December 3, 2011

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Subject: Proposal for METR-Compliant Mid-Term Review, Thailand Sapthip Biogas Project

Our team, the CH4 Killers, is a new private consultancy which aims to promote the dissemination of practices that turns waste into profits. We specialize in the sustainable development of the biofuel industry by promoting systems that simultaneously mitigate GHG emissions and fuel the future of energy. In short we believe that "hot-air can drive hot growth."

The Sapthip Biogas Project represents a treasure trove of lessons that can improve existing and future development projects. We propose the World Bank allow our team to conduct a mid-term review of the project's activities thereby furthering the project's goals of promoting wastewater treatment systems and cogeneration of electricity through biogas recovery. Our methodologies are built on METR-compliance and the five pillars of good governance (transparency, participation/inclusivity, accountability, responsiveness to feedback and cross-cutting); values which align with those of the World Bank.

Our process is dynamic and predicated upon the sensitivities of the project's participants, beneficiaries and external stakeholders. As such, should you have any questions or suggestions to our proposal please do not hesitate to contact us.

Warm Regards,

The CH_4 Killers
Nick Choy, Deron Hong
Lixi Li, Anuar Tulshov

METR (M&E) Proposal for SAPTHIP CO., LTD. WASTEWATER BIOGAS AND RENEWABLE ENERGY PROJECT

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FRE540
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Executive Summary

Purpose: To gain approval for conducting a midterm METR-compliant review of the Thailand Sapthip Biogas Project (World Bank Project-ID: P110040).

Framework: METR is a framework for collecting and analyzing information to evaluate a project's performance to drive improvements to the design and implementation of existing and proposed development projects. It promotes the willing adoption of positive changes to behaviour and holds itself to the standards of clear, logical objectives and good governance.

Proposed Project to Evaluate: The Sapthip Biogas Project was approved in 2009 and is scheduled to end in 2013. To avoid the negative externalities generated from processing cassava into bioethanol, the World Bank supported the implementation of two Clean Development Mechanism (CDM) components: 1. A wastewater treatment system with biogas collection that utilizes an up-flow anaerobic sludge blanket to capture methane thereby reducing GHG emissions and creating a source of renewable energy. 2. Renewable energy derived from the first component fuels two 20-ton/hr capacity boilers and the plant's electrical needs. Emissions Reductions of up to 154,864 tCO_2e per year would be certified by a Designated Operational Entity and the World Bank would facilitate the purchase and sale of Certified Emissions Reductions. The revenues from these sales allow the CDM components to be financially viable.

Benefits of METR Evaluation

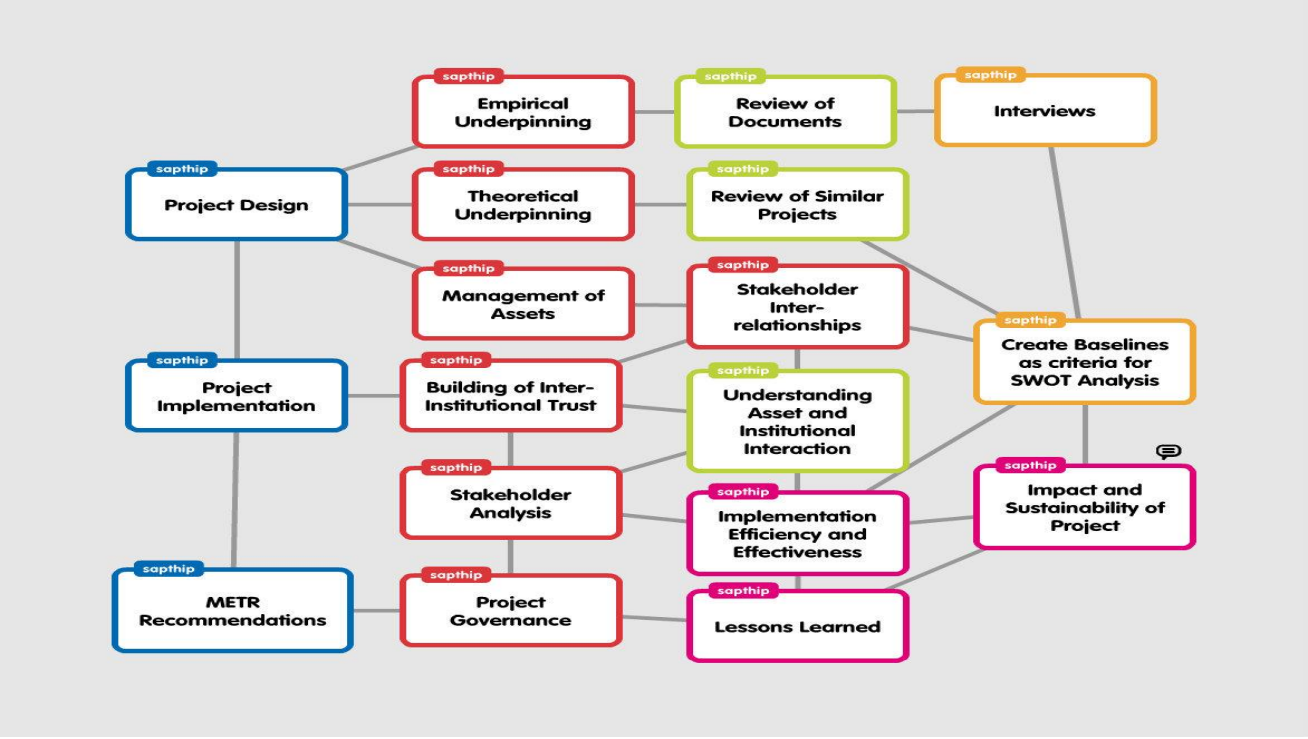
Our proposed METR-compliant Assessment can add value to the project by:

- Promoting good governance which can strengthen relationships between stakeholder institutions.
- Generating recommendations that can lead to the improvement of the efficiency and effectiveness of the current and future projects.

- Supporting the temporal sustainability of the project after the end of the ERPA by reassessing the assumptions and risks to the project's continued success with current data.
- Creating an arena for Shared Learning and opportunities for acting on Lessons Learned.

Methodologies: We combine quantitative analysis of economic factors, political institutions, social institutions, environmental risks and impacts drawn from documents and data with interviews and surveys with stakeholders at all levels. Our recommendations are propelled by the collective experiences of as many parties impacted by the project as we can feasibly connect with.

METR Components Evaluated



Cost per Consultant: approximately $15,000 for 30 days of work.

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List of Acronyms

CDM - Clean Development Mechanism
CDMOP - Clean Development Mechanism Operations Plan
CER - Certified Emission Reduction
CFO - Carbon Finance Operation
CH_4 – Methane
COD - Chemical Oxygen Demand
CO_2 - Carbon Dioxide
COP - Conference of the Parties (Kyoto Protocol)
DOE - Designated Operational Entity
EA - Environmental Assessment
EIA - Environmental Impact Assessment
EMP - Environmental Management Plan
ER – Emissions Reduction
ERPA - Emission Reduction Purchase Agreement
FAO - United Nations' Food and Agriculture Organization
GHG - Greenhouse Gas
IRR – Internal Rate of Return
ISDS – Integrated Safeguard Data Sheet
M&E – Monitoring and Evaluation
METR – Monitoring and Evaluation for Timely Response
MOP - Meeting of the Parties to the Kyoto Protocol
MP – Monitoring Plan
PAD - Project Appraisal Document
PDD - Project Design Document
PID - Project Information Document
RTG - Royal Thai Government
SWOT – Strengths Weaknesses Opportunities Threats
tCO2e - Tons of Carbon Dioxide Equivalent
TGO - Thailand Greenhouse Gas Management Organization
THB - Thai Baht
UASB - Up-Flow Anaerobic Sludge Blanket
UNFCCC - United Nations Framework Convention on Climate Change
UN – United Nations
WB – World Bank

Monitoring and Evaluation for Timely Response (METR) Proposal

1. Introduction

1.1 METR Background and Proposal Objective

METR is a framework for collecting and analyzing information to evaluate a project's performance to drive improvements to the design and implementation of existing and proposed development projects. Private consultants for international development organizations including the United Nations' Food and Agriculture Organization (FAO), the United States Agency for International Development (USAID) and the World Bank have utilized the METR framework. METR encourages willing and positive changes in behaviour among project implementers, beneficiaries and funders and upholds good governance (transparency, participation/inclusivity, accountability, responsiveness to feedback and cross-cutting).

