

Appendix 2: Environment and Social Management Plan of

Nepal Livestock and Research Centre Pvt. Ltd.

Executive Summary

This Environmental and Social Management Plan (ESMP) has been developed for proposed 40 m³ biogas sub-project in Nepal Livestock and Research Centre Pvt Ltd, Puranchaur-6, Kaski for mitigating likely environmental impacts from the sub-project implementation predicted during environmental and social screening. 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. Some of the impacts caused by the sub-project are: health and safety issues of construction workers, potential risk of intrusion of slurry into nearby river, workers health during slurry handling and foul smell. The possible mitigation measures have been proposed in this ESMP and shall be implemented by the Construction Company and developer. 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.

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1. Introduction

The Nepal Livestock and Research Center was established in ward no. 6 of Puranchaur VDC in 2015. The farm is spread to 9666 sq. m. (19 Ropani) of land area and there are altogether 130 number of pigs in the farm. The developer has proposed to construct a biogas plant from available pig manure and the detailed design study recommends construction of 40m³ of biogas plant which will utilize 230kg of pig manure as its feedstock. The biogas plant will produce 9.69m³ of biogas per day and 381 kg of digested bio-slurry which will produce 38kg of compost fertilizer each day. The proposed design of the biogas plant is native modified GGC 2047 model biogas. Thus produced biogas will be used for cooking food for farm staffs and preparation of feed for livestock.

2. Description of Sub-project and Location

This sub-project is located at Puranchaur VDC of Kaski district. The geographic coordinate of the sub-project site is 28°17'5.78" N, 83°56'43.19" E with altitude of 1065m. Figure1 illustrates the location (Google Earth Map) of sub-project.

The land use of the sub-project vicinity is moderately dominated by agricultural land with sparse settlement.

