Project design document form for CDM project activities

(Version 05.0)

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	GGP Biogas Project
Version number of the PDD	06
Completion date of the PDD	09/10/2014
Project participant(s)	• PT. Great Giant Pineapple (GGP) • Ministry of Climate and Energy, Danish Energy Agency
Host Party	Indonesia
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	**Sectoral scope:** 13 Waste handling and disposal. **Selected methodology:** ACM0014 version 04.1, Mitigation of greenhouse gas emissions from treatment of industrial wastewater".
Estimated amount of annual average GHG emission reductions	40,813 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

PT Gunung Sewu Kencana's (GSK) agribusiness operations in Lampung consist of two partially integrated commercial activities each operated by a subsidiary of GSK as follows;

- PT. Great Giant Pineapple (GGP), which operates the single largest vertically integrated pineapple plantation, cannery and juice concentrate operations in the world, meeting the highest quality standards in the United States, Europe and Japan. Currently the plants processing capacity is 2,500 tonnes of pineapple / day.
- PT. Umas Jaya Agrotama (UJA), a Tapioca Starch Division, currently is the third largest domestic producer in Indonesia. Current plant capacity is 200 tonnes of Tapioca starch / day.

Each of these operations currently treats their processing wastewater in separate lagoon based wastewater treatment systems which are a combination of open anaerobic, facultative and aerobic lagoons, with electrical powered forced aeration on the aerobic lagoons of GGP (refer Section A2.4. for lagoon layout). Methane generated through the anaerobic treatment of the high COD processing wastewater is currently being emitted to the atmosphere, contributing to Climate Change.

This Project will contribute to reducing the impacts of Climate Change through the installation of a new closed anaerobic wastewater treatment facility (Upflow Anaerobic Sludge Blanket digester, UASB) with biogas recover system. The installation of this new UASB wastewater treatment facility (WWT) will replace all of the existing anaerobic lagoons of GGP and UJA. This is except for UJA Lagoon 1 which will be redeveloped for mixing the effluent streams of UJA and GGP and stabilizing the highly acidic effluent from GGP prior to entry into the UASB facility. Of the existing aerobic lagoons only the aerobic lagoons of UJA will be used under the project activity for final "polishing" of the UASB effluent prior to release into the environment. The entire lagoon based WWT system of GGP, including the forced aeration, are not required under the project activity.

Biogas generated in the UASB will be use to supplement the current fossil fuel consumption used to provide the energy requirements of the processing facilities. The energy requirements are currently being met by;

- Electricity and Process Steam for the operational activities of the processing companies are provided via a captive 14MW Coal Fired Power Plant, own and operated by GGP, consisting of three steam boilers and two steam turbines. Steam produce through the combustion of coal in the boilers is used for the generation of electricity and process heat in the UJA factory.

  The electricity is distributed to the processing factories via an internal grid; no electricity is imported or exported for the operational activities of these companies. Due to the operational configuration of the power plant's boilers the plant runs 365 days a years regardless of any downtime of the internal grid,

  Waste steam from the power plant is directed to the heat recovery facility of UJA cassava factory for pre heating processing air.

- UJA uses thermal boilers fired by Heavy Fuel Oil (HFO) for the production of heat for the starch drying process. This fossil fuel generated process heat is supplemented with waste steam recovered from the Power Plant. The waste steam is used to pre-heat air prior to being further heated by the two (2) thermal boilers of UJA to the temperature required by the starch flash dryers. Waste steam will continue to be used under the project activity.

Greenhouse gases (CO_2) are emitted through the combustion of coal for steam generation and HFO for heat generation contributing to Climate Change. Biogas generated and captured in the UASB digester under the project activity will be used to reduce CO_2 emission via:

- Displacement of 100% of the HFO used in the two (2) thermal boilers that provide heat for UJA's cassava processing by retrofitting the HFO burners of the two thermal boilers with Bio Burners.

- Substitution of coal by biogas for steam generation in the Power Plant. The expected substitution is approximately 8 to 9% of the total energy requirement of the Power Plant. Due to limited energy availability from the biogas the use of only one boiler is viable but due to operational rotation of boilers during the year two (2) of the three (3) boilers will be retrofitted with biogas burners to provide year long utilization of the biogas, and

- For operational and safety reasons an "Open Flare" will be installed under the project activity for methane destruction when required.

Community development focus of the project

As the total workforce of UJA and GGP at the Lampung facility is approximately 14,234 they have an established Community Relation Development (CRD) which works with social development activities for all employees and the surrounding communities. Through the implementation of this CDM project the companies' will be able to enhance their current CRD Programs which cover such areas as follows:

- **Social Economy Development Program:** partnership with PKK (women organisation) in supplying employees' uniforms and also partnership with farmers.
- **Rolling Budget Program:** This stimulant is given to small economy productive units includes PKK groups, handicrafts home industry and other units around PT. GGP.
- **Social and Development Participation:** for examples, providing clean water for 197 villages and organizations in Lampung Tengah; Bamboo for 12 villages including social organizations, education facilities for schools and District Police Department. Other assisstance provided are: provision of budgets for social activities both personal and groups. The biggest contribution has been for the renovation of Trans Sumatera road in Lampung which has been badly destroyed by natural disasaters. disasaters.

Additionally the project is expected to deliver further benefits to the surrrounding community as follows:

- At present the unemployment rate is increasing, it is expected this GPP's methane gas capture project can improve job opportunities for surrounding community based on their required competency.
- Reducing odor from the wastewater lagoons.
- Reducing production costs, so that the company can be competitive and the sustainability can be maintained. By the ability to compete and the existence of the company business can be well maintained, so that this will bring the benefits to surrounding community, both direct or indirect, such as cassava farmers will continue sell their cassava to starch mill, also food stall, supplier, transportation services and other services, the partnership with community, will be well maintained.

A.2. Location of project activity

A.2.1. Host Party

The Republic of Indonesia

A.2.2. Region/State/Province etc.

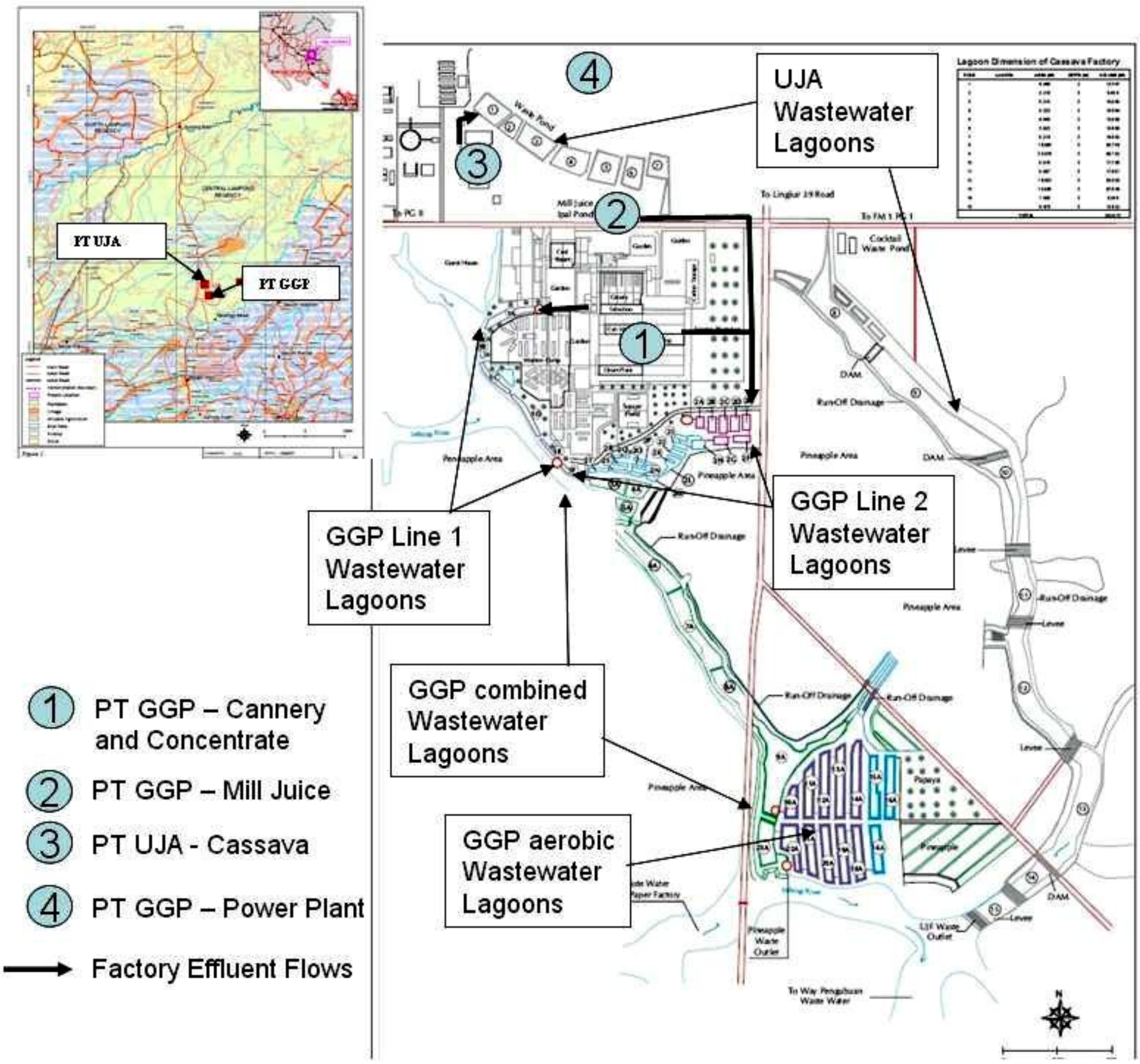
Province of Lampung
Central Lampung Regency

A.2.3. City/Town/Community etc.

Tebanggi Besar

A.2.4. Physical/Geographical location

Global coordinates of: 4^0 49' 18.71" S and 105^0 13' 53.75" E



A.3. Technologies and/or measures

The wastewater treatment technology to be implemented by this project is an Upflow Anaerobic Sludge Blanket (UASB) system. UASB, "high rate", anaerobic treatment technology are internationally recognised for their effectiveness in treating high strength organic wastewater from food processing industries.

The UASB Digester is a sealed steel cylinder wherein the conditioned influent wastewater from both GGP and UJA enters and is distributed over the entire bottom portion of the UASB digester. Baffles and settler/separator plates are provided to prevent the premature migration of solids

towards the surface. Sludge is retained at the influent distributor orifice areas spread all over the UASB bottom forming a "sludge blanket", therefore encouraging fresh influent-settled-sludge interfacing which increases sludge residence time for sufficient hydrolysis, acidification-fermentation and methanogenesis activity.

In order to maintain hydrolyzed/stabilized sludge re-circulation, up to 40% of settled sludge is pumped back to the anaerobic conditioning tank and about 60% is re-circulated within the UASB digester to effect mixing-interfacing with the fresh influent. The pump-backflow (return) enhances mixing and maintains the agitated anaerobic biological environment of the conditioning tank.

Further, re-circulation of sludge increases mean cell residence time of anaerobes in the anaerobic digester system, allowing longer periods wherein which methanogens convert acetic carbon dioxide and hydrogen into beneficial gaseous end-products as methane gas. Minimal sludge is generated overtime in the UASB due to this enhanced organic degradation process.

The treated effluent from the UASB system will flow into the existing aerobic lagoon of UJA for "polishing" prior to release into the environment. Through the utilization of this technology the Project will achieve a minimum of 90% COD removal, significantly reducing the COD load to the open aerobic lagoons, which will operate without any forced aeration, and hence the environment.

The biogas generated in the digester will be collected and distributed for use as a supplementary fuel in the existing thermal HFO heaters of UJA and the coal fired boilers of GGP power plant. To enable the use of biogas in the two (2) GGP power plant boilers (Boilers No 2 & 3) each will be retrofitted with biogas burners to enable these boilers to use coal and biogas simultaneously. The two (2) thermal boilers of UJA will have the existing HFO burners retrofitted by biogas burners. The actual amount of biogas generated in the UASB and used for fossil fuel displacement will vary according to the raw materials processed by both factories up to their designed production capacity.

For emergency and safety requirements an "open flare" will be installed for the destruction of methane when required. The destruction efficiency of the open flare is to be determined according to the UNFCCC Tool "Annex 13 - Methodological "Tool to determine project emissions from flaring gases containing methane".

As there are no heat requirements in the baseline scenario for the wastewater treatment facility or the UASB facility heat requirements per unit input of the water treatment facility remain unchanged.

Under the project activity the forced aeration which is in the baseline, will no longer be required however, electricity will be necessary for the UASB facility, approximately 766MWh/y (2,322 KWh/day x 330 days). Since in the baseline the electricity usage is 723MWh/y, the incremental difference has been accounted as part of project emissions.

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Indonesia (host)	Private entity : PT. Great Giant Pineapple (GGP) – Project Owner	No
Denmark	Ministry of Climate and Energy, Danish Energy Agency	Yes

A.5. Public funding of project activity

No ODA funds from Annex I countries will be used for this Project activity.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

The Project applies the approved consolidated baseline and monitoring methodology ACM0014 "Mitigation of greenhouse gas emissions from treatment of industrial wastewater" (Version 04.1).

The following Methodology Tools are also applied:

"Tool to determine project emissions from flaring gases containing methane", (Version 01) EB28 Annex13

"Tool for the demonstration and assessment of additionality", (Version 06)

"Tool to determine the baseline efficiency of thermal or electric energy generation systems", (Version 01)

"Tool to calculate baseline, project and/or leakage emissions from electricity consumption", (Version 01)

B.2. Applicability of methodology and standardized baseline

Methodology Applicability

ACM0014 Version 04.1 is applicable to project activities that aim at reducing methane emissions from industrial wastewater treatment. The Project Activity is applicable to Scenario 1 of this methodology as follows:

Scenario	Description of the Baseline	Description of the Project Activity
1	The wastewater is not treated, but directed to open lagoons that have clearly anaerobic conditions. In cases where solid materials are separated before directing the wastewater to the open lagoons, the solid materials have a different treatment than the wastewater	The wastewater will be treated in a new anaerobic digester. In cases where solid materials are separated from the wastewater (both in the project and baseline scenarios), they will be treated separately and not treated with the new anaerobic digester employed for treatment of liquid effluents. The biogas extracted from the anaerobic digester and, if applicable, biogas generated from the treatment of solid materials, is flared and/or used to generate electricity and/or heat. The residual from the anaerobic digester, after treatment, is directed to open lagoons and then sent to discharge or used for land application.

Project Applicability	At present, both GGP and UJA operate an open lagoon systems which consists of anaerobic, facultative and aerobic lagoons for wastewater treatment to comply with their regulator discharge requirements. All solid organic material that is separated before entering the open lagoons is combined with all other solid organic waste and processed as cattle feed. **UJA WWT** - The anaerobic lagoons clearly display active anaerobic conditions.[1] **GGP WWT** – Due to the poor performance of this WWT system in meeting the environmental discharge regulations[2], remedial steps have been undertaken to improve the anaerobic degradation of COD in this lagoon system. Through the implementation of the planned rehabilitation[3] the anaerobic lagoons (lagoons 3-9) are to be deepened from the existing average depth of 3m to > 5m to ensure that appropriate conditions are developed for anaerobic digestion and a prolonged HRT of approximately 37 days. This action, along with other remedial actions, will ensure active anaerobic conditions are developed for maximum degradation of COD. The implementation of the rehabilitation plan will ensure that the overall treatment of GGP's wastewater meets the environmental discharge regulations.	The project activity entails the replacement of the open lagoons of GGP and UJA via the installation of a closed anaerobic wastewater treatment (UASB) facility with biogas recover system. Within the UASB the degradable fraction contained in the wastewater will undergo anaerobic decomposition resulting in the generation of Biogas (CH_4 and CO_2). The treated effluent from the UASB system will flow into the existing aerobic lagoon for "polishing" prior to release into the surface waterway. The Biogas captured from this facility will be used to reduce the current consumption of coal and HFO. As the CO_2 is produced from a biogenic source these emission are neutral and not counted as GHG emissions of the project activity. Under the project activity the destruction of methane (CH_4) will occur via; • Co-combustion in the coal fired boiler of GGP Power Plant for the generation of steam and heat to meet the energy requirements of the two processing facilities, • Combustion in the heaters of UJA for process heat requirements, Combustion in the emergency Open Flare. All solid organic material that is separated before entering the UASB digester will continued to be combined with all other solid waste and processed as cattle feed.

The following applicability conditions of the methodology are met by the project activity:

- *The average depth of the open lagoons in the baseline scenario is at least 1 m^2;*
  The average depth of individual lagoons varies (refer Appendix 4);

[1] Consultants report *"GGP-UJA Biogas Project Viability Assessment"* PT ERM, April 2009

[2] http://legal-lampung.org/index.php?pilih=pergub&mod=yes

[3] Consultants report *"Improvement Of Anaerobic Lagoon Performance PT. GGP Waste Water Treatment Lagoons"*

UJA Average: 3m

GGP Average >5m according to the design requirements for the rehabilitation of GGP's anaerobic lagoons (lagoons 3 – 9).[4]

- *Heat and electricity requirements per unit input of the water treatment facility remain largely unchanged in the baseline scenario and the project activity;*

  Heat
  As there is no heat use in the baseline scenario for the wastewater treatment facility or the UASB facility heat requirements per unit input of the water treatment facility remain unchanged.

  Electricity
  Currently the aerobic lagoons of GGP require forced aeration consuming 723 MWh/year[5] of electricity from GGP's Power Plant. Under the project activity this forced aeration will become redundant but will be replaced by the parasitic electricity requirements of the UASB facility of approximately 766 MWh/year[6]. Therefore the electricity requirements per unit input of the water treatment facility will be slightly higher and therefore have been taken into account in the project emission calculations. Refer to Appendix 4 section 4-f for further details.

Data requirements as laid out in this methodology are fulfilled.

All necessary data requirements of the methodology are met as described in section B.6.2. and section B.7.

- *The residence time of the organic matter in the open lagoon system should be at least 30 days,*

  Based upon the volume of the anaerobic lagoon and the flow rates received the residence times are (refer to Appendix 4 for calculations);

  UJA 40 days

  GGP Due to the poor performance of this WWT system in meeting the environmental discharge regulations, a rehabilitation program has been implemented to increase the anaerobic degradation of COD in this lagoon system. The new anaerobic lagoons have been designed to have a residence time of approximately 37 days.[7]

- *Local regulations do not prevent discharge of wastewater in open lagoons.*

  Discharge of wastewater in open lagoons is not prevented by Indonesian *Peraturan Gubernur Lampung No. 7 Tahun 2010*[8] and it is standard practice for the industry.

- Solid Waste separated from the wastewater prior to entering the lagoons in the baseline or project activity is combined with other solid waste and processed for cattle feed. Emission reductions are not claimed for both methane avoidance and biogas generation from the solid materials

---

[4] Consultants report *"Improvement Of Anaerobic Lagoon Performance PT. GGP Waste Water Treatment Lagoons"*

[5] WWTP Equipment Data.xls

[6] refer: 2010-01-28 GWE Operating Costs for GGP.pdf

[7] Consultants report *"Improvement Of Anaerobic Lagoon Performance PT. GGP Waste Water Treatment Lagoons"*

[8] http://legal-lampung.org/index.php?pilih=pergub&mod=yes

B.3. Project boundary

According to ACM0014 Version 04.1, the applicable criteria for defining the spatial extent of the project activity boundary are:

- The site where the wastewater is treated in both the baseline and project scenarios,
- Any on-site power plants that supply electricity to the wastewater system;
- The anaerobic digester, the power and heat generation equipment and the flare installed under the project activity,

The proposed baseline is Scenario 1 (as per the definition in ACM0014) consists of the following;

- Effluent from GGP and UJA processing plants will continue to be treated by the existing open lagoon system, emitting a large amount of methane into the atmosphere. Methane emissions of all the anaerobic lagoons included in the baseline boundary (Figure 1) are;
  - UJA anaerobic wastewater treatment system Lagoons 1 – 4
  - GGP anaerobic wastewater treatment lagoons 3 -9
- CO_2 emissions from the combustion of fossil fuel (coal) used in Boiler No.2 and No. 3 of GGP captive power plant will continue as the “Business as Usual” activity.
- CO_2 emissions from the combustion of fossil fuel (HFO) used in the two Heaters of UJA processing plant will continue as the “Business as Usual” activity.

Project activities and emission sources that are considered within the spatial extent of the project activity baseline boundary are provided in Table 2 and shown schematically in Figure 1 & 2.

Table 2 Emissions sources included and excluded from the project boundary

Source		GHGs	Included?	Justification / Explanation
Baseline scenario	Wastewater treatment processes	CH_4	Included	The major source of emissions in the baseline from open lagoons (scenario 1)
		N_2O	Excluded	Excluded for simplification. This is conservative.
		CO_2	Excluded	CO2 emissions from the decomposition of organic waste are not accounted for.

