

Appendix III: Environmental and Social Management Plan (ESMP)

Poudel Multi Agro Farm Pvt.Ltd, Lamjung

Executive Summary:

This Environmental and Social Management Plan (ESMP) has been developed for proposed 20m³ biogas sub-project within Poudel Multi Agro Farm Pvt. Ltd in order to mitigate the 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, possible ground 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. 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.

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1. Introduction

For implementation of the biogas sub-project, this environmental and social management plan is prepared for Poudel Multi Agro Farm Pvt.Ltd, Kainitar, Lamjung, , Nepal. The farm has planned to establish a 20m³ large biogas plant from available cow dung within farm. The sub-project is supported by AEPC/SREP.

2. Description of Sub-project and Location

The proposed site of construction is within the cow farm boundary. The distance to the nearest market Tinpile is 1 km and the site is located at about 24Km from Dumre Bazaar Tanahu. Approximately 75 m² land will be required to construct proposed biogas plant. The constituents of the biogas plant will be inlet, digester, outlet and two compost pits.

The GPS location of the sub-project site is:

N	28°05'31.85''
E	84°29'19.14''
Altitude	584.911 m



Figure: Location Map of proposed sub-project

20m³ sized Modified GGC 2047 model biogas plant is proposed to install in Poudel Multi Agro Farm Pvt. Ltd. The estimated gas production is 3.4m³ per day. 86kg of cow dung generated within farm will be used as substrate as daily feeding with 105 litres of dilution water. The plant will produce 191 kg of slurry per day which will be stored in compost pit to make dry and convert it into compost manure.

The major works that will be carried out during establishment are excavation of earthwork, stone lining, and reinforcement and cement aggregate works. Once after the construction completion, the cow dung waste will be fed into the digester. Once after gas production starts, AEPC will perform testing and commissioning and verify the amount of gas production as specified in detailed design. The gas produced from the sub-project shall be used for thermal process only.

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 inhabitants will not be involved in the sub-project intervention. The negative impacts are not predicted since the sub-project itself reduces wastes and use of waste in order to produce energy. Similarly, the subproject is very small sized (15m³). 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 the Hilly region of Nepal. The meteorological data from 2008 to 2010 indicated that the region (Lamjung) has mean annual maximum temperature is about 31.4°C and minimum temperature is about 18.5°C. The total annual rainfall received by the station in 2010 was 2210 mm with maximum 24hr rainfall as 160 mm. The land-use pattern of the sub-project area indicates of more agricultural land and less settlement. A small patchy forest can be observed on south of the proposed subproject site.

Chepe river flows about 640m south from the subproject area hence the impact by the subproject towards river quality is not envisaged.

The sub-project location is dominated by Brahman-hill, Chhetri, Kumal and Dalits. The sub-project site is location within a sparse settlement. Most of this community depends in agriculture.

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 consumption of traditional energy sources specially firewood and cow dung. 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

During feasibility study of Poudel Multi Agro Farm Pvt.Ltd, 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 is provided below.

5.1 Beneficial impact

Considering benefit to the community, there seems no any direct advantage whereas, from the owners view there seems to be some benefit creating job opportunities to some extent during construction phase. The sub-project will provide renewable energy to the farm. The

gas produced will replace about 2.4 Cylinders of LPG consumption per month reducing GHG emission.

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.

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 5 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 5 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 (about 2 to 3 households) who rely on same source of water. The Chepe river is sufficiently far (about 650m) from the subproject location and hence it will not impact surface water quality. Because the plant is processing very small amount of slurry, the envisaged impact is expected to be low, but long term.

Aesthetic degradation due to haphazard disposal of bio-slurry: The biogas plant will produce 191kg of digested slurry each day. The haphazard disposal of this bio-slurry could lead to aesthetic degradation and untidy surrounding. Due to this, it could also provide favorable habitat for disease vectors like mosquitoes and flies. The impact is envisaged as site specific, low in magnitude, long term in duration, farm workers as receptor.

Foul smell due to slurry around surrounding: The undigested bio slurry could result foul odors which can be nuisance to farm workers (3 staffs) and biogas operator as well as local residents (2 to 3 households). 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 firing. 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 191 kg of liquid slurry will be produced each day; noting 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 (3 staffs) as well as local resident (2 to 3 households) 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

SN	Issue	Mitigating Measures	Cost of Mitigation (If Substantial)	Responsibility*	Time of Action
1. Construction Phase					
1.1	Worker health from dust inhalation	<ul style="list-style-type: none"> • Workers will be required to wear filter masks and eye protection • Dusty areas (construction site) will be sprayed with water, particularly during hot, windy weather 	<ul style="list-style-type: none"> • Minor 	Construction contractor	Digester pit, outlet pit and, manhole construction activities begin
1.2	Construction related accidents (Health and safety issue)	<ul style="list-style-type: none"> • Precautions need to be followed in every steps • Presence of First Aid kit in the work site. 	<ul style="list-style-type: none"> • Minor 	Construction Contractor	Construction Phase
2. Operation Phase					
2.1	Seepage and leakage from substrate storing area, digester and slurry storage yard into ground water resource:	<ul style="list-style-type: none"> • Compost pit will be constructed as per the design • Proper sealing of base of storage area as well as digester and outlet manure storage area with sealing material or concrete casting 	<ul style="list-style-type: none"> • Cost already included in BoQ and construction cost. 	Contractor	Construction Phase (construction of digester, outlet, compost)

