
VALIDATION REPORT

**South Pole Carbon Asset Management
Ltd.**

**SD Biosupply Wastewater
Treatment and Biogas Utilization
Project**

SGS Climate Change Programme

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Project Title:			
SD Biosupply Wastewater Treatment and Biogas Utilization Project			
Organisation:		Client:	
SGS United Kingdom Limited		South Pole Carbon Asset Management Ltd.	
Summary:			
South Pole Carbon Asset Management Ltd. has commissioned SGS to perform the validation of the project: SD Biosupply Wastewater Treatment and Biogas Utilization Project The proposed project activity involves installation of an anaerobic wastewater facility, based on Up-flow Anaerobic Sludge Blanket (UASB) technology, at the existing starch plant. The project will utilise the captured methane as fuel in biogas – heat generation devices to produce thermal energy which will be used in the starch production process for the partial replacement of fuel oil by biogas usage, if there is excess biogas it will be sent to flare. By installation of the biogas digester that will generate the biogas from wastewater coming out of the starch plant and methane destruction unit will result in reductions of the greenhouse gases (GHG) emission that are real, measurable and give long-term benefits to the mitigation of climate change. Methodology used : AMS III.H version 12 and AMS I.C version 14 Version and Date : AMS III.H version 12 is valid from 11/06/2009 – 30/07/2009 AMS I.C version 14 is valid from 08/04/2009 – 30/07/2009 The scope of the validation is defined as an independent and objective review of the Voluntary Carbon Standard (VCS) Project Description (PD) document, the project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against VCS2007 requirements and associated interpretations. SGS has employed a risk-based approach in the validation, focusing on the identification of significant risks for project implementation and the generation of VCUs. The report is based on the findings of document reviews, the stakeholder consultation process and responses from the project participants to the findings raised in this report. The report and the annexed validation describes a total of 15 findings which include: • 7 Corrective Action Requests; • 7 Clarification Requests; and • 1 Observation. All findings have been closed out satisfactorily but the observation needs to be verified during verification.			
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VCS2007 Project Validation			
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Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CH ₄	Methane
CL	Clarification Request
CO ₂	Carbon Dioxide
COD	Chemical Oxygen Demand
DOE	Designated Operational Entity
DNA	Designated National Authority
DR	Documents Review
EIA	Environmental Impact Assessment
EPPO	Energy Policy and Planning Office, Ministry of Energy, Thailand
GHG	Greenhouse Gas(es)
GLS	Gas-Liquid-Solid
HFO	Heavy Fuel Oil
I	Interview
IEE	Initial Environmental Evaluation
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
kW	Kilo Watt
LSHC	Local Stakeholder Consultation
MONRE	Ministry of Natural Resources and Environmental
MoV	Means of Validation
MP	Monitoring Plan
MW	Mega Watt
NCV	Net Calorific Value
NEB	National Environmental Board
NGO	Non Government Organization
OBS	Observation
OM	Operating Margin
O&M	Operation and Maintenance
PDD	Project Design Document
PEA	Provincial Electricity Authority
SSC	Small Scale
TGO	Thailand Greenhouse Gas Management Organization (Public Organization)
THB	Thai Baht
UASB	Upflow Anaerobic Sludge Blanket
UNFCCC	United Nations Framework Convention on Climate Change
VER	Verified Emission Reduction

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1. Validation Conclusion

SGS United Kingdom Limited has been contracted by South Pole Carbon Asset Management Ltd. to perform a validation of the project: SD Biosupply Wastewater Treatment and Biogas Utilization Project in Thailand

The Validation was performed in accordance with the VCS2007 requirements and host country criteria, as well as, criteria given to provide for consistent project operations, monitoring and reporting.

SGS reviewed the project description documentation, using a risk based approach and conducted follow-up interviews.

7 CARs, 7 CLs and 1 OBS were raised. The response to CARs and CLs was satisfactory and these were closed. However observation needs to be verified during verification.

In our opinion, the project meets all relevant VCS2007 requirements and all relevant host country criteria. The project correctly applies methodology AMS III.H & AMS I.C version 12 & 14 respectively.

It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The total emission reductions from the project are estimated to be **184,320 tCO₂e** over a 10 year crediting period, averaging **18,432 tCO₂e** annually. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given the underlying assumptions do not change.

The project will hence be recommended by SGS to the VCS Association for registration within the VCS registry system."

Signed on Behalf of the Validation Body by Authorized Signatory



Signature:

Name: Siddharth Yadav

Date: 31st December 2009

2. Introduction

2.1 Objective

South Pole Carbon Asset Management Ltd. has commissioned SGS to perform the validation of the project: SD Biosupply Wastewater Treatment and Biogas Utilization Project in Thailand with regard to the relevant requirements for VCS2007 project activities. The purpose of a validation is to have an independent third party assessment of the project design. In particular, project's baseline, monitoring plan (MP), compliance with relevant VCS2007, and host country criteria are validated in order to confirm that the project design as documented is sound and reasonable and meets the stated requirements and identified criteria. Validation is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of Voluntary Carbon Units (VCUs). VCS2007 criteria refer to the VCS criteria and the VCS2007 rules and modalities and related decisions by the VCS Board.

2.2 Scope and Criteria

The scope of the validation is defined as an independent and objective review of the project description documents, project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against VCS2007 requirements and rules and also associated interpretations. SGS has employed a risk-based approach in the validation, focusing on the identification of significant risks for project implementation and the generation of VCUs.

The validation is not meant to provide any consulting towards the Client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

2.3 VCS Project Description

The proposed project activity involves installation of an anaerobic wastewater facility, based on Up-flow Anaerobic Sludge Blanket (UASB) technology, at the existing starch plant. The project will utilise the captured methane as fuel in biogas – heat generation devices to produce thermal energy which will be used in the starch production process, if there is excess biogas it will be sent to flare. Thus the project contributes to the GHG emission reduction in two ways. One by avoiding the release of methane into the atmosphere and other by generating clean thermal energy which will replace the same amount of energy which predominantly uses fossil fuel in baseline scenario.

The project falling in type of project as normal project activity due to the expected annual emission reduction is 18,432 which more than 5,000 tCO₂e but less than 1 MtCO₂e per annum.

2.4 Level of assurance

The level of assurance of the validation report is reasonable assurance engagements.

3. Methodology

3.1 Review of VCS PD and Additional Documentation

The validation is performed primarily as a document review of the publicly available project documents and other supportive documents. The assessment is performed by trained assessors using validation protocols.

A site visit is usually required to verify assumptions in the baseline.

The site visit was performed on 10th April 2008 by lead assessor, expert and local assessor where the results are summarized in Annex 1 & 2 of this report.

Lead assessor and local assessor are local staffs which involved confirming other statements in the VCS PD through review of documents direct contacts with key stakeholders.

3.2 Follow up interviews

Date	Name	Position	Short Description of Subject Discussed
10/04/2008	Mr.Patrick Burgi	Managing Partner of Southpole Carbon Asset Mangement	Project Conceptualization Carbon finance consideration Project Management and VCS PD Development Baseline, Monitoring methodology and Additionality
10/04/2008	Ms.Jutamanee Martchamadol	CDM M&V Manager of Southpole Carbon Asset Mangement	Project Conceptualization Project Management and VCS PD Development Baseline, Monitoring methodology and Additionality
10/04/2008	Mr.Narong Tiyavanich	Plant Manager of Somdej Flour Mill Co.,Ltd	Carbon finance consideration Project Management Posse and Ownership of Project activity Local regulation and License
10/04/2008	Mr.Mont Uthaiattrakul	Deputy Managing Director of Papop Co.,Ltd	Project activity technology Implementation plan Monitoring plan of project activity

3.3 Resolution of any material discrepancy

There is no any material discrepancy found during validation.

3.4 Use of the Validation Protocol

The validation protocol used for the assessment is partly based on the templates of the IETA / World Bank Validation and Verification Manual and partly on the experience of SGS with the validation of CDM projects. It serves the following purposes:

- it organises, details and clarifies the requirements the project is expected to meet; and
- it documents both how a particular requirement has been validated and the result of the validation.

The validation protocol consists of several tables. The different columns in these tables are described below.

Checklist Question	Ref.	Means of verification (MoV)	Comment	Draft and/or Final Conclusion
The various requirements are linked to checklist questions the project should meet.	Lists any references and sources used in the validation process.	Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable.	The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached.	This is either acceptable based on evidence provided (Y), or a Corrective Action Request (CAR) due to non-compliance with the checklist question (See below). Clarification Request (CLs) is used when the validation team has identified a need for further clarification.

The completed validation protocol for this project is attached as Annex A.2 to this report

3.5 Findings

As an outcome of the validation process, the team can raise different types of findings

In general, where insufficient or inaccurate information is available and clarification or new information is required the Assessor shall raise a **Clarification Request (CL)** specifying what additional information is required.

Where a non-conformance arises the Assessor shall raise a **Corrective Action Request (CAR)**. A CAR is issued, where:

- I. mistakes have been made with a direct influence on project results;
- II. validation protocol requirements have not been met; or
- III. there is a risk that the project would not be accepted as a VCS2007 project or that emission reductions will not be verified.

The validation process may be halted until this information has been made available to the assessors' satisfaction. Failure to address a CL may result in a CAR. Information or clarifications provided as a result of a CL may also lead to a CAR.

Observations may be raised which are for the benefit of future projects and future verification or validation actors. These have no impact upon the completion of the validation or verification activity.

CARs and CLs are raised in the draft validation protocol and detailed in a separate form (Annex A.3). In this form, the Project Developer is given the opportunity to "close" outstanding CARs and respond to CLs and Observations.

3.6 Internal Quality Control

Following the completion of the assessment process and a recommendation by the Assessment team, all documentation will be forwarded to a Technical Reviewer. The task of the Technical Reviewer is to check that all procedures have been followed and all conclusions are justified. The Technical Reviewer will either accept or reject the recommendation made by the assessment team.

4. Validation Findings

4.1 Project Design

The project title is “SD Biosupply Wastewater Treatment and Biogas Utilization Project” which enables to uniquely identify the project under VCS program. The VCS PD has been prepared in accordance with VCS project description template which is available on <http://www.v-c-s.org/policydocs.html> without any alteration.

The proposed project activity involves installation of an anaerobic wastewater treatment facility, based on a Upflow Anaerobic Sludge Blanket digester technology (UASB), at the existing starch plant. The project will utilise the captured methane as fuel in biogas-heat generating devices to produce thermal energy (heat) which will be used in the starch production process for the partial replacement of fuel oil by biogas usage. Excess biogas will be sent to the flare. The technical specifications for the wastewater treatment reactor and thermal generation units were verified with technical proposal from the technology supplier. The design specification were checked and found acceptable.

GHG sources in the proposed project activity is well described in term of wastewater treatment and thermal generation unit however there are some GHG sources are not included in the list hence **CAR#8 was raised**. In response provided from PP, GHG emission from flaring, discharge wastewater and electricity consumption have been added to fulfill the GHG sources of proposed project activity. The revised VCS PD has been verified and found consistent then **CAR#8 was closed**.

Project activity adopted the approved methodology from UNFCCC-CDM, the GHG program which VCS board has approved. The project activity falls into the project categories under Scope 13 “Waste Handling and Disposal” and scope 1 “Renewable energy projects” and applies the methodology AMS.III.H and I.D respectively. Also the project size is settled as normal project type which annual emission reduction (ex-ante based) is 18,432 tCO₂e which higher than 5,000 tCO₂e but less than 1 MtCO₂e.

Condition prior to project initiation is clearly defined as the open anaerobic lagoons without methane recovery device for wastewater treatment system and the fossil fuel based in thermal generation unit. Both scenario are applicable under Thailand law and regulation and was not implemented to create GHG emissions primarily for the project activity.

Proof of project ownership has been assessed through the operation licence of starch plant and the wastewater treatment plant^{/20/} also the company affidavit of SD Biosupply^{/18/} and Emission Reduction Purchase Agreement (ERPA)^{/35/} are provided that found satisfactory in the project participant involved. Project activity has neither created another form of environmental credit nor has been rejected under other GHG programme, this has been verified by interviewing the plant manager during site visit and crosschecked on UNFCCC web site for project under validation and registration process which found consistency thus it is not possible to have the double counting in emission reduction of the other emission trading programme.

4.1.1 Choice of the Crediting Period

The project activity applied the VCS 2007.1 as standard procedure which specific on the starting date and their crediting period start date. **CAR#6 was raised** for asking to substantiate the starting date of project activity and crediting period of project activity which is unclear identified under section A.1.3 & A.1.6 of VCS PD. In the response PP provided the information of starting date of project activity as the 16th September 2005 which is the date start reducing the emission from the project activity, plant operation record has been provided as supporting documents that verified and found satisfactory in the detail. However the earliest starting date for crediting period under VCS 2007.1 is 28th March 2006 that PP has adopted the same date as crediting period starting date on 10 years renewable crediting period which found consistent with the guidance hence **CAR#6 was closed**.

4.2 Baseline Selection and Additionality

The project has applied baseline inline to the small scale methodology AMS III.H version12 for methane recovery in wastewater treatment and AMS I.C version 14 for thermal energy production with or without

electricity generation as per Appendix B of the simplified modalities and procedures for small-scale CDM project activities. The baseline scenario (VI) of the applied methodology AMS III.H version 12 “The existing anaerobic wastewater treatment system without methane recovery for the case of introduction of a sequential anaerobic wastewater treatment system with methane recovery” has been chosen appropriately for the project activity. The waste water is treated in the open lagoons in the baseline and in the project activity these will be treated in the UASB reactor and then the treated wastewater flows to the existing open lagoon.

CL#1 was raised for asking to substantiate the design specification of baseline activity and the assumption used for baseline calculation regarding to methodology AMS III.H and AMS I.C. In response PP provided drawing of the open lagoon^{15/} with actual dimension at the time design the anaerobic lagoons, historical record of the heavy fuel oil used^{19/} for generated thermal energy for starch plant, yearly plant operating day and starch production record^{25/}. These information have been and found consistent with the information reported for calculate emission in the proposed project activity hence **CL#1 was closed out**.

The open lagoon layout was checked and the depths of open lagoons are more than 2 meters. The depth of ponds were also cross verified physically and found more than 2 meters of all 8 ponds in the baseline. The ambient temperature in the region is 22°C on a yearly average basis as checked from meteorological reports^{36/} during 2003 – 2005 which above than 15°C. The retention time was found more than 30 days as checked from the calculations provided in the excel sheet based on the annual wastewater generated volume and the open lagoons total volume. Therefore, it was accepted that in the baseline methane must have been generated and released into the environment because of anaerobic conditions in the pond. In the baseline the wastewater treated in the open lagoon system was able to comply with the local environmental compliance of wastewater treatment.