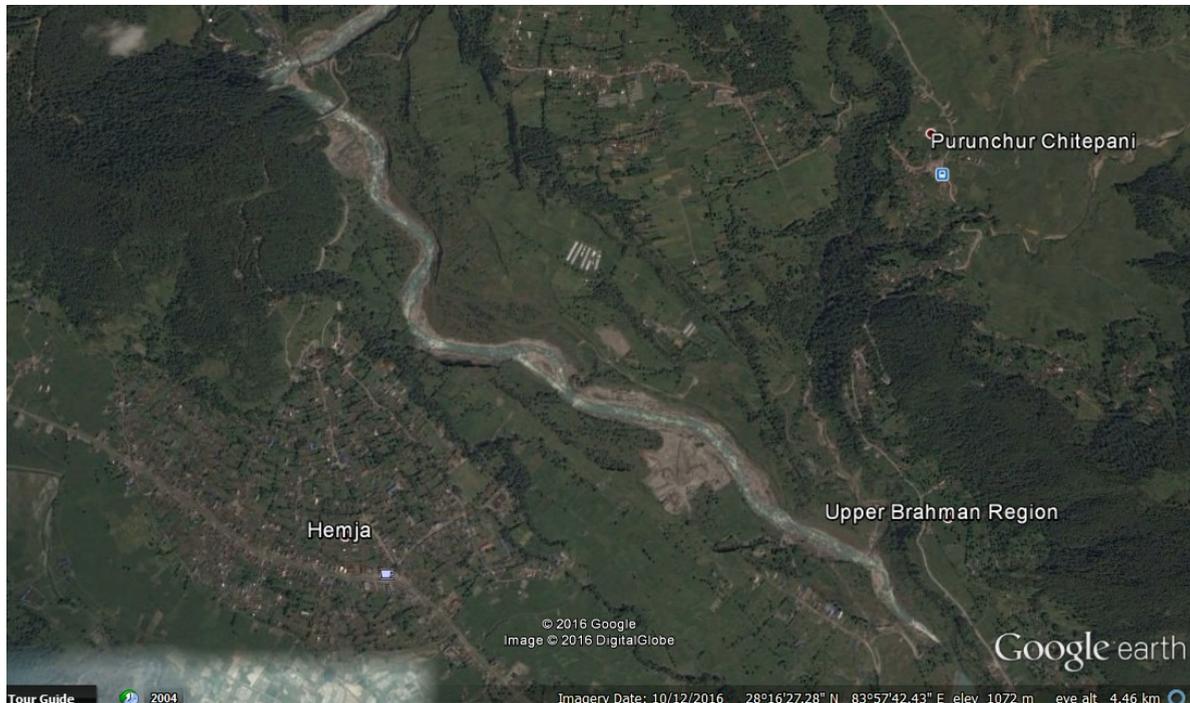


Figure-1 Google Earth Map

3. Relevancy of preparing ESMP

This Environmental and Social Management Plan (ESMP) is prepared for the proposed sub-project in order to mitigate the likely environmental impacts predicted during environmental and social screening. Any land acquisition or displacement of inhabitations will not be involved in the sub-project intervention. The significant negative impacts are not envisaged, however, negligible impacts identified during screening process might prevail during construction and operation phase. This sub-project is classified as "Category C", which means there is minimum environment 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 reduce thus identified adverse impacts prior to sub-project implementation.

4. Environmental and Social Baseline

The subproject location is located at altitude of 1650m in hilly region of Nepal. The sub-project site lies near Seti river in proximity of 300 m. The landuse pattern of the surrounding area is primarily agricultural. The subproject will require about 187 m² of agricultural land owned by the developer.

A total of 9666 sq. m. (19 Ropani) of land area owned by the developer. The land area requirement for the plant construction is only 187 sq. m. and will be constructed within farm boundary. The nearest settlement from the plant site is more than 300 meter away and consists of scattered settlement of about 8 to 10 houses. Hence, there will not be any significant negative affect to neighboring settlement. In addition, there is small scale seasonal spring water in eastern part which is about 1Km east from the plant site. Besides, there are no other water resources, public and private buildings nearby. Regarding water availability within farm, the deep boring source is within the farm premise.

The sub-project location is dominated by Brahman hill, Chettri and dalits. The settlement pattern around subproject vicinity is sparse. The blacktopped agricultural link road exists on the west, about 3 km from the proposed site.

The current status of respiratory diseases of the community is not documented however, in rural areas of Nepal, the respiratory diseases are caused mainly because of burning of traditional energy sources especially firewood and cow dung cake. The major diseases that the community are commonly suffered are diarrhea, dysentery, flues and in some cases cholera too and are mostly transmitted because of unhygienic condition and through disease vectors like flies and mosquitoes.

5. Environmental and Social Impacts

With consideration of environmental and social screening performed during feasibility stage, it is not predicted to have significant negative environmental and social impacts. The beneficial and adverse impacts are described below:

5.1 Beneficial Impacts

The construction of biogas plant with available waste within farm will provide renewable energy i.e. biogas which will save currently using fossil fuel and fuel wood. The farm will be benefited with utilization of waste. However, there would be no any significant benefit due to subproject intervention. In addition, the biogas will also replace fossil fuels such as firewood and LPG that is being consumed in the farm thereby further contributing in greenhouse gas reduction.

5.2 Adverse Impacts

There will be no any major adverse impacts to the surrounding community and environment due to intervention of subproject. However, following minor impacts have been predicted during construction and implementation.

Construction Phase

- **Construction related accidents:** There are several processes which will be involved in the site during its construction. Excavation work, masonry work and piping and instrumentation etc could lead minor accidents, but would be exceptional. It is projected that some 18 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.
- **Respiratory problems due to dusty environment:** During construction phase, there will be increased dust blown in construction site as well as nearby locality due to vehicular movements for transportation of construction materials in gravel road and excavation work. The dusty environment could be nuisance to workers (18 numbers of workers) and nearby settlement (about 8 to 10 households within 150m of periphery) and can directly affect the health of construction workers as well as local people of surrounding vicinity. However this impact would be prevailed for construction period only. However, the impact is envisaged to be a low in magnitude, short term duration and construction workers as receptor.
- **Increased noise due to construction activity:** Increased noise could be experienced due to vehicular movement and construction activities such as loading and unloading of construction materials and activities such as dome casting and concreting etc at site. This will mainly affect construction workers (18 workers) and partly to resident living close to the construction site (about 6 to 10) and the impact would be prevailed during construction time i.e. day time . The impact will remain for short duration i.e. construction period only and magnitude is projected to be low.

Operation Phase

- **Health and safety issue due to haphazard disposal and mismanagement of digested slurry:** 381 kg of liquid slurry will be

generated each day from the plant. If the slurry is not well managed and disposed haphazardly, this could establish favourable environment for disease vectors like mosquitoes and flies. In addition, the aesthetics of the site would also be decreased due to such haphazard disposal. During slurry handling, the workers who are engaged with such task could have impacted by pathogens contained in the digested slurry. This can affect farm workers (18 numbers) as well as local resident living in near vicinity (about 6 to 10 households). The impact will be area specific, with moderate magnitude and for long term duration.