	Electricity consumption / generation	CO_2	Excluded	No grid electricity is consumed or generated in the baseline.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Thermal energy generation	CO_2	Included	Thermal energy, in the form of process steam and heat, is generated in the baseline from use of coal in the GGP Power Plant Boilers and HFO use in the heaters of UJA.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
Project scenario	Wastewater treatment processes	CH_4	Included	The treatment of wastewater under the project activity may cause different emissions: (i) Methane emissions from the lagoons into which the digester effluent is discharge, (ii) Physical leakage of methane from the digester system, (iii) Methane emissions from flaring.
		CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not accounted for
		N_2O	Included	As the projects will involve land application of sludge from the anaerobic digesters
	On-site electricity use	CO_2	Included	Under the baseline scenario electricity is used for forced aeration of the aerobic lagoons of GGP which will become redundant under the project activity. The parasitic load requirements of the UASB facility is slightly higher to that of the baseline demand therefore which have been taken into account in the project emission calculations.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	On-site fossil fuel consumption	CO_2	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.

Figure 1 Schematic of spatial extent of the Project Activity Baseline Boundary

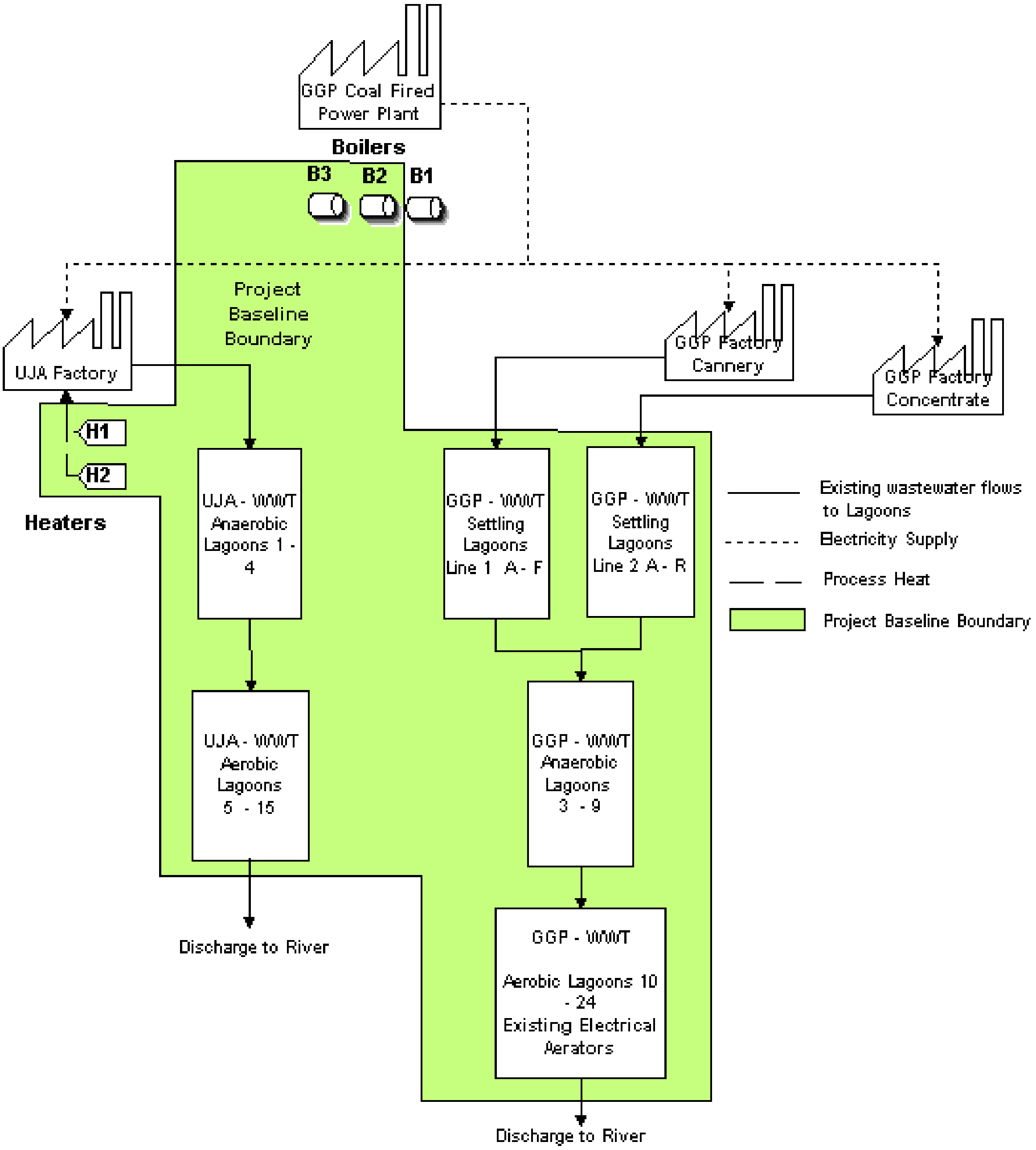
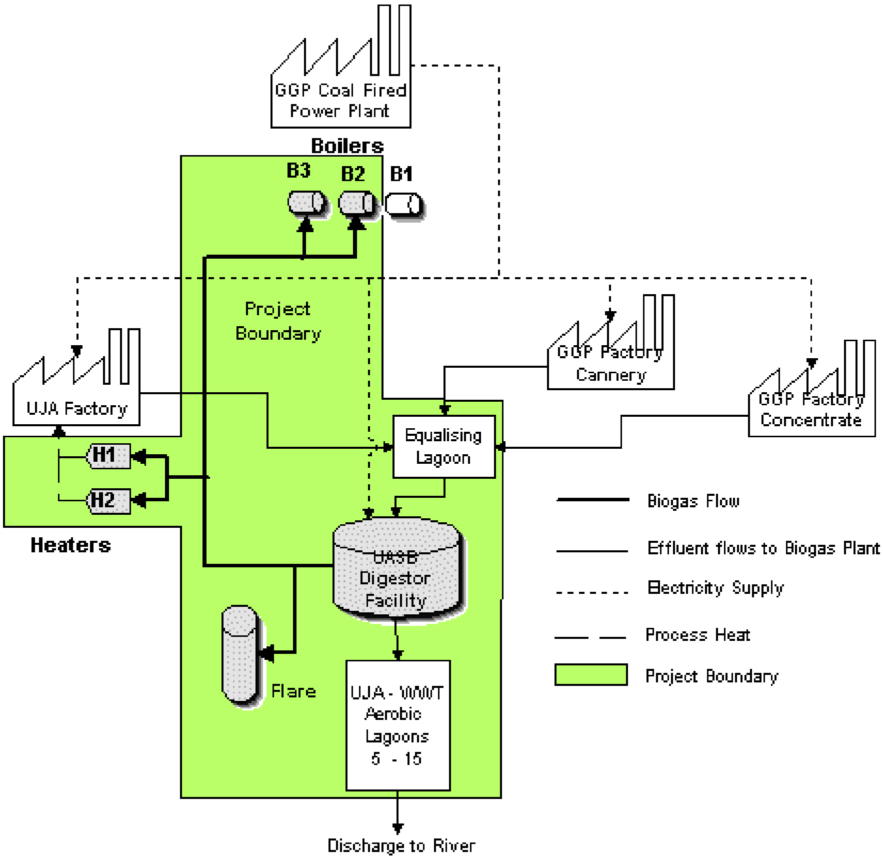


Figure 2 Schematic of the Project Activity Boundary[9]



B.4. Establishment and description of baseline scenario

In testing this baseline boundary, the step-wise approach for identifying the most plausible baseline scenario is applied as follows;

Step 1: Identification of alternative scenarios
Step 2: Eliminate alternatives that are not complying with applicable laws and regulations
Step 3: Eliminate alternatives that face prohibitive barriers
Step 4: Compare economic attractiveness of remaining alternatives

Step 1: Identification of alternative baseline scenarios

Identification is determined by assessing all realistic and credible alternatives to the proposed project baseline with regard to the possible scenarios that would occur in the absence of the project activity.

9 The forced aeration system has been taken out, the lagoons are still considered to be aerobic because the depth is only around 3m. According to GGP's waste water consultant, in order to have anaerobic lagoons, the depth would have to be above 4m.

Wastewater Treatment

The following are determined as being the most plausible alternatives for the treatment of wastewater (W);

W1. The use of open lagoons for the treatment of the wastewater;
W2. Direct release of wastewaters to a nearby water body;
W3. Aerobic wastewater treatment facilities (e.g., activated sludge or filter bed type treatment);
W4. Anaerobic digester with methane recovery and flaring;
W5. Anaerobic digester with methane recovery and utilization for electricity or heat generation;
W6: Wastewater is directed to land application without dewatering;
W7: Wastewater is dewatered and directed to land application/used as fuel in energy applications.

Of the above plausible options the following are assessed as not being realistic and credible alternatives as they provide no tangible benefits to the existing operational activities;

W3. Aerobic wastewater treatment facilities (e.g. activated sludge or filter bed type treatment),

The use of the existing open lagoons by GGP and UJA for treating their waste water
discharges is technically suitable for meeting regulatory requirements.

There are no mandatory requirements to use any other specific treatment technologies such activated sludge or filter bed type treatment.

W4. Anaerobic digester with methane recovery and flaring;

There is no regulation or mandatory requirement that enforces anaerobic waste water treatment with coupled biogas collection and flaring (methane destruction).

W6. Wastewater is directed to land application without dewatering;

The waste water coming from the canary and mixed with the tapioca waste water has very high acidity levels and therefore is not appropriate to be used for any kind of land application.

W7. Wastewater is dewatered and directed to land application/used as fuel in energy applications

The waste water coming from the canary and mixed with the tapioca waste water has very high acidity levels and therefore is not appropriate to be used for any kind of land application even if dewatered.

W1, W2 and W5 are deemed as possible alternatives for wastewater treatment.

Electricity Generation

Plausible alternative scenarios for the generation of electricity (E) have been determined as the following;

There is no electricity generation in the project baseline or activity.

Therefore no plausible alternative need to be assessed.

Heat Generation

Plausible alternative scenarios for the generation of heat (H) have been determined as the following;

H1. Co-generation of heat using fossil fuels in a captive cogeneration power plant;
H2. Heat generation using fossil fuels in a boilers;
H3. Heat generation using renewable sources;
H4. Waste heat use from captive steam turbine power plant;
H5. Importing heat

Of the above plausible options the following are assessed as not being realistic and credible alternatives as they provide no tangible benefits to the existing operational activities;

H1 Co-generation of heat using fossil fuels in a captive cogeneration power plant: This is the baseline scenario.

H2 Heat generation using fossil fuels in a boilers;

The remote rural location of GGP and UJA processing facilities relies upon established and reliable fuel supply network. This supply network is only established for the fossil fuels that are suitable for the installed equipment that the biogas will be used in, these being coal and heavy fuel oil. Therefore the continued use of coal and heavy fuel oil is the most plausable option for fueling the boilers.

H3 The use of biomass solid waste for heat generation has potential but is restricted due to the supply of sufficient resources. All biomass solid waste generated by UJA and GGP is used for cattle feed and compost production by the sister company PT. Great Giant Livestock (GGL).

Currently GGP is trialing the substitution of coal with solid waste (shell) from local Palm Oil Mill (POM) in the Power Plant Boilers. Results from the ongoing trials are showing that only around 14% to 20% mixture of coal and biomass canprovide the required calorific value without damage to the boilers.

For similar supply reasons for UJA heat requirements, as well as the additional investment for new biomass heaters, substitution with other renewable energy source is not a credible alternative.
This alternative also covers the possibility of using biogas for heat generation. This option is only possible if the waste water is treated in a biodigester and the biogas captured and used for heat generation at the GGP cogen boilers and at UJA. This is the project scenario described in section B.5.

H4 Waste heat (steam) use from the captive steam turbine power plant

Currently waste heat in the form of low temperature steam from the Power Plant is directed to UJA for pre heater air in the Heaters therefore reducing HFO combustion. This application is already at capacity and allows no further opportunity to increase HFO displacement.

H5 Importing heat

Due to the remote rural location of GGP and UJA processing facilities there are no industry within close proximity which could provide the opportunity for importing heat. This alternative is therefore not a realistic and credible alternative.

H1 and H2 are deemed as a possible alternative for heat generation in the boilers fueled by coal and heavy fuel oil

The assessment of all realistic and credible alternatives to the proposed project baseline are;

Alternative 1: **"Business as Usual"** which includes **W1**. The use of open lagoons for the treatment of the wastewater, **H1** co-generation of heat using fossil fuels in a captive cogeneration power plant and **H2** Heat generation using fossil fuels is boilers.

This "Business as Usual" alternative would included the rehabilitation of GGP's wastewater treatment system to ensure that the company meets its regulatory environmental discharge requirements.

Alternative 2: The **Project Scenario**, **not undertaken as a CDM**, which includes, **W5** Anaerobic digester with methane recovery and **H3** Heat generation using renewable sources (biogas).

Alternative 3: **W2**. Direct release of wastewaters to a nearby water body and **H1** Heat (thermal energy) generation using fossil fuels in a captive cogeneration power plant, and **H2** Heat generation using fossil fuels is boilers.

Step 2: Consistency with mandatory laws and regulations:

Identified realistic and credible alternative scenario(s) to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

To demonstrate the current applicable, policies, laws and regulations that have relevance to the above alternatives the following is considered:

Wastewater Treatment

In March 2010 the Government of Indonesia released its "Indonesian Climate Change Sector Roadmap (ICCSR)" http://www.icctf.org/site/node/37. The ICCSR outlines the GoI sectoral policies for Climate Change and related sectorial activities in Indonesia. At present the ICCSR has not develop a "Roadmap" for the Agri-Industry sector. It is concluded that until the GoI develops and releases its ICCSR for the Agri-Industry sector there are no new national and/or sectoral policies that impact on the baseline and/or project activity.

As open lagoons wastewater treatment systems for the Agri-Industry is common practice[10] this demonstrates that there are no national or local policies/regulations in place that restrict their continued use.

[10] *refer: email from Dr Udin to Ken Butler 4th Aug 10 re Common Practice.txt*

The Provincial Government of Lampung has however released new local environmental regulation [11] for the discharge of Agri-Industry (and others) that requires effluent discharges into watercourses to have COD not exceeding, 160 mg/L for fruit processing and 300 mg/L for tapioca processing.

Under Indonesia regulations, it is illegal to directly discharge wastewater into water bodies, as specified at both national[12] and provincial level Alternative 3 which includes (W2 - the direct release of wastewaters to a nearby water body) is not in compliance with Indonesian regulations and therefore must be eliminated.

Heat Generation

Whilst the Government of Indonesia has made some commitments under National Appropriate Mitigation Actions (NAMA) there are no legal or regulatory requirements that direct industrial generation and use of process heat or to maximize the utilisation of industrial waste heat. The ICCSR roadmap for the Industry Sector was release in March 2010, (http://www.icctf.org/site/node/37), providing detailed policy guidance in order to mainstream climate change issues into national development planning. In relation to industrial process heat this sectoral roadmap only considers the energy intense production process of the cement, steel and pulp-paper industries. It can therefore assessed that there are no new national and/or sectoral policies that impact on Heat Generation in the baseline and/or project activity.

The remaining Alternatives 1 & 2 complies with all applicable policies, laws and regulations.

Step 3: Barrier analysis

ACM0014 requires Step 3 of the "Tool for the demonstration and assessment of additionality", Version 06 to be applied to identified barriers that would prevent potential project proponents from carrying out the proposed project activity undertaken without being registered as a CDM project activity.

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

a. Investment barriers

At present, both GGP and UJA operate an open lagoon system consisting of anaerobic, facultative and aerobic lagoons for wastewater treatment to meet their regulator discharge requirements. If "shock load" affect regulatory performance, low cost solutions are available to ensure regulatory performance. Therefore, **Alternative 1** does not face any investment barriers.

Compared with the current practices, UASB anaerobic digesters systems entail high capital investment and O&M costs. As the companies already operate systems to meet their regulatory requirement there is little incentive for them to invest into a new wastewater treatment facility. Therefore the installation of a new wastewater treatment facility is not deemed commercially attractive to GGP/UJA if not implemented as CDM projects (Refer Section B.5 Step 2 Investment analysis)

---

[11] *Peraturan Gubernur Lampung No. 7 Tahun 2010* , http://legal-lampung.org/index.php?pilih=pergub&mod=yes

[12] Peraturan Menteri Negara Lingkungan Hidup, Nomor 05 Tahun 2007 http://www.menlh.go.id/i/art/permen_05_2007_sayuran.pdf

Based on the above arguments, it is concluded that **Alternatives 2** faces a significant investment barrier.

b. Technological barriers,

In general, Alternatives 1 and 2 face regulatory performance risks due to the potential for high acidic loadings, "shock loadings", associated with failure of factory equipment and processes. Aerobic and anaerobic degradation of organic carbon occurs within a neutral to a moderately alkaline environment. The implementation of an alternative technology approaches is determined base upon meeting the existing and future regulatory requirements.

Alternative 1 has been a common way of handling wastewater from pineapple and tapioca starch production in Indonesia (refer to Section B.5 Step 4 Common Practice). The related technology, skills and labor are readily available in Indonesia and there are few risks associated with this technology. Therefore, **Alternative 1** has low technical performance risk.

Alternative 2. At present UASB anaerobic digesters with methane capture and use of the biogas for captive thermal energy generation is not common practice in food processing industry in Indonesia. As a consequence, the use of biogas for heat generation is also not a common practice I Indonesia.

Though the related technologies may be available domestically due to the implementation of other CDM projects, the companies' labour force does not currently have the skills to operate and maintain the proposed new system of wastewater treatment. The required skills and experience will only be available after the extensive training to be provided by the technology supplier. This places considerable risk upon the companies' as they must meet their regulator requirements for wastewater discharge into the environment. Therefore, **Alternative 2** faces high technical barriers.

c. Legal barrier

Does the practice violate any host country laws or regulations or is it not in compliance with them?

At present in Indonesia there are no regulatory or mandatory requirements which enforce implementation of a specific wastewater treatment technology such as anaerobic digester treatment system to pineapple and cassava processing plants for effluent treatment.

Current Indonesian law allows utilization of open lagoon systems for wastewater treatment in the pineapple and tapioca industries. Currently GGP and UJA utilize this approach for treating their industrial wastewater effluent discharges so as to meet their regulatory requirements. **Alternative 1** therefore has no legal barriers.

Alternative 2 implements a wastewater treatment and use of biogas for heat generation technology change that does not violate any laws or regulations in Indonesia. Therefore **Alternative 2** does not face legal barriers.

d. Social barrier

Is the understanding of the technology low in the host country/ industry considered?

Since **Alternative 1** is currently used by GGP and UJA and is common practice in Indonesia, no social barriers are identified.

Alternative 2 faces certain social barriers associated with the low understanding of the technology. However, it is expected that these barriers can be overcome through the public meetings and public awareness promotion campaigns.

e. Business Culture barrier

Is there reluctance to change to alternative management practices in the absence of regulations?

Alternative 1 is currently used by GGP and UJA for treating all of the production facilities wastewater discharge treatment to meet all regulatory requirements of Indonesia. Therefore there is no barrier caused by the change of the management practice.

As there is no regulatory requirement for GGP and UJA to minimise methane gas emissions from the current wastewater treatment system there is little business incentive to implement **Alternative 2** to minimize methane gas emissions. As these alternatives are not classed as "core business" by companies and have significant business, commercial and technology risks there are significant business culture barriers associated with implementing **Alternative 2**.

Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

As detailed above, **Alternative 1**, continuation of the current situation, does not have any significant barriers whilst **Alternative 2** faces significant investment, technical, business and culture barriers which impede the implementation of this alternative.

Therefore, **Alternative 1**, continuation of the current situation, is therefore the only project activity, other than the proposed CDM project activity, that is not prevented by any of the identified barriers.

Step 4: Investment analysis

The purpose of this step is to determine whether the proposed project activity is not:

(a) The most economically or financially attractive; or
(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

Refer to Section B.5. Step 2 for the Investment analysis which demonstrates that Alternative 2, the project activity being undertaken without CDM, is not financially feasible.

Based upon the assessment in Section B.4, Alternative 1 **"Business as Usual"** which includes **W1**, the use of open lagoons for the treatment of the wastewater, **H1** co-generation of heat using fossil fuels in a captive cogeneration power plant and **H2** Heat (thermal energy) generation using fossil fuels, biomass and waste steam in boilers and heaters has been determined as the most realistic and credible Project Baseline.

B.5. Demonstration of additionality

Chronology of Events

Evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity is detailed in the follow table of events.