There is no legal requirement for the industry to treat the wastewater in closed anaerobic system and subsequent methane collection, To clarify on this point, the major act, National Environmental Quality Act B.E. 2535 (NEQA 1992), relates to Pollution Control Department (PCD) roles to establishment of pollution control standards from sources, categorization of pollution control source as controlled emissions, effluence or waste disposal. According to the Factories Act B.E. 2535 (1992) “PCD has authority to establish standards and criteria to control the factory operations, specially the standards and methods to control the disposal of waste, pollution or any contaminants caused from factory operation that impact the environment. Under the Factory Act, Ministry of Industry can also publish the Ministerial Regulation about the disposal of solid waste, nightsoil and garbage, to forbid wastewater discharge and emission from factories, and the guideline for having treatment facility, and also to establish noise level not exceed the EPA standard”. It is also mentioned in the Factory Act B.E.2535 Chapter 1 section para 5 of the Factories Act that Factory act adopt the standards and methods of controlling the discharge of wastes, pollutants or anything that affects the environment as a result of the engagement in a factory business. In addition, it is also mentioned in Ministerial regulation B.E.2546 mandated the waste water discharge punishment. Volumetric flow meters shall automatically measure temperature and pressure, expressing biogas volumes in normalized cubic meters (Nm³) This was validated against the publicly available acts, laws and regulation^{35/36/} and website of Pollution control board of Thailand on Thai regulation related to water quality standard (http://www.pcd.go.th/info_serv/en_reg_std_water.html),. **CL#4 was raised** for clarification on COD of wastewater monitoring which is not consistent with the methodology. In response provided, COD of wastewater will be monitored at the influent and effluent of UASB digester and the COD removal is calculated by differentiate of COD enter and leave digester hence **CL#4 was closed**. However project cannot request for registration before the expiration of methodology then **CL#7 was raised** to substantiate on the COD concentration used in the baseline emission calculations. In response PP provided the necessary supporting documents like the laboratory test^{32/} results for the COD values which is measurement campaign before implementing the project activity which found consistent with the methodology, at least 10 days measurement can be applied to calculate the baseline emission hence factor 0.89 is taken to account on the uncertainty range which consistent with the methodology AMS III.H version 12 hence **CL#7 was then closed**.

The values used for the baseline estimation are validated as below.

- Annual starch production is taken from the average annual starch production in historical data^{25/}. This has been validated against the historical of the plant log sheet and found correct.
- Since there is no historical data for wastewater generation, the measurement campaign in the baseline wastewater is determined by undertaking the measurement values during 2006 – 2008 and multiply by correction factor 0.89 to account for the uncertainty range (30% to 50%)

associated with this approach as compared to one-year historical data as per mentioned in the applied methodology AMS.III.H version 12. The below objective evidences are validated to confirm the baseline of project activity is not changed and still represent the baseline scenario is provided.

- Plant operating license^{/22/} issued by the government sector is provided to shown that the plant and its activity had not been changed or modified. This has been validated and found satisfactory.
- Plant data record of starch production during 2002 – 2008^{/25/} is provided and found that the starch plant production in historical are smooth for the production capacity. Thus the considering on the average value of starch production in year 2002 – 2004 is acceptable and reasonable to use for ex-ante calculation.
- COD_{in} and Efficiency of lagoon system or COD removal is checking against the COD historical data which provided by Papop Lab data (for design WWT plant). To determine this parameter, the measurement campaign is undertaken for 11 days^{/32/} under same typical operating conditions of the system and ambient condition. This is in accordance of the applied methodology AMS.III.H version 12 and acceptable.
- The volume of lagoons is validated against the site layout of the existing open lagoons.

The values used for the baseline emissions estimations are found consistent with the historical data of starch production^{/9/,/25/} COD test result in the baseline (anaerobic open lagoons)^{/32/} and starch plant operating day^{/25/}. The baseline selection was found inline to the applied methodology AMS III.H version 12.

The collected biogas will be used to generate thermal energy in thermal oil boiler and generated thermal energy will be used in the starch plant. The generated thermal energy thus displaces the equivalent amount of thermal energy generated in the baseline scenario of starch plant which predominantly uses fossil fuel for its generation. So methodology AMS.I.C version 14 is also applied here for the thermal energy generated component of this project activity. For claiming the emission reduction on account of thermal energy displaced in the baseline scenario, the calculation of emission reduction is accordance of the baseline emissions define as per AMS.I.C version 14 paragraph 15. The baseline parameters are determined as shown below

- Thermal energy requirement of starch plant is based on plant historical data. The fuel consumption and starch production whereas both fuel oil consumption and starch production are obtained from the historical plant record in year 2002 - 2004^{/34/} as supporting documents. The plant data record is provided and found correct. For ex-post, EG thermal will be monitored in term of energy input and output of the boiler. FC_{HFO, y} is also the parameter to be monitored measured by continuous flow meter registering fuel consumption by the boiler system. This parameter will be also monitored during ex-post.
- Efficiency of HFO boiler, Emission factor of residual fuel oil and NCV of residual fuel oil are obtained from conservative assumption as per AMS.I.C version 14. These parameters have been validated and found satisfactory.
- 50% of open flare efficiency has been adopted in the project activity base on assumption that all biogas sent to flare is automatically ignited. **CL#9 was raised** for asking to substantiate on flare ignition system. In response the PP provided the technical specification of the flare^{/33/} and example of SCADA logging system which has been validated and found acceptable hence **CL#9 was closed**. In addition, the default factor of 50% might be only applied if a flame is detected at the flare for more than 20 minutes in hour, whenever biogas is sent to the flare system. This is in accordance of the Tool to determine project emissions from flaring gases containing methane.
- Methane content used in the project activity is adopted the fraction of 65% methane in biogas from technical proposal^{/17/}. as ex-ante. For the ex-post, CH₄ content will be monitored using CH₄ gas analyzer measurements ensuring a 95% confidence level which is in line with the applied methodology AMS.III.H version 12. According to fraction of 65% methane in biogas, this figure has been validated against the various source of publicly available information of methane content in biogas generated by closed anaerobic WWT from starch production as listed below.

Source	Assumption	Anaerobic System
http://palangthai.org/en/docs/KWTE_REW.pdf	Methane content 62%	CIGAR (CDM Registered Project)
http://cdm.unfccc.int/UserManagement/FileStorage/M2H/VEXQ1IBGJO8SAT3476NC/FU0PWRD CWTE (VCS Verification)	Methane content 59%	CIGAR (CDM Registered Project)
http://cdm.unfccc.int/UserManagement/FileStorage/F6A471BP0L2W385NDMSGOHU/ZRTEIYJ (Univanich Lamthap)	Methane content 60%	CIGAR (CDM Registered Project)
http://cdm.unfccc.int/UserManagement/FileStorage/A843YJ0UMIPNEDK52WZTRBC7V6LO9S (SQS)	Methane content 50%	CIGAR (CDM Registered Project)
http://cdm.unfccc.int/UserManagement/FileStorage/L0Q8ZBK4VDM6T5X9I31EHS7P/YRNJCW (Chao khun agro)	Methane content 61.5%	CIGAR (CDM Registered Project)
http://cdm.unfccc.int/UserManagement/FileStorage/9L4I0BNKJ8PESXYWFZAV5TU3/R7DGH6 (Jiratpattana)	Methane content 58.7%	CIGAR (CDM Registered Project)
http://cdm.unfccc.int/UserManagement/FileStorage/VCZ436L80Q2UPJYFAN1TIK5DO7WEMR (Kitroongruang)	Methane content 62%	CIGAR (CDM Registered Project)
https://vcsprojectdatabase1.apx.com/mymodule/ProjectDoc/EditProjectDoc.asp?id1=82 (VERs issued by SGS)	Methane content 65%	UASB
http://cdm.unfccc.int/UserManagement/FileStorage/F7NIYWG5KHZCTEP3B1RXLJ0/AQ428SO (ES)	Methane content 60%	ABR (CDM Validating Project)
http://cdm.unfccc.int/Projects/Validation/DB/SR7QM88JQ7WDFFTESOFCH9N4Z7IPV2/view.html Saraff	Methane content 57%	CIGAR (CDM Validating Project)
http://cdm.unfccc.int/UserManagement/FileStorage/HZCVKXM0O2E7IFNAPQB4T69Y/GUR81D (SIMA II)	Methane content 60%	UASB (CDM Validating Project)

Refer to the project, “Wastewater Treatment with Biogas production (UASB) and heat utilization at General Starch Co Ltd.”, the methane content is also not being monitored but the fixed value has been applied (65% CH₄ content) and found acceptable. The biogas system designed for this project is same technology and provided by the same technology supplier. Thus, 65% of CH₄ content as fixed value can be applied in the same condition.

To further support the suitability of figure of 65% CH₄ content, the literature review of the various source of publicly available information of methane content in biogas generated by closed anaerobic WWT from starch production found that methane content for biogas generated from Anaerobic wastewater treatment system in starch plant is in range of 57 – 65%. As describe above the methane content at 65% is conservative in the justification to estimate emission reduction.

The chronology of the project is shown as below table. The objective evidence are validated and found satisfactory.

Date (DD/MM/YYYY)	Event	Objective evidence
01/03/1994	The starch factory starts operation	Somdej Flour Mill Co., Ltd. plant operating license ^{/22/}
July 2004	The technical and commercial proposal is submitted by the technology provider.	Technical and commercial proposal by Papop Co., Ltd. for the anaerobic digester. ^{/17/}
28/07/2004	Letter by Papop Co., Ltd. to Somdej Flour Mill Co., Ltd. outlining the importance of carbon credit revenues in order to improve the financial feasibility of the project.	Letter by Papop Co., Ltd. ^{/38/}
09/08/2004	Internal board meeting to discuss the feasibility of the biogas project, highlighting the need for carbon credit revenues as a crucial factor for the viability of the project.	Minutes of board meeting of Somdej Flour Mill Co., Ltd. ^{/39/}
07/07/2004	SD Biosupply Co., Ltd is registered as company	Company affidavit of SD Biosupply
06/10/2004	Biogas construction contract signed (Project investment decision date)	Design and construction contract between SD Biosupply Co., Ltd. and Papop Co., Ltd. ^{/24/}
10/06/2005	SD Biosupply Co., Ltd. starts operation	SD Biosupply operating license ^{/20/}
18/08/2005	Start date for receiving the wastewater to digester	SD confirmation letter on commissioning period ^{/26/}
16/09/2005	Project Start date as per VCS requirement (First date that project start reduce the GHG emission)	Plant log sheet for the first date the biogas utilized in boiler and flaring
12/05/2006	Confidentiality Agreement between Papop Co., Ltd. and South Pole Asset Management	Confidentiality Agreement has been verified which the VP biosupply is one of the project listed in annex 1 of the agreement. ^{/40/}
10/05/2007	Appointment of Authorization by Papop Co., Ltd for South Pole Carbon Asset Management to implementing project under carbon market	Appointment of Authorization Letter between Papop Co., Ltd and South Pole Carbon Asset Management ^{/41/}
20/02/2008	Emission Reduction Purchase Agreement for the VCUs	ERPA signed between SD Biosupply Co., Ltd. and South Pole Carbon Asset Management.
12/03/2008	Contracting with DOEs to project validation and verification	Signed agreement on the VCS validation and verification service.

CAR#14 was raised for asking clarified on number of open lagoons settled in the baseline scenario which inconsistent define in the VCS PD. In response PP has provided the drawing of the open lagoons in the baseline those 8 ponds of open lagoons has been indicated hence **CAR#14 was closed**.

Regarding to demonstration of the additionality, there is no specific approach in the methodology AMS III.H version 12 and AMS I.C versions 14 to demonstrate additionality of the project. The PP has chosen to demonstrate additionality using the additionality test as defined by VCS 2007.1 standard that there are three steps to demonstrate additionality in the proposed project activity,

Step 1: Regulatory surplus

In Thailand, no specific regulation on the proposed project activity, only industrial pollution control (end of pipe control) This was validated against the publicly regulation available on website of Pollution control board of Thailand (http://www.pcd.go.th/info_serv/en_reg_std_water.html) and it is found satisfactory that project activity is implemented under voluntary condition. By the way, Thailand no any cap&trade scheme and/or emission reduction target involved. The same has been confirmed by local assessor.

Step 2: Implementation barrier

PP decided to demonstrate barrier on proposed project implementation by the investment analysis comparing with the appropriate benchmark available.

CAR#2 & CL#11 were raised for asking to elaborate the sentence to demonstrate additionality and also the common practice analysis. In response the PP provided the calculation spreadsheet with the supportive documents to substantiate.

Parameters have been checked against the reference documents are listed below;

Parameter	Value	Reference /Objective evidence
Investment cost (Project design & Construction)	50,000,000 THB	Turnkey contract agreement between SD Biosupply and Papop enterprise (Design cost @ 5,000,0000 THB and the construction cost @ 45,000,000) ^{/24/} dated 6 th October 2004
Operational cost	3,110,770 THB	Turnkey contract agreement between SD Biosupply and Papop enterprise (Annual basis of electricity, chemical, maintenance and man power cost) ^{/24/} dated 6 th October 2004
Overhauls cost	5,500,000 THB	Turnkey contract agreement between SD Biosupply and Papop enterprise (Five years basis) ^{/24/} dated 6 th October 2004
Other cost	2,932,207 THB	Other cost which not included in the turn key contract (copies of invoiced have been used to verified)
Loan amount	30,000,000 THB	Loan agreement between SD Biosupply and Bangkok bank ^{/16/}
Exchange rate	51.10 THB/EUR	Printed screen of the calculation programme on 6 th October 2004
Heavy fuel oil price	8.149 THB/litre	The average value of HFO price during year 2002 – 2004 (http://www.eppo.go.th/petro/price/index.html)
Operational lifetime	15 years	Declaration letter from Papop enterprise (Technology supplier) ^{/28/} dated 17 th June 2009

Benchmark for the proposed project activity is obtained WACC (Weight Average Cost of Capital) to compare with the project IRR which found consistent as per the guidance on assessment of investment analysis paragraph 11 that the WACC is the appropriate benchmark for comparing with the project IRR

All figures on assessing shall be taken the available at the time decision taking hence all assumption is based on the information in year 2004.

Weight Average Cost of Capital is adopted the approach as per below detail,

$$\text{WACC} = [\text{Fraction of loan (dept) amount in total investment} * \text{Cost of Debt}] + [\text{Fraction of equity amount in total investment} * \text{Cost of Equity}]$$

Where; total investment amount = loan(dept) amount + equity amount

Expected return on Debt

is used the average Minimum Lending Rate (MLR) by publicly available information on the of Thai commercial bank

(http://www.bot.or.th/English/Statistics/FinancialMarkets/Interestrates/_layouts/application/interest_rate/IN_Rate.aspx), historical data is traced back to the date of 6th October 2004 which has been verified and found consistent hence 5.9125% is gathered.

Expected return on Equity

As there is no the publicly available data or research for the internal market return in the specific sector in Thailand, however the expected return cannot be accepted from the return from general stock market also (as per the investment tools paragraph 14). Thus the benchmark approach using in this project is found suitable and appropriate justification.

The first approach is based on US risk-free rate plus Country risk premium (while keeping US market as reference) derived from the paper published by A Damodaran.

Thus

- Government bond rate = US Treasury bond rates of 4.97 % for the figure on year 2004 (http://www.ustreas.gov/offices/domestic-finance/debt-management/interest-rate/ltcompositeindex_historical.shtml)
- Current risk premium for a mature equity market = value from publicly available data of year 2004 (reference information from : Mr. Adamoran, Professor of Finance at Stern School of Business at New York University, <http://pages.stern.nyu.edu/~adamodar/>) then final figure is 6.64%. The long term country risk premium is based on the country's rating and the spread of bond rates compared to the US Treasury bond rate. (As per this method the risk premium is not the premium for the US only because when applied the country (project host country) rating comparing to US country rating then premium is subjected to host country to be considered.(<http://pages.stern.nyu.edu/~adamodar/pdfiles/papers/riskprem.pdf>)

As there is no the publicly available data or research for the internal market return in the specific sector in Thailand, however the expected return cannot be accepted from the return from general stock market also (as per the investment tools paragraph 14). This approach using is found suitable and appropriate justification.

