

**PROJECT INFORMATION DOCUMENT (PID)  
APPRAISAL STAGE**

<b>Project Name</b>	Thailand: Small Scale livestock Waste Management Program
<b>Region</b>	East Asia and Pacific
<b>Sector</b>	Renewable Energy (70%), Sewage (20%), Animal Production (10%)
<b>Project ID</b>	P112092
<b>Borrower</b>	N/A
<b>Implementing Agency</b>	Energy Research and Development Institute (ERDI), Chiang Mai University
<b>Environment Category</b>	<input type="checkbox"/> A <input checked="" type="checkbox"/> B <input type="checkbox"/> C <input type="checkbox"/> FI <input type="checkbox"/> TBD (to be determined)
<b>Date PID Prepared</b>	June 12, 2009
<b>Date PID Updated</b>	
<b>Date of Appraisal Authorization</b>	May 20, 2009
<b>Date of Board Approval</b>	Not Applicable

### 1. Key Development Issues and Rationale for Bank Involvement

The World Bank has been a pioneer in the carbon market under the Kyoto Protocol, helping to develop policy, regulatory, fiscal, and financial instruments across sectors and countries to generate incentives to reduce GHGs. Over the past decade, the World Bank has managed twelve Carbon Funds including the Carbon Fund for Europe, which became operational in March 2007. These Carbon Funds do not finance investment in projects, but contract to purchase CERs in commercial transactions, with annual or periodic payments following verification by a third party auditor. These transactions have provided an additional revenue stream to reduce financial risks and to leverage new private and public investment into projects that reduce GHG emissions. The CERs in this CFO will provide not only a revenue stream, but a market-based incentive to the participating farms to support and improve their livestock waste management practices.

Support for client countries to address the objectives of international environmental conventions such as the Kyoto Protocol is an identified priority in the World Bank's Environment Strategy and was reaffirmed in the 2005 Environment Strategy for the East Asia and Pacific Region. The World Bank has supported Thailand's environmental sustainability objectives for many years, and is also associated with a major programme of environmental cooperation including Analytical and Advisory Activities. The objective of this CFO is consistent with the Country Development Partnership – Environment (CDP-E) Phase II (2008-2010)<sup>1</sup> for Thailand supporting the Water Quality

<sup>1</sup> The World Bank and the Ministry of Natural Resources and Environment (MoNRE) have been working together to support the goals and programs of the Country Development Partnership – Environment (CDP-E). The development of the Phase II of CDP-E is based on the successful relationship between Thailand and the World Bank during the CDP-E Phase I (2004 -2007). Some of the topics identified in CDP-E 1 remain valid such as (i) Water quality and community-based river basin management; and (ii) Waste

and Waste Management themes (especially from livestock waste management) as well as Climate Change, which the CDP-E Phase II has identified as an emerging issue and a main thematic area.

The World Bank, as a trustee of various Carbon Funds, has undertaken a pioneering role in developing the CDM market in Thailand, including awareness raising, capacity building and an emerging portfolio of CDM projects. The World Bank has played a key role in the development of other programmes that seek to improve conditions in the livestock sector in Thailand, e.g. the Livestock Waste Management in East Asia Project (LWMEA).<sup>2</sup>

This Project plays an important role in demonstrating the potential for such renewable energy projects and the use of market mechanisms such as the Kyoto Protocol's Clean Development Mechanism to promote them. The proposed Project is the first programmatic CDM project in Thailand. Programmatic CDM is also called Programme of Activities, which consists of the following characteristics: (a) using a single set of CDM methodologies to declare and manage carbon credits in multiple locations; (b) multiple project participants can join individually or as a coherent group of activities over the life-time of the POA; and (c) each activity or group of activities – also known as a CDM Programme Activity (CPA) – has its own crediting period. However, each CPA must follow the project design and the methodology (or methodologies, in the case of small scale projects) that are defined by the PoA as eligible for this PoA; therefore, each project and each CPA that is added to the PoA must have the same or very similar characteristics.

## **2. Proposed Objectives**

The Project development objectives are to (a) reduce methane emissions from improved livestock waste management practices through a carbon finance transaction between the World Bank and the Project sponsor, and (b) serve as a demonstration for future programmatic CDM activities in Thailand. The Project aims to improve livestock waste management practices and take advantage of the captured renewable energy in the form of biogas at participating farms.

## **3. Preliminary Description**

This CFO is composed of three Project components which are described below:

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management (especially livestock waste management). The CDP-E Phase II (2008-2010) will address other emerging issues like Climate Change as well as continue with the key topics identified during Phase I.

