Pitak Palm
Wastewater Treatment and Biogas Utilization Project

Additional PDD Annex as required for Gold Standard validation version 1

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Introductory Notes

This document contains the PDD Annex to validate the 1.063 MW Pitak Palm Wastewater Treatment and Biogas Utilization Project against the Gold Standard (version 1). Gold Standard validation shall be carried out in parallel with regular CDM validation.

The proposed project entails the installation of a Completely Stirred Tank Reactor (CSTR) and an Upflow Anaerobic Sludge Blanket technology (UASB) biogas reactor for treatment of wastewater and power generation at an existing palm oil mill in Ampher Sikao, located in the Trang Province in Southern Thailand. The major components of the project are:

a) the extraction of methane (biogas) from the wastewater stream through the biogas reactor and
b) the reuse of biogas as fuel for power generation, using an 1.063 MWel gas engine.

The project activity therefore implies a series of sustainable development aspects including technology transfer, environmental and social benefits.

The project activity avoids the release of methane into the atmosphere, which would occur due to the anaerobic digestion of the organic content in the open lagoon-based wastewater treatment system (anaerobic conditions, leading to methane generation within the lagoon are the result of a lagoon depth greater than 1m and an average atmospheric temperature of about 28°C).

The biogas will be used as fuel in a power generator (genset) with an installed capacity of 1,063 kWe, consequently displacing the emissions from the national grid's electricity – mainly generated by fossil fuel-fired power plants from the Thai national grid – and thus leading to further reductions of greenhouse gases.

Furthermore, the biogas reactor system allows the palm oil mill factory to reuse the treated effluent in the palm oil mill production process, contributing to water conservation.

Finally, the project will avoid odour emissions as compared to an anaerobic lagoon, thereby contributing significantly to an improved quality of life around the project site. Other benefits from the project include increased capacity building and technology transfer, creation of employment opportunities and contribution to poverty alleviation in the project region.

Project Type Eligibility Screen

GS Manual for CDM Project Developers: **Section 3.2**

The project activity falls under category "A.1. Renewable Energy (Electricity/Heat)", sub-category "A.1.1.2. Biogas", which applies to methane recovery from wastewater treatment, as specified in Appendix A of the Gold Standard Manual for CDM Project Developers.

The project activity fulfils the eligibility requirements of the Gold Standard for biogas projects as follows:

- Biogas used in the project activity is derived from wastewater coming from Palm Oil Mill Effluent (POME);
- Biomass resources (wastewater) used for the project would have lead to greenhouse gas emissions in open anaerobic lagoons in absence of the project;
- The biogas will reduce the use of electricity consumption by reusing the biogas for power generation on site and selling it to the national grid.

Gold Standard Additionality Screen

Previously announced projects screen

GS Manual for CDM Project Developers: **Section 3.3.1**

There has been no public announcement of the project going ahead without the CDM, prior to any payment being made for the implementation of the project.

UNFCCC Additionality Tool "Tool for the demonstration of additionality" (Version 05.2)

GS Manual for CDM Project Developers: **Section 3.3.2**

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

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

1. Status-quo: open anaerobic lagoon based wastewater treatment system
2. Proposed project activity undertaken without being registered as CDM project activity
3. Aerobic waste water treatment
4. Direct discharge
5. Methane recovery and flaring

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

Alternative 4 would violate effluent discharge standards set by the laws and regulations of Thailand. Therefore, it cannot be considered as baseline and is therefore excluded from further assessment.

Alternatives 1, 2, 3 and 5 are in compliance with current regulations in Thailand, which allow the use of open lagoon systems and other waste treatment technologies that meet effluent standards for the discharge of treated wastewater into the environment. There is no other regulatory requirement for the implementation of a specific wastewater treatment technology such as anaerobic digester or aerobic treatment system to palm oil processing plants for effluent treatment. Therefore, alternative 1, 2, 3 and 5 do not face any legal barriers.

Step 2. Investment Analysis

The additionality tool requires either an investment analysis or a barrier analysis. A barrier analysis has been conducted for the proposed project.

Step 3. Barrier Analysis

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

1. Technical barriers
2. Investment barriers
3. Social barriers
4. Prevailing practice barriers

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

Technical barriers

Alternative 1 is a common practice to handle POME in Thailand. Most of the palm oil production facilities in the project region utilize open lagoon systems for treating wastewater. The related technology, skills and labour are readily available in Thailand and there are few risks associated with this technology. Therefore, Alternative 1 does not face technical barriers.

When considering *Alternative 2*, it is implied that project operators will need to acquire by themselves - through contracting or in-sourcing - the skills and labour to properly operate and maintain such a facility. Personnel for the operation of these plants need to go through extensive training.
The experience from CDM projects that use similar technology, where methane recovery and utilization for heat generation and flaring of remaining methane, has shown that this technology has faced substantial performance problems due to the inexperience with operation. Under baseline conditions, substantial technical barriers remain for the proposed activity undertaken without being registered as CDM project activity.

Alternative 3 is well established and commonly used for both domestic and industrial wastewater treatment in many parts of the world. However, there is no experience with this type of technology in the palm oil industry in Thailand and palm oil factory operator considers the use of this technology at this point in time. This is mainly due to commercial reasons, since aerobic systems demand extremely high operational costs due to high electricity consumption and high sludge production and the associated disposal costs. Considering lack of interest and lack of commercial viability of this technology for palm oil mill effluent treatment, technical barriers are deemed irrelevant.

