Programme of activities design document form
(Version 09.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the PoA	"Methane recovery and combustion with renewable energy generation from anaerobic animal manure management systems under the Land Bank of the Philippines" (LBP) Carbon Finance Support Facility"
Version number of the PoA-DD	18
Completion date of the PoA-DD	10/02/2020
Coordinating/managing entity	Land Bank of the Philippines (LBP)
Host Parties	Republic of the Philippines
Applied methodologies and standardized baselines	AMS-III.D version 21, Methane recovery in animal manure management systems AMS-I.F version 3, Renewable electricity generation for captive use and mini-grid
Sectoral scopes	Sectoral Scope 13: Waste handling and disposal Sectoral scope 1: Energy industries (renewable / non-renewable sources)

PART I. Programme of activities (PoA)

SECTION A. Description of PoA

A.1. Purpose and general description of PoA

Land Bank of the Philippines (LBP), established in 1963, is the official Philippine government depository bank. Its mission is to promote growth and development especially in the countryside where resources are scarce and a majority of the poor reside. LBP has taken the lead in extending financial assistance to its priority sectors, particularly the 1) small farmers and fisherfolk cooperatives, 2) micro, small and medium enterprises, 3) agri-infrastructure and agribusiness, and 4) environment-related projects.

Under this Program of Activities (PoA), the LBP, as a financial and technical intermediary, will undertake a voluntary coordinated action for the adoption of wastewater methane recovery systems in a group of livestock farms. LBP will provide carbon finance and investment finance for the installation of anaerobic wastewater treatment systems that capture and combust methane gas while generating electricity of less than 15 MW. They will also act as the project entity in charge of validation and verification activities and aggregating project information and monitoring data for this purpose.

The projects themselves will be implemented by the livestock farms owners that meet the criteria outlined in this PoA. These livestock farm owners will operate the system and have agreements with LBP on the carbon finance transaction including their role in on-the-ground monitoring, quality control and reporting in accordance with the CDM rules.

Stated goal of the PoA

The PoA is a coordinated action by LBP to introduce wastewater methane recovery systems in livestock farms that are using open anaerobic systems to treat their wastewater. Through construction of the wastewater methane recovery systems, the PoA will reduce GHG emissions from methane compared to the emissions that would have occurred with the open anaerobic systems that would have been operating in the absence of the activities. With the installation of electricity generation units, GHG emissions will be further reduced by replacing grid electrical power sourced from fossil fuel plants with renewable energy from the recovered methane.

Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity

The program is part of a voluntary initiative on the part of LBP to catalyze clean technology investments in the country through the CDM which was initiated in November 2006 through the establishment of a Carbon Finance Support Facility (CFSF) in LBP. In January 2007 through technical assistance from the World Bank, LBP began pursuing the PoA for methane recovery in piggery/livestock farms wastewater. The involvement of LBP in carbon finance and this PoA is not mandated by law. In addition, methane recovery systems in livestock farms are also not mandated by law. The fact that the PoA is a voluntary action by LBP is also confirmed by the Letter of Approval from the Philippine DNA at the time of validation of the project activity.

Contribution to sustainable development:

1. Local Environmental Benefits: The technology introduced by the PoA reduces odors and provides more operational control than the baseline open lagoon technology; while the generation of electricity from the captured methane provides local energy self-sufficiency from a renewable

resource. Additionally, the land application of the effluent and organic fertilizer made from the sludge from the wastewater treatment plant provides nutrient enrichment for nearby crops.

2. Training and Outreach: LBP Carbon Finance Support Facility intends to establish partnerships with donors and universities to provide technical support to swine/livestock farmers, to help ensure safe conditions for farmers to adopt and operate biodigesters and other related equipment, which, combined with the incentive provided by the CDM will provide greater attention to the proper operation and maintenance.

Mobilizing Financing: Through its Carbon Finance Support Facility (CFSF), LBP will make available funds for farmers to construct biodigesters to enable livestock farms to participate in the program and provide additional revenues through carbon finance.

A.2. Physical/geographical boundary of PoA

The location of the PoA is the Republic of the Philippines

A.3. Technologies/measures

A typical CDM Programme Activity (CPA) would consist of replacing open anaerobic manure management systems with systems including anaerobic digestion, methane recovery and combustion through flaring or electricity generation.

The systems to be adopted will be comprised of the following basic components:

Anaerobic digestion system: The waste produced from the livestock farms will be treated in an enclosed anaerobic system that will prevent the release of methane. It may involve a single anaerobic reactor or sequential anaerobic components. Several technology options may be adopted under the PoA including most commonly:

Covered Lagoon systems: The covered lagoon consists of a lagoon that is covered by plastic which collects biogas produced by the digester and prevents atmospheric gases from leaking into the tank.

Mixed Reactor systems: The mixed reactor blends manure to reach a homogenous concentration. Commonly used designs are a Completely Mixed Digester (Constantly Stirred Tank Reactor; CSTR); Anaerobic Sequencing Batch Reactor (ASBR) ; Up-flow Anaerobic Sludge Blanket Digester (UASB) ; Anaerobic Filter (Fixed Film Digester, Fix- Bed Anaerobic Reactor) ; Fluidized Bed Reactor (Expanded Bed Reactor, Moving Bed Bio-film Reactor).

Plug-Flow Reactor systems: A plug-flow reactor is a long tank through which manure moves during processing. The reactors are typically made of concrete or plastic. Commonly used systems include tubular polyethylene and concrete digesters.

Biogas recovery and combustion system: Each CPA will include a system of collecting the biogas produced by the reactor and combusting it, thus preventing its release to the atmosphere. It will typically contain a blower system, piping to collect the gas, engines that will be used as main combustion equipment, and most probably a flare (either open or enclosed).

Sludge management system: The treatment system will produce sludge, the quantity dependent upon the type of anaerobic reactor and the size of the livestock farms. In all CPAs the sludge will be applied to soil in a manner that ensures aerobic conditions and avoids methane emissions.

Other components: Depending on the CPA, additional components may be added to enhance treatment including primary treatment (to reduce solids) and polishing ponds or artificial wetlands after the anaerobic digester.

The technologies to be adopted can be sourced from the Philippines with the exception of some specialized equipment (such as generator sets) or materials (such as HDPE cover for lagoons) which are available regionally. The technologies are known to be environmentally safe as they improve upon the existing open manure management systems by reducing odour and sludge production. Some training may be necessary for farmers especially on the monitoring systems. This will be undertaken by LBP on an as needed basis.

A.4. Coordinating/managing entity

The coordinating entity is the Land Bank of the Philippines (LBP).

A.5. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of the Philippines (host)	Land Bank of the Philippines Private entity	No
Kingdom of Spain	International Bank for Reconstruction and Development (IBRD) as Trustee of the Spanish Carbon Fund (SCF)	Yes
Kingdom of Spain	Kingdom of Spain- Kingdom of Spain – Ministry for the Ecological Transition & Ministry of Economy and Business	Yes
Norway	Norwegian Ministry of Climate and Environment	Yes
Sweden	Swedish Energy Agency (until 31/12/2022)	Yes

A.6. Public funding of PoA

Any public funding resources available for financing of the CPAs will not purchase any GHG emission reductions generated by the proposed PoA.

SECTION B. Management system

The operation and management of the PoA will be led by LBP in their role as technical and financial intermediary and the group in charge of organizing and ensuring compliance with the rules under the PoA. The main features of the system include:

First step for inclusion under the PoA: An interested pig/livestock farm owner shall sign the LBP CFSF Reply Form to participate in the PoA; this form will be the first intention of agreement between CPA and C/ME, and as such will include a statement by the livestock farm owner indicating that they are not part of another registered CDM project or another registered PoA, nor are they conducting validation under any other CDM project. After the LOI is signed, LBP will brief the proponent on the criteria for inclusion, and will proceed by collecting an initial round of information, enough to assess that the farm meets the eligibility criteria as set out by the PoA.

If the farm meets the eligibility criteria, a unique number within LBP record keeping system will be assigned, that will be associated with the project implementer or farm owner, the project location, geographical coordinates, technical and financial information of the CPA, and feasibility study, among others. Staff from the Environmental Program and Management Department of the LBP will confirm the information provided by the farm owner that the CPA is not a component of another CDM programme or has been registered as a project activity of another CDM project by double checking the project name and location with the Philippine DNA and available records on the UNFCCC website.

Subsequently, a Memorandum of Agreement (MOA) will be signed outlining the relative responsibilities for the development of the project to meet basic technical and financial criteria under the CDM. The MOA will include an initial agreement on the exclusivity and authorization to sell the CERs to a Carbon Buyer and will elaborate on the roles of each entity within the PoA.

After the agreement is signed, LBP will discuss with the proponent the additional documentation and monitoring requirements of the PoA and begin collecting the detailed project information necessary to finalize the CPA-DD. This will include collection of relevant CDM documentation, analysis and identification of emission reduction potential.

Inclusion in PoA: After the necessary information and documentation requirements have been met, LBP reviews the project for elaboration of the CPA as per the registered CPA-DD; LBP completes the CPA-DD. Once cleared by CFSF internal procedures, LBP submits the CPA-DD and other relevant information to the DOE for their review and inclusion as per the rules and procedures of PoAs.

After inclusion under the PoA: After the DOE confirms that the CPA is eligible for inclusion in the PoA, LBP finalizes the financing arrangements for carbon finance through a sub-project agreement with the CPA operators and the monitoring arrangements as per the registered CPA-DD. The subproject agreement contains the assignment of rights of CERs and will delineate the role of LBP as the coordinating entity for CDM validation and verification, as well as the role of the CPA operator in monitoring and verification, provision of carbon finance, and financial arrangements for lending (as applicable). During project activity operation, the monitoring plan will be implemented by the CPA project operator, as required by the LBP under the MoA and Sub-Project agreements. Training will also be provided at this time covering equipment operation, data monitoring and recording, reporting, internal quality control, operation, calibration, and maintenance.

Data management: LBP will maintain the records for the PoA as a whole. This includes a list of all projects that are under review for inclusion in the PoA and approved for inclusion in the PoA and the status of verification. On the database will be the major project features important for identifying the CPA and calculating the emission reductions for each individual CPA. This will cover documentation to ensure no double counting occurs in the claiming of emission reductions including a listing of the location (GPS coordinates), ownership and a copy of the letter of confirmation from the CPA operator concerning whether the CPA is a debundled component of another CPA or CDM programme or project activity. Complete information on the monitoring data will be kept by the project implementers (CPAs) and spot checks done by LBP for quality assurance will be included on the LBP internal database which will be updated monthly based on the monitoring reports provided by the CPAs and used to calculate the emission reductions in the database.

The parameters included in the monitoring plan shall be monitored and recorded for each of the farms independently, and will be the responsibility of each project implementer with guidance by LBP. Monitoring reports will be prepared separately for each of the CPAs for the purpose of verification and request for issuance of CERs. A database for all the monitoring reports provided by the CPAs shall be maintained by LBP and data will be recorded and kept for 2 years after the end of the crediting period. LBP has designed the following procedures which will be followed by the project implementers:

Monitoring and Measurements

a. Follow the Monitoring Procedure, as provided by LBP
b. Simultaneously follow the Calibration Procedure
c. Follow the Emergency Preparedness Procedure
d. Any problems encountered in the implementation of the monitoring procedures, maintenance or emergency will be recorded in order to take into account any unintended emissions by the project activities.
e. All reported data will be recorded within the LBP database
f. Procedure for quality assurance and quality check will be followed to provide for more accurate monitoring.

Reporting, and Verification

a. LBP as the C/ME will train the CPA implementers on how to gather all the necessary information from their database to be included in all the Monitoring Reports for CPAs.
b. LBP will conduct quality checks on Monitoring Reports by making spot checks on consistency for the provided data within the Monitoring Reports, with data provided on semi-annual site visits by LBP staff.
c. As per the procedures for registration of a Programme of Activities, LBP will make available all monitoring reports requested by the DOE for verification purposes. From these the DOE will select a sample to evaluate for verification purposes as indicated below.

For verification purposes, and following the General Guidelines for Sampling and Surveys for Small-Scale CDM project activities, on statistically sound sampling methods to be used by DOEs, the stratified random sampling method will be used

All CPAs will be monitored by the project implementers where Monitoring Reports will be recorded by LBP and it will all be made available to the DOE for verification. LBP will be the main interlocutor with the DOE and will take responsibility for making sure all records are being kept by the CPA implementers for all monitored data and will be in charge of conducting quality checks on the emission reduction estimates for each CPA to be then reported to the DOE.

In particular, LBP's roles are:

Data Aggregation: Monthly, LBP through their local lending centers will receive monitoring reports. The data will be checked for completeness and quality and placed in a central database located at the LBP Head Office – Environmental Program and Management Department (EPMD) that includes all projects under the PoA. Hardcopies of the monthly reports will also be kept on file.

Field visits: LBP will undertake regular field visits, at which necessary training for operational staff at project sites will be undertaken. This will serve as an additional check of the monthly monitoring report, to view the operation of the installed monitoring devices to ensure they are working properly and a means of following up on any questions on the data and any monitoring issues.

Calculation of emission reductions: LBP will use the aggregated data to calculate the emission reductions achieved based on the formulas for ex-post emission reduction calculations outlined in AMS-III.D and AMS-I.F. This database will be updated monthly based on the reports received.

Cataloging CPAs to prevent double counting and status of verification: In addition to including the calculation of emission reductions, the database will catalog each individual project and whether the data provided has been verified. Information, including names of farms, farm owners and specific project locations will be included in the database and documents to be verified to provide a transparent and verifiable means of preventing double counting.

Training and outreach: A training program will be developed for all employees involved in the programme, and given during field visits scheduled by LBP. LBP will try to establish partnerships with donors and universities to provide technical support/training and outreach to assist the

livestock farm owners establishing their system of monitoring and reporting with the proper quality controls; troubleshooting on monitoring issues; and in undertaking calibration. The owners will ensure that only trained staff will work in the project. The training program's content will depend on the trainees' background and the function to which each will be assigned. Depending on each staff member's assignment, they will receive comprehensive information on the general and technical aspects of the equipment. The technology suppliers will be requested to provide instructions and training to the project staff on the instalment, operation, maintenance and calibration of monitoring equipment. Over time, as staff members change, new employees will be trained by existing staff on these topics.

SECTION C. Demonstration of additionality of PoA

Among the LBP's activities are lending for agricultural, industrial, local infrastructure and home financing projects and other productive enterprises, as well as lending to farmers' cooperatives and associations to facilitate production, marketing of crops and acquisition of essential commodities. A major client of this work has been livestock farmers who have availed of LBP's lending [1] for the construction of their livestock farms.

Up until the advent of the CDM Program of Activities within LBP, lending to pig/livestock farmers has been dominated by providing working capital for the construction of pig/livestock farms houses and farm operation, targeting the production of swine/livestock farms, rather than targeted at the waste management side of the pig/livestock farms[2]; financing for biogas digesters has been very uncommon. The reasons for this are a combination of lack of demand for these investments, lack of awareness within LBP of these technologies and therefore a higher level of risk associated with them necessitating a marketing effort to promote a new technology relative to the size of the potential financing.

In particular:

1. Demand for these investments has been low due to the barriers outlined in the section below, as the technology is more costly than the common practice open lagoons, upfront cost is too high for implementers, it is technically more complex and involves additional effort that is different than the Livestock farms core business;

2. Awareness within LBP of these technologies, before the advent of the CDM and this PoA, was not high as it did not represent a large lending prospect. This was also exacerbated by the relative complexity of the technology and its benefits; and,

3. Marketing of this technology requires awareness building workshops with pig/livestock farms owners, site consultations and technical support. The amount of effort needed to do this is substantial and relative to the business of providing lending to working capital for Livestock farms provides a lower lending volume.