<sup>2</sup> In 2006, the Bank approved a Global Environment Facility grant of US\$7 million to support the improvement of livestock waste management for Thailand, China and Vietnam under the International Water window. The LWMEA project supports a comprehensive approach to reduce the major negative environmental and health impacts of rapidly increasing concentrated livestock production on water bodies and the people of East Asia. Its global environment objective is to reduce livestock-induced, land-based pollution and environmental degradation of the South China Sea where the three countries are a part of.

**Component A: Construction of Livestock Waste Management Facilities.** This CDM Project proposes to use Chiang Mai University-Channel Digester (CMU-CD)<sup>3</sup> technology to produce biogas for electricity generation, cooking and heating at all participating farms. The targeted farm size will range from 2,000 to 150,000 SPPs with a minimum of 300 m<sup>3</sup> wastewater treatment system to be installed.

GHG ERs will be achieved from the offset of baseline livestock waste management (open anaerobic lagoon) emissions. Table 1 shows the Project's SPP and the estimated ERs by farm. The average amount of ERs per year over 10 years is 234,000 tCO<sub>2</sub>e. The estimated annual ERs for the first CPA are 55,774 tCO<sub>2</sub>e. This amount is subject to verification of actual SPP of each participating farm. All required information of the three pig farms in the first CPA has been provided in the mini-Project Implementation Plan (PIP) for each participating farm submitted to the World Bank on May 27, 2009. Annex 3 shows a Table of Content of the actual mini-PIPs submitted and a summary of the main characteristics of these mini-PIPs. This format will be followed by other CPA farms.

**Table 1: Participating Farms**

CPA No.	No. of farms	Name of Participating Farms	Province	No. of Pigs (SPP)	Estimated ERs/year (tCO <sub>2</sub> e)
CPA1	3	Chokchaikansukorn Farm	Nakorn Ratchasima	30,000	18,063*
		Laemthong Hybrid Co., Ltd (Wang Noi Farm)	Ayutthaya	30,000	19,122*
		Khana Hybrid Co., Ltd (Phanom Sarakham)	Chachoengsao	30,000	18,589*
		<b>Subtotal</b>		<b>90,000</b>	<b>55,774</b>
CPA 2	7	Betagro 5	Lop Buri	24,000	9,600
		Thai SPF3/2	Prachin Buri	12,000	4,800
		Thai SPF3/1	Prachin Buri	8,000	3,200
		Nathaphong	Tak	7,200	2,880
		Kamolchat	Tak	4,800	1,920
		Boonyanuch	Suphan Buri	10,000	4,000
		Pho	Lop Buri	32,000	12,800
<b>Subtotal</b>		<b>98,000</b>	<b>39,200</b>		
CPA3	8	Damaphong	Chaiyaphum	10,000	4,000
		Phanatpokphan swine farm Co., Ltd. 1	Chon Buri	12,000	4,800
		Phanatpokphan swine farm Co., Ltd. 2	Chon Buri	12,000	4,800
		Phanatpokphan swine farm Co., Ltd. 3	Chon Buri	12,000	4,800
		Chaiyasit farm 1	Khon Kaen	13,000	5,200
		Chaiyasit farm 2	Nakorn Ratchasima	13,000	5,200
		Agrifeed and livestock	Ratchaburi	15,000	6,000
		Maneerat	Ratchaburi	30,000	12,000
<b>Subtotal</b>		<b>117,000</b>	<b>46,800</b>		
CPA4	1	Veerachai4	Ratchaburi	150,000	56,566
<b>Subtotal</b>				<b>150,000</b>	<b>56,566</b>
CPA5	8	Kanjanakul	Kanchanaburi	9,000	3,600
		Thanapan	Ratchaburi	11,000	4,400
		Kaopeenong	Ratchaburi	8,000	3,200
		Atchara	Chon Buri	5,000	2,000
		Sombat	Kanchanaburi	6,000	2,400
		Kiattisak	Kanchanaburi	10,400	4,160
		Arunee	Suphan Buri	8,000	3,200
		Betagro 1	Nakorn Ratchasima	12,000	4,800

<sup>3</sup> The CMU-CD system was developed by ERDI and has been installed successfully in over 200 medium and large scale pig farms in Thailand since 2004.

