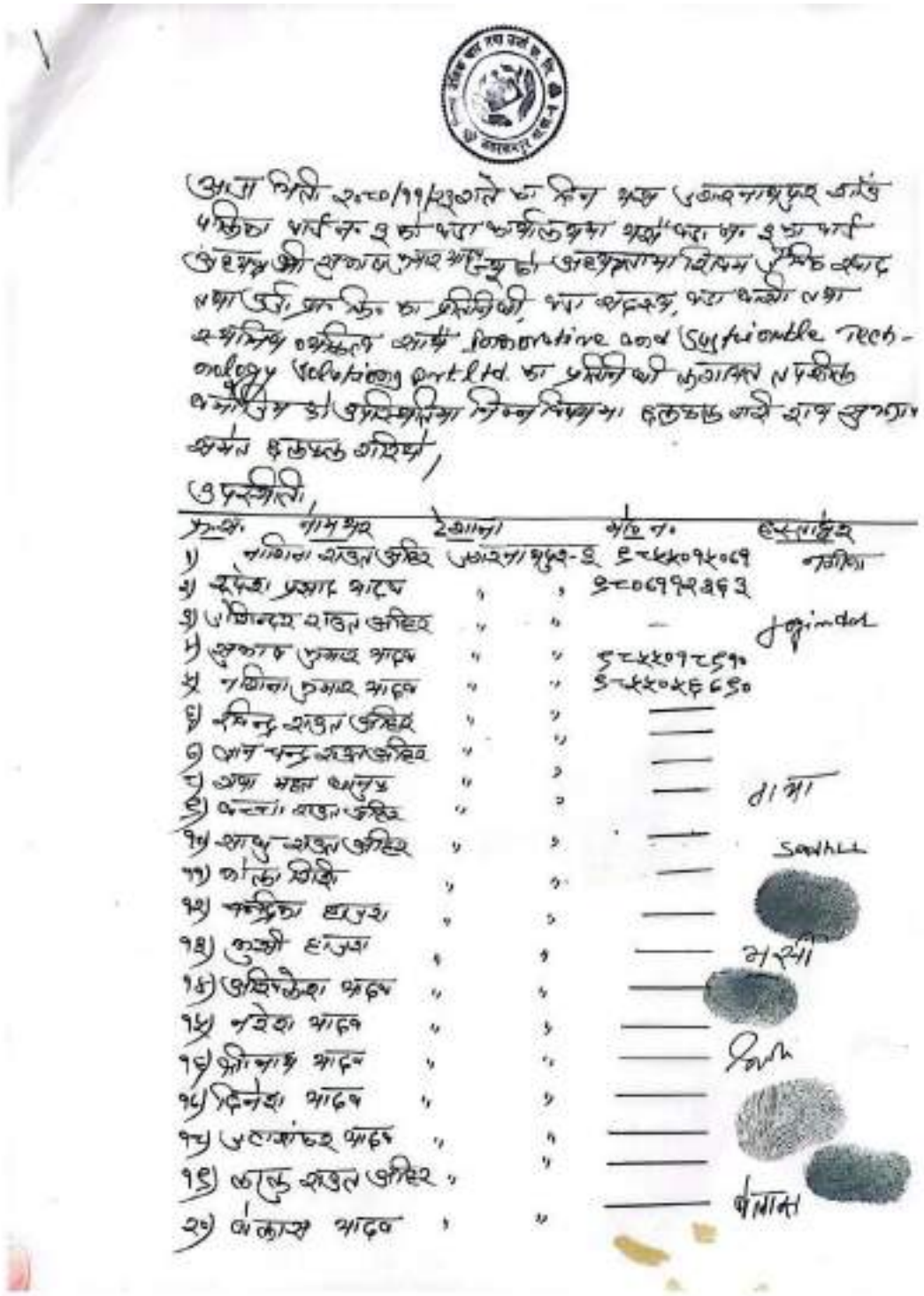
The slurry shall either be used inside farm or to be sold to nearby community or need to be disposed if not sold.		
Are effluents required to be discharged to a sewer or combined drainage system? If Yes, …….		No
2.8 Health and Safety Issues	**Yes**	**No**
a. Does project intervention affect health and safety condition?	Yes	
b. List of likely health and safety issues during construction period • Construction related accidents c. List of likely health and safety issues during implementation period • handling of slurry • Accidents associated with firing and explosion • And possibility of leakage of slurry.		
2.9 Other observations		

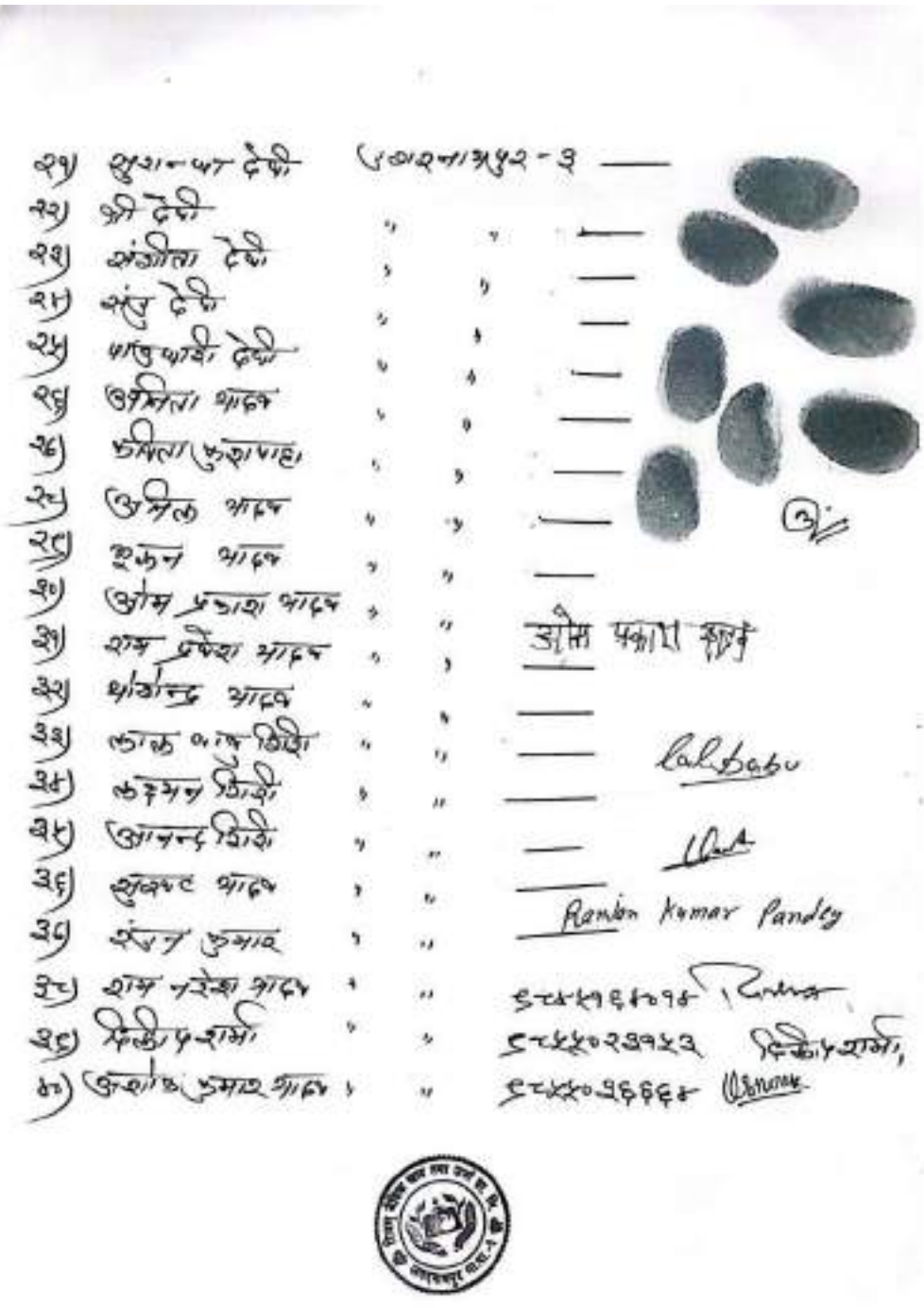
Can vector disease spread to the adjoining settlements?	Yes
Can foul odor affect the adjoining settlement?	Yes
Slurry use (proposed)	Slurry use for the fertilizer and they plan to sell it to the nearby community. There was good market for slurry as fertilizer.

Recommendations

As the project itself reduces waste generated from the institution and proposed to generate biogas energy, the negative impacts are not envisaged. However, negligible impacts listed above might prevail during construction and operation phase. The overall impact caused by the sub project intervention can be classified as "Category B" with no or minimal environmental impact and hence there is no need of conduction of further environmental assessments. Nevertheless, in order to reduce above mentioned identified adverse impacts, "Environmental and Social Assessment (ESA)" shall be prepared prior to construction start.

Annex A-3: Meeting Minute of Public Consultation





प्रस्ताव हरु :-

१) कार्यान्वयन तथा जैविक मल सम्बन्धी जानकारी,
२) राय सुझाव संकलन सम्बन्धी,
३) विविध सम्बन्धमा,

निर्णय हरु :-

१) प्रस्ताव १ माथि छलफल गर्दा Innovative and Sustainable Technology pvt. ltd. का प्रतिनिधि द्वारा, [illegible] जैविक खाद तथा ऊर्जा लि. [illegible] waste to energy Project संस्थाको सहकार्यमा निर्माणाधिन कार्यक्रम तथा जैविक मल सम्बन्धी जानकारी गराइयो,

२) प्रस्ताव नं २ माथि छलफल गर्दा [illegible] जैविक खाद तथा ऊर्जा लिमिटेड मा निर्माणाधिन कार्यान्वयन र जैविक मलको [illegible] तथा आर्थिक प्रक्रिया अन्तर्गत निम्न अनुसार का राय सुझाव संकलन गरियो,

राय सुझाव

१) स्थानीय क्षेत्रमा उद्योग स्थापना हुन लागेको तथा उद्योगको स्थापना तथा विकास र संचालनमा स्थानीयलाई सीप तथा क्षमताको आधारमा रोजगार प्रदान गरिनुपर्दछ,

२) वातावरणीय सकारात्मक प्रभाव पर्ने कार्यमा उद्योग [illegible] गर्नुपर्दछ,
३) उद्योग निर्माण तथा संचालनको क्रममा उद्योग बाट प्रदुषण तथा दुर्गन्ध आएमा उद्योगले स्वयं व्यवस्थापन गर्नुपर्दछ,
४) उद्योग संचालन भए पश्चात उत्पादन हुने जैविक मल स्थानीय बासिन्दा लाई सहुलियत दरमा उपलब्ध गराइनुपर्दछ,