Project operators do not consider *Alternative 5* due to commercial reasons as it creates no income streams and is not required by law. Technical reasons are deemed irrelevant.

Investment barriers

Alternative 1 is currently in operation and creates acceptable operational costs to achieve compliance with domestic effluent regulation. It does not face any financial barrier.

Alternative 2 entails high investment, high O&M costs and uncertain commercial returns (from the production and use of biogas). Prior to implementation of the project, the project owner assessed the costs, potential returns and the risks of the proposed activity and came to the conclusion that, given the

high investment costs and insecure returns due to technological risks, the company would not be able to implement the project without the long term financial returns linked to CERs. For more details related to this argument please refer to the financial analysis provided in the PDD.

Alternative 3 entails high investment and very high O&M costs. The major reason for high O&M costs for treating wastewater with high organic content in aerobic systems is the very high electricity demand for forced aeration and high costs associated to sludge disposal as compared to anaerobic treatment systems. Due to high investment and O&M costs and the lack of commercial returns from energy production or energy saving (as no biogas is produced), the financial barrier for this type of technology is not surmountable and the alternative is excluded from further analysis.

Alternative 4 is already excluded, as it is at odds with Thai law.

Alternative 5 also entails high investment and O&M costs and no commercial return as the produced biogas is destroyed without use. The financial barriers are not surmountable and the alternative is excluded from further analysis.

Social barriers

Alternative 1 is currently used at the Project site and is common practice in Thailand, no social barriers are identified.

Alternative 2 faces some social barriers due to the technology complexity. Technical understanding of the involved processes (biological, chemical and physical) in the technology is poorly understood and therefore decision-making is confused, slowing the uptake of this technology. Furthermore, it is of general knowledge that many biogas projects in Thailand did not perform as expected, while some even failed[1].
With the increased availability of operational experience, this barrier is however likely to become less relevant in the future. Given the lack of studies to confirm this barrier and in order to be on the conservative side, it was decided to judge this barrier as non-existing for Alternative 2.

Alternatives 3 to 5 have been excluded already.

Prevailing practice barriers

Alternative 1 is currently used for wastewater treatment and meets all regulatory requirements of Thailand. Therefore there is no prevailing practice barrier for this alternative.

Interest in *Alternative 2* as an alternative management practice is largely driven by the prospect to generate and use biogas in conjunction with the production of carbon credits. There is no foreseeable regulatory change that could stimulate such change as *alternative 1* usually exceeds regulatory requirements for water effluent discharge. Therefore, prevailing practice barriers are relevant due to existing and future lack of regulatory pressure to adopt alternative 2. For more information on this barrier please refer to the "common practice analysis" provided below.

Alternatives 3 to 5 have been excluded already.

[1] However, there is no market study, which could provide an accurate analysis of the status quo of installed projects and the perception of the technology in Thailand.

Conclusion of Barrier Analysis

As discussed above, *Alternative 1* - continuation of the current situation - does not face any significant barriers while *Alternative 2* - anaerobic digestion system - and *Alternative 3* - aerobic treatment system - face a number of technical, financial and prevailing practice barriers, which prevent the implementation of these alternatives under baseline conditions. *Alternative 4* is not in compliance with the law and *Alternative 5* is not considered by project operators as there are neither commercial nor regulatory incentives.

Since only *Alternative 1* - continuation of the current open lagoon based wastewater treatment system - does not face any barriers and since, as discussed above, there are no arguments other than CDM revenues to pick the solution under *Alternative 2*, *Alternative 1* would be considered as baseline scenario. It can also be concluded that it would not be possible to overcome the barriers that *Alternative 2* faces without CDM.

Step 4. Common practice analysis

Since the proposed CDM project is not a "first-of-its-kind", a common practice analysis is conducted.

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

According to the tool for the demonstration and assessment of additionally, projects are considered "similar" in case

- they are located in the "same country/region",
- they are of "similar scale", and
- they "take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc".

In Thailand, there is currently an average area of 0.29 million hectares of palm trees cultivation, most of which is located in the Southern region (92.2%), especially in the Krabi, Surat Thani, Chumpon, Trang and Satun Provinces[2]. The palm oil factories are closely dispersed in the palm oil plantation areas. Thus, this Southern region is chosen as the common practice comparison region.

In this region, most palm oil mills employ conventional biological treatment systems to treat their POME[3]. The systems comprise anaerobic and aerobic or facultative processes. 64% of palm oil mills use anaerobic and facultative ponds in series. The alternative treatment options for POME are anaerobic and aerobic lagoons in series (29%) or an anaerobic digestion tank and facultative ponds in series (7%)[4].
It has been observed that nearly all mills in Thailand are unable to treat their wastewater to meet the effluent standard. This effluent BOD limit is achievable if the treatment systems are well designed and operated.
Environmental impact problems from POME usually occur in the rainy season, especially with mills located close to communities and/or with mills that do not own an oil palm plantation. The overflow from the wastewater treatment plant causes heavy water pollution to the waterways nearby[5].
On top of that, the anaerobic ponds produce methane and carbon dioxide, both GHGs, which are released as gases into the air.