Document / Event	Parties	Date Issued/Signed
CDM Scoping Study	PT GGP, PT UJA, PT GGL and	19 July 2006
GGP Board of Directors, minutes of meeting regarding the companies policy for committing to Climate Change, implementation of a CDM project to reduce GHG emissions from the wastewater treatment lagoons of GGP and UJA and for appointing an international CDM consultant	PT GGP	23 March 2007
Preparation of project PDD for GGP and UJA wastewater treatment project. Methodology AM0022 version 4	PT GGP and PT ERM	17 April 2007
1st Stakeholder Meetings	PT GGP, PT UJA, PT ERM and	13 June 2007
PDD submission to the Indonesian DNA	PT GGP	November 2007
Indonesian DNA Letter of Approval	PT GGP, PT ERM and Indonesian DNA	6 March 2008
Sedimentation Study	PT ERM and PT ALS	17 to 24 December 2008
GGP wastewater treatment lagoons rehabilitation - Diversion of rain water from Selection and Cooker Area from entering the lagoon system	PT GGP	10 August 2009
Signing of an LoI between the Danish Ministry of Climate and Energy and GGP for the purchase of CERs up to 2012	PT GGP and Danish Ministry of Climate and Energy	18 November 2009
Commencement of PDD preparation for GGP and UJA wastewater treatment project. Methodology ACM0014 version 04.1	Danish Energy Management A/S and Danish Ministry of Climate and Energy	10 February 2010
Turnkey Contact for the Anaerobic Wastewater Treatment Plant	PT GGP and Global Water Engineering LTD.	11 February 2010
Commencement of the Project Activity	PT GGP and Global Water Engineering LTD.	1st payment: 15 Feb 2010 2nd payment: 12 Mar 2010
2nd Stakeholder Meetings was conducted due to long period since the first stakeholder meeting	PT GGP, PT UJA, Danish Energy Management, Stakeholders and CDM consultant	26 March 2010
Consultants GGP WWT rehabilitation study: “Improvement of anaerobic lagoon performance PT. GGPC waste water treatment lagoons”	PT GGP and Dr. Ir. Udin Hasanudin, M.T. Department of Agro-industrial Technology Faculty of Agriculture, The University of Lampung. Jl. Sumantri Brojonegoro No.1, Bandar Lampung-35145, Indonesia	The study commenced on the 7 April 2010 and the report issued on the 7 May 2010
Submission of the Prior Consideration form to the Indonesian DNA and UNFCCC with the new PP and based on the revised version of the PDD	PT GGP	21 May 2010

Commencement of initial Civil Works for the UASB facility – Site piling	PT GGP	5th May 2010
Contract with DOE for Validation of the project PDD	PT GGP and DNV	7th June 2010
Validation – Public Comments Period	PT GGP and DNV	12th June 2010
Notification to Indonesian DNA of a change of project participants	PT GGP	21st June 2010
GGP wastewater treatment lagoons rehabilitation – Construction of chemical separation lagoon prior to anaerobic lagoons	PT GGP	28th June 2010
GGP wastewater treatment lagoons rehabilitation - Diversion of rain water from Raw Material Area from entering the lagoon system	PT GGP	28 July 2010
Initial site preparation Civil Works completed	PT GGP	3 August 2010
Update of Indonesian DNA LoA	Indonesian DNA	29 July 2010
Consultants GGP WWT rehabilitation study: "Improvement of anaerobic lagoon performance PT. GGPC waste water treatment lagoons-Revision"	PT GGP and Dr. Ir. Udin Hasanudin, M.T. Department of Agro-industrial Technology Faculty of Agriculture, The University of Lampung. Jl. Sumantri Brojonegoro No.1, Bandar Lampung-35145, Indonesia	The seconded assessment study commenced on the 15 November 2010 and a revised report issued on the 13 December 2010

The application of the Methodological Tool "Tool for the demonstration and assessment of additionality", Version 06 provides the following step-wise approach to demonstrate and assess additionality;

Step 1 Identification of alternatives to the project activity;
Step 2 Investment analysis to determine that the proposed project activity is not the most economically or financially attractive;
Step 3 Barriers analysis; and
Step 4 Common practice analysis.

The Project activity involves a change of wastewater treatment technology from the existing open lagoon system to a closed anaerobic wastewater treatment with biogas recover system. Biogas captured from this facility will be used to reduce the current consumption of fossil fuels in the heaters (HFO) of UJA and in two coal fired boilers of GGP captive power plant.

The expected outputs and services to be provided by the Project activity include;

- Wastewater treatment system that meets the environmental discharge regulation,
- Reduction in the carbon footprint of the production facilities,
- On-site air quality improvement which will enhance the health of the workforce and residents,
- Workforce and community development.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

Section B.4 determined that the realistic and credible alternative scenarios for Project Activity was a combination of Wastewater Treatment (W), and the generation of heat (H) as follows;

Alternative 1: **"Business as Usual"** which includes **W1**. The use of open lagoons for the treatment of the wastewater, **H1** co-generation of heat using fossil fuels in a captive cogeneration power plant and **H2** Heat generation using fossil fuels is boilers.

Alternative 2: The **Project Scenario**, **not undertaken as a CDM**, which includes, **W5** Anaerobic digester with methane recovery and **H3** Heat generation using renewable sources (biogas).

Sub-step 1b. Consistency with mandatory laws and regulations:

Section B.4 determined that Alternative 1 and Alternative 2 are consistent with current policies, laws and regulations.

As per "Tool for the demonstration and assessment of additionality" Version 06 Step 2 *Investment analysis* has been chosen for the next assessment step.

Step 2. Investment analysis

Following the instruction outlined in "Tool for the demonstration and assessment of additionality" Version 06, investment analysis is conducted to demonstrate the proposed project activity is not financially feasible, without the revenue from the sale of certified emission reductions (CERs) i.e. Alternative 2.

Sub-step 2a: Determine appropriate analysis method

The development of project activity is determined by comparing the project IRR without CDM with the national lending commercial rate at the time of the investment.

Amongst three analysis methods, Option I, simple cost analysis, is not applicable to the project activity because the project would produce some economic benefit other than CDM related income (i.e. fuel purchase savings from fuel oil and coal, avoided cost associated with rehabilitation of GGP's WWT lagoons). From the remaining two choices of the investment comparison analysis (Option II) and the benchmark analysis (Option III), Option III, benchmark analysis is selected. The total initial investment of this project is of USD 4,320,000 of which all financed by equity, therefore the additionality is performed by comparing the project IRR to the benchmark of 15.1% which has been selected as the commercial lending rate in 2006 published by Bank Umum (Public Bank).[13]

Sub-step 2b: Option III. Benchmark analysis

The Project Internal Rate of Return (IRR) is used for investment comparison of alternatives.

Sub-step 2c: Calculation and comparison of financial indicators

[13] Benchmark of 15.1% was taken from the 2006 commercial lending rate for investment published by Bank Umum (Item I26) of the Bank of Indonesia website http://www.bi.go.id/web/en/Statistik/Statistik+Ekonomi+dan+Keuangan+Indonesia/Versi+HTML/Sektor+Moneter/

The following alternatives will be compared under this analysis:

1. Project activity without CDM (Alternative 2)
2. Project activity with CDM

The baseline scenario of open anaerobic lagoons is the most economical and the most common industrial practice, in compliance with the relevant laws and regulations in Indonesia, mainly due to low operating and maintenance costs and also due to the abundance of land in area where these types of plants are typically situated.

The project activity, on the other hand, proposes to use a state-of-the-art wastewater treatment system and requires a high upfront investment compared to other available technologies. As it is show in the Table 3 below, the Project Internal Rate of Return (IRR) without CDM is 10.8%. Therefore, it is highly unlikely that the project developer will pursue this option. However, with CDM revenues, the project has higher IRR value estimated at 16%, thereby making the investment worthwhile to the developer.

As per Table 3 below, CDM revenues justify the project activity from an investment point of view, when compare the project activity implemented with and without CDM.

Table 3 Investment Analysis

Investment Analysis Items	Unit	Project without CDM
Initial investment cost	US $	4,320,000
Total Operation & Maintenance cost	US $	384,279
CER Value	US	11.89
Corporate Income tax	%	30.0%
Project lifetime	years	20
Depreciatoin rate	%	5%
IRR	%	10.8%

Based on ERM CDM scoping study estimation, the biogas capture and utilization for fuel switching, requires an investment of USD 4.32 million. Financial parameters of investment cost, operational cost, tax, and interest rate were taken to calculate project IRR.[14]

Table 4 Project IRR with and without CDM

	Without CDM	Benchmark	With CDM*
Project IRR	10.8%	15.1 %	16%

Based on the estimated cost of financing the project, the IRR is 10.8% far below the benchmark of 15.1%. With CER revenue at a fixed price of CERs at 9.5 Euros/CER, the IRR increases to 16% pushing the project to be beyond the benchmark.

[14] *GGP-UJA Biogas Project Viability Assessment*, PT ERM Indonesia, April 2009

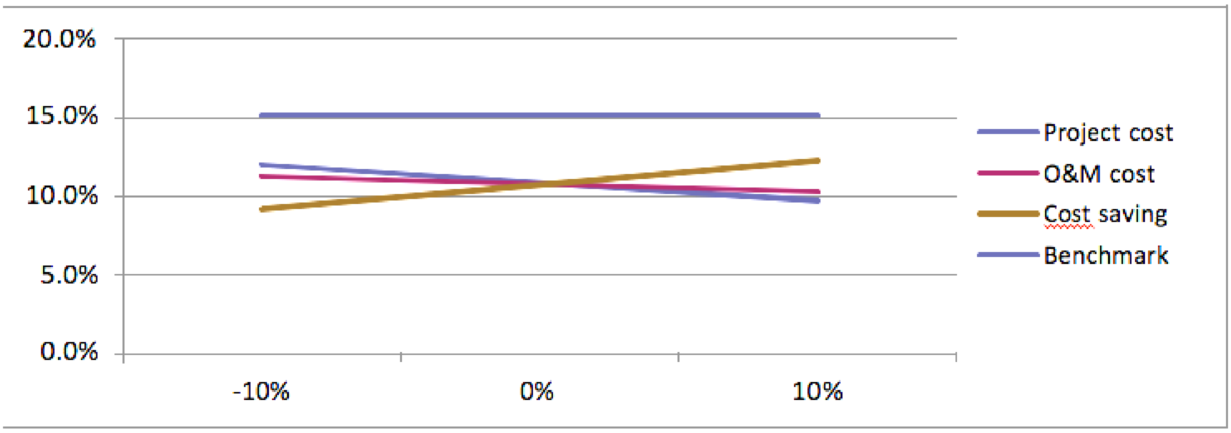
Sub step 2d Sensitivity analysis

In order to examine the project feasibility without revenue from CDM, the sensitivity analysis is conducted by comparing parameters for investment, revenue and cost. A sensitivity level is applied to i) the project cost, ii) operational and maintenance cost, iii) cost saving.

If a +/-10 is applied the results are as follows:

Table 5 Sensitivity analysis of the project

Sensitivity Analysis			
	-10%	**0%**	**10%**
	12.0%	10.8%	9.7%
Project Cost			
O&M cost	11.3%	10.8%	10.3%
Cost saving	9.2%	10.8%	12.3%
Benchmark	15.1%	15.1%	15.1%



Key Parameters variations

A sensitivity analysis was undertaken using assumptions that improve the project IRR to the benchmark value.

The table below shows the percentage variation that would be required for the three main parameters in order to meet the benchmark.

Scenari	% Change	IRR %
Original		10.8
Project costs	-	15.1
O&M costs	-93%	15.1
Cost Savings	+31%	15.1

Project cost

If a - 10% variation is applied to the project cost, the project IRR would only reach 10.8%. In order to meet the 15.1% level of the benchmark a -29.5% sensitivity would have to be applied. Although, the figures used in the IRR calculations are from a preliminary study, the technology is well established and therefore an increase of 31% by the time the equipment is bought would not be reasonable.

Table 6 Sensitivity analysis of the project cost

Sensitivity Analysis			
	-29.5%	**0%**	**10%**
Project cost	15.1%	10.8%	9.7%

Operation and Maintenance costs

If a - 10% variation is applied to the project cost, the project IRR would only reach 10.8%, much below the desired benchmark level. In order to meet the 15.1% level of the benchmark a -93% sensitivity would have to be applied. Operational and maintenance cost include labour, spare parts and overhauls. Labour costs (inflation on wages) have been increasing by about 10% a year and it is unlikely that the government would allow increase such as 93%. While the spare parts and the overhauls are usually pre-established when the equipment is bought and is unlikely that it would be 93% more than estimated as it should be in range of the market price.

Table 7 Sensitivity analysis of the O & M Cost

Sensitivity Analysis			
	-93%	**0%**	**10%**
O&M cost	15.1%	10.8%	10.3%

Cost Savings

If a +10% variation is applied to the project cost, the project IRR would only reach 12.3%. In order to meet the 15.1% level of the benchmark a +31% sensitivity would have to be applied. Based on the coal, HFO and steam prices from 2007 to 2010, the average increase on a yearly basis is only around 19%[15]. Based on the average increase calculated and the fact that the prices are market based, it is unlikely that
these numbers will increase as much as 31%. Table 8 Sensitivity analysis of the cost savings

Table 8 Sensitivity analysis of the cost savings

Sensitivity Analysis			
	-10%	**0%**	**31%**
Cost saving	9.2%	10.8%	15.1%

Based on above calculation it has been shown that the project IRR without CDM is too low compared to the benchmark and therefore GGP would not likely invest in the project. Furthermore, a sensitivity analysis has been applied and even with +/-10% the benchmark is not met. In order to meet the benchmark a variation between -93% to +31% need to be applied which is unlikely to happen.

Alternative 2 is determined not to be financially viable without the additional revenue generated from registration as a CDM project Activity

Step 4: Common practice analysis

This step determines the extent to which the proposed project type (e.g. technology or practice) has already diffused in the relevant sector and region. Other CDM project activities are not to be included in this analysis.

Sub-step 4a. Analyze other activities similar to the proposed project activity:

Following the procedure or common practice analysis provided in the latest version of "Tool for the demonstration and assessment of additionality" Version 06, common practice analysis was conducted.

Status on UASB digesters in Indonesia:

[15] Cost Increase 2007-2010.xls

This project combines the wastewater effluent from cassava (tapioca) and pineapple processing. The following background document "The Case Study Of Canned Pineapple In Indonesia"[16] shows that GGP is the only pineapple cannery in Indonesia. Therefore the combination of the highly acidic pineapple effluent with cassava processing effluent has not been undertaken in Indonesia with or without CDM.

Common Practice - Expert witness has been provide by[17]

Dr. Udin Hasanudin
Dept. of Agroindustrial Technology
Faculty of Agriculture, University of Lampung

In which he provides the following evidence related to Common Practice;

> *"Lagoon systems are common waste water treatment method in Indonesian agro-industries. The reasons are due to:*
>
> *- Big amount of wastewater from agroindustry with very high organic matter concentration.*
> *- Usually agro-industry located in remote area and wide land is available with low price.*
> *- Simple technique and low operating cost. The UASB digesters are recently used in Indonesian agroindustry under CDM project activities only.*
> *- The use of UASB digesters for treating pineapple processing wastewater, at the scale of GGP's production, is the first application of this anaerobic treatment technology in Indonesia"*

From the above expert witness it is confirmed that there are no non-CDM projects in this sector using UASB wastewater treatment processes.

An additional check to confirm Common Practice was undertaken of all registered CDM in the sector in Indonesia. In undertaking this check a search was undertaken of the IGES CDM Project Database (1 Jul 2010 updated)[18]. This search confirmed that for Indonesian Agri-Industry wastewater there were 17 registered projects, 6 Tapioca and 11 Palm Oil. The Tapioca projects used UASB technology and the Palm Oil used covered lagoons techniques[19]. None of these projects involved a combination of different agri-industry effluents.

No registered projects were found that dealt with the effluent from pineapple processing in Indonesia.

Common practice analysis:

The proposed project type is included in paragraph 6. Measures of the additionality tool under the type (b) *Switch of technology with or without change of energy source (including energy efficiency improvement as well as use of renewable energies*) thus paragraph 47. is applied for the common practice analysis.

---

[16] www.unctad.org/infocomm/diversification/bangkok/Pineap1.doc

[17] Refer: email from Dr Udin to Ken Butler 4th Aug 10 re Common Practice.txt

[18] http://www.iges.or.jp/en/cdm/report_cdm.html#ia

[19] Refer Appendix 4 Table 22 Agri-Industry Registered CDM projects in Indonesia

Step 1: Quantity of effluent from the digester in month m (FPJ,effl,dig,m***)*** is used as parameter for the capacity of the proposed project activity. FPJ,effl,dig,m is 166,168 m^3/month and the +/- 50% output range is thereby between 83,084 m^3/month – 249,252 m^3/month.

Step 2: As described in the “Status on UASB digesters in Indonesia”, UASB digesters are not common in Indonesia, and all similar projects have been supported by CDM. Since all CDM supported activities are excluded from the assessment, N_{all} equals 0.

Step 3: Since no plants are identified in step 2 and thereby no different technologies can be identified N_{diff} equals 0.

Step 4: Factor F is calculated by the following equation: F = 1 - N_{diff}/N_{all} which equals F = 1 – 0/0, and the F value is thereby set to 1.

The proposed project activity is not a common practice within a sector in the applicable geographical area as N_{all} – N_{diff} equals 0 which is smaller than 3, and item 47 (b) (N_{all}-N_{diff} is greater than 3) is thereby not fulfilled.

Sub-step 4b. Discuss any similar options that are occurring:

Not required as no similar projects have been identified in Sub-step 4b

The proposed project activity is therefore assessed as being additional to the baseline scenario

B.6. Emission reductions
B.6.1. Explanation of methodological choices

As per methodology AMC0014 Version 04.1, emission reductions of the project activity are equal to baseline emission minus project emissions. Leakage is not calculated as it is considered to be negligible.

Baseline Emission

Baseline emissions are estimated as follows:

As this project incorporates the wastewater treatment facilities of both UJA and GGP, AMC0014 version 04.1 ***Equation 1*** for determining overall Project Emissions is modified to the following;

$$BEy = UJA\ BE_{CH4} + GGP\ BE_{CH4} + BE_{EL,y} + BE_{HG,y} \qquad \textbf{Eq 1}$$

Where;

BEy	Baseline emissions in year *y* (tCO_2e/yr)
UJA_BECH4	Methane emission from anaerobic treatment of the wastewater in open lagoons (Scenario 1) system handling the effluent discharge from UJA Tapioca processing operations in the absence of the project activity in year y (tCO_2e/yr).
GGP_BECH4	Methane emission from anaerobic treatment of the wastewater in open lagoons (Scenario 1) system handling the effluent discharge from GGP Pineapple processing operations in the absence of the project activity in year y (tCO_2e/yr).
BEEL,y	CO_2 emissions associated with electricity generation that is displaced by the project activity and / or electricity consumption in the absence of the project activity in year y (tCO_2 / yr).

$BE_{HG,y}$	CO_2 emissions associated with fossil fuel combustion for heating equipment that is displaced by the project in year y (tCO_2 / yr)

No electricity is displaced by the Project Activity, so Equation 1 becomes;

BEy = UJA BECH4 + GGP BECH4 + BEHG,y ***Eq 1(modified)***

The following calculations are undertaken separately for both UJA and GGP wastewater treatment systems.[20]

The Baseline emissions for the project activity are calculated in the following two steps;

Step1: Calculation of baseline emissions from anaerobic treatment of the wastewater;
Step3: Calculation of baseline emissions from heat generation.

Step1: Calculation of baseline emissions from anaerobic treatment of the wastewater;

Determination of *CODBL,y*

*CODBL,y = ADBL * CODPJ,y*
Eq. 2

Where:
CODBL,y is the Quantity of chemical oxygen demand that would be treated in open lagoons (scenario 1) in the absence of the project activity in year y (tCOD/yr)

ADBL is the Effluent adjustment factor expression the percentage of COD that is degraded in open lagoons (scenario 1) in the absence of the project activity

CODBl,y is the Quantity of chemical oxygen demand that would be treated in open lagoons (scenario 1) in the absence of the project activity in year *y* (tCOD/yr)

Determination of *ADBL*

ADBL = 1 – (CODout,x / CODin,x) ***Eq. 3***

Where:
ADBL is the Effluent adjustment factor expression the percentage of COD that is degraded in open lagoons (scenario 1) in the absence of the project activity

CODout,x is the COD of the effluent in the period x (tCOD)

CODin,x is the COD directed to the open lagoons (scenario 1) in the period x (tCOD)

Note: The project activities are not being undertaken in a Greenfield facility therefore ***Equation 5*** of the methodology is not required

The methodology proposes two alternative methods for the estimation of methane emissions from open lagoons:

(a) The Methane Conversion Factor (MCF) Method

[20] Refer to Excel spreadsheet for detailed calculations GGP CER 270112.xls

(b) The Organic Removal Ratio (ORR) Method

Method (a) The Methane Conversion Factor (MCF) Method is selected as the calculation method for the project activity.