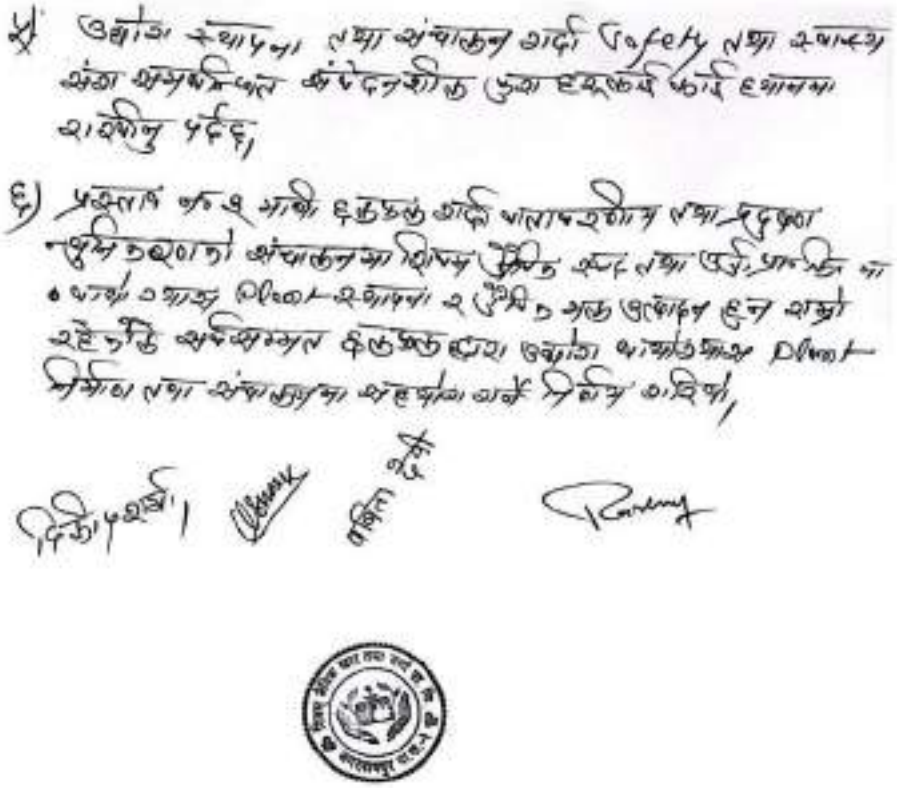


Figure 12 Minute

Figure 13 Public consolidation

Annex A-4: Description of Technology

CSTR Digester

Biogas is generated when bacteria degrade biological material in the absence of oxygen, in a process known as anaerobic digestion. Since biogas is a mixture of methane (also known as marsh gas or natural gas, CH4) and carbon dioxide it is a renewable fuel produced from waste treatment. Anaerobic digestion is basically a simple process carried out in a number of steps that can use almost any organic material as a substrate. Conventional anaerobic digestion has been a "liquid" process, where waste is mixed with water to facilitate digestion.

CSTR Digester

Anaerobic co-digestion of many different substrates has achieved the most success when utilizing a Continuous Stirred-Tank Reactor (CSTR). This is the most popular, and proven technology worldwide. CSTR systems are very large, heated insulated tanks, constructed of metal or concrete.

Biogas production is a complex process resulting from incomplete anaerobic mineralization of biomass, carried out in four steps in single-phase. Organic acids formed in the hydrolysis and acidogenesis are intermediates of the biological process and can be described as nutrients for the microbes in the acetogenesis and methanogenesis. A key design parameter for CSTR digester system is the overall loading rate. Loading rates are commonly expressed as the number of days of retention time or the quantity of organic matter applied to a given tank volume. Common detention times for digesters are roughly 20-30 days. Experience has shown that this time represents an optimum time where gas yield is maximized without over designing the residence time. Facilities that are co-digesting more complex wastes that include fats and proteins will commonly have retention times higher than 30 days. The CSTR is a proven digester design consisting of an above-ground tank with a Flexible Double membrane roof. Biogas is collected at the top of the tank and is pumped to a separate gas holder. Digestate is removed from the base of the digester tank. CSTR tanks are manufactured from RCC and can be insulated externally with 100mm of mineral wool and protected with plastic-coated steel panels. Except submersible agitators there is no mechanical equipment within the CSTR digester tank.

Mixing Inside Digester

Continuous stirred tank reactors (CSTR) are used for producing biogas organic residues. When using this type of biogas digester, the stirring of the substrate in the digesters is vital for the biogas formation process. The purpose of stirring is to distribute the nutrients in the biogas digester uniformly, to form a suspension of liquid and solid parts, to avoid sedimentation of particles, to ensure uniform heat distribution, to prevent foam formation and to enable gas lift from the fermentation substrate at high dry matter (DM) contents. In digester applications there can be a tendency for oily and fatty compounds to float out of solution and rise to the top of the digester's contents. If there is not adequate mixing to keep tank contents completely agitated this floating layer can accumulate to significant thickness if not properly managed. The best approach to managing a floating layer is to properly engineer the mixing system ahead of time to ensure proper agitation to prevent its formation. The theory of the CSTR is that, through rigorous mixing, the composition of the contents of the reactor in any given spot in the tank is the same as in any other spot in the tank.

Temperature & Heating System

The lower temperature, mesophillic systems can provide the benefit of a faster growing, more robust bacteria population vs thermophilic which have slower growing bacteria. The Digester is heated by an internal concentric-tube heat exchanger. Hot water is circulated through the heat exchanger by a central-heating pump. .There will be 8 rounds of pipeline of stainless steel with hot water flowing through it. The digester temperature will be maintained at 38^0 C .The inlet temperature will be about 80^0 C and the outlet temperature will be same as the temperature of the digester which will be recirculated to the system. There will be automatic temperature control system, however the temperature can be monitored and maintained manually as well.

Others

Digester tank controls include: continuous digester level monitoring, lightening protection electrode, temperature monitoring, gas pressure/vacuum relief valve and an emergency relief valve. The digester is discharged through Level box which withdraws digestate from the base of the digester. The amount of digestate discharged and the time between each discharge is variable and can be adjusted by the operator. The biogas flow is measured at the gas consumers from the double membrane gas holder via low level condensate traps. The gas holder is inflated by an air blower and pressure is maintained at a constant level of 1 to 1.5 kPa by an automatic control valve.

Technology used for generation of biogas:

The Plant will run using sophisticated and proven Anaerobic Digestion CSTR technology for generation of Raw Biogas and Pressure Swing Adsorption (PSA) technology for Biogas Purification. Anaerobic digestion is a renewable energy generation process in which microorganisms break down biodegradable material in the absence of oxygen.

Compound	Formula	%
Methane	CH_4	55-75
Carbon Dioxide	Co_2	25-45
Nitrogen	N_2	0-10
Hydrogen	H_2	0-1
Hydrogen Sulphide	H_2S	0-3
Oxygen	O_2	0-0.5

Pre-Treatment/Slurry Preparation and Handling

The collected waste will be dumped in the plant site. The waste will be fed to the organic and inorganic waste separator. The organic waste will be treated to the biogas plant. Some of the useful recyclable inorganic waste will be sold.

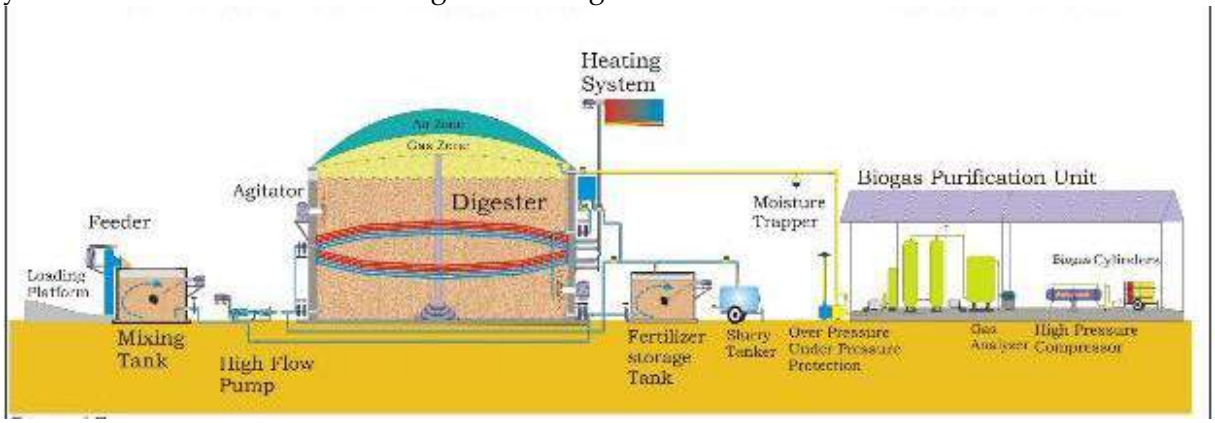
Feeding

The total waste will be 65 TPD with DS of 20 % which will require 65000 liter of water each day to maintain the DS of the slurry to 10%. The organic waste and water will be put into a Feed preparation pit. The submersible mixer, which will mix different feedstock and bring it to unpacked, fluffy and consistency. From time to time it releases small quantities of feedstock into an open mouth pump with capacity of 50 m^3/hr. The liquid itself comes in the beginning of the daily preparation period from a Fertilizer pit or sometimes directly from digester. The mixture of feedstock and effluent will be pumped into the digester. Both, the Fertilizer pit and the Feed prep pit are complete of the same design. Digester will be comprised of a standing cylindrical tank of

reinforced concrete with a net volume of 5000 m3, including a freeboard head space for gas release. Digester will also be covered with a membrane gas roof with inbuilt gas storage capacity. This will reduce emission as well as it increases the gas storage capacity of the whole system. The Fertilizer pit and the Feed preparation pit are fully mixed by high quality submersible agitators. Whilst its way from the Feed prep pit to the digester, the biomass passes through an additional chopper to refine the whole mixture for better pumping, piping and mixing consistence. This way of maintaining an acceptable fluid viscosity even of high dry mater containing mixtures will also reduce the demand of electrical self-consumption of the plant.