The program is a voluntary coordinated action (as outlined in Section A.2) on the part of LBP designed to provide financing to pig/livestock farmers where the financial institution providing the loan will accept carbon revenues to partially secure the repayment of the loans in order to catalyze the adoption of methane recovery and subsequent electricity generation technologies in those pig/livestock farms with open anaerobic systems. This is the first of such programs undertaken by the LBP and the reason why their Carbon Finance Support Facility was put in place. Without the

[1] As of 2006, Land Bank has provided financing for the establishment of 668 piggeries focusing primarily on pig houses and equipment with no direct lending for biogas digester construction.

[2] Evidence from LBPs records has been submitted to the Validator as evidence

PoA and its associated CDM benefits, LBP would not target such investments for the reasons mentioned above. For further details please refer to the section below.

Assessment and demonstration of additionality for a typical SSC- CPA Barrier Analysis

As per AMS-III. D. version 21, paragraphs 15 and 16 "Project activities may demonstrate the additionality by showing that there is no regulation in the host country, applicable to the project site, that requires the collection and destruction of methane from livestock manure. If so, it is not required to apply the *"*Guidelines on the demonstration of additionality of small-scale project activities*.*

"This additionality condition also applies to Greenfield project activities. Furthermore, for project activities applying this methodology in combination with a Type I methodology, that has an energy component whose installed capacity is less than 5 MW, this procedure for additionality demonstration also applies to that component'.

For all CPAs, paragraph 15 applies since there is no regulation applicable to the Host country/Programme boundary that requires the collection and destruction of methane from livestock manure, thus additionality is demonstrated. Most CPAs can also apply the additionality condition in paragraph 16 in combination with a Type I methodology, i.e. CPAs that has an energy component whose installed capacity is less than 5 MW can apply this procedure for additionality demonstration for the energy component. For CPAs with energy component above 5 MW, the analysis below is applied.

The main objective of this analysis is to demonstrate that the proposed project activity is not business as usual for typical waste management systems in the Philippines. The analysis demonstrates the additionality determined by AMS-III.D. Consistent with Attachment A to Appendix B of the simplified modalities and procedures from CDM small-scale activities, the typical CPA is additional due to the following barriers: a) Access to Finance, b) Technological barrier, and c) Common practice. These are further explained below.

As reported by the Philippine Statistics Authority (PSA)[3], the swine industry in the Philippines has dominated the livestock sector of the country. In a span of 16 years, the number of pigs and hogs on commercial farms increased from 18 percent to 29 percent of the total population. This change was brought about by the intensification of swine production in urban and semi-urban areas[4] which responded to the increases in both domestic and international demand; this situation has kept hog populations in the Philippines above 13 million since 2008.

As seen in the PSA's statistics, the majority of these farms, (an approximate 70%) have been classified as "backyard farms"[5], and waste management for these has been identified a growing problem because waste from swine farms is known to be highly contaminating for water sources. Effluents from larger swine farms have therefore needed to be regulated by the Department of Environment and Natural Resources (DENR), particularly the Environmental Management Bureau (EMB), which is the government monitoring and regulating agency. In order to comply with effluent regulations, commercial swine producing farms have taken the most cost effective route for the control of swine wastes, and this has been to construct lagoons[6] and settling ponds[7] that meet the effluent discharge permits as stipulated by DENR. As for the smaller backyard farms, they too have

3 Publicly available information found at https://psa.gov.ph/content/livestock-and-poultry-statistics-philippines,
4 "*Resource Assessment for Livestock and Agro-industrial Wastes – Philippines"*, by International Institute for Energy Conservation, 2009. Found online at: http://www.globalmethane.org/documents/ag_philippines_res_assessment.pdf
5 Backyard farms as per the definitions are considered to be farms with 21 heads of adult swines and zero young
6 As per the glossary of terms of the study, a lagoon refers to any large holding or detention structure, usually with earthen dikes, used to contain wastewater while sedimentation and biological oxidation or reduction occurs
7 As per the glossary of terms of the study a "Settling Pond" is considered to be an earthen basin in which wastewater containing settleable solids is retained to remove a part of suspended matter by gravity. Also called a settling or sedimentation basin and settling tanks or basins perform the same function.

opted for the use of lagoons and or settling ponds as this is the most cost effective option, additionally to be the common practice in the country.

The latter has been evidenced in the case study from the report from the *Resource Assessment for Livestock and Agro-industrial Wastes – Philippines*[8]*,* when analyzing data from one of the top swine producing regions with the highest number of backyard farms: The Western Visayas (Region VI). The study identified that as of 2003, 63 to 65 percent of the medium to large commercial farms use lagoon systems; while for small commercial farms 49 percent use lagoon systems while another 47 percent use settling ponds[9].

The use of lagoons and ponds is attractive for swine producers as this is the least-cost option because 1) it requires little to no capital investment (as it exists already and even if required upgrades or constructed from scratch would be lower cost than a system with methane capture); and, 2) has lower operation and maintenance costs over the project lifetime.

In recent years, some private project developers started the implementation of Anaerobic Digestion (AD) systems, bringing capital and technological knowledge to registered CDM projects which overcame the existing barriers, unfortunately this has led to limited technological transfer to small farmers and little knowledge sharing for the correct operation of the systems. This has been evidenced as per the findings of latest Philippine case study from the US EPA[10] Global Methane Initiative, where interviews were conducted with farmers and banks regarding the waste management practices and barriers for implementation of new technologies in the Philippines. In this study participating swine farm owners indicated that the main reason for them not to adopt a different technology, is the high initial investment cost. Backyard swine farmers indicate that the main constraint is the "lack of capital and operating funds to build, operate and maintain the digester, added to limited access to financing schemes and bank credit"; larger commercial farm owners who participated in the interviews highlighted that "cost and access to favorable credit terms" are the most prohibitive barriers.[11] Therefore one of the conclusions of the study is that the main problem that farmers face when thinking about changing technologies for waste management is getting access to finance from local banks that are willing to take the risk of adding these projects to their portfolio.

On another study, "*Feasibility Study of a National Biogas Programme on Domestic Biogas in the Philippines*" by SNV Netherlands Development Organization and Winrock International[12], the researchers conducted interviews to many stakeholders in the swine industry in the Philippines, and the same situation was observed, where they state in their concluding remarks "the consultants observed that rural Philippines is poor and many farming households will not have the financial ability to pay for a biodigester."; within the study they state "An overview of different models (of Anaerobic Digestion systems) is presented in this study report and one important observation was the exceptional high costs of the digesters, namely up to triple of those in surrounding countries. This is primarily explained by the absence of bricks and reliance on costly cement."[13]. What can be observed through these studies is that the average implementer under

8 "*Resource Assessment for Livestock and Agro-industrial Wastes – Philippines"*, by International Institute for Energy Conservation, 2009, page i and 3-11, table 3.7b

9 Please refer to footnote 8 above.

10 "*Barriers and Constraints to Implementation of Anaerobic Digestion Systems in Swine Farms in the Philippines*" page 11.

12"*Barriers and Constraints to Implementation of Anaerobic Digestion Systems in Swine Farms in the Philippines*" page 10.

12 SNV Netherlands Development Organization and Winrock International. 2010. "Feasibility Study of a National Biogas Program on Domestic Biogas in the Philippines."

13 SNV Netherlands Development Organization and Winrock International. 2010. "Feasibility Study of a National Biogas Program on Domestic Biogas in the Philippines."

this PoA will probably be a local farm owner, usually being an individual entrepreneur whose access to capital, technologies and skilled labor is quite limited. Additionally it has to be noted that LBPs own history of poor loan application for biogas projects, being an official Philippine government depository bank whose mission is to promote growth and development especially in the countryside where resources are scarce and majority of the poor reside, is already an indication of the lack of interest in these type of projects and the perception of high risk from lending institutions.

The Agricultural Credit Policy Council (ACPC) notes that lending by banks in the Philippines to the agriculture sector has steadily increased over the last few years. However, farm improvement loans are targeted to agricultural production and facilities given that this is intended to have a positive effect on revenue streams for the farm, but this does not happen with waste management investments. Farmers interviewed by the Global Methane Initiative study; said they have difficulty of accessing finance because they "are not able to put up enough collateral to secure the loan. In general, Philippine banks don't want to get involved in chattel mortgages and prefer accepting land as collateral". According to the interviews conducted with officials from five different banks in the Philippines, "(bank officials) mentioned that chattel mortgages, was not encouraged because it increased the bank's burden should the borrower default on the loan payment" . Another constraint stated by one managing director was that rural banks "do not have enough staff to review and manage the auction of chattel mortgage should the borrower default on the loan. This could be particularly problematic when dealing with small-scale and backyard farmers with very limited assets. Accepting chattel mortgage from small-scale farmers also increases the bank's risk". The study points out "During the interviews, we learned that there are also human resource constraints within each bank to understand agricultural technology, including AD systems; consequently, the bank loan officers tend to have a difficult time understanding and accepting loan applications".

On the technology side, farmers interviewed in the US EPA study stated that lack of local capacity to conduct operation and maintenance (O&M) services for anaerobic digestion (AD) systems and generators is a big issue in the Philippines. Long term sustainability of AD systems is compromised when O&M is not performed correctly, and the unit operations start failing. On the study by the Netherlands Development Organisation, the researchers state their observations for one of the visited provinces where they saw poor installations of AD systems and so they observed: "the unfolding of an environmental hazard caused by intensive hog raising. The bad reputation of biogas technology is associated with the lack of knowledge of technicians and constructors resulting in poor quality digesters" and on another province they note "Like so often, this model requires constant maintenance and will only operate well if the user is committed to carry out constant repairs. The quality of the digesters and therefore its reputation are bottlenecks". Installation and operation of anaerobic bioreactor technologies and methane collection and combustion system is technically more complex than continued operation of lagoons or settling pond systems. A basic open anaerobic system requires little effort to construct (sizing and digging of a pond and construction of a conveyance system) and operational control is very limited (i.e., monitoring hydraulic loading and periodic sludge maintenance). On the other hand, the bioreactor requires the design of an enclosed reactor or covered lagoon which requires active operational monitoring and control and includes a gas collection system, blowers and flare or electricity generating equipment which require additional skills and effort for installation, start-up and operation and maintenance. With these challenges and the lack of knowledge and interest among livestock farm owners in spending time outside of their core business to learn and operate such a system, the baseline scenario of continued operation of an open lagoon continues to prevail.

Summary

The current and expected practice of waste management systems by swine/livestock farm owners in the Philippines is the use of open lagoons and settling pond systems. The change to a different technology is being prevented by the existence of the following barriers, listed in order of importance:

a) *Access to finance:* small and commercial swine/livestock farm owners, as documented by studies in the Philippines, highlight the difficulty to secure financing and access to favorable credit terms for the high cost of the new technology implementation. Banks are interested in providing financing to productive activities but see waste management technologies as riskier and more burdensome for the institution in case of a default in payment.

b) *Technological barrier:* there is little knowledge of the operation of new technologies, and even though CDM projects have been implemented, under the scheme that they are being operated, there is little room for technological knowledge transfer. There is a need for assistance in the implementation and operation of waste management technologies and renewable energy generators.

c) *Common practice:* lagoon and settling ponds are systems widely used in the Philippines; they are the least cost option, which permits the farms to meet governmental regulations on effluent discharges.

Without financial assistance, acceptance of future CER revenues as collateral for the loan agreements, technical training, and a solid institution to lead the way in the CDM process these barriers are causing the livestock farms owners to continue to operate the open lagoon system.

The objective of this PoA is therefore to provide solid support to swine/livestock farms with a strong coordinating/managing entity able to lead the process, providing financial assistance along with technological training for implementation of the waste systems, and technical training for the realization of the CER revenues, so that the above mentioned barriers can be overcome.

SECTION D. Start date and duration of PoA

D.1. Start date of PoA

24/12/2009, this was the date of publication of the PoA-DD for global stakeholder consultation.

D.2. Duration of PoA

28 years, 0 months

SECTION E. Environmental impacts

E.1. Level at which environmental impacts analysis is undertaken

Environmental Analysis is done at SSC-CPA level. This is consistent with Philippine law which requires an analysis for each farm under the PoA. There is no technical or administrative advantage of doing an environmental analysis at the PoA level as the impacts are confined to each project activity site and managed at that level.

E.2. Analysis of environmental impacts

With the proper design, the impacts of the systems will be positive, reducing odours while complying with water quality regulations. The minor potential negative impacts are not transboundary and easy to manage using readily available mitigation measures and include safety procedures in handling methane; noise during construction and operation; and good housekeeping to ensure manure is handled properly throughout treatment.

E.3. Environmental impact assessment

Even though no environmental assessment (i.e., Environmental Compliance Certificate, Initial Environmental Examination, or Environmental Impact Assessment) is required by the Philippine Law for the project activities that will be implemented under the PoA, it will be necessary for the CPAs to be included in the proposed PoA to provide to LBP current compliance with the law with the ECC certificate from DENR and corresponding discharge permits for the farm, according to LBP's requirements, for inclusion into the PoA. The latter will confirm that the entering CPAs are compliant with all environmental regulations that apply to their operations.

SECTION F. Local stakeholder consultation

F.1. Level at which local stakeholder consultation is undertaken

Local consultation is done at CPA level to ensure full participation and consultation of local stakeholders of the Livestock farms participation in the PoA.

F.2. Modalities for local stakeholder consultation

Local stakeholders will be invited at the SSC-CPA level to participate in a stakeholder meeting, and feedback will be solicited with the comments considered in the design and implementation of the project. These will be documented in each CPA.

F.3. Summary of comments received

Comments received on the different CPAs are documented in the SSC-CPA-DD files

F.4. Consideration of comments received

Response to comments received on the different CPAs are documented in the SSC-CPA-DD files.

SECTION G. Approval and authorization

The letters of approval from Parties that wish to be involved in the PoA were available at the time of submitting the PoA-DD to the validating DOE during the first crediting period.

PART II. Generic component project activity (CPA)

SECTION H. Description of generic CPA

H.1. Title of generic CPA

>> CPA-xxxx : Methane recovery and combustion with renewable energy generation from anaerobic animal manure management systems under the Land Bank of the Philippines' (LBP) Carbon Finance Support Facility

H.2. Reference number of generic CPA

>> 5979-P1-xxxx-CP1

H.3. Purpose and general description of generic CPA

>> The CPA replaces an open anaerobic manure management system with an enclosed anaerobic digestion system with methane recovery and combustion. The project will consist of

anaerobic digester/s, biogas recovery and combustion systems, sludge management systems and other components. These are described in detail in section H.4.

The CPA will consider the small scale methodology AMS-III.D version 21: Methane Recovery in Animal Manure Management Systems and the Small Scale Methodology AMS-I.F. version 3: Renewable electricity generation for captive use and mini-grid. The methodologies are discussed in detail in section I.1 in accordance to project standard.