As per discussion above the expected return of the project is 4.97% + 6.64% = 11.61%

However the risk free rate can be applied, risk free rate on the project activity host country to be most closed to he project activity base in Thailand hence

- Government bond rate = Thai long term government bond auctions resulted in rates of 5.51% (Thai data from http://www.thaibma.or.th/price_yield.html) on 6th October 2004 with 15 years bond life time.

On this approach the expected return will be 5.51% + 6.64% = 12.15%

These two expected return on equity are found appropriate on the justification that found consistent with the discount rate/benchmark indicated in the additionality tools (under CDM programme) version05.2 sub- step 2b option III. Thus the lowest figure, 11.61% is applied on the conservative manner.

Calculation on the fraction of debt and fraction of equity for the investment,

- Total cost of the project (52,932,207 THB) is project design and construction cost plus the other cost
- Loan amount applied in the project activity (30,000,000 THB)

Then	Debt portion	=	(30,000,000/52,932,207)	=	0.43
	Equity portion	=	1 – (30,000,000/52,932,207)	=	0.57

So,	WACC	=	(0.43*5.9125%) + (0.57 * 11.61%)
		=	8.38 %

For validating the investment analysis in the project activity, the financial indicator (project IRR) has been chosen. The project IRR is the internal rate of return of the project based on the investment cost of the project. IRR is estimate on net cash flow of the project along the project lifetime (period)

From the information verified above,

- Total investment cost (Fixed cost) is project design and construction cost plus the other cost (50,000,000 + 2,932,207 = 52,932,207 THB)
- Project operation cost (Vary cost) is the result of chemical cost, electricity cost, Maintenance cost, Man power and the Overhaul cost every 5 years.
- Income from the project activity is come from only one sources, revenue of biogas generated from the anaerobic digester to displace the same amount of fuel oil used for generate thermal energy in starch plant
- Then the operational lifetime of project activity which confirmed by the technology supplier at 15 years, this also adopted as project lifetime for investment analysis.

On the assumption that the investment cost (Fixed cost) have to indicate as cost (-) in the year prior project activity start. Afterward, net cash flow generated in the project activity will be calculated by the differentiate of revenue (+) and operation cost (-).

Also Construction period of the project activity has been verified with the signed agreement which is on 6th October 2004 and commissioning report which has made on 3th October 2005. Then the operating cost is divided into 2 years. Hence it found reasonable on the judgment. And there are 3 months gap between the operating cost and revenue from fuel displacement. The justification for this point is UASB had been commissioned in September of year 2005 hence the revenue from fuel displacement was start in September. Evidence to substantiate is the plant data log sheet during period of August 2005 to November 2006 this is found reasonable and acceptable.

In conclusion, the project IRR (without VERs revenue) is 6.10% which calculated by the verified value and correct calculation method.

Project is taken sensitivity analysis in the range of -10% and +10% of the all direct parameter related to project implementation cost and income that significant effect to the project rate of return. Hence Methane generation, O/M cost, Investment cost and the fuel oil price are taking in consideration.

Sensitivity analysis	Change in methane generation (ton/year)	Operation and maintenance cost (EUR/year)	Investment cost (EUR)	Fuel oil price (THB/l)
-10%	3.77%	6.62%	7.55%	3.77%
-5%	4.96%	6.36%	6.80%	4.96%
0%	6.10%	6.10%	6.10%	6.10%
5%	7.18%	5.84%	5.45%	7.18%
10%	8.22%	5.57%	4.84%	8.22%

The IRR for sensitivity analysis of all variable still below than the benchmark applied for the project activity.

Due to huge uncertainty in the number of operating days, the avg number of operating days should be appropriately demonstrated for long term operations of the plant. The variation of operating days should be monitored and if it significantly goes above 240 days then additionality should be re assessed at the time of verification. Hence OBS#15 was raised.

From the information described above can justify that the project is not financial feasibility without subsidiary from Carbon finance for its implementation as project equity IRR is less than the benchmark for investment analysis justification.

Step 3: Common practice

Geographical scope of the common practice analysis was identified as Thailand which appropriate to assess the common practice and technology in the region.

The justification on the open lagoon is widely used in the starch industry is referred to the government official report from The Promotion of Biogas from Wastewater as An Alternative Energy and for Environmental Improvement, published by the Energy Conservation and Renewable Energy Division and Energy Policy and Planning Office (EPPO), 2007 “ *Most of the tapioca starch plants choose to retain wastewater in their open lagoons because of insufficient knowledge /confidence in the technology, high investment cost compared to cheap land price, the resulting operating cost throughout the treatment life*” .

The publicly available information from Thai Tapioca Starch Association website (<http://www.thaitapiocastarch.org/article05.asp>) is used to demonstrate total number of starch industry in Thailand (85) then information of the project going on for CDM program, VCS program and LOA requesting from host country. These information are tracking from the information publish on the available official website.

As of now no national regulation for the wastewater discharge from starch plant to operate in closed system hence the open lagoons is widely found in the region which is low operation & maintenance cost.

Biogas digesters are not a common practice amongst the starch industry in Thailand. That 25 projects from totally 85 project which account to be 29.41% mentioned in the VCS PD have either availed or applying to avail CDM benefits (or VCS benefits). The same was checked with <http://cdm.unfccc.int/index.html> for the project applied for CDM and for the project requesting LOA from Thai DNA was checked with publicly available website

http://www.tgo.or.th/index.php?option=com_content&task=category§ionid=6&id=30&Itemid=29

Concerning the VCS projects that not need to be web hosted. Some VCS projects are listed in the website of developer via <http://www.southpolecarbon.com/portfolio.htm> and the same was checked and found satisfactory.

As per substantiation and clarification in the addiitonality from PP found satisfactory hence **CAR#2 and CL#11 were closed.**

4.3 Application of Baseline Methodology and Monitoring Plan

Equation and parameters used for emission reduction calculation are comply with the requirement of the baseline methodology AMS III.H version12 and AMS I.C version14, The project has applied baseline methodology as mentioned in the small scale methodology AMS III.H version12 for Methane recovery in wastewater treatment and AMS I.C version14 for Thermal energy production as per Appendix B of the simplified modalities and procedures for small-scale CDM project activities. The scenario 06 (vi) of baseline methodology AMS III.H version12 has been selected and applied correctly.

The project category comprises measures that recover methane from biogenic organic matter in wastewaters by any of the 6 options as given in AMS IIIH version 12. The project activity involves “Introduction of a sequential stage of wastewater treatment with biogas recovery and combustion with or without sludge treatment, to and existing anaerobic wastewater treatment system without biogas system” which qualifies under AMS IIIH option No.06 (vi) as per the methodology. The recovered methane can be used for thermal or electrical generation directly. In this project activity the recovered methane will be used for thermal energy production using biogas in thermal oil boiler with dual fuel burner. A flare system is in place to be used in emergency case. The recovered methane is used for thermal generation that component of the project activity can use a corresponding Type I category and accordingly AMS I.C version 14 is being used in this project. The baseline and project emissions are clearly described in VCS PD as per the applicable methodology. **CL#10 was raised** to substantiate on the boiler capacity and lifetime. Technical specification of the boiler has been obtained and found acceptable which is 4.56 MWth and less limitation of methodology at 45 MWth ,also the proofing of it operational lifetime as 15 years which found acceptable when verified with tool to determine remaining lifetime of the equipment hence **CL#10 was closed.**

The present VCS project activity applied with monitoring methodology AMS III.H version 12 and AMS I.C version 14. The flow of Biogas recovery, Biogas generated to boiler and sent to flare will be by gas flow meter in Nm³ unit (Volumetric flow meters shall automatically measure temperature and pressure, expressing biogas volumes in normalized cubic meters). As per methodology during monitoring the emission reduction shall be based on the lowest amount of methane on COD removal basis or methane recovered and fuelled or flared, that is monitored ex-post.

The following parameters, Amount of biogas recovered and combusted for thermal production, Amount of biogas recovered and flared, Flame detector in flaring system, Electricity consumption in the biogas facility and the anaerobic treatment facility, Volume of wastewater treated in year y, Chemical oxygen demand of the treated wastewater in year y, Chemical oxygen demand of the wastewater entering the Biogas system in year y, have been listed as parameter to be monitor ex-post. However, Sludge Application for end use of sludge was unclear in the VCS PD version 1.0 that how the sludge removed from the UASB digester to be treated/utilized in the project activity thus **CAR#13 was raised**. In response PP clarify that the sludge removing purposed by the project activity is using as seeding bacterial for new biogas reactors start-up otherwise the dried sludge is applied as soil improvement on-site. The VCS PD was revised to add the parameter Sludge Application to be monitor as per applied methodology AMS.III.H version 12 hence **CAR #13 was closed**.

The following parameters will be monitored as per the requirement of monitoring plan –

AMS.III.H version 12 & Tool to determine project emissions from flaring gases containing methane, v 01:

- A. Volume of wastewater treated in year y
- B. COD of wastewater entering the treatment plant
- C. COD of water exiting the UASB treatment process
- D. Amount of biogas produced by the digester
- E. Methane content in the biogas in the year y
- F. Amount of biogas (volumetric flow) sent to the flare system
- G. Amount of biogas sent to boiler in the year y
- H. Electricity from the grid consumed by the project activity
- I. Amount of final sludge generated by the wastewater treatment and type of application/disposal
- J. Flare efficiency

AMS – I.C. version 14:

- A. Net quantity of thermal energy supplied
- B. Quantity of fossil fuel co-fired or fired along with biogas

The monitoring methodology and the monitoring parameters are consistent in the context of parameters to be monitored and parameters and data are available at validation consistent with the simplified methodology.

The emission reduction calculation in the project activity will be based on the lowest value along the ex-post monitoring of biogas combusted & flared and the calculation method of COD loading which treated in the project activity for III.H component and for I.C the emission reduction will be claimed based on the specific fuel oil consumption per tonne starch produced (total fuel oil used) minus the quantity of fuel used as auxiliary fuel on site. Detailed information about the monitoring plan has been provided in VCS PD. The monitoring methodology is consistent in the context of all the parameters to be monitored and all parameters and data are available at validation.

4.4 Calculation of GHG Emissions

For calculating the project emissions following GHG components are required to be considered as per the applied methodology AMS III.H.

- (i) CO₂ emissions on account of power used by the project activity facilities. Has been accounted correctly as there is no any electricity generation unit from the recovered biogas of proposed project activity installed. Thus grid electricity will be used in the project activity.

Grid emission factor (0.521 tCO₂/MWh) is fixed through the crediting period. This figure has been validated against “Tools to calculate grid emission factor” and publicly information from the government sector. This is also cross-reference with the (0.5057 tCO₂/MWh) grid emission factor public on the DEDE website (http://www2.dede.go.th/cdm/520126_GridEmission2007.pdf) in the conservative manner.

- (ii) Methane emission from wastewater treatment system affected by the project activity, and not equipped with biogas recovery in the project situation, has been accounted correctly.
- (iii) Methane emission from sludge treatment system affected by project activity and not equipped with biogas recovery in the project situation has not been considered because there is no sludge treatment system in the proposed project activity.
- (iv) Methane emissions on account of degradable organic carbon in treated wastewater, has not been considered because wastewater treated in the project activity will not be discharged out of the project boundary this is confirmed with the starch plant operating license.
- (v) Methane emissions from the decay of the final sludge generated by the treatment systems, has not been considered.
- (vi) As for Methane fugitive emissions on account of inefficiencies in capture systems, has been accounted correctly.
- (vii) Methane emission due to incomplete flaring has been considered correctly as per methodology and “tool to determine project emission from flaring gases containing methane.
- (viii) Methane emission from biomass stored under anaerobic condition which does not take place in the baseline situation, has not been considered as the project activity no other biomass sources storage in the boundary.

The emission factor has been calculated inline to the “Tool to calculate the emission factor for electricity system” v1.1, (EB 35). For the grid emission factor the combined margin approach has been adopted. The calculation method adopted was found in line with the tool. However the figure calculated by the other project which already registered under CDM program has been obtained as more conservative. The ex-ante calculated grid emission factor is fixed for the first crediting period.

Parameter indicated in the VCS PD are inconsistent with name of parameter in methodology hence **CAR#12** was raised. In response PP corrected parameters name to consistent with methodology then **CAR#12 was closed.**

There is no leakage considered under approved methodology AMS III.H version 12 and AMS I.C version 14 hence found acceptable on the justification. Also observation during site visit found no significant emission left out from the proposed project activity.

4.5 Environmental Impacts

In the project activity the wastewater will be treated in an Upflow Anaerobic Sludge Blanket (UASB) digester and the collected methane will be used for thermal generation. Therefore, no environmental impacts envisaged are associated with the project activity and also cross checked with operation license. There is no requirement for a separate consent to operate for the project specific activities. The project activity does comply with the environmental legislation in the host country and there is no requirement to conduct a EIA study for this project activity and consistent with regulation. The project activity will not create any adverse environmental effects and was checked from source during onsite.

4.6 Comments by Local Stakeholders

As per host country regulations there is no need to conduct stakeholder consultation for the project activity. But as part of VCS program, **CL#5 was raised** for asking the stakeholder meeting involved in the project activity. In response PP provided the briefing note of the project activity which has been used to invited comments from stakeholder and revised the statement under section 6 of the VCS PD hence **CL#5 is closed.**

Stakeholder meeting was conducted on 22/07/2008. Stakeholders comments were invited through questionnaire and leaflet by interviewing, the copy of the same were checked during validation. Stakeholders who have been consulted need to be signed of acknowledgement the project implementation and environmental aspect. The invitees included all village chiefs nearby the factory, local government officials,



key members of the community and staff working at the factory. The details of the local stakeholder meeting conducted and comments received have been discussed under section 6 of the VCS PD which there is no any adverse comments received through the stakeholder consultation.