Digester design and sizing suitable for multi-feedstock:

The feeding of the anaerobic digester will work as a semi-automatic storage-flow-process, by which the bio mass is guided into the digester from the feed prep pit per day. Any process of pumping from, and to any containment will be monitored by level switches, which are connected to the PLC-System, and will supervise the pumping system. The Digester will be fully mixed by high quality submersible agitator and will be operated in a mesophilic (38 °C ± 1°C) temperature range. The hydraulic retention time for the slurry inside the digester will be for 30 days. This leads to a stable process and an economical optimized demand for process heat. So, a maximum gas yield which results in maximum greenhouse gas reduction will be guaranteed. The digester will be comprised of a standing cylindrical tank of reinforced concrete with a net volume of 2200 m3 including a freeboard head space for gas release. The Digester will cover with double membrane gas roof for storage of Raw Biogas. The solids that are fed into the Digestion System for decomposition or degradation of the Volatile Solids (VS) (Organic Dry Matter) present inside the feed substrate . The degradation is done in the one digester. The plant will work on a storage flow-process. Bio mass is guided into the single digester by the pumping system several times per day. Additionally, re-circulated slurry will be pumped into the digester. The treated sludge will be pumped to the liquid fertilizer tank when indicators show a certain level within the digester is reached. As described above, the digesters will be fully mixed by high quality submersible agitators and will be operated in a Mesospheric temperature range. This combination leads to a stable process with good Hygienic results and a minimized effort as far as area requirements and digester volume are concerned. On the other hand it aims at maximum gas yield which results in maximum greenhouse gas reduction.



Biogas Storage

The digester will be covered with Flexible Double Membrane Roof and an approximate pressure of 1 to 1.5 kPa gas pressure is maintained.

- Outer-membrane & inner-membrane Material: Euro-standard membrane, anti-UV, self-clean (PVDF coating), Anti-corrosion, anti-aging, acid proof, alkali proof and high strength.
- Double membrane roof will be fully controlled by PLC/ Control panel with additional benefits Electric control cabinet Display system: pressure/volume/control process display.
- Function control system: LCC more than 20 functions.
- Sensor system: pressure / volume sensor made of stainless steel, explosion proof.
- Operation cabinet: Air boost blower, Non return valve
- Safety function design: more than 8 ways,

The technology used is CSTR (continuously stirred reactors). The Agitators ensure extremely homogenous mixing of the slurry. The digested feed material has VS content in it to produce a gas comprising of maximum methane CH4 and the rest containing of CO_2 and H_2S. After digestion the feed material is taken for further storage. This technology ensures that the maximum biodegradable feedstock is degraded and maximum efficiency is attained out of the biogas generation plant.

Biogas Up-Gradation/Purification/Enrichment Technology

Biogas that is produced after the digestion process consists of pure biogas and Carbon-dioxide (CO_2) along with some traces gases such as Water Vapor, Hydrogen Sulphide, Nitrogen, Hydrogen and Oxygen.

Pressure swing adsorption (PSA):

Pressure Swing Adsorption, or PSA, is a method for the separation of carbon dioxide from CBG by adsorption /desorption of carbon dioxide on zeolites or activated carbon at different pressure levels. The adsorption material adsorbs hydrogen sulphide irreversibly and is thus poisoned by hydrogen sulphide. For this reason a hydrogen sulphide removing step is often included in the PSA process. The upgrading system consists of two or four absorber vessels filled with adsorption material. During normal operation each absorber operates in an alternating cycle of adsorption, regeneration and pressure build-up. During the adsorption phase biogas enters from the bottom into one of the absorbers. When passing the absorber vessel, carbon dioxide, oxygen and nitrogen are adsorbed on the adsorbent material surface. The gas leaving the top of the absorber vessel contains > 95% pure CNG. Before the adsorbent material is completely saturated with the adsorbed feed gas components, the adsorption phase is stopped and another absorber vessel that has been regenerated is switched into adsorption mode to achieve continuous operation. Regeneration of the saturated adsorbent material is performed by a stepwise depressurization of the absorber vessel to atmospheric pressure and finally to near vacuum conditions. Initially the pressure is reduced by a pressure balance with an already regenerated absorber vessel. This is followed by a second depressurization step to almost atmospheric pressure. The gas leaving the vessel during this step contains significant amounts of pure biogas and is recycled to the gas inlet. Before the adsorption phase starts again, the absorber vessel is depressurized stepwise to the final adsorption pressure. After a pressure balance with an absorber that has been in adsorption mode

before, the final pressure build-up is achieved with feed gas. It has been observed that PSA is economical technology which is available for cleaning the raw biogas. By adopting PSA technology raw biogas can be easily cleaning from hydrogen sulphide and carbon dioxide but the main issue being purging of clean gas (loss of valuable cleaned gas @ 0-5%). Mixing both water absorption along with the PSA system is possible but it proved to be quite expensive and because it could not justify the economics of the project it had been opted for a cleaning and upgrading system which guarantees us the end product with sufficient pressure and without any loss in the clean gas. Various points had been taken into considerations such as electricity consumption, water consumption and cost economics and came to a conclusion that the fusion of ZnO based hydrogen sulphide removal system along removal of carbon dioxide from biogas by adsorption process in which the PSA is used with further drying the gas for final application and pressurizing at the desired levels proves to be well proven and this system ensures negligible losses of gas from the entire system. The apex in case of PSA system is optimum and there good recovery of gas is also present. Carbon Dioxide and trace gases such as Water Vapor and H2S must be removed before the biogas can be used because:

The Hydrogen Sulphide gas is corrosive

Water Vapour may cause corrosion when combined with H2S on metal surfaces and reduce the heating value.

After up-gradation of biogas, the gas goes to a filling unit via high pressure compressor. BioCNG will be filled into transporting cylinders cascades at the filling unit at pressure of 200 bars.

DESIGN BASIS FOR BIOGAS PURIFICATION UNIT:

Influent characteristics

The composition of biogas and plant load characteristics is indicated in the tables below.

Flow	125 M^3/hr
CH4	65%
H2S	1000 PPM (± 400 PPM)
CO2	34% (± 2%)
Pressure	50 k Pa

Flow	65-70 M^3/hr
CH4	95% (± 3 %)
H2S	<8 PPM
CO2	<4 %
Pressure	20 kPa

While one set of towers are purifying the gas, the other towers is taken for regeneration which is achieved by

a. Depressurization of the tower.
b. Creating partial vacuum in the tower
c. Providing small purge of pure gas in the reverse direction in the tower.

The changeover from one tower to another is fully automatic and accordingly continuous supply of purified gas is available at the outlet of the system. The outgoing purified gas can be used for combustion purpose.

Post Treatment of Digested Slurry:

The digester will release overflow digested slurry after digestion. The suspended solids out of this slurry can be effectively used directly in field as a bio-manure (Dry) after drying with Solid Liquid Separators. A part of overflow will be used again by the feeding system to prepare a mixture from biomass for feeding into the digester. This practice guarantees real zero pollution and will not release any effluent back to environment or for discharge. Being enriched in humus and complex building capacity it will also guarantee an organic cycle of extraction and supply to the soil, and increasing water holding capability and fertility for the farmland.

Description of Major Components

Mixing Tank:.The raw material will be decanted in the mixing tank. The raw material will be mixed with water in this tank. The agitator with capacity with 7.5 HP will agitate the mixture. Then the raw material will be fed to the digester tank through automated conveyor operated through Programme Logistic Control (PLC)

Digester Tank: The volume of Digester tank will be of 5000 m3. In the digester highly controlled biological reaction process will happen comprising the use of specifically and finely cultured microbial ecosystem for aerobic and anaerobic digestion of organic feedstock. The digester will have heating systems, agitators, pumps, sensors and other instrumentations. There will be 8 rounds of pipeline of stainless steel with hot water flowing through it. There will be 5 High flow Agitators for Mixing, scum breaking and Circulation of slurry mixture with different capacity. The digester tank will be covered by double membrane roof.

Fertilizer Tank: The volume of the Fertilizer Tank will be of 58.87m3. The digested slurry from digester will be released to the fertilizer tank. The tank will have pump for slurry transfer to solid liquid separator.

Biogas Purification Unit: The unit will have high pressure compressor of capacity of 50m3.The PSA based purification will have 2 towers purification Unit for removal of H2S, moisture and CO2, with inline standby equipment for raw gas based on pressure swing adsorption technology. There will be skid mounted, blower, receiver tank, measurement equipment, and internal gas piping stainless steel, valves, NR-valves, safety equipment, flame arrester & fittings as per requirement, desulphurization unit for removal of H2S from a level of max. 3,000 ppm down below a level of max 5 ppm. The maintained pressure at delivery limit will be of 0.2 bar - 0.4 bar. There will be Gas analyser for CH4, Co2, H2S and Moisture. The high pressure manifold will have 20 cylinders filling points. The biogas will be filled in high pressure cascade with capacity of 750 litres water capacity of each stack with valve each having 75 Ltr W.C., working pressure of 204 Kgf/cm² and OD 267 mm, cylinders assembled in single Bank configuration with SS & Brass fittings & SS tube.

Electrical Control Panel: There will be Electrical Control Panel for Biogas Generation, with all Preventers, Ampere meter on every connection, Voltage Indicator. The Programmable Logic Control (PLC) included for all automatized operation connected with all sensors and SCADA for Report generation .The system will be timer based, programmable, expandable .The system includes phase drop preventer, for protection of drives against fade out by phase drop, fluctuating voltage, reverse phase connection, overload, or dry run.

Process design:

The biogas plant will be 5820 m3 CSTR biogas plant. The technological option of the plant is shown in table below:

Type of digestion	Wet	Temperature	37+/-2 ◎C
Stage	Single stage	Continuous/batch	Continuous

The parameters considered for the design is given in below table

Design and sizing criteria for all process units are listed in table below:

Digester feed (m3/day)	HRT (days)	Total digester Volume (m3)	Biogas plant volume (m3)
140	30	4200	5000
Mass loading to digester (wet)		140000.0	kg solids/day
% DS		21	no water added
Digester feed %DS		10.0%	
Dilution water required		60000	l/day
OLR		2.64	kg VS/(m3 * day)
C:N ratio		18.3	
VS destruction		20.0	
Digester Slurry mass dry		60%	kg solids/day
Digester Slurry Mass wet		7362.0	kg/day
Digester Slurry DS%		140000	%DS
VS load (kg/day)		VS dest (kg/day)	
11096.0		6657.0	

Compost DS%	70.0%	%DS
Compost production	17500	kg/day

Waste	Fed Waste
Poultry Waste (Kg/Day)	8,000.00
Cow Dung (Kg/Day)	46,000.00
Press Mud (Kg/Day)	5,000.00
Organic Waste (Kg/Day)	1,000.00
	60,000.00

Annex A-5 : Land Document

Figure 14 Layout of land

Annex A-6: Reviews of Plans/ Policies/Legislations and Guidelines

The Constitution of Nepal

The Constitution has prioritized the human rights and protection of environment. Article 30 (1) of the Constitution asserts that every person shall have the right to live in a healthy environment. Similarly, Article 51 (G) asserts that; the State shall make such arrangements as may be required to keep the environment clean and stated Policies relating to protection, promotion and use of natural resources. The State shall give priority to the prevention of adverse impacts in the environment from physical development activities, by increasing the awareness of the general public about environmental cleanliness, as well as to the protection of the environment and special safeguard of the rare wildlife. The State shall make arrangements for the protection of, sustainable uses of, and the equitable distribution of benefits derived from, the flora and fauna and biological diversity.