2 Source: Published paper on ASEAN Renewable Energy Project Competition 2007: Biogas from wastewater in Palm oil mill project (Asian Palm Oil Co.,Ltd); and Chavalparit, 2006: Clean Technology for the Crude Palm Oil Industry in Thailand
3 Source : Ibidem
4 Source : Ibidem
5 Source : Clean Technology for the Crude Palm Oil Industry in Thailand (Chavalparit, 2006)

Another problem for mills located nearby communities is the bad smell from poorly managed effluent treatment systems. POME contains large amounts of grease and oil, which are not decomposed by anaerobic bacteria under the circumstances detailed above. They accumulate and cover the surface of the pond and cause odour emissions.

In view of all the above-mentioned inconveniences, it can be straightforwardly be concluded that such wastes and waste treatment pose a serious threat to the environment and the quality of life in rural areas, unless proper pollution measures are taken.

Based on 2007 data, there are 40 standardized palm oil mills in Thailand, 13 of which have installed anaerobic digesters (32.5%). Thus, the proposed project needs to be compared with 13 projects[6].

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

Out of 13 projects, 11 projects have now received the letter of approval (LoA) from the Thai DNA and are undergoing validation (Table A1). Two projects are requesting the LoA to the Thai DNA, as listed in Table A2.

This analysis clearly demonstrates that all 13 installed biogas reactor projects face prohibitive barriers without CDM revenues. Therefore, this project is additional.

Table A1 : Projects applying for CDM

No.	Project Title	Project Developer	Project status
1	Natural Palm Oil Company Limited – 1 MW Electricity Generation and Biogas Plant Project[7]	Natural Palm Oil Co., Ltd.	LoA (2007) Validation
2	Chumporn Applied Biogas Technology for Advanced Waste Water Management, Thailand[8]	Chumporn Palm Oil Industry Public Co. Ltd.	LoA (2007) Validation
3	Univanich Lamthap POME Biogas Project in Krabi, Thailand[9]	Univanich Palm Oil Public Co.,Ltd	LoA (2008) Validation
4	Green to Energy Wastewater Treatment Project in Thailand (the project)[10]	Green to Energy Co.,Ltd	LoA (2008) Validation
5	Wastewater Treatment with Biogas System in Palm Oil Mill at Sikao, Trang, Thailand[11]	Otaco Co.,Ltd	LoA (2009) Validation
6	Wastewater Treatment with Biogas System in Palm Oil Mill at Saikhueng, Surat Thani, Thailand[12]	Thaithalo Co.,Ltd	LoA (2009) Validation
7	Wastewater Treatment with Biogas System in Palm Oil Mill at Sinpun, Surat Thani, Thailand[13]	SPO Co.,Ltd	LoA (2009) Validation
8	Wastewater Treatment with Biogas System in Palm Oil Mill at Kanjanadij, Surat Thani, Thailand[14]	Sangsiri Industrial co.,Ltd	LoA (2009) Validation

[6] Source : Clean Technology for the Crude Palm Oil Industry in Thailand (Chavalparit, 2006)
[7] Source: http://cdm.unfccc.int/Projects/Validation/DB/YKDO2DNUCHSAS70MWXK8NJV2C6JZ07/view.html
[8] Source: http://cdm.unfccc.int/Projects/Validation/DB/RJTP25FM12RFSI8CBIYX9Q2XPACJPR/view.html
[9] Source: http://cdm.unfccc.int/Projects/Validation/DB/IE3HIUYPUMSRZ0NQDA14I0S87HJDVG/view.html
[10] Source: http://cdm.unfccc.int/Projects/Validation/DB/BTV41245RQHIYU4R4UHDZ2711UE8U0/view.html
[11] Source: http://cdm.unfccc.int/Projects/Validation/DB/2DZO22FMWMLSYJM1X5FFADMD733QH8/view.html
[12] Source: http://cdm.unfccc.int/Projects/Validation/DB/BMEM18YX60P2Z3K9XG5YX1EQRK60MJ/view.html
[13] Source: http://cdm.unfccc.int/Projects/Validation/DB/5U0SSE499IK4IBA8A8NJWAXQKQ6SH6/view.html
[14] Source: http://cdm.unfccc.int/Projects/Validation/DB/JZZ8VWAU07JMH55UJ6VPBKUC0MPWTU/view.html

9	Univanich Siam Biogas to Energy Project[15]	Univanich Palm Oil Public Company Limited	LoA (2008) Validation
10	Thachana Palm Oil Company Wastewater Treatment Project in Thailand[16]	Thachana Palm Oil Co., Ltd.	LoA Validation
11	Univanich TOPI Biogas Project[17]	Univanich Palm Oil Public Co. Ltd	Public consultation closed. Validation.

Table A2: Projects having applied for LoA[18]

12	Lam Soon Forced Methane Extraction from Organic Waste-Water Treatment Plant for energy generation in production process	Lam Soon (Thailand) PLC.	request of the letter of approval (LoA)
13	UPOIC Forced Methane Organic Waste-Water Treatment Plant for energy generation in production process	United Palm Oil Industry PLC.	request of the letter of approval (LoA)

ODA Additionality Screen

GS Manual for CDM Project Developers: **Section 3.3.3**

Project financing for this project activity will not use any Official Development Assistance (ODA) funds as defined in the Gold Standard Manual for Project Developers. No loans or grants have been provided by International Financial Institutions.

Written documents from the project owner demonstrating that no ODA was used for financing the project will be provided during validation.

