

ANNEX III: Environmental and Social Management Plan
of
Himalayan Dairy Farm, Dangraha-6, Morang

Executive Summary: This Environmental and Social Management Plan (ESMP) has been developed for proposed 35m³ biogas sub-project to be constructed in the premises of Himalayan Dairy Farm in order to mitigate the likely environmental impacts predicted during environmental and social screening. Since it is envisaged that the subproject will pose minimum environmental and social impact, this sub-project is classified as “Category C”. Some of the impacts caused by the sub-project are: health and safety issues of construction workers, construction related increased noise, possible chance ground water contamination of bio-slurry, Safety issues with workers health during plant operation aesthetic degradation and possible intrusion of bioslurry into nearby river etc. The possible mitigation measures have been proposed and shall be implemented by the responsible authority (construction company or developer) as mentioned in this ESMP. In addition, the monitoring as mentioned in this ESMP shall also be performed accordingly. The likely impacts not identified during screening as well as in this ESMP, if perceived during construction and/or operation phase shall also be avoided or mitigated by the Construction Company and/or developer.

sfo{sf/L ;f/f+z M lxdfnog 8]/L kmfd{df k|:tfljt #% 3g ld6/sf] afof]Uof; Knf06 lgdf{0f tyf ;~rfngaf6 x'g;Sg] ;Defljt k|Its"n jftfj/0fLo tyf ;fdflhs k|efjx?sf] Go"lgs/0f ug{ o; jftfj/0fLo tyf ;fdflhs Joj:yfkg of]hgf tof/ ul/Psf] 5 . ;Defjotf cWoogsf] l;nl;nfdf ;DkGg jftfj/0fLo tyf ;fdflhs 5gf}6n] klxrfg ul/Psf k|Its"n k|efjx? nfO{ dWogh/ ul/ o; kl/of]hgf nfO{ æu au{Æ df auL{s/0f ul/Psf] 5 . o; kl/of]hgfaf6 pNn]Vo jftfj/0fLo tyf ;fdflhs k|efjx? kfg] { gb]lvPtfklg ;fdfGo k|efjx? h:t} lgdf{0f r/0fdf sfdbf/x?sf] :jf:Yodf x'g;Sg] k|efj, lgdf{0f lf]qdf Wj]lgsf] dfqdf a[l4, lgdf{0f ;fdu|L tyf lgdf0f{sf] qmddf pTkGg x'g] kmf]x/sf] Joj:yfkg, kfgLsf] >f]tdf x'g;Sg] k|b'if0f,:n/L;DaGwL sfo{ubf{ x'g;Sg] :jf:Yo ;DaGwL ;d:of tyf kl/of]hgf lf]qdf x'g;Sg] b'u{Gw h:tf k|efjx? kg{ ;Sg] b]lvG5 . o; jftfj/0fLo tyf ;fdflhs Joj:yfkg of]hgf]n] dfly pNn]lvt ;fdfGo k|efjx? sf] Go"lgs/0fsf pkfox? lglb{i6 u/]sf] 5 / oL k|efj Go"lgs/0fsf pkfox? clgjfo{ ?kdf nfu' ugf{sf ;fy} ;f] sf] cg'udg ;d]t ug{'kg] { 5 . olb o; of]hgfdf pNn]v gePsf s'g} k|efjx? kl/of]hgf lgdf{0f tyf ;~rfngsf ;dodf pTkGg ePdf To:tf k|efjx?nfO{ ;d]t Go"lgs/0f ug] { bfloTj lgdf{0f sDkgL jf ;~rfnssf] x'g] 5 .

1. Introduction

For implementation of the biogas sub-project, the environmental and social management plan is prepared for Himalayan Dairy Farm, Dangraha-6, Morang, Nepal. The dairy farm is going to construct a 35m³ large biogas plant within its farm boundary. A part of the financial support for the sub-project will be provided as a subsidy by AEPC/SREP.

2. Description of Sub-project and Location

The location of the sub-project is Dangraha-6, Morang district. The proposed site of construction is within the area of the Dairy farm. The farm has the total land of 5 bigha.