This proposal is for a METR-complaint mid-term of the Sapthip Wastewater Biogas and Cogeneration Project (World Bank Project-ID: P110040) located in Thailand, which was authorized in 2009 and is planned to end in 2013.

1.2 Priorities and Goals of Project Participants

Lender - World Bank:

1. Support the Royal Thai Government by delivering global benefits through reduced GHG emissions using carbon finance.
2. Promoting sustainable development in Thailand by improving environmental quality.
3. Encouraging adoption of cost-effective energy alternatives.
4. Promote achievement of Thailand's renewable-energy and energy efficiency targets by exploring technological and policy options for development of energy from biogas, biofuels and biomass.

Project Implementer/Beneficiary - Sapthip Co., Ltd.:

1. Reduce GHG emissions from fossil fuel used in processing cassava into ethanol and methane from plant's wastewater by recovering methane from wastewater treatment in the form of biogas and solid waste (wet cake) to fuel plant operations.
2. Address community concerns of pollution (wastewater and odour).

1.3 Project Description: Sapthip Wastewater Biogas and Cogeneration Project

In 2008 Sapthip Co., Ltd. proposed plans to include CDM components in the construction of their bioethanol processing plant in Tambon Nikom Lumnarai, Amphoe Chaibadal District, Lopburi Province in Thailand. Production planned to use 500 tons of cassava per day as feedstock to produce 200,000 litres of bioethanol per day. At the time, prevailing practices for similar projects used fossil fuels for energy and open lagoons to treat wastewater operations. These methods carried environmental risks to groundwater, risks to human health, emitted foul odours and generated GHG emissions which contribute to climate change; practices that were attractive because of low capital costs. In 2007, Thailand's cassava-processing industry produced an estimated 5 million tons of GHG emissions, including methane, which is 21 times more potent than carbon dioxide (PAD, 2009, p.1), and was projected to increase to 60 million tons by 2010 (PID, 2009, p.2). Thus, the implementation of pollution mitigation technologies would benefit the local and global community if the capital costs could be mitigated.

During the project design phase, consultations with the local community raised concerns regarding health risks and foul odour from wastewater generated by the ethanol plant. Coupled with the goals of the Royal Thailand Government's Power Development Plan, which targeted an increase in proportion of renewable energy from 0.3% in 2003 to 8% in 2011, technological alternatives were considered. These resulted in the proposal of the following CDM components:

1. Wastewater system with biogas collection: Rather than using open lagoons to treat wastewater which allowed CH_4 to be directly released into the atmosphere, wastewater (1580 m^3/day) would undergo treatment using an up-flow anaerobic

sludge blanket (UASB) to capture most of the methane biogas. Also, rather than discharging the final effluent into the river 3 km from the site it would be used to irrigate the project's Eucalyptus tree plantation thereby releasing no wastewater effluent outside the project (zero discharge target).

2. Renewable energy use: Two 20-ton/hr capacity boilers supply an average of 20 tons/hr of steam to power the plant using the biogas recovered from the wastewater treatment process (58,000 m^3/day) and solid residue (30 tons/day) from the distillation dried from waste heat from the boiler. The boiler would rely on approximately 70% biogas and 30% wet cake for energy rather than coal.

Carbon Finance Operation: The project would be Thailand's "first wastewater CDM project for a Greenfield manufacturing facility" (PAD, 2009, p.3). If successful this project would act as a model that would promote Thai CDM projects on the international CDM market and promote the implementation of modern wastewater and biogas cogeneration technologies. However, the WB's involvement was essential to the implementation of the CDM components. Without the revenue from selling CERs, the project would not be economically viable (CDM-Executive Board, 2006, p.23). It was estimated that Sapthip's ethanol facility would cost US$41.1 million, the two CDM components would cost an estimated US$5.47 million (PID, 2009, p.4) to $US6.19 million and the investment would be half equity-financed and half debt-financed over a 7 year period with a grace period of 2 years at a 7.5% interest rate (PAD, 2009, p.7) The WB, acting as Trustee of the Netherlands CDM Facility, would finance the purchase of ERs with an estimated value of US$5 million (Morton, 2009, p.5) to US$10 million (PAD, 2009, p.5) over a 7-10 year contracted period. Sapthip's CDM operations would avoid up to 154,864 tCO_2e per year and contingent on meeting the safeguard aspects and actions agreed in the EMP (PID, 2009, p.11) CERs would be issued after verification and certification. The DOE, ERM Certification and Verification Services Ltd will use the ACM0014 version 3 methodologies to verify eligibility for CERs under Kyoto Protocol Article 12 (CDM-Executive Board, 2006). An ERPA to reduce up to 375,000 tCO_2e from 2010-2012 was signed in 2009 between the World Bank and Sapthip (Morton, 2009).

2.METR Resources and Methodology

Team Member (Role)	Experience	METR Skills
Nick Choy (Environmental & Technical Analyst)	- Bachelor of Arts, University of British Columbia: Economics and Asian Studies - Deliverable Coordinator for 2011 International Student Energy Summit: 10unsolvables.org	Conceptual Integrity of Project Design: review of similar projects to generate baseline for evaluating Sapthip Achievement of OVIs: EMP, environmental impact and valuation of natural capital Performance of Technology: - Impacts of Outputs on stakeholders - Project Implementation Efficiency - Management of Capital and Assets
Deron Hong (Economist & Technical Analyst)	-Bachelor of Engineering, University of Beijing Union: Bio-engineering -Assistant manager of purchasing department	Conceptual Integrity of Project Design Management of Capital and Assets Stakeholder Analysis: Asset and institutional interaction Project Implementation Effectiveness Outcomes of Project
Lixi Li (Economist & Institutional Analyst)	- Bachelor of Management, Tianjin University of Finance and Economics: Marketing	Management of Capital and Assets Stakeholder Analysis: Asset and institutional interaction Building of Social Capital and Trust Project Governance & Efficiency Impact/Outcomes of Project
Anuar Tuleshov (Institutional & Environmental Analyst)	- Bachelor of Policy Law Making and Economics	Conceptual Integrity of Project Design Stakeholder Analysis & Management of Capital and Assets Understanding of Assets & interaction with Institutional Policies Implementation Effectiveness Outcomes/Impact of Project

2.1 Methodology

Pre-Onsite Research: To expedite the M&E process, prior to arriving in Thailand, we aim to conduct as much research as possible from our present location. This will involve contacting stakeholders, collecting and analyzing data. Collaborating to produce this proposal has helped build intra-team trust and further research will improve team cooperation and efficiency prior to arriving onsite. Further, to demonstrate our competency, provided we are granted access to the necessary data, we will conduct a portion of this research free of charge prior to being hired. Our current appreciation of the WB's, Sapthip's, and other stakeholders' sensitivities and motivations can be found

in the sections: *Evaluating the Integrity of Our Logical Framework* (p. 14) and our *Stakeholder Analysis* (p. 20). Other examples of pre-site research include:

- Economic analysis of cassava, coal, molasses (as a substitute) and ethanol using Excess Supply and Demand models to determine impacts on price and quantity of production
- Policy conditions at project inception, over project lifetime and currently-proposed policies (Appendix IV)
- Review of similar CDM projects (Appendix III)

2.2 METR Implementation – Team Engagement

1. Introductions

2. Appreciative Project Inquiry (API): enhance project's critical asset of mutual trust among project participants. To establish the Trajectory of Trust among key project institutions we will ask about the hopes, fears and expectations of stakeholders to establish mutual understanding in order to facilitate mutual respect and mutual trust. Please refer to Appendix II for examples of stakeholders and lines of inquiry we would follow.

    i. What was the best moment of the project for you?

    ii. What are your hopes and fears of this METR implementation?

    iii. Name one thing you would like or think we can help you with, please.