SN	Issue	Mitigating Measures	Cost of Mitigation (If Substantial)	Responsibility*	Time of Action
2.2	Aesthetic degradation due to haphazard disposal of bio-slurry	<ul style="list-style-type: none"> The haphazard disposal of bio-slurry shall be discouraged and the bio-slurry shall be channelized to compost pit for compost 	<ul style="list-style-type: none"> Cost already included in BoQ and construction cost. 	Contractor	During Operation phase
2.3	Foul smell due to slurry around surrounding community, during extreme temperature and windy day.	<ul style="list-style-type: none"> Avoid storing substrate as far as possible and daily feeding with recommended amount shall be performed 	Minor	client	During Operation phase
2.4	Accident associated with firing and explosion	<ul style="list-style-type: none"> As methane is combustible gas, naked flames shall be avoided strictly near digester area. Care shall be taken during use of biogas. 	Minor	Client	During Operation phase
2.5	Flies and mosquito breeding, due to slurry	<ul style="list-style-type: none"> Avoid storing substrate as far as possible. Prevent haphazard disposal of bio-slurry and prevent formation ditches 	Minor	Client	During Operation phase
2.6	Operational health and safety during handling of slurry and compost	<ul style="list-style-type: none"> provision of personal protective safety measures like boots, gloves and masks to worker 	Minor	Client	During Operation phase

7. Monitoring

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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.

3. Environmental and Social Monitoring Plan

4. 5. 6. 7. 8. 9. 10. 11. P hase	12. 13. 14. 15. 16. 17. What parameter is to be monitored?	18. 19. 20. 21. 22. 23. 24. Where is the parameter to be monitored?	26. 27. 28. 29. How is the parameter to be monitored/ type of monitoring equipment?	30. W hen is the parameter to be monitored - frequency of measurem ent or continuou s?	35. 36. 37. Monito ring Cost 38. 39. What is the cost of equipment or contractor charges to perform monitoring	41. 42. 43. 44. 45. 46. 47. Respon sibility	48. 49. 50. 51. 52. 53. 54. 55. Start Date	56. 57. 58. 59. 60. 61. 62. 63. End Date
65.64.	67. Worker health 68. 69. 70. 71. Dust	72. At constructi on site	73. Visual: Worker wearing 74. equip ment	77. Wee kly: 78. rand om 79. times 80.	83. Mi nor 84. 85. 86. 87.	90. Constr uction Contractor 91. 92. 93.	96. Constructio n activities begin	97. Till constructi on 98. work ends.
100.99. 101. Operation	102. Proper management of slurry waste and waste water via composting. 103. 104.	107. At subproject site	108. Visual: 109. Periodic 110. monitori ng and testing	111. Mont hly	112. Mi nor	113. Contr actor 114. 115. Clients	116. Constructi on 117. b egins.	118. Till the sub-project 119. run s.
121.120.	123. Ground water 124. pollution	127. 128. In the periphery of	129. Slurry properly 130. manage	132. Mont hly	133. Mi nor	134. Client	135. Entire operation 136. p	137. Enti re

	due to 125. leakage of slurry liquid; 126. possibility of contamination of drinking water pipes due to the surface and subsurface flow of slurry liquid	100m of sub-project site	d. 131. No leakage and overflow in outlet and compost pit.				hase	138. operation al 139. pha se
141.140. 142. Operation	143. Pathogens harm 144. during Slurry 145. handling to clear compost pit and making dry compost	146. 147. 148. 149. For workers	150. Monitoring of use of 151. personal protective measures during slurry handling.	152. 153. 154. 155. Once in two month	156. 157. 158. 159. Minor	160. 161. 162. Client 163. Client	164. 165. 166. Start of Compost pit clearing	167. 168. 169. 170. End of compost pit clearing
172.171. 173. Operation	174. Foul smell due to 175. slurry around 176. surrounding community, during extreme temperature and windy day	177. 178. 179. Farm area and surrounding community	180. 181. 182. Comment from community, 183. and workers in farm	184. 185. 186. 187. 188. Monthly	189. 190. 191. 192. 193. Minor	194. 195. 196. 197. Client 198. Client	199. 200. 201. 202. Sub-project operation phase	203. 204. 205. 206. End of sub-project operation phase.
207. 208. Operation	209. Flies and mosquito 210. breeding, due to slurry	211. 212. Nearby farm area	213. 214. 215. Physically seen	216. 217. 218. Weekly	219. 220. 221. Minor	222. 223. Client 224. Client	225. 226. Sub-project operation phase	227. 228. End of sub-project operation phase

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230. **Conclusion**

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232. 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.