Latitude 26°35'26.42"N
Longitude 87°20'20.77"E
Altitude 99m

Locally, the sub-project is proposed to be constructed within the area owned by the dairy farm. The Google map of the proposed location is provided below:

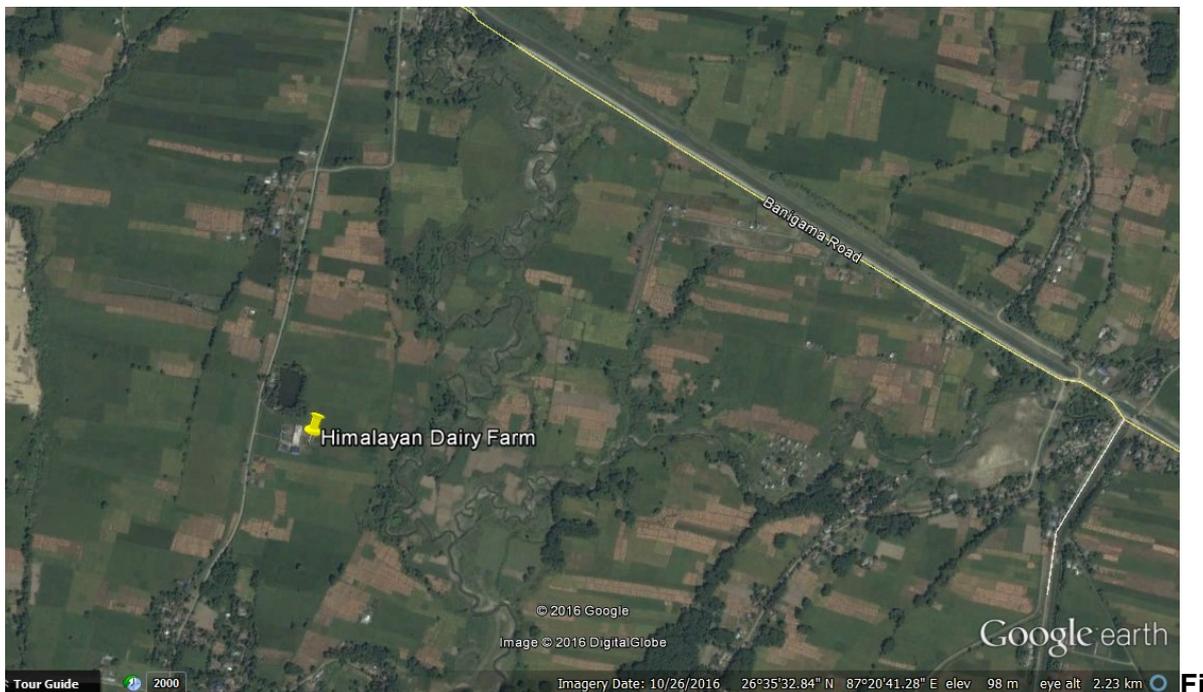


Figure: Location Map of proposed sub-project



The capacity of the proposed biogas plant will be 35m³ and it will produce 7.6 m³ per day of biogas. In addition, the plant will also produce 424 kg of bio-slurry per day which will be converted into the compost manure in the compost pit. The proposed technology of anaerobic digestion for this sub-project is native fixed dome Modified GGC 2047 Model.

The major works that will be carried out during construction period are earthwork in excavation, stone lining, masonry works as well as cement concrete works. After the completion of the construction works, the feedstock (i.e cow dung) will be fed into the biogas digester. Once the gas production begins, AEPC will carry out the testing and commissioning in order to verify the amount of gas production against guaranteed performance requirement (GRP) as mentioned in detailed design. The gas produced from the sub-project will be used to meet the thermal energy demand of the farm.

3. Relevancy of preparing ESMP

This Environmental and Social Management Plan (ESMP) has been prepared for the proposed sub-project in order to mitigate the likely environmental impacts which were predicted during screening. The sub-project intervention will not require any type of land acquisition or displacement of inhabitations as the farm itself owns the necessary land required for the construction of the biogas plant. Anaerobic digestion is a waste treatment process and produces biogas which can be used as energy. This sub-project is classified as "Category C", which means there is minimum environmental/social impact and hence there is no need of conduction of further environmental or social assessment. The Environmental and Social Management Plan has been prepared in order to mitigate thus identified adverse impacts prior to sub-project implementation.

4. Environmental and Social Baseline

Topographically, the sub-project site lies in the plain area of Terai. The meteorological data indicates that the region (Biratnagar Airport, Morang) has mean annual maximum temperature is about 30.6°C and minimum temperature is about 19.8°C. The total annual rainfall received by the station in 2010 was 1870 mm with maximum 24hr rainfall as 170mm on July of that year. The subproject area has sparse settlement dominated by agricultural land use pattern however, moderately dense patches of settlements can be observed in southern part. The site can be accessed following Banigama road from Khanar of Koshi Highway at distance of about 8 km.