3. Project Performance Evaluators derived from API: Throughout our METR proposal we indicate the types of questions we will ask questions to gain insight into where, how and why the project is still on track or has left the tracts.

4. An essential component of generating our Lessons-Learned section involves asking:

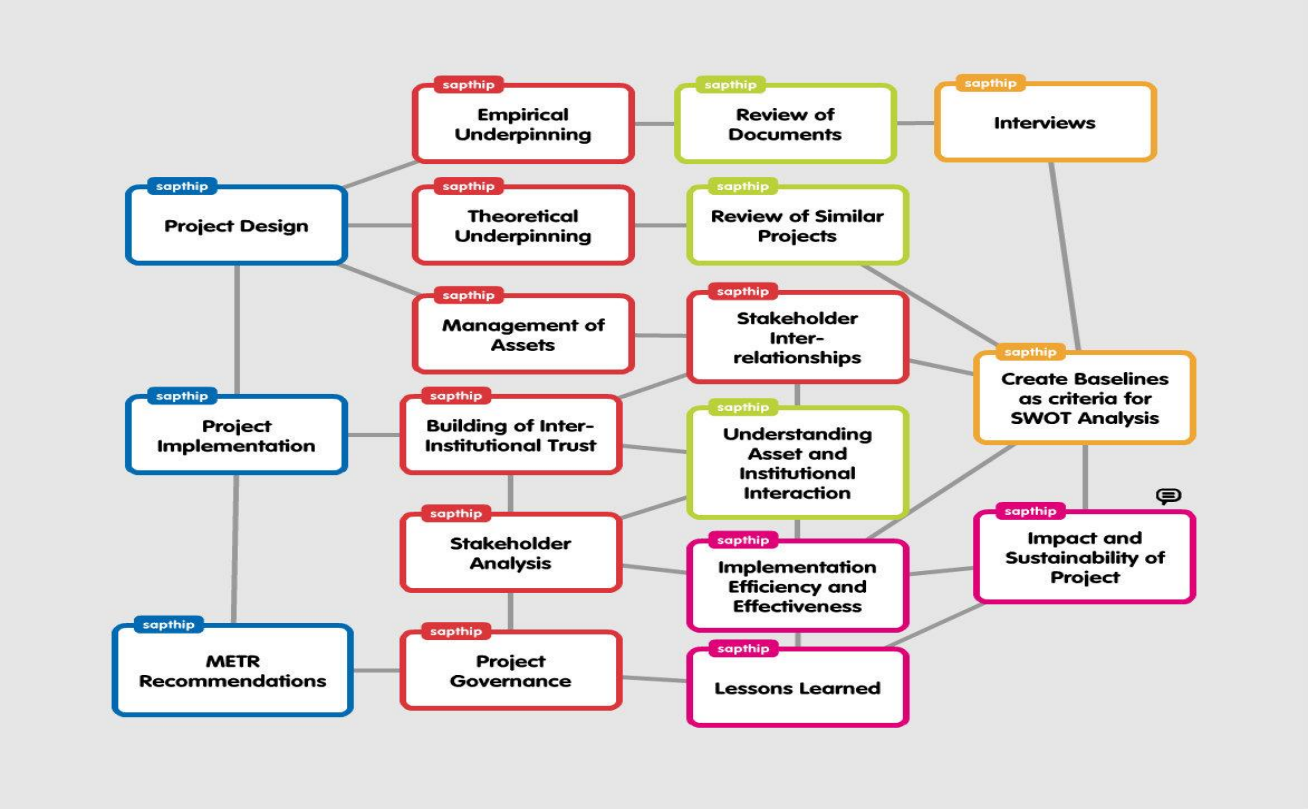
    i. What for you was the best moment during the present METR?

    ii. What was the worst moment?

    iii. Which came first?

Timeframe: Step 1 and 2 – up to 2 days as part of pre-site research through phone conversations and email and 1 day onsite.

Breakdown of METR Components and Process:



2.3 Onsite Field Work

Project Design:

- Pre-site research – 4 days to create SWOT analysis baseline by reviewing other projects, economic/policy/institution analysis. We will attempt communicate through video conferencing and phone interviews with WB members, CDM Executive board members, Netherlands CDM Facility members and Danish Carbon Fund representatives who are not onsite anyway.
- Onsite – 5 days to streamline and substantiate SWOT analysis and generate management of capital and assets, through stakeholder interviews.
    - Review of documents: 1/5 days
    - 4/5 days: Interviews and surveys with community members, government agents, Sapthip's plant employees will take place within the district. For stakeholders outside the district like government agencies we will attempt to communicate via video conferencing and setup appointments before

arriving onsite. Refer to Appendix II for types of stakeholders we will interview.

Project Implementation:

- Onsite – 15 days to evaluate building of social capital and inter-institutional trust; stakeholder analysis; understanding about relevant assets, institutional policies and interactions; project governance; implementation efficiency; implementation effectiveness; outcomes/impacts; lessons learned.
    - Review of documents: 4/15 days
    - 11/15 days: Interviews and surveys with community members, government agents, plant employees will take place within the district. Possible field tests for environmental impact also be within the district. For stakeholders outside the district like government agencies we will attempt to communicate via video conferencing and setup appointments before arriving onsite. Refer to Appendix II for types of stakeholders we will interview.

METR Recommendations:

- Onsite – 3 days to generate recommendations based on findings and to reconnect with stakeholders to clarify or improve points and finally draft presentation.

Total onsite time: 28 days total - 24 x 15 hrs work days (6 work days/week).

2.4 Cost components of METR (per consultant)

Consultant wage: $500 per work day (24 onsite days, 2 pre-site days) = $13,000

Expenses: room charge per night at Lopburi Inn Hotel - $23.85 x 29 days = $691.65

Round-trip flight from Vancouver = $1060 plus taxes

Round trip between Bangkok and Lopburi for Chiang Mai train = $17.86

Total: approximately $14,769.51 (expenses subject to change)

Translator/Local Third-party Experts = To Be Determined

3. Proposed Applications of METR Parameters

3.1 Project Design

- Purpose: Our first task entails assessing the relevance and logical consistency of the project's design towards meeting its goals and purpose.
- Summary of Methodology:
    - The project did not have a logical framework (log-frame) so we generated our own rapid log-frame (Appendix I) based on our review of the PAD, PID, PDD and EA, which links some root causes driving the core problem, which the project aims at addressing.
        - Pre-onsite research: To ensure our team's understanding is consistent the project's goals we will contact its designers and implementers.
    - Create baseline drawn from soundness of project's conceptual integrity by
        - Drawing criteria from M&E, validation and completion reports from similar projects to establish benchmarks. We will focus on the lessons learned, threats, risks and assumptions relevant to the project, which affect the delivery of benefits.
    - Use baseline to measure the project's design against its implementation with respect to the inter-relationships between stakeholder institutions and the management of the project's assets and capital such as:
        - Planned employment of human capital/knowledge and its expected impact on the project.
        - Catalogue of financial, physical and natural capital that was taken into account at project inception and their expected impact.
    - Our evaluation aims to determine whether resources were fully utilized and to identify areas that stakeholders feel can be optimized by reducing externalities, expanding valuation of resources and reducing uncertainties.