1. Plans and Policies

a. National Environment Policy, 2076

National Environment Policy, 2076 B.S. aims to protect constitutional right of citizens to live in clean and healthy environment conferred in article 30 of the Constitution of Nepal. The policy is structured around six major policy measures to achieve the goal and objectives adopted. These include pollution prevention, control and minimization, environmental mainstreaming, environmental justice, public participation, sustainable development, and good governance, research and capacity development. The policy among others, adopts the policy to promote the use of environment friendly technologies while operating industries, factories, hospitals and vehicles. The policy recognizes the need of environmental and social assessments for implementation of any policy, program of project and that the environmental aspects are internalized at each stage.

The policy aims minimize the adverse environmental impacts due to development projects through enhancement of impact mitigation and adaptation measures. Similarly, the policy targets to instate appropriate mechanism to ensure objectivity and reliability of the Environmental Impact Assessment reports.

With reference to the policy of environmental justice, the policy internalizes the measure of "polluter pay principle" and provisions rationale compensation to the community directly affected by adverse environmental impacts from the respective development project. The policy targets to strengthen and make more effective the role of multiple-stakeholders in environmental management.

b. National Forest Policy, 2076

It guides sub sectoral programmes relating to forests, plant resources, wildlife, biodiversity, medicinal plants, and soil and watershed conservation. It also covers periodic assessment and updating on information on forest resources of the country

c. National Transport Policy, 2058

The principal objective of the National Transport Policy is to develop a reliable, cost effective, safe facility oriented and sustainable transport system that promotes and sustains the economic, social, cultural and tourism development of the Nepal as a whole. The policy include provision for the construction and development of transport infrastructure in central and local level, connection of roads to the headquarters of all the districts, connection of roads to northern border, etc. it also include action plan for transport infrastructure, motor vehicles, involvement of private sectors, standard of service, institutional structure, etc.

d. Fifteenth Plan (2076/77-2080/81)

In alignment with the broader national aspiration, GoN has adopted the 15th Periodic Plan along with the 25-year Long Term Vision that aims at achieving transformational development and bringing about structural changes in the economy. Thirty-four indicators for the long-term vision and 60 indicators for the 15th Periodic Plan have been identified as milestone targets. This plan has envisioned the strategy for environmental protection by developing standards and guidelines to control and prevention of all kinds of pollutions in soil, water, air, noise, radioactive and hazardous pollutions. It has set the national strategy to sustainable economic growth and increase the production as well as productivity of major grains, fish and livestock products to be self-dependent on food items.

e. Climate Change Policy, 2076

This has various objectives that includes advancing capacity on CCA, developing ecosystem resilience, promoting green economy by adopting low carbon economic development concept, mobilizing national and international financial resources, making effective the information service, mainstreaming climate change into relevant policy, strategy, plan and programmes, and also mainstreaming gender and social inclusion, including in climate change mitigation and adaptation programmes.

f. Renewable Energy Subsidy Policy, 2073

The Policy aims to develop the renewable energy sector and encourage very poor households to use renewables by providing subsidy for deployment.

It revises the subsidy determined in the Renewable Energy Subsidy Policy – 2012 and Urban Solar System Subsidy and Credit Mobilization Guidelines. The subsidy amount is expected to cover 40% of the total costs; with around 30% coming from credit and around 30% from private sector investment and/or community or households contribution (cash or in kind).

The policy primarily focusses on off-grid applications and provides subsidies for mini/micro hydropower, improved water mill, solar energy (home systems, mini-grids, grid connected), biogas, biomass energy, wind energy and wind-solar hybrids. Detail of the subsidy for each

technology type is provided in the policy document. The subsidy amount differs according to technology and the region - with higher subsidy being offered for remote areas. Selected examples are:

Solar PV mini-grid:

- Generation – equip. (per kWp): NPR 175,000 to 150,000/kWp (USD 1640 to 1410).
- Distribution (per household): NPR 32,000 to 28,000/household (USD 300 to 260).

Mini/micro hydropower

- Generation – equip. (per kW): NPR 125,000 to 80,000/kWp (USD 1175 to 750).
- Generation – civil. (per kW): NPR 80,000 to 20,000/kWp (USD 300 to 190).
- Distribution (per household): NPR 35,500 to 28,000/household (USD 333 to 260).

For technologies producing electricity output, the subsidy is not only given for equipment and civil work but also, where applicable, for development of distribution infrastructure.

Subsidy will also be provided for installation of solar PV systems in grid connected areas with irregular supply. This includes subsidies for solar street lighting in urban and rural areas and for solar PV systems in households, public educational institutions, public health facilities and religious places.

A subsidy delivery mechanism will be prepared by the Alternative Energy Promotion Centre (AEPC) and implemented after approval from the Ministry.

g. National Energy Crisis Reduction and Electricity Development Concept Paper, 2072

The Ministry of Energy ("MOF") has declared the decade 2016-2026 as the National Energy Crisis Reduction and Electricity Development Decade ("Energy Emergency Decade"). In this regard, the MOF has issued a Concept Paper on Elimination of Energy Emergency and Electricity Development Decade, 2015 (2072) ("Concept Paper") on February 18, 2016, with the objective to substantially end the power outage within the next one year, completely end power outage (even in the dry season) within the next two years, and to ensure energy security within the next decade.

It is relevant to note that this is the third time the Government of Nepal ("GON") has declared "Energy Emergency" in the last eight years. However, this time around, the GON has identified a detailed action plan with timelines, to ensure that the aforesaid objectives are met. Some of the key reforms proposed by the Concept Paper includes topics like Force Majeure Event, Convertible Currency denominated PPA, Certain provisions under the PPA,Government Guarantee for NEA Payments, One-Time Recommendation for Foreign Currency Payments, Shares to Public, Land Acquisition, Environmental Clearances.

2. Acts

a. **Environment Protection Act, 2076**

The Act focuses on that development project before implementation, requires either Brief Environmental Examination or Initial Environmental Examination or Environmental Impact Assessment depending upon the location, type and size of the projects [(Schedule 2 (10)].

It has provisioned for the preparation of Environmental Management Plan (EMP) [Schedule 2 (10)] and Supplementary Environmental Impact Assessment (SEIA) [Schedule 2 (11)].

The Parliament enacted the Environment Protection Act, 2076 B.S. (2019 A.D.) (the "Act") on July 19th, 2019. As a result, the earlier Environment Protection Act, 2053 B.S. (the "1997, Act") is now repealed.

One of the main features of the Act in contrast to the 1997 Act, is that it mandates several compliances to Project Developers while developing a Proposal of a Project, to ensure that the implementation of the Project does not harm the environment.

The 1997 Act, mandated a project developer to only comply with Initial Environment Examination and Environmental Impact Assessment. As per the present Act, a Project Developer needs to comply with the following compliances while developing a Project:

Environmental Study Report - is to be prepared prior to initiation of the Proposal, depending on the Proposal, and includes the following:

• Summary Environmental Study (environmental study report in short)

• Initial Environment Examination (examination of the possible impact on the environment and measures to mitigate it) or

• Environmental Impact Assessment (assessment of possible impact on the environment and solutions that can be opted)

This EPA:

Sets out the review and approval process of Environmental Study Reports, that involve informing and consulting stakeholders;

• stipulates that no one is to create pollution that would cause significant adverse impacts on the environment or harm to public life and health, or to generate pollution beyond the prescribed standards;

• specifies for the Ministry in charge of environment (currently the MoFE) to conduct inspection of approved projects to ensure that pollution prevention, control or mitigation is carried out according to the approved Environmental Study Report;

• provides for the protection of objects and places of national heritage and places with rare plants, wildlife and biological diversity; and

• states that any person/party affected by pollution or adverse environmental impact caused by anybody may apply to the prescribed authority for compensation to be recovered from the polluter/pollution generator.

b. Bagmati Province Environment Protection Act, 2077

This is a legal provision to protect the environment of Bagmati Province. Section 2 of this act specifies provision for environment study report. The environment study reportshould be

prepred as per article 3 of this section 2. Foer the purpose of sub article 1 of article 3, the proposer shall conduct brief environmental study as per schedule 1, IEE as per schedule 2 and EIA as per schedule3.

c. Local Government Operation Act, 2074

Local Government Operation Act outlines work, responsibility and powers of the local governments (Rural Sub Metropolitan City and Sub Metropolitan City levels). It specifies authorities devolved by the Constitution of Nepal to the local bodies. Section 3 of the act specifies the authorities of the local government bodies. Article 11 empowers local government to formulate local level policy for the environmental conversation and biodiversity and requires the local bodies to act for the environmental risk reduction, pollution control and control of hazardous substances.

d. Labor Act, 2074

This Act strictly prohibits the concerned parties who hire the work force to over utilize them during its different activities. Section 5 of the Act prohibits child labor engagement. Similarly, Section 6 prohibits any kind of discriminations like religion, gender, caste ethnicity, mother tongue etc. among employees. Section 22 states that prior work permit is required for non-Nepali citizens and they are allowed to work in Nepal for certain period only in the area where the Nepali work force is not available or not competent. Section 28 provisioned the working hours as 8 hours a day and 48 hours a week. The same section provisioned that thirty minutes must be allowed for rest and/or refreshments should be given in every five hours of work. Likewise, Section 30 allows employer to engage employee additional of 4 hours per day or 24 hours per week and shall provide over-time payment as 1.5 times the normal wage as per Section 31. Section 74 emphasizes constitution of Safety and Health Committee where 20 or more employees are engaged.

e. Land Acquisition Act, 2034

It guides the compulsory acquisition of land. It also describes that GoN can acquire land at any place and in any quantity by giving compensation pursuant to the act for the land acquired for any public purposes or for operation of any development project initiated by GoN.

f. Child Labor (Prohibition and Regulation) Act, 2056

The Child Labor (Prohibition and Regulation) Act 2056 is the main legal expedient to prohibit engaging children in factories, mines or similar risky activities and to make necessary provisions with regard to their health, security, services and facilities while engaging them in other activities. Under the Section 3 of the Act, child having not attained the age of 14 years is strictly prohibited to be engaged in works as a laborer. Similarly, under Section 4, engagement of child in works as a laborer against his/her will by way of persuasion, misrepresentation or by subjecting him/her to any influence or fear or threat or coercion or by any other means is prohibited. Under Section 6, in case any Enterprise has to engage a child in works, an approval has to be obtained from the concerned Labor Office or any authority or official prescribed by that office and form the father, mother or guardian of the child.