Conservative Approach

GS Manual for CDM Project Developers: **Section 3.3.4**

The baseline scenario selection and the calculation of green house gas emission reductions have been carried out in a conservative manner:

- Project proponents have used an approved methodology by CDM Executive Board (AMS-III.H-Version 10 "Methane Recovery in Wastewater Treatment) in order to determine the baseline scenario and calculate emission reductions;
- Likely baseline scenarios have been developed and assessed using guidance provided by methodology AMS-III.H. A set of quantified scenarios has been described and the most conservative baseline scenario has been selected;
- Calculations have been done in a transparent manner providing full documentation and references to data sources to the DOE.

Please refer to the PDD Sections B.3, B.4, B.5 and B.6 for more details on project boundary definition, baseline scenario selection and emission reductions calculation.

[15] Source: http://cdm.unfccc.int/Projects/Validation/DB/B589DFXP2IZCCD27HXFVKW70KU5HY2/view.html
[16] Source: http://cdm.unfccc.int/Projects/Validation/DB/Q8QP39Q9SZX0NVQHMS0GXON2XIRPV9/view.html
[17] Source: http://cdm.unfccc.int/Projects/Validation/DB/RSULN0W3BXFM03Z4V3Y0ZTJQOR7TF4/view.html
[18] Source: Thai Greenhouse Gas Management Organization, Thailand, data updated in 15th January, 2009

Technology Transfer and Knowledge Innovation

GS Manual for CDM Project Developers: **Section 3.3.5**

The project activity results in technology and knowledge innovation related to:

- Implementation of an advanced biogas reactor system, reusing biogas as fuel for heat and electricity production. As compared to the baseline scenario, the installed wastewater treatment system consists of a highly efficient process for wastewater treatment based on state of the art technology from one of the leading anaerobic reactor suppliers in the world, which comply with stricter wastewater discharge norms than the Thai regulations;
- Promotion of new technology in Thailand with replication options;
- The anaerobic digester requires special training of skilled staff to operate and maintain the power plant, creating employment and leading to knowledge transfer to the host country and especially to rural region of the country.

Geographically, transfer of technology and know-how has occurred mainly from urban to rural areas.

Sustainable Development

Sustainable Development Assessment

GS Manual for CDM Project Developers: **Section 3.4.1**

The sustainable development assessment matrix presented in the table below is based on a comparison of the project activity versus an anaerobic lagoon as the baseline.

Any project seeking to obtain the Gold Standard must demonstrate clear benefits in terms of sustainable development. The contribution of the proposed project activity to the sustainable development of the country is based on indicators of three broad **components**:

- Local/global environment sustainability;
- Social sustainability and development;
- Economic and technological development.

The indicators within these three components are set out in the Sustainable Development Assessment Matrix (see Box 3 below). They do not provide "yes" or "no" answers, but a rating of how the project performs against a series of parameters, based on quantitative and/or qualitative assessment. The project's performance must be assessed using the following **scoring system**:

-2:	major negative impacts, i.e. where there is significant damage to ecological, social and/or economic systems that cannot be mitigated through preventive (not remedial) measures.
-1:	minor negative impacts, i.e. where there is a measurable impact but not one that is considered by stakeholders to mitigate against the implementation of the project activity or cause significant damage to ecological, social and/or economic systems.
0:	no, or negligible impacts, i.e. there is no impact or the impact is considered insignificant by stakeholders.
+1:	minor positive impacts
+2:	major positive impacts

For each indicator in the matrix, a score between -2 and +2 has been assigned.

The sustainable development assessment matrix is applied to the Pitak Palm wastewater treatment plant as follows:

Component Indicators	**Score** (-2 to +2)	**Rational**
Local / Regional / Global Environment		
• Water quality and quantity	+2	There is a significant improvement in water quality due to the implementation of a more efficient and reliable effluent treatment system. The wastewater discharged after the effluent treatment process will meet the standards and requirements of national regulation for wastewater discharge and some of the treated wastewater will be reused in the process (Zero Discharge), which contributes to a significant improvement in terms of water quantity. Risks of groundwater contamination due to leakage of organic pollutants from the bottom of the lagoons into the groundwater can also be reduced by the special lining High-Density Polyethylene (HDPE) sheet on the bottom of reactor. Thus, it is likely that wastewater leakage will not happen.
• Air quality (emissions other than GHG)	+2	By replacing the open anaerobic lagoon with an enclosed bio-digester, the project significantly contributes to an improvement of odour emissions, which has a substantial impact on quality of life for the employees at the palm oil plant and residents living in the area close to the lagoons. Furthermore, air quality is improved substantially compared to emission levels (SO_x and NO_x) related to fossil fuel combustion, which is displaced by the use of biogas from the project activity for thermal energy generation.
• Other pollutants (including, where relevant, toxicity, radioactivity, POPs, stratospheric ozone layer depleting gases)	0	Apart from water, soil and air pollutants mentioned in this matrix, no other relevant pollutants have been identified.
• Soil condition (quality and quantity)	+1	As compared to open lagoons, the bio-digester allows for an easier handling of the produced sludge, which can be used as high quality organic fertilizer, thus replacing the use of chemical fertilisers.
• Biodiversity (species and habitat conservation)	0	As compared to the baseline, no significant change in biodiversity is expected.
Sub Total	**+5**	
Social Sustainability and Development		
• Employment (including job quality, fulfilment of labour standards)	+1	The project leads to employment generation in the power plant itself and in the operation and maintenance of the biogas system. Seven fulltime positions have been created within the plant. The employment of skilled staff has a significant impact on