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H.4. Technologies/measures

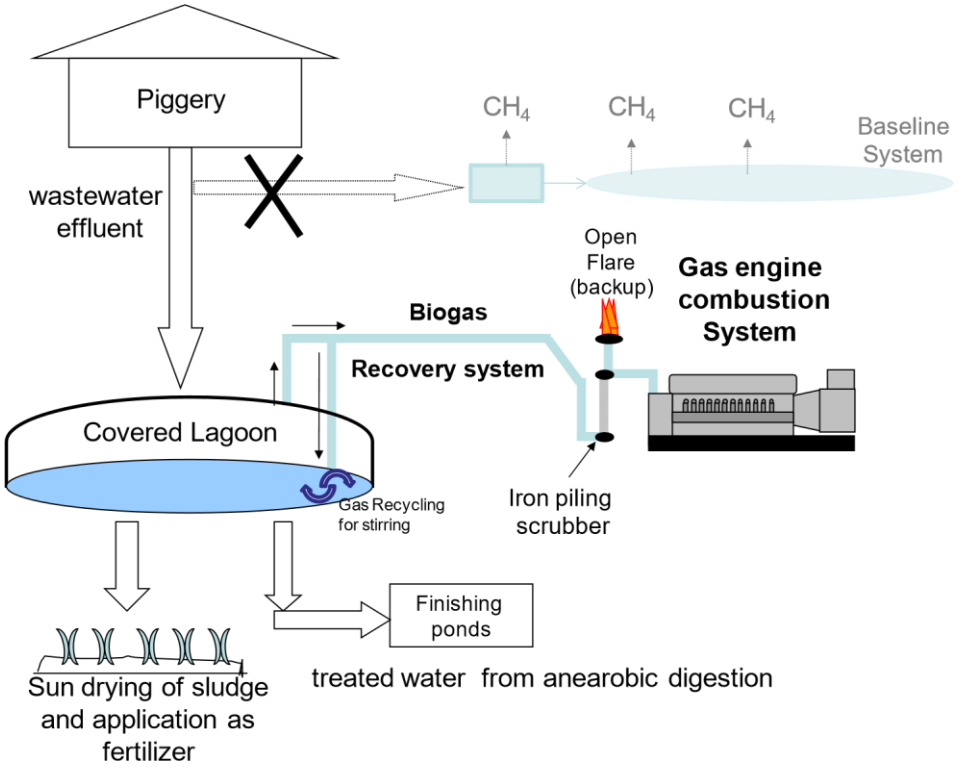
>> The CPA replaces an open anaerobic manure management system with an enclosed anaerobic digestion system with methane recovery and combustion. The project consists of the following:

Anaerobic digestion system: [modify to fit CPA description as necessary]
The waste produced from swine and other livestock farms will be treated in an enclosed anaerobic system that will prevent the release of methane. The system will consist of a lagoon that is covered by HDPE or an anaerobic biodigester to collect the biogas and prevent atmospheric gases from leaking into the tank.

Biogas recovery and combustion system: [modify to fit CPA description as necessary]
A system of collection and combustion of the biogas produced by the reactor will also be installed. The system will include a blower system, piping system to collect the gas, a gas filtering system, gas engine(s) where the gas will be combusted and/or a flare.

Sludge management system: [modify to fit CPA description as necessary]
The treatment system will produce sludge. The sludge will be removed from the biodigester through a pipe, sun dried and applied to soil as fertilizer in a manner that ensures aerobic conditions and avoids methane emissions.

Other components: [modify to fit CPA description as necessary]
After the anaerobic digester, digested wastewater will be discharged to aeration and settling ponds. All power to run the project activity will be provided by the gas engine and as a result no fossil fuel based electricity or other fuel will be used.



[modify diagram to be consistent with CPA description as necessary]

SECTION I. Application of methodologies and standardized baselines

I.1. References to methodologies and standardized baselines

The CPA will consider the small scale methodology AMS-III.D version 21: Methane Recovery in Animal Manure Management Systems and the Small Scale Methodology AMS-I.F. version 3: Renewable electricity generation for captive use and mini-grid.

The combination of these two approved methodologies has been approved by the CDM EB on its 59th meeting, paragraph 11a), and included in the list of combinations of methodologies that can be applied in a PoA without a pre-approval.

Both methodologies are available at the UNFCCC website at the following links respectively:
https://cdm.unfccc.int/methodologies/DB/H9DVSB24O7GEZQYLYNWUX23YS6G4RC
https://cdm.unfccc.int/methodologies/DB/9KJWQ1G0WEG6LKHX21MLPS8BQR7242

The CPA will also use the tools: “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion” version 3, “Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation” version 3, “Project and leakage emissions from anaerobic digesters” version 2, and “Project emissions from flaring” version 3

These mentioned tools are available at the UNFCCC website at the following links:
https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf
https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v3.pdf
https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v3.0.pdf
https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-14-v2.pdf.

I.2. Applicability of methodologies and standardized baselines

The CPA uses AMS-III.D as it covers the replacement and extension of existing anaerobic manure management systems in livestock farms to achieve methane recovery and destruction. The project activities will result in emission reductions lower than 60,000 tCO_2e annually.

The following shows how the CPAs will comply with the applicability criteria of AMS-III.D version 21.

AMS-III.D Applicability Criteria	Justification
The livestock population in the farm is managed under confined conditions.	Only farms with this characteristic will be eligible as CPAs (section K).
Manure or the streams obtained after treatment are not discharged into natural water resources (e.g. streams or estuaries).	Only farms with this characteristic will be eligible as CPAs (section K)
Annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5°C	The Philippines has a mean annual temperature over 5°C. The mean annual temperature for the country is 26.6°C and Baguio is the coldest place in the country and has a mean annual temperature of 18.3°C. (http://bagong.pagasa.dost.gov.ph/information/climate-philippines)
In the baseline scenario, the retention time of manure waste in the anaerobic treatment system is greater than 1 month, and in case of anaerobic lagoons in the baseline, their depths are at least 1 m.	Only farms with this characteristic will be eligible as CPAs (section K).
No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario.	Only farms with this characteristic will be eligible as CPAs (section K).
The residual waste from the animal manure management system shall be handled aerobically, otherwise the related emissions shall be taken into account as per relevant procedures of "AMS-III.AO Methane recovery through controlled anaerobic digestion". In the case of soil application, proper conditions and procedures (not resulting in methane emissions) must be ensured;	Only project activities with this characteristic will be eligible as CPAs (section K).
Technical measures shall be used (e.g. including a flare for exigencies) to ensure that all biogas produced by the digester is used or flared.	Only project activities with this characteristic will be eligible as CPAs (section K).
The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester. If the project proponent can demonstrate that the dry matter content of the manure when removed from the animal barns is larger than 20%, this time constraint will not apply.	Only project activities with this characteristic will be eligible as CPAs (section K).
Measures are limited to those that result in aggregate emission reductions of less than or equal to 60 kt CO_2 equivalent annually from all Type III components of the project activity.	Only project activities with this characteristic will be eligible as CPAs (section K).
New facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the "General Guidelines to SSC	Only project activities with this characteristic will be eligible as CPAs (section K).

CDM methodologies".	
The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the "General guidelines for SSC CDM methodologies".	Only project activities with this characteristic will be eligible as CPAs (section K).

Conformance to the above table demonstrates that the design of the generic CPA qualifies as Type III.D in accordance with applicable provisions on small-scale project type and eligibility in the project standard.

In this case the generic CPA only contains Type III.D of Type III , thus as required of the scale of components belonging to the same small-scale project type does not exceed the limits of that project type.

The following table shows how the CPA complies with the applicability criteria of AMS-I.F v3:

AMS-I.F Applicability Criteria	Justification
This methodology is applicable for project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition,3 (c) Involve a retrofit of (an) existing plant(s); or (d) Involve a replacement of (an) existing plant(s).	Only project activities with this characteristic will be eligible as CPAs (section K).
Illustration of respective situations under which each of the methodology (AMS-I.D., AMS-I.F. and AMS-I.A.2) applies is included in Table 3.	Project activities under this PoA will not supply energy to the grid, they will supply energy to farms and replace energy that would have otherwise been consumed from the grid. Hence as per table 3 of the methodology, AMS-I.F is applicable as per point 2, it will displace grid electricity consumption or point 4 project supplies electricity to a mini grid system where in the baseline all generators use exclusively fuel oil and/or diesel fuel
If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	Only renewable energy components less than or equal to 15 MW will be eligible as CPAs (section K).
Combined heat and power (co-generation) systems are not eligible under this category.	Only electricity generation from the recovered methane emissions projects are eligible as CPAs (section K). They are not combined heat and power.
For project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and be physically distinct from the existing units.	Only projects of this type that have an added capacity of less than 15 MW and that are physically distinct from existing units will be eligible as CPAs (section K).

In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	Only projects of this type with the total output of the modified or retrofitted generating unit not exceeding 15 MW will be eligible as CPAs (section K)
If electricity and/or steam/heat produced by the project activity is delivered to a third party, i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures that there is no double counting of emission reductions..	CPAs under this PoA will be required to have this contract when the situation is determined applicable.
In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	Not applicable to the project activities.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: (a) The project activity is implemented in an existing reservoir with no change in the volume of reservoir; (b) The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2; (c) The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	Not applicable to the project activities since the PoA does not have Hydro power plants in the CPAs. .
Parameters relevant to hydro and geothermal plants not included in the tables in the methodology shall be monitored following the most recent version of ACM0002.	Not applicable to the project activities since the PoA does not have Hydro and geothermal power plants in the CPAs.

Conformance to the above table demonstrates that the design of the generic CPA qualifies as Type I.F in accordance with applicable provisions on small-scale project type and eligibility in the project standard.

In this case the generic CPA only contains Type I.F of Type I , thus as required of the scale of components belonging to the same small-scale project type does not exceed the limits of that project type.

I.3. Application of multiple methodologies

>> The CPA will consider the small scale methodology AMS-III.D version 21: Methane Recovery in Animal Manure Management Systems and the Small Scale Methodology AMS-I.F. version 3: Renewable electricity generation for captive use and mini-grid.

The combination of these two approved methodologies has been approved by the CDM EB on its 59th meeting, paragraph 11a), and included in the list of combinations of methodologies that can be applied in a PoA without a pre-approval. See section I.1 for details.

Also as per General guidelines for SSC CDM methodologies section 4.6 paragraph 19 (b) ". The following combinations of approved methodologies may be applied without further assessment of cross effects: (b) Combination of any one of the Type-III methodologies where activities lead to methane generation (i.e. AMS-III.H., AMS-III.D., AMS-III.F. and AMS-III.G.), with any one of the Type I methodologies that utilise the methane for generating renewable energy, (i.e. AMS-I.A., AMS-I.C., AMS-I.D. and AMS-I.F.) (approved at EB 56).

I.4. Project boundary, sources and greenhouse gases (GHGs)

The spatial extent of the project boundary encompasses the physical and geographical site of the methane recovery facility and of the renewable generation unit. In terms of GHG emissions, the project is limited to CH_4 emissions from leakage, and CO_2 and CH_4 from the gas engine or flare. As the project activity includes the generation of renewable energy and does not include many electrical appliances except for blowers of minimal electricity consumption that is to be supplied by the system itself, the anthropogenic emission from use of fossil fuel based electricity is considered to be zero.

In line with AMS-III.D, the following sources and gases are included in the project boundary:

Source		GHG	Included?	Justification/Explanation
Baseline	Anaerobic digestion in the open lagoons	CO_2	Excluded	Excluded for simplification.
		CH_4	Included	The major source of emissions in the baseline.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Emissions from Electricity	CO_2	Excluded	Excluded for simplification. This is conservative.
		CH_4	Excluded	Excluded for simplification. This is conservative.
	Consumption from the Grid	N_2O	Excluded	Excluded for simplification. This is conservative.
	Emissions from heat generation	CO_2	Excluded	Excluded for simplification. This is conservative
		CH4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project activity	On-site fossil electricity or fuel use due to the project activity	CO_2	Excluded/ Included	It will be [excluded/included] since it has been demonstrated by the CPA that the level of anthropogenic emissions from use of fossil fuel for electricity use can be considered [negligible/ significant].
		CH_4	Excluded	Excluded for simplification. Emissions assumed to be very small.
		N_2O	Excluded	Excluded for simplification. Emissions assumed to be very small.
	Physical leakage	CO_2	Excluded	Excluded for simplification. Emissions assumed to be very small.
		CH_4	Included	Estimated with conservative assumptions based on AMS-III.D.

Source		GHG	Included?	Justification/Explanation
		N_2O	Excluded	Excluded for simplification. Emissions assumed to be very small.
	Flaring	CO_2	Included	Calculated with the flaring gas tool.
		CH4	Included	Calculated with the flaring gas tool.
		N_2O	Excluded	Excluded for simplification. Emissions assumed to be very small.

In line with AMS-I.F, the following sources and gases are included in the project boundary:

Source		GHG	Included?	Justification/Explanation
Baseline	Emissions from Electricity consumption from the Grid	CO_2	Included	The major source of emissions in the baseline.
Project activity	On-site fossil electricity or fuel use due to the project activity	CO_2	Excluded	Engine used will not require fossil fuel and/or fossil fuel based electricity during start-up or at any stage of generation.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.

I.5. Establishment and description of baseline scenario

As per AMS-III.D, the baseline scenario of the methane recovery component is the situation where, in the absence of the project activity, animal manure is left to decay anaerobically within the project boundary and methane is emitted to the atmosphere. The applicability criteria for use of AMS-III.D. include:

- The livestock farm has livestock populations managed under confined conditions.
- The livestock farm has manure, or the streams obtained after treatment is not discharged into natural water resources (e.g. rivers and estuaries).
- The baseline system of waste management is an open anaerobic system with no methane recovery and destruction by flaring, combustion or gainful use.
- For anaerobic treatment systems in the baseline, the retention time of manure waste must be greater than 1 month.
- For anaerobic lagoons in the baseline the depth is at least 1 m.

These will be identified as part of the development of each CPA through site inspections, measurements and documented accordingly. The emissions from the baseline scenario from each CPA will be calculated in accordance with AMS-III.D and AMS-I.F and these formulas are described in Section I.6.1.

Additionally, the characteristics of the manure and the management system employed are important factors to defining the baseline for each CPA.

The key characteristics of the manure are the amount of organic material in the manure or volatile solids (VS) content and the maximum amount of methane potentially produced from the manure (Bo). For each CPA, the proponent has a choice of estimating these parameters using national or regional defaults or if the source of the livestock is from an Annex I country, defaults from those

countries. For VS they also have the option of adjusting the value based on site specific animal weight conditions.

The manure management system employed affects the Methane Correction Factor (MCF) which represents the degree to which the Bo is achieved and therefore the amount of the potential methane emissions that could be released. The MCF will be determined for each CPA using IPCC defaults.

The details of the estimation of these parameters and other constants in the baseline calculations are listed in sections I.6.2 and I.6.3.

As per AMS-I.F, the baseline emission scenario of the renewable energy generation component is based on the electricity that is displaced from the electricity distribution system by the project activities. It is calculated as the emission factor of the baseline electricity distribution system multiplied by the electricity production of the project activity. In accordance with AMS-I.F, below are pertinent aspects of the baseline that must be identified and documented for each CPA.

The emission factor of the baseline electricity system is dependent on the source/mix of generation of the grid from which the electricity is displaced:

In cases *where the baseline system includes generators that exclusively use fuel oil and/or diesel fuel*, the baseline emission factor is for a modern diesel generating unit of the relevant capacity operating at optimal load. These are given in Table 2 of AMS-I.F.

For all other CPAs, the emission factor is a coefficient (measured in tCO_2e/MWh) based on data from an official source[14] and made publicly available.

The amount of electricity displaced by the project activity is equivalent to the electricity production of the project activity for all but the cases outlined below. The equations used in the calculations are outlined in Section I.6.1.

CPAs that involve the addition of energy generation units at an existing generation facility: In these cases, the amount of electricity generated by the CPA is considered to be the total electricity produced by the combined system (both the project activity expansion and the existing units) minus the estimated electricity that would have been produced by the existing units assuming the capacity and operating parameters are the same as at the time of the start of the project.