5. Document References

Documents (documents provided by the Client that relate directly to the GHG components of the project and background documents used to check project assumptions and confirm the validity of information)

- /1/ VCS PD version 1.0 dated 25th march 2008 (First version received for start validation)
- /2/ VCS PD version 2.0 dated 17th October 2009 (Intermediate Version)
- /3/ VCS PD version 3.0 dated 20th January 2009 (Intermediate Version)
- /4/ VCS PD version 3.0 dated 7th April 2009 (Intermediate Version)
- /5/ VCS PD version 4.0 dated 18th May 2009 (Intermediate Version)
- /6/ VCS PD version 5.0 dated 27th May 2009 (Intermediate Version)
- /7/ VCS PD version 6.0 dated 30th June 2009 (Intermediate Version)
- /8/ VCS PD version 6.1 dated 15th September 2009 (Intermediate Version)
- /9/ VCS PD version 6.2 dated 23rd September 2009 (Intermediate Version))
- /9.1/ VCS PD version 6.4 dated 19rd November 2009 (Final Version))
- /10/ Excel sheet for emission reduction calculation, dated 19th November 2009
- /11/ Excel sheet for investment analysis worksheet, dated 17th November 2009
- /12/ AMS III.H version 12 dated 11th June 2009
- /13/ AMS I.C version 14 dated 8th April 2009
- /14/ Voluntary Carbon Standard (VCS) 2007.1 dated 18th November 2008
- /15/ Open anaerobic lagoons layout and hydraulic profile, issued for Somdej Starch Plant, Kalasin Province
- /16/ Loan agreement between SD Biosupply and Bangkok Bank, dated 21st September 2006
- /17/ Technical proposal for the biogas generation plant and burner modification, dated July 2004, by Papop enterprise
- /18/ Final receipt/Tax invoice of the project activity by Papop enterprise, dated 26th December 2005
- /19/ Plant historical record of the monthly fossil fuel consumption in year 2003 – 2008, issued by Somdej Flour Mill
- /20/ Biogas generation plant operating license for SD biosupply, reference No. 10/2548, dated 10th June 2005
- /21/ SD Biosupply plant organization chart, revised to consistent with actual operation found during site visit
- /22/ Somdej Flour Mill operating license, reference No. 51/2537, dated 1st March 1994
- /23/ Sludge generation rate in UASB and its utilization, issued by Papop Enterprise
- /24/ Turnkey contract agreement for the biogas generation plant and burner modification, dated 6th October 2004, between SD Biosupply and Papop enterprise
- /25/ Historical data of the starch production for year 2006-2008, issued by Somdej Flour Mill
- /26/ Final commissioning report and biogas digester start up, issued by Papop enterprise, dated 18th August 2005
- /27/ Plant daily log sheet of SD Biosupply in August 2005 – November 2005 for substantiated the start date of project activity
- /28/ Confirmation letter of the operational lifetime of UASB reactor, dated 17th June 2009, issued by Papop enterprise
- /29/ Dual fuel burner technical specification, type RGMS 7 to11, by weishaupt
- /30/ Biogas digester implementation investment and O/M cost, issued by Papop enterprise, dated 6th October 2004
- /31/ Self confirmation letter that there is no any official subsidy assistant in the project activity, issued by SD Biosupply, dated 10th September 2009
- /32/ COD test report base on campaign measurement duration of 28th August 2004 to 1st October 2004 by Papop enterprise
- /33/ Flare Specification which the flaring system is ordered made, issued by Papop enterprise
- /34/ SCADA Fixing Progress Report, issued by San Max Control, dated 18th September 2009
- /35/ ERPA between SD Biosupply and Souhtpole Carbon Asset Management dated 20th February 2008
- /36/ Summary Weather B.E. 2547 – 2549 (2003 – 2005) issued by Thai Meteorological Department (http://www.tmd.go.th/NCCT/yearly_summary.php)

- /37/ Average annual starch production in historical data in year 2005 - 2008, issued by Somdej Flour Mill
- /38/ PAPOP letter to outlining the carbon finance revenue to improve the financial feasibility in project activity, dated 28th July 2004
- /39/ Minute of Meeting of Somdej Flour Mill regarding to decision taking to the carbon finance, dated 9th August 2004
- /40/ Confidentiality Agreement between PAPOP Co.,Ltd and Southpole Carbon Asset Management, dated 12th May 2006
- /41/ Appointment of Authorization Letter between PAPOP Co.,Ltd and Southpole Carbon Asset Management, dated 10th May 2007

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A.1 Annex 1: Local Assessment

This checklist is designed to provide confirmation of in-country data and information provided in the Project Description for “SD Biosupply Wastewater Treatment and Biogas Utilization Project”.

It serves as a “**reality check**” on the project that is completed by a local assessor from SGS Thailand

Issue	Findings	Source/Mean of Verification	Further Action / Clarification / Information Required?
The plant layout of baseline and project activity should be provided (project boundary).	Open anaerobic lagoons in the baseline have been substantiated with the plant layout which the lowest depth in 8 series lagoons is 2 metres. For the project activity has been assessed through the technical proposal from technology supplier that UASB reactor is adopted to treat wastewater from starch plant before entering to the open anaerobic in the existing baseline. Both the baseline and project activity have been cross-verified during site visit and found consistent along the supporting documents provided.	Open lagoons layout and the dimension Technical proposal from Papop Observed during site visit	CL#1 & CAR#14 Both are closed as found satisfactory in the supportive documents provided.
Check the production capacity of starch per day and quantity of wastewater production per day.	The production capacity of the starch plant has been verified with starch plant operating license across the historical data available at plant during site visit. Average capacity is around 250 -300 tonne of dry starch per day, which the quantity of wastewater generated is calculated base on specific value of 5.5 cu.m per tonne dry starch. Figure 5.5 has been verified against the real measurement of wastewater in 2007 at project site and found acceptable	Starch plant operating license Technical proposal from Papop Historical data report from the starch plant (yearly with information in monthly)	N/A
Check the technical specification of open lagoons treatment system in the	The open lagoons in the baseline has no the methane recovery system in place, also wastewater were treated in gravity flow	Open lagoons layout and the dimension	N/A

Issue	Findings	Source/Mean of Verification	Further Action / Clarification / Information Required?
baseline scenario.	hence there is no any power consume in the baseline. During site visit has been observed on the baseline scenario and found consistent with the plant operating license and information described in VCS PD	Observed during site visit	
Check whether fuel oil fired thermal boiler was used before the project activity (baseline).	Historical data of fuel oil used in thermal energy generation unit has been obtained and verified during site visit that found the significant reduction in the fuel oil demand for generation thermal oil. However the technical proposal is indicated the modification of burner type in the project activity implementation to be the dual fuel burner type. Also the technical specification has been provided.	Historical data of fuel oil consumption in the starch plant before and after biogas plant commissioning. Technical proposal from Papop	N/A
Check the technical specification and also the installed capacity as follow - Upflow Anaerobic Sludge Blanket (UASB) - Gas burner for heat generation (boiler) - Open flare system	PP provided the technical proposal from the technology supplier as supportive documents that the detail can be summarized as below, - UASB design capacity at 18,000 m³/day with maximum COD content at 25,000 mg/L. Overall efficiency at 90%. - Gas burner has changed to be dual fuel fired burner with the same capacity of the boiler - Open flare is covered the maximum generation rate of the biogas in the project activity and also is auto ignition system for the biogas sent to flaring system	Technical proposal from Papop Gas burner technical specification Flare specification from Papop	CL#9
Check the location of the project activity as per VCS PD	The project location and address has been verified with the official letter that contact between the governments (i.e operation licence) that found consistent in the detail of project activity take place.	Plant operating license Summary plant report Name card of plant manger	N/A
Check evidence for allow the implementation of the project.	The biogas plant operating license has been provided from the PP to substantiate that project activity has been requested the permission before starting the project activity.	Starch plant operating license Biogas plant operating license	N/A

Issue	Findings	Source/Mean of Verification	Further Action / Clarification / Information Required?
Conservativeness addressed in the way of identifying for calculation the emission reduction and the deviation.	As there are the deviation in the project activity against the approved methodology hence the conservativeness shall be address to identify the way how to justify the deviation. - On the fuel oil consumption in the project activity three years historical data have been obtained and selected the lowest specific fuel oil consumption per tonne starch produce. - Quantification of the biogas sent to flare is used the balancing of total quantity of biogas generated minus with biogas sent to boiler that residual of biogas is subjected to quantity of biogas flared. During sit visit has been observed and found satisfactory on this basis as there is only boiler will be utilize biogas. - Flare efficiency at 50% for an opened flare system is accepted on the justification by the specific condition of flaring system that will be automatically ignition that can be ensure the combustion of biogas as 100% - Methane concentration at 65%, PP adopted the design concentration of the technical proposal provided by the technology supplier. However during the monitoring period the lowest value when estimate the biogas in project activity will be choose from direct measurement of biogas and the theoretical calculation by COD removal base. These deviations found acceptable as all the deviation is addressed in the conservative justification.	Interviewing the person in monitoring period Clarification on the method used (VCS PD) Observation during site visit Flare specification from Papop Flaring tools (EB28) VCS 2007.1 on the guidance of deviation	N/A
Check the applicability of AMS.III.H “Methane recovery in wastewater treatment” and AMS.I.C “thermal energy production with or without electricity” to the project	Follow methodology AMS III.H version 12 - Para 1 Scenario.6 and Para 2 (a) are applicable to the project activity as “An UASB is installed with biogas recovery system then biogas captured is utilizing in the thermal oil boiler. If there are excess gas will be flared.	Observed during site visit Ex-ante ER calculation Technical proposal from Papop	N/A

Issue	Findings	Source/Mean of Verification	Further Action / Clarification / Information Required?
activity is correct or not.	- Ex-ante annual emission reduction is less than 60 ktCO₂ As methodology AMS I.C version 14 - Project activity is generate thermal with the biogas which displace the fossil fuel (fuel oil) consumption in the baseline - And the total capacity of the thermal generation is less than 45 MWth.	Burner technical specification	
Check whether it is a grouped project or not?	As observed during site visit found that there is no further project will be occurred in nearby project activity. Also checking on VCS registry and CDM validation programme that no any project activity will be created as the group of project activity.	Observed during site visit Browsing information from website	N/A
Is there the sludge treatment process in baseline and project activity?	In the baseline the sludge removal is taken one in 5-10 years depend on pond retention time and the COD removal rate. However the final sludge will be used as land application and to start up the anaerobic digester. In the project activity, sludge profile and their estimation has been provided and found satisfactory. By the way, in the methodology require the put sludge application to be monitored during crediting period.	Interviewing the person in plant operating Sludge generation rate calculation Methodology AMS II.H version 12	CAR#3 Closed as found satisfied in the sludge generation rate and revised monitoring plan.
Have Local stakeholder been consulted as a part of project implementation?	The local stakeholder has been taken by the interviewing and group meeting with nearby people around the biogas plant the summary of stakeholder consultation method has been described in the VCS PD. Also the sample of signed for project activity acknowledge are provided as supportive documents.	Interviewing plant manager Summary information of biogas plant implementation and he environmental aspect Picture and media used for invited comment	CL#5 Closed as the stakeholder meeting has conducted in the project activity.
Remain operational lifetime	The operation lifetime of project activity has been substantiated	Observed during site visit and	CL#10

Issue	Findings	Source/Mean of Verification	Further Action / Clarification / Information Required?
of the equipment included in project activity	by the declaration letter from technology supplier that 15 years is estimated to UASB system. However for the boiler the operational lifetime is not affected to the project activity as the boiler will be replace immediately in when breakdown as it is the necessary device in starch production process.	clarification from PP	Closed as found acceptable in the clarification

