OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

23358

Final Report

Under contract No. 16001097 between the United Nations Industrial Development Organization (UNIDO) and Vietnam Cleaner Production Centre (VNCPC)

For the provision of services relating to the:

Support for the Development and Uptake of CDM projects in the Industrial Sector: Pilot Project in Co-operation with the Austrian Industry

Submitted to
United Nations Industrial Development Organization (UNIDO)

by
Vietnam Cleaner Production Centre
Hanoi, Vietnam

December 2006

Table of Contents

List of Abbreviations

CDM	Clean Development Mechanism
DNA	Designated National Authority
IET	International Emission Trading
JI	Joint Implementation
KP	Kyoto Protocol
MOI	Ministry of Industry
MONRE	Ministry of Natural Resources and Environment
MPI	Ministry of Planning and Investment
PDD	Project Design Document
PIN	Project Idea Note
RCEE	Research Center for Energy and Environment
UNFCCC	United Nations Frame Convention on Climate Change
UNIDO	United Nation Industrial Development Organization
VNCPC	Vietnam Cleaner Production Centre

1. Introduction

This project was a cooperative undertaking between UNIDO and Austrian business as well as industry and government institutions engaged in managing climate change and Kyoto Protocol-related activities. Its main goal is to pilot the promotion of new and innovative partnerships that will facilitate the development and implementation of successful CDM projects.

The project aimed at providing:

- A CDM project development process that connects to an investor, technology and related service providers and a carbon buyer and helps host country parties to learn and understand their interests and needs;
- A structured quality control process and technical assistance for development of CDM projects;
- Reduction of early project risks and transaction costs;
- Support for the DNA approval process;
- "Buyer ready" project documentation (PIN/PDD level).

The project will: 1) develop and strengthen national capacities for preparing high quality CDM projects in the host countries; 2) facilitate partnerships between Austrian business and industry that provide technology, expertise and financial services for and project developers and proponents in the host countries; 3) promote the entry of the CDM projects into the 'carbon project pipeline' through the Austrian CDM/JI Programme.

Objectives of the project

The immediate objectives of the project are to facilitate capacity building in project host countries and to facilitate partnerships with Austrian technology and service providers that would help to unlock the potential of the Clean Development Mechanism in the industrial sector of the participating countries. The forthcoming activities and the outputs will therefore be structured around specific technologies available from Austrian industry and project types that also represent the priorities of the participating countries (Mexico, South Africa and Vietnam).

In Vietnam, it is also the objective of this project to fully engage the VNCPC in CDM activities and to provide the necessary skills upgrade and "learning-by-doing" opportunities to facilitate the entry of the VNCPC into the carbon services market.

As VCPC has developed technical expertise in industrial environmental management and because of the continuous involvement in cleaner production projects at the national level, the objective of engaging VNCPC in this project is to augment its expertise and extend its services to industry in the area of carbon asset generation. This will help industry to fully benefit from the emerging opportunities under the CDM, thereby increasing Vietnam's potential to generate certified emissions reductions (CERs).

It is expected that, after project implementation, the VNCPC will be better equipped to contribute to the development of national CDM project portfolios and to support local institutions and industry in this process. Thus the participation of the VNCPC is expected to add to the overall sustainability and success of the project.

About Vietnam Cleaner Production Centre

The Vietnam Cleaner Production Centre (VNCPC) was established in 1998 within the framework of the UNIDO/UNEP National Cleaner Production Programme, sponsored by the Swiss Government through the State Secretariat for Economic Affairs (SECO). It acts as a centre of excellence and advocacy in the field of Cleaner Production (CP). Since 1998, the Centre has helped create public awareness for greener production through seminars in 19 cities and provinces, attended by a total of over 1,700 participants; it has delivered more than 5,000 person-days of training, introduced CP in the curriculum of five national universities, and coached over 100 future consultants in sector-specific CP assessment. The VNCPC has also conducted over 100 in-plant assessments in the textile, pulp and paper and metal industrial sectors. By now, the participating enterprises have invested between them US$ 1.15 million in the implementation of CP recommendations. This outlay has helped the firms cut their combined yearly costs by an estimated US$ 6 million. Moreover, in the period of 2004-2005, VNCPC has implemented Energy efficiency (CP-EE) programmes under the framework of UNEP projects. The CP-EE programmes have had remarkable results with the participation of 20 industrial companies, total annual savings from energy efficiency of 1.14 million USD and the reduction of 460,000 tons CO_2 emissions through reduction of energy consumption .

Since the beginning of 2005, the VNCPC has entered a new phase of development, aiming at promoting new services. The objective is to improve the eco-efficiency and the corporate social responsibility of enterprises using instruments such as Cleaner Production (CP), Environmentally Sound Technology (EST) transfers or social services, taking into account supply chain constraints. This includes activities in the promotion of multilateral environment agreements such as the Kyoto Protocol on the reduction of Greenhouse Gases emissions, the Stockholm Convention on Persistent Organic Pollutants or possibly the Basel Convention on hazardous waste.

2. Project activities implemented by VNCPC within the UNIDO CDM project framework

VNCPC's participation in the UNIDO CDM project discussed here represented its first formal activities in the field of CDM. UNIDO wanted to engage with VNCPC in this CDM project because VNCPC has developed technical expertise in industrial environmental management and because of its continuous involvement in cleaner production projects at the national level. The second objective of the centre's involvement in the project was to augment its expertise and extend VNCPC's services to industry in the area of carbon asset generation.

VNCPC's activities in the framework of this UNIDO project can be described as as follows:

2.1 Organization of and participation to the CDM training course "PDD development and baseline analysis, including training on using UNIDO methodology and COMFAR for preparation of CDM projects".

The training report including the course's objectives, contents, international lecturers, guests, participants and the learner's evaluation is attached in the Appendix 1 of this report.

One of the objectives of the UNIDO CDM project is to improve the capability of VNCPC as well as other relevant agencies in Vietnam in the CDM activity implementation. The Training course "PDD development and baseline analysis, including training on using UNIDO methodology and COMFAR for preparation of CDM projects" was held with this purpose from 26 to 30 June 2006 in Hanoi, Vietnam.

The training course consisted of 2 main parts. The first part took place on 26 and 27 June 2006 and equipped the participants with practical information and tools for the implementation of the Clean Development Mechanism (CDM) and the development of CDM projects. The second part was implemented from 28 to 30 June 2006 and focused on the introduction and application of COMFAR III. This software facilitates economic-financial feasibility analyses for investment project, including CDM/JI projects.

The course was conducted by international experts with considerable experience on Kyoto protocol and on the CDM.

As the main objective of the training course was to improve capacity of CDM implementation in Vietnam, participants were:

- Service providers who will be acting as project developers in the future, including research and consultancy institutions like VNCPC, the Research Centre for Energy and Environment (RCEE) etc.;
- Government agencies related to CDM such as the Vietnam Designated National Authority (DNA), MOI, MPI; and
- Industrial sub-sectors: companies and corporations that can apply CDM in their future investment plans.