- **Foul odour from substrate storage area:** If not properly managed, the slurry can generate foul odors which can be nuisance to farm workers (some 30 workers/operators) as well as local residents (about 6 to 10 households). But such foul odour would be prevalent only if the slurry is not properly digested. However, the compost pit constructed to manage slurry will reduce the smell. The magnitude is expected to be low, long term in duration and farm workers as the main receptor.
- **Ground water and surface water (Seti River) intrusion of slurry due to seepage and leakage from substrate storing area, digester and slurry storage yard:** The seepage of water from manure and slurry can change ground water quality by changing its nitrogen level and organic matter load. In addition, the subproject location is located nearby to Seti River, thus discarded digested slurry can reach nearby river and can increase BOD and Total solids causing surface water quality deterioration. This can affect not only workers but also people living nearby (about 6 to 10 households) who rely on same source of water. The magnitude of impact is predicted to be moderate with long term impact and farm workers and local resident as the main receptor.
- **Occupational health and safety issues including accidents associated with firing and explosion:** The biogas is highly flammable and can happen accidental firing in anytime. 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.

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 Plan**

S. N.	Environmental/Social Impacts	Mitigation Measures	Time of Action	Estimated Mitigation Cost (NRs.)	Responsibility
1.0 Construction Phase					
1.1	Construction related accidents	The construction premises shall be barricaded by rope or wire	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
1.2	Respiratory problem due to dusty environment/vehicular emission in construction site	Spraying of water during excavation and vehicular use to reduce dust re-suspension	During construction phase	-	Construction Company/ Sub-project Developer
1.3	Increased noise due to construction activity	Work will be conducted from 8:00 AM-6:00 PM. If additional times are needed, local residents will be informed prior to do so.	During construction phase	-	Construction Company/ Sub-project Developer
2.0 Operation Phase					
2.1	Health and safety issue due to haphazard disposal and mismanagement of digested slurry	Use of separate pit with cover for slurry storage and composting in closed yard	During operation phase	-	Sub-project Developer
		Use of personal protective equipments during slurry	During operation phase	5,000	Sub-project Developer

		handling process			
2.2	Foul odour from substrate storage area	Avoid storing substrate as far as possible	During operation phase	-	Sub-project Developer
		Appropriate amount of daily feeding shall be done for complete digestion of slurry.	During operation Phase	--	Sub-project Developer
		Storage of dry manure/compost and wet slurry in closed yard/structure	During operation Phase	-	
2.3	Ground water and surface water (seti river) intrusion of slurry due to seepage and leakage from substrate storing area , digester and slurry storage for producing dry manure	Proper sealing of base of storage area as well as digester and outlet/dewatering unit/ manure storage area with sealing material or concrete casting	During Construction Phase	Already included in construction cost	Construction Company/Sub-project Developer
		Avoid haphazard disposal of digested slurry into nearby river	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

Regarding alternatives, the technology selected for this subproject is native Modified GGC 2047 Model from wide range of available technologies. Similarly, construction work is permitted for day time only. In case of management of digested slurry, provision of compost pit is prescribed

7. 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 project. The monitoring plan is provided in the table below:

Environmental and Social Monitoring Plan

S.N.	Indicators	Methods	Frequency/Ti me	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	-
1.1.5	Compliance of construction activities performed only in designated time (8:00 to 6:00)	Interview with locals	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 slurry handling	Direct observation/ Photographs	Once prior to operation	Project Site	Sub-project Developer	-
1.2.3	Avoid storing substrate as far as possible	Direct observation	Bi-weekly	Project Site	Sub-project Developer	-
1.2.4	Storage of compost and wet slurry in designated area	Direct observation	Bi-weekly	Project Site	Sub-project Developer/Site manager	-
1.2.5	Proper sealing of base of storage area as well as	Record of specification of constructed plant	During construction	Project Site	Sub-project Developer	-

	digester and outlet manure storage area with sealing material or concrete casting					
1.2.6	Avoid naked flames near digester	Direct observation	Daily	Project Site	Sub-project Developer/Site manager	-
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 sub-project staff and other costs are minor.

8. Conclusion and recommendation

The above mentioned mitigation measures shall strictly be implemented by the responsible individuals 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.