A.2 Annex 2: Validation Protocol

Table 1 VCS PD

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
A. General Description of Project Activity					
A.1. Project Title					
A.1.1. Does the used project title clearly enable to identify the unique VCS activity?	/1/, /8/	DR	The project title is clearly identified the project activity and plant where it located. Also enable to uniquely indentify on VCS program	Y	Y
A.1.2. Are there an indication of a revision number and the date of the revision?	/1/, /8/	DR	Yes, there is the revision number and date of the VCS PD indicated on the front page and under section 1.1	Y	Y
A.2. Type/Category of the project					
A.2.1. What is the project category which is part of a GHG programme that has been approved by the VCS Board?	/1/, /8/, /11/, /12/, /13/	DR	Project activity is adopted the approved methodology from UNFCCC-CDM (GHG program) which VCS board has approved. Project category is the small scale with two methodology, AMS II.H and AMS I.C that settled under scope 13 & 1 respectively	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
A.2.2. Is the project a Grouped project?	Sec. 5.6 of VC Standard 2007.1 /1/, /8/, /13/	DR, SV	The project activity is not the grouped project which has been verified during site visit.	Y	Y
A.3. Estimation of Emission Reduction and Project Size					
A.3.1. How much emission reduction per year has been estimated from the project activity?	/1/, /8/, /9/, /11/, /12/, /13/	DR	Ex-ante estimation on the annual emission reduction is 23,635 tCO ₂ e.	Y	Y
A.3.2. What type of project, based on ER number, is this?	VCS Prog. Guidance 2007.1 /1/, /8/, /9/, /13/	DR	Project size is the normal project which has annual emission reduction (ex-ante base) more than 5,000 tCO ₂ e but less than 1 MtCO ₂ e	Y	Y
A.4. Brief description of the project technology					
A.4.1. Does the description of the technology to be applied provide sufficient and transparent input to evaluate its impact on the greenhouse gas balance and is the explanation how the project will reduce greenhouse gas emission transparent and suitable?	/1/, /8/, /9/, /13/, /15/, /23/, /26/	DR	Project activity has adopted the UASB for treated the wastewater from starch plant which the anaerobic open lagoons was existing project before project activity implementing. GHG emission reduction is from the methane capturing by the UASB and then utilize as the fuel instead the fuel oil which used in the starch plant for thermal energy purpose (thermal oil and steam generation).	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
A.5. Project locations and specific extent					
A.5.1. Does the information provided on the location of the project activity allow for a clear identification of the site(s)?	/1/, /8/, /9/, /13/	DR	Description of the project activity site is clearly identified with both registered (official address) and the geographical coordinator. The official address has been verified with the plant operational license that found consistent.	Y	Y
A.5.2. Are the latitude and longitude of the site indicated (decimal points)?	1/, /8/, /9/, /13/	DR	Geographical coordinator has been indicated, 16°40'40.20"N and 103°48'19.67"E	Y	Y
A.6. Duration of the Project / Crediting Period					
A.6.1. Is the project start date defined and reasonable?	1/, /8/, /9/, /13/, /17/, /18/, /19/, /24/	DR	It is unclear on the project starting date and chronology of project implementation The date on which a financial commitment was made to the project and the project reached a financial closure.	CAR#6 Closed as found satisfactory in the revised PD	Y
A.6.2. Is the crediting period start date is defined?	1/, /8/, /9/, /13/, /17/, /18/, /19/, /24/	DR	The starting date of crediting period is defined as per the VCS 2007.1 requirement which allow the first date of crediting period on 28 th March 2006	Y	Y
A.6.3. Are the VCS project crediting period and life time of the project are reasonable?	1/, /8/, /9/, /13/, /17/, /18/, /19/, /24/, /27/	DR	Yes, the crediting period is reasonable as indicated for 10 years The confirmation letter from technology supplier (PAPOP) was provided and found that the lifetime of project activity indicate as 15 years which exceed the crediting period of project activity.	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
A.7. Conditions prior to project initiation					
A.7.1. Are the conditions prior to the project initiation described in the VCS PD?	/1/, /8/, /9/, /13/	DR	Pre-project scenario is clearly identified. For the wastewater treatment system is series anaerobic open lagoons with no methane recovery system. For the thermal energy sources is the bunker oil fired boiler. Both scenarios have been verified during site visit.	Y	Y
A.8. Compliance with relevant local laws and regulations related to the project					
A.8.1. Are relevant local laws and regulations related to the project identified in the VCS PD?	VCS PD- 1.6 /1/, /8/, /9/, /13/, /17/, /18/, /19/	DR, SV	For project implemented in Thailand , the approval of operating license is to be obtained and required renew/prolong the license as per regulated. The supportive document is to be provided and checked. The operational license of biogas plant is provided during site visit and found that the license is still valid. (Project operating license has been provided, issued dated 10/06/2005 with ref No. 10/2548). This is found satisfactory.	Y	Y
A.8.2. Is the demonstration of compliance with them described in the VCS PD?	/1/, /8/, /9/, /13/	DR	Project is defined in the VCS PD that project is in compliance with Thailand law and regulation.	Y	Y
A.9. Identification of Risks that may substantially affect the project's GHG emission reductions or removal enhancements					
A.9.1. Are there risks which may substantially affect the project's GHG emission reductions or removal enhancements identified in the VCS PD?	VCSPD 1.11 /1/, /8/, /9/, /13/	DR	Project risk which will be affected to the project activity are the leakage of biogas capturing, operational of anaerobic wastewater system and variation of wastewater quality & quantity. These issue have been clearly defined under section 1.11	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
A.10.Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction					
A.10.1. Is it demonstrated in the VCS PD that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction?	VCSPD 1.12 /1/, /8/, /9/, /13/,	DR	The project was not implemented to create any GHG emission prior starting the project activity in the purpose of subsequent removal. The proof on the open lagoons layout in the project site without the modification and the operational license of the starch plant were validated and found satisfactory.	Y	Y
A.11.Demonstration that the project has not created another form of environmental credit					
A.11.1. Is it demonstrated in the VCS PD that the project has not created another form of environmental credit?	VCS PD1.13 /1/, /8/, /9/, /13/,	DR	There is no any other form of environmental credit involved in the project activity which confirmed during discussion on site visit	Y	Y
A.12.Project rejected under other GHG programmes (if applicable)					
A.12.1. Is the project rejected under another GHG programme?	/1/, /8/, /9/, /13/,	DR	Project is not applied other GHG programme before and also no rejection in any GHG programme.	Y	Y
A.12.2. Is the Project rejected by other GHG programmes, due to procedural or eligibility requirements where the GHG programme applied?		DR	Not Applicable	Y	Y
A.12.3. Is the GHG programme which rejected this project approved under VCS Programme	Sec.5.2. 2 VCS Standar d 2007.1	DR	Not Applicable	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
A.12.4. Is it clearly stated in the VCS PD all GHG programmes for which the project has applied for credits and why the project was rejected?		DR	Not Applicable	Y	Y
A.12.5. Are the actual rejection document(s) including explanation provided?		DR	Not Applicable	Y	Y
A.12.6. Is the project validated against VCS 2007.1 requirements		DR	Not Applicable	Y	Y
A.13. List of commercially sensitive information (if applicable)					
A.13.1. Is a list of commercially sensitive information provided by the project proponent?	Sec.5.2.2 VCS Standard 2007.1	DR	Not applicable However, the project proponent has provided the baseline an emission reduction calculation and also the investment analysis worksheet which used for demonstrate additionality.	Y	Y
B. Baseline and Monitoring Methodology					
B.1. Choice and Applicability					
B.1.1. Is the baseline methodology approved under the VCS?	Sec.5.1 VCS Standard /1/, /8/, /9/, /13/	DR	In section 2.1 the methodology and version used have clearly been identified on, AMS III.H version 12 and AMS I.C version 14. These methodologies have been approved under UNFCCC-CDM GHG programme	Y	Y
B.1.2. Is the methodology approved by any other GHG programme approved by VCS Programme?	/1/, /8/, /9/, /11/, /12/, /13/	DR	Yes, methodologies used for the project activity are approved on UNFCCC-CDM.	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.1.3. Is the baseline methodology the one deemed most applicable for this project?	/1/, /8/, /9/, /11/, /12/, /13/	DR	Methodologies used is the most recent version and applicable on the project activity The methodology AMS.III.H and AMS. I.C are applicable to the project activity as the project involves in installation of UASB digester as a sequential stage of existing wastewater treatment system (AMS.III.H) in which the biogas will be captured and combusted in the purpose of heat generation to the starch plant to displace the fossil fuel consumption in the existing project (AMS.I.C). The explanation on the chosen baseline scenario is clearly described as mentioned in section 2.2, 2.4 and 2.5 of the VCS PD version 6.2. This is found satisfactory. The project activity is small scale project as the total emission reduction under category III is less than 60 kTCO₂ (14,880 VERs per annum) and the total output from the thermal generation unit is less than 45 MWh (4.652 MWth).	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.1.4. Is the choice of the methodology correctly justified by the VCS PD and is the project in conformance with all applicability criteria of the applied methodology?	/1/, /8/, /9/, /11/, /12/, /13/	DR	Applicability of methodology has been met as per information below, Refer to the methodology AMS III.H version 12, the project activity is under categories VI of the methodology as the project involves in installation of UASB digester as a sequential stage of existing wastewater treatment system in which the biogas will be captured and combusted in the purpose of heat generation to the starch plant. The ex-ante emission reduction is 14,880 VERs per annum which less than 60 ktCO₂ per annum. This is consistent to the methodology. According to the methodology AMS I.C version 14, the total capacity of the thermal generation in the project is 4.652 MWth which less than 45 MWth This is validated against the boiler and burner specification and found satisfactory. The thermal generated by the biogas captured will displace/reduce the fossil fuel (heavy fuel oil) consumed in the existing starch plant prior the project activity start. Thermal generation unit involved in the project activity is not the co-generation unit and the co-fired system and is not delivered to another facility. Hence, the methodology AMS.I.C is also applicable to the project activity.	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.1.5. Are the project specific deviations against the applied methodology discussed clearly?	Sec.5.1 VCS Standard	DR	Under section 3.3, the project proponent has been discussed on any deviation that made to the methodology applied. Estimation of the fuel oil replace in the project activity, flaring emission, methane content in the biogas generated and the project emission from treated wastewater are the issues mentioned in the VCS PD.	Y	Y
B.1.6. Are the deviations project specific?	/1/, /8/, /9/, /11/, /12/, /13/,	DR	Yes, the deviation is specific for the project activity	Y	Y
B.1.7. Are the applied deviations impacting the conservativeness of methodology negatively?	/1/, /8/, /9/, /11/, /12/, /13/,	DR	There is no negative effect baseon the conservativeness of emission reduction calculation from each deviation.	Y	Y
B.1.8. Is there any revision in the methodology has been applied?	Sec.5.1 VCS Standard	DR	There is no any revision in the methodology	Y	Y
B.2. GHGs sources, sink and reservoir for the baseline scenario and for the project					
B.2.1. Are all emission sources and gases related to the baseline scenario, project scenario and leakage clearly identified and described in a complete manner?	Sec.5.1 VCS Standard /1/, /8/, /9/, /11/, /12/, /13/,	DR	Emission sources and gases related to the project activity are CO2 and CH4 CO2 is from emission of renewable energy which displace the fossil fuel used in the baseline CH4 is captured from wastewater treatment process and also the emission from wastewater which cannot recovery by the project activity. However the emission from flaring and discharge wastewater have not been identified	CAR#8 Closed as found satisfactory in the revised VCS PD	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.2.2. Are the GHG sink and reservoir identified clearly for baseline scenario and project activity?	/1/, /8/, /9/, /11/, /12/, /13/	DR	There is no GHG sink found in the project activity.	Y	Y
B.3. Identification of the Baseline Scenario					
B.3.1. Does the VCS PD discuss the identification of the most likely baseline scenario? Does the VCS PD follow the steps to determine the baseline scenario required by the methodology and is the application of the methodology and the discussion and determination of the chosen baseline transparent?	Sec.6.3 VCS Standard 2007.1 /1/, /8/, /9/, /11/, /12/, /13/	DR	Baseline scenario of the project has been discussed as per the methodology which open lagoons is applicable under the methodology adopted. There is no step require by the methodology to identify the most likely baseline but there is the existing baseline in project activity which applicable by the methodology AMS III.H and AMS I.C However the assumption and criteria for the baseline justification need to be substantiate with documentary evidence Also numbers of the open lagoons in the baseline is in consistent along the section of PD please justify In response provided from PP, open lagoon layout and drawing have been validated and found consistent with information indicated in VCS PD and real situation observe during site visit.	CL#1 CAR#14 Closed as supportive documents provided the lagoons in the baseline scenario that consistent with information in revised PD	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.3.2. Does the application consider all potential realistic and credible baseline scenarios in the discussion taking into account relevant national and/or sectoral policies, macro-economic trends and political aspirations??	/1/, /8/, /9/, /11/, /12/, /13/, /17/, /19/	DR	All potential and plausible scenario for the baseline identification has been discussed and found consistent with national regulation and practice in the region. As the baseline scenario (open lagoon) is complied with Thai regulation on the wastewater effluent standard and cheaper in their operation cost thus there is no advantage to replace the baseline activity with project activity	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.3.3. Is the choice of the baseline compatible with the available data?	Sec.6.3 VCS Standard 2007.1 /22/ /32/	DR	The assumption and data used in the baseline scenario are consistent with publicly available data however historical data of an existing activity are also applied in the emission reduction calculation. The historical data has been validated during site visit by interviewing the plant operation staff as well as checking the plant data record against the data reported. The historical data have been substantiated with documentary evidence that found consistent and appropriate adopted. As details below. - Open lagoon removal efficiency which calculated from the COD test report of influent and effluent wastewater issued by PAPOP during 28/08/2004 to 01/10/2004 that found consistent and acceptable. - Heavy fuel oil consumption in year 2002 - 2005, plant record signed by plant manager has been obtained and found consistent. As project activity need to re-validate with the recent version of methodology hence the COD applied in the PD need to be substantiate in their applicability in new version of methodology	CL#7 Closed as PP adopted the formulae of new version methodology in the COD estimation.	Y
B.3.4. Is conservativeness addressed in the way of identifying the baseline?	/1/, /8/, /9/, /11/, /12/, /13/	DR	The conservativeness has been taken into account for estimation of emissions in the project activity	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.3.5. Does the selected baseline represent the most likely scenario among other possible and/or discussed scenarios?	/1/, /8/, /9/, /11/, /12/, /13/	DR	Selected baseline scenario is reflect to the most plausible scenario will be occurred when the project activity is no implementing. As discuss in section 2.5 of the VCS PD, direct discharge to the water body is limited by the regulation. Treating wastewater with aerobic and anaerobic digester (proposed project activity without VCS revenue) are need to invest in technology and knowledge However the existing anaerobic lagoons is cheaper than the other alternative in operation cost and also the treated wastewater is meet Thailand wastewater effluent standard. In conclusion, open lagoon is the most likely scenario among other possible.	Y	Y
B.4. Additionality					
B.4.1. Does the VCS PD clearly demonstrate the additionality using additionality tests as defined by VCS 2007.1 standard?	Sect 5.8 VCS Stand 2007.1	DR	Project additionality is adopted an approved project test to demonstrate additionality which found applicable as per VCS guidance. Regarding to VCS 2007.1 standard section 5.8, additionality can be applied one of the test indicated by the standard (1. The project test, 2. Performance Test and 3. Technology Test) Hence PP decided to adopted "The project test " to demonstrate additionality which found acceptable to the project activity.	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.4.2. Is the discussion on additionality and the evidence provided consistent with the starting date of the project If the project has started before the validation is it discussed how the fund from VCU was taken into account in the decision to go ahead with the project activity.	Sect 5.8 VCS Stand 2007.1 /1/, /8/, /10/, /13/, /15/, /29/	DR	As the project starting date is defined as in year 2005. All documents and their evidence are settled in year 2004 and later that found consistent in the project timeline. However justification in the additionality demonstration (Investment analysis and common practice barrier) need to be substantiated with documentary evidence The starting date of crediting period is found consistent with the requirement indicated in VCS2007 standard Also the supporting documents in the investment analysis worksheet need to be substantiated. In the response, supporting documents have been provided along with project investment analysis worksheet - Investment cost, operation cost and overhaul cost : PP provided the turnkey contract to substantiate the figure used - Subsidy cost has been verified by the MOU between project and department of industrial work (DIW) - Project life time : confirmation letter from PAPOP which clearly defines as 15 years that adopted consistently in investment analysis. - Price of the fuel oil : http://www.eppo.go.th/price/index.html The benchmark justification is adopted one in three options which is the most conservative figure (lowest) used for demonstrated additionality. All assumption has been verified and found acceptable in the proposed project activity.	CAR#2 CL#11 Both are closed as found satisfactory in the supportive documents provided and its calculation method	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.4.3. Is the discussion on additionality consistent with the identification all potential realistic and credible baseline scenarios Do the identified alternative include technologies and practices that include outputs (e.g.) cement or services comparable with the proposed CDM project activity	/1/, /8/, /9/, /11/, /12/, /13/	DR	Additionality is adopted the investment analysis method which comparing with the benchmark, appropriate to project activity thus there is no information of baseline scenario need in this case. Also in common practice barrier analysis the project is comparing the normal condition of similar project which found in the region. Reference of the information which reported in the VCS PD has been provided as the footnote in the documents. All links have been verified and found consistent. Furthermore pending on the justification provide by PP	Pending This issue is closed as all alternative has been discussed in the VCS PD with reference/sources	Y
B.4.4. If the Test 1 'The Project Test' has been used, then has it followed all steps including 'Regulatory Surplus'?	Sect 5.8 VCS Stand 2007.1 /1/, /8/, /17/, /19/	DR	All steps require are inline with the project test for demonstrating additionality. There is no any regulatory in host country to implementing proposed project activity which verified across local permit and licensing. - Biogas plant operating license However the assumption and benchmark adopted pending on substantiation	Pending with point B.4.2 above Closed as the assumption and benchmark is well substantiated and provide (pls see B.4.2 above)	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.4.5. If an implementation barrier analysis has been used, has it been shown that the proposed project activity faces barriers that prevent the implementation of this type of proposed project activity but would not have prevented the implementation of at least one of the alternatives?	Sect 5.8 VCS Stand 2007.1	DR	As project faced the financial barrier thus there is no any further barrier identified for demonstrate additionality in the project activity. Documents and supporting evidence for the investment analysis and benchmark applied in the project are pending on submission	Pending with point B.4.2 above Closed as IRR & benchmark cal sheet provided with clarification in the VCS PD	Y
B.4.6. Has it been shown in step three that the project is not common practice?	Sect 5.8 VCS Stand 2007.1 /1/, /8/	DR	In step three, project proponent has been discussed that the project in not found in common practice of Thailand which demonstrate by the number of project applied CDM, VCS and the project on LoA issuance process. However the sources of information indicated in the VCS PD is unclear thus pending on substantiation In the VCS PD version 6.2, reference source of the project developing under CDM, VCS and host country approval process have been indicated which verified and found consistent . Also it is inline with section 5.8 of the VCS Standard. Number of starch plant in Thailand has been indicated as 85 plants and 25 plants shown in the VCS PD are well reference to publicly available sources.	Pending Closed as the total number starch plant in region and the number of project developing under carbon finance have been provided. Also verified with the publicly available data and found consistent.	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.5. Application of the Baseline Methodology					
B.5.1. Has the approved methodology been applied correctly for determining baseline emissions ?	Sect. 5.8 VCS Stand 2007.1 1/, /8/, /9/, /11/, /12/	DR	Baseline emission is applied correctly as per the methodology. Equation used for calculate the baseline emission is show clearly in the VCS PD also the justification in each parameter applied.	Y	Y
B.5.2. Has the approved methodology been applied correctly for determining project emissions ?	/1/, /8/, /9/, /11/, /12/	DR	Project emission is correctly applied as per methodology However it is unclear on the justification that sludge treatment process is not included for calculate project emission	CAR#3 Clarification in the calculation method and their justification in sludge generation is found satisfactory.	Y
B.5.3. Has the approved methodology been applied correctly for determining leakage ?	1/, /8/, /9/, /11/, /12/	DR	There is no leakage related to the project activity as per methodology	Y	Y
B.5.4. Where applicable, has the approved methodology been applied correctly for the direct calculation of emission reductions	1/, /8/, /9/, /11/, /12/	DR	Emission reduction applied in the project activity is correctly applied as per methodology.	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.6. Ex-ante Data and Parameters Used					
B.6.1. Are the data provided in compliance with the methodology?	/1/, /8/, /11/, /12/	DR	All ex-ante parameters have been listed under section 3.3 that have been verified during site visit and found consistent in the detail. The parameter indicated in the VCS PD is on consistent along the section of documents, and also the methodology hence correction is required.	CAR#12 Closed as found satisfactory in the revised PD that consistent in the parameters used.	Y
B.6.2. Is all the data derived from official data sources or replicable records and have these been correctly quoted?		DR	For the default value and emission factor that adopted from the official source and online value have been verified and found consistent in the figure used. Level of assurance is medium to high as the reference sources is well known organization in GHG filed and host country.	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.7. Data and Parameters Monitored					
B.7.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the emission reductions within the project boundary during the crediting period?	Sect 6.5.1 VCS Stand 2007.1	DR	The parameters to be monitored in project activity are clearly defined however the COD output of project activity is not mention as parameter to be monitored. Also justification of the COD removal ration which adopted in the project activity And the sludge application is not included as the parameter to be monitored. In response, PP indicated the COD of effluent and the sludge application to monitor during crediting period.	CL#4 CAR#13 Closed as the revised PD have included all parameter to be monitored	Y
B.7.2. Is the information given for each monitoring variable by the presented table sufficient to ensure the verification of a proper implementation of the monitoring plan?	/24/, /26/	DR	Monitoring methodology of each parameter is clearly enough to implement the project during crediting period. Units, measurement instrument and description of parameter are indicated under section 3.3 as tabular format. In the deviation made to the flaring system need to be more substantiated that the flaring system is automatically ignition PP respond has been validated with the technical specification of the flaring system (flaring system is ordered made) which clearly defined as automatically ignition system with flame detector to control the operating condition of flare. Also the example of plant record have been provided as supportive documents on flare operating condition.	CL#9 Closed as the specification of flare has been provided as supportive documents. (Full detail of the acceptance please go through Findings overview documents)	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.8. Quality Control (QC) and Quality Assurance (QA) Procedures					
B.8.1. Is the selection of data undergoing quality control and quality assurance procedures complete?	/8/, /11/, /12/	DR	QA/QC procedure for the project activity is clearly defined, with the appropriate justification of calibration frequency.	Y	Y
B.8.2. Is the belonging determination of uncertainty levels done correctly for each ID in a correct and reliable manner?	Sect 6.5.2 VCS Stand 2007.1	DR	For the uncertainty in each parameter have been justified toward the guidance in methodology and its technical specification. Which will not lead to over- estimate the emission reduction in project activity.	Y	Y
B.8.3. Are quality management procedures and quality assurance procedures sufficiently described to ensure the delivery of high quality data?	Sect 6.5.4 VCS Stand 2007.1	DR	To ensure the delivery of high quality data, project participant has set the monitoring management in the project. In the detail is separate in the operational, QA/QC, monitoring equipment maintenance and calibration and data collecting system that are appropriate to address high quality of data.	Y	Y
B.8.4. Is it ensured that data will be bound to national or internal reference standards?	/8/, /14/, /22/, /27/	DR	As the meter will be subjected to the appropriate calibration frequency that can be confirmed on the data report for calculate emission reduction. However if the data report will be compare with the national standard to reduce data uncertainty. It has to be assessed whether monitoring data will be clearly reproducible and comparable and will not be dependent on site-specific adjustments.	Y	Y
C. Environmental Impacts					
C.1.1. Has an analysis of the environmental impacts of the project activity been sufficiently described?	Sect-05 of VCS-PD, temp.	DR	There is no major environmental impact from the project activity as the project will increase in air quality that affected by an odor from open anaerobic lagoons of baseline.	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
C.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/8/	DR	EIA report is not required for the project activity implementation as per Thailand regulation This information can be validated against the government website : http://www.onep.go.th/eia/ENGLISH/size/e_size_index.htm that found consistent with information indicated in VCS PD	Y	Y
C.1.3. Have the summary of environmental impacts assessment been provided in the project design?	/8/	DR	As no EIA required, thus no information indicated under this section	Y	Y
D. Stakeholder Comments					
D.1.1. Have relevant stakeholders been consulted?	/8/. /13/	DR	Yes, the relevant stakeholder have been consulted	Y	Y
D.1.2. Have appropriate media been used to invite comments by local stakeholders?	Sec 05 of VCS PD	DR	Stakeholder consultation media used in the project is the leaflet and the explanation to the stakeholder. For inviting the comment from stakeholder, meeting session has been set. However the reference documents of the stakeholder consultation media need to be provided In response provided, the copy of meeting documents and the picture during stakeholder meeting session have been verified which PP also attached as Annex of VCS PD. Thus clarification request is closed.	CL#5 Clarification in stakeholder process are found satisfactory hence closed	Y
D.1.3. Is the undertaken stakeholder process described in a complete and transparent manner?	/8/. /13/	DR	Yes, stakeholder process have been described clearly under section 6 of the VCS PD	Y	Y
D.1.4. Is a summary of the stakeholder comments received provided?	/8/. /13/	DR	There is no negative opinion receiving from the meeting and consultation session.	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
E. Schedule					
E.1.1. Are the chronological plans for the date of initiating project activities defined?	/15/ /17/ /18/ /19/, /23/	DR	Evidence of chronological plans for initiating the projects should be checked in PD. And also there is no chronology listed under section 7 In the response provide from PP, project implementation schedule and the supporting documents have been provided to verify the consistency of the information report with supportive documents. - The construction contract between SD Biosupply and PAPOP has been provided - SD Biosupply plant operating license - Confirmation letter from PAPOP on the commissioning date - Stakeholder consultation media and record These documents have been provided which verified and found consistent with information indicated under section 7 of the VCS PD.	CAR#6 Closed as the revised PD has included and corrected address.	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
E.1.2. Are the date of terminating the project, frequency of monitoring and reporting and the project period, including relevant project activities in each step of the GHG project cycle mentioned?	Sec. 04 of VCS PD Temp	DR	The operational life time of project activity is clearly defined and also he crediting period will be considering one finished 10 years first crediting period. As the boiler involved in the project activity has been modified in the burner type hence clarification in their remaining lifetime is required	CL#10 Closed as the boiler are main device in starch production that if it broke down the new one will replace immediately	Y
F. Ownership					
F.1. Proof of Title					
F.1.1. Is evidence of proof of title provided?	Sec 8.1 of VCS-PD /17/, /18/	DR	Evidence proof on the wastewater treatment plant and its operation has been provided as the operating license of project activity(dated 10/06/2005, Ref No.10/2548), also the project design criteria which adopted in the project activity	Y	Y
F.2. Projects that reduce GHG emissions from activities that participate in an emissions trading programme (if applicable)					
F.2.1. Is the project proponent of the project included in an emission trading programme?		DR	Not applicable as no emission trading programme involved in project activity	Y	Y
F.2.2. Does the project take place in a jurisdiction or sector in which binding limits are established on GHG emissions?		DR	Not applicable	Y	Y