Khadam Khola, a tributary of Singiya river flows about 250m east from the subproject location. There is a pond at a distance of 125m. There is no any forest area near sub-project;

The community around the sub-project site consists of mixed heterogeneous settlement of Tharu Brahmin, and Chhetri community. The nearest settlements are Dangraha, Kamalpur and Simariya.

5. Environmental and Social Impacts

During feasibility study of Himalayan Dairy Farm, considering environmental and social screening performed, it is not predicted to have significant negative environmental and social impacts. However, few impacts have been predicted due to implementation of subproject and are provided below.

5.1 Beneficial impact

There is no direct benefit to the community from this subproject however during construction phase nearby people may have opportunity to work as labour, but this will require very few people (1 or 2) and will be limited for few months only. The sub-project will provide renewable energy and compost manure to the farm.

5.2 Adverse impact

There will not be any major adverse impact to the surrounding community and environment. During construction phase, some minor impacts may be seen for example increased noise level and occupational health and safety of construction workers, possible intrusion of bio-slurry into surface and ground water etc.

Construction phase

Worker health from dust inhalation during excavation and construction work: During the construction phase, the excavation work shall be done for construction of inlet, digester, outlet and compost pit. In this case, there would be chance of dust inhalation to workers. There will be about 6 skilled and semi skilled man power. In this regard, the envisaged impact would be site specific, low in magnitude, short term in duration.

Construction related accidents (health and safety issue): There are several processes which will be involved in the site during its construction. Excavation work, use of construction machineries, etc. could lead minor accidents. It is projected that some 6 skilled and unskilled human resources will be involved in construction process. The impact is envisaged as site specific, low in magnitude, short term in duration, and construction workers as receptor.

Operation Phase

Seepage and leakage from substrate storing area, digester and slurry storage yard into ground water resource: The seepage of water from feedstock storage, digester, outlet and compost pit may reach to groundwater increasing nitrogen level. This can affect not only workers but also people living nearby who rely on same source of water. However, because the plant size is comparatively small, the impact is expected to be low, but long term.

Aesthetic degradation and river water pollution due to haphazard disposal and mismanagement of digested slurry: The haphazard disposal of digested slurry in nearby area of subproject location would be unpleasant. The moist dampen surrounding not only degrade the aesthetic beauty but also can promote disease vectors. In addition, as the subproject site is located nearby to river within distance of 200m, during rainy season, the left out digested slurry could even reach to river and can cause increased BOD and turbidity. However, considering the size of the plant and proximity of nearby river, this impact is characterized as site specific, low in magnitude and long term in duration.

Foul smell: The undigested bio slurry could result foul odors which can be nuisance to farm workers and biogas operator. The overfeeding is one of the most reasons of under digestion of feedstock within biogas digester. The magnitude is expected to be low because of biogas plant size but is expected for long term in duration and farm workers as the main receptor.

Accidents associated with firing and explosion: The biogas is highly flammable. The open firing or electrical shorts can cause huge fire and explosion. Also, the gas stoves in use during the operation could lead to fire or accidents. The impact is envisaged as site specific, low in magnitude, occasional but the risk is long term in duration, farm workers as receptor.

Spreading of disease due to increased disease vectors, flies, and mosquitoes: About 424 kg of liquid slurry will be generated each day from the plant, however the volume is so tiny and manageable. If the slurry is left over near plant location could result formation ditch and wet area, this can favor several disease vectors including flies and mosquitoes. This can affect farm workers as well as local resident living in near vicinity. The impact can be area specific, with moderate magnitude and for long term duration and farm workers and community as receptors.

Operational Health and Safety during handling of slurry and compost: It is possible to present contaminants and disease causing pathogens in bio-slurry, especially in undigested bio-slurry. In this regard, during handling of slurry, it could have chance to impact worker who deals with such handling of slurry and compost. The impact is predicted as site specific, with low magnitude and for long term duration and operator as receptors.