		job quality in the rural context of the project.
• Livelihood of the poor (including poverty alleviation, distributional equity, and access to essential services)	0	As compared to the baseline, no significant change is expected.
• Access to energy services	+1	Since the project activity is a net exporter of electricity to the grid, it contributes to a better reliability of the local grid and helps adding renewable energy based capacity generation to the national grid.
• Human and institutional capacity (including empowerment, education, involvement, gender)	0	As compared to the baseline, no significant change is expected.
Sub Total	**+2**	
Economic and Technological Development		
• Employment (numbers)	+1	Seven fulltime jobs are created for plant operation and maintenance. Per MWh of electricity produced, more jobs are created by this small biogas power production plant as compared to conventional power plants. Indirect benefit: The project will contribute to improving the cost efficiency of the palm oil production (due to reduced energy costs), which makes the palm oil industry more competitive. An increased competitiveness usually leads to growth of the sector, which leads to an increased demand for Crude Palm Oil (CPO) and subsequently to more jobs and revenues in the rural sector.
• Balance of payments (sustainability)	+1	As previously mentioned, the project activity leads to a significant energy cost reduction by replacing fossil fuels for electricity generation. In addition, the project generates extra revenues by exporting electricity to the grid, contributing to the economic sustainability of the project. From a macro-economic perspective, the project will have an impact on net foreign currency savings related to fossil fuel import since most of the fossil fuel used in the baseline is from foreign origin.
• Technological self reliance (including project replicability, hard currency liability, institutional capacity, technology transfer)	+1	The project showcases an innovative way to treat wastewater, generate clean and renewable electricity and improve the cost efficiency of agro industry. The project has a great replication potential in the palm oil sector in Thailand and other countries and also contributes to technology transfer.
Sub Total	**+3**	
Total	**+10**	

To meet the requirements of the Gold Standard, each of the above three components must have a

positive sub-total score, the total score must be positive, and none of the indicators should score –2. As the project scores +10, this project satisfies all requirements to meet the Gold Standard.

EIA requirements

GS Manual for CDM Project Developers: **Section 3.4.2**

EIA Gold Standard Requirements according to section 3.4.2 of the Gold Standard Manual apply to the project activity as follows:

1. *Host country EIA requirements*
   The project does not fall under the purview of the Environmental Impact Assessment (EIA) notification of the Ministry of Natural Resources and Environment (MONRE), Government of Thailand with the approval of National Environment Board (NEB). As per information from the Ministry of Natural Resources and Environment, no EIA is required for the proposed project activity.

2. *CDM Executive Board EIA requirements*
   The CDM Executive Board does not pose extra requirements for biogas power projects related to the EIA.

3. *Gold Standard Initial Stakeholder Consultation*
   The Gold Standard Initial Stakeholder Consultation was within the Pitak Palm factory on 4 August 2008. The results of the Gold Standard Initial Stakeholders Consultation did not show any significant environmental and/or social impact.

4. None of the indicators in the Sustainable Development Assessment Matrix scores -1.

5. None of the above steps shows a requirement to conduct an EIA.

A description of environmental impacts of the project activity is featured under Section D in the PDD and will be validated by the DOE throughout the regular CDM validation process.

Public consultation procedures

GS Manual for CDM Project Developers: **Section 3.4.3**

Initial Stakeholder Consultation

The initial stakeholder consultation was held on 4th August 2008 at a meeting room of the local government office of the Sikao District, which is located in Trang province, which is located 5 km away from the wastewater treatment plant. This meeting was attended by representatives from the palm oil factory, representatives of the local government, local residents, rural entrepreneurs, media representatives and farmers.

The overall response to the project, from all invited stakeholders, was encouraging. Most of the questions from the participant regarded potential environmental impacts such as landscape impacts, and project's safety. These questions were clarified during the meeting.

In all, no adverse reaction/comments/clarifications have been received during the Initial Stakeholder Consultation process. The participants to the meetings and the Gold Standard supporting NGOs have not raised concerns related to potential project impacts.

A detailed report on the Initial Stakeholder Consultation is available in **Attachment 1** to this document.

Main Stakeholder Consultation

The Gold Standard Main Stakeholder Consultation is based on a set of additional criteria in addition to UNFCCC requirements. Full documentation of the project activity was made publicly available for two months prior to conclusion of the Gold Standard validation at www.southpolecarbon.com/goldstandard.htm, including:

- The original and complete PDD
- A non-technical summary of the project design document (in appropriate local language)
- Relevant supporting information

During the consultation period, stakeholders are invited to submit their comments and questions related to the project activity. For this purpose an online comment form is available at www.southpolecarbon.com/goldstandard.htm.

The report on the Main Stakeholder Consultation process will be made publicly available and sent to the DOE for validation.

Gold Standard Monitoring

GS Manual for CDM Project Developers: **Section 3.5.1**

According to the Gold Standard Manual for CDM Project Developers, Gold Standard monitoring requirements in addition to regular CDM monitoring procedures are defined based on the outcomes of the stakeholder consultation meeting and the Sustainable Development Assessment conducted above. The Sustainable Development Assessment Matrix shows that there are no indicators, which would be critical for a positive contribution of the project to Sustainable Development or that are particularly sensitive since no indicator scored below zero.