2.2 Development of a portfolio of PINs

In line with its CP expertise, VNCPC then focused its activities in CDM on industry-related projects. Many options have been suggested during VNCPC's CP and Energy efficiency assessments in enterprises nationwide to improve their production efficiency and reduce GHGs emission. However, in most cases, the GHGs reduction was not sufficient for CDM application. The reason is that mainly low-cost options have been implemented due to a lack of investment capital. Indeed, the enterprises that participated in CP assessments are mostly small and medium scale ones and their financial capabilities for clean technology investment are limited. Moreover, even if they change their technology, the potential for greenhouse gases reduction is quite limited (less than 15,000 tons CO_2 per year) and the transaction costs for CDM too high compared to the potential benefits.

For that reason, we have searched for potential CDM project ideas from all enterprises throughout the country, not only from enterprises that had previously performed a CP assessment with the centre. Five companies were thus selected based on their CDM potential and the related PINs developed.
The PINs' informations are listed in the Table 1 below.

Table 1: The potential CDM Project Idea Notes developed by VNCPC

No	Project Idea	Description	Place of implementation	Capacity/Potential of CO2 equ. reduction
1	Building a waste treatment plant to minimize landfill disposal at Son Tay town, Ha Tay province, VIETNAM, including waste recycling, composting and energy regeneration	A project including process of: waste recycling, compost fertilizer production and energy recovery.	S n Tây town Hà Tây province.	Capacity: 200 tons of waste per day (~ 73,000 tons per year). It is equivalent to the daily collected waste of the S n Tây town and surrouding area. - CO_2 eq reduction: 38,674 tons/year - Period 2008 – 2012: 193,370 tons
2	Switch from FO to natural gas in Hiep Phuoc IPP Power plant	Switch from FO to natural gas by installing a new gas titanium burner, a gas pipeline, a pressure reducing station and part of the control system	Hiep Phuoc power plant, Dong Nai province	Capacity 375 MW, annual electricity output 1.5 bil. kWh, FO consumption is about 400,000 tons/year - CO_2 eq reduction: 258,014 tons/year - Period 2008 – 2012: 1,290,068 tons
3	Rice husk burning for electricity and steam cogeneration in Thot Not District, Can Tho Province.	Install Cogen. station using rice husk from rice husk peeling stations	Thot Not District, Can Tho Province.	Have potential to install a Cogen. station with the capacity of 2.5-3 MW. - CO_2 eq reduction: 22,976 tons/year - Period 2008 – 2012: 114,880 tons
4	Building a new and modern biomass boiler in Bai Bang Pulp and Paper Company	Building a new and modern biomass boiler in Bai Bang Pulp and Paper Company	Bai Bang Paper Company, Phong Chau, Phu Tho Province.	- CO_2 eq reduction: 40,010 tons/year - Period 2008 – 2012: 200,050 tons
5	The investment of energy efficiency and cogeneration system in Sao Vang Rubber Company	✓ Install Cogen. system ✓ Improve energy efficiency of thermal network.	Sao Vang Rubber compay, 23 Nguyen Trai, Thanh Xuan, Ha Noi.	Energy consumption: P= 3.000 kW, E= 20 mil. kWh; Steam: 30 tons/h, T=250^{0}C, p= 10 bar, h = 7.000 h/n. With the boiler modification, the Cogen. capacity can be 2 MW.

No	Project Idea	Description	Place of implementation	Capacity/Potential of CO2 equ. reduction
				- CO_2 eq reduction: 9,600 tons/year - Period 2008 – 2012: 48,000 tons

The full contents of these PINs are shown in Appendix 2. As required by the project, these PINs are developed according to the UNIDO's standard form.

2.3 Preparation of one PDD

In cooperation with the national and international experts, VNCPC in a second stage selected the PIN with highest potential, namely "*Building a waste treatment plant to minimize landfill disposal at Son Tay town, Ha Tay province, Vietnam, including waste recycling, composting and energy regeneration*", for PDD development. This PDD was made based on the standard form on PDD. This form is available on the website http://cdm.unfccc.int/methodologies according to the instructions of CDM Executive Board (see the full contents of the PDD in Appendix 3). The elaboration of actual PDDs is essential in the development of the relevant skills within VNCPC for the identification and preparation of CDM projects, as the Clean Development Mechanism is still a new concept not only to VNCPC but also to most consulting agencies and companies in Vietnam. The continuous development and identification of CDM projects will create favourable conditions for companies to invest in world-class technologies and for VNCPC and other consulting agencies to sell their services.

2.4 Establishment of relationship with related CDM organizations

VNCPC has established coordination and cooperation arrangements with appropriate entities in the industrial sub-sectors and relevant institutions at the national level to ensure wider engagement of national experts that are active in carbon asset generation activities.

Besides, VNCPC established relations with many international carbon organizations, international CDM programmes and CDM experts. This will facilitate VNCPC's step by step involvement in the actual development of CDM projects from project identification to registration with the CDM Executive Board.

3. The future role of VNCPC in the CDM activities in the country

VNCPC's overall mission is to promote sustainable industrial development in Vietnam through the application of Cleaner Production and related techniques. While the centre's successes in the promotion of CP have been recognized by its national and international partners, it still needs to develop additional commercial services that will allow it to become financially sustainable in the near future, as requested by its sponsors, seco and UNIDO. The current development of the CDM market in Vietnam presents a unique opportunity for VNCPC to reach this target.

At the moment, a limited number of companies and organizations are operating in the CDM field in Vietnam. Table 2 shows the list of current project developers. Although some of these organizations started activities in the field a few years ago and already designed and submitted PINs and PDDs for approval to the Vietnam DNA, VNCPC still feels confident that it can be successful in this new field due to the following reasons:

- VNCPC has developed technical expertise in industrial environmental management and continuous involvement in cleaner production projects at the national level;
- VNCPC has established close relations with industrial sub-sectors. This will create good potential for CDM project development in the near future;
- VNCPC has an active and well-trained staff;
- Directly under the UNIDO/UNEP network of CP Programmes, VNCPC enjoys privileged access to technical support from international experts in related fields.

Table 2: List of CDM Project Developers in Vietnam

No.	Name	Address	Phone/Fax/Email/Web
1	Vietnam Institute of Energy	No. 6, Ton That Tung, Street, Hanoi City	P: 84.4.5743279 F: 84.4.8523311
2	Electricity of Vietnam (EVN)	No. 18 Tran Nguyen Han Street, Hanoi City	P: 84.4 8249508 F: 84.4.8523311 E: vp@evn.com.vn W: www.evn.com.vn
3	Japan Vietnam Petroleum Co. Ltd (JVPC)	Petrovietnam Tower, 7th floor, No. 8, Hoang Dieu Street, Vung Tau City.	P: 84.64.856937 F: 84.64.856943 E: thanhdn@jvpc.com.vn
4	Netherlands Development	SNV Vietnam 105-112, D1 Van	P: 84.4 8463791

No.	Name	Address	Phone/Fax/Email/Web
	Organization (SNV)	Phuc Diplomatic Compound, GPO box, Hanoi City	F: 84.4.8463794 E: claudia@snv.org.vn W: www.snvworld.org or www.snv.org.vn
5	Assistance for Natural Conservation & Community Development Center	No. 14, Hang Bot Street, Hanoi City	P: 84.4. 8232198 E: tuuboi@hn.vnn.vn
6	Research Center for Energy and Environment (RCEE)	Lan 62, Nguyen Tri Thanh, Hanoi City	P: 84.4. 7733686 F: 84.4 7734022 E: ngrcee@hn.vnn.vn W: www.rcee.net
7	Vietnam Cleaner Production Centre (VNCPC)	4th Floor, C10 Building, Hanoi University of Technology, Dai Co Viet Road, Hanoi City.	P/F: 84.4 8681618 E: vncpc@vncpc.org W: www.vncpc.org

The participation in the UNIDO CDM project is an extremely advantageous starting point for VNCPC when initially developing CDM consultation service. Since joining in the project, we have done the main following works:

1. Established the domestic and international relations on CDM;
2. Grasped the process of building a CDM project from PIN identification, PDD development to submittal for approval of DNA, CDM EB;
3. Designed a database (knowledge and information) to continue identifying further project ideas.