3.1.1 Evaluating the Integrity of Our Logical Framework

- Summary: The project documents did not include a log-frame so we constructed one based on a problem tree we created. We find the project's design logically addresses the root causes of the core problem that prevailed during its inception.
- Core Problem: Prevailing practices and technology used in cassava processing caused negative externalities for the local community (bad odour, environmental and health risks from not treating and discharging wastewater) and global community (GHG emissions from using coal to fuel operations).
    - Root causes:
        - Lack of demonstrated benefits that modern wastewater treatment systems in Thailand outweigh the costs of implementation. Proving benefits outweigh the costs should increase demand, and subsequently supply, of this pollution mitigation technology.
        - These uncertainties coupled with private firms' needs to remain competitive and profitable represented significant risks for a company to be the first to implement biogas wastewater and cogeneration systems.
    - Proximate causes:
        - Low adoption rate of wastewater treatment and biogas cogeneration of energy because "capital cost was the most important barrier affecting the competitiveness and hence the viability of the renewable energy" (Ruangrong, 2008, p.1).
    - Beneficial impacts:
        - Project Goals (effects beyond local sphere of influence):
            - Demonstration of cost-benefits from implementing technology.
            - Demonstration of using CFOs to mitigate the financial burden and risks of adopting this technology.
        - Project Purpose (direct influence on local sphere): Reduction of negative externalities and costs of technology.

- Methodology: We will contact stakeholders involved in or affected by the design of the project (Appendix II) to ensure our understanding of the goals and purpose of the project is correct; if we excluded any issues.

3.1.2 Conceptual Integrity of Project

- Goals of analyzing the conceptual integrity:
    - Accurately trace the logic and motivations that drove the design of the project and the likelihood of beneficial impacts enduring.
    - Identify factors learned by stakeholders that could impact the success of future projects which could lay foundation for future contingency plans.
    - List current risks to the project identified by stakeholders.
    - Catalogue suggestions that could overcome these risks.
- Criteria to evaluate the project's design (Example Sources in Appendix III)
    - Theoretical underpinning - Given the goals and purpose stated in our log-frame how have other projects/nations:
        - Sought to achieve carbon reductions with biogas projects with CDM components (Source 1).
        - Monitored CDM wastewater system treatment projects in Thailand (Source 2).
        - Validated CDM wastewater system treatment projects in Thailand (Source 3).
        - Evaluated the development of the cassava industry (Source 5).
        - Considered the various technological possibilities of biomethanation to reduce GHG emissions (Source 6).
        - Identified best practices and what are they (Source 7).
    - Empirical underpinning – What are the standards for monitoring CDM projects (Source 4), what kind of quantitative targets are used and why (Source 1-7)? Do the quantitative targets support the theoretical underpinning given the socio-economic and environmental factors?

- Methodology
    - Empirical Underpinning: Consistency of targets in EMP, CDMOP, and MP with CDM standards and relevance to goals as well as concerns raised by stakeholders during project inception.
    - Theoretical Underpinning: We will conceptually evaluate the project's design by drawing on interviews with stakeholders and our own analyses by generating a SWOT analysis of Sapthip's Biogas project design:
        - Strengths: design parameters that coincide with successful strategies employed by other projects or were included by Sapthip that other projects did not employ.
        - Weaknesses: successful design parameters of the time from other projects that Sapthip excluded; threats, risks and assumptions that could have detracted from success that Sapthip did not account for. What would project designers have included in retrospect?
        - Opportunities: at project inception what trends, expectations and predictions did project designers seek to take advantage of in terms of policies, economic climate and technological innovations; elements specific to Sapthip's socio-economic setting.
        - Threats: what assumptions did project designers make (as outlined in the risks/assumptions column of our log-frame)?
            - What methods and types of analyses were used to justify these assumptions?
            - How accurate were these assumptions?
            - If assumptions were violated what were the reasons/causes?
            - What would project designers have done differently?
            - Did project designers create contingency plans in case assumptions were violated?
    - We will substantiate our SWOT analysis through interviews with stakeholders involved in the design and implementation of the project. Specific points/topics of inquiry:

- Policies - interviews with national, provincial, district government agencies to determine if they were consulted at project inception and if their views/concerns were incorporated into project design, such as:
    - Safeguards Policies described in the EA and ISDS.
    - Results from EIA and local community outreach.
    - Thailand's policies on the cassava industry, bioethanol, gasohol, renewable energy, biofuels, exports of cassava and ethanol, tariffs, mandates, price supports, taxes or subsidies, environmental protection, labour, land use and acquisition.
- Technology – interviews with Biogas Forerunner (project contractor in charge of implementing and monitoring of EMP provisions) and project designers:
    - What alternatives were considered?
    - Why were these systems and brands used instead of others?
- Economic factors – interviews with Sapthip and WB members
    - Inputs to production: domestic and international supply, demand, trade and price of cassava.
    - Outputs from production: domestic and international supply, demand, trade of bioethanol.
- Social impact – interviews with plant's employees as well as local community leaders and members investigating:
    - If concerns and suggestions from consultation identified in the EA incorporated into project design to the satisfaction of the community?
    - Did anticipated impacts of these suggestions meet expectations? If not, how could the project's design have been modified?

- Our team's analysis (Appendix IV)
    - Policies and Economic factors:

- Review of requests made by Thailand's bioethanol and cassava industries for policy changes like stabilization of cassava prices (Sapp, 2011) through theoretical modelling of these suggestions (e.g. supply and demand models and impact on project's production).
- Comparison of project designers' sensitivity analyses regarding prices of cassava, demand of ethanol and other assumptions to actual historical trends from 2008-2011.
- Comparison of Thailand's policies to other nations to determine possible best-practices that can be suggested for adoption.
- Comparison of molasses and other substitutes to cassava as bioethanol feedstock.

3.1.3 Management of Capital and Assets

- Purpose: To create a baseline of asset valuation during project inception and design in order to evaluate project implementation.
- Elements of capital and assets
    - Stakeholder institutions: rights, responsibilities, roles and relationships
    - Capital: financial, physical, natural, knowledge, human and social.
- Methodology: evaluate if project designers linked the inter-relationships between stakeholders and capital to achieve project goals, purposes and OVI targets.
    - The PAD, PID and EA outlined many relevant stakeholders, their roles and responsibilities. To fully illustrate the extent capital and assets were appraised and managed we will interview all the stakeholders listed in our stakeholder analysis found below.

3.2 Project Implementation

- Purpose: evaluate project implementation in terms of efficiency, impact, governance by examining the interactions between stakeholders and assets. Special attention to factors stakeholders feel are threats to the continued success of the project especially once the ERPA reaches its end.

- Building of Social Capital of Inter-Institutional Trust:
    - Inception phase: How was mutual trust and respect between project designers, implementers, local community, government, and other stakeholders generated? Which stakeholders were included? What strategies were employed to open the lines of communication? How effective were these strategies from the point of view of both parties? How responsive were project designers/implementers to community suggestions? Was advice sought from World Bank employees and others who experienced with CDM projects?
    - Implementation phase: How responsive were project designers/implementers to stakeholder suggestions? How effective was communication vertically and laterally along the project team's organizational structure, Sapthip's organizational structure, political hierarchy? Especially in terms of expressing concerns and successful strategies, proposals for changes and responsiveness to queries/suggestions from stakeholders outside the project domain.
        - Did Sapthip take responsibility and redress damages or harm?
        - What kind of government supports were in place or promises of help?
        - Were promises made and fulfilled by project staff/supporters?
- Rapid Stakeholder analysis: To overcome the lack of a formal stakeholder analysis, our team will fortify elements of stakeholder consultations from project documents with interviews to complete the following rapid stakeholder analysis.