CPAs that seek to retrofit or modify an existing facility for renewable energy generation: In these cases, the electricity generated by the CPA is the total electricity produced minus baseline generated electricity based on the existing unmodified facility. This is considered given that the existing facility would continue to provide electricity at historical average levels until the time at which the generation facility would be replaced / retrofitted in the absence of the CDM project activity. After this time, the project activity is assumed to be the baseline and no emissions reduction occur.

This requires identifying the baseline electricity delivered by the existing facility following which will be documented as the maximum of (i) the estimated electricity that would have been produced under the available resources or (ii) the historical average. The historical average will be determined using a minimum of 3 years of historical generation data and spanning all data from the most recent available year (or month, week or other time period) to the time at which the facility was constructed, retrofitted or modified.

[14] The national grid emission factor published by the Philippine Department of Energy found in link https://www.doe.gov.ph/electric-power/2015-2017-national-grid-emission-factor-ngef for the Luzon-Visayas and Mindanao electricity grid is used, as appropriate.

The point in time that the existing equipment is replaced will be identified in a conservative manner using: (i) the typical average technical lifetime of the equipment type taking into account common practices in the sector and country; or (ii) the common practice of the responsible company regarding replacement schedules; or (iii) using "Tool to determine the remaining lifetime of equipment (EB50, Annex 15)".

Following the latest PoA-PS (version 2) paragraph 289 which states "289. The coordinating/managing entity shall assess and incorporate the impact of national and/or sectoral policies and circumstances existing at the time of requesting renewal of the PoA period on the modalities to estimate baseline GHG emissions for the subsequent crediting period of each corresponding CPA, without reassessing the baseline scenario". Thus, the steps 1.2-1.4 only provided in the "Methodological tool11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" which refers to assessment of baseline are applied.

Step 1.2: Assess the impact of circumstances
Assess the impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions, without reassessing the baseline scenario.
In the situation where the baseline scenario identified at the validation of the project activity was the continuation of the current practice without any investment, an assessment of the changes in market characteristics is required for the renewal of the crediting period.

The national/and/or sectoral policies existing at the time of the renewal are assessed and are found the same as in the first crediting period and thus will not have any impact on the modalities to estimate baseline GHG emissions for the subsequent crediting period of each corresponding CPA. As discussed in section C of this PoA-DD, i.e. in order to comply with effluent regulations, commercial livestock producing farms have taken the most cost effective route for the control of animal wastes, and this has been to construct lagoons and settling ponds that meet the effluent discharge permits as stipulated by DENR. As for the smaller backyard farms, they too have opted for the use of lagoons and or settling ponds as this is the most cost effective option. This remains additionally to be the common practice[15] in the country, and the market situation has not changed. Thus for both methodologies described above, the conditions used to determine the baseline emissions in the previous crediting period are still valid.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.
This sub-step is not applied since the baseline scenario identified at the validation of the project activity was the continuation of use of open lagoons and settling ponds without any investment and, the projects proponents or third party (or parties) would not undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology.

Step 1.4: Assessment of the validity of the data and parameters
For PoA-PS version 2 paragraph 291 which states that "291. If data and parameters used for determining the original baseline, that were determined ex ante and not monitored during the PoA period, are no longer valid, the coordinating/managing entity shall update such data and parameters in accordance with the Methodological tool: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period". The coordinating/managing entity has updated such data and parameters in accordance with the tool: The updated parameters such as GWP, EF (as appropriate to the CPA) as well as a check on other parameters like $W_{default}$, Bo, VS default values as per IPCC were done ($W_{default}$, Bo, VS default values found to be the same).

[15] "*Resource Assessment for Livestock and Agro-industrial Wastes – Philippines"*, by International Institute for Energy Conservation, 2009. Found online at: http://www.globalmethane.org/documents/ag_philippines_res_assessment.pdf

I.6. Estimation of emission reductions

I.6.1. Explanation of methodological choices

The methodology applied to the typical CPA is AMS-III.D (version 21) and AMS-I.F (version 3). *Ex ante* emissions of the project activity are calculated using the following formula:

$$PER_y = MER_y + GER_y$$

Where
MER_y Emission reduction in year "y" (tCO_2-e) from methane recovery (as per AMS-III.D)
GER_y Emission reduction in year "y" (tCO_2-e) from renewable electricity generation (as per AMS-I.F)

***Ex ante* emissions from methane recovery and destruction** are calculated using the following formula:

$$MER_y = MBE_y - (MPE_y + MLeakage_y)$$

Where
MER_y Emission reduction in year "y" (tCO_2-e) from methane recovery
MBE_y Baseline emissions in year "y" (tCO_2-e) from methane recovery
MPE_y Project emissions in year "y" (tCO_2-e) from methane recovery
$MLeakage_y$ Project leakage in year "y" (tCO_2-e) from methane recovery

Baseline emissions (MBE_y), project emissions (MPE_y) and leakage ($MLeakage_y$) from the recovery of methane are to be calculated based on AMS III D as shown below:

Baseline Emissions from methane recovery and destruction (MBE_y)

Baseline emissions related to the recovery of methane are calculated using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity. The following formula was used:

$$MBE_y = GWP_{CH4} * D_{CH4} * Uf_b * \sum_{j,LT} MCFj * B_{O,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{Bl,j}$$

where:

MBE_y	baseline emissions in year "y" (tCO_2-e/yr)
GWP_{CH4}	Global Warming Potential (GWP) of CH_4
D_{CH4}	CH_4 density (0.00067 t/m^3 at room temperature (20ºC) and 1 atm pressure).
LT	Index for all types of livestock
j	Index for animal waste management system
MCF_j	Annual methane conversion factor (MCF) for the baseline animal waste management system "j" in percentages (digester in project scenario).
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated for animal type "LT" (m^3 CH_4/kg dm)
$N_{LT,y}$	Annual average number of animals of type "LT" in year "y" (numbers) calculated using the formula below.
$VS_{LT,y}$	Volatile solids for livestock "LT" entering the animal manure management system in year "y" (on a dry matter weight basis, kg dm/animal/year)
$MS\%_{Bl,j}$	Fraction of manure handled in baseline animal manure management system "j"
Uf_b	Model correction factor to account for model uncertainties (0.94)

The annual average animal population ($N_{LT,y}$) in each farm/CPA is determined from a pig census and calculated using equation (4) of AMS-IIID ver. 21 for each CPA .

$$N_{LT,y} = Nda,_y * (Np,_y/365)$$

where:

$Nda_{,y}$ Number of days animal is alive in the farm in the year "y" (numbers)

$Np_{,y}$ Number of animals produced annually of type "LT" for the year "y" (numbers)

The various constants used in the above equations are to be estimated in line with the baseline scenario description in the methodology AMS-III.D.

B_0 and VS are dependent on country and site-specific conditions and each CPA will be given options in how it is estimated. In particular:

Choice of defaults for B_0 and VS:
There are several options for determining the default values of B_0 and VS for the baseline calculations.

For B_o, nationally published sources for the Philippines will be used if they are available at the time of adding the CPA and apply to the species used. If these are not available, B_0 can be either calculated using the methodology found in section 10.2 in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10 or default values for Asia provided in tables 10 A-4 to A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10 will be used.

For VS, country-specific VS values based on published sources will be used. If these sources are not available, a calculated value from feed intake levels using the procedure outlined in section 10.2 in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10 or default values for Asia provided in tables 10 A-4 to A-9 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10 will be used.

If the genetic source of the production operations livestock originates from an Annex I country, the project proponent can use the above approach to determine B_0 or VS or may choose to use default values corresponding to Annex I species, in which case the following will be demonstrated:

- The farm uses formulated feed rations (FFR) which are optimized for the various stages of animal growth, category, weight gain, productivity and genetics;
- The use of FFR can be validated and recorded in the CPA (through on-site records, feed supplier, etc.);
- The project's specified animal weight is more similar to developed country IPCC default values than to Asian default values.

Adjustment of VS for animal weight:
Each project proponent is given the option to adjust for the defaults for VS for site specific average animal weight. The weights, default values and corresponding calculations are to be documented in the CPA and the following formula would be used:

$$VS_{LT,y} = (W_{site} / W_{default}) \times VS_{default} * nd_y$$

where:

VS_{site}: Adjusted volatile solid excretion per day on dry-matter basis for defined livestock population at project site, in kg-dm/animal.

W_{site} Average site animal weight for defined population, in kg.

$W_{default}$ Default average animal weight for defined population, in kg.

$VS_{default}$ Default value (IPCC) for the volatile solid excretion per day on a dry- matter basis for defined livestock population, in kg-dm/animal.

nd_y Number of days in year "y" where the treatment plant was operational.

Project Emissions from methane recovery and destruction (MPE)

Project emissions, as per the methodology, are calculated using the following formula:

$MPE_y = PE_{PL,y} + PE_{flare,y} + PE_{power,y} + PE_{transp,y} + PE_{storage,y}$

Where:

MPE_y Project emissions in year "y" (tCO_2e)
$PE_{PL,y}$ Emissions due to physical leakage of biogas in year "y" (tCO_2e)
$PE_{flare,y}$ Emissions from flaring of the biogas stream in the year "y" (tCO_2e)
$PE_{power,y}$ Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year "y" (tCO_2e)
$PE_{transp,y}$ Emissions from incremental transportation in the year y (tCO_2e)
$PE_{storage,y}$ Emissions from the storage of manure (tCO_2e)

The latter two parameters will be considered as zero, as manure systems within this PoA will all be within the participating farms, and no incremental transportation will occur, nor storage of manure, as it will flow directly into the farms digester.

Emissions due to physical leakage are estimated as 10% of: the maximum methane producing potential of the manure fed into the management systems implemented by the project activity, calculated as follows:

$PE_{PL,y} = 0.10 * GWP_{CH4} * D_{CH4} * \sum_{j,LT} B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{i,y}$

Where:

$MS\%_{i,y}$ Fraction of manure handled in system "i" in year "y"

For CPAs that use sequential treatment stages, the reduction of the volatile solids during a treatment stage is estimated based on referenced data for different treatment types. Emissions from the next treatment stage are then calculated following the approach outlined above, but with volatile solids adjusted for the reduction from the previous treatment stages by multiplying by (1 - RVS), where RVS is the relative reduction of volatile solids from the previous stage. The relative reduction of volatile solids (RVS) depends on the treatment technology. This is estimated in a conservative manner based on project design or using default values for different treatment technologies which can be found in the table in the Appendix of AMS III.D.

If the CPA is using flares to combust the biogas stream, project activity emissions from this activity will be estimated using the tool to determine "Project emissions from flaring'.

For each CPA the ex-ante emissions will be calculated using a default flare efficiency depending on the type of flare expected to be installed at CPA level. As per the Tool for "Project emissions from flaring" the value will be set depending on the following conditions:

For enclosed flares

0.9 If (a) the temperature of the flare and the flow rate of the residual gas to the flare is within the manufacturer's specification for the flare in minute m; and
(b) The flame is detected in minute m .Otherwise flare efficiency, m is 0%.

For enclosed flares that are defined as low height flares, the flare efficiency shall be adjusted, as a conservative approach, by subtracting 10 percentile points. For example, the default value applied shall be 80%, rather than 90%.

For open flares,

0.5 flare efficiency in the minute m is 50% when the flame ($Flame_m$) is detected in the minute m. otherwise FE,m is 0%

Ex-post, these will be calculated using the following formulas.

$PE_{flare} = \Sigma F_{CH4\ RG,m} * (1 – FE) * GWP_{CH4} / 1000$

Where:
PE_{flare} is the project emissions from flaring of the residual gas in year y (tCO2e)
$F_{CH4\ RG,m}$ is the mass flow of methane in residual gas in minute m (kg)
FE is the flare efficiency (fraction)
GWP_{CH4} is the GWP of methane

Mass flow of methane in the residual gas in the minute *m*

$$F_{CH4\ RG,m} = FV_{RG,m} * fv_{CH4,RG,m} * \rho_{CH\ 4,n}$$

Where:

$F_{CH4\ RG,m}$	Mass flow of methane in the residual gas in the minute m (kg)
$FV_{RG,m}$	Volumetric flow rate of the residual gas in dry basis at normal (Nm^3) conditions in minute, m (also volumetric flow rate of gas going to the flare)
$fv_{CH4,RG,m}$	Volumetric fraction of methane in the residual gas on dry basis in min, *m* (this corresponds to w_{CH4}).
$\rho_{CH\ 4,n}$	Density of methane at normal conditions (0.716 kg/m^3)

The list of parameters, as required under the *Tool to determine "Project emissions from flaring"* will be monitored ex-post and $PE_{flare,y}$ will be adjusted accordingly.

Project emissions from fossil fuel consumption for electricity generation will be considered in the CPAs when it is demonstrated[16] that electricity from the grid is not reliable. The emission factor for the fossil fuel shall be used (tCO_2/tonne). Local values are to be used, if local values are difficult to obtain, IPCC default values may be used.

As per methodology AMS-III.D (version 21 paragraph 6), "If recovered methane is used to power auxiliary equipment of the project it should be taken into account accordingly, using zero as its emission factor." Thus when the project activities include the generation of electricity using the recovered methane to power auxiliary equipment i.e. blowers of minimal consumption, electricity generation will be taken into account and zero will be used as its emission factor.

$PE_{power,y} = EC_{AE} * 0$

In the event that there is not enough gas, or for any other reason the energy generator is not operating, the project activity shall monitor the energy consumption from the grid $EC_{PJ,y,}$ and shall consider it as project activity emissions, where the emission factor will be that for the Philippine grid it is connected to. Where:

$PE_{power,y} = EC_{PJ,y} * EF_{CO2,y}$

Leakage from methane recovery and destruction (MLeakage)

[16] Energy generated from fossil fuel will be included as part of the project boundary for CPAs, unless demonstrated that power supplied by the grid is stable. Stable in this context means that the grid serving the specific site, has presented outages of less than 1% of the past year.

As per paragraph 26 AMS-III.D version 21, it is determined by following the relevant procedure in the methodological tool "Project and leakage emissions from anaerobic digesters". Under the PoA, if the project involves replacement of equipment and the same equipment is not scrapped and used in a way that increases greenhouse gas emissions, these additional emissions will be accounted in the calculations of the CPA.

***Ex ante* emissions from renewable electricity generation are calculated using the following formula:**

$GER_y = GBE_y - (GPE_y + GLeakage_y)$

Where

GER_y Emission reduction in year "y" (tCO_2-e) from electricity generation
GBE_y Baseline emissions in year "y" (tCO_2-e) from renewable electricity generation
GPE_y Project emissions in year "y" (tCO_2-e) from renewable electricity generation
$GLeakage_y$ Project leakage in year "y" (tCO_2-e) from renewable electricity generation

Baseline emissions (GBE_y), project emissions (GPE_y) and leakage ($GLeakage_y$) from renewable electricity generation are to be calculated based on AMS I. F as shown below:

Baseline Emissions from electricity generation (GBEy)

Baseline emissions related to the use of the recovered methane for electricity generation that displaces electricity from a fossil fuel based electricity distribution system are equivalent to the amount of electricity (MWh) produced by the project activity multiplied by the emission factor (tCO_2/MWh) of the relevant electrical grid.

$GBE_y = (EG_y - EG_{baseline}) * EF_{CO2,y}$

Where

GBE_y Baseline emissions in year y (tCO_2) from renewable electricity generation
EG_y Electricity generated by the project in year y (MWh/yr)
$EG_{baseline}$ Baseline electricity supplied to the grid in case of modified or retrofit units (MWh/yr) $EF_{CO2,y}$ Baseline emissions factor (tCO_2-e/MWh)

$EF_{CO2,y}$ The baseline emissions factor will be calculated ex-ante for each CPA and applied for the whole crediting period as follows:

CPAs where the baseline system includes generators that exclusively use fuel oil and/or diesel fuel: In these cases, the baseline emission factor is given in Table 2 of AMS-I.F.