g. Soil and Water resource conservation Act, 2039

This Act is enacted to manage the watersheds of Nepal. Section 3 empowers the government to declare any area as a protected watershed area. Section 4 provides that a watershed conservation officer has the authority to implement the following works in protected watershed areas

h. Solid Waste Management Act, 2068

The Solid Waste Management Act, 2011 emphasize on the responsibility of waste producers (individuals/institutions) for the treatment and management of hazardous waste, health care waste, chemical and industrial waste as per the mandated standards. This act also outlines the duties of local government to take actions to control haphazard waste generation, disposal or collection and has provisions for various measures against those engaged in activities detrimental to the intentions of the act. Section 5 emphasizes any individual, organization or institution shall have to reduce the amount of generated solid waste as much as possible while carrying out any work or business. Section 38 of the Act states that : to throw, keep, discharge or cause to discharge chemical waste, industrial waste, medical waste or hazardous waste haphazardly are considered as offensive and could led to punishment and penalties as mentioned in Section 39 of the Act

i. Water Resources Act, 1992

The Water Resources Act (1992) makes arrangements for the rational use of surface and underground water. The Act seeks to prevent environmental and hazardous effects from the use of water and prohibit water pollution by chemicals, industrial waste or litter. Water may only be used in a manner that does not permit soil erosion, landslide or flood. Pollution of drinking water is prohibited under the Nepal Drinking Water Corporation Act (1989).

j. Forest Act, 2076

- The Act facilitates (i) to manage the national forest in the form of Government Managed Forest, Forest Protection Zone, Community Forest, Partnership Forest, Lease-hold Forest & Religious Forest and (ii) to contribute for national prosperity by conserving, promoting and utilizing the wild life, environment, watersheds and bio-diversity, while promoting the private, public and urban forest
- Chapter 12 of this act has provisions related to development projects. It states in regard to the use of forest area that "Notwithstanding anything contained elsewhere in this Act, if there is no other alternative to the using of forest area for the operation of a national priority project, plan of which investment is approved by the Investment Board, project of national pride and it appears from the environment examination referred to in the prevailing law that the operation of such plan does not result in significant adverse effects on the environment, the Government of Nepal may give approval, as prescribed, to use any part of the national forest for the purpose of operating such plan.
- It also states that "If there is no other alternative to the using of forest area for the operation of any development project by the Province or and it appears from the environment examination referred to in the prevailing law that the operation of such plan does not result in significant

adverse effects on the environment, it may request the Government of Nepal for acquisition of the land in such forest area for the operation of the project.

3. Rules

a. Environment Protection Rules, 2077

For effective implementation of the EPA (2076), Environment Protection Rules (EPR) has been enforced. EPR contains the elaborative provisions on the process to be followed during preparation and approval of projects requiring EIA and IEE including scoping document, terms of reference, information dissemination, public consultation and hearing, and environmental monitoring and auditing. EPR calls for the public consultation prior to the preparation of Terms of Reference and public hearing prior to the approval of IEE Report

b. Solid waste Management Rules, 2070

Government of Nepal, Ministry of Federal Affairs and Local Development (MOFALD) has enacted Solid Waste Management Regulation 2070 as per the power conferred by the section 50 of Solid Waste Management Act 2068. Rule three of the regulation has the provision about the segregation and management of solid wastes. The rule legal obliges to segregate the hazardous and chemical wastes while segregating the degradable and non-degradable waste at source. Sub rule 2 of Rule three requires the waste producing body to manage the chemical and hazardous waste by the producers themselves. Rule 5 requires that the hazardous, chemical, degradable and non-degradable waste be not mixed together, that collection, deposition and handling of such wastes should be carefully done. Rule 4 of the act mentions about the role of local government in disposal of solid waste. Rule 24 has the provision that local authority can direct the waste producers to adopt the measures and techniques for reduction the waste at source, to adopt the certain method for minimizing the waste, to pay the fee in due time and sub-rule 3 of rule 24 obliges the waste producers to follow such direction. Rule 25 of the regulation has the provision for monitoring of such matters.

c. Labor Rules, 2075

The Labor Rule, 2075 is formulated in accordance to Section 182 of Labor Act, 2074. Rule 7 of this Rule states, prior work permit is required to employ any non-Nepali citizens and according to Sub-section 3 of Section 22 of the Act, all the information about the labor should be enlisted. Rule 16 provisioned that working hours should be allocated according to the nature of work and Rule 17 provisioned, women with child not more than 3 years old or pregnant women should be given additional thirty minutes of time than stated in Section 28 of the Act to rest/ feed their child. Rule 34 emphasizes on making guidelines of occupational health and safety measures of the worker in the workplace and Rule 39 emphasizes on the safety against the possible injuries eye injury, impact of chemicals in workplace and fire hazards. Laborers involved in construction as well as operation activity should be given the personal protective equipment's and should be given first aid as soon as possible according to the Rule 53.

4. Guidelines/Frameworks and Standards

a. National EIA Guidelines, 1993

To address environmental impact assessment as envisaged by NCS, 1987, National Environmental Impact Assessment (EIA) Guidelines were endorsed by Government of Nepal on 27 September 1992 and gazetted on 19 July in 1993, Volume 43, Number 5. The guideline provides criteria for project screening and initial environmental examination (IEE). This also includes scoping, preparation of terms of reference for EIA, methods of EIA report, impact identification and prediction, impact mitigation measures, review of the draft EIA report, impact monitoring, evaluation of impact studies, impact auditing, community participation and schedules and annexes to IEE and EIA.

Many of the guideline provisions are now included in the Environment Protection Act, 1997, and Environment Protection Regulation, 1997. However, as the National EIA Guidelines, 1993 have not been issued under the Environment Protection Act (1997); they do not have any legal force. It is a policy guideline issued by the Government that is still followed in the matters which are not covered by the Environment Protection Act (1997) and Environment Protection Regulations (1997).

b. EIA guidelines for forestry sector, 2052

Nepal's socio-economic development largely depends upon the conservation, management and sustainable use of renewable natural resource base, particularly the forests. Inadequate ex ante consideration of the environmental aspects, in the past, led to the degradation of the forest environment in particular. Economic growth which proceeds without proper attention to the management and sustainable use of the forestry resources may even be detrimental to the whole process of improving the quality of life. Numerous examples confirm the fact that development and conservation must go hand in hand for sustainability. With this in perspective, His Majesty's Government of Nepal endorsed this Environmental Impact Assessment Guidelines for the Forestry Sector on 3 April 1995 in order to ensure the integration of environmental aspects in Nepal's forestry development proposals or the development proposals of other sectors to be implemented in the forest areas. These Guidelines were prepared entirely through a participatory process to produce a document suitable to the Nepalese context. These Guidelines are in line with the National Environmental impact Assessment Guidelines, 1993 and details the steps required to ensure the incorporation of environmental aspects in project planning and implementation processes. His Majesty's Government of Nepal has framed the following Guidelines in order to minimize or avoid adverse impacts on the environment of development projects by integrating environmental aspects in the planning cycle of the forestry development proposals or other development works that affect forest areas.

The guideline provides criteria for project screening and initial environmental examination (IEE). This also includes scoping, preparation of terms of reference for EIA, methods of EIA report, impact identification and prediction, impact mitigation measures, review of the draft EIA report,

impact monitoring, evaluation of impact studies, impact auditing, community participation and schedules and annexes to IEE and EIA.

c. Environment Friendly Local Governance Framework, 2070

- This has been issued to add value to the environment friendly local development concept encouraging environmental protection through local bodies.
- One of its expected results is to bring improvement in the field of environment protection, waste management, climate change adaptation and disaster management throughout the nation

d. Other Directives related to forest

Other guidelines include Forest Encroachment Control and Managements strategy 2068, Directive of District Forest Co-ordination committee, 2068, Pratibandhit Ban Paidawar, Rastriya Prathamikta Prapta yojana ka lagi Rastriya Ban Kshetra proyog garne sambandhi karyabidhi, 2074, Ban Kshetra ka bibhinna Karya yojana nirman Prakriya sanga sambandhit Ban bibhag bata parit bishaya suchi ko sangalo, etc.

e. National Ambient Air Quality Standards, 2069

The National Ambient Air Quality Standards, 2003 enforced by GoN has set quality standards for seven parameters: TSP, PM10, Sulphur Dioxide, Nitrogen Oxide, Carbon Mono-Oxide, Lead and Benzene for the maintenance of the ambient air quality. The project during its construction and operation will have to comply with the standards for the ambient air quality.

f. Noise Level Standard of Nepal, 2069

Due to increased urbanization and industrialization high noise level has been experienced. The noise level standard sets ambient noise level relating to different areas like high traffic, low traffic, public places, residential and commercial places and so on.It provides standards for improving the noise quality so as to reduce impacts on human health. The threshold limit of noise for Leq in decibel as prescribed by the National Standard of Noise 2069 has for different sector in day and night are as follows:

Type of environment	Noise limit Leq (db)	
	Day	Night
Industrial Area	75	70
Commercial Area	65	55
Rural Settlement Area	45	40
Urban Residential Area	55	50
Mixed Residential Area	63	55
Peaceful Area	50	40

g. Generic Standard for discharging industrial effluent in inland surface water, 2058 .

The Ministry of Environment has set tolerance limits for the industrial effluents to be discharged into the inland surface water through Gazette Notification. Since the project is considered as an industry it will have to comply with the tolerance limits set in the generic standard prior to the discharge of the effluents into the inland surface water during the construction and operation period.

h. **National Diesel Generator Emission Standard, 2068**

The MoPE introduced in October 2012 AD the National Diesel Generator Emission Standard (NDGES) for new and in-use diesel generators with a capacity of 8 kW-560 kW (under the 1997 Environment Protection Act). In doing so they followed the Indian standards for construction equipment rather than for diesel generators. Hence the Nepal emission standards for new and in-use diesel generators are less stringent than in India. The emissions standards set for new diesel generator imports is equivalent to Bharat Stage III standards and, for in-use diesel generators, is equivalent to Bharat Stage II.