The Methane Conversion Factor (MCF) Method

The quantity of methane generated from COD disposed to the open lagoon (Scenario 1) or in sludge pits (Scenario 2) depends mainly on the temperature and the depth of the lagoon or sludge pit. Accordingly, the methane conversion factor is calculated based on a factor f_d, expressing the influence of the depth of the lagoon or sludge pit on methane generation, and a factor $f_{T,y}$ expressing the influence of the temperature on the methane generation. In addition, a conservativeness factor of 0.89 is applied to account for the considerable uncertainty associated with this approach. $MCF_{BL,y}$ is calculated as follows:

$$MCF_{BL,y} = f_d \times f_{T,y} \times 0.89 \qquad \textbf{Eq. 4}$$

Where:

$MCF_{BL,y}$ is the average baseline methane conversion factor (fraction) in year y, representing the fraction of (CODPJ,y x Bo) that would be degraded to CH4 in the absence of the project activity

f_d is the factor expressing the influence of the depth of the lagoon on methane generation

$f_{T,y}$ is the factor expressing the influence of the temperature on the methane generation in year y

0.89 is the Conservativeness factor

<u>*Determination of $f_{T,y}$*</u>

In some regions, the ambient temperature varies significantly over the year. Therefore, the factor $f_{T,y}$ is calculated with the help of a monthly stock change model which aims at assessing how much COD degrades in each month. For each month *m*, the quantity of wastewater directed to the lagoon directed to a pit, the quantity of organic compounds that decay and the quantity of any effluent water from the lagoon is balanced, giving the quantity of COD that is available for degradation in the next month: The amount of organic matter available for degradation to methane ($COD_{available,m}$) is assumed to be equal to the amount of organic matter directed to the open lagoon, less any effluent, plus the COD that may have remained in the lagoon from previous months, as follows:

$$COD_{available,m} = COD_{BL,m} + (1- f_{T,m}) \times COD_{available,m-1} \qquad \textbf{Eq. 5}$$

$$COD_{BL,m} = AD_{BL} \times COD_{PJ,m} \qquad \textbf{Eq. 6}$$

$$COD_{PJ,m} = F_{PJ,dig,m} \times w_{COD,dig,m}$$
Eq. 7

Where:

$COD_{available,m}$ is the quantity of chemical oxygen demand available for degradation in the open lagoon in month m (tCOD/month)

$COD_{BL,m}$ is the quantity of chemical oxygen demand that would be treated in open lagoons (Scenario 1) in the absence of the project activity in month m (tCOD/month)

$\mathbf{COD_{PJ,m}}$ is the quantity of chemical oxygen demand that is treated in the anaerobic digester or under clearly aerobic conditions in the project activity in month m (tCOD/month)

$\mathbf{AD_{BL}}$ is the effluent adjustment factor expressing the percentage of COD that is degraded in open lagoons (Scenario 1) in the absence of the project activity

$\mathbf{F_{PJ,dig,m}}$ is the quantity of wastewater that is treated in the anaerobic digester or under clearly aerobic conditions in the project activity in month m (m^3/month)

$\mathbf{w_{COD,dig,m}}$ is the average chemical oxygen demand in the wastewater that is treated in the anaerobic digester or under clearly aerobic conditions in the project activity in month m ($tCOD/m^3$)

$\mathbf{f_{T,m}}$ is the factor expressing the influence of the temperature on the methane generation in month m

m is the months of year y of the crediting period

The carry-over calculations are limited to a maximum of one year. In case the residence time in the open lagoon is less than one year (like in the case of the proposed project), carry-on calculations are limited to the period where the wastewater remains in the lagoon. The retention time of organic matter in all lagoons is defined by volume of lagoon/wastewater flow.

At the project location the average monthly temperature is within the interval $283\ K < T_{2,m} < 303\ K$, the monthly factor fT,m to account for the influence of the temperature on methane generation is calculated based on the following “van’t Hoff - Arrhenius” approach, as follows:

The monthly factor to account for the influence of the temperature on methane generation is calculated based on the following “van’t Hoff – Arrhenius” approach:

$$f_{T,m} = \begin{cases} 0 & if \quad T_{2,m} < 283\,K \\ \exp\left(\frac{E * (T_{2,m} - T_1)}{R * T_1 * T_{2,m}}\right) & if \quad 283\,K < T_{2,m} < 303\,K \\ 1 & if \quad T_{2,m} > 303\,K \end{cases}$$

Eq.8

Where:

$\mathbf{f_{T,m}}$ is the factor expressing the influence of the temperature on the methane generation in month m

E is the activation energy constant (15,175 cal/mol)

$\mathbf{T_{2,m}}$ is the average temperature at the project site in month m (K)

$\mathbf{T_1}$ is 303.16K (273.16 K+ 30K)

R is the ideal gas constant (1.987 cal/K mol)

m is the months of year y of the crediting period

As indicated in equation (8) above, the value of $f_{T,m}$ cannot exceed 1 and should be assumed to be zero if the ambient temperature is below 10°C.
Based on the monthly values $f_{T,m}$ the annual value $f_{T,y}$ is calculated as follows:

$$f_{T,y} = \frac{\sum_{m=1}^{12} f_{T,m} \times COD_{available,m}}{\sum_{m=1}^{12} COD_{BL,m}}$$ ***Eq. 9***

Where:

$f_{T,y}$ is the factor expressing the influence of the temperature on the methane generation in year y

$f_{T,m}$ is the factor expressing the influence of the temperature on the methane generation in month m

$COD_{available,m}$ is the quantity of chemical oxygen demand available for degradation in the open lagoon in month m (tCOD/month)

$COD_{BL,m}$ is the quantity of chemical oxygen demand that would be treated in open lagoons in the absence of the project activity in month m (tCOD/month)

m is the months of year y of the crediting period

Step 3: Baseline emissions from the generation of heat

This step is applicable if the biogas captured from the new anaerobic digester is utilized in the project scenario for heat generation. If the baseline Scenarios H1 or H3 apply, $BE_{HG,y}$ = 0. If Scenario H2 applies, fossil fuels from the generation of heat in boilers are displaced and baseline emissions are calculated as follows:

$$BE_{HG,y} = \frac{HG_{PJ,y} \times EF_{CO2,FF,boiler}}{\eta_{BL,boiler}}$$ ***Eq. 10***

Where:

$BE_{HG,y}$ is the CO_2 emissions associated with fossil fuel combustion for heating equipment that is displaced by the project in year *y* (tCO_2/yr)

$HG_{PJ,y}$ is the net quantity of heat generated in year *y* with biogas from the new anaerobic digester (GJ)

$EF_{CO2,FF,boiler/heater}$ is the CO_2 emission factor of the fossil fuel type used in the boiler/heater for heat generation in the absence of the project activity (tCO_2/GJ)

$\eta BL_{,boiler/heater}$ is the efficiency of the boiler/heater that would be used for heat generation in the absence of the project activity

<u>Project Emissions</u>

Scenario 1 of the methodology is applicable to the Project Activity and the emissions attributed to the project activity are associated with;

(i) Methane emissions from the lagoons (applicable if effluent from the treatment under the project activity is directed to a lagoon system);

In the case of project activities that introduce an anaerobic digester for the treatment of wastewater:

(ii) Physical leakage of methane from the digester system;
(iii) Methane emissions from flaring (applicable if biogas from the digester is flared);

In the case of projects that introduce a treatment of sludge:

(iv) Methane and nitrous oxide emissions from land application of sludge (if applicable);

In the case of projects that consume electricity or heat under the project activity:

(v) CO_2 emissions from consumption of electricity and or fossil fuels in the project activity.

Project emissions are calculated as follows:

$$PE_{,y} = PE_{CH4,effluent,y} + PE_{CH4,digest,y} + PE_{,flare,y} + PE_{sludge,LA,y} + PE_{EC,y} + PE_{FC,y} \quad \textit{Eq. 11}$$

Where:

$PE_{,y}$ is the Project emissions in year y (tCO_2e / yr)

$PE_{CH4,effluent,y}$ is the Project emissions from treatment of wastewater effluent from the anaerobic digester in year y (tCO_2e / yr)

$PE_{CH4,digest,y}$ is the Project emissions from physical leakage of methane from the anaerobic digester in year y (tCO_2e / yr)

$PE_{,flare,y}$ is the Project emissions from flaring of biogas generated in the anaerobic digester in year y (tCO_2e / yr)

$PE_{sludge,LA,y}$ is the Project emissions from land application of sludge in year y (tCO_2e / yr)

$PE_{EC,y}$ is the Project emissions from electricity consumption in year y (tCO_2e / yr)

$PE_{FC,y}$ is the Project emissions from fossil fuel consumption in year y (tCO_2e / yr)

The will be no use of waste water for land application therefore $PE_{ww,LA,y}$ has been taken out of the equation 11 and the monitoring parameters.

(i) Project methane emissions from effluent from the digester

This step is applicable if a new digester is installed under the project activity and if the effluent from this digester is directed to open lagoons (scenario 1).
A significant amount of the COD load is usually degraded in the new anaerobic digester and open lagoonscan be expected to operate under largely aerobic conditions. However, due to the uncertainty regarding the exact extent of aerobic / anaerobic degradation after project implementation, the calculation of any CH4 emissions is conservatively carried out in the same way as for the baseline, using either the methane conversion factor method (MCF) or the organic removal ratio (ORR) method. The same method as for the baseline emissions shall be applied.

Methane conversion factor method

Project methane emissions from treatment of the effluent from the digester are estimated as follows:

$$PE_{CH4,effluent,y} = GWP_{CH4} \times MCF_{PJ,y} \times B_o \times \left(COD_{PJ,effl,dig,y} - COD_{PJ,effl,lag,y}\right) \quad \textbf{Eq. 12}$$

$$COD_{PJ,effl,dig,y} = \sum_{m=1}^{12} F_{PJ,effl,dig,m} \times w_{COD,effl,dig,m} \quad \textbf{Eq. 13}$$

$$COD_{PJ,effl,lag,y} = \sum_{m=1}^{12} F_{PJ,effl,lag,m} \times w_{COD,effl,lag,m} \quad \textbf{Eq. 14}$$

Where:

$PE_{CH4,effluent,y}$ is the project emissions from treatment of wastewater effluent from the anaerobic digester in year *y* (tCO_2e/yr)

GWP_{CH4} is the Global Warming Potential of methane valid for the commitment period ($tCO_2e/tCH4$)

$MCF_{PJ,y}$ is the Project methane conversion factor (fraction) in year *y,* representing the fraction of ($COD_{PJ,effluent,y}$ x B_o) that degrades to CH_4

B_o is the maximum methane producing capacity, expressing the maximum amount of CH_4 that can be produced from a given quantity of chemical oxygen demand ($tCH_4/tCOD$)

$COD_{PJ,effl,dig,y}$ is the quantity of chemical oxygen demand in the effluent from the digester in year *y* (tCOD/yr)

$COD_{PJ,lag,y}$ is the quantity of chemical oxygen demand in the effluent of the open lagoon or dewatering facility in which the effluent from the digester is treated in year *y* (tCOD/yr)

$F_{PJ,effl,dig,m}$ is the quantity of effluent from the digester in month *m* (m^3/month)

$WCOD_{,effl,dig,m}$ is the average chemical oxygen demand in the effluent from the digester in month *m* (t COD/m^3)

$F_{PJ,effl,lag,m}$ is the quantity of effluent from the open lagoon or dewatering facility in which the effluent from the digester is treated in month *m* (m^3/month)

$WCOD_{,effl,lag,m}$ is the average chemical oxygen demand in the effluent from the open lagoon or dewatering facility in which the effluent from the digester is treated in month *m* (tCOD/m^3)

The quantity of methane generated from COD disposed to the open lagoon or in dewatering facility is calculated as follows:

$$MCF_{PJ,y} = f_d \times f_{PJ,T,y} \quad \textbf{Eq. 15}$$

Where:

$MCF_{PJ,y}$ is the Project methane conversion factor (fraction) in year *y,* representing the fraction of ($COD_{PJ,effluent,y}$ x B_o) that degrades to CH_4

F_d is the factor expressing the influence of the depth of the lagoon or dewatering facility on methane generation

$f_{PJ,T,y}$ is the factor expression the influence of the temperature on the methane generation under the project activity in year *y*

The factor $f_{T,PJ,y}$ is calculated, as under baseline emissions, with the help of a monthly stock change model which aims at assessing how much COD degrades in each month, as follows:

$$COD_{PJ,available,m} = \left(COD_{PJ,effl,dig,m} - COD_{PJ,effl,lag,m}\right) + (1 - f_{T,m}) \times COD_{PJ,available,m-1}$$ ***Eq. 16***

$$COD_{PJ,effl,dig,m} = F_{PJ,effl,dig,m} \times w_{COD,effl,dig,m}$$ ***Eq. 17***

$$COD_{PJ,effl,lag,m} = F_{PJ,effl,lag,m} \times w_{COD,effl,lag,m}$$ ***Eq. 18***

Where:

$COD_{PJ,available.m}$ is the quantity of chemical oxygen demand available for degradation in the open lagoon or dewatering facility under the project activity in month *m* (tCOD/month)

$COD_{PJeffl,dig,m}$ is the quantity of chemical oxygen demand in the effluent from the digester in month *m* (tCOD/month)

$COD_{PJ,effl,lag,m}$ is the quantity of chemical oxygen demand in the effluent of the open lagoon or dewatering facility in which the effluent from the digester is treated in month *m* (tCOD/month)

$F_{PJ,effl,dig,m}$ is the quantity of effluent from the digester in month *m* (m^3/month)

$WCOD^{,effl,dig,m}$ is the average chemical oxygen demand in the effluent from the digester in month *m* ($tCOD/m^3$)

$F_{PJ,effl,lag,m}$ is the quantity of effluent from the open lagoon or dewatering facility in which the effluent from the digester is treated in month *m* (m^3/month)

$W_{COD,effl,lag,m}$ is the average chemical oxygen demand in the effluent from the open lagoon or dewatering facility in which the effluent from the digester is treated in month *m* ($tCOD/m^3$)

$f_{T,m}$ is the factor expressing the influence of the temperature on the methane generation in month m

m is the months of year y of the crediting period

As for the baseline emissions, the carry-over calculations are limited to a maximum of one year. In case the residence time in the open lagoon or the dewatering facility is less than one year, carry-on calculations are limited to the period where the wastewater remains in the lagoon or dewatering facility. Project participants should provide evidence of the typical residence time of the organic matter in the lagoon or the dewatering facility.

The monthly factor to account for the influence of the temperature on methane generation is calculated as per equation 10 above.

Based on the monthly values $f_{T,m}$ the annual value $f_{T,PJ,y}$ is calculated as follows:

$$f_{PJ,T,y} = \frac{\sum_{m=1}^{12} f_{T,m} \times COD_{PJ,avaialble,m}}{\sum_{m=1}^{12} \left(COD_{PJ,effl,dig,m} - COD_{PJ,effl,lag,m} \right)} \quad \textbf{Eq. 19}$$

Where:

$\mathbf{f_{PJ,T,y}}$ is the factor expression the influence of the temperature on the methane generation under the project activity in year *y*

$\mathbf{f_{T,m}}$ is the factor expressing the influence of the temperature on the methane generation in month m

$\mathbf{COD_{PJ,available.m}}$ is the quantity of chemical oxygen demand available for degradation in the open lagoon or dewatering facility under the project activity in month *m* (tCOD/month)

$\mathbf{COD_{PJeffl,dig,m}}$ is the quantity of chemical oxygen demand in the effluent from the digester in month *m* (tCOD/month)

$\mathbf{COD_{PJ,effl,lag,m}}$ is the quantity of chemical oxygen demand in the effluent of the open lagoon or dewatering facility in which the effluent from the digester is treated in month *m* (tCOD/month)

m is the months of year y of the crediting period

(ii) Project emissions related to physical leakage from the digester

This step is applicable if the project activity includes the construction of a new anaerobic digester. The emissions directly associated with the operation of digesters involve the physical leakage of methane from the digester system. Methane emissions from the new digester are calculated as follows:

$$PE_{CH4,digest,y} = F_{biogas,y} * FL_{biogas,digest} * w_{CH4,biogas,y} * GWP_{CH4} * 0.001 \quad \textbf{Eq.20}$$

Where:

$\mathbf{PE_{CH4,digest,y}}$ is the Project emissions from physical leakage of methane from the anaerobic digester in year *y* (tCO_2e /yr)

$\mathbf{F_{biogas,y}}$ is the Amount of biogas collected in the outlet of the new digester in year *y* (m^3/ yr)

$\mathbf{FL_{biogas,digest}}$ is the Fraction of biogas that leaks from the digester (m^3 biogas leaked / m^3 biogas produced)

$\mathbf{w_{CH4,biogas,y}}$ is the Concentration of methane in the biogas in the outlet of the new digester (kg CH_4 / m^3)

$\mathbf{GWP_{CH4}}$ is the Global Warming Potential of methane valid for the commitment period (tCO_2e / tCH_4)

(iii) Methane emissions from flaring

An Open Flare will be installed to meet safety requirements of the project and as methane maybe flared and emissions from flaring must be accounted for. These potential emissions from flaring are to be calculated according to the "Tool to determine project emissions from flaring gases containing methane". As per the guidance of the tool, a simplified approach will be used and only the volumetric fraction of methane will be measured, the difference is considered to be 100% Nitrogen.

Determination of methane mass flow rate in the residual gas on a dry basis

The quantity of methane in the residual gas flowing into the flare is the product of the volumetric flow rate of the residual gas ($FV_{RG,h}$), the volumetric fraction of methane in the residual gas ($fv_{CH4,RG,h}$) and the density of methane ($\rho_{CH4,n,h}$) in the same reference conditions as follows;

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n,h}$$ ***Eq.21***

Where:

$TM_{RG,h}$ is the mass flow rate of methane in the residual gas in the hour *h* (kg/h)

$FV_{RG,h}$ is the volumetric flow rate of the residual gas in dry basis at normal conditions in hour *h* (m^3/h)

$fv_{CH4,RG,h}$ is the volumetric fraction of methane in the residual gas on dry basis in hour *h* (NB: this corresponds to $fv_{i,RG,h}$ where *i* refers to methane).

$\rho_{CH4,n,h}$ is the density of methane at normal conditions (0.716 kg/m^3)

Calculation of annual project emissions from flaring

Project emissions from flaring ($PE_{CH4,flare,y}$)are calculated as the sum of emissions from each hour h, based on the methane flow rate in the residual gas ($TM_{RG,h}$) and the flare efficiency during each hour *h* ($\eta_{flare,h}$), as follows:

$$PE_{CH4flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1 - \eta_{flare,h}) \times (GWP_{CH4} / 1{,}000)$$ ***Eq.22***

Where:

$PE_{CH4flare,y}$ is the project emissions from flaring of the residual gas stream in year *y*

$TM_{RG,h}$ is the mass flow rate of methane in the residual gas in the hour *h*

η_{flare}, is the flare efficiency in the hour *h*

GWP_{CH4} is the Global Warming Potential of methane valid for the commitment period (tCO_2e / tCH_4)

Determination of the hourly flare efficiency

In case of open flares, the flare efficiency in the hour h ($\eta_{flare,h}$) is:

- 0% if the flame is not detected for more than 20 minutes during the hour *h*.
- 50%, if the flare is detected for more than 20 minutes during the hour *h*.

(iv) Project emissions from land application of sludge

This step is applicable if under the project activity sludge is applied on lands. For conservativeness, an MCF of 0.05 is to be used to estimate possible methane emissions from the land application treatment process to account for any possible anaerobic pockets. These emissions are to be estimated from the following equation:

$$PE_{sludge,LA,y} = COD_{sludge,LA,y}*B_o*MCF_{sludge,LA}*S_{LA,y}*w_{N,sludge,y}*EF_{N2O,LA,sludge}*GWP_{N2O} \quad \textbf{Eq.23}$$

Where:

$PE_{sludge,LA,y}$ is project emissions from land application of sludge in year *y* (t CO_2e / yr)

$W_{sludgeCOD,LA,y}$ is the chemical oxygen demand (COD) of the sludge applied to land after the dewatering process in year *y* (tCOD / yr)

$MCF_{sludge,LA}$ is the methane conversion factor for the application of sludge to lands

GWP_{CH4} is the Global Warming Potential of methane valid for the applicable commitment period (t CO_2e / tCH_4)

$S_{LA,y}$ is the amount of sludge applied to land in year *y* (t/yr)

$w_{N,sludge,y}$ is the mass fraction of nitrogen in the sludge applied to land in year *y* (tN / t sludge)

$EF_{N2O,LA,sludge}$ is the N_2O emission factor for nitrogen from sludge applied to land (t N_2O/t N)

GWP_{N2O} is the Global Warming Potential of nitrous dioxide (t CO_2e / t N_2O)

(v) Project emissions from electricity consumption and combustion of fossil fuels in the project

Project emissions from electricity consumption and combustion of fossil fuels in the project are calculated based on the *"Tool to calculate baseline, project and/or leakage emissions from electricity consumption"* Version 01.

GGP produces it's own electricity in its captive coal power plant therefore Section B is the applicable scenario for the project activity, *"Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s)".*

$$PE_{EC,y} = \sum_{j} EC_{PJ,j,y} \text{ x } EF_{EL,j,y} \text{ x } (1+TDL_{j,y}) \quad \textbf{Eq.24}$$

Where:

$PE_{EC,y}$ Project emissions from electricity consumption in year y (t CO_2/yr)

$EC_{PJ,j,y}$ is the quantity of electricity consumed by the project electricity consumption source j in year y O(MWh/yr)

$EF_{EL,j,y}$ is the emission factor for electricity generation for source j in year y (t CO_2/MWh)

TDL $_{j,y}$ is the average technical transmission and distribution losses for providing electricity to source j Oin year y

The EF $_{EL,j,y}$ value applied for the calculations of the PE is as per option B2 default value of 1.3 (t CO_2/MWh)

Following the tool, the average technical transmission and distribution losses for providing electricity to the project are considered 0.

Leakage

As per the methodology, no leakage is estimated.

Emissions Reduction

Emission reductions for any given year of the crediting period are obtained by subtracting project emissions from baseline emissions:

$$ER_y = BE_y - PE_y \quad \text{Eq. 24}$$

Where:

ER	*Emission reduction* (tCO_2e)
BE_y	*Baseline Emission,* $UJA\_E_{BL} + GGP\_E_{BL} + BE_{HG,UJA,y} + BE_{HG,GGP,y}$ (tCO_2e)
PE_y	*Project Emission* (tCO_2e)

B.6.2. Data and parameters fixed ex ante

All data and parameters used for the emission reductions calculations but not monitored during the crediting period are provided in the following tables.