CPA No.	No. of farms	Name of Participating Farms	Province	No. of Pigs (SPP)	Estimated ERs/year (tCO <sub>2</sub> e)
		<b>Subtotal</b>		<b>69,400</b>	<b>27,760</b>
CPA6	9	Kittitat	Ratchaburi	7,000	2,800
		Somsit	Ratchaburi	7,200	2,880
		Veena	Chon Buri	4,000	1,600
		Aumporn	Nakornnayok	5,000	2,000
		Chuensuk	Nakornnayok	8,500	3,400
		Duangjai	Chon Buri	4,000	1,600
		Duangchai	Chon Buri	3,500	1,400
		Sukstien	Chon Buri	4,500	1,800
		Nukul	Rayong	5,000	2,000
		<b>Subtotal</b>		<b>48,700</b>	<b>19,480</b>
<b>TOTAL</b>	<b>36</b>			<b>573,100</b>	<b>245,580</b>

- For CPA1, data is from Mini-PIP
- Estimate weight of pig around 60 kg per head
- Biogas rate is LU x 1.0 m<sup>3</sup>/day, % Methane is 60%

Component activities include (a) installation of anaerobic wastewater treatment systems; (b) installation of monitoring equipment and devices; and (c) implementation of an environmental management and indigenous people plan during construction and operation phases. A detailed Project technical description is provided in Annex 1. A complete technical description of these activities and the subsequent ERs are included in the CDM Programme Activity Design Document (CPA-DD) for CPA1.

- The CMU-CD system is a concrete tank structure, where both the channel digester and up-flow anaerobic reactor are housed and are covered with a flexible top to store biogas. Electricity will be generated by using biogas produced from the anaerobic process and combusted in an internal combustion engine and generator set. The number, size, and capacity of generators vary by farm but all electricity generated is expected for on-farm consumption except Veerachai4 farm (CPA4) where the farm owner intends to sell some of its electricity generated to the local grid. The electricity output is expected between 87 to 95 percent of the engines rated capacity. Flaring devices will be installed at farms to avoid venting of biogas when engines are repaired or serviced and provide a level of farm safety as biogas is flammable.
- Monitoring equipment and devices consisting of largely biogas flow meters and groundwater sampling wells will be installed for monitoring purposes. Remote data acquisition devices will also be installed at each participating farm and at ERDI to transmit certain key operating data e.g. pH, gas production rate, and wastewater flow readings as an early warning system.

**Component B: Carbon Finance Transaction.** The CDM enables the creation, issuance, and sale of CERs from projects undertaken in non-Annex I countries<sup>4</sup> that reduce emissions of GHGs. This component will facilitate the purchase and transaction of CERs from the participating farms through several CPAs. The transaction will be between

<sup>4</sup> Under the Kyoto Protocol, governments are separated into two general categories: developed countries, referred to as Annex 1 countries (who have accepted GHG emission reduction obligations); and developing countries, referred to as Non-Annex 1 countries (who have no GHG emission reduction obligations and must submit an annual greenhouse gas inventory).

ERDI (serving as the Project sponsor) and the World Bank. The terms and conditions will be agreed in the Emission Reduction Purchase Agreement (ERPA) to be signed by the two parties. The purchase will be a performance-based contract under which payments are triggered by successful registration with the UNFCCC, verification of the reduction of GHG emissions by an independent, accredited international entity, i.e. Designated Operational Entity (DOE)<sup>5</sup>, and issuance of the CERs by the UNFCCC under the CDM rules. The quantity of CERs to be contracted, the length of time over which the purchase will be made, and the price to be paid will be agreed between the World Bank and ERDI during ERPA negotiations. According to ERDI's agreement with the farms, the CER revenues will be electronically transferred to the farms' account within 30 working days after ERDI receives the payment from the World Bank. In addition, as part of its responsibilities, the World Bank will ensure registration of the Project with the CDM Executive Board.

**Component C: Capacity Building.** Participating farms will be responsible for operating and monitoring the livestock waste treatment systems on their own farms as required under the CDM with technical assistance provided by ERDI and ERDI's consultants. ERDI will provide a capacity building program for the participating farms including: (a) training on the operation of anaerobic wastewater treatment system; (b) training on the handling of monitoring data; (c) ensuring training for operation and maintenance in close cooperation with suppliers of the generators and monitoring equipments.

ERDI will also conduct a training program for its staff and consultants who will work throughout the country transferring ERDI's technical know-how, good operation practices of anaerobic wastewater treatment system and managing of monitoring and evaluation plan in a proper and systematic approach. A capacity building strategy has been prepared by ERDI.

#### **4. Financing**

The financing plan is based on total Project costs for all 36 farms. Participating farms of the first CPA are expected to use about 40% debt financing, while the remaining 60% is equity financed including about 10 percentage points to be financed by Energy Conservation Fund of Thailand (known as EPPO) as a subsidy through EDRI. The debt financing through local banks has a 7 year maturity at 8% interest rate per annum. Project financing under subsequent CPAs is expected to follow a similar debt-equity pattern. However, EPPO subsidy is expected to be available for most CPA2 farms only.