Equipment	Maximum (db)
Diesel Generator	90

5. International Treaty Agreement

a. Convention on Biodiversity (CBD), 1992

The main objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

b. UN framework convention on Climate Change, 1992

Parties to take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. This IEE study will enforce the implementation of environmental management plans as measure to minimize the causes of climate change

Annex A-7: Environmental Standards

Table35Standards for effluents discharged into inland waters

SN	Parameters	Tolerance Limits
1	Total Supended solids, mg/L, Max	30-200
2	Particle size of total suspended particles	Shall pass 850-micron Sieve.
3	pH	5.5 to 9.0
4	Temperature	Shall not exceed 40 degree C in any section
5	Biochemical oxygen demand (BOD) for 5 days	30-100
6	Oils and grease, mg/L, Max	10
7	Phenolic compounds, mg/L, Max	1
8	Cyanides (as CN), mg/L, Max	0.2
9	Sulphides (as S), mg/L, Max	2
10	Radioactive materials:	
11	a. Alpha emitters, c/ml, Max	7 OCT
12	b. Beta emitters, c/ml, Max	8 OCT
13	Insecticides	Absent
14	Total residual chlorine, mg/L	1
15	Fluorides (as F), mg/L, Max	2
16	Arsenic (as As), mg/L, Max	0.2
17	Cadmium (as, Cd), mg/L, Max	2
18	Hexavalent chromium (as Cr), mg/L, Max	0.1
19	Copper (as Cu), mg/L, Max	3
20	Lead (as Pb), mg/L, Max	0.1
21	Mercury (as Hg), mg/L, Max	.01
22	Nickel (as Ni), mg/L, Max	3
23	Selenium (as Se), mg/L, Max	0.05
24	Zinc (as Zn), mg/L, Max	5
25	Ammonical nitrogen, mg/L, Max	50
26	Chemical Oxygen Demand, mg/L, Max	250
27	Silver, mg/L, Max	0.1

(Source: Standards adopted from MoEST, gazette on 2058/01/17 by GoN)

Table36Drinking water quality standards

SN	Parameters	Desirable Limits	Maximum Tolerable
1.	Colour, Hazen units, Max	10	15
2.	Odour	Unobjectionable	
3.	Taste	Agreeable	

4.	Turbidity, NTU, Max	5[1]	10
5.	Total Dissolved Solids, mg/l , Max	500	1500
6.	pH value	6.5 – 8.5	May be relaxed up to 5.5 on the lower and up to 9 on higher side.
7.	Total Hardness (as $CaCO_3$) mg/l, Max	250	
8.	Calcium (as Ca), mg/l, Max	75	
9.	Magnesium (as Mg), mg/l, Max	30	
10.	Copper (as Cu), mg/l, Max	1	may be extended up to 1.5
11.	Iron (as Fe), mg/l, Max	0.3	
12.	Manganese (as Mn), mg/l, Max	0.1	may be extended up to 0.5
13.	Chlorides (as Cl), mg/l, Max	250	
14.	Sulphate, (as SO_4), mg/l, Max	150[3]	
15.	Nitrate (as NO_3), mg/l, Max	45	No relaxation
16.	Fluoride (as F), mg/l, Max	1.5	
17.	Phenolic compounds, (as C_6H_5OH), mg/l,	0.001	May be relaxed up to 0.002
18.	Mercury (as Hg), mg/l, Max	0.001	No relaxation
19.	Cadmium (as Cd), mg/l, Max	0.01	No relaxation
20.	Selenium (as Se), mg/l, Max	0.01	No relaxation
21.	Lead (as Pb), mg/l, Max	0.01	No relaxation
22.	Arsenic (as As), mg/l, Max	0.05	No relaxation
23.	Cyanide (as CN), mg/l, Max	0.05	No relaxation
24.	Chromium (as Cr^{6+}), mg/l, Max	0.05	No relaxation
25.	Residual free Chlorine, (as Cl), mg/l, Min	0.2	
26.	Ammonia, mg/l, Max	1.5	
27.	Aluminium, mg/l, max	0.2	
28.	Boron mg/l, max	0.3	
29.	Nickel, mg/l, max	0.02	
30.	Hydrogen sulphide, mg/l, max	0.1	
31.	Zinc, mg/l, max	3	

(Source: Standards adopted from Department of Water Supply & Sewerage)

Table37National standard for noise quality

SN	Area of Exposure	Noise Limit (L_{eq}) in decibels	
		Day Time	Night Time
1.	Industrial Area	75	70
2.	Commercial Area	65	55
3.	Rural Residential Area	45	40
4.	Urban Residential Area	55	50
5.	Mixed Residential Area	63	55
6.	Quiet Area	50	40

(Source: Gazette Notification, 2012)

[2] Value for turbidity is 5 in FAR(for mineral water), PFA, BS, WHO
[3] Value for Sulphate BS:200, FAR(for mineral water) and PFA:250

Table 38Permissible emission standards for biogas generator (adopted from diesel generator standard)

CATEGORY (KW)	CO (g/kWh)	HC+NOx (g/kWh)	PM (g/kWh)
kW<8	8.00	7.50	0.80
8=kW<19	6.60	7.50	0.80
19=kW<37	5.50	7.50	0.60
37=kW<75	5.00	4.70	0.40
75=kW<130	5.00	4.00	0.30
130=kW<560	3.50	4.00	0.20

Source: Nepal Gazette (Nepal Gazette Notification, 2069 Kartik 13, BS)

Annex A-8: Grievance Redress Format

Name of Grievant:	**Contact detail** **Work Phone:** **Home Phone:** **Mobile No.:**
Home Mailing Address:	**Work Mailing Address:**
Date, time and place of grievance recorded:	
Detailed description of grievance:	
Proposed solution to grievance:	
_____ Signature of Grievant	_____ Signature of Grievance Receiver

Table39Grievance redress format

S.N.	Name of Grievant	Date		Time of Grievance Recorded	Issue Raised	Time Frame to Resolve

Annex A-9: Plant Layout and Drawings

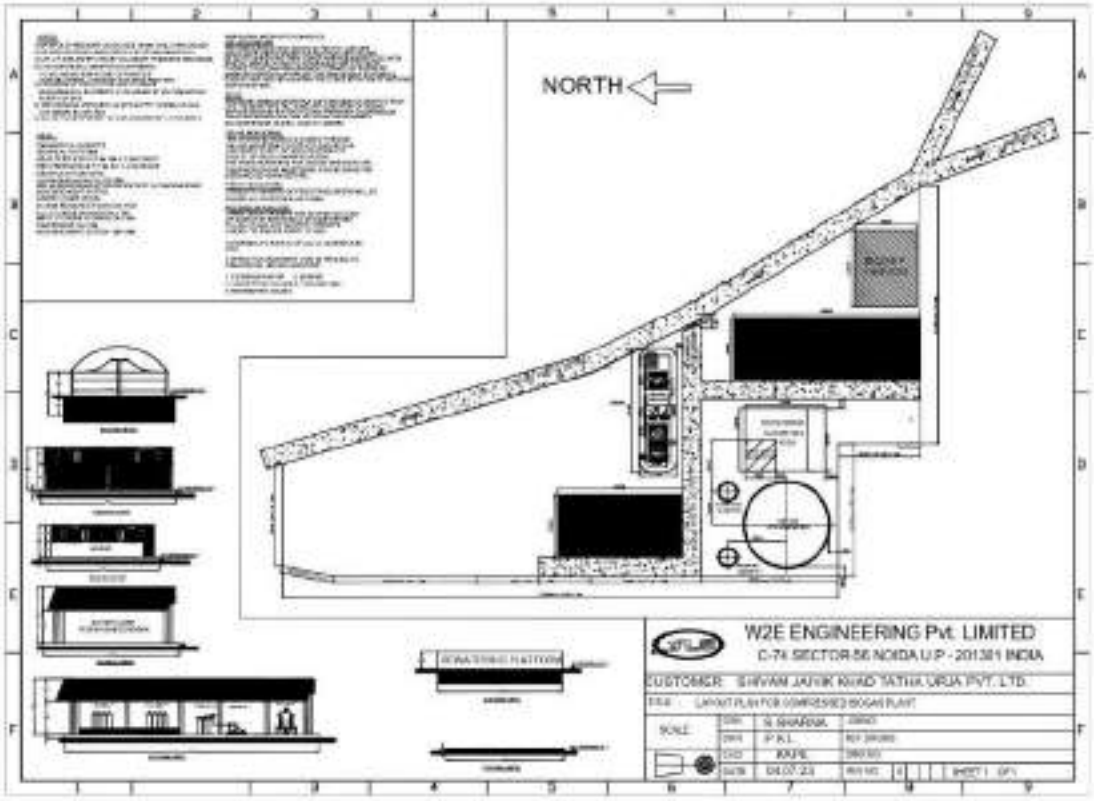


Figure 15 Plant layout

Annex A-10: Emergency Preparedness Plan

Emergency Response Plan for Biogas Plants

1. Types of Incident, Severity and Level of Response

Types of Incident	Severity	Level of Response
Serious injury or medical emergency Fire or explosion Chemical spill Gas leak Vandalism and other threats Others	Level 1 – Minor: localized fire Level 2 – Serious: containable fire Level 3 – Severe: serious fire	**Level 1** • can be dealt with by the person identifying the problem • supervisor should be informed and the incident formally logged • do not involve plant evacuation or Emergency Response Team **Level 2** • Immediate action should be taken • the person identifying the problem call Security to summon ERT assistance • ERT takes necessary emergency actions • May involve plant evacuation **Level 3** • Immediate action should be taken • the person identifying the problem call Security to summon ERT assistance • ERT takes necessary emergency actions • Must involve plant evacuation and Emergency Response Team

ERT – Emergency Response Team

2. The Emergency Organization

Operating Personnel	ERT	External Services	Others

Problem Identifier Supervisor	Incident controller First Aiders Fire checkers Pump checkers Gas line checkers Roll Call Co-coordinator others	Ambulance Fire Medical Health & Safety Security	Crisis Management Team ESS specialist Site in charge

3. Emergency Response Equipment

Emergency Response Equipment	**Location**	**Capability functions**	**Inspection frequency**
Smoke Purge Generator	Utilities	To Extract Smoke To power in emergency	Monthly and quarterly
Fire pumps	Fire system pump house	To supply sprinkler water to the plant	Weekly
Fire alarm	Reception and plant rooms	To audibly alert all personnel of the presences of a Fire or Smoke	Weekly
Spill kits	Security	To contain potential local leaks	Monthly
Radio	Individually held and Reception	To ensure clear open communication in event of emergency	Weekly
Fire Extinguishers	Plant wide	To provide local, portable extinguishers for the suppression of a small fire	Annual
First Aid Kits	Security	To Supply Dressing/Burn Material	Weekly
Gas detector	Security	Gas detection CH_4 leak and H_2S leak	Weekly

Responsibility for operation should be defined

4. Training

To	**On what**
Employees	Emergency response and evacuation
Contractors	Emergency response and evacuation
Visitors	
Emergency Response Team	Emergency response procedure Basic fire response procedure Chemical Spill Gas leak
First aiders	First aid
Security	Call response and dealing with external threat
Incident controller	Incident control

5. Drill and communication – *should be taken annually*

6. Incident Response

Personal Injury/Medical Emergency			
Instructions for all employees and contractors	**Instruction for First Aid Personnel**	**Instruction for Supervisors**	**Instructions for Security**
If incident involves personal injury - remove the hazard if safe to do so	On instruction from Security or Incident Controller, proceed to scene of injured personnel	Liaise with First Aider and find out what further medical intervention is required.	Ask caller to **Remain Calm**
General Site Evacuation			
should make safe any equipment you are using if safe to do so and immediately leave the building by			

the nearest emergency exit Proceed to your designated Assembly Point			
Fire			
If trapped - Close as many doors as possible between you and the fire In case of smoke - Stay as low as possible			Receive emergency call Fire alarm activation Sprinkler water flow alarm
Chemical spill			
Others:			
Instructions for • Emergency Response Team • Pump House Checker • Gas Leak Checkers • Roll Call Coordinator • Others			

7. Incident Report Checklist

A. Attendance		
Person	**Present**	**Signature**
Fire checker		
Pump House checker		
Roll call coordinator		
B. Notification		
	Notified	**Response**
Ambulance	Yes/No	Yes/No
Fire brigade		
C. Responsibilities		
Issue	**Who**	**What**
Gas Leak	Gas leak checker	
Radios		

Security	Security guard	Ensured no authorized entry

8. Directory of Emergency Contacts

Name	Organization	Contact Address	Contact No.
	Security		
Dr.	Physician		
	Hospital		
	Fire Brigade		
	Ambulance		
	Municipality		
	Ward Office		
	ESS Focal Person		
	Team Leader, ERT		
	Contractor		

Annex-A11: Occupational Health and Safety Plan

Management Commitment to Occupational Health Safety (OHS)
Goals for OHS Plan:

- Develop, implement, and maintain a safe workplace for our employees consistent with all applicable national regulations
- Consistently improve the safety program to minimize incidents, therefore ensuring employees' long-term safety and wellness.