Local stakeholders have indicated issues of potentially significant importance. A detailed report of the issues raised and the answer provided by the project owner are provided in the Initial Stakeholder Consultation Report (Attachment 1 to this Annex).
A summary of the raised issues and their implications on the monitoring requirements is provided in the table below:

Addressed Issue	Answer by project owner	Implications on monitoring requirements
Accidents during construction or operation of the Project which could affect human health (explosion risks due to biogas leakage)	The wastewater treatment plant has all provisions for a safe handling of biogas, including an automated flaring system and a warning system in case of a significant pressure drop (indicating leakage) in the system. The construction and operation of the plant is carried out in accordance with relevant safety standards and procedures. Accident risks are mitigated to the extent that can be influenced by the project owner.	There are no evident monitoring parameters, apart from standard regular safety procedures and the installed biogas handling equipment and procedures (flare, safety valves, safety sensors), which could significantly reduce accident risks during the operation of the project.
Natural resource contamination	The aim of the project is to improve the current wastewater treatment facilities	Contamination of local water streams or ground water is the most serious risk of the

	and avoid any harm or threat to the environment or people. The installed wastewater treatment system is more efficient and robust (from a process control perspective) than the open anaerobic lagoon system (baseline scenario). It should be noted that the biogas reactor system will reduce 90% to 95% of the Chemical Oxygen Demand (COD) load in the wastewater (replacing all the work that was previously done by the lagoon system). Nevertheless, the effluent from the biogas reactor is still diverted to the old lagoon system, for a final treatment, which will further reduce the COD load to a value, which is way below the Thai wastewater discharge limits. The lagoon system at Pitak is designed in such a way that there is no discharge of water. Most of the produced wastewater is constantly re-circulated as wash water for the CPO production process. The rest is stored in the aerobic lagoons at the end of the cascading lagoon system, where part of the water evaporates, keeping a hydrological balance. If the plant is not operated as it should, the project activity might lead to release of untreated water or release of methane to the atmosphere. However, the wastewater treatment plant includes safety and monitoring devices as well as safety and quality control procedures in order to avoid abnormal operating conditions, which could lead to biogas leakage or abnormal wastewater discharges. The quality of the treated wastewater is constantly monitored and periodically checked by environmental authorities in order avoid any contamination. Biogas production, its use as a fuel in the boilers or its combustion in the flare systems is also constantly monitored. The project fully complies with safety and health regulations and any threats to human health are being avoided to the extent that can be influenced by the project owner.	project. However, wastewater discharge quality after the reactor is already subject to continuous monitoring under CDM and periodic controls by environmental authorities. COD values, representing the main indicator for the quality of the wastewater prior to discharge, will be measured on a daily basis, with 3 samples per day prior to discharge into the lagoons. As mentioned above there is no effluent leaving the lagoon system since the water is kept in a closed loop. There is no need for additional monitoring parameters.
Odour from the wastewater treatment plant	The odour will be reduced because the new system is closed and the biogas produced is utilized for electricity and heat generation. Any gases that would lead to odour emissions (mainly H2S and other sulphur compounds) are captured with the biogas and either destroyed in the boilers or removed in the desulphurization system prior to engine, without release of odour emissions to the atmosphere.	Given the fact that the new system makes a substantial contribution towards an improvement of odour emissions from the open anaerobic lagoons, there is no need for additional monitoring procedures.

None of the issues in the table above can be converted into additional monitoring requirements because:

- the CDM monitoring requirements already prescribe monitoring of all relevant parameters; or
- the indicated issues cannot be influenced by the project owner during the operation of the plant;
- the indicated issues are not relevant or have rather a positive effect as compared to the baseline.

Regular CDM monitoring procedures as specified in the PDD of the project activity account for:

- Determination of project emissions and emission reductions during the crediting period;
- Determination of monitoring method (including data registration, monitoring measurement and calibration) and the equipment applied;
- Quality assurance and control procedures for the monitoring process;
- Documentation of all relevant monitoring steps.

Attachment 1 - Initial Stakeholder Consultation Report

Pitak Palm
Wastewater Treatment and Biogas Utilization Project

Ampher Sikao, Trang Province, Thailand

Procedure followed to invite stakeholder comments

A. Public hearing for local stakeholders:

Invitation procedure

The Gold Standard Initial Stakeholder Consultation has been conducted by the project owner Nantana Panapitakkul with assistance from South Pole Carbon Asset Management Limited (Switzerland based company responsible for CDM project development) and PAPOP (Thai engineering company responsible for the implementation of the wastewater treatment plant).

Stakeholder groups as defined in the Gold Standard procedures have been identified and informed through oral and written means about the meetings. The invitation letter was sent by fax to participants located a long distance from the project, by regular mail to participants without access to a fax and the meeting was announced in the local newspaper in the Trang province. This invitation process was done within two weeks before the meeting date. The local newspaper and the invitation letters were collected for evidence (see annex I).

Place and date of the meetings

The initial stakeholder consultation was held at a meeting room of the local government office of the Sikao District, which is located in Trang province, on 4th of August 2008. As this meeting room is close to the project site, all participants were able to examine the location where the proposed project will take place.

Meeting Participants

The meeting was attended by local residents who lived nearby the project around 3-5 kilometers and representatives from the following stakeholder categories:

1. Local residents
2. Local government representatives
3. Delegates from political parties
4. Local entrepreneurs
5. Employees

There were total 43 people who accepted the invitation, but only 35 participants who attended the meeting. However, the participants comprised government people and local residents potentially directly impacted by the project activity. The name list of participants is showed below.