General Project Parameters	
Data / Parameter	B_o
Unit	tCH_4 / tCOD
Description	Maximum methane producing capacity, expressing the maximum amount of CH_4 that can be produced from a given quantity of chemical oxygen demand (COD)
Source of data	ACM0014 version 04.1.0
Value(s) applied	0.21 kg CH_4 / kg COD

Choice of data or Measurement methods and procedures	No measurement procedures.
Purpose of data	Baseline emission calculation Project emission calculation
Additional comment	Taking into account the uncertainty of this estimate a value of 0.21 kg CH_4 / kg COD is used as a conservative assumption for B_o

Data / Parameter	f_d
Unit	-
Description	Factor expressing the influence of the depth of the lagoon on methane generation
Source of data	ACM0014 version 04.1.0
Value(s) applied	Fd UJA 50%, Fd GGP 70%
Choice of data or Measurement methods and procedures	70% Default value proposed by ACM 14 version 04.1.0 for lagoon depth > 5 m or 50% if depth of the lagoon is 5m or below.
Purpose of data	Baseline emission calculation Project emission calculation
Additional comment	Applicable to the methane conversion factor method.

Data / Parameter	$FL_{biogas,digest,y}$
Unit	m^3 biogas leaked/m^3 biogas produced
Description	Fraction of biogas that leaks from the digester
Source of data	IPCC (2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5, Chapter 4, Page 4.4). Default leak factor of 0.05 m^3 biogas leaked/m^3 biogas produced
Value(s) applied	0.05
Choice of data or Measurement methods and procedures	ACM0014 version 04.1.0
Purpose of data	Project emission calculation
Additional comment	Applicable because a new digester is installed as part of the Project Activity.

Data / Parameter	EF_{CO2,FF,GGP_Coal}
Unit	tCO_2 / TJ
Description	CO_2 emission factor of the fossil fuel Coal used in the boiler for heat generation in the absence of the project activity.

Source of data	In the absence regional data the IPCC (2006) defaults is used. IPCC (2006) default for sub-bituminous coal. IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value(s) applied	92.8
Choice of data or Measurement methods and procedures	In March 2010 the Government of Indonesia released its "Indonesian Climate Change Sector Roadmap" http://www.icctf.org/site/en/indonesia-climate-change-sectoral-roadmap.html which, in the absence of national emission factors for fossil fuels, uses the IPCC 2006 defaults. As no Indonesian Emission Factors are available this project also uses the IPCC 2006 defaults for this fossil fuel type.
Purpose of data	Baseline emission calculation
Additional comment	

Data / Parameter	EF_{CO2,FF,UJA_HFO}
Unit	tCO_2 / TJ
Description	CO_2 emission factor of the fossil fuel Heavy Fuel Oil (HFO) used in the heaters for process heat generation in the absence of the project activity
Source of data	In the absence regional data the IPCC (2006) defaults is used. IPCC (2006) default for RFO. IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value(s) applied	75.5
Choice of data or Measurement methods and procedures	In March 2010 the Government of Indonesia released its "Indonesian Climate Change Sector Roadmap" http://www.icctf.org/site/en/indonesia-climate-change- sectoral-roadmap.html which, in the absence of national emission factors for fossil fuels, uses the IPCC 2006 defaults. As no Indonesian Emission Factors are available this project also uses the IPCC 2006 defaults for this fossil fuel type.
Purpose of data	Baseline emission calculation
Additional comment	

Data / Parameter	BL,GGP_boiler
Unit	%
Description	Efficiency of the boiler that would be used for heat generation in the absence of the project

Source of data	Project Proponents operational data, third party performance study and "Tool to determine the baseline efficiency of thermal or electric energy generation systems, version 1" Table 1
Value(s) applied	86.33%
Choice of data or Measurement methods and procedures	To determine the conservativeness of the Proponents efficiency of 86.325% this was compared to the default efficiency in the methodology tool. Table 1 of this tools provides a default efficiency for New coal fired boiler = 85%. As the consultant's calculation efficiency of 86.325% is more conservative than default value of 85% the consultants studies result is used for project baseline calculations. Refer: Steam Production-Power Plant.xls and "Laporan Akhir, Performance Test GGP Cogen Plant untuk PT. Great Giant Pineapple", August 2009
Purpose of data	Baseline emission calculation
Additional comment	Refer Appendix 4 for further details

Data / Parameter	BL,UJA_heater
Unit	%
Description	Efficiency of the heaters that would be used for heat generation in the absence of the project activity
Source of data	Project Proponents operational calculation and "Tool to determine the baseline efficiency of thermal or electric energy generation systems, version 1" Table 1
Value(s) applied	85.0%
Choice of data or Measurement methods and procedures	To determine the conservativeness of the Proponents efficiency of 75.3% this was compared to the default efficiency in the methodology tool. Table 1 of this tools provides a default efficiency for Old Oil fired boiler = 85%. As the default value is more conservative than the Project Proponents calculated value of 75.3% the default value is used for the project baseline calculations. refer : DATA BOILER UJA 2009-R2.xls
Purpose of data	Baseline emission calculation
Additional comment	Refer Appendix 4 for further details

Data / Parameter	GWP_{CH4}
Unit	tCO_2e / tCH_4
Description	Global warming potential for CH_4
Source of data	IPCC 2006
Value(s) applied	21
Choice of data or Measurement methods and procedures	Default to be applied: 21 for the first commitment period.
Purpose of data	Baseline emission calculation Project emission calculation

Additional comment	Shall be updated according to any future COP/MOP decisions

Data / Parameter	$\rho_{CH4,n,h}$
Unit	kg/m^3
Description	Density of methane at normal conditions
Source of data	UNFCCC, EB 28 Meeting report, Annex 13 - Methodological "Tool to determine project emissions from flaring gases containing methane"
Value(s) applied	0.7168
Choice of data or Measurement methods and procedures	Constants provided in Annex 13 - Methodological "Tool to determine project emissions from flaring gases containing methane"
Purpose of data	Project emission calculation
Additional comment	Used to determine project emissions from flaring gases containing methane

Data / Parameter	$RR_{Digester}$
Unit	%
Description	Design COD Removal Efficiency of UASB digester (minimal)
Source of data	GWE Technical Design Document
Value(s) applied	90%
Choice of data or Measurement methods and procedures	This is the value that the technology supplier, GWE, uses for the design specification of their UASB digester for this project
Purpose of data	Project emission calculation
Additional comment	Used in the ex-ante estimates for COD removal in the digester and the value of $w_{COD,effl,dig,m}$

Data / Parameter	Average Temperature
Unit	^0C
Description	Average temperature at the project site
Source of data	At the weather station MENGGALA/ASTRA KSETR at about 4.45°S 105.10°E. reference: http://www.worldclimate.com/cgi-bin/data.pl?ref=S04E105+1102+96273W
Value(s) applied	27.1
Choice of data or Measurement methods and procedures	This parameter is used to calculate the MCF
Purpose of data	Project emission calculation
Additional comment	Monitored values to be sourced from the local meteorological center

UJA General Parameters

Data / Parameter	$CODin_{,x,UJA}$
Unit	tonne COD / year
Description	COD of the effluent in the period x COD directed to the open lagoons (scenario 1) in the period x
Source of data	Project entity – 10 day sampling study of UJA effluent prior to entering lagoon 1 of their WWT system
Value(s) applied	8,725
Choice of data or Measurement methods and procedures	A 10 day sample study was under taken by a third party during the period 18 Oct - 10 Nov 2010. The measurements taken during this period were representative of typical operation conditions of the plant and ambient conditions of the site (temperature, etc). The average CODin and CODout values from the measurement campaign are used in equation (4) and the result is multiplied by 0.89 to account for the uncertainty range (of 30% to 50%) associated with this approach as compared to one-year historical data.
Purpose of data	Baseline emission calculation
Additional comment	Average COD of mill effluent entering into Lagoon 1 Refer Appendix 4 for further details

Data / Parameter	$CODout_{,x,UJA}$
Unit	tonne COD / year
Description	COD of the effluent in the period x COD directed to the open lagoons (scenario 1) in the period x
Source of data	Project entity – 10 day sampling study of UJA effluent leaving lagoon 4 of their WWT system
Value(s) applied	493
Choice of data or Measurement methods and procedures	A 10 day sample study was under taken by a third party during the period 18 Oct - 10 Nov 2010. The measurements taken during this period were representative of typical operation conditions of the plant and ambient conditions of the site (temperature, etc). The average CODin and CODout values from the measurement campaign are used in equation (4) and the result is multiplied by 0.89 to account for the uncertainty range (of 30% to 50%) associated with this approach as compared to one-year historical data.
Purpose of data	Baseline emission calculation
Additional comment	Average COD of mill effluent leaving Lagoon 4 Refer Appendix 4 for further details

Data / Parameter	D_{UJA}

Unit	m
Description	Average depth of the lagoon
Source of data	Project proponents measurements
Value(s) applied	3.24
Choice of data or Measurement methods and procedures	Determined by measuring the average depths of the whole lagoon under normal operating conditions
Purpose of data	Baseline emission calculation Project emission calculation
Additional comment	Refer Appendix 4 for further details

Data / Parameter	A_{UJA}
Unit	Unit of area (ha)
Description	Surface of the lagoon
Source of data	Project Entity UJA
Value(s) applied	1.72
Choice of data or Measurement methods and procedures	Combined area of the UJA anaerobic lagoons 1 to 4
Purpose of data	Baseline emission calculation Project emission calculation
Additional comment	Refer Appendix 4 for further details

GGP General Parameters

Data / Parameter	$COD_{in,x,GGP}$
Unit	tonne COD / year
Description	COD of the effluent in the period x. COD directed to the open lagoons (scenario 1) in the period x.
Source of data	Project entity – 10 days sampling study of GGP line 1 & 2 effluent leaving the factory
Value(s) applied	9,712

Choice of data or Measurement methods and procedures	A 10 day sample study was under taken by the project entity during the period 31 Mar 10 to 28 Apr 10. The measurements taken during this period were representative of typical operation conditions of the plant and ambient conditions of the site (temperature, etc). The average CODin and CODout values from the measurement campaign are used in equation (4) and the result is multiplied by 0.89 to account for the uncertainty range (of 30% to 50%) associated with this approach as compared to one-year historical data.
Purpose of data	Baseline emission calculation
Additional comment	Refer Appendix 4 of PDD for further details

Data / Parameter	$COD_{out,x,GGP}$
Unit	tonne COD / year
Description	COD of the effluent in the period x. COD leaving the open lagoons (scenario 1) in the period x.
Source of data	Project entity – Under the rehabilitation plan for GGP WWT anaerobic lagoons 80% reduction of COD leaving the anaerobic lagoons is used as the design parameter. $COD_{out,x,GGP}$ = 80% reduction of $COD_{in,x,GGP}$
Value(s) applied)	1,942
Choice of data or Measurement methods and procedures	A 10 day sample study was under taken by the project entity during the period 31 Mar 10 to 28 Apr 10. The measurements taken during this period were representative of typical operation conditions of the plant and ambient conditions of the site (temperature, etc). The average CODin and CODout values from the measurement campaign are used in equation (4) and the result is multiplied by 0.89 to account for the uncertainty range (of 30% to 50%) associated with this approach as compared to one-year historical data.
Purpose of data	Baseline emission calculation
Additional comment	Refer Appendix 4 of PDD for further details

Data / Parameter	D_{GGP}
Unit	M
Description	Average depth of the lagoon
Source of data	Consultants report "*Improvement Of Anaerobic Lagoon Performance PT. GGP Waste Water Treatment Lagoons*"
Value(s) applied)	> 5
Choice of data or Measurement methods and procedures	Design requirements for the rehabilitation of GGP's anaerobic lagoons (lagoons 3 – 9).
Purpose of data	Baseline emission calculation Project emission calculation
Additional comment	Refer Appendix 4 of PDD for further details.

Data / Parameter	A_{GGP}
Unit	Unit of area (ha)
Description	Surface of the lagoon
Source of data	Project Entity GGP
Value(s) applied)	3.351
Choice of data or Measurement methods and procedures	Combined area of the GGP anaerobic lagoons 3 to 9
Purpose of data	Baseline emission calculation Project emission calculation
Additional comment	Refer Appendix 4 of PDD for further details.

B.6.3. Ex ante calculation of emission reductions

Table 9 Estimated emission contribution from individual project component

Project Years	UJA Project Baseline Emission (tonnes CO_2/year)	GGP Project Baseline Emission (tonnes CO_2/year)	Baseline emissions from the generation of heat and flaring (tonnes CO_2/year)	Total Baseline Emissions (tonnes CO_2/year)	Total Project Emissions (tonnes CO_2/year)	Estimation of Project Emission Reduction (tonnes CO_2/year)
2012 (15/11/12) - (31/12/12)	839	3,516	3,001	7,357.0	1,545	5,812
2013	6,714	28,134	18,325	53,174.0	12,360	40,813
2014	6,714	28,134	18,325	53,174.0	12,360	40,813
2015	6,714	28,134	18,325	53,174.0	12,360	40,813
2016	6,714	28,134	18,325	53,174.0	12,360	40,813
2017	6,714	28,134	18,325	53,174.0	12,360	40,813
2018	6,714	28,134	18,325	53,174.0	12,360	40,813
2019	6,714	28,134	18,325	53,174.0	12,360	40,813
2020	6,714	28,134	18,325	53,174.0	12,360	40,813
2021	6,714	28,134	18,325	53,174.0	12,360	40,813
2022 (01/01/2022) - (14/11/2022)	5,875	24,617	15,324	45,817.0	10,815	35,001
Total estimated reductions (tonnes of CO_2)	**67,140**	**281,339**	**183,250**	**531,740**	**123,600**	**408,130**
Annual average over the crediting period of estimated reduction (tonnes of CO_2e)	**6,714**	**28,134**	**18,325**	**53,174**	**12,360**	**40,813**

[21]The following estimations are calculated based on the equations in B.6.1 and the parameters provided in B.6.2 and B.7.3.

<u>Baseline Emissions</u> in a Full Credit Year *(tonne CO2e / yr)*

Methane emissions baseline from the existing anaerobic wastewater treatment lagoons

UJA BEy = **6,715** *tonne CO_2e / yr*

GGP BEy = **28,134** *tonne CO_2e / yr*

[21] Refer to Excel spreadsheet for detailed calculations *GGP CER .xls*

CO_2 emission baseline from the combustion of fossil fuels.

$BE_{HG,\ PJ,y} = BE_{HG,\ UJA,y} + BE_{HG,\ GGP,y}$

$BE_{HG,\ UJA,y}$ = 1,311 *tonne* CO_2e */ yr*

$BE_{HG,\ GGP,y}$ = 16,714 *tonne* CO_2e */ yr*

$BE_{HG,\ PJ,y}$ **=** 18,026 *tonne* CO_2e */ yr*

CO_2 emission baseline from the destruction of methane in the Flare

$\mathbf{BE_{CH4,flare,y}}$ = 299 *tonne* CO_2e */ yr*

Total Baseline Emissions in a Full Credit Year

BE_y = UJA BE_y + GGP BE_y + $BE_{HG,\ PJ,y}$ + $BE_{CH4,flare,y}$

BE_y = 53,174 *tonne* CO_2e */ yr*

<u>Project emissions in a Full Credit Year</u> *(tonne* CO_2e */ yr)*

(i) Project methane emissions from effluent from the digester

$PE_{CH4,effluent,y}$ = 8,347 *tonne* CO_2e */ yr*

(ii) Project emissions related to physical leakage from the digester

$PE_{CH4,digest,y}$ = 3,659 *tonne* CO_2e */ yr*

(iii) Project emissions from flaring

$PE_{CH4,flare,y}$ = 299 *tonne* CO_2e */ yr*

(iv) Project emissions from land application of sludge

$PE_{sludge,LA,y}$ = 0 *tonne* CO_2e */ yr*

(v) Project emissions from electricity consumption

$PE_{EC,y}$ = 56 *tonne* CO_2e */ yr*

$PE_{EC,y}$ = 0 *tonne* CO_2e */ yr*

<u>Total Project Emissions in a Full Credit Year</u>

$PE,y = PE_{CH4,effluent,y} + PE_{CH4,digest,y} + PE_{CH4,flare,y} + PE_{sludge,LA,y} + PE_{EC,y} + PE_{FC,y}$

PE,y = 12,361 *tonne* CO_2e */ yr*

Leakage

As per the methodology, leakage is considered to be negligible.

Emission Reductions in a Full Credit Year

ER,y = BE_y - $PE_{,y}$

ER,y = 40,813 tonne CO_2e / yr

B.6.4. Summary of ex ante estimates of emission reductions

Table 10 Summary of ex-ante estimated of emission reductions

Year	Baseline Emissions (t CO_2e)	Project Emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2012 (15/11/12) - (31/12/12	7,357.0	1,545	0	5,81 2
2013	53,174.0	12,360	0	40,813
2014	53,174.0	12,360	0	40,813
2015	53,174.0	12,360	0	40,813
2016	53,174.0	12,360	0	40,813
2017	53,174.0	12,360	0	40,813
2018	53,174.0	12,360	0	40,813
2019	53,174.0	12,360	0	40,813
2020	53,174.0	12,360	0	40,813
2021	53,174.0	12,360	0	40,813
2022 (01/01/2022) - (14/11/2022	45,817.0	10,815	0	35,001
Total	**531,740**	**123,600**	**0**	**408,130**
Total number of crediting years	**10**			
Annual average over the crediting period	**53,174**	**12,360**	**0**	**40,813**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	$F_{PJ,dig,m}$
Unit	m³ / month
Description	Quantity of wastewater that is treated in the anaerobic digester in the project activity in month *m*
Source of data	Measured
Value(s) applied	166,186

Measurement methods and procedures	Parameter monitored continuously with flow meters and will be aggregated annually for calculations. The accuracy of the flow meter will be according to the manufacturer's specifications. Period of archival: During the crediting period and two years after project completion
Monitoring frequency	Parameter monitored continuously with flow meters and will be aggregated annually for calculations.
QA/QC procedures	Maintenance and calibration are established subject to appropriate manufacturer standards.
Purpose of data	Baseline emission calculation
Additional comment	

Data / Parameter	$w_{COD,dig,m}$
Unit	t COD / m³
Description	Average chemical oxygen demand in the wastewater that is treated in the anaerobic digester or under clearly aerobic
Source of data	Measurement
Value(s) applied	0.0104814
Measurement methods and procedures	Measured will be done by an accredited third party laboratory monthly but aggregated annually for calculations. Measure the COD according to national or international standards. Period of archival: During the crediting period and two years after project completion
Monitoring frequency	Measured will be done by an accredited third party laboratory monthly but aggregated annually for calculations.
QA/QC procedures	External third party conducting the COD test must be accredited
Purpose of data	Baseline emission calculation
Additional comment	Aerobic lagoons will be used to reduce the COD in the digester effluent to meet the Provincial Government of Lampung's environmental regulations. 160 mg/L for fruit processing and 300 mg/L for tapioca processing.

Data / Parameter	$F_{PJ,effl,dig,m}$
Unit	m³ / month
Description	Quantity of effluent from the digester in month m
Source of data	Measured
Value(s) applied	166,186
Measurement methods and procedures	Parameter monitored continuously with flow meters and will be aggregated annually for calculations. The accuracy of the flow meter will be according to the manufacturers specifications Period of archival: During the crediting period and two years after project completion
Monitoring frequency	Parameter monitored continuously with flow meters and will be aggregated annually for calculations.
QA/QC procedures	Flow meters will be calibrated prior to operation and a calibration certificate issued. The meters will be calibrated every three years or as specified by manufacturer, whichever is earliest.
Purpose of data	Project emission calculation
Additional comment	

Data / Parameter	$F_{PJ,effl,lag,m}$
Unit	m³ / month
Description	Quantity of effluent from the open lagoon in which the effluent from the digester is treated in month m
Source of data	Measured
Value(s) applied	166,186
Measurement methods and procedures	Parameter monitored continuously with flow meters and will be aggregated annually for calculations. The accuracy of the flow meter will be according to the manufacturers specifications Period of archival: During the crediting period and two years after project completion
Monitoring frequency	Parameter monitored continuously with flow meters and will be aggregated annually for calculations.
QA/QC procedures	Flow meters will be calibrated prior to operation and a calibration certificate issued. The meters will be calibrated every three years or as specified by manufacturer, whichever is earliest.
Purpose of data	Project emission calculation
Additional comment	

Data / Parameter	$E_{G,y}$
Data unit	MWh/y
Description	Metering the electricity consumed by the biogas plant that is generated by GGP's captive power plant in year y
Source of data	Actual measurement

Value(s) applied	Actual monitored data will be used during implementation of project activity (Ex ante value is 43MWh/y)
Measurement methods and procedures	Measured continuously using electricity meter
Monitoring frequency	Measured continuously using electricity meter
QA/QC procedures to be applied:	A. Monitored continuously. The electricity meter is to be periodically calibrated according to the manufacturer's recommendation. The monitoring result will be consolidated and compiled on a monthly basis.
Purpose of data	Project emission calculation
Additional comment	The accuracy is as per manufacturer's specification

Data / Parameter	$T_{2,m}$
Unit	K
Description	Average temperature at the project site in month m
Source of data	Region weather statistic[22]
Value(s) applied	27.1 ^{0}C
Measurement methods and procedures	Check data every start of the month
Monitoring frequency	Check data every start of the month
QA/QC procedures	
Purpose of data	Baseline emission calculation Project emission calculation
Additional comment	Applicable since methane conversion factor method is used

Data / Parameter	$HG_{PJ,UJA,y}$
Unit	TJ / year
Description	Net quantity of heat generated in year y in the UJA heaters with biogas from the new anaerobic digester
Source of data	Calculated from the measurement of the volume of biogas received and used for heat generation multiplied by the methane content of the gas, CV methane, and the efficiency of the boiler.
Value(s) applied	14.8
Measurement methods and procedures	Calculated and aggregated monthly for emission reduction calculations
Monitoring frequency	Calculated and aggregated monthly
QA/QC procedures	All instruments used to collect data for this calculation are periodically calibrated in order to secure accuracy. Period of archival: During the crediting period and two years after project completion
Purpose of data	Baseline emission calculation
Additional comment	

[22] BMG (Badan Metereologi dan Geofisika/Meteorological and Geophysical Agency) for Terbanggi Besar area

Data / Parameter	$HG_{PJ,GGP,y}$
Unit	TJ / year
Description	Net quantity of heat generated in year y in GGP Boilers (2 & 3) with biogas from the new anaerobic digester
Source of data	Calculated from the measurement of the volume of biogas received and used for heat generation multiplied by the methane content of the gas, CV methane, and the efficiency of the boiler.
Value(s) applied	155.5
Measurement methods and procedures	Calculated and aggregated monthly for emission reduction calculations
Monitoring frequency	Calculated and aggregated monthly
QA/QC procedures	All instruments used to collect data for this calculation are periodically calibrated in order to secure accuracy. Period of archival: During the crediting period and two years after project completion
Purpose of data	Baseline emission calculation
Additional comment	

Data / Parameter	$W_{COD,effl,dig,m}$
Unit	t COD / m³
Description	Average chemical oxygen demand in the effluent from the digester in month *m*
Source of data	Calculated for the purpose of Section B5 using the UASB design COD removal efficiency of 90%. Refer to $RR_{digester}$ Section B6.2 Under the project activity this parameter is to be measured
Value(s) applied	0.00087
Measurement methods and procedures	Measured will be done by an accredited third party laboratory monthly but aggregated annually for calculations. Measure the COD according to national or international standards. Period of archival: During the crediting period and two years after project completion
Monitoring frequency	Measured will be done by an accredited third party laboratory monthly but aggregated annually for calculations.
QA/QC procedures	All sampling and analysis is to be undertaken by a trained laboratory staff. Instruments used for this analysis is to undergo minimum of yearly calibration or as required by manufacturer specifications.
Purpose of data	Project emission calculation
Additional comment	Aerobic lagoons will be used to reduce the COD in the digester effluent to meet the Provincial Government of Lampung's environmental regulations. 160 mg/L for fruit processing and 300 mg/L for tapioca processing.