After the UNIDO project is terminated, VNCPC will keep enhancing activities related to CDM with the **objective to be one of the leading consultants on CDM in Vietnam**. New services on CDM that VNCPC intends to offer in the future are the following:

- PIN (Project Identification Note) development;
- Buyer identification;
- PDD development including all required additional studies;
- Supervision of the validation process;
- Assistance in national approval with DNA;
- Answer to all requests relating to CDM;
- Training on CDM;
- And other servicess related to Monitoring, Verification of GHGs emission reduction etc.

4. Conclusions and Recommendations

Most of the VNCPC officials are trained on CDM by means of training courses organized by VNCPC, especially the one-week prolonged training course by UNIDO. VNCPC also built some practical experiences through the current UNIDO project. However, since CDM is a new field for the centre, we still need additional practical experience in PDD development, in submission for approval in host country as well as international organizations and other required procedures until the projects get the Certified Emissions Reductions (CERs) from the CDM Executive Board.

VNCPC intends to acquire this experience by "Learning by doing", in particular by continuing the work on the already developed PINs and PDD whenever possible, but also by identifying and developing new projects. This process could be greatly facilitated with further technical support from UNIDO, including training and quality control for the first projects developed by the centre. This support would help VNCPC build the capacity that will allow it to provide the professional and fast service that is necessary to ensure the satisfaction of its customers and the future success of the centre in the CDM field.

5. Appendices

1 Report on the training workshop on "Capacity Development for Clean Development Mechanism"

2 Portfolio of Project Idea Notes (PINs)

- 2.1 Building a waste treatment plant to minimize dumping. Includes waste recycling, composting and energy generation.
- 2.2 Gas conversion project for the oil-fired Hiep Phuoc power plant
- 2.3 Rice husk burning for electricity and steam co-generation in Thot Not district, Can Tho province
- 2.4 Building a new and modern biomass boiler in Bai Bang pulp and paper company (Bapaco), using in-site biomass residue from pulping production
- 2.5 Energy efficiency and co-generation system (Cogen) in Sao Vang Rubber Company

3 Project Designed Document (PDD) "Building a waste treatment plant to minimize dumping. Includes waste recycling, composting and energy generation at Son Tay town, Ha Tay province, Vietnam"

Appendix 1

Report on Training Course
Capacity Development for Clean Development Mechanism

under the project: Support for the Development and Uptake of CDM projects in the Industrial sector: Pilot Project in Co-operation with the Austrian Industry[1]

June 26 -30, 2006
Hanoi, Vietnam

1 US/GLO/04/096, UNIDO Project No.: US/RER/02/164, Partnerships with business & industry

Table of Contents

Training Course on
Capacity Development for Clean Development Mechanism
June 26 -30, 2006
Hanoi, Vietnam

1. Summary

Being fully aware of the importance of environmental protection and sustainable development. Vietnam ratified the United Nations Frame Convention on Climate Change (UNFCCC) in 16/11/1994 and Kyoto Protocol (KP) in 25/9/2002. Kyoto Protocol has introduced cooperation mechanism in order to achieve GHG emission in developed countries and support sustainable development in developing countries. The protocol includes 3 mechanisms: International Emission Trading (IET), Joint Implementation (JI) and Cleaner Development Mechanism (CDM).

Since then, several projects on capacity building for CDM implementation have been developed in Vietnam and a number of CDM projects have been approved and under implementation, such as associated gas recovery and utilization in Rang Dong mine, Song Muc hydroelectricity project, energy efficiency project in Thanh Hoa Beer Company and other potential projects.

To support CDM project development in Vietnam, under the framework of project "Support for the Development and Uptake of CDM projects in the Industrial sector: Pilot Project in Co-operation with the Austrian Industry", United Nations Industrial Development Organization (UNIDO) has cooperated with Vietnam Cleaner Production Center (VNCPC) in this project implementation since early 2006.

The current UNIDO support programme for developing and uptake of CDM projects in Vietnam is now well underway. Following the inception report and the Austrian Mission to Vietnam in March 2006, a practical, hands on training course on the Clean Development Mechanism (CDM) of the United Nation's Framework Convention on Climate Change (UNFCCC), Kyoto Protocol was held in Hanoi, Vietnam from Monday to Tuesday 26th and 30th June 2006.

The objectives of the training course are to develop capacity for service providers like VCPC, RCEE to further actively engage in CDM projects development in industrial sectors, to raise awareness on CDM for industry sub-sectors and other related CDM authorities.

2. Course Contents:

The Training course on Capacity Development for CDM and the Introduction and Application of COMFAR model was held during 26-30 June 2006 at Guoman Hotel, Hanoi, Vietnam. The Agenda of the workshop is given in Annex A.

2.1 Contents

The training course consisted of 2 main parts. The first part took place in 2 days, 26-27, June 2006, focusing on the Clean Development Mechanism (CDM) under the framework of Kyoto Protocol and United Nations Frame Convention on Climate Change (UNFCCC). The second part was implemented in 3 days, 28-30 June 2006, focusing on the introduction and application of COMFAR III. This software enables the economic-financial feasibility of investment project, including CDM/JI projects.

Regarding the first part, the training course addressed practical areas of the CDM, from the CDM project cycle, to carbon financing to PDD preparation and acceptance and marketing of credits. The training course focused on practical examples relevant to Vietnam, and drew on projects and project areas already identified in Vietnam. Main modules discussed during the course were:

- Brief background to Kyoto and the progress of the flexible mechanisms to date
- CDM Framework in Vietnam
- Practical examples of International CDM projects under development and lessons learned to date
- The CDM Project Cycle – Examples from and for Vietnam
- The Austrian JI/CDM Programme
- Understanding the Carbon Market and Carbon Finance Today-2006
- Preparation of PINs & PDDs: Best Practices and 'How to Guides'
- Practical preparation of key points for good PINs and PDDs, using real potential Vietnamese CDM projects

The second part focused on COMFAR, computer software that permits the user to simulate the short- and long-term financial and economic situation of investment projects. The software permits the analysis of industrial as well as non-industrial projects, whether new investments, rehabilitations, expansions, joint venture or privatisation projects. Bellows is the main content of modules:

- Introduction to COMFAR III Expert – Overview: Introduction to interface, functions, calculation methodology, input data entry and output data reading/analyzing.
- Practical case study – Introduction of example project: Several "business as usual (BAU)" case studies have been discussed. Participants and lecturers carried out some situation analysis, input data entry and output analysis.