All other CPAs: For all other CPAs, the emissions factor

For all other CPAs, the emission factor is a coefficient (measured in tCO2e/MWh) based on data from an official source[17] and made publicly available.

EG_y or $EG_{baseline}$ Electricity generation by the project (EG_y) and baseline electricity supplied to the grid in case of modified or retrofit units ($EG_{baseline}$) are calculated as follows:

CPAs that add energy generation units at an existing renewable generation facility that shares the same source for power generation:

[17] The national grid emission factor published by the Philippine Department of Energy found in link https://www.doe.gov.ph/electric-power/2015-2017-national-grid-emission-factor-ngef for the Luzon-Visayas and Mindanao electricity grid is used, as appropriate.

$EG_{baseline} = 0$

$EG_y = TE_y - WTE_y$

Where:

TE_y total electricity produced in year "y" by all units, existing and new project units;
WTE_y the estimated electricity that would have been produced by existing units (installed before the project activity) in year "y" in the absence of the project activity, where WTEy = MAX (WTEactual,y, WTEestimated,y)

Where:

$WTE_{actual,y}$ the actual measured electricity production of the existing units in year "y"
$WTE_{estimated,y}$ the estimated electricity that would have been produced by the existing units under the observed availability of the resource for year "y"

If the existing units shut down, derated or otherwise become limited in production $WTE_{estimated,y}$ will be estimated based on the same capacity and operating parameters as found at the time of the start of the project activity. If the existing units are subject to modifications or retrofits that increase production, then $WTE_{estimated,y}$ shall be estimated in the same manner as $EG_{baseline}$ for a retrofit or modification of an existing facility (see below).

CPAs that retrofit or modify an existing facility for renewable energy generation:

EG_y = Electricity generated by the project facility that has been modified/retrofitted in year y (MWh/yr)

$EG_{baseline}$ = MAX ($EG_{historical}$, $EG_{estimated,y}$) until '$DATE_{BaselineRetrofit}$' $EG_{baseline} = EG_y$ on/after '$DATE_{BaselineRetrofit}$'

Where:

$EG_{historical}$ average of 3-year historical electricity delivered by the existing facility
$EG_{estimated,y}$ estimated electricity that would have been produced by the existing units under the observed availability of the renewable resource for year y.
$DATE_{BaselineRetrofit}$ the point in time when the existing equipment would need to be replaced in the absence of the project activity

All other CPAs:

EG_y = Electricity generated by the project facility in year y (MWh/yr)
$EG_{baseline} = 0$

Project emission from electricity generation (GPE_y)

As per AMS-I.F version 3, paragraph 24, the project activity does not belong to categories requiring the use of ACM0002. There are no project emissions.

$GPE_y = 0$

As per paragraph 25, CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion". As mentioned on the above section, these have already been included under the project emissions for methodology AMS-III.D.

Leakage from energy generation *(GLeakage)*

As per AMS-I.F version 3 paragraph 25,"General guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of biomass residues". [not applicable] . There is no leakage to be considered as the energy generating equipment is not transferred equipment from another activity.

$GLeakage_y = 0$

Leakage is considered to be negligible in this small scale PoA.

In addition to the above, the key methodological choices that were considered for application to the CPAs are:

- A 90% default value for flare efficiency will be applied for enclosed flares and a 50% value for open flares will be applied to all CPAs and none will undertake continuous monitoring of the flare efficiency;
- A 60% default value of methane content will be applied to all CPAs and none will undertake continuous monitoring of the fraction of methane in the biogas.
- As per AMS-III.D, each CPA has been given options on approaches to be taken in choosing different defaults for VS and B_0 including nationally published sources and IPCC guidelines. In cases where the genetic source of the production livestock is from an annex I country, a corresponding VS can be used. In addition, VS can be adjusted for site specific animal weights. This is outlined in Section I.6.2 and I.6.3.
- As per AMS-I.F, each CPA will use the 2015-2017 National grid emission factors published by official sources and applied to the entire crediting period.
- Project emissions of CO_2 from use of fossil fuel based electricity for operation will be included within the project boundary unless it can be demonstrated that they can be considered negligible as the project activity may include the generation of renewable energy and does not include additional electrical appliances except for blowers whose consumption is minimal and is to be supplied by the system itself.
- If the recovered biogas is combusted for electrical energy production or for other gainful use, the methane destruction efficiency can be considered as 100%, as long as energy generated by the project is being monitored.

I.6.2. Data and parameters fixed ex ante

Data / Parameter	**W_{site}**
Data unit	kg
Description	Average site animal weight for defined population
Source of data	_____ Farms data recording system. The weight will be monthly monitored with the scale installed at the farm by project owner.
Value(s) applied	To be defined at CPA level
Choice of data or Measurement methods and procedures	Used for calculating $VS_{LT,y}$ adjusted for animal weight. Based on average weight of animal census for _____ Farm.
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data / Parameter	**$W_{default}$**
Data unit	kg
Description	Default animal weight for defined population
Source of data	IPCC default Tables 10 A-7 & A-8, A-9 of IPCC 2006 Vol 4 Chapter 10 Emissions from livestock and manure management.

Value(s) applied	To be defined at CPA level
Choice of data or Measurement methods and procedures	Based on _____ breeds as justified under the methodology and described in this section under the parameters $B_{o,LT}$ and $VS_{LT,y}$.
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data / Parameter	**$N_{da,y}$**
Data unit	Days
Description	Number of days animal is alive in the farm in the year "y"
Source of data	Based on farm records and estimates.
Value(s) applied	To be defined at CPA level
Choice of data or Measurement methods and procedures	Used in the calculation of $N_{LT,y}$
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data / Parameter	**$N_{p,y}$**
Data unit	Number
Description	Number of animals produced annually of type "LT" for the year *y*
Source of data	Farm records
Value(s) applied	To be defined at CPA level
Choice of data or Measurement methods and procedures	Based on actual farm data
Purpose of data	Calculation of baseline emissions
Additional comment	-

Data / Parameter	**MCF_j**
Data unit	Fraction
Description	Annual methane conversion factor (MCF) for the baseline animal waste management system "j"
Source of data	Table 10.17 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 4 Chapter 10, "Uncovered Anaerobic Lagoon"
Value(s) applied	To be defined at CPA level
Choice of data or Measurement methods and procedures	Corresponds to '_____' manure management systems with a mean annual temperature of greater than 26°C. According to the Philippine Atmospheric Geophysical & Astronomical Services Administration (PAGASA[18]), the mean annual temperature is >26°C.
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data / Parameter	**$B_{o,LT}$**

[18] For details and record of annual mean temperature http://bagong.pagasa.dost.gov.ph/information/climate-philippines

Data unit	m^3 CH_4/kg dm
Description	Maximum methane producing potential of the volatile solid generated for animal type "LT".
Source of data	The genetic source of the production operations livestock originates from an Annex I country, and the CPA will use default values corresponding to Annex I species found in Table 10A-7 (market animals) & 10A-8 (breeding animals), Table 10A-9 (others) of IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, Chapter 10.
Value(s) applied	To be defined at CPA level
Choice of data or Measurement methods and procedures	The use of Annex I species defaults for VS is justified based on the requirements of AMS-III.D as follows: (i) _____ Farms uses formulated feed rations (FFR) which are optimized for the various stages of animal growth, category, weight gain, productivity and genetics evidence of which is available for review by the DOE. (ii) The project's specified animal weight is more similar to developed country IPCC default values (XX kg for market and XX kg for breeding) than to Asian default values (XX kg for market and breeding).
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data / Parameter	**$VS_{LT,y}$**
Data unit	Kg dm/animal/year
Description	Volatile solids for livestock "LT" entering the animal manure management system in year "y" (on a dry matter weight basis, kg dm/animal/year).
Source of data	(i) Default values: The genetic source of the production operations livestock originates from an Annex I country, and the CPA will use default values corresponding to Annex I species found in Table 10A-7 (market animals) & 10A-8 (breeding animals), Table 10A-9 (others) of IPCC Guidelines for National Greenhouse Gas Inventories, volume 4, Chapter 10. (ii) Adjustment for animal weight: VS is adjusted for animal weight according to the calculations outlined in AMS-III.D.
Value(s) applied	To be defined at CPA level
Choice of data or Measurement methods and procedures	The use of Annex I species defaults for VS is justified based on the requirements of AMS-III.D as follows: (i) _____ Farms uses formulated feed rations (FFR) which are optimized for the various stages of animal growth, category, weight gain, productivity and genetics evidence of which is available for review by the DOE (ii) The project's specified animal weight is more similar to developed country IPCC default values (ex.XX kg for market and XX kg for breeding) than to Asian default values (ex.XX kg for market and breeding).
Purpose of data	Calculation of baseline emissions
Additional comment	Calculations are shown in Section B.6.3.

Data / Parameter	**FE**
Data unit	%
Description	Flare efficiency
Source of data	Based on defaults defined in tool for "Project emissions from flaring "
Value(s) applied	To be defined at CPA level
Choice of data or Measurement methods and procedures	As per the Tool for "Project emissions from flaring" the value will be set depending on the following conditions: For enclosed flares, Flare efficiency is 90% if (a)the temperature of the flare and the flow rate of the residual gas to the flare

	is within the manufacturer's specification for the flare in minute m; and (b) The flame is detected in minute m . Otherwise flare efficiency, m is 0%. For enclosed flares that are defined as low height flares, the flare efficiency shall be adjusted, as a conservative approach, by subtracting 10 percentile points. For example, the default value applied shall be 80%, rather than 90%. In the case of open flares, the flare efficiency in the minute m is 50% when the flame is detected in the minute m ($Flame_m$), otherwise FE,m is 0%.
Purpose of data	Calculation of project emissions
Additional comment	None

Data / Parameter	**$SPEC_{flare}$**
Data unit	Temperature - °C Flow rate or heat flux - kg/h or m_3/h Maintenance schedule - number of days
Description	Manufacturer's flare specifications for temperature, flow rate and maintenance schedule
Source of data	Flare manufacturer
Value(s) applied	To be defined at CPA level
Choice of data or Measurement methods and procedures	The flare specifications set by the manufacturer for the correct operation of the flare for the following parameters: (a) Minimum and maximum inlet flow rate, if necessary converted to flow rate at reference conditions or heat flux; (b) Minimum and maximum operating temperature; and (c) Maximum duration in days between maintenance events [Choose as relevant].
Purpose of data	Calculation of project emissions
Additional comment	Only applicable in case of enclosed flares. The maintenance schedule is not required if Option A is selected to determine flare efficiency of an enclosed flare

Data / Parameter	**GWP_{CH4}**
Data unit	tCO_2-e/tCH_4
Description	Global warming potential for CH_4
Source of data	IPCC
Value(s) applied	25
Choice of data or Measurement methods and procedures	
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data / Parameter	**$MS\%_{Bi,y}$**
Data unit	Fraction

Description	Fraction of manure handled in the baseline animal manure management system
Source of data	Based on baseline system operation.
Value(s) applied	To be defined at CPA level
Choice of data or Measurement methods and procedures	All manure was treated in the _____.
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data / Parameter	**$W_{CH4,y}$**
Data unit	%
Description	Methane content in biogas in year "y"
Source of data	Based on options provided in AMS III D v21
Value(s) applied	60% (dry basis)
Choice of data or Measurement methods and procedures	Default value used.
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data / Parameter	**nd_y**
Data unit	Days
Description	Number of days in year "y" where the treatment plant is operational.
Source of data	Based on project design.
Value(s) applied	To be defined at CPA level
Choice of data or Measurement methods and procedures	Used in calculating $VS_{LT,y}$
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data / Parameter	**EG_y**
Data unit	MWh
Description	Net quantity of electricity estimated to be generated in the project plant during the year y
Source of data	Estimated based on project design and as outlined in this PoA-DD
Value(s) applied	To be defined at CPA level
Choice of data or Measurement methods and procedures	Based on requirements of AMS-I.F and dependent on the particulars of the CPA; whether addition on capacity, retrofit, or otherwise as per AMS-I.F.
Purpose of data	Calculation of baseline emissions
Additional comment	None

Data / Parameter	**$EF_{CO2,y}$**
Data unit	tCO_2 / MWh
Description	Factor of emissions of the _____ electricity grid
Source of data	2015-2017 National Grid Emission Factor published by the Philippines Department of Energy (DOE).

Value(s) applied	To be defined at CPA level ,based on grid
Choice of data or Measurement methods and procedures	Combined margin (including inter-regional and cross-border electricity transfers), provided by Philippine DOE (Department of Energy).
Purpose of data	Calculation of baseline emissions
Additional comment	$EF_{CO2,y}$ is calculated as a weighted sum of the OM and BM emission factors

I.6.3. Modalities for ex ante calculation of emission reductions

Ex ante emission reductions of the project activity were calculated using the following formula:

$$PER_y = MER_y + GER_y$$

Where

MER_y Emission reduction in year "y" (tCO_2-e) from methane recovery (as per AMS-III.D)

GER_y Emission reduction in year "y" (tCO_2-e) from renewable electricity generation (as per AMS-I.F)

Ex ante emissions from methane recovery were calculated using the following formula:

$$MER_y = MBE_y - (MPE_y + MLeakage_y)$$

Where

MER_y	Emission reduction in year "y" (tCO_2-e)
MBE_y	Baseline emissions in year "y" (tCO_2-e)
MPE_y	Project emissions in year "y" (tCO_2-e)
$MLeakage_y$	Project leakage in year "y" (tCO_2-e)

Baseline emissions (MBE_y), project emissions (MPE_y) and leakage ($MLeakage_y$) were calculated based on AMS-III.D as shown below:

Baseline Emissions from methane recovery and destruction (MBEy)

Baseline emissions are calculated using the amount of the waste or raw material that would decay anaerobically in the absence of the project activity. The following formula was used:

$$MBE_y = GWP_{CH4} * D_{CH4} * Uf_b * \sum_{j,LT} MCF_j * B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{Bl,j}$$

where:

MBE_y	baseline emissions in year "y" (tCO_2-e/yr)
GWP_{CH4}	Global Warming Potential (GWP) of CH_4
D_{CH4}	CH_4 density (0.00067 t/m^3 at room temperature (20ºC) and 1 atm pressure).
LT	Index for all types of livestock
j	Index for animal waste management system
MCF_j	Annual methane conversion factor (MCF) for the baseline animal waste management system "j" in percentages (digester in project scenario).
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated for animal type "LT" (m_3 CH_4/kg dm)
$N_{LT,y}$	Annual average number of animals of type "LT" in year "y" (numbers) calculated using the formula below.

$VS_{LT,y}$ Volatile solids for livestock "LT" entering the animal manure management system in year "y" (on a dry matter weight basis, kg dm/animal/year)
$MS\%_{Bl,j}$ Fraction of manure handled in baseline animal manure management system "j"
UF_b Model correction factor to account for model uncertainties (0.94)

Annual average animal population ($N_{LT,y}$) for livestock is determined from actual and projected livestock census for _____ farm and calculated:

$N_{LT,y} = Nda_{,y} * (Np_{,y}/365)$

where:
$Nda_{,y}$ Number of days animal is alive in the farm in the year "y" (numbers)
$Np_{,y}$ Number of animals produced annually of type "LT" for the year "y" (numbers)

Population projections	Livestock Type				Livestock Type	
	LT_1		LT_2		LT_3	
Year	average population	average weight (kg)	average population	average weight (kg)	average population	average weight (kg)
XX	XX	XX	XX	XX	XX	XX

Calculation of VS: VS are calculated by adjusting default VS using site specific animal weights as follows:

$VS_{site,LT,y} = (W_{site} / W_{default}) \times VS_{default} * nd_y$

where:

$VS_{site,LT,y}$ Adjusted volatile solid excretion for livestock "LT" entering the animal manure management system in year "y" (on a dry matter weight basis, kg dm/animal/year)
W_{site} Average site animal weight for defined population, in kg.
$W_{default}$ Default average animal weight for defined population, in kg.
$VS_{default}$ Default value (IPCC) for the volatile solid excretion per day on a dry- matter basis for defined livestock population, in kg-dm/animal/year
nd_y Number of days in year "y" where the treatment plant was operational

Parameter	W_{site}	$W_{default}$	$VS_{default}$	nd_y	Calculated value ($VS_{LT,y}$)
$VS_{breed,y}$	XX	XX	XX	XX	XX
$VS_{market,,y}$	XX	XX	XX	XX	XX

Summary of Calculation of Annual Baseline Emissions: Summarized below are the constants and outcome of the calculation from the formula above for MBE_y.