Stakeholder	Rights	Responsibilities	Roles	Relationships
Sapthip Ltd., Co.	- Receive benefits for fulfillment of ERPA with WB, Dutch Carbon Fund as well as other contracts - Continued ability to operate plant - Receive government support and subsidies if applicable - support from parent company, Sapsathaporn Group	- Repayment of loan to WB - Upholding of law and stakeholder wellbeing - Plant management and operation: safety of workers and community - Accountable for actions of employees, Biogas Forerunners & plant operations - Fulfill requirements of ERPA to sell CERs - Monitoring and reporting of plant operations - Meet targets in EMP, CDMOP, MP - Disclosure of monitoring for validation of CERs - Practicing of good governance - Payment of profits to Sapsathaporn Group	- Project Implementer - Borrower from WB - Profit seeking firm in Thailand's cassava processing industry - Leader in promoting CFOs in Thailand - Project participant in CDM - Seller of CERs - subsidiary of Sapsathaporn Group	- Under jurisdiction of government and CDM executive board - Beneficiary of WB through ERPA and loan - Liable to government & community - Client of Biogas Forerunner - Monitored by NGOs - Validation of CDM activities by DOE - Seller of CERs to Danish Carbon CDM -Sapsathaporn Group
Sapsathaporn Group	- Receive profits from Sapthip	- Financial standing used to evaluate viability of Satphip - Practicing of good governance - Support to Sapthip	- Parent company of Sapthip	- Sapthip - WB - Government - Local community
World Bank	- Validation of contract requirements under ERPA - Repayment of loan to Sapthip - Access to project information	- Ensure the delivery of benefits under the ERPA - Accountable to International Monetary Fund - Transparency of operations - Distribution of loans to developing nations - practicing of god governance	- Lender for CDM component to Sapthip - Trustee for CERs transactions - Promoter of CDM projects	- Benefactor to Sapthip - Trustee for Danish Carbon Fund - Funded by International Monetary Fund - Collaboration with CDM Executive board
Danish Carbon Fund	- Receive benefits from purchase of	- Mission to reach Denmark's emission targets	- Project participant in CDM project	- Purchaser of CERs from Sapthip - Trustee of WB

	CERs - verification of CERs	- Pay for purchases of CERs - Ensure CER purchases are validated	- Purchaser of CERs	- CDM executive board - Danish government as Kyoto Protocol Host Country
CDM Executive Board	- access to reports by Sapthip, WB, DOE and Danish Carbon Fund	- CDM rules and processes are being fulfilled by project participants - practicing of good governance	- Administration and management of CDM projects	- Sapthip - WB - Danish Carbon Fund - United Nations - ERM Certification and Verification Services Ltd.
ERM Certification and Verification Services Limited	- Ability to fulfill its responsibilities as DOE	- Verify eligibility of Sapthip's emissions reductions as CERs - practicing of good governance	- DOE of Sapthip Biogas Project	- CDM Executive Board - Danish Carbon Fund - WB - Sapthip
Thai Government: local, district, provincial, national	- Enforce relevant laws - Pass new laws - Collect taxes - Rights as Kyoto Protocol Host Party	- Uphold welfare of citizens and stakeholders - Enactment of laws - Enforcement of laws - Transparency of affairs - Fulfill duties as Kyoto Protocol Host - practicing of good governance	- Governing body of Thailand - Host Party of Kyoto Protocol	- Sapthip - Thai citizens - Thai firms - CDM Executive board - Global Community - Other nations
Local Community (residents, farmers, industry): village, district, province, nation Global Community	- Protection of safety, living conditions, health and environment - Fair arbitration of disputes and contracts - Compensation for damages or violation of contracts - good governance by project implementers	- Upholding of regulations and laws - Truthful reporting of complaints and inquiries regarding Sapthip's operations - Payment of taxes - Not jeopardizing welfare of other members of the community	- Citizens of Thailand - Members of community - Beneficiaries of CDM components from Sapthip - Beneficiaries of Kyoto Protocol	- Sapthip - WB - Government - NGOs - Biogas Forerunner Co., Ltd.
Biogas	- Receipt of	- Wastewater	- Construction	- Sapthip

Forerunner Co., Ltd	payment for services to Sapthip - Sharing of truthful and accurate report without fear of punishment	management system at Sapthip: Design, construction, management, training of staff, start-up and first 2 years of operations - Accurate and truthful reporting of monitoring reports - Upholding regulations, laws and protecting welfare of stakeholders - practicing of good governance	and managing of wastewater system at Sapthip's plant	- WB - ERM Certification and Verification Services Ltd. - Government - Local community
NGOs(Thailand Greenhouse Gas Management Organization)	- access to accurate reports - ability to publish accurate reports - good governance by project implementers	- practicing of good governance in reporting and monitoring of operations - objective evaluation of the project's impact	- External observers of the project	- Sapthip - WB - Government - CDM Executive Board - local and global community

- We will build on stakeholder interactions recorded in the project documents and community outreach conducted by project designers/implementers through interviews and surveys (Appendix II), specifically inquiring about:
    - Well executed portions/elements of the project; unexpected obstacles and challenges.
    - Whether project implementation and operations meet designed projections and expectations?
        - Hopes and fears.
        - Impact on local economy (increase in employment, income and equitable distribution of resulting benefits or lack thereof).

        - Did roles or relationships between stakeholders change? How and was this positive or negative?
        - Were responsibilities fulfilled and rights upheld?
    - <u>If problems arise, who do stakeholders feel they can turn to and rely on to address the problem?</u>

- Understanding About Relevant Assets, Institutional Policies and their interactions:
    - We will substantiate the results from our management of capital and assets from evaluating the project design to illustrate the relationships between stakeholders. Materials used include reports and interviews.
    - E.g. the PAD and PID list the WB as Trustee of the Netherlands CDM Facility with project cost of approximately USD$5 million for an estimated 10 year period. But the World Bank's website indicates the project's close date will be 2013 and 2019 anymore, with project cost of USD$630,000. Finally, the 2009 Carbon Finance for the WB report lists the Danish Carbon Fund instead of the Netherlands CDM Facility will pay for reducing 375,000 tCO_2e. The reasons driving the change in beneficiaries paying for the CERs as well as the shortening of contract timeframe from the perspectives of all parties might improve the design and implementation of future CDM projects. Did financial and capital assets affect this decision, what other risks or motivating factors played a role?

- Project Governance: how aware are stakeholders of their rights/responsibilities?
    - Transparency - It was difficult to access reports and documents (e.g. the ERPA) as well as project progress over the internet. Does the local community face the same problem? Are the local community and government aware if Sapthip is meeting EMP, CDMOP and MP targets?
    - Inclusivity – Did stakeholders feel they were left out at any stage (design, implementation)? Did any suggestions not get implemented and why? What was the impact on outcomes/outputs of the project?

- Accountability – Have any of the EMP, CDMOP or MP targets not been met? How was this addressed? Have community concerns not been addressed? How effective is the current system of fielding feedback?
    - Compare number and type of complaints and grievances filed by community directly to Sapthip to those filed with the Provincial Department of Industrial Works of the Ministry of Industry.
    - If complaints are not being addressed do stakeholders know who else they can turn to? Have they tried to appeal to "higher powers" and what was the outcome?
    - How does performance in transparency and accountability affect project impact?
- Responsiveness to monitoring and evaluation tracking: focus on interviews and reports from Biogas Forerunner, employees and DOE.
    - Internal: Has the schedule for tracking targets in the EMP, CDMOP, etc. been met? If targets are not being met what changes have been made? Are targets harder to meet during certain times than others? Which targets have been hardest to meet? What suggestions have been proposed and implemented?
    - External: Were these reports deemed accurate and fair? What benefits have external evaluations brought to the project? What aspects did external evaluators over/under emphasize? What suggestions were (not) implemented and why?
- Timeliness of responsiveness and cross-cutting – To achieve the project's goals and purposes, how quick have responses to suggestions (especially the following cross-cutting issues) been implemented?
    - Transparency and freedom of information: criteria for CERs and to disseminate successes/failures to inform other projects.
    - Accountability: promotes credibility of project by protecting rights and upholding responsibilities of stakeholders and strengthen relationships; lays foundation of trust for future projects/changes.

- Consultation and contestability: continued success of project and acceptance of future projects are predicated on these elements.
- Efficiency and Effectiveness: crucial to meeting goals/purposes.
- Other issues identified by interviewing stakeholders.