- Practical case study – Introduction of CDM related data: Based on BAU practical case studies, this exercise included CDM issues into that so that participants can later apply for CDM projects.

2.2 Instructors and Guests

The course was conducted by international experts with considerable experience on Kyoto and on the CDM. These experts were invited by UNIDO, including:

1. Ms. Marina PLOUTAKHINA,
   Unido Project Manager, PTC/ECB/EEC Unit
   Tel: +43 1 26026-5051, Email: M.Ploutakhina@unido.org

2. Mr. Robert Novax, Unido
   Unido Expert, PTC/ITP/IPU Unit
   Tel: +43 1 26026-3855, Email: R.Novak@unido.org

3. Mr. Mike Bess, Director, International Division
   Energy for Sustainable Development Ltd.
   Overmoor, Neston, Corsham, Wiltshire SN139 TZ
   Tel: 44 1225 816 808;
   Email: mike@esd.co.uk; website: www.esd.co.uk

4. Mr. Manfred Stockmayer, Managing Director
   KWI Management Consultants GmbH
   Tel : +43 1 52520 256, Email: ms@kwi.at

5. Mr. Igo Pulh
   International CDM Expert, Email: admin@500ppm.com

Under the framework of this training course, it was our pleasure to welcome our distinguished guests in the opening and closing ceremony, including:

1. Mr. Nguyen Khac Hieu, Deputy Director General, Department of International Cooperation, MONRE, Chief of DNA Vietnam.

2. Mr. Philippe Scholtes, Chief Representative of UNIDO-Vietnam

3. Mr. Tran Van Nhan, General Director of VNCPC

4. Mr. Bui Huy Phung, Senior Expert in Energy Efficiency and CDM, Vietnamese Academy of Science and Technology

2.3 Participants

As the main objective of the training course is to improve capacity of CDM implementation in Vietnam, main categories of participants can be found in Annex B, They are:

- Service Providers: These institutions can be acted as project developers in future, including research and consultancy institutions.
- Research Center for Energy and Environment (RCCE): RCEE has jointed to the CDM activities since early stage after Kyoto protocol signed. RCEE has developed several PINs/PDDs submitted to DNA Vietnam. This training course conducted by experienced international experts provided further capacity building to selected RCEE staff members.
- Vietnam Cleaner Production Center (VNCPC): Focal point in Vietnam for promoting and implementing cleaner production in industrial sectors. Participation in UNIDO CDM project activities will allow VNCPC to expand its services and engage in new CDM projects in the near future.
- Vietnam Designated National Authority (DNA)
- Authority agencies related to CDM such as MOI, MOPI
- Industrial sub-sectors: companies and corporations that can apply CDM in their future production plan.

2.4 Preparation

To ensure the success of the training course, preparation activities have been implemented in cooperation with UNIDO project team from the very early stage. Main preparation activities implemented by VNCPC were:

- Develop a list of participants
- Contact and invite participants
- Contact with UNIDO for content, manuals, transportation, accommodation, etc.
- Manual preparation: Translate into Vietnamese, etc.
- Prepare venue and other facilities
- Interpreting from English to Vietnamese during the training course
- Arrange transportation for lecturers and UNIDO representatives during workshop
- Logistic activities for the workshop
- Others

3. Training Evaluation

3.1 Evaluation of the participants

It can be said that CDM is a relatively novel concept not only in Vietnam but also in other developing countries. For that reason, it is very time consuming and effort requiring to fully understanding CDM concept to have appropriate CDM application in practice. The course was designed on the basis of the combination of theory, practice and CDM development experiences in Vietnam and in the world. With the excited and useful instructions of international lecturers, most participants could understand the concept and its implications and gave positive feedback during the course.

Participants were asked to fill in the questionnaires for their feedback. The evaluation results are shown in the below table:

Table 1: Training Evaluation results

No.	Evaluation items	Average
1	Training objectives achieved	8.64
2	Training quality	
	2.1 Introduction to UNFCC/Kyoto Protocol	
	✓ Content	8.56
	✓ Presentation	8.64
	2.2 CDM Project cycle/Financial Markets/PDD preparation/Case studies review	
	✓ Content	8.36
	✓ Presentation	8.26
	2.3 Introduction to COMFAR	
	✓ Content	9.04
	✓ Presentation	9.13
	2.4 Using COMFAR for project analysis	
	✓ Content	8.80
	✓ Presentation	9.13
	2.5 Using COMFAR for CDM analysis	
	✓ Content	9.40
	✓ Presentation	9.33
3	Other evaluations	
	✓ Interpreter	9.00
	✓ Assistance from project staff	9.38
	✓ Reading materials	8.83

The average mark for the objectives meeting is 8.64/10. This is a good result. However, from our observation, some participants could not meet their objectives for several reasons:

- The "concept" itself was difficult and new, they could hardly understand the core of the concept.

- CDM will not be applied right now in their work, thus the focus level during the course was not high.

Lectures of COMFAR were highly marked, the reasons are:

- The content was easy to understand and less abstract than CDM
- The software and computers were available; participants could practice on their own computers. COMFAR is highly applicable, not only to CDM projects but also to other investment projects.

Other activities such as translation, documents, project staff supports, etc. were also highly marked.

3.2 Recommendation of the participants

Besides, many ideas, opinions were provided by participants. Below are main ideas:

General recommendation:

1. It would be better if we have more participating organizations, e.g. large-scaled companies, relating ministries and sectors.
2. It would be better if: (i) participants would be provided with reading materials before the course take place; (ii) the duration of using COMFAR III would be longer, i.e. 10 - 15 days; and (iii) participants would be provided with CD of all presentations to listen to lecturers and view from personal laptop at the same time.
3. It would be better if longer time is given to practices and opinions exchange.
4. It would be better if the duration of the course was longer, so that the participants would gain deep understanding on the subjects.
5. There should be the training regulations that participants attend the course fully and on time
6. The sound system should be improved. It would be better if organizer could arrange a room for participant to take rest during lunch break. Allow participant using software for long time to practice more.

In terms of CDM

1. The reading materials for PINs and PDDs are not sufficient. The form or table should be more detailed.
2. Lack of information on carbon market and CDM project developers.
3. Topic on PIN and PDD preparation was too short. A day given to topic on Introduction to COMFAR is too long, it could include more practical exercises

4. There were several problems where lecturer's explanations are not sufficient resulting in fewer participants' confidence in information provided by lecturers.
5. Go more detailed on specific situation analysis that possibly challenges the project investors as well as CDM project developers. The design of training materials should be improved.
6. Longer time should be given to the presentation of PDD of successful CDM projects in several sectors.
7. The course should give more case studies on baseline identification and additionality
8. Examples on PINs and PDDs developed in the industries sectors such as energy efficiency. What are methodologies?