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
F.2.3. Is evidence that the reductions or removals generated by the project have or will not be used in the Programme or jurisdiction for the purpose of demonstrating compliance provided?	Sec. 8.2 of VCS-PD Temp	DR	Not Applicable	Y	Y

Reference List		
ID	Document	Description
1.	VCS PD version 1.0	dated 25 th march 2008 (First version received for start validation)
2.	VCS PD version 2.0	dated 20 th October 2009 (Intermediate Version)
3.	VCS PD version 3.0	dated 7 th April 2009 (Intermediate Version)
4.	VCS PD version 4.0	dated 18 th May 2009 (Intermediate Version)
5.	VCS PD version 5.0	dated 27 th May 2009 (Intermediate Version)
6.	VCS PD version 6.0	dated 30 th June 2009 (Intermediate Version)
7.	VCS PD version 6.1	dated 10 th September 2009 (Intermediate Version)
8.	VCS PD version 6.2	dated 23 rd September 2009 (Final Version))
9.	Excel sheet for emission reduction calculation,	dated 24 th September 2009
10.	Excel sheet for investment analysis worksheet,	dated 24 th September 2009
11.	AMS III.H version 12 dated 11 th June 2009	
12.	AMS I.C version 14 dated 8 th April 2009	
13.	Voluntary Carbon Standard (VCS) 2007.1 dated 18 th November 2008	Latest version available during the validation
14.	Open anaerobic lagoons layout and drawing,	issued for Somdej Starch Plant, Kalasin Province,
15.	Technical proposal for the biogas generation plant and burner modification,	dated 6 th October 2004, by Papop enterprise
16.	SD Biosupply plant organization chart,	revised to consistent with actual operation found during site visit
17.	Biogas generation plant operating license for SD biosupply, reference No. 10/2548, dated 10 th June 2005	reference No. 10/2548, dated 10 th June 2005
18.	Final receipt/Tax invoice of the project activity by Papop enterprise,	dated 26 th December 2005
19.	Plant historical record of the monthly fossil fuel consumption in year 2003 - 2005,	issued by Sondej Flour Mill as the yearly record
20.	Final commissioning report and biogas digester start up,	issued by Papop enterprise, dated 10 th October 2005

21.	Plant daily log sheet of SD Biosupply in October 2005 – January 2006 for substantiated the start date of project activity	
22.	Self confirmation letter on the financial sources and subsidy involved in the project activity,	dated 22 nd September 2009
23.	Flare Specification which the flaring system is ordered made	, issued by Papop enterprise
24.	Confirmation letter of the operational lifetime of UASB reactor,	dated 17 th June 2009, issued by Papop enterprise
25.	Boiler and burner technical specification of baseline scenario,	issued by Wiesloch
26.	Turnkey contract agreement for the biogas generation plant and burner modification	, dated 6 th October 2004, between VP Biosupply and Papop enterprise
27.	Dual fuel burner technical specification,	type RGMS 7 to11, by weishaupt
28.	COD test report base on campaign measurement	duration of 28 th August 2004 to 1 st October 2004 by Papop enterprise

A.3 Annex 3: Overview of Findings

Validation Findings Overview

Findings from validation of "SD Biosupply waste water treatment and biogas utilization"

Each Table below represents a finding from the validation assessment. The findings are numbered consecutively, approximately in the order that they have been identified and irrespective of the nature of the findings, for eg.: CAR #1, CAR #2, CL #3, OBS #4 etc.

Description of Table:

Type Findings are either: Corrective Action Requests (CARs), Clarification Requests (CLs), and Observations (Obs)

A corrective action request (CAR) is raised if one of the following occurs:

- IV. mistakes have been made with a direct influence on project results;
- V. validation protocol requirements have not been met; or
- VI. there is a risk that the project would not be accepted as a VCS2007 project or that emission reductions will not be verified.

A clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable VCS requirements have been met. The validation process may be halted until this information has been made available to the assessors' satisfaction. Failure to address a CL may result in a CAR. Information or clarifications provided as a result of a CL may also lead to a CAR.

Observations may be raised which are for the benefit of future projects and future verification or validation actors. These have no impact upon the completion of the validation or verification activity.

Lead Assessor Details the content of the finding

Comments

Ref Refers to the item number in the Validation Protocol

Response Please insert response to finding, starting with the date of entry.

Please Note: This is an open list and more findings may be added as validation progresses.

Responses to each Finding and relevant associated documentation should be recorded in this form by the Client and send back to the Lead Assessor in one submission to SGS (exception of finding linked to Letter of Approval, which can be submitted separately).

SGS reserves the right to review the associated fees and timeline if:

- more than one response submission is received from the Client
- a finding (CL/CAR), raised by the Lead Assessor prior to Technical Review stage, is not closed within 30 days of notification to the Client by SGS.

Rows for comments and further response will be appended to the table until the Findings has been addressed to the satisfaction of the Lead Assessor.

Findings Overview Summary

	CARs	CLs	OBSs
Total Number raised	7	7	1

Deadline for submission of Response by Client¹: 18/09/2009, 23/09/2009

Date:	25/04/2008	Raised by:	Kaviraj S, Nattarin T & Pitipoom T
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¹ Response to all findings with relevant associated documentation to be sent to SGS in one submission.

Type:	CL	Number:	01	Reference:	B.3.3
Lead Assessor Comment:					
<u>Baseline</u>					
Please provide the design specifications of anaerobic lagoon in the baseline and also, the sources of all the assumptions used for baseline calculations (IIIH).					
Please also provide the fossil fuel consumption records in the plant corresponding to baseline (IC)					
Project Participant Response:				Date: 17/10/2008	
The design specifications for the lagoon system and baseline assumptions are included in the revised version of VCS-PD.					
The fossil fuel consumption details are also included in the revised version of VCS PD.					
Documentation Provided by Project Participant:					
136_SDBiosupplyWWT_PDD_hs_081025					
136_SDBiosupply_LOG_HFO_2003-2008					
136_SDBiosupply_LOG_HFO_Jan2006					
136_SDBiosupply_REF_LagoonDrawing_Sec1					
136_SDBiosupply_REF_LagoonDrawing_Sec2					
136_SDBiosupply_VERs Validation_081025					
Information Verified by Lead Assessor:					
Drawing of WWT provided just only 8 ponds and the depth are 1.5 – 3.0 metre that not consistent with VCS PD					
The revised on assumption and source describe is not clear, please more clarify.					
Data mismatch of previous HFO consumption record was found when verified with VCS PD in 2004 and no evidence provided for 2002. but it is consistent with VER calculation workbook please clarify					
Reasoning for not Acceptance:				Date: 31/10/2008	
Regarding to information provided as revised in VCS PD section 1.4 and drawing of previous WWT lagoons are mismatch in the detail					
With the historical fossil fuel record the data provided not consistent with statement in VCS PD section 2.4					
Hence CL01 is open.					
Project Participant Response:				Date: 20/01/2009	
The info in section 1.4 is edited to match the details.					
The fossil fuel consumption records were corrected corresponding to official document and the baseline emissions were revised corresponding to same.					
Documentation Provided by Project Participant:					
136_SDBiosupplyWWT_PDD_hs_090122					
136_SDBiosupply_LOG_HFO_2003-2008					
136_SDBiosupply_LOG_HFO_Jan2006					
136_SDBiosupply_REF_LagoonDrawing_Sec1					
136_SDBiosupply_REF_LagoonDrawing_Sec2					
Information Verified by Lead Assessor:					
WWT lagoons specification in the baseline already checked in the depth with documents provided that found consistent however surface area, capacity and retention time have not been provided.					
HFO record in 2003 & 2004 reported in the PDD are consistent to the historical plant record furthermore figure reported for 2002 can not be verified, please substantiate.					
Reasoning for not Acceptance:				Date: 10/02/2009	
CL01 is still open due to following issues,					
- the date of completion is incorrect address, please justify - evidence for the open lagoons surface area, capacity and the retention time need to be substantiate. - Please justify under section 1.7 of VCS PD to consistent with information provided					
Please provide the supporting document for substantiate the HFO consumption in year 2002. Also the figure report in the VCS PD should be in the same number of decimal unit.					
Project Participant Response:				Date: DD/MM/YYYY	