Person responsible for implementing and monitoring the Safety Program: *TBD*
Managing Director:
Date:

Employer Responsibilities

To provide employees with a workplace free of hazards that may cause illness or serious physical harm.
To comply with standards, rules, and regulations

- Allow employees free access to tools and equipment necessary to do a job safely.
- Provide employees with training/orientation on specific safety issues and equipment.
- Conduct regular inspections.
- Following up after safety incidents with thorough accident investigations, correcting problems and post-accident employee training.
- Recognize employees with the best OHS practices.

Employee Responsibilities

- Handle equipment and work processes in accordance with established procedures and documented protocols.
- Report any unsafe conditions, defects in equipment, or injuries to management immediately.
- Complying with all management instructions for safe conduct.
- Attend OHS related trainings/orientations and practice drills.
- Obtain permission to operate equipment.
- Never participate in horseplay, scuffling, and other acts that endanger the safety or well-being of the team.
- Not report to work under the influence of alcohol and/or drugs or during illness.

Employee Injury and Illness Reporting

All injuries must be reported to immediate supervisor or Emergency Response Team.
Information

- Location of First-aid box and fire extinguisher

- Emergency contact number
- Emergency health centre location:
- Evacuation location:

Report any hazard to:
Supervisor's Name:
Contact No.:
After hours/weekends:

Incident Investigation
In an emergency situation, **dial 100** immediately

- All injuries and illnesses should be reported, no matter how large or small.
- Fill up incident reporting Form.
- Document the injury/illness completely while doing a thorough root cause analysis of the incident so that corrective action can be determined to prevent future incidents.
- Part of the safety corrections may include employee orientation and counseling to correct unsafe behaviors, prevent injuries, and improve safety.

Hazard Identification and Assessment

Information available in the workplace may include:

- Equipment and machinery operating manuals.
- Material Safety Data Sheets (MSDS)
- Records of previous injuries and illnesses
- Patterns/trends of frequently occurring injuries and illnesses
- Existing safety and health programs, such tagout, confined spaces, process safety management, personal protective equipment etc
- Input from workers

General Safety Programs

- Confined space entry
- Driving safety
- Electrical safety (wiring methods, components and equipment, electrical system design)
- Emergency Action Plan
- Ergonomics (scientific study of people and their working environment)
- Fall protection
- Fire safety

Personal Protective Equipment

All personal protective equipment (PPE) and tools to safely perform the work will be provided to employees and properly maintained in accordance with manufacturer guidelines.

Organization's PPE plan – use of appropriate PPE

All employees will be trained on the personal protective equipment that is required to do their jobs effectively.The Company will review any employee feedback on the use of this equipment and potential improvements that can be made. This will be in line with the current COVID 19 situation and its long term implications in terms of health safety and contagion control. The following steps will be done for disinfection

1. Clean up and disinfect office space, common areas and construction site with soap/detergent water and/or disinfectant (such as 1% hypochlorite) where workers would have to move frequently
2. Disinfect frequently touched objects, surfaces and equipment
3. Provide hand washing facilities at the construction site (recommendation: use foot operated tap and soap dispenser)
4. Provide soap and water in toilet with hand drying facility such as disposable paper towel
5. Display poster on hand-washing steps

In case of someone at the construction site becomes ill with symptoms of communicable disease, developers/contractors shall develop an Emergency Response Plan to deal with the emergency situation. Project developers and contractors shall assume that everyone is potentially infectious at the construction site, thus shall introduce good infection control plan. If proper procedures are followed at all times, spread of disease can be avoided. Construction sites shall be provided with an appropriate first aid kit and at least one staff member shall be appointed as ESS focal person and trained in first aid. Moreover, Personal Protective Equipment (PPE) such as facemask, gloves, gowns, eye goggles and face shields should be provided on site

Education on Communicable Disease

1. Orient employees/workers on communicable disease like COVID-19, its symptoms and Occupational Health and Safety (OHS) Plan of the project
2. Provide notification on risk and scope of risk to make understanding on the disease
3. Provide up-to-date information on weekly basis from reliable and authentic sources such as GoN and WHO
4. Instruct workers to strictly follow guidelines/ instruction of the Government of Nepal
5. Encourage workers to strictly follow OHS Plan along with GON prescribed measures to avoid and minimize the risk of Infection

Hazard Prevention and Control

Using the following standard methods:

- Safe Work Practices
- Engineering Control
- Training
- Enforcement
- Personal Protective Equipment
- Administrative Control
- Preventive Maintenance

Work Place Environment

- Light
- Temperature
- Ventilation
- Sound
- Working space Cleanliness
- Garbage Management
- Provision of Drinking Water
- Canteen
- Toilet Facility
- Resting time and resting place
- Safety provision in workplace

Communication

Standard methods for the communication with employees:

- Group orientation/individual induction
- Posters/signage/forms/formats
- Regular Meetings on OHS
- Safety suggestion box
- Online forms
- Hotline

Training and Education

Safety training will be provided for employees:

- During new hire on boarding.
- When beginning new job assignments.
- When cross training on new types of machinery/equipment.
- When new substances, processes, procedures, or equipment are introduced to the workplace and represent a new hazard.

- Periodically, in the form of refresher training (this may be following a near miss or incident, which can be required).

The purpose of our training program is to provide employees with:

- Knowledge and skills needed to do their work safely and avoid creating hazards that could place themselves or others at risk.
- Provide awareness and understanding of workplace hazards and how to identify, report, and control them.
- Specialized training, when their work involves unique hazards.

Program Evaluation and Improvement

- Verify that the core elements of the program have been fully implemented. Ensure that the following key processes are in place and operating:
    - Reporting injuries, illnesses, incidents, hazards, and concerns.
    - Conducting workplace inspections and incident investigations.
    - Tracking progress in controlling identified hazards and ensuring that hazard control measures remain effective and is completed promptly.
    - Collecting and reporting any data needed to monitor progress and performance.
- Review the results of any compliance audits to confirm that any program shortcomings are being identified and that actions are being taken that will prevent recurrence.
- Review and update plans/processes based on the company's loss history.
- The person tasked with the overall responsibility to evaluate the Company's safety program and processes is:

Name: TBD
Contact Information: _____

Annex A -12: Land Lease Document

बहालनामाको कागज

देउकी राउत अहिरको नाति, शंकर राउत अहिरको छोरा जिल्ला पर्सा गा.वि.स विजवनिया वडा नं. ७ परिवर्तित भई कायम ऐ. जगरनाथपुर गाउपालिका वडा नं. ३ बस्ने वर्ष .... को (ना.प्र.प.नं. ३४१०१९/१८६ जारी मिति ०६८/०३/१४–पर्सा) अशोक कुमार यादव जसलाई यस बहालनामाको कागजमा प्रथम पक्ष भनिएको छ।

जिल्ला पर्सा जगरनाथपुर गाउपालिका वडा नं ३ स्थित शिवम जैविक खाद तथा उर्जा प्रा.लि. (प्रा.लि. नं. २४८८२०–०७७/७८) को तर्फबाट ऐ.का अध्यक्ष नगिना कुमार यादव जसलाई यस बहालनामाको कागजमा दोश्रो पक्ष भनिएको छ।

आगे म प्रथम पक्षको नाउ दर्ता हकभोगको जिल्ला पर्सा गा.वि.स. जानकीटोला वडा नं. ७ परिवर्तित भई कायम ऐ. जगरनाथपुर गाउपालिका वडा नं. २ को कि.नं. २१२ को ज.वि. ०–१४–० जग्गा दोश्रो पक्ष भाडामा लिई शिवम जैविक खाद तथा उर्जा प्रा.लि. को कारोबार संचालन गर्नका लागि भाडामा दिन तपाई दोश्रो पक्षले माग गरेकोमा तपसिलमा उल्लेखित शर्तहरुको अधिनमा रही म प्रथम पक्ष सो जग्गा भाडामा दिन सहमत भएकोले दुवै पक्षको आपसी सहमतीले उल्लेखित जग्गा भाडामा लिन दिन मंजुर भई यो बहालनामाको कागज लेखि लेखाई सही छाप गरी एक एक प्रति लियौ दियौ साक्षी रोहबरको सदर।

शर्तहरु

१. उल्लेखित जग्गाको बहाल प्रति कठा प्रति वर्ष रु. २५००/०० - (दुई हजार पांच सय मात्र) निर्धारित गरियो। सो बहाल रकममा प्रत्येक बर्ष मा मुल बहाल रकमामा १०% ले वृद्धि हुनेछ।

२. सो भाडा दोश्रो पक्षले प्रथम पक्षलाई महिनाको ५ गते भित्र बुझाईनु पर्ने छ।

३. बहाल बापत लाग्ने कर दोश्रो पक्ष कम्पनी स्वयले बुझाइ सो को निरस्ता प्रथम पक्षलाई दिनु पर्ने छ।

४. उल्लेखित जग्गामा आवश्यक पर्ने निर्माण कार्य,विद्युत, पानी लगायतको सम्पूर्ण कार्य दोश्रो पक्षले आफै गराउनु पर्नेछ ।

५. प्रथम पक्षले दोश्रो पक्षलाई बहालमा दिएको जग्गा जुन प्रयोजनको लागि लिएको हो सो बाहेक अन्य कुनै प्रयोजनमा प्रयोग गर्न पाउने छैनन ।