- Implementation Efficiency:
  - Cost-Benefit Analyses:
    - Valuation of benefits: Compare baseline predictions used in project design to realized outputs.
      - Reductions in GHG Emissions (CH_4, CO_2), COD of water
      - Satisfaction of Sapthip employees, government as well as local community: odour, economic/social benefits including training and other human capital development, etc.
      - Revenue generated from CERs.
      - Government subsidies from renewable energy generation.
      - Eucalyptus plantation: CO_2 sequestering, revenue, etc.
      - Other benefits and positive impacts from stakeholder interviews (especially environmental and health).
    - Costs: Comparison of expected costs to actual expenditures.
      - CDM components (construction, operation and maintenance)
        - Is the technology functioning as predicted?
        - Have unscheduled/unplanned costs arisen?
      - Opportunity costs (comparison of alternatives to components/elements used by project)
        - Economic: Coal versus biogas for electricity generation, etc.
        - Technological: UASB versus open lagoon for water treatment; utilized brands versus alternatives, etc.
        - Financial: comparison of IRR used in PAD's financial sensitivity analyses to one that might be used today.

        - Environmental: e.g. land used by project and possibility of influencing policy makers to employ unused land for cassava cultivation to increase employment and supply of feedstock for ethanol processing.
    - Types of analytical tools, models, processes, elements used for cost-benefit analysis:
        - Net Present Value of capital investments; Payback analysis; Private versus Social Cost and Benefit analysis.
        - Technological and human capital transfer: cost of expertise used versus training of new labour.
        - Time: adherence to proposed schedule
            - How long did payment for CERs take and how did this affect the project?

- Implementation Effectiveness (Impact of Results):
    - We will compare the benefits described above against the baselines and SWOT analysis established from evaluating project design.
        - E.g. if the CO_2 sequestering from the eucalyptus plantation was not accounted for by project designers then the project had greater impact than planned, but could be considered a Weakness in project design.
        - The project reports give a range of 154,864 (CDM-Executive Board, 2006, p.2) to 204,626 (PDD, 2009, p.2) tCO2e in reductions per day. What were the realized reductions and the reasons behind this figure?
        - What was the price of CERs and revenue earned plant? Was this within expectations?

- Outcomes and Impact of the Project
    - Spatial: Using reports, surveys and interviews we will compare the impacts from implementation effectiveness to the purpose and goals in the log-frame
        - How many other cassava processing and bioethanol plants in Thailand are aware of Sapthip?
        - How many other wastewater, biogas, methane recovery, etc. projects in Thailand are aware of Sapthip?
        - How aware are these plants of Thailand's CFO program?
        - How many implemented wastewater treatment or biogas systems because of Sapthip or awareness of CDM?
        - What are reasons for (not) implementing these types of systems?
        - Have they heard of challenges, obstacles, benefits, problems, successes associated with Sapthip and its operations?
        - Compare the results of this research against responses from NGOs and government agencies.
    - Temporal: What are the greatest threats to the continued success of the project especially once the ERPA reaches its end? What factors could impede/aid Sapthip's ability to repay its loan? It was determined that implementing the CDM components was not financially viable without the sale of CERs, how effective was the ERPA length of 2010-2012 in mitigating financial risk? How does this shortened timeframe affect Sapthip's ability to repay the WB loan? Will the savings generated by the CDM components (e.g. biogas instead of coal for electricity) beyond project completion outweigh the implementation and opportunity costs? What kind of policy changes could aid/hamper the continued success? Are there plans to mitigate economic risks (e.g. cost of cassava and bioethanol, price of molasses as a competitor for bioethanol feedstock, etc.)? Would it be possible to extend ERPA contract?

- Lesson-learned from Implementation Experience:
    - Shared learning: was knowledge and experience from non-project institutions incorporated into project design/implementation (e.g. experts from similar biogas recovery projects or CDM projects)? Have experiences from Sapthip been incorporated into other new projects? How have policy-makers been influenced or advised by Sapthip's experiences?
    - What were some cross-cutting issues identified early on?
    - Did assumptions and risks identified in log-frame meet expectations?
    - What are the lessons to be learned identified through internal and external M&E studies?
    - What pre-conceptions of stakeholders did experience with the project change?

3.3 METR Recommendations

- Purpose: drawing on our evaluation of the project's design and implementation we will produce recommendations, which are integrated across sectors, aimed at improving the current project's performance and the design of future projects.
- Methodology:
    - Recommendations focus on:
        - Economic Efficiency – management of assets, performance of technology, efficiency and effectiveness of implementation.
        - Environmental Management – efficiency, effectiveness, completeness and appropriateness of OVIs identified in log-frame and targets in EMP, EA, PAD. Lessons learned, and suggestions from SWOT baseline evaluation.
        - Equity Considerations – project governance, cross-cutting effectiveness, stakeholder analysis.
    - To ensure our work embodies the five pillars of good governance (transparency, participation/inclusivity, accountability, responsiveness to feedback and timeliness) we will note responses to the presentation of our draft METR Recommendations.
    - To assure project and public utility of recommendations we will:
        - Document and present our findings and recommendations clearly
        - Ensure our METR report is publicly available and easily accessed
        - Facilitate shared learning to inform outside institutions that exert pressure for adaptive change by project implementers/designers and policy/decision makers

4. Value of METR Performance Assessment

- Our proposed METR-compliant Assessment can add value to the project by:
    - Promoting Good Governance which can strengthen relationships between stakeholder institutions; currently there exists a lack of easily accessed project progress reports.
    - Generating recommendations that can lead to the improvement of Project Efficiency and Effectiveness as well as support the temporal Sustainability of the Project after the end of the ERPA.
    - Creating an arena for Shared Learning and opportunities for acting on Lessons Learned.
    - Reassessing the assumptions and risks to the project's continued success with current data: It was estimated that a sustained increase of 60% over 2007 levels in the price of cassava chips was required to affect the plant's production, but such an increase would be unprecedented (PAD, 2009, p.7). But the Thaioil Ethanol Company, attributing its investment in Sapthip Co., Ltd, which faced higher feedstock costs sparked by natural disaster, reported an earnings before taxes, depreciation and amortization loss of THB 8 million (Bloomberg Businessweek, 2011). According to the PAD 2008, saw a 25% increase over and then a return in prices to 2007 levels (p.7) by 2009; these figures coincide with an FAO report on the freight on board price of cassava chips from Bangkok to China (Food and Agriculture Organization, 2010). The same report also shows a 52.4% increase in prices from 2009 (which are comparable to 2007 prices) to 2010. Thus, the rising price of inputs could impact the success of the project. Application of a METR-compliant Assessment could generate recommendations to influence policy/decision-makers that could mitigate these kinds of threats to the project's continued success.

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Appendix I: Rapid Logical Framework