Data / Parameter	$W_{COD,effl,lag,m}$
Unit	t COD / m³
Description	Average chemical oxygen demand in the effluent from the open lagoon in which the effluent from the digester is treated in month *m*
Source of data	Calculated. For section B5 calculation the environment discharge limit of 160mg/l is used
Value(s) applied	0.00016
Measurement methods and procedures	Measured will be done by an accredited third party laboratory monthly but aggregated annually for calculations. Measure the COD according to national or international standards. Period of archival: During the crediting period and two years after project completion
Monitoring frequency	Measured will be done by an accredited third party laboratory monthly but aggregated annually for calculations.
QA/QC procedures	All sampling and analysis is to be undertaken by a trained laboratory staff. Instruments used for this analysis is to undergo minimum of yearly calibration or as required by manufacturer specifications.
Purpose of data	Project emission calculation
Additional comment	Aerobic lagoons will be used to reduce the COD in the digester effluent to meet the Provincial Government of Lampung's environmental regulations. 160 mg/L for fruit processing and 300 mg/L for tapioca processing.

Data / Parameter	$W_{sludgeCOD,LA,m}$
Unit	tCOD / m
Description	Chemical oxygen demand (COD) of the sludge applied to land after the dewatering process in
Source of data	Measured
Value(s) applied	Measure the COD according to national or international standards. Measured will be done by an accredited third party laboratory.
Measurement methods and procedures	Regularly when sludge is applied to land. Monthly and annual values will be calculated
Monitoring frequency	Monthly and annual values will be calculated
QA/QC procedures	All sampling and analysis is to be undertaken by a trained laboratory staff. Instruments used for this analysis is to undergo minimum of yearly calibration or as required by manufacturer specifications.
Purpose of data	Project emission calculation
Additional comment	

Data / Parameter	$S_{LA,y}$
Unit	t /m
Description	Amount of sludge applied to land in month *m*
Source of data	Measured
Value(s) applied	

Measurement methods and procedures	Parameter will be monitored continuously in the event that there is sludge application. It is foreseen that there will be little sludge removal and if so it will occur only after a few years of the project being commissioned.
Monitoring frequency	Parameter will be monitored continuously in the event that there is sludge application.
QA/QC procedures	
Purpose of data	Project emission calculation
Additional comment	

Data / Parameter	$w_{N,sludge,y}$
Unit	t N/t sludge
Description	Mass fraction of nitrogen in the sludge applied to land in month *m*
Source of data	Measured
Value(s) applied	
Measurement methods and procedures	Parameter will be monitored continuously in the event that there is sludge application. It is foreseen that there will be little sludge removal and if so it will occur only after a few years of the project being commissioned.
Monitoring frequency	Parameter will be monitored continuously in the event that there is sludge application.
QA/QC procedures	
Purpose of data	Project emission calculation
Additional comment	

Data / Parameter	$F_{UJA,biogas,y}$
Unit	Nm^3 / yr
Description	Amount of biogas that is sent to the UJA heaters in
Source of data	Measured at the UJA off-take point from the main biogas line from the digester
Value(s) applied	641,160
Measurement methods and procedures	Parameter monitored continuously but aggregated annually for calculations. Flow rates will be measured using international standard flow rate meter with accuracy of 2% Period of archival: During the crediting period and two years after project completion
Monitoring frequency	Parameter monitored continuously but aggregated annually for calculations.
QA/QC procedures	Flow meters will undergo maintenance / calibration subject to appropriate industry standards. The frequency of calibration and control procedures would be different for each application.

Purpose of data	Project emission calculation
Additional comment	Applied to estimate emissions associated with physical leakage from the digester

Data / Parameter	$F_{GGP,biogas,y}$
Unit	Nm^3 / yr
Description	Amount of biogas that is sent to GGP Boilers (B2 & B3) in
Source of data	Measured at the GGP off-take point from the main biogas line from the digester
Value(s) applied	6,752,415
Measurement methods and procedures	Parameter monitored continuously but aggregated annually for calculations. Flow rates will be measured using international standard flow rate meter with accuracy of 2% Period of archival: During the crediting period and two years after project completion
Monitoring frequency	Parameter monitored continuously but aggregated annually for calculations.
QA/QC procedures	Flow meters will undergo maintenance / calibration subject to appropriate industry standards. The frequency of calibration and control procedures would be different for each application.
Purpose of data	Project emission calculation
Additional comment	Applied to estimate emissions associated with physical leakage from the digester

Data / Parameter	$F_{Flare,biogas,y}$
Unit	Nm^3/yr
Description	Amount of biogas that is sent to the flare in year *y*
Source of data	Measured at the Flare off-take point from the main biogas line from the digester
Value(s) applied	85,376 This ex-anti estimate is based upon 100 operational hours per year of the emergency flare
Measurement methods and procedures	Parameter monitored continuously but aggregated annually for calculations. Flow rates will be measured using international standard flow rate meter with accuracy of 2% Period of archival: During the crediting period and two years after project completion
Monitoring frequency	Parameter monitored continuously but aggregated annually for calculations.

QA/QC procedures	Flow meters will undergo maintenance / calibration subject to appropriate industry standards. The frequency of calibration and control procedures would be different for each application.
Purpose of data	Project emission calculation
Additional comment	Applied to estimate emissions associated with physical leakage from the digester

Data / Parameter	$w_{CH4,biogas,y}$
Unit	$kgCH_4/m^3$
Description	Concentration of methane in the biogas in the outlet of the new digester
Source of data	Measured with continuous analyser
Value(s) applied	0.4659
Measurement methods and procedures	Period of archival: During the crediting period and two years after project completion
Monitoring frequency	Continuous
QA/QC procedures	Gas analyser will be periodically calibrated according to the manufacturer's recommendation.
Purpose of data	Project emission calculation
Additional comment	

Data / Parameter	$FV_{RG,h}$
Unit	Nm^3/h
Description	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour *h*
Source of data	Measurements by project participants using a flow meter
Value(s) applied	85,376
Measurement methods and procedures	Ensure that the same basis (dry or wet) is considered for this measurement and the measurement of volumetric fraction of all components in the residual gas (*fvi,h*) when the residual gas temperature exceeds 60 ºC. Measured continuously and averaged hourly. Period of archival: During the crediting period and two years after project completion
Monitoring frequency	Measured continuously and averaged hourly.
QA/QC procedures	Flow meters are to be periodically calibrated according to the manufacturer's recommendation.
Purpose of data	Project emission calculation
Additional comment	

Data / Parameter	Flare efficiency
Unit	%
Description	Flare efficiency of the open flare
Source of data	UNFCCC, EB 28 Meeting report, Annex 13 - Methodological "Tool to determine project emissions from flaring gases containing methane"
Value(s) applied	50%

Measurement methods and procedures	According to the "Tool to determine project emissions from flaring gases containing methane" for an open flare, the default efficiency to be applied is: 0% if the flame is not detected for more than 20 minutes during the hour h. 50%, if the flare is detected for more than 20 minutes during the hour h. Therefore, the time that the flare is on in a given hour shall also be monitored.
Monitoring frequency	Continuous measuring and reading, hourly recording and will be aggregated monthly for calculations
QA/QC procedures	
Purpose of data	Project emission calculation
Additional comment	

B.7.2. Sampling plan

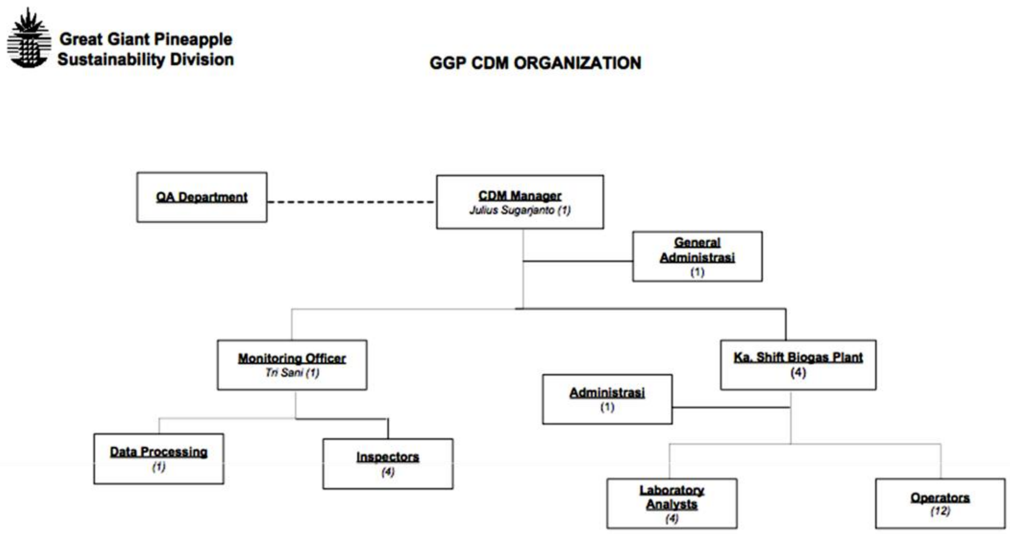
No data and parameters monitored in section B.7.1 above are to be determined by a sampling approach.

B.7.3. Other elements of monitoring plan

The Monitoring Plan ensures that parameters for both project and baseline emissions are monitored according to the requirements of ACM0014 Version 04.1 as described in section B.7.1 above.

CDM monitoring organisation and management

Prior to the start of the crediting period, the organisation of the monitoring team will be finalised. Clear roles and responsibilities will be assigned to all staff involved in the CDM project. The Project Developer will have a designated CDM Manager on site who will be responsible for monitoring emissions reductions of the project activity. CDM Manager will coordinate all staff involved in the collection of data and records.



<u>Data collection and record keeping arrangements:</u>
Data monitored for CDM purposes will be recorded at the appropriate frequency. The CDM Manager will be responsible for managing the collection, storage and archiving of all data and records. All relevant data will be archived electronically, and backed up regularly.

A SCADA system will provide control and management of the operational activities associated with the new wastewater treatment facility and the end use of the biogas. Monitoring data will be recorded/downloaded monthly and stored electronically in a database. Any problems with the monitoring equipment will be noted in an operation and maintenance log and entered into the database. A quarterly monitoring report will be produced containing the monthly monitoring data files and details of any equipment faults and/or loss of data. The quarterly report will be submitted to the project participants for review and acceptance.

All data will be stored on spreadsheets and backed up electronically on a separate computer. Copies of the collated data will be printed monthly as part of the monthly monitoring report. All data will be kept for at least 2 years following the end of the crediting period. Any lost data due to equipment failure will be reconstructed from former and subsequent series measurements up to 6 months after the equipment failed. This is considered reasonable as despite a quality control, maintenance and auditing system in place, instrument failure and delays in replacement may still occur. During this period, additional evidence will be used to demonstrate the continuing of factory operations to avoid suspicion that the data is indeed missing due to instrument failure and not cessation of the production process.

<u>Data Quality Control and Quality Assurance</u>
The following quality assurance measures will be taken relating to the monitoring equipment and its installation and operation:

- All meters, sensing and sampling equipment will be designed and manufactured to International standards.
- Prior to operation, GGP's QA department will validate that the monitoring equipment is calibrated according to the appropriate standards.
- The central SCADA system used for managing the data requirements of the biogas plant will be located in a secure, sealed housing to prevent damage or tampering.
- Routine maintenance and calibration of all monitoring equipment will be performed in accordance with the manufacturer's specification to ensure that the data remains accurate.

To ensure the quality of the recorded data, all personnel will be trained in accordance with this monitoring plan.

The following quality assurance measures will be taken relating to the storage of the monitored data:

- A paper backup of the monthly electronic data file will be stored in a secure location onsite.
- The monthly data files will be included as part of the quarterly monitoring report and an electronic backup of the report will be emailed to a separate location (i.e. PT GGP head office Jakarta).

All data collected will be checked by the CDM Manager. The CDM Monitoring Manager will be responsible for the overall quality control. The Plant Manager will also checks for anomalies or other monitoring issues before forwarding data to Danish, Ministry of Climate and Energy on a monthly basis.

<u>Quality Control Procedures</u>
To ensure malfunction is identified promptly, all monitoring equipment will be manually inspected on a yearly basis. Any equipment faults or loss of data will be recorded in the database with details of the fault and length of time over which data was affected.

Additional maintenance, testing and calibration will be undertaken as per the following table.

Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored			
Data	Uncertainty level of data (High/Medium/ Low)	Are QA/QC procedures planned for these data?	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
Biogas Flow measurements	Low	Yes	Flow meters shall be subject to a regular maintenance, testing regime and calibration to ensure accuracy. Maintenance and calibration are to be undertaken in accordance with the manufacturers specification.
CH_4 in the Biogas	Low	Yes	Continuous gas analyser shall be subjected to regular maintenance and testing regime to ensure accuracy. They are be calibrated regularly according to the manufacturers specification and procedures
Wastewater flow meters	Low	Yes	Flow meters shall be subject to a regular maintenance, testing regime and calibration to ensure accuracy. Maintenance and calibration are to be undertaken in accordance with the manufacturers specification.
Flare Temperature	Low	Yes	The thermocouples used to measure the temperature of the flare when it is operational will undergo quarterly checks on there functionality. Thermocouples are to be replaced or calibrated every year.

An audit of the monitoring plan will be undertaken on a random basis at least every twelve month basis. The audit will check that the monitoring procedure and the Quality Assurance and Quality Control procedures are being followed correctly.

B.7.4. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

The baseline study was determine and completed on May 25,2011 by Danish Energy Management and Mr. Kenneth Butler, on behalf of PT Great Giant Pineapple.

Danish Energy Management (Danish CDM Programme Indonesia) 30/ Menara Kadin Indonesia, office 22O Jl. H.R Rasuna Said Blok X-5, Kav 2-3OJakarta 12950, Indonesia

Kenneth Buttler: contact: kenrbutler@yahoo.com.au)

Danish Energy Management and Mr. Kenneth Buttler are not project participants.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

11th Feb 2010 Date of signing the “Turn Key” Contract between PT GGP to Global Water Engineering LTD.

C.1.2. Expected operational lifetime of project activity

20 years

C.2. Crediting period of project activity

C.2.1. Type of crediting period

Fixed crediting period

C.2.2. Start date of crediting period

15th Nov 2012 or the date of registration, whichever is later

C.2.3. Length of crediting period

1 x 10 years

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

According to Law No. 23 of the Republic of Indonesia, year 1997, on Environmental Management, every project and/ or activity with large and significant environmental impact must conduct an “*Analisis Mengenai Dampak Lingkungan”* (AMDAL) or Environmental Impact Assessment (EIA), in order to attain the approval to proceed with the project and/ or activity.

EIA requirements are defined in *Decree Concerning Types Of Businesses Or Activities Required To Prepare An Environmental Impact Assessment*, Decree No. Kep-11/Menlh/3/1994, *APPENDIX I, List Of Activities Requiring Environmental Impact Assessment*.

An Environmental Impact Scoping Study (EISS) and Stakeholder Consultation process have been undertaken as components of project development so as to determine the scale of any new significant environmental impacts associated with this new wastewater treatment activity. Where according to the Indonesian regulation regarding Environmental Impact Assessment, Number 51 of 1993,Article 3, and Decree Concerning Guidelines For The Determination Of Significant Impacts, BAPEDAL, Decree Number, Kep-056 of 1994, the significant impacts of a business or activity on the environment are determined by:

1. number of people affected;
2. extent of the affected area;
3. duration of the impact;
4. intensity of the impact:
5. number of other environmental components affected;
6. cumulative nature of the impact;
7. reversibility or irreversibility of the impact.

The results of the EISS and SC determined that there are many positive impacts through the implementation of this improved wastewater treatment activity such as reduced groundwater pollution, disease vector control, reduced emissions of methane, reduced air pollution from the open lagoons and community development activities. The enclosed treatment of wastewater will have major positive environmental and health impacts for the workforce of both UJA and GGP.

Potential negative impacts such as short-term noise and dust during implementation whilst under operational conditions potential negative impacts are the plume of the flare emissions, safety issue associated with the high temperature flare. These identified operational impacts are to be minimised through the design and location of the flaring facility. Section E of this document covers the potential impacts (both positive and negative) on the local population.

D.2. Environmental impact assessment

All identified negative environmental impacts will be dealt with in the project design and implementation plans. This will include the development of;

- An environmental management plan (*Upaya Pengelolaan Lingkungan* -UKL) document details actions that will be made to manage the significant environmental impacts which could result from the project activity, and

- An environmental monitoring plan (*Upaya Pemantauan Lingkungan* - UPL) document detailing actions that will be made to monitor the environmental components which could be subjected to significant impacts arising from a proposed project activity.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

1st Stakeholder meeting 13 June 2007[23]

PT Great Giant Pineapple (GGP) organised public participation through public consultation meeting at the GGP Mess on 13 June 2007. local stakeholder were invited together with representatives of the Ministry of the Environment (KLH) Jakarta, Mr Gunardi as head of secretariat of national committee CDM. The meeting was attended by about 34 people, the member of community (the list is inserted) who live around the facilities of PT GGP and PT UJA. They are the beneficiaries, the leader in the community such as RT/RW, Lurah, and other member of community that work at GGP and UJA, local government officials (especially those that deal with the environment) and non governmental organization (such as young people organization, religion group and the representative women from PKK).attended the meeting,

Speech from:

a. Machmud Santoso, management representative as Community Relation Department Manager.
   Welcome speech by Machmud Santoso as representative of GGP management. Santoso also introduced the participant, representative from Lampung Tengah district and Tebangi sub-district officials, as well as other stakeholders.
b. M. Harun Alrasyid, who as a ERM representative explained the CDM Project of GGP/UJA. Also he spoke about sustainable development and why the people are involved in this project.
c. Julius S, Head of Environment Control of GGP Lampung Tengah. Julius presented the proposed GGP should look into job opportunities for the local community and the environment impact from its operations.
d. Ir. Gunardi, government official representative from Komnas PMB. Gunardi presented the Clean Development Mechanism (CDM) concept, the motivation for the project, and overview of the Kyoto Protocol.
e. Nasir AT, environment agency of local government of Lampung Tengah. Closing speech by Nasir ATT. He welcomed the CDM project of PT GGP and supported the development by GGP. He requested PT GGP to manage and complete the authority's approvals of environment permits.

2nd Stakeholder meeting 26 March 2010[24]

The purpose of this 2nd stakeholder meeting was aimed as a social gathering between the company and the surrounding local community, and also as a mean to tighten the friendship between each others. The stakeholders were invited and asked to comment on the proposed project activity are from local government, informal community leaders, religious leaders, local community and local company representative (the list is inserted).

PT Great Giant Pineapple (GGP), Danish CDM and CDM consultant organized public participation through public consultation meeting at the Guest House of GGP on the 26 March 2010. The meeting was attended by 45 participants (not including PT GGP & PT UJA staff). Through this event local stakeholders were informed of the objective and description of the CDM project and asked to give their comments.