In terms of COMFAR

9. It would be better if software is provided for each participants and the course provides more exercises for participants to practice after the course. This will help participants master the application of software.

10. The practical part with COMFAR shall be based on real example from participating companies. The speed of COMFAR introduction delivery is too slow.

11. It should have some time for participants doing exercise on COMFAR III by themselves and then compare the result with others. It should have more groups working on COMFAR.

4. Conclusions

The training course was successfully organized in terms of both organization and content. Regarding to the content, the training course has provided participants with knowledge, practices in CDM and especially the integration of COMFAR in economic-financial feasibility analysis for investment projects.

- For VNCPC staff, after this course, VNCPC will actively take part in the CDM activities in Vietnam, especially in industrial field.
- For RCEE and other consulting agencies, the training course has improved their capacity in CDM implementation at different levels.
- For some industrial enterprises, the training course has improved their awareness in CDM to further apply it to their enterprises.
- Besides, the training course has also improved the CDM awareness for staffs of some ministries, sectors and relevant universities.

However, there are some remarks for the training course, detailed as:

- There should be clear explanation for the basic concepts such as what CDM is, baseline studies, methodology, etc, as not all participants had understood CDM concept previously. More explanation about benefits/cost of CDM for the industries, more formal presentation of the CDM project cycle (and who does what throughout the cycle).

- Two days for CDM itself is rather short. In particular, more time should be spent to give examples of successful projects (PINs and PDDs, especially in the industrial sector), and to present the main existing methodologies, in particular the small scale ones (which are quite generic and can be used for various projects). The presentation of some methodologies was foreseen in the programme but didn't take place because of a lack of time.

Annex A

Training Agenda
Support for the Development and Uptake of CDM projects in the Industrial sector: Pilot Project in Co-operation with the Austrian Industry
Hanoi, Vietnam, 26th - 30th June 2006

Day 1
26th June 2006 (Monday)

08:00-08:15 Registration

08:15-08:45
- Introductions (DNA Vietnam, UNIDO, KWI/ESD, VNCPC etc.)
- Vietnam's CDM activities by Mr. Nguyen Khac Hieu, Deputy Director, Dep. of International Cooperation, MONRE

8:45 - 9:15 Brief background to Kyoto and the progress of the flexible mechanisms to date
- The UNFCCC – key actions on the road to the Kyoto Commitment Period, 2008-2012
- Key actions in the Kyoto process:
- Ratification
- The European Union Emissions Trading System
- Operations of the UNFCCC CDM Executive Board (EB) and its 'Methodology Panel'
- Status of CDM and JI, and prospects pre-Commitment Period
- Implications for CDM in Vietnam

9:15 - 9:30 Questions and discussion

9:30 - 9:45 Coffee Tea break

9:45 - 10:30 CDM Framework in Vietnam: Working groups (3) Define priorities, priority sectors, and priority actions for CDM in Vietnam[2]

10:30 - 11:15 Brief Working group presentations on priorities for Vietnam CDM, plenary discussion

11:15 - 11:45 Practical examples of International CDM projects under development and lessons learned to date
- Overview of CDM projects approved to date
- Overview of CDM projects in the pipeline

[2] The participants will be broken up into three (3) Working Groups comprised of Government, non-government organisation, industry and other participants to work on practical issues presented by the consultants. Each Working Group will have a chair person and a rapporteur. Working Group topics and assignments will be given to each. After the Working Group sessions, the rapporteurs will present the findings, conclusions, etc. from the Working Group to the plenary (main group) for discussions. This will ensure practical discussion of the topics presented by the Consultants, and open discussions of the key issues, findings and recommendations.

- Examples of CDM projects relevant to Vietnam's priorities
- Industrial energy efficiency
- Industrial fuel substitution/fuel-switching
- Renewable energy projects in the electricity sector
- Landfill gas
- Key lessons learned from CDM projects relevant to Vietnam

11:45 - 12:00 Discussion, questions and answers

12:00 - 13:30 Lunch

13:30 - 14:00 The CDM Project Cycle – Examples from and for Vietnam
- Normal Project Cycle
- What is different between a 'normal project cycle' and a 'CDM project cycle'?
- Key steps needed for Vietnam CDM project cycle
- Key steps needed for Vietnam CDM projects in UNFCCC and in current & future CDM carbon market
- Lessons learned from other CDM projects relevant to Vietnam
- Roles of Industry, Government, NGO and International Institutions & Partnerships for Vietnam CDM

14:00 - 14:15 Questions, Answers, Discussion

14:15 - 15:30 Working groups (3) – Practical Examples of the CDM Project Cycle - Vietnam CDM Projects (proposed and potential)

15:30 - 15:45 Tea/coffee break

15:45 - 17:00 Presentation by Working Groups (3) to plenary (main group) on Vietnam Practical CDM Projects & discussion by all on these practical examples

17:00 - 17:30 Wrap up of Day 1, and Conclusions to Day 1

Day 2
Tuesday 27th June 2006 (Tuesday)

8:00 - 8:15 Welcome, Summary of Day 1, and Introduction to Day 2

8:15 - 8:45 The Austrian JI/CDM Programme
- Overview
- Current Areas of Focus – CDM project types and geographic coverage
- Austrian Programme and Vietnam CDM
- Kinds of Vietnam CDM Projects of Likely Interest to Austrian Programme

8:45 - 9:00 Questions, answers, discussion

9:00 - 9:30 Understanding the Carbon Market and Carbon Finance Today – 2006

- Overview of the Carbon Market
- Who is Buying and Selling at Present?
- What kinds of prices are buyers paying for what kinds of CDM projects now?
- What is the difference between the 'long-term' CDM market and the current 'spot' market for carbon buyers, & why is this important for Vietnam CDM project developers?
- What CDM Project Emission Reductions are People Buying Now
- The EU Emissions Trading System and its relevance to Vietnam CDM
- Opportunities & Interactions between Vietnam CDM Projects and the EU **ETS**
- Carbon Market Dynamics for Vietnam
- What should Vietnam CDM project developers look for from carbon buyers?

9:30 - 9:45 Questions, answers, discussion

9:45 - 10:00 Coffee/tea break

10:00 - 12:00 Working Groups (3) – Development, Sourcing and Use of Carbon Financing – Where to find it, what to use it for, and how to use it in CDM projects.