No.	Participant	Occupation/Organisation	Attendance
1	Seree Panichkul	District-chief officer	yes
2	Keaw Unteng	Mayor of Tumbol Kuankul	yes
3	Chareonporn Sukcharoen	Mayor Assistant of Tumbol Kuankul	No
4	Sa-Nguan Unteng	Member of Trang Province Administration Organization	yes
5	Thanachart Boonphoe	Superintendent, Amphoe Sikao Police Station	No
6	Prasit teehor	President of Kalasae Subdistrict Administration Organization	No
7	Chairit Taiyuai	Village headman of Tumbol Kalasae	yes
8	Yongyuth Teehor	Headman of Moo 2	yes
9	Luan Kluemeepol	Headman of Moo 3	yes
10	Surachart Chusuwan	Head of Provincial Industrial Organization	yes
11	Ratchadapa Tongkaew	Head of Provincial Industrial Organization	yes
12	Utchariya Noparat	Manager of Lam Soon (Thailand) Public Co., Ltd.	yes
13	Suwanna Unteng	Manager of Otago (Thailand) Public Co., Ltd.	yes
14	Kanphai Kupkunkarn	Director of Wat Rom Muang School	yes
15	Krurb Paergjene	Director of Kamol Sri School	yes
16	Yuan Pongsirikul	Director of Ban Bang Kang Kao	No
17	Kimpoon Teehor	Local resident (Tambol Kalasae)	yes
18	Samath Changate	Local resident (Tambol Kalasae)	yes
19	Sompop Poetaworn	Local resident (Tambol Kalasae)	No
20	Charoen Sootrak	Member of Kuangul Subdistrict Administration Organization	yes
21	Arroon Meekaew	Local resident (Tambol Kalasae)	yes
22	Jintanaporn Longtee	Municipal council in charge of health	yes
23	Kwanhathai Tamsrinuan	Municipal council in charge of health	yes
24	Prasong Inta	Member of Saikao Subdistrict Administration Organization	yes
25	Surachai Thamparnoisuth	Local resident (Tambol Kalasae)	No
26	Sattha Thongkam	Deputy(senior) of Klongtomp Subdistrict Administration Organization	yes
27	Worrapong Mukdamontri	Headman of Klongtomp	yes
28	Chatchai Kongying	Assistant headman of Klongtomp	yes
29	Chuan Kruittirat	Mayor of Tumbol Wangwiset	yes
30	Wai Noothong	Headman of Moo 7 (Ban Prupri)	yes
31	Utsanee Leesurawanich	Committee	yes
32	Chatiupong Tuadam	Member of Wang Wiset Subdistrict Administration Organization	yes

33	Somsak Supphamitr	Member of Wang Wiset Subdistrict Administration Organization	yes
34	Panom Naluan	Member of Wang Wiset Subdistrict Administration Organization	yes
35	Pornwisit Kina	Member of a municipal council	yes
36	Thavee Kaewtongsuan	Assistant of Thai Youth Center	yes
37	Kimpoon Teehor	Local resident (Tambol Kalasae)	yes
38	Seree Panichkul	District Officer of Sikao	yes
39	Surasak Teehor	Secretary of Kalasae Subdistrict Administration Organization	yes
40	Utth Chitpiclirawate	Local resident (No specification)	yes
41	Teanchai Limpichart	Local resident (No specification)	yes
42	Oonchai Limpichart	Local resident (No specification)	yes
43	Sudarat Thongnak	Local resident (No specification)	yes

Language
Documentation and meeting were held in Thai (local language).

Meetings procedure

- Opening of the meeting ceremony by Sa-nguan Unteng (Member of Trang Province Administration Organization) (10 min)
- Purpose of the consultation by Nantana Panapitakkul (Director of company) (15 min)
- Description of the project and environmental impacts by PAPOP company (30 min)
- Questions and Answers session (10 min)
- Description of Clean Development Mechanism (CDM) session (30 min)
- Completing checklists (Appendix E to the Gold Standard Project Developer's Manual) (30 min)
- General feedback (15 min)
- Closing the meeting ceremony (10 min)
- Dinner (40 min)

Meeting documents and protocols
Prior to the meeting, registration was held in order to clarify who attended this consultation meeting. During the meeting, documentation was delivered to participants in order to explain the project description, the environmental impact of the project and the Gold Standard checklist form. Upon completion of the meeting, the following documentation was collected and attested by the signatures of the stakeholders that were present:

1. Presence list with name, address and occupation,
2. Non-technical description of the project,
3. Documentation on environmental impacts of the project,
4. Filled out Appendix E of Gold Standard (checklist).

These documents were available as hardcopies and will be handed over to the Designated Operational Entity (DOE) conducting the Gold Standard validation process. Scanned documents are available in Annex I.

B. Email consultation for Gold Standard supporting organizations in Thailand:

Invitation procedure
An invitation was sent to representatives of Gold Standard supporting organizations in Thailand on July 24th, 2008. At the time of the meeting, the only Gold Standard supporting NGO in Thailand was the local branch of Greenpeace. The invitation included a short introduction of the project and the date and location of the scheduled initial stakeholder consultation. No reply was received.

Period of email consultation
24 July 2008 to 4 August 2008.