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<sup>5</sup> All DOEs have to be accredited by the CDM Executive Board (EB); they have two basic functions: 1) to validate compliance of a proposed CDM project activity and the related project design document (PDD) with applicable CDM rules and modalities; and 2) to verify compliance of the project with the registered PDD and the amount of the emission reductions the activity has generated .

## 5. Safeguards Policies that Might Apply

This Project triggers the World Bank’s Environmental Assessment policy (OP/BP 4.01) and Indigenous Peoples policy (OP/BP 4.10) and was assigned a Category B as the potential negative environmental and social impacts of the Project are site-specific and manageable with the proposed mitigation measures. Table 2 below lists the applicable World Bank’s safeguard policies.

**Table2: Safeguard Policies**

<b>Safeguard Policies Triggered by the Project</b>	Yes	No
<a href="#">Environmental Assessment (OP/BP 4.01)</a>	[X]	[ ]
Natural Habitats ( <a href="#">OP/BP 4.04</a> )	[ ]	[X]
Pest Management ( <a href="#">OP 4.09</a> )	[ ]	[X]
Physical Cultural Resources (OP/BP 4.11)	[ ]	[X]
Involuntary Resettlement ( <a href="#">OP/BP 4.12</a> )	[ ]	[X]
Indigenous Peoples ( <a href="#">OP/BP 4.10</a> )	[X]	[ ]
Forests ( <a href="#">OP/BP 4.36</a> )	[ ]	[X]
Safety of Dams ( <a href="#">OP/BP 4.37</a> )	[ ]	[X]
Projects in Disputed Areas ( <a href="#">OP/BP 7.60</a> )*	[ ]	[X]
Projects on International Waterways ( <a href="#">OP/BP 7.50</a> )	[ ]	[X]
Piloting the Use of Borrower Systems to Address Environmental and Social Issues in Bank-Supported Projects (OP/BP 4.00)	[ ]	[X]

**Environmental Analysis.** An Initial Environment Evaluation (IEE) report was prepared to assess the environmental impact of the Project, while incorporating social considerations and containing an Environment Management Plan (EMP). The IEE report is considered a “Framework” to serve as the basis for preparation of individual specific action plans at each farm (sub-project site). The individual action plans have been prepared for the participating farms under the first CPA which identified a mechanism to provide training for the participating farms and a tool for ERDI to monitor the implementation of the action plan. Implementation of the respective action plans will be funded by the participating farms while training will be funded by ERDI and/or through its consultant teams.

Overall, this Project will contribute to reducing environmental impacts associated with the current pig farm operations (methane and odor generation from the open lagoons) and will significantly benefit local communities and nearby residential areas. No major negative environmental impacts are envisaged. The Project has been designed to use appropriate technology that is internationally acceptable to maximize the capturing of

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\* *By supporting the proposed project, the Bank does not intend to prejudice the final determination of the parties' claims on the disputed areas*

methane and to reduce potential negative impacts on the environment due to noise, disposal of wastes, etc. To ensure effective mitigation of the remnant environmental impacts, this Project triggers the World Bank's Environmental Assessment Category Policy (OP/BP 4.01) and was assigned a Category B, where negative environmental impact can be mitigated. The proposed mitigation measures are found satisfactory to the Bank.

**Social Analysis.** Based on the Project design, field visits, discussion with various stakeholders including participating farms, Government, NGO, research institutes, consultants and information provided, the World Bank team concluded that none of the World Bank's policies on Indigenous Peoples (OP/BP 4.10), Involuntary Resettlement (OP/BP 4.12), and Physical Cultural Resources (OP/BP 4.11) is triggered under the construction of the waste management facilities for the first CPA farms. Civil works under the Project will require land, but all participating farms have their own existing open lagoons and available land space for construction. Thus land acquisition is not an issue for the first CPA farms. To ensure that this issue will not be encountered for future CPA farms, the following eligibility criteria have been adopted: (a) the owner of the Project has rightful ownership of the land; and (b) there are available spaces for the new treatment system at existing land without involuntary resettlement and/or land acquisition. Therefore the World Bank Policy on Involuntary Resettlement (OP/BP 4.12) is not triggered for this Project.

Despite the fact that no indigenous people is affected at the participating farms under the first CPA, it is however agreed that the World Bank policy on Indigenous Peoples (OP/BP 4.10) will be applied given a wide coverage of the Project areas where indigenous people communities might be affected. The client has developed the Indigenous People Planning Framework (IPPF) to provide guidance for the development of an Indigenous People Plan (IPP) at the farm level during the life of the Project. The IPPF was reviewed by the World Bank and found to be satisfactory. This IPPF will be applied for the whole life of the Project and the IPP will be developed for any farm included in future CPAs where Indigenous Peoples policy is triggered.

**7. Contact Point:**

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