Parameter	Value
GWP_{CH4}	25
D_{CH4}	0.00067

Uf_b	0.94
MCF_j	XX
$B_{0\ breed,y}$	XX
$B_{0\ market,y}$	XX
$VS_{\ breed,y}$	XX
$VS_{\ market,y}$	XX
$N_{\ breed,y}$	XX
$N_{\ market\ ,\ y}$	XX
$MS\%_{BI,\ j}$	XX
MBE_y	_____ tCO_2-e/yr

Project Emissions from methane recovery and destruction (MPE_y)

Project emissions are calculated using the following formula:

$MPE_y = PE_{PL,,y} + PE_{flare,y} + PE_{power,y}$

Where:

MPE_y	Project emissions in year "y" (tCO_2e)
$PE_{PL,y}$	Emissions due to physical leakage of biogas in year "y" (tCO_2e)
$PE_{flare,y}$	Emissions from flaring of the biogas stream in the year "y" (tCO_2e)
$PE_{power,y}$	Emissions from the use of fossil fuel or electricity for the operation of the installed facilities in the year "y" (tCO_2e)

Emissions due to physical leakage ($PE_{PL,y}$) are estimated as per AMS-III.D as 10% of: the maximum methane producing potential of the manure fed into the management systems implemented by the project activity. As the ___ farm system is not a sequential treatment system no adjustment (RVS) is necessary to account for sequential stages.

$PE_{PL,y} = 0.10 * GWP_{CH4} * D_{CH4} * \sum_{j,LT} B_{0,LT} * N_{LT,y} * VS_{LT,y} * MS\%_{i,y}$

Refer to MBE_y formula for the value of the parameters applied in $PE_{PL,y}$ equation. $PE_{PL,y}$ is calculated as ____ tCO_2e/year on average of the crediting period.

Emissions due to flaring ($PE_{flare,y}$) The ____ farm system may flare the biogas when the energy generator is not operational and in case there is sufficient biogas available in the digester. The *ex-ante* project emissions are calculated using a default flare efficiency of 0.5 or 0.9 depending on the type of flare to be installed at CPA level during downtime of the energy generator. *Ex-post*, these will be calculated using the Tool for "Project emissions from flaring"' through the following formula:

$PE_{flare} = \Sigma\ F_{CH4\ RG,m} * (1 - FE_{,\ m}) * GWP_{CH4} / 1000$

Where:

$F_{CH4\ RG,m}$	is the mass flow rate of methane in residual gas in minute m
FE, *m*	is the flare efficiency in minute m
GWP_{CH4}	is the GWP of methane according to IPCC.

Mass flow of methane in the residual gas in the minute *m*

$$F_{CH4\ RG,m} = FV_{RG,m} * fv_{CH4,RG,m} * \rho_{CH\ 4,n}$$

Where:

$FV_{RG,m}$ Volumetric flow rate of the residual gas in dry basis at normal (Nm^3) conditions in minute, m (also volumetric flow rate of gas going to the flare)

$fv_{CH4,RG,m}$ Volumetric fraction of methane in the residual gas on dry basis in min, *m* (this corresponds to w_{CH4}).

$\rho_{CH\ 4,n}$ Density of methane at normal conditions (0.716 kg/m^3)

The list of parameters, as required under the *Tool to determine "Project emissions from flaring"* will be monitored ex-post and $PE_{flare,y}$ will be adjusted accordingly.

$PE_{flare,y}$ is calculated as __ tCO_2e/year on average of the crediting period, based on a XX% *ex-ante* default value for flare efficiency.

Emission for power use ($PE_{power,y}$) is zero because the farm is expected to use the power from recovered biogas for the operation of the facility.

Average annual project emissions from methane recovery and destruction (MPE_y)

Parameter	Value
$PE_{PL,,y}$	XX
$PE_{flare,y}$	XX
$PE_{power,y}$	XX
MPE_y	_____**tCO_2-e/yr**

Leakage from methane recovery and destruction ($MLeakage_y$)

The _____ CPA [does/not] involve replacement of equipment and therefore leakage is ___.

The annual emission reduction from methane recovery is estimated as:

Methane recovery emission reductions	MBE_y tCO_2e	MPE_y tCO_2e	MER_y tCO_2e
Year	XX	XX	XX
Year	XX	XX	XX

***Ex ante* emissions from renewable electricity generation** are calculated using the following formula:

$$GER_y = GBE_y - (GPE_y + GLeakage_y)$$

Where

GER_y Emission reduction in year "y" (tCO_2-e) from electricity generation

GBE_y Baseline emissions in year "y" (tCO_2-e) from renewable electricity generation

GPE_y Project emissions in year "y" (tCO_2-e) from renewable electricity generation

$GLeakage_y$ Project leakage in year "y" (tCO_2-e) from renewable electricity generation

Baseline emissions (GBE_y), project emissions (GPE_y) and leakage ($GLeakage_y$) from renewable electricity generation are to be calculated based on AMS-I.F as shown below:

Baseline Emissions from electricity generation (GBE_y)

Baseline emissions related to the use of the recovered methane for electricity generation that displaces electricity from a fossil fuelbased electricity distribution system are equivalent to the amount of electricity (MWh) produced by the project activity multiplied by the emission factor (tCO_2/MWh) of the relevant electrical grid.

$GBE_y = (EG_y - EG_{baseline}) * EF_{CO2,y}$

Where

GBE_y Baseline emissions in year y (tCO_2) from renewable electricity generation
EG_y Electricity generated by the project in year y (MWh/yr)
$EG_{baseline}$ Baseline electricity supplied to the grid in case of modified or retrofit units (MWh/yr) $EF_{CO2,y}$ Baseline emissions factor (tCO_2-e/MWh)

Electricity generated by the project (EG_y) are estimated based on the rated capacity of XX kW. XX gas engines will be used for electricity generation utilizing the recovered methane. The engines are assumed to run XX hours a day, (365-n) days a year, where n is the amount of days that the generator is expected to be on maintenance, for a total of XXXX hours a year at an operating rate of XX%. The total annual amount of electricity displaced from the grid by the project activity is estimated as:

EG_y = XX MW * XX% * X,XXX hours
EG_y = XX MWh / year

Baseline electricity generated ($EG_{baseline}$) is considered ____ as the project [does/not] involve any modification / retrofit or addition to an existing generating facility.

$EG_{baseline}$ = XX MWh

Baseline emissions factor (EF_y) are from official sources using the combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "Tool to calculate the emission factor for an electricity system". The electricity system considered is the _____ grid.
EF_y = XX tCO_2-e/MWh

The total annual baseline emission to be considered in electricity generation is estimated as:

GBEy = (XX MWh - 0 MWh) * XX tCO_2-e/MWh
GBEy = XX tCO_2-e / year

Project emission from electricity generation (GPE_y)

As per methodology AMS-III.D. (version 21 paragraph 6), "If recovered methane is used to power auxiliary equipment of the project it should be taken into account accordingly, using zero as its emission factor." Thus when the project activities include the generation of electricity using the recovered methane to power auxiliary equipment i.e. blowers of minimal consumption, electricity generation will be taken into account and zero will be used as its emission factor.

$PE_{power,y} = EC_{AE} * 0$

In the event that there is not enough gas, or for any other reason the energy generator is not operating, the project activity shall monitor the energy consumption from the grid $EC_{PJ,y,}$ and

shall consider it as project activity emissions, where the emission factor will be that for the Philippine grid it is connected to. Where:

$PE_{power,y} = EC_{PJ,y} * EF_y$

Leakage from electricity generation ($GLeakage_y$)

As per AMS-I.F version 3 paragraph 25,"General guidance on leakage in biomass project activities shall be followed to quantify leakages pertaining to the use of biomass residues". [not applicable] . There is no leakage to be considered as the energy generating equipment is not transferred equipment from another activity.

The average annual emission reduction by the generation of electricity from recovered methane that displaces fossil fuel- based electricity from the grid is estimated as:

$GER_y = GBE_y - (GPE_y + GLeakage_y)$
$GER_y = XX\ tCO_2\text{-}e - (0 + 0)$
$GER_y = XX\ tCO_2\text{-}e / year$

The total annual emission reduction of the project activity is estimated as:

$PER_y = MER_y + GER_y$
$PER_y = XX\ tCO_2\text{-}e/yr + XX\ tCO_2\text{-}e/year$
$PER_y = XX\ tCO_2\text{-}e/yr$

I.7. Monitoring plan

I.7.1. Data and parameters to be monitored

Data / Parameter:	**$BG_{burnt,y}$**
Data unit:	Nm^3
Description:	Biogas flared or combusted in year "y"
Source of data:	flow meters on site
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	The amount of biogas recovered and fuelled, flared or used gainfully shall be monitored ex post, using flow meters. If the biogas flared and fuelled (or utilized) is continuously monitored separately, the two fractions can be added to determine the biogas recovered. In that case, recovered biogas need not be monitored separately. The system should be built and operated to ensure that there is no air ingress into the biogas pipeline. The methane content measurement shall be carried out close to a location in the system where a biogas flow measurement takes place, and on the same basis (wet or dry)If default value for methane content is used, this will be reported on dry basis.
Monitoring frequency:	Annually, based on continuous flow measurement with accumulated volume recording (e.g. hourly/daily accumulated reading)
QA/QC procedures:	Flow meters shall be subject to regular maintenance, testing and calibration.
Purpose of data	Calculation of baseline emissions

Additional comment:	Project activities where a portion of the biogas is destroyed through flaring and the other portion is used for energy may consider applying the flare efficiency to the portion of the biogas used for energy, if separate measurements of the respective flows are not performed. When the amount of methane that is combusted for energy and that is flared is separately monitored, a destruction efficiency of 100% can be used for the amount that is combusted for energy Data will be kept for two years after the end of the crediting period. Alternatively, if the CPA utilize the recovered methane for power generation, and if no flow meter is installed on site, this parameter will not be reported for monitoring.

Data / Parameter:	**$FV_{RG,m}$**
Data unit:	Nm^3
Description:	Parameter related to project emissions from flaring of the residual gas stream in year y -Volumetric flow rate of the residual gas in dry basis at normal conditions in minute, m; also volumetric flow rate of gas going to the flare
Source of data:	Flare flow meter, or if combined, total biogas flow meter on site
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	Used to calculate $PE_{flare,y}$. As per the tool "Project emissions from flaring"
Monitoring frequency:	Annually, based on continuous flow measurement with accumulated volume recording (e.g. hourly/daily accumulated reading)
QA/QC procedures:	Flow meters shall be subject to regular maintenance, testing and calibration.
Purpose of data	Calculation of project emissions
Additional comment:	Project activities where a portion of the biogas is destroyed through flaring and the other portion is used for energy may consider applying the flare efficiency to the portion of the biogas used for energy, if separate measurements of the respective flows are not performed. Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**T**
Data unit:	^oC
Description:	Temperature of the biogas
Source of data:	Project implementer
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	Measured continuously. No separate monitoring is necessary when using flow meters that automatically measure the temperature and pressure, expressing biogas volumes in normalized cubic meters
Monitoring frequency:	Monitored continuously

QA/QC procedures:	Measuring instruments shall be subject to a regular maintenance and testing regime, based on the manufacturer/supplier's recommendations
Purpose of data	Calculation of baseline emissions
Additional comment:	Alternatively, if the CPA utilize the recovered methane for power generation, and if no flow meter is installed on site, this parameter will not be reported for monitoring. Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**P**
Data unit:	Pa
Description:	Pressure of the biogas
Source of data:	Project implementer
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	Measured continuously. No separate monitoring is necessary when using flow meters that automatically measure the temperature and pressure, expressing biogas volumes in normalized cubic meters
Monitoring frequency:	Monitored continuously.
QA/QC procedures:	Measuring instruments shall be subject to a regular maintenance and testing regime, based on the manufacturer/supplier's recommendations
Purpose of data	Calculation of baseline emissions
Additional comment:	Alternatively, if the CPA utilize the recovered methane for power generation, and if no flow meter is installed on site, this parameter will not be reported for monitoring. Data will be kept for two years after the end of the crediting period.

Data / Parameter:	**FE**
Data unit:	%
Description:	Flare efficiency in the year "y"
Source of data:	Default will be used as per the Tool "Project emissions from flaring" (Option A)
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	As per the Tool for "Project emissions from flaring" the value will be set depending on the following conditions: For enclosed flares 0.9 If (a)the temperature of the flare and the flow rate of the residual gas to the flare is within the manufacturer's specification for the flare in minute m; and (b) The flame is detected in minute m . 0 otherwise. Otherwise flare efficiency, m is 0%. For enclosed flares that are defined as low height flares, the flare efficiency shall be adjusted, as a conservative approach, by subtracting 10 percentile points. For example, the default value applied shall be 80%, rather than 90%. For open flares, 0.5 flare efficiency in the minute m is 50% when the flame is detected in the minute m 0 otherwise
Monitoring frequency:	Continuous

QA/QC procedures:	Regular maintenance shall be carried out to ensure optimal operation of flares as per manufacturer/supplier recommendations.
Purpose of data	Calculation of project emissions
Additional comment:	Data will be kept for two years after the end of the crediting period

Data / Parameter:	$T_{EG,m}$
Data unit:	°C
Description:	Temperature in the exhaust gas of the enclosed flare in minute *m*
Source of data:	Measurements by farm owners.
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	Measure the temperature of the exhaust gas in the flare by an appropriate temperature measurement equipment. Measurements outside the operational temperature specified by the manufacturer may indicate that the flare is not functioning correctly and may require maintenance. Flare manufacturers must provide suitable monitoring ports for the monitoring of the temperature of the flare. These would normally be expected to be in the middle third of the flare. Where more than one temperature port is fitted to the flare, the flare manufacturer must provide written instructions detailing the conditions under which each location shall be used and the port most suitable for monitoring the operation of the flare according to manufacturer's specifications for temperature
Monitoring frequency:	Once per minute
QA/QC procedures:	Temperature measurement equipment should be replaced or calibrated in accordance with their maintenance schedule
Purpose of data	Calculation of project emissions
Additional comment:	Unexpected changes such as a sudden increase/drop in temperature can occur for different reasons. These events should be noted in the site records along with any corrective action that was implemented to correct the issue. Monitoring of this parameter is applicable in case of enclosed flares. Measurements are required to determine if manufacturer's flare specifications for operating temperature are met

Data / Parameter:	$Flame_m$
Data unit:	Flame on or Flame off
Description:	Flame detection of flare in the minute *m*
Source of data:	Project participants
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	Measure using a fixed installation optical flame detector: Ultra Violet detector or Infra-Red or both
Monitoring frequency:	Once per minute. Detection of flame recorded as a minute that the flame was on, otherwise recorded as a minute that the flame was off
QA/QC procedures:	Equipment shall be maintained and calibrated in accordance with manufacturer's recommendations
Purpose of data	Calculation of project emissions