6. Mitigation Measures

The environmental mitigation with their time of action, mitigation cost and responsibility are illustrated in the following table:

Environmental and Social Mitigation Measures

S.N.	Environmental/Social Impacts	Mitigation Measures	Time of Action	Estimated Mitigation Cost (NRs.)	Responsibility
1.0 Construction Phase					
1.1	Worker health from dust inhalation during excavation and construction work	Spraying of water during excavation and vehicular use to reduce dust re-suspension, wearing mask by workers	During construction phase	-	Construction Company/ Sub-project Developer
1.2	Construction related accidents	The construction premises shall be barricaded	During construction phase	-	Construction Company
		Provision of personal protective equipments (PPEs) like helmets, boots, gloves, etc for construction workers	During construction phase	-	Construction Company
		Provision of First Aid Kits at construction site	During construction phase	Minor	Construction Company/ Sub-project Developer
2.0 Operation Phase					
2.1	Seepage and leakage from substrate storing area , digester and outlet/compost facility	Proper sealing of base of storage area as well as digester and outlet manure storage area with sealing material or concrete casting	During Construction Phase	Already included in construction cost	Construction Company/Sub-project Developer
2.2	Aesthetic degradation and river water pollution due to haphazard disposal and mismanagement of digested slurry	The digested slurry shall not be disposed haphazardly. the slurry shall be channelized into compost pit for making compost fertilizer	Operation Phase	-	Sub-project Developer

2.3	Foul odour from substrate storage area and outlet	Avoid storing substrate as far as possible and daily feeding with recommended amount shall be performed	During operation phase	-	Sub-project Developer
2.4	Occupational health and safety issues including accidents associated with firing and explosion	Strictly avoid naked flames near digester	During operation phase	-	Sub-project Developer
		Awareness building of workers on safety practices	During operation phase	-	Sub-project Developer
2.5	Spreading of diseases due to increased disease vectors, flies, mosquitoes etc	Avoid storing substrate as far as possible.	During Operation phase	-	Sub-project Developer
		Prevent haphazard disposal of bio-slurry and prevent formation ditches	During Operation phase	-	Sub-project Developer
2.6	Operational Health and Safety during handling of slurry and compost	Use of personal protective equipments during slurry handling process	During operation phase	5,000	Sub-project Developer

Monitoring

It is also necessary to monitor to ascertain implementation of mitigation measures mentioned as well as to perform impact monitoring to figure out the impacts of the sub-project. The monitoring plan is provided in the table below: Regarding alternatives, the technology selected for this subproject is modified GGC 2047 model from wide range of anaerobic digestion technologies. The compost pit has been proposed as cost effective measures to process digested slurry. The construction work shall be permitted in day time only.

Environmental and Social Monitoring Plan

S.N.	Indicators	Methods	Frequency/Time	Place	Monitoring Authority	Monitoring Cost (NRs.)
1.1 Construction Phase						
1.1.1	The construction premises shall be barricaded	Direct Observation	During construction	Project Site	Sub-project Developer	-
1.1.2	Provision of personal protective equipments (PPEs) like helmets, boots, gloves, etc for construction workers	Direct Observation	During construction	Project Site	Sub-project Developer	-
1.1.3	Provision of First Aid Kits at construction site	Direct Observation	Once prior to start of construction	Project Site	Sub-project Developer	-
1.1.4	Spraying of water reduce dust re-suspension	Records/Photographs	During construction	Project Site	Sub-project Developer	-
1.2 Operation Phase						
1.2.1	Provision of composting pit	Direct observation/ Photographs/records	During construction	Project Site	Sub-project Developer	-
1.2.2	Provision of personal protective equipments (PPEs) during operation	Direct observation/ Photographs	Once prior to operation	Project Site	Sub-project Developer	-
1.2.3	Avoid storing substrate as far as possible and adopt daily feeding with recommended amount of feedstock	Direct observation	Bi-weekly	Project Site	Sub-project Developer	-
1.2.4	Avoid haphazard disposal of digested bioslurry	Direct observation	Bi-weekly	Project Site	Sub-project Developer	-
1.2.5	Storage of compost and wet slurry in designated area only	Direct observation	Bi-weekly	Project Site	Sub-project Developer/Site manager	-

1.2.6	Proper sealing of base of storage area as well as digester and outlet manure storage area with sealing material or concrete casting	Record of specification of constructed plant	During construction	Project Site	Sub-project Developer	-
1.2.7	Build awareness of workers on safety practices	Direct observation/ verification of training conducted by technology provider and/or construction company	Once prior to operation	Project Site	Sub-project Developer	-

Most of the mitigation costs are covered within total construction cost and others required minor costs. The monitoring part is assigned to developer and will require one human resource which will be assigned to existing subproject staff and other costs are minor.

7. Conclusion

The mitigation measures mentioned above shall be strictly be implemented by concerned authority as mentioned in this ESMP. In addition, the monitoring as per the frequency mentioned in this ESMP shall also be performed accordingly. If any likely impacts not identified during screening as well as in this ESMP, if perceived during construction and/or operation phase shall also be avoided or mitigated by the Construction Company and/or developer.