Compilation of comments received

A. Public hearing for local stakeholders

The overall response to the Wastewater Treatment and Biogas Utilization Project from participating local stakeholders was encouraging and positive. The greatest asset achieved by the project appears to be its environmentally friendly aspect. Stakeholders recognized that the project activity has zero discharge to the river or other natural sources such as soils and groundwater. The treated water, which contains plant nutrient such as Nitrogen, Phosphorus and Potassium, will be stored in the holding ponds, the last pond in the wastewater treatment series.
Project participants demanded to use the final treated water for irrigation on the company's oil palm plantations. The benefits are double, with both water and fertilizer savings.

Two concerns arose from the stakeholders' comments on groundwater consumption and wastewater leakage by the project activity. Since the project owner has its water storage from precipitation for utilizing in the manufacturing process, the problem of groundwater shortage for the community should not happen. Additionally, a special lining (HDPE lining) will prevent the groundwater from wastewater contamination. Thus, it is unlikely that wastewater leakage should happen.

Another benefit is that the odour is eliminated with the new closed wastewater treatment. Consequently, local people's health is put less at risk through the reduction of the odour from the open lagoon wastewater treatment system.

This project is believed to be sustainable since it will decrease environmental problems by replacing the old style technology with higher quality equipment, and increasing the quality of life of local people by increasing employment and providing financial supports and donations in local events such as temple fair, sport competition for the local community. To sum up the sustainability of the project, the various benefits (as reported by local stakeholders) are listed below:

1. The installed technology contributes to clean soil and water and reduced air pollution (methane and hydrogen sulfide which are the potential Greenhouse gaseous);
2. The use of biogas represents a sustainable method of generating energy;
3. The project leads to a reduction in the dependency on oil while at the same it enhances energy security by increasing diversity of fuel supply;
4. As the system operates within strict environmental standards there will be no negative impacts to the environment due to the plant;
5. The project is well designed, returning clean water to the environment and not producing additional pollution;
6. The plant will create new jobs at the plant. It increases the total income of local communities from employing the local labours for construction and civil work.

Nine persons did not express any comments or reactions. No negative comments or reactions to the project have been received during the public hearing.

Five participants left general comments related to the project:

1. The Mayor of Tumbol Kuankul asked for common quality control procedures to make sure that there are less environmental impacts for the long term during the commissioning period.

   Comment by the project owner: "To operate the plant in the most effective way, quality control is a major part of the process and trained people are required in order to reduce human failure. Moreover the standard inspection by qualified validators is done during the commissioning stage for safety standards."

2. The village headman of Tumbol Kalasae asked the capacity of the wastewater treatment system in case the amount of wastewater was increased due to larger scale of operation in the future.

   Answer by the project developer: "This wastewater treatment is designed to support a high amount of wastewater. Otherwise, in case of an emergency situation, the existing open lagoon is used for wastewater storage prior to other treatment processes."

3. The Local resident of Tambol Kalasae[1st] asked about the species of microorganisms (bacteria) which will be used in the UASB system. Should these microorganisms come from the native species in the area, not from outside?

   Comment by the project owner: "Absolutely, the microorganisms are selected from the native site in order to survive and work effectively since they have already adapted in the real environment."

4. The Local resident of Tambol Kalasae[2nd] asked for the amount of electricity generated by the biogas plant.

   Answer by the project developer: "The capacity of the biogas plant depends on the quantity and quality of the wastewater, which is the raw material for producing the biogas. All the generated electricity is sold to the Provincial Electricity Authority."

5. The Secretary of Kalasae Subdistrict Administration Organization commented about the treated wastewater: Is the treated wastewater discharged or does it have another more optimal use?

   Answer by the project developer: "Because of the high nutrition content of the treated wastewater, this water is used for nourishing the palm trees, which are the buffer zone within the plant area."

The Gold Standard questionnaire (Appendix E to the Gold Standard Manual for CDM Project Developers) has been presented in the local language (Thai). It consisted of 23 questions that were to be answered.
From the result of the questionnaire, there were no "yes" answers to these questions. This means that everyone approved of this project, which will lead to sustainable development for the local residents and the environment.

B. Email consultation for Gold Standard supporting organizations in Thailand:

Regarding to this consultation meeting, the consultation document was sent two weeks prior to meeting to many Gold Standard supporting organizations in Thailand such as the Appropriate Technology Association (ATA), Dhammanart Foundation and Renewable Energy Institute of Thailand (REIT). No comments were received.

Changes to Project design based on comments received

No major environmental or social concerns, which were already studied and addressed in the Initial Environment Evaluation (IEE), were stated during the initial stakeholder consultation process. The IEE was studied in order to understand all of the possible impacts (i.e. environmental and social impacts) from the project and to set the plan for the project. There was some feedback from participants about the impacts, as already stated in section A, the project owner and project developer answered all the questions and comments. Participants reported that there were only positive impacts from this project for both environmental and social aspects. For environmental aspects, there will be a higher quality of wastewater treatment, a high standard of technology for pollution control (i.e. noise pollution, odour pollution and air pollution) during the project construction and the commissioning. For social aspects, there will be no changes in local tradition from the project and there will be more employment opportunities with the local people considered first. According to the IEE study, which will be approved by the Thailand Greenhouse Gas Management Organization, it was neither necessary to make any changes to the Project design nor to incorporate any additional measures to limit or avoid negative environmental impacts. The same applies to socio-economic concerns, which have not been stated at all.

It is evident from the stakeholder consultation process that the project is perceived as a positive example in Thailand and that it contributes to sustainable development in the region.