12:00- 13:30 Lunch

13:30-14:15 *Preparation of PINs & PDDs: Best Practices and 'How to Guides'*

- What makes a good PIN
- What makes a good PDD?
- Who are we preparing a PDD for – who is the PDD 'audience'?
- What should a PDD achieve?
- What does the Vietnam designated national authority (DNA) want to see in a PDD?
- What does a designated operational entity (DOE) want to see in a PDD?
- What does the CDM Executive Board (EB) want to see in a PDD?
- What do 'carbon' buyers want to see in a PDD?
- Practical examples of PDDs
- PDD 'do's' and 'don'ts'
- Key steps in PDD preparation
- Key steps in PDD approval
- How to improve your PDD's chance of approval
- Examples of the best PDDs
- Examples of the best PDD methodologies

14:15-14:30 Discussion, questions and answers

14:30 - 14:45 Coffee/tea break

14:45 - 16:15 Working group – practical preparation of key points for good PINs and PDDs, using real potential Vietnamese CDM projects

16:15 - 17:00 Discussions of practical PINs and PDDs presented by Working Groups

17:00 - 17:30 Conclusions and Recommendations from Day 2 and the Training Workshop

---

Day 3
28th June 2006 (Wednesday)

8:00 -8:30 Brief introduction to Project Appraisal and UNIDO's related methodology

8:30 - 10:00 Introduction to COMFAR III Expert - Overview

- Graphical user interface
- Data structure
- Menus
- Data input options:
    - Classification of projects
    - Planning horizon
    - Currencies
    - Products
    - JV-partners
    - Discounting
    - Fixed investment costs

10:00-10:15 Coffee Tea break

10:15-12:00 Introduction to COMFAR III Expert – Overview (continued)

- Data input options:
    - Production costs
    - Sales programme
    - Working capital

Discussion, questions and answers will be done within the framework of the introduction

12:00- 13:30 Lunch

13:30-15:30 Introduction to COMFAR III Expert – Overview (continued)

- Data input options:
    - Project financing
    - Profit distribution
    - Taxes, allowances

Discussion, questions and answers will be done within the framework of the introduction

15:30-15:45 Tea/coffee break

15:45-17:00 Introduction to COMFAR III Expert – Overview (continued)

- Calculation system
- Results generated
    - Business results (Cash flow analysis, Net income statement, Break-even analysis, Balance sheet)
    - Graphical presentation of results
- Auxiliary modules
    - Parametric analysis
    - Sensitivity analysis

17:00-17:30 Wrap up of Day 3, and Conclusions to Day 3

Day 4
29th June 2006 (Thursday)

8:00 -8:30 Practical case study – Introduction of example project

8:30 - 10:00 Individual group work on example project (if possible max. 2 participants per PC)

- Data input

10:00-10:15 Coffee Tea break

10:15-12:00 Individual group work on example project (continued)

- Data input

Discussion, questions and answers will be done within the framework of the group work

12:00- 13:30 Lunch

13:30-15:30 Individual group work on example project (continued)

- Data input (finalized)
- Calculation
- Results

Discussion, questions and answers will be done within the framework of the group work

15:30-15:45 Tea/coffee break

15:45-17:00 Individual group work on example project (continued)

- Results
- Auxiliary modules

17:00-17:30 Wrap up of Day 4, and Conclusions to Day 4

Day 5
30th June 2006 (Friday)

8:00 -8:30 Practical case study – Introduction of CDM related data

8:30 - 10:00 Introduction to CDM related functions of COMFAR III Expert – Overview

- The investment ranking test from the UNFCCC Additionality Tool
  - Function and process
  - Applicability

- Data input
  - Investment ranking test
  - Definition of crediting period
  - Definition of emission reductions
  - CDM/JI related investment costs
  - CDM/JI related operating costs
  - Sales programme
- Analysis
  - Selection of financial indicator
  - Sensitivity analysis
  - CDM comparative analysis

Discussion, questions and answers will be done within the framework of the introduction

10:00-10:15 Coffee Tea break

10:15-12:00 Individual group work on example project from day 4 (continued)

- Data input related to CDM/JI

Discussion, questions and answers will be done within the framework of the group work

12:00- 13:30 Lunch

13:30 -15:30 Individual group work on example project (continued)

- Data input (finalized)
- Calculation
- Analysis
- Results

Discussion, questions and answers will be done within the framework of the group work

15:30-15:45 Tea/coffee break

15:45-16:15 Wrap up of Day 5, and Conclusions to Day 5

16:15-16:45 Wrap up of workshop, conclusions and evaluation

16:45-17:30 Closing

Annex B

List of the participants

No	Name	Institutions	Tel.	Fax.
1.	Nguyen Thi Thanh Le	Vietnam Petroleum Institute (VPI), Trung Kinh, Yen Hoa, Cau Giay District, Hanoi	04.7843061 0912351106	04.7844156
2.	Nguy en Duc Vinh Nam	Vietnam Steel Corporation, 91 Lang Ha, Hanoi	04.8561602 0983294252	04.8561815
3.	Tran Thi Thu Ha	Construction Material Institute – Ministry of Construction, 235 Nguyen Trai, Thanh Xuan, Hanoi. Email: vienvlxd@hn.vnn.vn/ tamnt_tbmt@yahoo.com	04.8582217; 0953376778	04.581112
4.	Nguyen Thi Tam		0915502834	
5.	Nguyen Xuan Sinh	Centre of Environmental Engineering and Chemical Technology, 21A Cat Linh, Hanoi E-mail: xscece@yahoo.com	04.8235335 091.332.3383	04.8232325
6.	Nguyen Trong Cuu	Centre for Environmental consulting, training, and technology transfer (CECT), Vietnam Environment Protection Agency (VEPA), 67 Nguyen Du, Hanoi	04.8223795 0912349767	04.8223221
7.	Nguyen Van Minh	DNA Vietnam Office, Ministry of Environment and Natural resourse (MONRE) , 45 Tue Tinh, Hanoi.	04.9743195 0983080281	04.9743200
8.	Vu Ngoc Duc	Institute of Energy (IOE), 6 Ton That Tung, Hanoi.	04.8527085 0903291024	04.8523311
9.	Pham Minh Hoa		04.8523353	
10.	Nguyen Ba Hai	Research Center for Energy and Environment (RCEE), 62 Nguyen Chi Thanh, Hanoi	84.4.7733686	7734022
11.	Le Viet Cong	Department of International Cooperation, Vietnam Alcohol and Brewery Coporation, 183 Hoang Hoa Tham, Hanoi, email: vietcong_le@yahoo.com	04.7236791 0912503899	
12.	Bui Huy Phung	Research Center of Energy, Vietnamese Academy of Science and Technology, 18 Hoàng Quốc Việt, Cầu Giấy, Hà Nội	04.7564333 84.913381801	

No	Name	Institutions	Tel.	Fax.
13.	Chu Nhat Quang	Seraphin Environmental Technology Company, 5 Trung Yen, Trung Hoa, Cau Giay District, Hanoi	04.7830850 090.423.0960	04.7830849
14.	Pham Quynh Van		04.7830.850	
15.	Pham Hong Tien	Hiep Phuoc Power Company, Hiep Phuoc Commnune, Nha Be District, Hochiminh City. Email: tienhp@hotmail.com	08.7818032 090.371.7766	08.7818020
16.	Nguyen Duc Can	Bai Bang Paper Co. Ltd, Phong Chau, Phu Tho Province.	0210.830123, 0210.827283	0210.829177
17.	Pham Van Tho	Danang Science & Technology Progress Application Centre, 51A Ly Tu Trong, Da Nang City. Email : thopv@stac.com.vn	0511.892823 0985000090	0511.892822
18.	Nguyen Thi Truyen	Cleaner Production Center, Hochiminh City Environmetal Protection Agency (HEPA), DONRE, 137 bis Nguyen Dinh Chinh, Phu Nhuan District, Hochinh City.	08.8443881 095.898.0796	08.8443868
19.	Nguyen Thi Ngoc Tho	The Energy Conservation Center, HCMC-VN (ECC), Department of Science and Technology, Hochiminh City, 244 Dien Bien Phu, District 3, Hochiminh City.	08.9322372, 0908821218	08.9322373
20.	Le Thu Hoa	National University of Economics, Hanoi, Vietnam.	0913043585	
21.	Le Ha Thanh	Centre for Environmental Economic and Regional Development, Hanoi.		
22.	Lai Thu Nguyet	Vietnam Petroleum Institute (VPI), Yen Hoa, Cau Giay, Hanoi	04.7843061	04.7844.156
23.	Nguyen Thanh Quang	Research Center for Energy and Environment (RCEE), 466/62 Nguyen Chi Thanh, Hanoi	04.773.3686	04.7.734.022
24.	Bui Huy Khanh			