६. यो घरको बहाल अवधि आजको मितिले २० वर्षको लागि हुने छ । सो उपरान्त आवश्यकता अनुसार बहाल सम्बन्धमा सम्झौता गर्न सकिने छ । उक्त अवधि पश्चात नया सम्झौता हुन नसकी जग्गा खाली गरी दिने अवस्था आएमा दोश्रो पक्षले निर्माण गरेका घर टहरा लगायत अन्य सामाग्रीहरु प्रथम पक्षले आपसी सहमतिले कायम मोल बुझ बुझारथ गरी उक्त समानहरु राख्न सक्नेछन वा कायम मोल तिर्न नसके दोश्रो पक्षले उक्त समान लैजान पाउने छन ।

७. दोश्रो पक्षले बहालमा लिएको जग्गा निर्धारित अवधि भन्दा पहिले छाड्न चाहेमा प्रथम पक्षलाई ६ महिना पहिले लिखित जानकारी दिनु पर्नेछ ।

८. यसमा लेखिएको शर्तहरु दुवै पक्षलाई कानुन सरह लागु हुने छ ।

प्रथम पक्ष

अशोक कुमार यादव.....१

दोश्रो पक्ष

शिवम जैविक खाद तथा उत्पा
दा लि को तर्फबाट ऐ का अध्यक्ष
नगिना कुमार यादव १

रोहबर

जिल्ला पर्सा वी म न पा वार्ड न ११ बस्ने वर्ष को दिलिप शर्मा.....१

ईति सम्वत २०७८ साल जेष्ठ महिना गते रोज मा शुभम

बहालनामाको कागज

देउकी राउत अहिरको नाति, शंकर राउत अहिरको छोरा जिल्ला पर्सा गा.वि.स. विजवनिया वडा नं. ७ परिवर्तित भई कायम ऐ. जगरनाथपुर गाउपालिका वडा नं. ३ बस्ने वर्ष २८ को ।ना.प्र.प.न.३४-०१-६९-०२८७१ जारी मिती २०६९।०८।०७ -पर्सा। सुभाष कुमार यादव जसलाई यस बहालनामाको कागजमा प्रथम पक्ष भनिएको छ।

जिल्ला पर्सा जगरनाथपुर गाउपालिका वडा नं.३ स्थित शिवम जैविक खाद तथा उर्जा प्रा.लि. (प्रा.लि. नं. २४८८२०-०७७/७८। को तर्फबाट ऐ.का अध्यक्ष नगिना कुमार यादव जसलाई यस बहालनामाको कागजमा दोश्रो पक्ष भनिएको छ।

आगे म प्रथम पक्षको नाउ दर्ता हकभोगको जिल्ला पर्सा गा.वि.स. विजवनिया वडा नं. ७ परिवर्तित भई कायम ऐ. जगरनाथपुर गाउपालिका वडा नं. ३ कि.नं. २२४ को ज.वि. ०-७-१०, र जिल्ला पर्सा गा.वि.स. जानकीटोला वडा नं. ७ परिवर्तित भई कायम ऐ. जगरनाथपुर गाउपालिका वडा नं. २ ऐ. कि.नं. १११ को ज.वि. ०-९-५ तथा जिल्ला पर्सा गा.वि.स. जानकीटोला वडा नं. ७ परिवर्तित भइ ऐ. जगरनाथपुर गाउपालिका वडा नं. २ कि.नं. २७५ को ज.वि. ०-७-५ समेत जम्मा ज.वि. १-४-० जग्गा दोश्रो पक्ष भाडामा लिई शिवम जैविक खाद तथा उर्जा प्रा.लि. को कारोवार संचालन गर्नका लागि भाडामा दिन तपाई दोश्रो पक्षले माग गरेकोमा तपसिलमा उल्लेखित शर्तहरुको अधिनमा रही म प्रथम पक्ष सो जग्गा भाडामा दिन सहमत भएकोले दुवै पक्षको आपसी सहमतीले उल्लेखित जग्गा भाडामा लिन दिन मंजुर भई यो बहालनामाको कागज लेखि लेखाई सही छाप गरी एक एक प्रति लियौ दियौ साक्षी रोहबरको सदर।

शर्तहरु

१. उल्लेखित जग्गाको बहाल प्रति कठा प्रति वर्ष रु २५००/०० - (दुई हजार पांच सय मात्र) निर्धारित गरियो । सो बहाल रकममा प्रत्येक वर्ष मा मुल बहाल रकममा १०% ले वृद्धि हुनेछ ।

२. सो भाडा दोश्रो पक्षले प्रथम पक्षलाई महिनाको ५ गते भित्र बुझाईनु पर्ने छ ।

३. बहाल बापत लाग्ने कर दोश्रो पक्ष कम्पनी स्वयंले बुझाइ सो को निरसा प्रथम पक्षलाई दिनु पर्ने छ ।

४. उल्लेखित जग्गामा आवश्यक पर्ने निर्माण कार्य,विधुत, पानी लगायतको सम्पुर्ण कार्य दोश्रो पक्षले आफै गराउनु पर्नेछ ।

५. प्रथम पक्षले दोश्रो पक्षलाई बहालमा दिएको जग्गा जुन प्रयोजनको लागि लिएको हो सो बाहेक अन्य कुनै प्रयोजनमा प्रयोग गर्न पाउने छैनन ।

६. यो घरको बहाल अवधि आजको मितिले २० वर्षको लागि हुने छ । सो उपरान्त आवश्यकता अनुसार बहाल सम्बन्धमा सम्झौता गर्न सकिने छ । उक्त अवधि पश्चात नया सम्झौता हुन नसकी जग्गा खाली गरी दिने अवस्था आएमा दोश्रो पक्षले निर्माण गरेका घर ढहरा लगायत अन्य सामाग्रीहरु प्रथम पक्षले आपसी सहमतिले कायम मोल बुझ बुझारथ गरी उक्त समानहरु राख्न सक्नेछन वा कायम मोल तिर्न नसके दोश्रो पक्षले उक्त समान लैजान पाउने छन ।

७. दोश्रो पक्षले बहालमा लिएको जग्गा निर्धारित अवधि भन्दा पहिले छाडन चाहेमा प्रथम पक्षलाई ६ महिना पहिले लिखित जानकारी दिनु पर्नेछ ।

८. यसमा लेखिएको शर्तहरु दुवै पक्षलाई कानुन सरह लागु हुने छ ।

प्रथम पक्ष

सुभाष कुमार यादव १

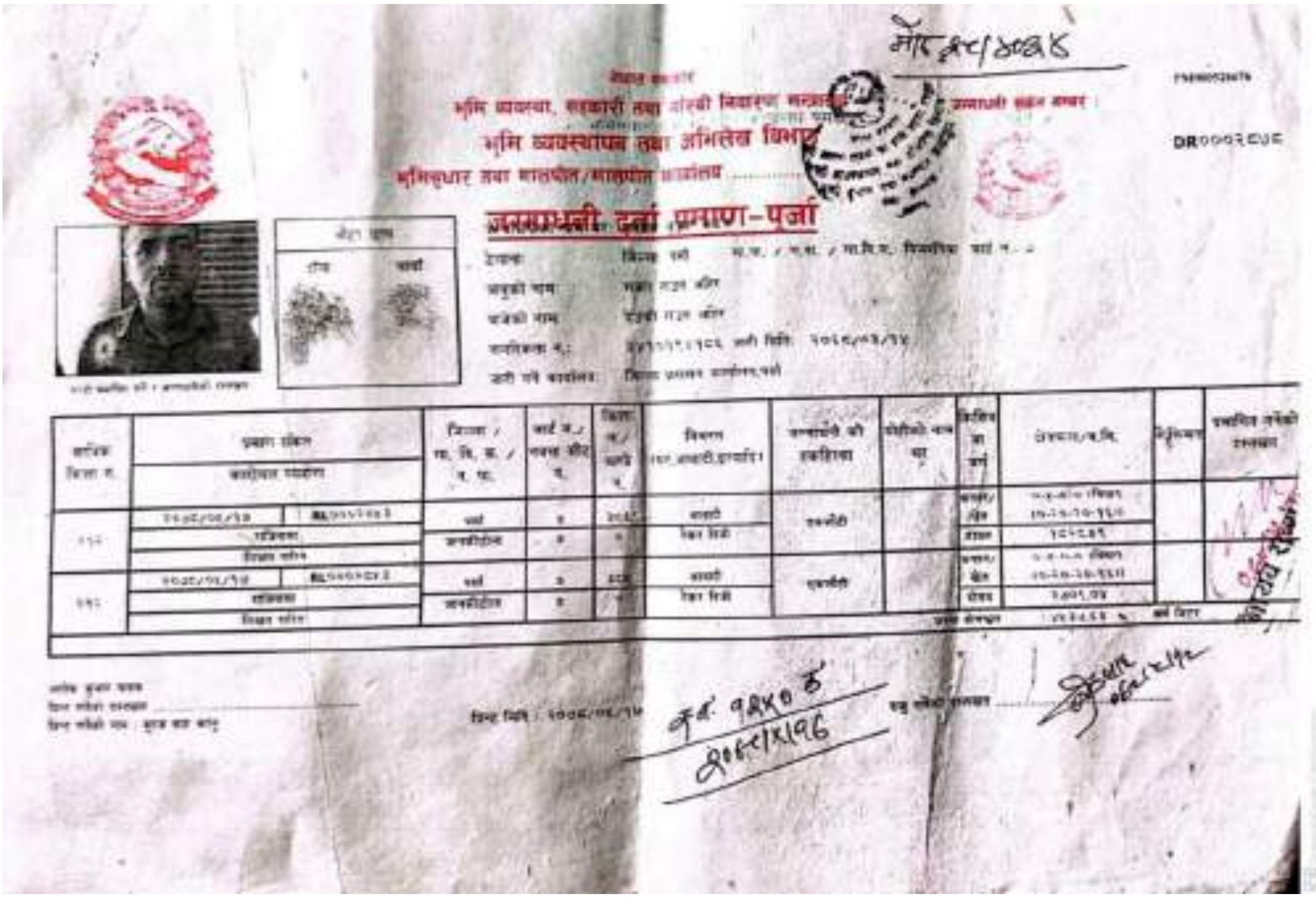
दोश्रो पक्ष

शिवम जैविक खाद तथा उर्जा
प्रा.लि.को तर्फबाट ऐ.का अध्यक्ष
नगिना कुमार यादव १

रोहबर

जिल्ला पर्सा वी.म.न.पा वार्ड न.११ बस्ने वर्ष .. को दिलिप शर्मा १

इति सम्वत २०७८ साल जेष्ठ महिना .. गते रोज .... मा शुभम


भूमि व्यवस्था, सहकारी तथा गरिबी निवारण मन्त्रालय
भूमि व्यवस्थापन तथा अभिलेख विभाग
भूमिसुधार तथा मालपोत/मालपोत कार्यालय
जग्गाधनी दर्ता प्रमाण-पूर्जा

Annex A -13: Photos

Figure 16 Field location of project

Figure 17 Poultry farm for biogas production

Figure 18 Cattle farm for biogas production