- Date of completion has been revised to consistent with real situation - Please find supporting document on the lagoons layout in attachment - Under section 1.7 has been revised accordingly with the information provided	
Documentation Provided by Project Participant:	
Revised VCS PD & Layout of the open lagoons in the baseline	
Information Verified by Lead Assessor:	
In the detail of open lagoons has been verified and found consistent with the layout provided and also revised information under section 1.7	
Proof of the HFO in year 2002 has been provided that found consistent	
Reasoning for Acceptance and Close Out:	Date: 23/03/2009
CL01 is closed as appropriate justification and substantiation have been provided At the validation, the historical data of the fuel consumption has been used to estimate baseline emission also, thermal energy generating to be monitored in the project activity during monitoring period, which found consistent with the applied methodology.	
Acceptance and Close out by Lead Assessor:	Date: 23/03/2009

Date:	25/04/2008	Raised by:	Kaviraj S, Nattarin T & Pitipoom T		
Type:	CAR	Number:	02	Reference:	B.4.6
Lead Assessor Comment:					
<u>Additionality</u> Please state about the investment barriers if faced in the project activity in the referred section of PDD. Please also provide the elaborate explanation for the barrier due to common practice with supportive document.					
Project Participant Response:				Date: 17/10/2008	
The Barrier analysis as per the requirement of VCS is elaborated in revised version of PDD.					
Documentation Provided by Project Participant:					
136_SDBiosupply_IRR_Calculation_081025 136_SDBiosupply_VERs_Validation_081025 136_SDBiosupply_REF_BiogasStart_License 136_SDBiosupplyWWT_PDD_hs_081025					
Information Verified by Lead Assessor:					
The investment barrier analysis of SD was found satisfactory and consistent with the statement in VCS PD.. Common practice about the project in Thailand has checked against actual situation and projects listed in VCS PD that found consistent					
Reasoning for not Acceptance:				Date: 31/10/2008	
Please provide the proof of benchmark and also justified that the taken benchmark is conservative. Also provide the sources of all the assumptions used to calculate the IRR of the project activity. CAR02 open.					
Project Participant Response:				Date: 20/01/2009	
The PDD revised for Benchmark analysis. The assumptions are provided in the excel sheet and PDD.					
Documentation Provided by Project Participant:					
136_SDBiosupply_Technical_Proposal 136_SDBiosupplyWWT_PDD_hs_090122 136_SDBiosupply_IRR_Calculation_090122					
Information Verified by Lead Assessor:					
The VCS PD is verified against the supporting documents provided that there are some point needs to be clarify and substantiate.					
Reasoning for not Acceptance:				Date: 10/02/2009	

CAR02 is opened due to,	
- please more clarify why the project IRR calculated in the revised VCS PD version 3.0 is lower than the IRR has been reported in version 2.0 - benchmark used for the project need more clarify on the reference documents (link address & documents name) of the risk premium applied for this project that why applied the rate from US as the reference - Please provided supporting documents for the operation cost used in the IRR calculation sheet - Please clarify on the interest used in IRR calculation as 15% per year.	
Project Participant Response:	Date: DD/MM/YYYY
- The reference on the risk premium is adopted from the available data that calculated base on information of US and credit rating by Moody for Thailand. - IRR calculation in the spreadsheet is just the guidance figure which is not directly used for calculate the IRR of project cash flow.	
Documentation Provided by Project Participant:	
Information Verified by Lead Assessor:	
For the benchmark applied for the project activity is adopted by risk free rate plus with premium which are well substantiate with documentary evidence and also it is less than the benchmark applied for the CDM registered project (15%).	
On the IRR calculation formulae is found satisfactory that 15% is guidance figure, no affect to the calculation.	
Reasoning for Acceptance and Close Out:	Date: 23/03/2009
CAR#2 is closed as found satisfactory in the clarification provided by PP and also the supporting document is consistent with information indicate for investment analysis.	
Acceptance and Close out by Lead Assessor:	Date: 23/03/2009

Date:	25/04/2008	Raised by:	Kaviraj S, Nattarin T & Pitipoom T
Type:	CAR	Number:	03
		Reference:	B.5.2
Lead Assessor Comment:			
<u>Project Emission</u>			
Please explain why the project emission because of generated sludge from USAB has not accounted?			
Project Participant Response:	Date: 17/10/2008		

Excess sludge volume produced in UASB tank by Papop technology is calculated as the following:

Waste water Flow	=	3,000	m ³ /d
COD load	=	50,000	kg COD/d
COD removed	=	90%	
New cell yield	=	5%	of COD removed
Sludge mass	=	50,000 x 0.9 x 0.05	
	=	2,250	kg SS/d
SS wash out	=	650	mg/L
	=	650 x 3,000/1,000	
Sludge wash out	=	1,950	kg SS/d
Excess sludge	=	2,250-1,950	
	=	300	kg SS/d
Biogas operating day	=	180	days/year (designed data)
Excess sludge	=	300 x 180	
	=	54,000	kg SS/year
SS drained out	=	70,000	mg/L
Excess sludge volume	=	54,000 x 1,000/70,000	
	=	770	m ³ /year

Due to a small amount of excess sludge producing from UASB tank, because of the low new cell yield as only 5% of COD removal. Thus, the accumulation of sludge in UASB tank is long time increasing until rising up to the level to drain out. According to the calculation indicate that there is a small amount of sludge only 1,160 m³/year.

However, the UASB tank is designed to keep sludge height as 3 meters and there are remain 3 meters for space of excess sludge which in term of volume is approximate 2,000 m³. So we can keep excess sludge in UASB tank almost 3 years.

The excess sludge is drained out from the tank and is either used by the plant operator (also the technology supplier) either to be used for seeding in other plants in very small quantities or be used as fertilizer by giving it to farmers from nearby areas.

Documentation Provided by Project Participant:

136_SDBiosupply_Technical_Proposal

Information Verified by Lead Assessor:

Design criteria for the sludge production from UASB reactor

Reasoning for not Acceptance:

Date: 31/10/2008

Please provide the supportive evidences for the default value used for the estimation of baseline and also justify that taken approach is conservative.

CAR03 open

Project Participant Response:

Date: 20/01/2009

The analysis provided is provided by technology provider and all the sludge removal in the following years is monitored for end use. However it is established to use the sludge for fertilizer purposes.

Documentation Provided by Project Participant:

136_SDBiosupply_VERs_Validation_090122

Information Verified by Lead Assessor:

Calculation sheet of VERs is verified with the information provide but there are some point need to be clarify and substantiate

Reasoning for not Acceptance:

Date: 10/02/2009

CAR03 is opened with the following issues,

- As mentioned in VCS PD that wastewater treated will subject to the cascade open lagoon but the PE calculation base on the poorly aerobic treatment, please clarify which treatment process is consistent to real project situation
- Please substantiate with documentary evidence that no sludge generate from the project activity and how the fertilizer process will be applied.
- Why the emission from biogas to be flare in project activity is zero, please justify

Project Participant Response:

Date: DD/MM/YYYY

- Correction in the calculation method to consistent with the real situation occurred on site (cascade open lagoon)
- The final sludge from anaerobic reactor is subject to used as soil conditioner/fertilizer which can provide to the nearby farmer
- For the ex-ante estimation is base on all biogas is utilize in the boiler which there is no the excess gas sent to flare

Documentation Provided by Project Participant:

Information Verified by Lead Assessor:

In the revised VCS PD, baseline situation and their emission calculation is reflect to the actual situation on site which confirmed by observed during site visit
The final sludge is used in an appropriate justification which is the aerobic condition and also this is applicable by the methodology
Clarification of the emission from flaring system is found satisfactory and reasonable which there is no emission from flaring for ex-ante emission calculation

Reasoning for Acceptance and Close Out: **Date:** 23/03/2009

Clarification from PP found satisfactory and also the situation found onsite is consistent.
Thus CAR03 is closed.

Acceptance and Close out by Lead Assessor: **Date:** 23/03/2009

Date:	25/04/2008	Raised by:	Kaviraj S, Nattarin T & Pitipoom T		
Type:	CL	Number:	04	Reference:	B.9.1
Lead Assessor Comment:					
<u>Monitoring Methodology</u> COD of waste water untreated has not been considered in monitoring plan of PDD. However the COD removed has been taken which is not required as it a calculated value.					
Project Participant Response:				Date: 17/10/2008	
Regarding to methodology AMS III.H version 9, COD _{y, removed, i} is one parameter of emission calculation that is the difference between the inflow COD (COD _{y, ww, untreated}) and outflow COD (COD _{y, ww, treated}). Actually, the biogas operator responsible for testing COD of waste water at 3 different points on daily basis (3 times per day); 1) outlet of acid pond (inflow COD), 2) inside of UASB tanks, and 3) Outlet of UASB tanks (outflow COD of UASB). Therefore, the COD of waste water untreated is monitored as item 2. The parameter is included in revised monitoring plan in PDD.					
Documentation Provided by Project Participant:					
136_SDBiosupplyWWT_PDD_hs_081025					
Information Verified by Lead Assessor:					
Sampling point of Wastewater COD testing in anaerobic system and the PD has been revised					
Reasoning for Acceptance and Close Out:				Date: 31/10/2008	
The monitoring plan has been revised CL04 is closed out.					
Acceptance and Close out by Lead Assessor:				Date: 31/10/2008	

Date:	25/04/2008	Raised by:	Kaviraj S, Nattarin T & Pitipoom T		
Type:	CL	Number:	05	Reference:	E.1.1
Lead Assessor Comment:					
<u>Stakeholder Consultation</u> Please provide information about the stakeholders' consultation as per the requirement of VCS PDD section 6.					
Project Participant Response:				Date: 17/10/2008	

A stakeholder consultation has been included at the project site and details of same included in the revised VCS PD	
Documentation Provided by Project Participant:	
136_SDBiosupplyWWT_PDD_hs_081025	
Information Verified by Lead Assessor:	
Description of Stakeholder consultation that mentioned in VCS PD	
Reasoning for Acceptance and Close Out:	Date: 31/10/2008
Clarification and substantiation on the stakeholder consultation process found satisfactory hence CL05 is closed out	
Acceptance and Close out by Lead Assessor:	Date: 31/10/2008

Date:	04/09/2009	Raised by:	Nattarin T & Pitipoom T		
Type:	CAR	Number:	06	Reference:	
Lead Assessor Comment:					
<u>Starting Date of Project Activity</u>					
- There is no information of the start date of project activity indicated under section 1.6 of VCS PD. - The chronology of the project activity is required to be listed under section 7. - As explained under section 1.6 of VCS PD, the duration of the project is estimated as 30 years. However, this is inconsistent with operation life time for calculating the investment analysis which indicated as 20 year. Proof of the operation life time is to be provided.					
Please justify and substantiate with documentary evidence in the each event listed.					
Project Participant Response:				Date: 10/09/2009	
The project start date is referred to the commissioning report done by Papop company as the technology provider. The project start date (16th September 2005) is accounted for the first date of biogas produced and utilized in boiler or flared. However, the first date of wastewater treated in UASB reactor is on 18th August 2005 as ensured by the commissioning report. The chronology of the project activity is added in the section 7 in VCS PD. The relevant document will be provided for supporting the action. The project lifetime reactor (UASB) is designed for 15 years approximately by Papop company. The project proponent revised VCS PD to be in consistency with the IRR calculation and the lifetime of reactor.					
Documentation Provided by Project Participant:					
a) The commissioning report (the first date of wastewater treated in UASB) b) The first log sheet of biogas record (proof for project starting date) c) The lifetime of UASB reactor (proof of operation life time of project)					
Information Verified by Lead Assessor:					
The confirmation letter of the start date of commissioning the wastewater treatment plant has been verified and found consistent. Plant log sheet of the project activity has been verified that found acceptable. However the start date of crediting period is consistent with VCS requirement on 28th March 2006. Proof of the operational lifetime of project activity is provided that 15 years of operational lifetime indicated					
Reasoning for Acceptance and Close Out:				Date: 20/09/2009	
CAR#6 is closed as found satisfactory on the supporting documents provide for the start date of project activity.					
Acceptance and Close out by Lead Assessor:				Date: 20/09/2009	

Date:	04/09/2009	Raised by:	Nattarin T & Pitipoom T	
Type:	CL	Number:	07	Reference:
Lead Assessor Comment:				

Baseline Information	
As the VCS PD of the project activity is revised to the methodology AMS III.H version 12, the historical record of COD data is to be provided. Clarification on how the historical data is applicable as per para 17 – 18 of the applied methodology. need to be provided.	
Project Participant Response:	Date: 10/09/2009
The COD data for the baseline lagoon efficiency are provided and the emission reduction estimations are thereby revised as per the same. The efficiency is estimated in a conservative manner and is in line with the applicable methodology.	
Documentation Provided by Project Participant:	
g) The COD baseline 11 figures	
Information Verified by Lead Assessor:	
Supporting documents on the COD test result at the time starting design project activity (year 2004) have been provided that found consistent with the information indicated in the PD and ER cal sheet.	
Reasoning for Acceptance and Close Out:	Date: 20/09/2009
CL#07 is closed as found satisfactory in the test report provided and clarification in the applicability of COD value adopted in the project activity. As paragraph 17-18 of AMS III.H version 12, if the one year historical data is not available, the at least 10 day measurement campaign will be used. In this project adopted the 10 days wastewater analysis on CODin and CODout this can calculate the COD removal efficiency of the baseline. Also the factor of 0.89 is used for adjust figure due to the uncertainty of data which found consistent with the applied methodology.	
Acceptance and Close out by Lead Assessor:	Date: 20/09/2009

Date:	04/09/2009	Raised by:	Nattarin T & Pitipoom T		
Type:	CAR	Number:	08	Reference:	
Lead Assessor Comment:					
<u>GHG Sources in Project Boundary</u> The GHG emission sources in the baseline and project activity are not covering as per the emission reduction calculation provided in the further chapters of VCS PD. Please justify. Baseline : discharge wastewater, electricity in baseline Project Activity : flaring system					
Project Participant Response:				Date: 10/09/2009	
The corrections suggested are incorporated in the revised calculations and PD.					
Documentation Provided by Project Participant:					
N/A					
Information Verified by Lead Assessor:					
In the revised PD found that the sources of GHG in the project boundary has been clearly defined .					
Reasoning for Acceptance and Close Out:				Date: 20/09/2009	
CAR#8 is closed as the revised PDD is fully complied with the methodology of project boundary and project activity					
Acceptance and Close out by Lead Assessor:				Date: 20/09/2009	

Date:	04/09/2009	Raised by:	Nattarin T & Pitipoom T	
Type:	CL	Number:	09	Reference:
Lead Assessor Comment:				
<u>Flaring System</u> As the deviation listed for the flaring efficiency, proof on how to ensure the 100% combustion of flare system need to be substantiated.				
Project Participant Response:			Date: 10/09/2009	
http://cdm.unfccc.int/UserManagement/FileStorage/VNWAGY8MS92ZXDKUHEF5LB07QICT1P The proposal document provided by technology supplier mentions the flare to be an automatic flare, which means that valve supplying biogas to flare is opened when flare is in combustion state. The flare on or off signal and biogas supply parameters are normally visible on SCADA screen. However, SCADA logs cannot be provided to prove the functioning of flare when biogas is being supplied to flare, because of CPU error. The SCADA is under repair and shall be ready to display and provide the data logs in a short while in future.				