Annex C

Participant number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Average
1. To what extent were the training objectives achieved ?	8	8	8	9	9	8	9	7	9	8	9	10	9	7	9	10	8	8	10	10	8	8	9	9	9	8.64
2. Rate the following aspects of training design																										
2.a. Topic evaluation																										
2.a.1. Introduction to UNFCC/Kyoto Protocol																										
2.a.1.1. Content	8	7	9	9	8	9	9	7	9	10	10	8	9	7	6	9	8	10	9	9	9	8	9	9	9	8.56
2.a.1.2. Presentation	8	7	9	9	8		9	7	9		10		9	7	7	10	9	9	10	9	9	8	9	9	9	8.64
2.a.2. CDM project cycle/Financial markets/PDD preparation/Case studies review																										
2.a.2.1. Content	8	7	9	9	8	9	9	6	10	5	8	9	9	6	8	9	8	9	10	10	8	8	9	9	9	8.36
2.a.2.2. Presentation	8	7	9	8	8		9	6	9	5	9		9	6	8	10	8	9	10	10	8	7	9	9	9	8.26
2.a.3. Introduction to COMFAR																										
2.a.3.1. Content	9	8	8	9	10	8	9	7	10	9	8	10	10	9	9	10	8	7	10	10	10	9	10	9	10	9.04
2.a.3.2. Presentation	9	8	8	9	10	8	9	7	10	9	10		10	9	9	10	9	6	10	10	10	10	10	9	10	9.13
2.a.4. Using COMFAR for project analysis																										
2.a.3.1. Content	9	7	9	10	0	9	10	6	9	8	9	10	10	9	9	10	8	9	10	10	10	10	10	9	10	8.80
2.a.3.2. Presentation	9	7	9	10	10	8	10	6	9	8	9		10	9	9	10	8	9	10	10	10	10	10	9	10	9.13
2.a.5. Using COMFAR for CDM analysis																										
2.a.3.1. Content	9	8	9	10	10	9	10	6	10	9	9	10	9	10	9	10	8	10	10	10	10	10	10	10	10	9.40
2.a.3.2. Presentation	9	9	9	10	10	8	10	6	9	9	9		9	10	9	10	8	10	10	10	10	10	10	10	10	9.33
2.b. Interpreter	9	9	10	10	9	8	8	8	9	10	8	10	9	8	9	9	8	8	10	9	10	8	10	9	10	9.00

Participant number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Average
2.c. Assistance from project staff	9	9	10	10	9	10	9	8	10	10	9	10	10	9	10	10	9	8	10	10	10	7	10	9	9.5	9.38
2.d. Reading materials	*9*	*9*	*9*	*8*	*10*	*9*	*8*	*8*	*8*	*10*	*9*	*8*	*9*	*8*		*9*	*9*	*7*	10	10	10	7	9	9	10	8.83
3. Did you feel the duration of training (too short, too long, just about right)	OK	OK	TL	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	TS	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	
a. Too short (TS)															1											4.0%
b. Too long (TL)			1																							4.0%
c. Just about right (OK)	1	1		1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	92.0%

Appendix 2

Portfolio of Project Idea Notes (PINs)

under the project: Support for the Development and Uptake of CDM projects in the Industrial sector: Pilot Project in Co-operation with the Austrian Industry[1]

1 US/GLO/04/096, UNIDO Project No.: US/RER/02/164, Partnerships with business & industry

Table of Contents

2.1 Portfolio of Project Idea Notes (PINs)

Building a waste treatment plant to minimize dumping. Includes waste recycling, composting and energy generation.

Table of Contents

I. Introduction

The Project Idea Note (PIN) is the first general information on the project and enables the Programme Management to assess the basic eligibility of a potential JI or CDM project.
It comprises details on the following subjects:

- Project identification;
- Project participants;
- Host Country;
- General project information;
- Project organization;
- Greenhouse gas emission reductions;
- (Additional) ecological, socio-economic and/or development effects; and
- Additionality and sustainability effects.

Chapter II contains the PIN template.[1]

[1] It focuses on "directly" emission-reducing projects. In the case of sink projects the template has to be adapted and used accordingly.

II. Template for the Project Idea Note (PIN)

A. PROJECT IDENTIFICATION

A 1 Project summary	
Title of project activity	Building a municipal waste treatment plant to minimize waste dumping. Includes waste recycling, composting and energy generation.
Applicant	Green Environmental Joint Stock Company (SERAPHIN)
Host Country	Vietnam
Project type	
Category of project activity	
Generation of emission reductions	From: 2008 to 2012
Estimated emission reductions *(in t CO_{2e} up to 2012)*	Annual (average): 38,674 tons CO_2 Total: 193,370 tons CO_2
Crediting Period	From: 2008 to 2017
Offered amount of emission reductions	☐ Joint Implementation: ERUs: _____ AAUs ("early credits"): _____ ☒ Clean Development Mechanism: CERs: 38,674 tons CO_2 eq. per year
Proposed ERU/CER price (EUR)	5.2 EUR ~ 6.5 USD/ton CO_2
Date of submission of Expression of Interest	March 2006

B PROJECT PARTICIPANTS

B 1 Applicant	
Name	SERAPHIN Joint Stock Company
Type of organization *Please also describe the ownership structure.*	Joint Stock Company (Private Sector)
Other functions of the Applicant within the project	○ Sponsor ○ Intermediary ○ Technical consultant ☒ Other: Project Owner
Main activities, knowledge and experience	The main activities of the company are as follows: • Consultation and implementation projects on environmental issues, waste processing, waste recycling and wastewater processing. • Fabrication and installation of machines for waste and waste water treatment and recycling. • Production and trading of waste recycled products. Besides of that, the company is supported by leading scientists, professors, doctors and knowledgeable cooperation staff experienced in various fields: *Microbiology, Chemistry, and Construction etc.* Now, Seraphin are implementing a project on improving technology at the waste treatment plant in Thuy Phuong, Hue city. The work includes supply of technology chain, equipments and technology. Beside of that project, Seraphin has also constructed one new waste treatment plant in Vinh city, Nghe An province.
Name of contact person	Mr. Do Duc Thang, General Director of SERAPHIN Joint Stock Company
Address	Room 303, Trung Hoa - Cau Giay Urban area, Hanoi
Phone/fax	Phone: 84-4-2811270 Fax: 84-4-2811271
E-mail	*sales@greenseraphin.com; seraphintech@gmail.com; www.greenseraphin.com*