[23] Refer to *Comdev_GGP_Profile.pdf* for the full report on the 1st Stakeholder Meeting

[24] Refer to *Stakeholder report GGP March.doc* for the full report on the 2nd Stakeholder Meeting

E.2. Summary of comments received

Initial Stakeholder meeting 13 June 2007

Stakeholders were invited to ask questions, make comments or express concerns in relation to the project activity. Community requests that concluded in public consultation are as follows:

1. Through CDM Program, it is hoped that environment pollution will decrease, especially the factory pollution.
2. People expect that with the implementation of this project odour from the liquid waste of GGP/UJA will be reduced.
3. Involvement of the public in reduction green house gas.
4. CDM program could bring economic development by offering economic opportunities to the community.
5. The biogas generated by the liquid waste and captured by this project could be used for households needs.

2nd Stakeholder meeting 26 March 2010

Stakeholders were invited to ask questions, make comments or express concerns in relation to the project activity. Community requests that concluded in public consultation are as follows :

Question 1: Abu Bakar (Chairman of Tanjung Anom Farmer Group)

What is the real benefit from GGP's Methane Gas capture Project to surrounding Community?

Question 2: Machfud santoso (CRD Manager PT. GGP)

What is the barriers that the project developer faced in the establishing a methane gas capture project?

E.3. Report on consideration of comments received

Initial Stakeholder meeting 13 June 2007

Due account was taken of all comment and GGP provided detailed explanation of all issues raised during the stakeholders meeting.

1. **Environment pollution and Odor reduction;** the factory of GGP was contain a lower pollution.
   GGP always concern to look into the environmental impact from its operation. GGP has sought the relevant approvals from the agencies concerned. Environment permits will be obtained by GGP as it a requirement for CDM activities. GGP has undertaken and is obliged to implement Environment Management Procedure (UKL) and Environment Monitoring Procedure (UPL). The periodic measurement and monitoring scheduled stipulated in the UKL and UPL will be regularly undertaken so as to anticipate any occurrence of leakage of biogas.

   Implementation of the CDM Project will reduce pollution and odours from lagoon by using the proposed technology. This project is to improve the environmental impact from the facilities. At least there is no negative impact for the environment compare with existing open lagoon facilities. The smell problem from the open lagoon facilities will be improved by the covered lagoon facilities.

2. **Public involvement and economic opportunities**; GGP will look into job opportunities for the local community. The CDM project needs manpower approximately 15 persons and the sub district government will support and provide the manpower to work in this project. Construction and operation of lagoon system will generate temporary and permanent job for local communities.

During the meeting the participants were able to understand that GGP has a strong commitment to community development and providing opportunities for the community who live around the GGP site since the corporate established 1979. These include, **Social Economy Development Program** : partnership with PKK in supplying employees' uniforms and also partnership with farmers of cows and potatos.

Revolving Fund Program : This stimulant is given to small economy productive units includes PKK groups, handicrafts home industry and other units around GGP site. **Social and Development Participation** : for examples , providing clean water for 197 villages and organizations in Lampung Tengah; Bamboo for 12 villages including social organizations, schools and District Police Department, then basic education facilities. Another assisstances are : providing budget for social activities both personal and groups. In 2007, GGP Management has planned the budget of Community Development, almost 3 Million Rupiah.

3. The gas of liquid waste from GGP could be used for households needs; the first step of the CDM project is gas flaring. In the future, GGP will take research for gas benefits, especially for households' needs of those that live around the GGP/UJA facilities.

Based on the result of the interview between stakeholders and public counsultant, the program of Community Development is taken as consideration by doing such as :

a. Creating active demands to have healthy environment through certain activities such as :
   - increasing the number and capacity of the community in caring, managing and sustaining the environment ;
   - increasing the local community empowerment in managing and sustaining the natural resources through religious, custom and cultural approaches.

b. Conducting local initiation in handling environment problems through activities such as:
   - Building partnership pattern among social institutions
   - protecting the customs' rights in managing and sustaining both natural resources and the environment
   - conducting economy, social and cultural study, mobilizing traditional wisdom in maintaining environment and protecting traditional technology which is environment-friendly
   - increasing obedience of corporate and social awareness of laws and local community values of
     environment.

2nd Stakeholder meeting 26 March 2010

<u>Answers to Question 1</u>

Head of Mining & Energy Service of Center Lampung (Ir. Nasir AT, M.Sc):

All government stakeholders, i.e. head of sub-districts, head of villages and head of neighbourhoods should facilitate community in this methane gas capture project.

Head of Manpower Service of Center Lampung (Mr. Boediharjo):

At present the unemployment rate is increasing, it is expected this GPP's methane gas capture project can improve job opportunities for surrounding community based on their required competency.

Head of Environment of PT GGP (Mr. Ir. Julius S)
The realistic benefits can be enjoyed by the surrounding community are as follows:
- Reducing odor from the waste

- Reducing production costs, so that the company can be competitive and the sustainability can be maintained. By the ability to compete and the existence of the company business can be well maintained, so that this will bring the benefits to surrounding community, both direct or indirect, such as cassava farmers will continue sell their cassava to starch mill, also food stall, supplier, transportation services and other services, the partnership with community, etc will be well maintained.
- For job opportunity, this project will only require 2 competent persons, i.e. this person holds a certificate of competence which related to CDM project data records.

CRD Manager of PT GGP (Mr. Ir. Machfud Santoso)
By this biogas project, we hope there will be many businesses appear automatically in the surrounding project location and this will increase the income of surrounding community.

Answer Question 2

CDM Consultant (Mr. Ken Butler/Dr. Petrus Panaka -translator)
The main barrier is data availability. In GGP & UJA CDM project, the processes are very complicated since the project will utilize 2 wastewater streams: starch and pineapple, the biogas will then substitute coal.

The important thing of this project is data validation, it means all the data should be valid and all the data will be validated and verified by the third party (DOE).

All data will be monitored by the world so this validation and verification processes are very strict and will be checked constantly.

During the meeting a questionnaire was distributed to all particiapants with the feedback as follows:

- From 45 questionnaires that had been distributed to all participants during the meeting, 35 questionnaires had been returned and evaluated. Participants who agreed with the project were 35 persons (100%), not agreed was 0 person (0%), and abstain were 0 persons (0%) (see Appendix 5)

- Discussion among the participants and project owner resulted in enthusiasm for the biogas project development and realization of GGP project.

SECTION F. Approval and authorization

The Letter of Approval (LoA) from DNA of Indonesia has been received on 29/07/2010.

The Letter of Approval (LoA) from Danish Energy Agency (DNA of Denmark) has been received on 28/02/2011.

- - - - -

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	PT Great Giant Pineapple (GGP)
Street/P.O. Box	Jl. Jendral Sudirman Kav.21
Building	Chase Plaza Podium, 5th Floor
City	Jakarta
State/Region	DKI Jakarta
Postcode	12920
Country	Indonesia
Telephone	(62 21) 5208338
Fax	(62 21) 5208332
E-mail	
Website	www.greatgiantpineapple.com
Contact person	Mr
Title	Krisno
Salutation	
Last name	Ruslan
Middle name	
First name	
Department	
Mobile	
Direct fax	(62 21) 5208332
Direct tel.	(62 21) 5208338
Personal e-mail	Ruslan.Krisno@ggpc.co.id

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Ministry of Climate and Energy, Danish Energy Agency
Street/P.O. Box	Amaliegrade 44
Building	
City	Copenhagen K
State/Region	
Postcode	DK 1256
Country	Denmark
Telephone	(45 33) 92 67 00
Fax	(45 33) 11 47 43
E-mail	ens@ens.dk
Website	
Contact person	
Title	Counsellor

Salutation	Mr
Last name	Emmik Sorensen
Middle name	
First name	Ole
Department	
Mobile	(45) 2249 4427
Direct fax	
Direct tel.	(45 33) 926772
Personal e-mail	oes@ens.dk

Appendix 2. Affirmation regarding public funding

No ODA funds will be used will be used for this project.

Appendix 3. Applicability of methodology and standardized baseline

Please see section B.2. Applicability of methodology.

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

INFORMATION INDEX:

4–A Site Location and Layout

Figure 4 Pre Project Site Layout of PT GGP and PT UJA

4-B UJA Baseline Information

Table 11 UJA 2009 Production Summary
Table 12 UJA WWT Lagoon dimensions

Table 13 UJA 10 Day Sampling Results
Table 14 UJA Heater Operational Data
Table 15 Thermal Boiler Efficiency12

4-C GGP Baseline Information

Table 16 GGP Production Summary

Table 17 GGP 10 Day Sampling Study

4-D GGP Wastewater treatment system rehabilitation

Table 18 Proposed depth of Lagoons #3 to #9 and additional volume required
Table 19 Estimation cost for improve the Performance of Anaerobic Lagoons of GGP's WWT Lagoons

4-E GGP Power Plant Operational Data

Table 20 Nett Heat Produced – 2009
Table 21 Fossil Fuel Consumption - 2009
Table 22 Boiler Efficiency - August 2009

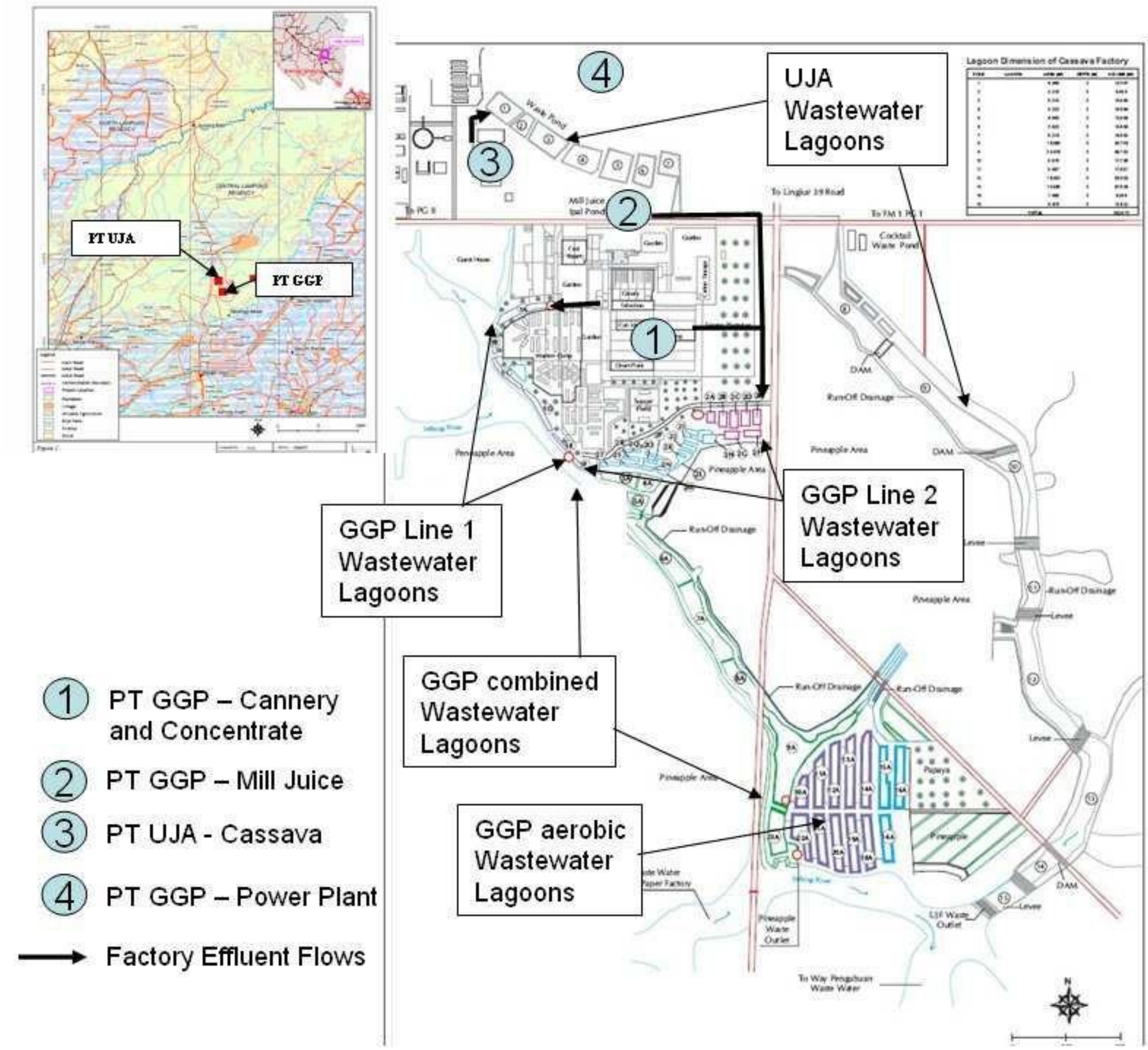
4-F GGP WWT system and Project UASB electrical requirement

Table 23 GGP WWT system forced aeration
Table 24 UASB operational electricity requirements

4-G Common Practice
Table 25 Agri-Industry Registered CDM projects in Indonesia

4-A Site Location and Layout

Pre Project Site Layout of PT GGP and PT UJA



4-B UJA Baseline Information

Table 11 UJA 2009 Production Summary[25]

UJA 2009 Production of Tapioca Starch		Average data Year 2009
PRODUCTION RATE	**unit**	
Raw Material	tonne / month	19,774
Working Hours	hours/month	983
Working Days / month	days / month	23.3
Working Hours / day	hours / day	21.1
Average Cassava Processed	tonne/hour	17.5

Table 12 UJA WWT Lagoon dimensions[26]

Lagoon ID	Process	area	depth	volume
		m^2	m	m^3
1	anaerobic	4,449	3.00	13,347
2	anaerobic	2,218	3.00	6,654
3	anaerobic	5,315	3.00	15,945
4	anaerobic	5,223	3.00	15,669
Sub total Anaerobic		**4,301**	3.00	**51,615**
5		4,666	3.00	13,998
6		3,623	3.00	10,869
7		6,214	3.00	18,642
8		14,598	3.00	43,794
9		23,034	3.00	69,102
10		5,916	3.00	17,748
11		5,997	3.00	17,991
12		14,503	3.00	43,509
13		15,946	3.00	47,838
14		1,448	3.00	4,344
15		4,471	3.00	13,413
Sub total Facculative & Aerobic		**100,416**		**301,248**

Table 13 UJA 10 Day Sampling Results[27]

[25] CDM Update Des 09.xls and Preliminary Design Criteria ver5 - 300112.xls

[26] CDM Update Des 09.xls and Preliminary Design Criteria ver5 -300112.xls

[27] Preliminary Design Criteria ver5 -300112.xls

The 10 Day Sampling Study was undertaken according to the requirements of the methodology ACM0014 version 04.1.

UJA		
Discharge Volume	39,844	m^3/month
CODin	18,249	mg/L
CODout	1,031	mg/L
CODin	8,725	tCOD/y
CODout	493	tCOD/y

Wastewater discharge into UJA	1,915.1	m^3 / day
	39,844	m^3 / month
	478,124	m^3 / year
COD Loading into UJA Pond 1	18.2490	kg-COD/m^3
	34.949	tonne-COD/day
	727.11	t COD / month
	8,725	tonne/year
COD Loading out of UJA Pond 4	1.0306	kg-COD/m^3
	1.974	tonne-COD/day
	41.06	t COD / month
	493	tonne/year

Table 14 UJA Heater Operational Data[28]

NO	DISCRIPTION	BOILER O1		BOILER 02		TOTAL	
1	Operating Hours of each Thermal Oil Boiler	5,901	Hours/year	5,897	Hours/year	11,798	Hours/year
2	Fuel type Consumption of each thermal oil Boiler	367,635	Ltr/year	24,185	Ltr/year	391,820	Ltr/year
3	Calorific Value of the used	9,000	Kcal/L	9,000	Kcal/L	9,000	Kcal/L
4	Amount of Waste heat used per Boiler per hour	16,322,825	Kg	16,322,825	Kg	32,645,650	Kg
5	Price of HFO and capital cost of supplying from heat	5,520	Rp/kg	5,520	Rp/kg	5,520	Rp/kg

Table 15 Thermal Boiler Efficiency[12]

No	Description		BOILER 01	BOILER 02
1	Furnace temperature	ºC	425	425

[28] Data boiler UJA 2009-R2.xls

2	Flue gas temperature	ºC	105	105
3	Delta temperature	ºC	320	320
4	Efficiency	%	75.3	75.3

To determine the conservativeness of the Proponents efficiency of 75.3% this was compared to the default efficiency in the methodology tool *"Tool to determine the baseline efficiency of thermal or electric energy generation systems, version 1".* Table 1 of this tools provides a default efficiency for Old Oil fired boiler = 85%. As the default value is more conservative than the Project Proponents calculated value of 75.3% the default value of 85% is used for the project baseline calculations.

4-C Great Giant Pineapple Baseline Information

Table 16 GGP Production Summary[29]

GGP Production Capacity 2009	tonne/day Raw Pineapple	2,200
	tonne/year	712,800
PRODUCTION RATE	**unit**	**Yearly Average**
Raw Material / month	tonne / month	35,841
Working Hours / month	hours month	428
Working Days / month	days / month	21
Working Hours / day	hours / day	20
Average Pineapple Process	tonne/hour	83.8
Raw Material / year	tonne/year	430,094
Percentage of Capacity	%	60%

2009 Cannary Production - Effluent

Wastewater discharge	m^3 / hour	166.9
Wastewater discharge	m^3 / day	3,331
Wastewater discharge	m^3 /month	71,348
Wastewater discharge	m^3 / year	856,172
COD Loading	kg-COD/m^3	8.37
COD Loading	tonne-COD/day	#VALUE!
COD per year	kg	7,169,373

Factory Effluent (2009)	Average
pH	3.8
COD mg/l	8,374

2009 Concentrate Production - Effluent

Wastewater disc	m^3 / hour	129
Wastewater disc	m^3 / day	2,568
Wastewater disc	m^3 /month	54,994
Wastewater disc	m^3 / year	659,927
COD Loading	kg-COD/m^3	4.75
COD Loading	tonne-COD/day	#VALUE!
COD per year (ir	kg	3,133,335

Factory Effluen	Average
pH	0.00
COD mg/l	4,748

Combined Flows

Wastewater discharge	295.50	m^3 / hour
Wastewater discharge	5,899.22	m^3 / day
Wastewater discharge	126,342	m^3 / month
Wastewater discharge	1,516,100	m^3 / year

Table 17 GGP 10 Day Sampling Study[30]

The 10 Day Sampling Study was undertaken according to the requirements of the methodology ACM0014 version 04.1.

[29] CDM Update Des 09.xls and Preliminary Design Criteria ver5 - 300112.xls

[30] CDM Update Des 09.xls and Preliminary Design Criteria ver5 - 300112.xls

COD

No	Pond	31-Mar-10 42/L.GGP/LS/III/10	6-Apr-10 47/L.GGP/LS/III/12	9-Apr-10 51/L.GGP/LS/III/12	10-Apr-10 54/L.GGP/LS/III/12	12-Apr-10 55/L.GGP/LS/III/10	13-Apr-10 56/L.GGP/LS/III/10	14-Apr-10 57/L.GGP/LS/III/10
1	Inlet Pond 1A	11,375	6,125	6,338	5,175	6,425	6,913	8,650
2	Outlet Pond 1F	2,710	4,940	4,890	3,275	5,575	5,570	5,485
3	Inlet Pond IIA	3,740	5,590	3,275	4,095	3,170	3,630	2,930
4	Outlet Pond 2R	2,180	2,590	2,390	2,100	3,120	2,905	3,050
5	Outlet Pond 3	3,910	4,200	4,885	4,570	5,360	5,625	5,820
6	Outlet Pond 9	2,285	2,275	2,570	1,910	2,330	2,390	2,240
7	Outlet Pond 24	1,040	1,445	1,470	830	1,555	1,590	1,530

No	Pond	15-Apr-10 58/L.GGP/LS/III/10	19-Apr-10 59/L.GGP/LS/IV/10	21-Apr-10 60/L.GGP/LS/IV/10	22-Apr-10 61/L.GGP/LS/IV/10	23-Apr-10 62/L.GGP/LS/IV/10	26-Apr-10 66/L.GGP/LS/IV/10	27-Apr-10 67/L.GGP/LS/IV/10	28-Apr-10 68/L.GGP/LS/IV/10
1	Inlet Pond 1A	8,700	6,938	5,888	8,313	4,963	6,713	10,250	9,463
2	Outlet Pond 1F	4,865	2,685	4,290	5,055	5,585	4,710	4,650	4,880
3	Inlet Pond IIA	4,120	4,630	6,695	4,225	4,625	2,745	2,880	6,130
4	Outlet Pond 2R	2,775	2,270	2,625	2,595	3,740	3,860	4,000	4,080
5	Outlet Pond 3	5,640	2,275	4,390	4,245	4,465	4,770	4,885	4,890
6	Outlet Pond 9	1,925	3,150	3,030	2,560	2,795	2,785	2,715	3,380
7	Outlet Pond 24	935	1,070	1,775	1,690	1,885	1,695	1,830	2,100

4-D GGP Wastewater treatment system rehabilitation

An independent study undertaken by PT ERM Indonesia over the period December 2008 to April 2009[31] confirmed the company's data that showed that the discharge to the environment did not meet the regulatory requirements due to in-activity of GGP's the anaerobic lagoons. This study made recommendations to GPP to improve the anaerobic performance of the existing wastewater system so as to meet the regulatory environmental discharge requirements. If the anaerobic lagoons are rehabilitated the company will be able to meet their regulatory environmental discharge requirements the anaerobic activity in the anaerobic lagoons will be such that sedimentation is unlikely to occur.

