Appendix 2: Environmental and Social Management Plan (ESMP)

Shuvarambha Krishi Farm and Dudh Bikri Kendra

Executive Summary:

This Environmental and Social Management Plan (ESMP) has been developed for proposed 40 m3 biogas sub-project in Shuvarambha Krishi Farm and Dudh Bikri Kendra for mitigating likely environmental impacts predicted during environmental and social screening. 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. Some of the impacts caused by the sub-project are: health and safety issues of construction workers, construction related health risks, possible water sources contamination due to leakage of slurry liquid, 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

For implementation of the biogas sub-project, this environmental and social management plan is prepared for Shuvarambha Krishi Farm and Dudh Bikri Kendra, Chandragiri-6, Kathmandu, Nepal. The organization is going to establish a 40 m^3 large biogas plant within its premise which will utilize buffalo dung and night soil from toilet as feedstock. The sub-project is supported by AEPC/NRREP/SREP.

2. Description of Sub-project and Location

The sub-project lies in Chandragiri-6, Kathmandu district. The coordinate of the sub-project site 27°41' 12.30" N, 85°12' 27.10" E with altitude of 1553 m

The biogas plant is proposed to be constructed within the organization. The Google map of the proposed location is provided below:

Figure: Location Map of proposed sub-project

The gas produced by the plant will be 6.83m^3 per day. The plant will produce 381 kg of slurry per day which will be stored in compost pit to make dry and convert it into compost manure.

The construction work starts with excavation of earthwork followed by stone lining, and reinforcement and cement aggregate works. Once after the construction completion, the dung and kitchen waste will be fed into the digester. The gas produced from the sub-project shall be used for thermal process only. AEPC will provide subsidy only after successful testing and commissioning of plant against guaranteed performance requirement as mentioned in DFS report.

3. Relevancy of preparing ESMP

This Environmental and Social Management Plan (ESMP) has been done 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

Topographically, the sub-project site lies in Hilly. The meteorological data from indicates that the region has warm summer days with cold winter temperature. The land-use pattern of the sub-project area indicates of agricultural land as major land-use. The sub-project site lies near outskirt settlement of Thankot. The immediate vicinity starts with Chandragiri Community Forest.

Developer owns 1ropani (508 m^2) of land and the biogas plant will require 187m^2 of land. Almost all land is being used for grass production for livestock.

The sub-project location is dominated by Chhetri and Brahman-hill. The settlement pattern is sparse. An all weather asphalted road exists to reach the sub-project location at distance of 1 km from main road.

5. Environmentaland Social Impacts

During feasibility study of Shuvarambha Krishi Farm and Dudh Bikri Kendra, 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 impacts

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.

Cow manure is rich in organic substances so significant quantity of methane is released to the atmosphere during manure storage with anaerobic

condition inside the dump. Methane is highly potent greenhouse gas than $CO_2$with global warming potential 28- 36 over 100 years time period. The installation of biogas plant will directly reduce the emissions of methane gas from cattle manure. 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 impact

There will be no any major adverse impact to the surrounding community and environment. During construction phase, some minor impacts may be seen such as dust pollution, increased noise level and occupational health and safety of construction workers.

5.2.1 Adverse impact (Construction phase)

• **Construction related accidents:** There are several processes which will be involved in the site during its construction. Excavation work, use of machineries, welding etc. could lead accidents, but would be exceptional. It is projected that some 12 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 regular vehicle movements for transportation of construction materials which can generate large volume of dust from gravel road. The dusty environment can directly affect the health of construction workers as well as local people of surrounding vicinity. 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:** The noise will be created due to vehicular movement and construction activities such as loading and unloading of construction materials and activities at site. This will mainly affect construction workers and partly to resident living close to the construction site. The impact will remain for short duration i.e. construction period only and magnitude is projected to be low.

5.2.2 Adverse Impact (Operation Phase)

• **Health and safety issue due to haphazard disposal and mismanagement of digested slurry:** 603 kg of liquid slurry will be generated each day from the plant. If the slurry is not well managed, this can result vector borne diseases. 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. Farm workers and community as receptors.

• **Foul odor from substrate storage area:** If not properly managed, the slurry can generate foul odors which can be nuisance to farm workers (some 6 workers) as well as local residents. 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 contamination due to seepage and leakage from substrate storing area, digester and slurry storage yard:** The seepage of water from manure and slurry can pollute downstream water sources decreasing its quality. This can affect not only workers but also people living nearby who rely on same source of water. Since the water source is upstream the magnitude can 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. 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.

6. Mitigation Measures

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

ENVIROMENTAL 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 handling process	During operation phase	5,000	Sub-project Developer
2.2	Foul odour from substrate storage area	Avoid storing substrate as far as possible	During operation phase	-	Sub-project Developer
		Covering of substrate by a polythene sheet, in case of storage of substrate required	During operation Phase	10,000	Sub-project Developer
		Storage of dry manure/compost and wet slurry in closed yard/structure	During operation Phase	-	
2.4	Ground water contamination due to seepage and leakage from substrate storing area , digester and dewatering facility 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
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 formation of waste ditches and pits; collection of bio-slurry in designated compost pit	During Operation phase	-	Sub-project Developer
2.6	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	During operation phase	-	Sub-project Developer

		safety practices			

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 by	Direct Observation	During construction	Sub-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	Sub	Sub-project Developer	-
1.1.3	Provision of First Aid Kits at construction site	Direct Observation	Once prior to start of construction	Sub	Sub-project Developer	-
1.1.4	Spraying of water reduce dust re-suspension	Records/Photographs	During construction	Sub	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	Sub	Sub-project Developer	-
1.2 Operation Phase						

1.2.1	Provision of composting pit	Direct observation/ Photographs/records	During construction	Sub	Sub-project Developer	-
1.2.2	Provision of personal protective equipments (PPEs) during operation	Direct observation/ Photographs	Once prior to operation	Sub	Sub-project Developer	-
1.2.3	Avoid storing substrate as far as possible	Direct observation	Bi-weekly	Sub	Sub-project Developer	-
1.2.4	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	Sub	Sub-project Developer	-
1.2.5	Storage of compost and wet slurry in designated area	Direct observation	Bi-weekly	Sub	Sub-project Developer/ Site manager	-
1.2.6	Avoid naked flames near digester	Direct observation	Daily	Sub	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	Sub	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.

7. Conclusion

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.