Additional comment:	Applicable to all flares

Data / Parameter:	**nd_y**
Data unit:	Days
Description:	The number of days that the animal manure management system was operational.
Source of data:	Recorded on farm based on actual operation.
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	If any farm has no operations on a given day it needs to be documented (e.g. logbook) and taken into account for the calculation of BE ex-post
Monitoring frequency:	Annually, based on daily records and monthly aggregation
QA/QC procedures:	-
Purpose of data	Calculation of baseline emissions
Additional comment:	Data will be kept for two years after the end of the crediting period

Data / Parameter:	**$MS\%_{i,y}$**
Data unit:	Fraction
Description:	Fraction of manure handled in system i in project activity in year y
Source of data:	Recorded on farm based on actual operation.
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	If animal manure is treated in different treatment systems manure weight delivered to each system shall be directly measured or alternatively manure volume can be measured together with the density determined from representative sample (90/10 precision). The quantity of animal manure from different farms and different animal types shall be recorded separately for cross-check. Recording of the baseline animal manure management system where the animal manure would have been treated anaerobically is also required
Monitoring frequency:	Annually, based on daily measurement and monthly aggregation
QA/QC procedures:	-
Purpose of data	Calculation of baseline emissions ex-post
Additional comment:	Data will be kept for two years after the end of the crediting period

Data / Parameter:	**$N_{p,y}$**
Data unit:	Number
Description:	Number of animal produced annually of type “LT” for the year *y*
Source of data:	Farm records
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	Based on animal census in each farm
Monitoring frequency:	Annually, based on monthly records.
QA/QC procedures:	Cross checked against indirect information (records of sales and food purchases for example).
Purpose of data	Calculation of baseline emissions

Additional comment:	Data will be kept for two years after the end of the crediting period

Data / Parameter:	**$N_{da,y}$**
Data unit:	Days
Description:	Number of days animal is alive in the farm in the year “y”
Source of data:	Farm recorded data keeping system
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	As per farm records
Monitoring frequency:	Annually, based on monthly records
QA/QC procedures:	Cross checked records for sale of animals
Purpose of data	Calculation of baseline emissions
Additional comment:	Data will be kept for two years after the end of the crediting period

Data / Parameter:	**W_{site}**
Data unit:	Kg
Description:	Average animal weight of the farm’s livestock population.
Source of data:	Farm recorded data keeping system
Value(s) applied	-
Measurement methods and procedures:	Weighed on site. The weight will be monitored monthly with the scale installed at the farm by project owner The entire population will be weighed or alternately sampling procedures may be used to estimate this variable as per the latest “Standard for sampling and surveys for CDM project activities and Programmes of Activities”, using a 90/10 confidence/precision as the criteria for reliability of sampling efforts for small-scale project activities. Stratified random sampling approach will be preferred. The sample size will be determined depending on the animal population at each CPA.
Monitoring frequency:	Annually
QA/QC procedures:	Every technician to monitor the sampled animal type will fill in the date and signature; the monitor forms will be collected, summarized and kept by the project participant. In addition, the scale will be calibrated annually.
Purpose of data	Calculation of baseline emissions
Additional comment:	If current practice of farm is not to weigh sow/boar to avoid stressing them, an alternative method used by the farm to determine weights with same sample size required will be used. Data will be kept for two years after the end of the crediting period

Data / Parameter:	**Genetic source of the production operations livestock**
Data unit:	-
Description:	Genetic source of the production operations livestock originating from an Annex I Party.
Source of data:	Based on documentation of purchases of livestock.
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	-

Monitoring frequency:	-
QA/QC procedures:	-
Purpose of data	Calculation of baseline emissions
Additional comment:	Data will be kept for two years after the end of the crediting period

Data / Parameter:	**FFR**
Data unit:	--
Description:	Use of formulated feed rations.
Source of data:	Based on on-farm record keeping, feed supplier and other documentation.
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	Information collected will validate that the farm is using formulated feed rations which are optimized for the various animal(s), stage of growth, category, weight gain/productivity and/or genetics.
Monitoring frequency:	-
QA/QC procedures:	-
Purpose of data	Calculation of baseline emissions
Additional comment:	Data will be kept for two years after the end of the crediting period

Data / Parameter:	**RVS**
Data unit:	%
Description:	Relative reduction of volatile solids from the previous stage
Source of data:	Farm recorded data keeping system
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	Only applies to sequential manure management systems. This is estimated in a conservative manner based on monitored reductions in each stage for VS or using default values contained in AMS-III.D.
Monitoring frequency:	Annually
QA/QC procedures:	-
Purpose of data	Calculation of baseline emissions
Additional comment:	Data will be kept for two years after the end of the crediting period

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Total electricity generated from the recovered biogas in the year y
Source of data:	energy meter
Value(s) applied	To be provided by CPA implementer
Measurement methods and procedures:	Measurement using energy meter. Only required for project activities that utilize the recovered methane for power generation
Monitoring frequency:	Annually, based on monthly records
QA/QC procedures:	Equipment shall be maintained as per manufacturer/supplier specifications
Purpose of data	Calculation of baseline emissions
Additional comment:	Data will be kept for two years after the end of the crediting period

Data / Parameter:	EC_{AE}
Data unit:	kWh
Description:	Electricity consumed by the auxiliary equipment within the project activity during the year y
Source of data:	Electricity sub-meter
Value(s) applied	Actual measurement
Measurement methods and procedures:	To be measured from electrical sub-meters installed at the site. Data will be archived electronically.
Monitoring frequency:	-
QA/QC procedures:	internal audits, capacity assessments, equipment monitoring & performance standards, equipment calibration, process control
Purpose of data	Calculation of project emissions
Additional comment:	Only to be monitored if the recovered biogas is used to power auxiliary equipment of the project activity. Data will be kept for two years after the end of the crediting period

Data / Parameter:	$EC_{PJ,j,y}$
Data unit:	MWh
Description:	Quantity of electricity from the grid consumed by the project activity during the year MWh
Source of data:	Project participants, electricity meter to be installed
Value(s) applied	To be provided by CPA implementer.
Measurement methods and procedures:	Electricity meter. Measured continuously, aggregated as required for the period used for the verification of the PoA
Monitoring frequency:	Annually, based on monthly records
QA/QC procedures:	Electricity meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy
Purpose of data	Calculation of project emissions
Additional comment:	As per the *"Tool to calculate baseline, project and/or leakage emissions from electricity consumption";* scenario A Data will be kept for at least two years after the end of the crediting period. Alternatively, in case no separate electricity meter is installed to monitor the electricity consumption of the project, it will be estimated based on the relevant equipment operating at full rated capacity plus 10% to account for distribution losses, for 8760 hours per annum", in accordance with para. 26 of the methodology.

Data / Parameter:	EE_y
Data unit:	%
Description:	Energy conversion efficiency of the project equipment
Source of data:	CPA implementer, if default value is not used
Value(s) applied	-
Measurement methods and procedures:	Specification provided by the equipment manufacture. The equipment shall be designed to utilize biogas as fuel, and efficiency specification is for this fuel. If the specification provides a range of efficiency values, the highest value of the range shall be used for the calculation

Monitoring frequency:	-
QA/QC procedures:	-
Purpose of data	Calculation of baseline emissions
Additional comment:	Report this parameter for monitoring only if default value of 40% is not applied

Parameters to be monitored in CPAs where the grid is not considered reliable

Data / Parameter:	**$FC_{i,,j,y}$**
Data unit:	Mass or volume unit per year (e.g. ton/yr or m^3/yr)
Description:	Quantity of fuel type combusted for energy generation during the year
Source of data:	On-site measurements
Value(s) applied	-
Measurement methods and procedures:	• Use either mass or volume meters. In cases where fuel is supplied from small daily tanks, rulers can be used to determine mass or volume of the fuel consumed, with the following conditions: The ruler gauge must be part of the daily tank and calibrated at least once a year and have a book of control for recording the measurements (on a daily basis or per shift); • Accessories such as transducers, sonar and piezoelectronic devices are accepted if they are properly calibrated with the ruler gauge and receiving a reasonable maintenance; • In case of daily tanks with pre-heaters for heavy oil, the calibration will be made with the system at typical operational conditions.
Monitoring frequency:	Annually, based on monthly records
QA/QC procedures:	Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Purpose of data	Calculation of project emissions
Additional comment:	Data will be kept for at least two years after the end of the crediting period

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	GJ/mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type I in year y
Source of data:	The following data sources may be used if the relevant conditions apply:

Data source	Conditions for using the data source
Values provided by the fuel supplier of the power plants in invoices	If data is collected from power plant operators (e.g, utilities).
Regional or national average default values.	If values are reliable and documented in regional or national energy statistics /energy balances.
IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.	

Value(s) applied	
Measurement methods and procedures:	Calculated using government data from the most recent three historical years for which data is available at the time of submission of the CPA-DD to the DOE.
Monitoring frequency:	-

QA/QC procedures:	-
Purpose of data	Calculation of project emissions
Additional comment:	The gross calorific value (GCV) of the fuel can be used, if gross calorific values are provided by the data sources used. In these cases, a gross calorific value will also be used as a basis for the CO_2 emission factor.

I.7.2. Sampling plan

A sampling plan may be applied for the parameter **W_{site}** (average animal weight for defined population). The sampling design described below is in line with the requirements of the "Standard for sampling and surveys for CDM project activities and programme of activities":

- *Target population*: categories of livestock as applicable; ex. categories of pigs: breeding / market / sow / boar / finisher / nursery / suckling etc.

- *Sampling method*: stratified random sampling approach with a level of confidence and precision of 90/10. This method is applicable as per AMS-III.D ver 21 Box 2 Non-binding best practice example 3
- *Sample size*: it will depend on the total number of heads per category in each farm (parameter to be monitored as N_{LT})
    - o *Parameter of interest*: average value of animal weight per type of animal (W_{site})
    - o *Target value*: it will depend on the practice of each farm

- *Data to be collected:* total number of heads per type of animal, animal weight per type and number of samples.

I.7.3. Other elements of monitoring plan

The approved monitoring methodology follows the ""General guidelines for SSC CDM methodologies ", version 23 and the approved methodologies AMS-III.D version 21 and AMS-I.F version 3.

CPA Operations Plan: ____ Farms will develop an operations plan that defines a standard against which the project performance will be measured in terms of its emission reductions (ER) and conformance with all standards and criteria under the PoA. It will assist ____ Farms in establishing a credible, transparent, and adequate data measurement, collection, recording and management system to coordinate all the monitoring requirements for generating certified emission reductions from their project and for ensuring compliance with the obligations with LBP under the PoA.

The CPA Operations Plan outlines the following plan:

Monitoring: To be monitored are those parameters described in the tables above which also detail the means of measurement and QA/QC procedures. These parameters were adapted to the situation of the ____ CPA. In particular:

Type of flare or combustion system: The type of combustion system affects the default flare efficiency. _____ Farms will probably use an open/enclosed flare when the genset(s) is/are in downtime. [*Delete as necessary*] However, it is worth noting

that _____ Farm plans to install two gensets, one used as a backup of the other one, so there might be no need for a flare ____ Farms will monitor and record the use and compliance with manufacturers' specifications as described in the monitoring plan.

Use of sequential manure management systems: _____ manure management system will not be sequential and therefore no special monitoring protocols for treatment stages are necessary. [Revise as necessary]

Type of fuel used: The monitoring of the emissions from power will depend on the source of energy used in powering the system.

Use of Annex I country VS and B_0: ___ Farms will use VS and B_0 values from Annex I countries and therefore the genetic source of the livestock will need to be monitored.

Quality Assurance and Quality Control: The proponent will have a quality assurance and quality control plan in order to ensure that monitoring is done accurately and with properly calibrated instruments. The basic requirements are outlined in the tables in the monitoring plan section. In particular, scales, methane measurement devices, waste flow measurement devices, biogas flow meters, thermometers, pressure meters and electricity meters will be calibrated as per manufacturer specifications.

Data recording: Proper management processes and systems records will be required by the operator, as the auditors will request copies of such records to judge compliance with the required management systems. All data recording of the monitored data will include both paper and electronic versions, backup systems and periodic checking for data entry mistakes.

Reporting: Monitoring data will be reported quarterly to LBP along with any major issues related to the monitoring system that may need attention. The estimation of emission reductions and reporting of the data for verification purposes will be done annually by LBP.

Calculation of emissions reductions: Based on the monitoring data the emission reductions will be calculated ex-post using the following approach:

$$PER_y = MER_{y,ex\text{-}post} + GER_{y,ex\text{-}post}$$

Where:

$MER_{y,ex\text{-}post}$ Emission reduction in year "y" (tCO_2e) from methane recovery (as per AMS III.D)
$GER_{y,ex\text{-}post}$ Emission reduction in year "y" (tCO_2e) from renewable electricity generation (as per AMS I.F)

The emission reductions achieved in any year from methane recovery are the lowest value of the following:

$$MER_{y,ex\text{-}post} = \min [(MBE_{y,ex\text{-}post} - MPE_{y,ex\text{-}post}) , (MD_y)]$$

Where:

$ER_{y,ex\text{-}post}$ Emission reductions achieved by the project activity based on monitored values for year "y" (tCO_2e)
$BE_{y,ex\text{-}post}$ Baseline emissions calculated using the formula found in Section I.6.1 using *ex post* monitored values of $N_{LT,y}$ and if applicable $VS_{LT,y}$
$PE_{y,ex\text{-}post}$ Project emissions calculated using the formula found in Section I.6.1 using *ex post*

monitored values of $N_{LT,y}$, $MS\%_{i,y}$ and if applicable $VS_{LT,y}$

MD_y Methane captured and destroyed or used gainfully by the project activity in year "y" (tCO_2e)

$$MD_y = BG_{burnt,y} * W_{CH4,y} * D_{CH4} * FE * GWP_{CH4}$$

Where:

$BG_{burnt,y}$	Biogas flared or combusted in year "y" (m^3).
$W_{CH4,y}$	Methane content in biogas in the year "y" (volume fraction)
FE	Flare efficiency in the year "y" (fraction) when biogas is flared

Methane content in biogas, $W_{CH4:}$ As per AMS.III.D version 21 there are three options to monitor/determine the fraction of methane in the biogas: a) should be measured with a continuous analyzer or alternatively, b) with periodical measurements at a 90/10 confidence/precision level or, alternatively c) a default value of 60% methane content can be used. For all CPAs under this PoA **option c) will be adopted**: a default value of 60% methane content

Flare efficiency FE, will be determined using default values and $PE_{flare,y}$ will be calculated using this default flare efficiency value.

Alternatively, if the CPA utilizes the recovered methane for power generation, MD_y may be calculated as follows, based on the amount of monitored electricity generation, without monitoring methane flow and concentration

$$MDy = EG_y \times 3600 / (NCV_{CH4} \times EE_y) \times D_{CH4} \times GWP_{CH4}$$

Where:

EG_y	Total electricity generated from the recovered biogas in year *y* (MWh)
3600	Conversion factor (1 MWh = 3600 MJ)
NCV_{CH4}	NCV of methane (MJ/Nm^3) use default value: 35.9 MJ/Nm^3)
EE_y	Energy conversion efficiency of the project equipment, which is determined by adopting one of the following criteria: - Specification provided by the equipment manufacture. The equipment shall be designed to utilize biogas as fuel, and efficiency specification is for this fuel. If the specification provides a range of efficiency values, the highest value of the range shall be used for the calculation; - Default efficiency of 40% (more likely option to be used by CPAs)

As per AMS III.D version 21 § 33 "Project activities where a portion of the biogas is destroyed through flaring and the other portion is used for energy may consider applying the flare efficiency to the portion of the biogas used for energy, if separate measurements of the respective flows are not performed. When the amount of methane that is combusted for energy and that is flared is separately monitored, or when only the biogas flow to the flare is monitored and the biogas used for energy is calculated based on electricity generation, a destruction efficiency of 100% can be used for the amount that is combusted for energy".