Objectives	Objectively Verifiable Indicators	Means of Verification	Assumptions/Risks
Goal: Demonstrate the financial sustainability of modern wastewater systems, and role Carbon Development Mechanisms can play in furthering this aim, to promote adoption of this technology and establish the viability of Thai Carbon Finance Operation projects.	From beginning of 2nd year of operations onwards: (1. a) Increase in the number of applications for wastewater CDM projects: shows increase in interest. (1. b) Increase in the number of registered wastewater CDM projects: shows improvement in ability to gain approval. (1. c) Existing wastewater CDM projects' continued fulfillment of Emissions Reductions Purchase Agreements. (2) Increase in the implementation of modern wastewater systems by processors through retrofits or in new projects with or without CDM assistance.	(1. a) Source: CDM Executive Board. (1. b) Source: CDM executive board, crosschecked with purchaser of Certified Emissions Reductions. (1. c) Source: Designated Operational Entity responsible for verifying CERs and receipt of payment to CDM project implementers. (2) Survey of plants eligible for retrofits and new projects suitable for modern wastewater systems.	(1) Once registered, economic and policy conditions do not impede the continued operation of the CDM projects until ERPA contract completion. (2) Continued availability and unrestricted access to international market for Certified Emission Reductions. (3) Cost of technology does not rise relative to prices of inputs and outputs of production causing costs to outweigh the benefits.
Purpose: (1) Reduce negative environmental externalities like GHG emissions by implementing UASB system that will recover methane gas power plant operations as renewable energy. (2) Finance portion of technology costs through Carbon Finance Operations by selling Certified Emissions Reductions.	(1. a) Capture methane gas that otherwise would have been released, reduce CO_2 emissions by replacing coal with biogas to generate electricity and replace grid electricity (1. b) Address concerns of community by eliminating odour from processing and reducing risk of groundwater contamination. (2) Timely delivery of CERs ERPA for contracted period.	(1. a) Tracking of performance like targets in EMP, CDMOP and MP (1. b) Tracking responses to community grievance mechanisms through surveys to determine whether stakeholder concerns are continuously being addressed. (2. a) Source: CDM executive board, project participants (Sapthip, Netherlands CDM Facility etc.), DOE (ERM Certification and Verification Services Ltd.)	(1) Proposed project cannot be implemented without revenue from sale of CERs. (3) Financial performance of plant does not affect delivery of CERs and CDM components e.g. operations of plant does not rise above cost of using coal. (4) Government policies do not impede implementation of CDM projects.
Outputs: (1) GHG emissions. (2) Wastewater. (3)Renewable energy generated through CDM components. (4)Quantity of effluent stored and applied to Eucalyptus plantation is within projected range.	(1) Fulfillment of targets in the EMP, CDM Operations Plan and the Monitoring Plan included in Project Design Document to achieve certification. E.g. Reduction of 154,864 tCO2e annually; air and water quality. (2) Wastewater flow within projected 1580 m^3/day and treating up to 85,000 mg/litre COD/day. (3) 20 tons/hr steam; 58,000 m^3/day biogas recovered; 30 tons/day of wet cake recovered a day. (4) Zero discharge of effluent per year. (5) Expectations and concerns of community e.g. odour.	Cross-referencing of plant operation generated reports against DOE reports. Compare performance to baseline predictions in PDD & EIA. If possible, employ third-party examination of environmental components not required for monitoring by the EMP (soil elusion) Surveys and interviews with stakeholders using questions to gauge direct and indirect impacts resulting from the project (e.g. if there was an increase in income from greater economic activity, how was this spent?)	Risks: Change in policy and environmental standards; Environmental/natural disasters like floods, earthquakes, etc. Economic factors or policies might alter the required amount and flow of inputs and therefore outputs. Predicted and forecasted impacts of simulated models beyond expectations. Reactions and opinions of local and global community.
Activities: (1) Processing of cassava into bioethanol. (2) Sale of bioethanol.	(1) Production is as predicted 200,000 litres/day of bioethanol from 500 tons of cassava chips. (2) Domestic supply of bioethanol of 11.3 million litres/day will exceed domestic demand of 2.4 million litres/day and excess exported to Singapore (48%) and EU (33%) within price range used for sensitivity analyses.	(1) Plant production reports. (2) Plant reports on sales, government reports and external sources for prices of bioethanol and cassava.	(1) Economic or policy factors do not push production requirements outside the bounds of sensitivity analyses used in Project Appraisal Document. e.g. price of inputs (cassava chips) and price of bioethanol; supply/demand for cassava and bioethanol.

Appendix II: Appreciative Project Inquiry

Design Phase Stakeholders – we will contact:

- John Morton (original project manager for the WB) to ensure we have accurately gauged the WB's reasons for involvement; our understanding of the project goal in our log-frame is correct; ascertain the reasons behind the WB signing an ERPA contract (for reducing 375,000 tCO_2e from 2010-2012) as opposed to a longer term. Why did the WB feel supporting Sapthip in particular could promote the WB's mission? What trepidations did the WB have? How did the WB build on lessons learned from similar previous projects?
- Waraporn Hirunwatsiri (current task manager for the WB) to see if WB's priorities changed over time and project implementation.
- Netherlands CDM Facility to determine why they did not ultimately become CDM project participants.
- Dutch Carbon Fund to determine the organization's motivations for choosing Sapthip's project over other possibilities; any reservations they may have had; any concerns they may have raised, if these were addressed and if so how?
- Sapsathaporn Group as parent company of Sapthip what were its hopes and motivations for establishing Sapthip. What were its perspectives regarding including the CDM components? Did it have any prior experience with CDM projects and what factors motivated it towards including these components?
- Sapthip's representative in charge of producing the PAD and negotiating the ERPA to ensure consistency of project's purpose in the log-frame as well as our listed outputs. What were its primary motivating factors for including the CDM components? What reservations of fears did it have? Also their feelings regarding changes in the original and signed ERPA contract length.
- Southeast Asia Technology Co., Ltd.'s team which conducted the EA to verify the sensibility of the listed outputs in our log-frame.
- Biogas Forerunner Co., Ltd. responsible for design, construction, management, training of staff, start-up and first 2 years of wastewater system's operations.

- Government agencies to determine the extent political institutions were consulted and considered; the degree of influence and support for the project.
- Local community to determine the extent community members' concerns and feelings were taken into account in project design.

Implementation Phase Stakeholders – we will contact:

- Waraporn Hirunwatsiri (current task manager for the WB) regarding WB's view of project implementation: efficiency, impact, governance, successes, and challenges? Do operations meet design expectations? How has project affected beneficiaries? How can this be improved? What changes can be made? What is the greatest threat to the continued success of the project especially once the ERPA reaches its end? Is the project a worthwhile investment and what changes would you recommend for the implementation of similar projects?
- Dutch Carbon Fund to determine the organization's motivations for choosing Sapthip's project over other possibilities; any reservations they may have had; any concerns they may have raised, if these were addressed and if so how.
- ERM Certification and Verification Services Limited, which is the DOE for verifying CDM requirements have been met for CERs, regarding any challenges or positive findings from the project; responsiveness of feedback and suggestions; threats to continued success of the project.
- Sapthip's management and employees regarding project implementation: operations, efficiency, impact, governance, successes, challenges. If the training they received was effective and any changes or suggestions they might have. What is the greatest threat to the continued success of the project especially once the ERPA reaches its end? Where has Sapthip turned to for support?
- Sapsathaporn Group: were its hopes or fears realized? If performance has fallen short of expectations, what plans or strategies can be used to promote Sapthip's success? Where can Sapsathaporn turn to for support?
- Biogas Forerunner Co., Ltd. regarding how project operations, efficiency, impact, and governance meet design expectations. What were some of the successes,

and challenges? Looking back what kind of changes could be implemented? What were some positive/negative surprises? How have suggestions made by Biogas Forerunner been received by project implementers? How has Biogas Forerunner received and implemented suggestions from other stakeholders? What is the greatest threat to the continued success of the project especially once the ERPA reaches its end?

- Government and local community: how expectations, hopes and fears from changed from project inception to implementation. Particularly participants involved in the opinion and community views survey identified in the EA. How has the project impacted the daily lives of citizens and in turn the government's ability to meet its responsibilities?

Appendix III: Possible Examples of Projects as Sources for Benchmarking Criteria (Basis for SWOT Analysis)

Biogas Sector Partnership Nepal (BSP-Nepal) (2006). *Annual Emission Reduction Report for Project Activity 2 of CDM Project in Biogas Support Programme of Nepal: CDM Project Reference No: 0139 Monitoring Period: 1st August 2005 to 19th October 2006.* Submitted to World Bank. Source: http://cdm.unfccc.int/filestorage/V/J/3/VJ3WRU9I7ODX0IFIFPNBQASKBZYHVH/Revised%20verification%20and%20certification%20report.pdf?t=MUF8bHZubzBmfDCSGs71fJx07AVXYGmfpl41