Documentation Provided by Project Participant:	
h) Flare specification (extracted from operation manual of biogas plant)	
i) SCADA repair under process.	
Information Verified by Lead Assessor:	
Copies of SCADA log sheet provided are found satisfactory that monitoring procedure of flaring system is in place for estimate the quantity of biogas sent to flare.	
The information of flaring technical specification has been provided which checked and found satisfactory	
Reasoning for not Acceptance:	Date: 20/09/2009
CL#9 is closed as clearly defined on the operation process and the technical specification as automatic ignition flaring system.	
In validation stage, the flaring efficiency of the project is to be monitored on the time of flaring if higher than 20 minutes in an hour, 50% will taken. Otherwise 0% is to be used. This is clearly mentioned in the final revision of VCS PD that found consistent with the methodology applied.	
Acceptance and Close out by Lead Assessor:	Date: 20/09/2009

Date:	04/09/2009	Raised by:	Nattarin T & Pitipoom T		
Type:	CL	Number:	10	Reference:	
Lead Assessor Comment:					
<u>Boiler Capacity & Lifetime</u>					
Please substantiate on the technical specification of boiler used in the project site included maximum capacity and its remaining operational lifetime					
Project Participant Response:				Date: 10/09/2009	
The boiler specification is provided in soft file.					
The remaining lifetime of boiler should not be a concern for project activity as the boiler is not a part of project activity, rather it would be there at project site as a part of normal operation to supply steam to manufacturing process. The boiler is installed along with start of starch production process.					
As per requirement, the boiler specifications are provided. A nominal lifetime of 20 years for boiler would ensure its operation through the lifetime of project activity which has 15 years of lifetime.					
Documentation Provided by Project Participant:					
a) The technical data for boiler					
Information Verified by Lead Assessor:					
Technical specification of boiler has been provided that found satisfactory in the detail.					
On the justification of operational lifetime is appropriate as the boiler is major equipment for operate the starch plant hence if the boiler is breakdown, the new one will install instead.					
Reasoning for Acceptance and Close Out:				Date: 20/09/2009	
CL#10 is closed as found satisfactory in the boiler specification and justification on operational lifetime.					
Acceptance and Close out by Lead Assessor:				Date: 20/09/2009	

Date:	04/09/2009	Raised by:	Nattarin T & Pitipoom T		
Type:	CL	Number:	11	Reference:	
Lead Assessor Comment:					
<u>Investment Analysis</u>					
Supporting documentary evidence for calculating investment barrier and all assumption shall be provided as below list.					
- Total Investment - O&M Cost - Overhaul Cost in every 5 years - Man Power Cost - Working Capital					
In addition, kindly clarify how the subsidy from government involves in the project activity which resulted in the project investment.					

Project Participant Response:		Date: 10/09/2009	
All the investment cost and operation and maintenance cost are ensured to be corrected. The supporting document will be sent with the latest VCS PD. However, this project is not supposed to receive any supporting from government. So the project investment is not related to any subsidy from government.			
Documentation Provided by Project Participant:			
b) Extract of investment cost and operation and maintenance cost (from the construction signed contract) c) The non subsidy confirmation letter from project proponent			
Information Verified by Lead Assessor:			
Supporting documents on the investment and operating cost of the project activity used for calculate IRR are found consistent with figure reported. In the method used for calculate IRR need more clarify that why there is the operating cost in year 0, and the overhaul cost in year 15 Confirmation that there is no subsidy received to the proposed project activity is found satisfactory.			
Reasoning for not Acceptance:		Date: 20/09/2009	
CL#11 is opened as the calculation method for IRR need to more clarify as following point, - The IRR calculation sheet should not have the monitoring parameters/figures indicated for calculation. As the additionality need to be proof at the time project making decision. - Bullet indicated type of cost in project activity in worksheet "IRR Analysis" row 31-40 is inconsistent with supporting documents provided (consultancy contract) - The quantity of electricity used at project activity is inconsistent along investment analysis worksheet and emission reduction calculation sheet - The efficiency of the treatment system used for calculates project emission is incorrect as adopted the efficiency of baseline for ER calculation (ex-ante). Please clarify.			
Project Participant Response:		Date: 22/09/2009	
- IRR sheet is corrected for the values as per the documentation provided. - Corrected in Excel Sheet in accordance to consultancy contract. - The electricity used in both excel sheets is consistent in revised version. - The formula is as per revised methodology i.e. version 12 and based on COD treated in baseline.			
Documentation Provided by Project Participant:			
N/A			
Information Verified by Lead Assessor:			
In the revised IRR calculation sheet has been verified in the following issues, - The monitoring figures are left out from the investment calculation sheet that found satisfactory. - Corrected the description of cost to consistent with supporting documents provided - Corrected in the power consumption to consistent in both documents - Clarification in the formulae used is found consistent with methodology			
Reasoning for Acceptance and Close Out:		Date: 27/09/2009	
Clarification and revision in the IRR calculation sheet are found satisfactory hence CL#11 is closed			
Acceptance and Close out by Lead Assessor:		Date: 27/09/2009	

Date:	04/09/2009	Raised by:	Nattarin T & Pitipoom T		
Type:	CAR	Number:	12	Reference:	
Lead Assessor Comment:					

Inconsistency parameters

The parameters indicated in the VCS PD are inconsistent with the applied methodology and correlation with further chapter as below.

- parameter for equation number (3) & (4) : $BE_{heat} = BE_{y,FO}$
- typo on methane correction factor parameter and Model correction factor in equation number (5) : (MC : MCF), ($UF_{BL} : U_{BL}$) and $MEP_{ww,treatment,y} : MEP_{y,ww,treatment}$ in equation number (10) & (11).

Please correct.

Project Participant Response:	Date: 10/09/2009
VCS PD is corrected for editorial errors.	
Documentation Provided by Project Participant:	
N/A	
Information Verified by Lead Assessor:	
Revised PD has been checked that found consistent along the PD and methodology	
Reasoning for Acceptance and Close Out:	Date: 20/08/2009
Corrected in the VCS PD thus CAR#12 is closed.	
Acceptance and Close out by Lead Assessor:	Date: 20/08/2009

Date:	04/09/2009		Raised by:	Nattarin T & Pitipoom T	
Type:	CAR	Number:	13	Reference:	
Lead Assessor Comment:					
Parameter to be Monitored					
It is unclear in the VCS PD that how the sludge removed from the UASB digester to be treated/utilized in the project activity.					
Also please justify regarding to paragraph 38 – 39 of methodology AMS III.H version 12.					
Project Participant Response:				Date: 10/09/2009	
The sludge is removed time by time by the technology provider (Papop company) as seeding bacterial for new biogas reactors start-up otherwise the dried sludge is applied as soil improvement on-site. The amount of removed sludge is written for the internal evident and end application is also monitored.					
Documentation Provided by Project Participant:					
N/A					
Information Verified by Lead Assessor:					
Clarification from PP is found satisfactory and consistent with the information interviewed during site visit , also the end use of sludge in the project activity is subjected to monitor during monitoring period.					
Reasoning for Acceptance and Close Out:				Date: 19/09/2009	
CAR#13 is closed as found satisfactory in the detail of sludge utilization and thus parameter is to be monitoring.					
Acceptance and Close out by Lead Assessor:				Date: 19/09/2009	

Date:	04/09/2009		Raised by:	Nattarin T & Pitipoom T	
Type:	CAR	Number:	14	Reference:	
Lead Assessor Comment:					
<u>Baseline information inconsistent</u> Under section 1.4, 1.7 and 2.4 of the VCS PD indicated that exiting open anaerobic lagoons in the baseline consist of 8 ponds however the number indicated in the diagram under section 2.3 is 11 ponds. Please justify.					
Project Participant Response:				Date: 10/09/2009	
The correction of baseline (8) lagoons is done to be in consistency throughout the document. Please see the revised VCS PD.					

Documentation Provided by Project Participant:	
N/A	
Information Verified by Lead Assessor:	
In the revised VCS PD found that the number of open lagoons in the baseline are found consistent however why the information use for explain to the stakeholder is 12 ponds need to more clarify.	
Reasoning for not Acceptance:	Date: 20/09/2009
The information used for local stakeholder consultation and now indicated in the VCS PD is inconsistent thus CAR#14 is opened.	
Project Participant Response:	Date: 22/09/2009
The mistake happened while perpetration of stakeholder documentation for the project activity. In actual there are 8 lagoons, however the stakeholder summary says 12 lagoons, which is a typographic error made by entity that conducted stakeholder consultation. Supporting document in form of lagoon drawing is provided.	
Documentation Provided by Project Participant:	
j) the drawing of baseline (8) open lagoon	
Information Verified by Lead Assessor:	
The drawing of open lagoons in the baseline activity has been provided and found consistent with information indicated in the VCS PD	
Reasoning for Acceptance and Close Out:	Date: 27/09/2009
CAR#14 is closed with the supporting documents in the number of lagoons in the baseline.	
Acceptance and Close out by Lead Assessor:	Date: DD/MM/YYYY

Date:	19/11/2009	Raised by:	Abhishek Mahawar		
Type:	OBS	Number:	15	Reference:	
Lead Assessor Comment:					
<u>Operating days of Starch Plant</u>					
The number of operational days can be validated by at the time of validation however the number of operating days should be monitored and if it significantly goes above 240 days then additionality should be re assessed at the time of verification.					
Project Participant Response:				Date:	
N/A					
Documentation Provided by Project Participant:					
N/A					
Information Verified by Lead Assessor:					
Operating day of starch plant is found appropriate justification based on the project historical data.					
Reasoning for Acceptance and Close Out:				Date: 19/11/2009	
OBS#15 is raised and subjected to verify the operating date of start plant during verification, if the significant goes above 240 days then additionality should be re assessed at the time of verification.					
Acceptance and Close out by Lead Assessor:				Date: 19/11/2009	

A.4 Annex 4: Team Members Statements of Competency

Statement of Competence

Name: Nattarin Thunsiri

SGS Affiliate: SGS (Thailand) Co., Ltd

Status

- | | | |
|---------------------------|-------------------------------------|--------------------------|
| - Product Co-ordinator | ☐ | |
| - Operations Co-ordinator | | ☐ |
| - Technical Reviewer | ☐ | |
| - Expert | ☒ | |

Validation

Verification

- | | | |
|---------------------------|-------------------------------------|-------------------------------------|
| - Local Assessor | ☒ | ☒ |
| - Lead Assessor | ☒ | ☒ |
| - Assessor | ☒ | ☒ |
| - / Trainee Lead Assessor | | |

Scopes of Expertise

- | | | |
|--|-------------------------------------|--------------------------|
| 1. Energy Industries (renewable / non-renewable) | ☒ | |
| 2. Energy Distribution | ☐ | |
| 3. Energy Demand | ☐ | |
| 4. Manufacturing | ☐ | |
| 5. Chemical Industry | ☐ | |
| 6. Construction | ☐ | |
| 7. Transport | ☐ | |
| 8. Mining/Mineral Production | ☐ | |
| 9. Metal Production | ☐ | |
| 10. Fugitive Emissions from Fuels (solid, oil and gas) | | ☐ |
| 11. Fugitive Emissions from Production and | | ☐ |

Consumption of Halocarbons and Sulphur Hexafluoride

- | | |
|-------------------------------------|--------------------------|
| 12. Solvent Use | ☐ |
| 13. Waste Handling and Disposal | ☐ |
| 14. Afforestation and Reforestation | ☐ |
| 15. Agriculture | ☐ |

Approved Member of Staff by Sanjeev Kumar and Siddharth Yadav

Date: 19/01/2009 and 15/04/2009

Statement of Competence

Name: Pitipoom Tungsiriruteekul

SGS Affiliate: SGS (Thailand) Co., Ltd

Status

- | | | |
|---------------------------|-------------------------------------|--------------------------|
| - Product Co-ordinator | ☐ | |
| - Operations Co-ordinator | | ☐ |
| - Technical Reviewer | ☐ | |
| - Expert | ☒ | |

Validation

Verification

- | | | |
|---------------------------------------|-------------------------------------|-------------------------------------|
| - Local Assessor | ☒ | ☒ |
| - Lead Assessor | ☐ | ☐ |
| - Assessor
/ Trainee Lead Assessor | ☒ | ☒ |

Scopes of Expertise

- | | | |
|--|-------------------------------------|--------------------------|
| 1. Energy Industries (renewable / non-renewable) | ☒ | |
| 2. Energy Distribution | ☐ | |
| 3. Energy Demand | ☐ | |
| 4. Manufacturing | ☐ | |
| 16. Chemical Industry | ☐ | |
| 17. Construction | ☐ | |
| 18. Transport | ☐ | |
| 19. Mining/Mineral Production | ☐ | |
| 20. Metal Production | ☐ | |
| 21. Fugitive Emissions from Fuels (solid, oil and gas) | | ☐ |
| 22. Fugitive Emissions from Production and | | ☐ |

Consumption of Halocarbons and Sulphur Hexafluoride

- | | |
|-------------------------------------|--------------------------|
| 23. Solvent Use | ☐ |
| 24. Waste Handling and Disposal | ☐ |
| 25. Afforestation and Reforestation | ☐ |
| 26. Agriculture | ☐ |

Approved Member of Staff by Sanjeev Kumar and Siddharth Yadav

Date: 19/01/2009 and 15/04/2009

Statement of Competence

Name: **Singh, Kaviraj** SGS Affiliate: **SGS United Kingdom**

Status

- Lead Assessor	☐	- Expert	☒
- Assessor	☐	- Financial Expert	☐
- Local Assessor	☐	- Technical Reviewer	☒

Scopes of Expertise

1. Energy Industries (renewable / non-renewable)	☐
<i>Sub scope(s):</i>	
2. Energy Distribution	☐
<i>Sub scope(s):</i>	
3. Energy Demand	☐
<i>Sub scope(s):</i>	
4. Manufacturing	☐
<i>Sub scope(s):</i>	
5. Chemical Industry	☐
<i>Sub scope(s):</i>	
6. Construction	☐
<i>Sub scope(s):</i>	
7. Transport	☐
<i>Sub scope(s):</i>	
8. Mining/Mineral Production	☐
<i>Sub scope(s):</i>	
9. Metal Production	☐
<i>Sub scope(s):</i>	
10. Fugitive Emissions from Fuels (solid, oil and gas)	☐
<i>Sub scope(s):</i>	
11. Fugitive Emissions from Production and Consumption of Halocarbons and Sulphur Hexafluoride	☐
<i>Sub scope(s):</i>	
12. Solvent Use	☐
<i>Sub scope(s):</i>	
13. Waste Handling and Disposal	☒
<i>Sub scope(s): Landfill gas, Wastewater and sludge treatment, Composting</i>	
14. Afforestation and Reforestation	☐
<i>Sub scope(s):</i>	
15. Agriculture	☐
<i>Sub scope(s):</i>	

Approved Member of Staff by: **Siddharth Yadav** Date: **05/10/2009**