Consultants report: ***Improvement of Anaerobic Lagoon Performance PT GGP Waste Water Treatment Lagoons*,**[32]
Dr. Udin Hasanudin,
Department of Agro-industrial Technology, Faculty of Agriculture, The University of Lampung.

Evaluation of the Performance of GGP's WWT Lagoon

Base on existing condition of depth, HRT, pH, and COD removal at GGP's WWT lagoon, it is very clear that anaerobic digestion was hardly happened. Here are some possibilities that caused the anaerobic digestion process is poorly going on:

- Depth of anaerobic lagoons (#3 → #9) are too shallow and are not appropriate for anaerobic digestion.
- HRT in each anaerobic lagoon is too short.
- pH of wastewater entering anaerobic lagoons is too low.
- The amount of anaerobic microorganisms accumulated in anaerobic lagoons was not enough.
- The toxic or refractory organic chemicals entering anaerobic lagoons occurred in such shock
  loads that it destroys the biological system.

Based on those conditions, some modifications are required to improve anaerobic digestion process in lagoons #3 until #9, such as:

1. Anaerobic lagoons are made deeper than the existing one. It is recommended that lagoon should have at > 5 m depth to make appropriate condition for anaerobic digestion and prolong the HRT to a minimum of 30 days.
2. Reduce the flow rate of wastewater entering WWT lagoon by separating and keeping away rain water entering WWT lagoon.
3. Install some recirculation pumps to re-circulate wastewater from lagoon #9 to lagoon #4, #5, and #6. Recirculation of wastewater from lagoon #9 to lagoon #4, #5, and #6 is needed to adjust pH of wastewater entering anaerobic lagoons, increase concentration of active anaerobic microorganisms in anaerobic lagoon, and reduce the washing out of active anaerobic microorganisms.
4. Add seeding sludge to inoculate with some anaerobic microorganisms to anaerobic

[31] *GGP-UJA Biogas Project Viability Assessment*, PT ERM Indonesia, April 2009

[32] Improvement of GGP Anaerobic Lagoon.pdf

lagoons. Due to almost no activity of anaerobic microorganism, additional anaerobic microorganisms from outside lagoon are needed to seeding sludge in order to activate anaerobic digestion in anaerobic lagoons. Active anaerobic sludge found from other anaerobic lagoon having similar characteristic, such as from tapioca anaerobic lagoon, can be used as seeding sludge. Utilization of one anaerobic lagoon with low loading rate as a seeding lagoon is needed to acclimatize active microorganisms with new condition using pineapple wastewater.

5. Install chemicals pond to retain wastewater chemicals from machinery cleaning section and then deliver the wastewater to WWT lagoon using low and flat flow rate. This method is importance to avoid shock loading of chemicals and refractory organic matters.

Table 18 Proposed depth of Lagoons #3 to #9 and additional volume required

Name of lagoon	Depth (m)		Existing Area (m^2)	Existing Volume (m^3)	Proposed Volume (m^3)	Additional Volume (m^3)
	Existing	Proposed				
3	3.1	>5	2,443	7,573.30	12,215.00	4,641.70
4	3.6	>5	2,207	7,945.20	11,035.00	3,089.80
5	2.8	>5	1,837	5,143.60	9,185.00	4,041.40
6	2.5	>5	6,360	15,900.00	31,800.00	15,900.00
7	2.9	>5	8,000	23,200.00	40,000.00	16,800.00
8	3.3	>5	4,256	14,044.80	21,280.00	7,235.20
9	4.5	>5	17,916	80,622.00	89,580.00	8,958.00
Total/Average	**3.24**	**>5**	**43,019**	**154,428.90**	**215,095.00**	**60,666.10**

Existing HRT	26.18
Proposed HRT	36.46

Table 19 Estimation cost for improve the Performance of Anaerobic Lagoons of GGP's WWT Lagoons

No.	Cost component	Estimation Cost (IDR)
1.	Increasing depth of anaerobic lagoons	1,031,260,334,-
2.	Construction of wastewater recirculation system	115,000,000,-
3.	Construction of additional drainage canal to avoid rain water entering GGP's WWT Lagoons	199,722,600,-
4.	Development of seeding lagoon system	50,000,000,-
5.	Construction of chemicals pond	1,565,120,000,-
TOTAL		**2,961,102,934,-**

4-E GGP Power Plant Operational Data[33]

Table 20 Nett Heat Produced – 2009

[33] DATA POWER PLANT-R2-FIX.xls

Month	Boiler 1			Boiler 2			Boiler 3		
	Steam (Tonne)	Enthalpy (Kj/Kg)	Heat (Kj)	Steam (Tonne)	Enthalpy (Kj/Kg)	Heat (Kj)	Steam (Tonne)	Enthalpy (Kj/Kg)	Heat (Kj)
1	3,062	3,303	10,113,786	12,223	3,303	40,372,569	10,068	3,303	33,254,604
2	-	3,303	-	12,666	3,303	41,835,798	17,071	3,303	56,385,513
3	-	3,303	-	16,760	3,303	55,358,280	19,971	3,303	65,964,213
4	7,287	3,303	24,068,961	8,514	3,303	28,121,742	18,676	3,303	61,686,828
5	1,666	3,303	5,502,798	11,764	3,303	38,856,492	18,850	3,303	62,261,550
6		3,303	-	12,348	3,303	40,785,444	18,563	3,303	61,313,589
7	18,632	3,303	61,541,496	17,957	3,303	59,311,971	990	3,303	3,269,970
8	18,622	3,303	61,508,466	1,355	3,303	4,475,565	16,807	3,303	55,513,521
9	6,666	3,303	22,017,798	885	3,303	2,923,155	11,828	3,303	39,067,884
10		3,303	-	18,636	3,303	61,554,708	18,142	3,303	59,923,026
11	9,448	3,303	31,206,744	16,653	3,303	55,004,859	8,326	3,303	27,500,778
12	20,441	3,303	67,516,623	18,995	3,303	62,740,485		3,303	-
Total	**85,824**		**283,476,672**	**148,756**		**491,341,068**	**159,292**		**526,141,476**

Table 21 Fossil Fuel Consumption – 2009

Periode : 2009

MONTH	BOILER 1	BOILER 2	BOILER 3	TOTAL	TOTAL Tonne Coal Boilers 2 &3	Energy Inputs Boiler 2 & 3	
	COAL (KG)	COAL (KG)	COAL (KG)			kcal	TJ
1	843,846	3,051,152	2,541,725	6,436,722	5,592,877	29,642,246,038	124
2	0	3,526,796	4,667,152	8,193,948	8,193,948	41,723,582,327	175
3	0	4,048,080	4,885,087	8,933,167	8,933,167	47,345,783,616	198
4	1,668,664	2,182,426	4,821,177	8,672,267	7,003,603	35,718,376,543	149
5	863,228	3,044,795	4,944,838	8,852,861	7,989,633	43,144,018,806	181
6	0	3,292,701	4,846,122	8,138,823	8,138,823	43,949,644,200	184
7	4,234,318	3,935,466	223,515	8,393,299	4,158,981	22,250,548,350	93
8	4,496,085	307,515	3,464,199	8,267,799	3,771,714	20,367,256,076	85
9	1,626,360	290,827	2,487,607	4,404,794	2,778,434	15,003,541,800	63
10	0	5,489,976	4,680,303	10,170,279	10,170,279	54,919,507,200	230
11	2,469,958	4,348,763	2,534,163	9,352,883	6,882,925	37,167,797,400	156
12	5,069,227	4,317,112	0	9,386,338	4,317,112	23,312,402,600	98
SUM	**21,271,685**	**37,835,607**	**40,095,888**	**99,203,181**	**77,931,495**	**414,544,704,956**	**1,734**

Coal Displacement

Total energy input from Biogas 143..04 TJ/y

Table 22 Boiler Efficiency - August 2009[34]

Boiler 2 - Performance Test

No.	Max load efficiency			Guaranteed (49.5 tonne)	Performanc e Boiler 2
1	40%	19	T/H	84.47%	83.34%
2	60%	27	T/H	85.57%	84.93%
3	80%	36	T/H	86.67%	84.93%
4	100%	45	T/H	87.79%	86.10%

[34] Source: Laporan Akhir, Performance Test GGP Cogen Plant untuk PT. Great Giant Pineapple, August 2009, PT Indopower Systems

Boiler 3 - Performance Test

No.	Max load efficiency			Guaranteed (49.5 tonne)	Performanc e Boiler 3
1	40%	18	T/H	84.47%	85.33%
2	60%	27	T/H	85.57%	87.75%
3	80%	36	T/H	86.67%	88.26%
4	100%	45	T/H	87.79%	89.24%
5	110%	48	T/H	87.40%	89.06%

To determine the conservativeness of the Proponents efficiency of 86.325% this was compared to the default efficiency in the methodology tool *"Tool to determine the baseline efficiency of thermal or electric energy generation systems, version 1"*. Table 1 of this tools provides a default efficiency for New coal fired boiler = 85%. As the consultant's calculation efficiency of 86.325% is more conservative than default value of 85% the consultants studies result is used for project baseline calculations.

4-F GGP WWT system and Project UASB electrical requirement

Demonstration that the electricity requirement per unit of water treated in the baseline and project scenario are largely unchanged is as follows;

Baseline

Yearly flow rates

GGP		1,291,371	m^3
UJA		566,664	m^3
	Total	**1,858,035**	m^3

Yearly electricity consumption

GGP		723	MWh/year
UJA		0	MWh/year
	Total	**723**	**MWh/year**

Electricity per unit input of water **0.389** **kWh/m³**

Project

Yearly flow rates

Biogas plant 1,858,035 m^3

Yearly electricity consumption

Biogas plant	766	MWh/year
Electricity per unit input of	**0.456**	**kWh/m³**

Table 23 GGP WWT system forced aeration[35]

Kind of Equipment	Number of Units	Horse Power per unit	kWh / Unit	total kWh Capacity	Time Operation ~ normally (hours per day)	Energy Usage / day	kWh/year (based upon plant operating hours)	Location
			Conversion factor			**kWh/day**	**365**	**GGP (2006 plant operational hours)**
			0.7456999			**1,980**		
Custom aerator, designed by Engineering Department	8	2	1.491	11.931	9	107.38	39,194	Aerobic pond of GGP Pineapple WWTP (pond 11 and 12)
	4	5	3.728	14.914	9	134.23	48,992	
Custom aerator, designed by Maintenance Cannery Department	11	7.5	5.593	61.520	18	1107.36	404,188	Aerobic pond of GGP Pineapple WWTP (pond 21)
Spray Aeration by Pump :								Aerobic pond of GGP Pineapple WWTP
PS 1	1	20	14.914	14.914	18	268.45	97,985	
PS 2	1	15	11.185	11.185	18	201.34	73,489	
PS 3	1	5	3.728	3.728	18	67.11	24,496	
PS 4	1	7	5.220	5.220	18	93.96	34,295	
			Total	**123.413**		**-**	**722,639**	

[35] Refer: WWT Equipment Data-Aerobic.xls

Table 24 UASB operational electricity requirements[36]

GLOBAL WATER ENGINEERING

GREAT GIANT PINEAPPLE , INDONESIA
ANUBIX-B
proposal REV. 8 (28/01/10)
63.6 ton COD/day

GWE ref: 3427

DESCRIPTION	Quantity		KW per Unit Installed	KW per Unit Operational	Total installed kW	Total operational kW	Running Hrs./day	kWh/Day
	Installed	Work ing						
Additional pumping								
P001A/B	2	1	18.5	14.5	37	14.5	24	348
P002A/B	2	1	2.2	1.1	4.4	1.1	24	26
sub total					**41.4**	**15.6**		**374**
Pre treatment								
A101	1	1	11	11	11	11	24	264
P100A/B	2	1	18.5	13.1	37	13.1	24	314
P107A/B	2	1	5.5	4.4	11	4.4	24	106
R101	1	1	0.37	0.37	0.37	0.37	24	9
S106	1	1	1.1	1.1	1.1	1.1	2	2
sub total					**60.5**	**30.0**		**695**
Anaerobic treatment								
A105	1	1	3	3	3	3	24	72
P101A/B	2	1	22	16.7	44	16.7	24	401
P103A/B	2	1	0.55	0.44	1.1	0.44	0	0
sub total					**48.1**	**20.1**		**473**
Biogas handling and reuse								
C101A/B	2	1	30	25	60	25	24	600
sub total					**60.0**	**25.0**		**600**
Utilities								
instruments, control, PLC, PC	1	1	2	2	2	2	24	48
HVAC, lighting, small power, ...	1	1	10	10	10	10	12	120
other	1	1	1	1	1	1	12	12
sub total					**13.0**	**13.0**		**180**
Total power consumption incl utilities					**223.0**	**103.7**		**2,322**

[36] Refer: 2010-01-28 GWE Operating Costs for GGP.pdf

Table 25 Agri-Industry Registered CDM projects in Indonesia

*Updated up to 1July 2010

IGES-ID	Status-ID	CDM-EB Ref	Name of CDM Project Activity	Region	Host Party	Type of Project	Supplemental Information	Scale	PDD Form	Methodology	Ver	Food Processing Type	Technology
R-2266	RD	2674	BAJ Pakuan Agung Factory tapioca starch wastewater biogas extraction and utilization project, Lampung Province, Republic of Indonesia	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-I.D. AMS-III.H.	13 9	Tapioca starch	UASB
R-2260	RD	2662	ID08-WWP-11, Methane Recovery in Wastewater Treatment, Jambi, Indonesia	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-III.H.	9	Palm Oil	Covered lagoons
R-2146	RD	2664	ID08-WWP-14, Methane Recovery in Wastewater Treatment, Riau Province, Indonesia	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-III.H.	9	Palm Oil	Covered lagoons
R-2126	RD	2622	AIN08-W-06, Methane Recovery in Wastewater Treatment, Sumatera Utara, Indonesia	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-III.H.	9	Palm Oil	Covered lagoons
R-2125	RD	2634	AIN08-W-07, Methane Recovery in Wastewater Treatment, Sumatera Utara, Indonesia	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-III.H.	9	Palm Oil	Covered lagoons
R-2122	RD	2663	ID08-WWP-09, Methane Recovery in Wastewater Treatment, Aceh, Indonesia	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-III.H.	9	Palm Oil	Covered lagoons
R-2116	RD	2621	Methane Recovery in Wastewater Treatment, Project AIN07-W-05, Sumatera Utara, Indonesia	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-III.H.	9	Palm Oil	Covered lagoons
R-2115	RD	2633	AIN08-W-03, Methane Recovery in Wastewater Treatment, Sumatera Utara, Indonesia	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-III.H.	9	Palm Oil	Covered lagoons
R-2114	RD	2643	ID08-WWP-10, Methane Recovery in Wastewater Treatment, West Sumatera, Indonesia	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-III.H.	9	Palm Oil	Covered lagoons
R-2076	RD	2650	Biogas project, BAJ Terbanggi	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-I.D. AMS-III.H.	13 9	Tapioca starch	UASB
R-2058	RD	2612	AANE Belitung biogas recovery from Palm Oil Mill Effluent (POME) ponds and biogas flaring / utilisation	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-I.D. AMS-III.H.	13 9	Palm Oil	Covered lagoons
R-2049	RD	2673	BAJ Gunung Agung Factory tapioca starch wastewater biogas extraction and utilization project, Lampung Province, Republic of Indonesia	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-I.D. AMS-III.H.	13 9	Tapioca starch	UASB
R-2026	RD	2652	Biogas project, BAJ Way Jepara	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-I.D. AMS-III.H.	13 9	Tapioca starch	UASB
R-2014	RD	2631	Biogas project, BAJ Unit 6	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-I.D. AMS-III.H.	13 9	Tapioca starch	UASB
R-1561	RD	2130	Methane Recovery in Wastewater Treatment, Project AIN07-W-04, Sumatera Utara, Indonesia	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-III.H.	7	Palm Oil	Covered lagoons
R-1471	RD	1899	Methane Recovery in Wastewater Treatment, Project AIN07-W-01, Sumatera Utara (North Sumatera), Indonesia	Asia	Indonesia	Biogas	Wastewater treatment	small-scale	CDM-SSC-PDD	AMS-III.H.	6	Palm Oil	Covered lagoons
R-1035	RD	1176	PT. BUDI ACID JAYA Tapioca Starch Production Facilities Effluent Methane Extraction And On-site Power Generation Project in Lampung Province, Republic of	Asia	Indonesia	Biogas	Wastewater treatment	large	CDM-PDD	AM0022	4	Tapioca starch	UASB

Appendix 5. Further background information on monitoring plan

1. Training

- Under the contract agreement between GGP and Global Water Engineering (GWE) will provided training for the following;

    - Training program to families the operational and maintenance team with the ongoing maintenance issue of USAB system (including the open flare and biogas burners.

    - Provided operational and maintenance training programs for the collection and flaring system.

    - Provide information and training for the maintenance and calibration requirements of the monitoring instrumentation including the SCADA management system.

2. Gas Management Plan

A key operational component of this project will be the development of a Biogas Management Plan (BGMP) that provides a framework for the management of Biogas production and utilization facility based on the system requirements and the nature and extent of the gas control system. This project's BGMP will be developed according to the GWE guidance standards,

The BGMP will provide a clear and auditable route-map setting out the methods, procedures and actions to be implemented at the site for the duration of the project. The key elements covered will be:

- risk assessment,
- control measures,
- operational procedures,
- monitoring plan,
- action plan,
- aftercare and completion plan.

These elements will provide the project with operational guidance, procedures and practices to fulfill the following project objectives:

- bring together all aspects of gas management considered during the risk assessment and proposed operational controls;
- provide an estimate of gas production;
- set out performance criteria for the gas control measures;
- set out the design objectives and principles for the gas control measures;
- set out the methods of implementing site-specific gas management systems to:
    - prevent the leakage of biogas from the system
    - minimise the impact on local air quality
    - minimise the contribution to climate change
    - control the release of odorants
    - minimise the risk of accidents
    - prevent harm to human health
- set out the installation criteria and construction quality assurance procedures for the gas control measures;
- set out the procedures and responsibilities for installation, operation, maintenance and monitoring of the gas control measures;

- demonstrate that performance of the control measures meets the requirements and objectives for gas management;
- set out the procedures for managing changes and reviewing the performance of the gas control system.

Relevant component of the BGMP are as follows;

Monitoring and sampling plan

The monitoring and sampling plan is an integral part of the overall Biogas Management Plan. It allows the performance of the gas management system to be established and assessed against the conceptual site model and provides for developments of the model.

The monitoring and sampling plan is to include as a minimum:

- a schedule for specific data collection and frequency of monitoring at all stages of the site (i.e. prior to site development to obtain background data and beyond the closure of the site to demonstrate site completion);
- a layout showing the construction and location of monitoring points in relation to the site, surrounding area, geology, and phasing of operation;
- a description of the measurement techniques and sampling strategy;
- an analysis and testing schedule;
- a methodology for data storage, retrieval and presentation;
- the background and action/trigger values against which collected data will be evaluated;
- the methodology for data interpretation, review and reporting;
- the means of communicating the results of the monitoring and interpretation to the Validator.

Action plan

The Biogas Management Plan sets out the actions to be taken by the operator as a result of:
any abnormal changes observed in collected monitoring data;

- all identified operational problems or failure of the gas control system established as part of the routine inspection or maintenance programme;
- a reported event, e.g. an odour complaint.

Remedial actions

Where a deficiency is identified, either via routine monitoring, inspection, maintenance or failure of elements of the gas management system, then appropriate measures need to be identified. An appropriate remediation time-scale will be prescribed in the BiogasMP.

Emergency procedures and protocols

Significant events identified at the risk assessment stage, which result in either an unacceptable level of risk or which are an extraordinary occurrence, should be identified as emergency scenarios. Specific procedures will be set out to manage these events, including the immediate actions required.

3. Monitory and Information Management

- The Project Activity performance will be controlled through data logging at each individual data collection point,
- Onsite monitoring the system will be managed by the Laboratories of GGP
- Performance data is collected be a SCADA system where information gathered will be stored locally and at the corporate offices of GGP.
- The existing Quality Control department of GGP will provide the overall monitoring QA/QC
- process as well as yearly validation reporting requirements.

Figure 5, 6 and 7 described the proposed monitoring, data storage and responsibilities of this project which will be further defined during the planning and implementation stages of the project.

Appendix 6. Summary of post registration changes

Post registration changes in revised PDD:

Parameters in section B.7.1 of this PDD	Proposed changes
$F_{UJA,biogas,y}$, $F_{GGP,biogas,y}$ and $F_{Flare,biogas,y}$	Change of accuracy class of the flow meter from 1.5% to 2%.

- - - - -

Document information

Version	*Date*	*Description*
05.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the project design document form for CDM project activities (these instructions supersede the "Guidelines for completing the project design document form" (Version 01.0)); • 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 project activity in B.7.4 and Appendix 1; • Change the reference number from *F-CDM-PDD* to *CDM-PDD-FORM;* • Editorial improvement.
04.1	11 April 2012	Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b
04.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the project design document form for CDM project activities" (EB 66, Annex 8).
03.0	26 July 2006	EB 25, Annex 15
02.0	14 June 2004	EB 14, Annex 06b
01.0	03 August 2002	EB 05, Paragraph 12 Initial adoption.

Decision Class: Regulatory
Document Type: Form
Business Function: Registration
Keywords: project activities, project design document