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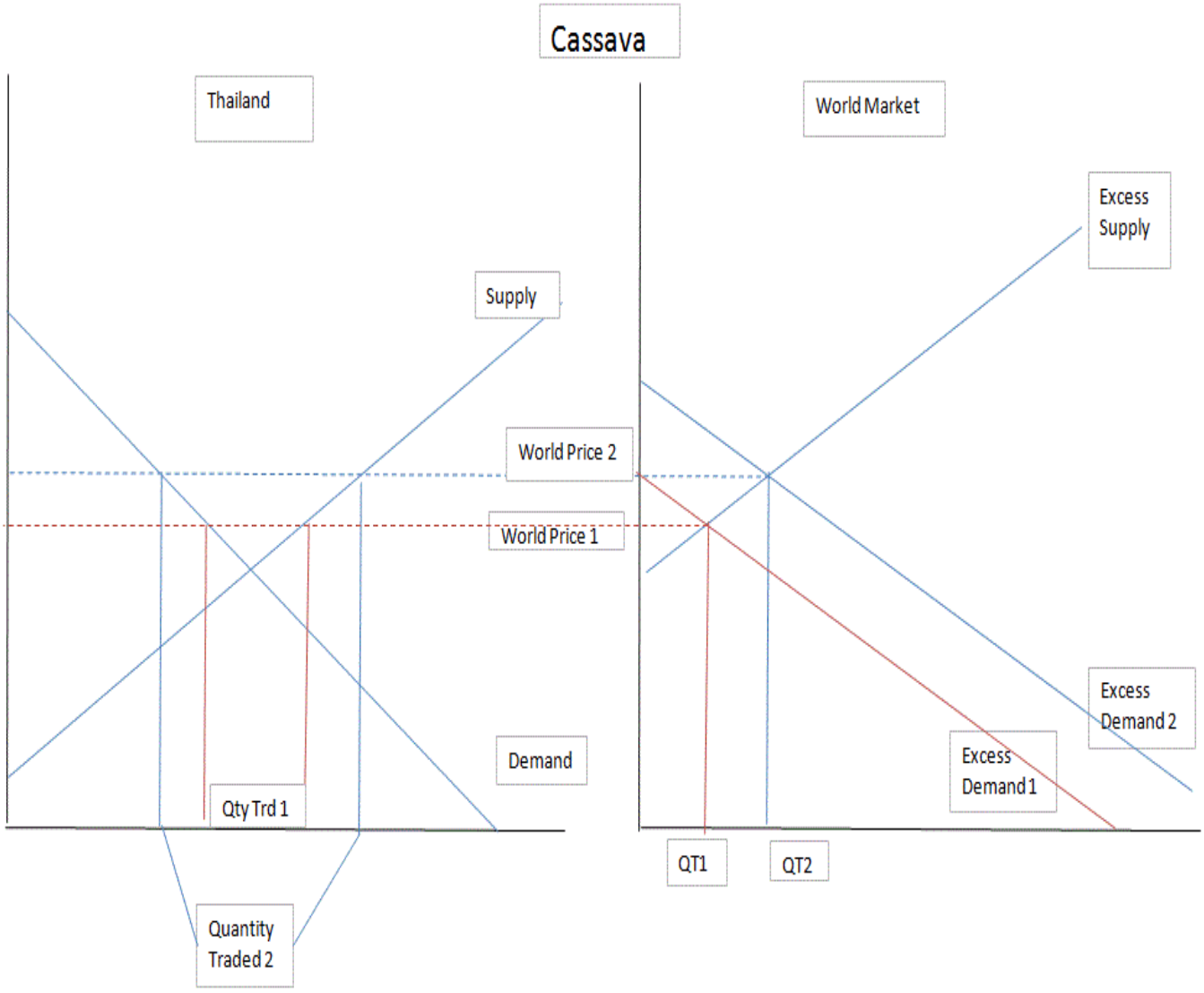
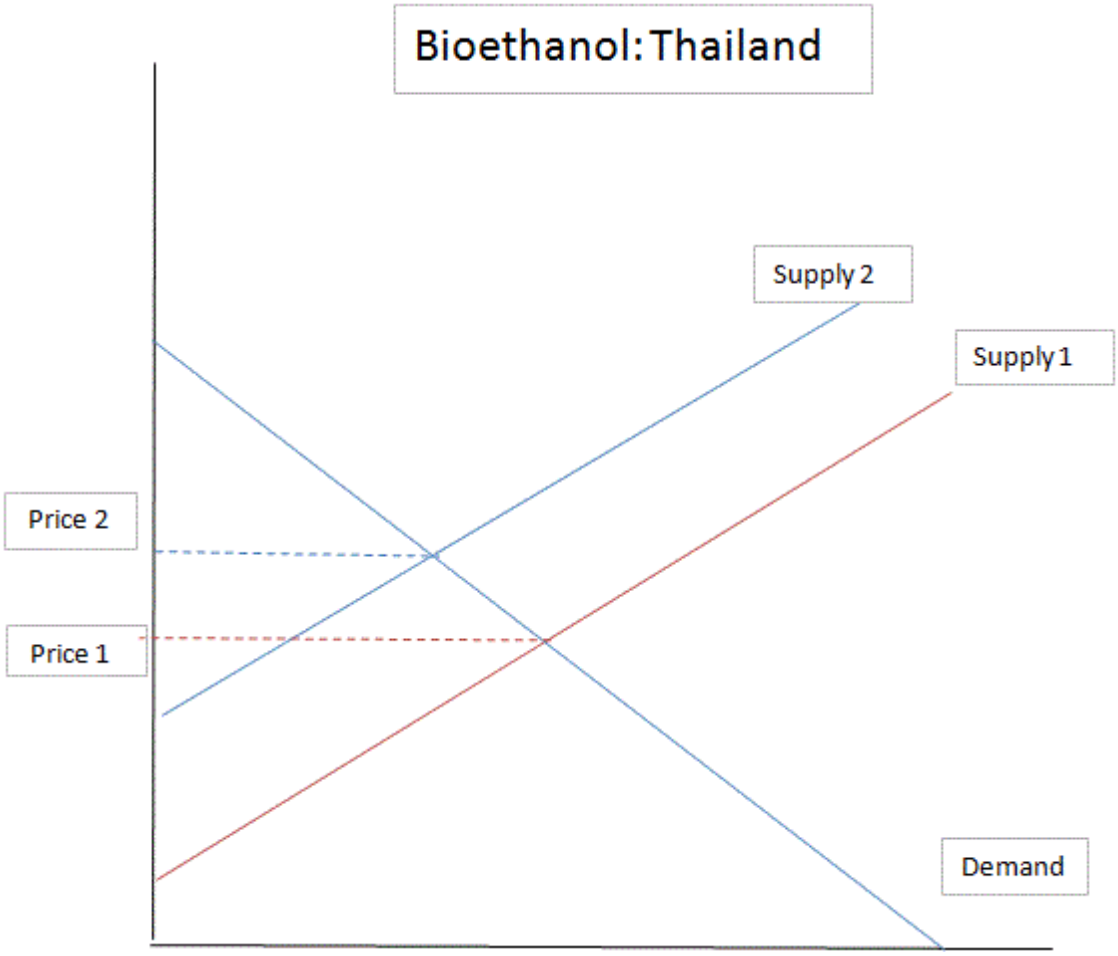
Appendix IV: Examples of Economic and Policy Analysis Tools/Models



Thailand is one of the largest producers and exporters of cassava in the world. If global demand for cassava rises (Excess Demand 1 increases to Excess Demand 2) the price of cassava will rise (from World Price 1 to World Price 2) thereby increasing Thailand's incentive to export more cassava. Quantity traded will increase from QT1 to QT2.

As the main input into the production of bioethanol, the increase in cassava price will decrease production and shift the supply curve to the left from Supply 1 to Supply 2 (depicted below):



Subsequently the price of Thailand's bioethanol will rise from Price 1 to Price 2 leading to a decrease in quantity demanded. Further, this increase in price makes Thai bioethanol less attractive to foreign markets who would then reduce demand.

Some possible policy solutions include:

1. Reducing exports of cassava by imposing an export tax or export quota which would increase the domestic supply of cassava for bioethanol processors at a lower price. Although this might harm cassava farmers and cassava processors, foreign countries that import Thai cassava chips might be using this product to produce bioethanol. In which case the reduction in availability of cassava chips could encourage these countries to import bioethanol from Thailand instead.
2. Imposing export subsidies for bioethanol or a price support through deficiency payment.