In the case of § 33 wherein no separate flows are performed, and flare efficiency is applied on $BG_{burnt,y}$, $BG_{burnt,y} = FV_{RG,m}$ and corresponding PE_{flare} will be calculated.

SECTION J. Crediting period type and duration

>> Renewable, 28 years

SECTION K. Eligibility criteria for inclusion of CPAs

LBP PoA applies to project activities that have signed an agreement to be part of the LBP Program of Activities as described in section I.2 of this PoA-DD and that meet the following criteria:

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
	Project Baseline		
1	As per PoA Guidelines, CPA is not a component of another CDM programme, has not been registered as a project activity of another CDM project, is undergoing validation within another CDM project, nor is a debundled component of a large scale project activity.	LBP CFSF Reply Form, with confirmation statement by the farm owner, indicating that the CPA is not a component of another CDM programme, has not been registered as a project activity of another CDM project, is undergoing validation within another CDM project, nor is a debundled component of a large scale project activity.	Signed Letter of Intent and confirmation statement by the CPA Implementer
2	Livestock farms from livestock populations managed under confined conditions.	As per AMS-III.D, para 3.	Documented evidence from site visit by LBP staff.
3	Livestock farms where manure or the streams obtained after treatment is not discharged into natural water resources (e.g. rivers and estuaries).	As per AMS-III.D, para 3.	Documented evidence from site visit by LBP staff.
4	Annual average temperature of baseline site where anaerobic manure treatment facility is located is higher than 5^{o}C	As per AMS-III.D, para 3.	The Philippines has a mean annual temperature over 5^{o}C. The mean annual temperature for the country is 26.6^{o}C and Baguio is the coldest place in the country and has a mean annual temperature of 18.3^{o}C. (http://bagong.pagasa.dost.gov.ph/information/climate-philippines)
5	For anaerobic treatment systems in the baseline, the retention time of manure waste must be greater than 1 month.	As per AMS-III.D, para 3	Documented evidence on site visit along with information provided by CPA implementer: Dimension of existing lagoon/s and water consumption and/or farm discharge permits
6	For anaerobic lagoons in the baseline the depth is at least 1 meter.	As per AMS-III.D, para 3	Documented evidence provided by CPA implementer.
7	The baseline system of waste management is an open anaerobic system with no methane recovery and destruction by flaring, combustion or gainful use.	As per para 3. AMS-III.D	Documented evidence from site visit by LBP staff or document provided by CPA implementer.

8	Connection to an electricity distribution system that is supplied by at least one fossil fuel generating unit.	As per para 2. AMS-I.F. v3	Documented evidence on site visit and provided by CPA implementer: grid electricity consumption receipts of the site.
	Project Activity		
9	The project objective is the replacement of existing open lagoons and anaerobic ponds in livestock farms for anaerobic digesters with combustion equipment to destroy methane by utilizing either open or standardized enclosed stainless steel flares, sized to handle the generated biogas design volume to ensure high combustion efficiency, and/or use of the recovered methane for electricity generation with gas engines	As per para 2. AMS-III.D	Documented as per project design
10	The sludge is handled aerobically, and final application is made in proper conditions (i.e.,not resulting in methane emissions).	As per AMS-III.D, para 4.	Documented as per project design
11	Technical measures are used (e.g. flared, combusted) to ensure that all biogas produced by the digester is utilized and combusted.	As per AMS-III.D, para 4.	Documented as per project design
12	The storage time of the manure after removal from the animal barns, including transportation, should not exceed 45 days before being fed into the anaerobic digester. If the project proponent can demonstrate that the dry matter content of the manure when removed from the animal barns is larger than 20%, this time constraint will not apply.	As per AMS-III.D, para 4.	Documented as per project design
13	New facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the General Guidelines to SSC CDM methodologies	As per AMS-III.D, para 7.	Documented as per project design
14	The requirements concerning demonstration of the remaining lifetime of the replaced equipment shall be met as described in the General Guidelines to SSC CDM methodologies.	As per AMS-III.D, para 8.	Documented as per project design

15	Measures are limited to those that result in aggregate emission reductions of less than or equal to 60 kt CO_2 equivalent annually from all Type III components of the project activity.	As per AMS-III.D, para 9;	Documented as per project design and ER spreadsheet calculation.
16	Renewable electricity generation from the recovered methane emissions with a maximum output capacity of 15 MW.	As per AMS-I.F v3 para 16	Documented as per project design
17	The maximum capacity of the renewable energy component (in cases where it is a combination of renewable and non-renewable) is 15 MW	As per AMS-I.F v3 para 8	Documented as per project design
18	Installation of additional generation units utilizing the recovered methane emissions at an existing renewable energy facility provided that the added capacity of the project should be lower than 15 MW and is physically distinct [19] from the existing units.	As per AMS-I.F v3 para 6	Documented as per project design
	Additionality		
19	Retrofitting or modification of an existing electricity generation facility to utilize the recovered methane emissions as fuel with the total output of the modified or retrofitted generating unit not exceeding 15 MW	As per AMS-I.F v3 para 7	Documented as per project design
20	The farm is operating an open anaerobic wastewater system in the baseline and the project technology involves higher costs of installation and operation to the farm owner coupled with higher technical requirements for construction, operation and maintenance than continued operation of the open system. Hence this shall be demonstrated through: 1- Project technology involves the installation of a biogas collection and flare/use system 2- Project needs to be financed with future carbon revenues, used as securities to repay the loan.	.As per “General guidelines for SSC CDM methodologies”	Documented evidence on site visit and provided by CPA implementer: 1.Project design with biogas collection system and 2. Confirmation letter from the financial institution providing the loan, where future carbon revenues have been presented for the loan evaluation and are partial security to repay the loan

[19] Physically distinct units are those that are capable of generating electricity without the operation of existing units and that do not directly affect the mechanical, thermal or electrical characteristics of the existing facility.

21	The farm is compliant with the applicable Philippine environmental rules and regulations	.As per Philippine environmental regulations	Copy of the environmental compliance certificate to be provided by the project implementer
	Requirement to be part of the programme		
22	After all the above conditions have been met and documented, the project proponent must have signed an MOA with LBP to be in a CPA in this program.	Project proponent must have signed an MOA with LBP to be in a CPA in this program	Signed MOA between LBP and each CPA implementer
23	Emission reductions claimed under the CPA are those derived only from gas use for electricity generation and/or flared. No credits shall be claimed for any other uses of the gas.	Emission reductions claimed under the CPA are those derived only from gas use for electricity generation and/or flared	Documented as per project design
	Environmental and Social Issues		
24	The project must have undertaken an environmental analysis as outlined in section E and a stakeholder consultation as outlined in Section F.	Conduct of Environmental impact assessment and Stakeholder's consultation as per CDM project standard	ECC at CPA level; Stakeholder comments done at the CPA level
	General Conditions		
25	Geographical boundaries of CPAs should be consistent with the geographical boundary of the PoA	As per CDM project standard for programmes of activities (version 2), paragraph 124	Geographical location of farm/project; documented evidence from site visit by LBP staff.
26	Double counting of GHG emission reductions or net anthropogenic GHG removals, should be avoided through measures such as unique identifications of product and end-user locations (e.g. programme logo)	As per CDM project standard for programmes of activities (version 2), paragraph 124	Documented as per project design
27	Start dates of CPAs should be checked through documentary evidence	As per CDM project standard for programmes of activities (version 2), paragraph 124	Documented evidence provided by CPA implementer.
28	Compliance with the applicability of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents	As per CDM project standard for programmes of activities (version 2), paragraph 124	Documented as per project design
29	If the generic CPA is small-scale or microscale, conditions for the debundling check based on the "Methodological tool: Assessment of debundling for small-scale project activities". However, if the generic CPA consists solely of units that qualify as "microscale CDM units", these conditions are not required.	As per CDM project standard for programmes of activities (version 2), paragraph 124	Documented as per project design

Appendix 1. Contact information of coordinating/managing entity and project participants

Coordinating/managing entity and/or project participants	☒ Coordinating/managing entity ☐ Project participant
Organization name	Land Bank of the Philippines
Country	Philippines
Address	1598 M.H. del Pilar cor. Dr. J. Quintos Sts 18/F LANDBANK Plaza Malate, Manila
Telephone	+632-405-7540
Fax	+632-528-8523
E-mail	
Website	www.landbank.com
Contact person	Cecilia Borromeo

Coordinating/managing entity and/or project participants	☐ Coordinating/managing entity ☒ Project participant
Organization name	International Bank for Reconstruction and Development (IBRD) as Trustee of the Spanish Carbon Fund (SCF)
Country	USA
Address	1818 H Street, NW MC46414 Washington DC
Telephone	+1 202-458-1873
Fax	+1 202-522-7432
E-mail	Ibrd-carbonfinance@worldbank.org
Website	
Contact person	Dan Radack

Coordinating/managing entity and/or project participants	☐ Coordinating/managing entity ☒ Project participant
Organization name	Kingdom of Spain- Kingdom of Spain – Ministry for the Ecological Transition & Ministry of Economy and Business
Country	Spain
Address	C/Alcala 92, 28009 Madrid, Spain
Telephone	
Fax	
E-mail	
Website	
Contact person	Valvanera Ulargui Aparicio

Coordinating/managing entity and/or project participants	☐ Coordinating/managing entity ☒ Project participant
Organization name	Swedish Energy Agency
Country	Sweden
Address	Box 310, 631 04 Eskilstuna, Sweden
Telephone	
Fax	
E-mail	
Website	
Contact person	Christopher Zink

Coordinating/managing entity and/or project participants	☐ Coordinating/managing entity ☒ Project participant
Organization name	Norwegian Ministry of Climate and Environment
Country	Norway
Address	Kongensgate 20, 0030 Oslo,Norway
Telephone	
Fax	
E-mail	
Website	
Contact person	Anne Smeby Evjen

Appendix 2. Affirmation regarding public funding

Any public funding resources available for financing of the CPAs will not purchase any GHG emission reductions generated by the proposed PoA.

Appendix 3. Applicability of methodologies and standardized baselines

Refer to section I.2

Appendix 4. Further background information on ex ante calculation of emission reductions

2015-2017 National Grid Emission Factor (NGEF)[20]

[20] The national grid emission factor published by the Philippine Department of Energy found in link https://www.doe.gov.ph/electric-power/2015-2017-national-grid-emission-factor-ngef for the Luzon-Visayas and Mindanao electricity grid.

Tables below shows the computed grid emission factor derived using the 2015-2017 power statistics.

Table 1. Summary of the NEG for Luzon-Visayas Grid

a. Simple Operating Margin (OM) Emission Factor

Parameters	(t-CO_2/MWh)
2015-2017 Average EFgrid, OMsimple,y	0.7122

b. Build Margin (BM) Emission Factor

Parameters	(t-CO_2/MWh)
BM Emission Factor	0.5979

c. Combined Margin (CM) Emission Factor

Parameters	(t-CO_2/MWh)
2015-2017 EFgrid, CM,y (Wind and solar)	0.6836
2015-2017 EFgrid, CM,y (Other projects)	0.6265

Table 2. Summary of the CDM Baseline Construction for Mindanao Grid

a. Simple Operating Margin (OM) Emission Factor

Parameters	(t-CO_2/MWh)
2015-2017 Average EFgrid, OMsimple,y	0.7797

b. Build Margin (BM) Emission Factor

Parameters	(t-CO_2/MWh)
BM Emission Factor	0.8045

c. Combined Margin (CM) Emission Factor

Parameters	(t-CO_2/MWh)
2015-2017 EFgrid, CM,y (Wind and solar)	0.7859
2015-2017 EFgrid, CM,y (Other projects)	0.7983

Appendix 5. Further background information on monitoring plan

Please refer to I.7 for details.

Appendix 6. Summary report of comments received from local stakeholders

Please refer to F.3 for details.

Appendix 7. Summary of post-registration changes

Post-registration changes approved on 29/06/2015
Corrections

- Calculation formula for of ex-ante project emissions from flaring has been clarified to use the default flare efficiency of 0.9.
- Nomenclature of parameters between sections has been corrected for consistency
- It has been clarified that if the recovered biogas is combusted for electrical energy production or for other gainful use, the methane destruction efficiency can be considered as 100%, as long as the energy generated by the project is being monitored.
- Parameter GWP_{CH4} has been clarified to include the value to be used in the second commitment period of the Kyoto Protocol.

Permanent changes from the registered monitoring plan or applied methodology:

- Measurement methods have been added to parameter $BG_{burnt,y}$
- Parameters T and P, temperature and pressure of the biogas, have been added
- The flare Efficiency parameter name has been corrected for consistency within the document and text has been added to comply with the “Tool to determine project emissions from flaring gases containing methane”.
- References to specific equipment have been deleted in parameter T_{flare}.
- Text has been clarified for parameter “other flare operation parameters”.
- Parameter EGy has been clarified following that in version 19 of AMS-III.D .
- An alternative has been included for the monitoring of grid electricity consumption, following the provision on paragraph 26 of the methodology (AMS-III.D version 17), to monitor the farms electricity consumption when there is no separate electricity meter.
- Possible use of sampling methods and procedures for parameter $\mathbf{W_{site}}$ has been added.

Post-registration changes requested in May 2017:
Corrections:

- The flare efficiency default value will be defined at CPA level
- Editorial changes including typo mistakes, incorrect sentences and inconsistencies

Permanent changes from the registered monitoring plan or applied methodology:

- Alternative monitoring of MD_y based on the amount of monitored electricity generation, without monitoring methane flow and concentration (based on para. 29 of AMS-III.D v 20.1)

Additional comment: parameters $BG_{burnt,y}$, T and P will not be included in the monitoring in case MD_y is not calculated based on flow meters, temperature sensor and pressure sensor measurements but based on the amount of monitored electricity generation

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Document information

Version	*Date*	*Description*
09.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN); • Make editorial improvements.
08.1	28 June 2017	Revision to: • Remove a duplicated instruction; • Make editorial improvement.
08.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for programmes of activities" and with the PDD and CPA-DD forms; • Make editorial improvement.
07.0	25 May 2017	Revision to: • Ensure consistency with the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN) (version 01.0); • Incorporate the "Programme design document form for small-scale CDM programmes of activities" (CDM-SSC-PoA-DD-FORM); • Make editorial improvement.
06.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
05.0	9 March 2015	Revision to: • Include provisions related to choice of start date of PoA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Add exception for generic CPA where technology is under positive lists; • Make editorial improvement.
04.1	5 August 2014	Editorial revision to correct the document information table.

Version	*Date*	*Description*
04.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM programme of activities (these instructions supersede the Guideline: Completing the programme design document form for CDM programme of activities (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the PoA in B.4 and Appendix 1; • Add general instructions on post-registration changes in paragraphs 2 and 3 of general instructions and Appendix 6; • Change the reference number from F-CDM-PoA-DD to CDM-PoA-DD-FORM; • Make editorial improvement.
03.0	3 December 2012	EB 70 Revision to reflect changes to the *Guideline: Completing the programme design document form for CDM programmes of activities* (EB 70, Annex 6).
02.0	13 March 2012	EB 66 Revision required to ensure consistency with the "Guidelines for completing the programme design document form for CDM programmes of activities" (EB 66, annex 12).
01.0	27 July 2007	EB 33, Annex 41 Initial publication.

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