B 2 Project developer	
Name	Vietnam Cleaner Production Centre (VNCPC)
Type of organization	Governmental Organization
Other functions of the project developer within the project	○ Sponsor ○ Intermediary ☒ Technical consultant ○ Other: _____

Main activities, knowledge and experience	Viet Nam Cleaner Production Centre was eshtablished in 1998, a member of the UNIDO/UNEP network of national cleaner production centres. VNCPC has been carrying out a lot of projects on the following areas: • Training and in-plant assessment on cleaner production (CP); technology gap, technology transfer, energy efficiency and recovery etc (with more than 100 companies has been participated since 1998). • Policy Assessment and Advice. • CDM and climate change issues (organization of training, information dissemination, PIN and PDD development etc.) Under the Unido framework, VNCPC has been supported by Unido international/national CDM experts in the identification and development of CDM projects especially in industrial sectors.
Name of contact person	Mr. Le Thanh Tung, Responsible for CDM activities
Address	Vietnam Cleaner Production Centre, 4th Floor C10 Building, Hanoi University of Technology, No 1, Dai Co Viet street, Hanoi, Vietnam
Phone/fax	Phone: (00-84) 4 - 8684849, ext 23 Fax: (00-84) 4 - 8681618
E-mail	tung.lt@vncpc.org

B 3 Other project participants	
Name of project participant	
Type of organization	○ Governmental body: _____ ○ Private enterprise ○ NGO ○ Other: _____
Function within the project	○ Sponsor ○ Intermediary ○ Technical consultant ○ Other: _____
Name of contact person	
Address	
Phone/fax	
E-mail	

C HOST COUNTRY

C 1 Location of project activity	
Host Country Party(ies)	Vietnam
Region/State/Province etc.	Red River Delta
City/Town/Community etc.	Ha Tay province, Son Tay town
Brief description of the project location	**I. Particular trait of the Son Tay town, Ha Tay province** • Province areas: 113,47 km^2 • Population: 110.827 peoples • Administration units: 6 wards, 9 communes • GDP growth rate: 9,8%/ year • Economic structure: Industry 43,2%, trade - tourism - service 36,1%, agriculture 20,7%/ year Son Tay town is located in the Northern part of Ha Tay province, which far from Ha Dong town and Hanoi city about 40 km. **II. Infrastructure:** Located in the favorable position with two high ways which are national road 21A connecting Son Tay to Hanoi and other HaTay's districts, towns; National road 32A connecting Son Tay to northern provinces which also has Son Tay harbor for waterway transportation. This area is convenient for trade and tourism and diverse economic development. Previously, Son Tay developed very fast with the growth rate of 9.8%/year. Among different sectors, industry is the decisive economic sector, it occupied 43.2% GDP. Electricity, water and telecommunication system: Almost all communes and towns in Son Tay dispose of electricity and water supply, Son Tay post office can supply the connection to all the countries in the world. ADSL internet service is also very popular in Son Tay, which makes favorable condition for local people in approaching high technology.

C 2 Status of Host Country	
Host Country[2]	☒ Signed and ratified, accepted, approved or acceded to the Kyoto Protocol (*) ○ Signed the Kyoto Protocol and has demonstrated a clear interest in becoming a Party in due time ○ Has already started or is on the verge of starting the national accession process

(*)

- Viet Nam ratified the UNFCCC on 16 November 1994 and KP on 25 September 2002. The International Cooperation Department of MONRE was designated as Clean Development

[2] The list of countries which have ratified the Kyoto Protocol is available at http://unfccc.int/files/essential_background/kyoto_protocol/application/pdf/kpstats.pdf.

National Authority (CNA) in Vietnam in March 2003. It plays function as the Designated National Authority (DNA) for CDM in Vietnam.

- CDM National Executive and Consultative Board (CNECB) were established in April 2003. CNECB consists of 12 representatives.
- 02 CDM projects were approved by EB in 2006 and many CDM projects are developing.

Existing Memorandum of Understanding (MoU) (if Yes, please list the countries)	☒ Yes, Austria and Vietnam have signed a MoU on co-operation for the facilitation of JI/CDM projects implementation. ○ No

D GENERAL PROJECT INFORMATION

D 1 General Information	
Project name	Building a municipal waste treatment plant with the capacity of 200 tons/day including composting, recycling and controlled waste combustion for power generation in Son Tay town, Ha Tay province, Vietnam
Project objective	To avoid the production of methane from municipal solid waste that would otherwise be decayed anaerobically on landfill site without methane recovery. Due to the project activities, the emission is prevented through separation and alternative treatment of all organic matter from municipal solid waste. With these methods, the biodegradable group is treated aerobically by composting, and the combustible group is treated by controlled incineration. The compost product is applied for soil treatment, and the heat produced from combustion is recovered for electric generation. Electricity will be sold by 25 year power purchasing agreements (PPAs) with Electricity of Vietnam (EVN). The project will support Vietnam's sustainable growth by providing electricity through biomass power production without relying on fossil fuel combustion.
Description of project background	Son Tay is one of the two big towns of Ha Tay province. The population of Son Tay town is about 110,000 people. The amount of waste daily generated by the town is about 150 tons (including hotels, offices, restaurants, etc.,) and about 50 tons by surrounding area. Everyday, Son Tay URENCO has responsibility to collect the household waste inside the town and surrounding area and dump it in the open landfill at Xuan Son commune, Son Tay town, Ha Tay province (total 200 tons of waste/day). The project will construct a waste treatment plant within an area of 2.5 ha which is near the current landfill and about 12 km and 1km far from centre of Son Tay town, and resident area respectively. The roads are convenient for traveling.

D 2 Category(ies) of project activity	
Project category *Please mark accordingly.*	○ Construction (or retrofitting) of combined heat and power installations; ○ Fuel-switch projects in energy conversion installations and production plants to renewable energy sources or from energy sources with high carbon content to energy sources with lower carbon content, especially in existing district heating systems; ○ Construction (or retrofitting) of generating plants operated with renewable energy sources (especially wind power plants, biogas or biomass combined heat and power plants as well as hydroelectric power plants); ○ Projects whose purpose is the avoidance or (energy) recovery of landfill gas; ☒ Waste management measures which contribute to the avoidance of greenhouse gas emissions, especially through energy recovery from waste, if possible with waste heat utilisation; ○ Energy efficiency projects: projects serving the reduction of end-user energy consumption in residential buildings, public and private office buildings as well as industrial applications and processes (including waste heat potentials); ○ Other: _____

D 3 Technical aspects

Technical description

The essential technical aspects should be briefly presented.

A detailed description (max. 3 A4 pages) should be enclosed with the PIN including the following aspects:

Project purpose

Applicant's facilities to generate Emission Reductions

Description of technology employed and associated risks

Milestones, time schedule and current status of implementation

Key permits and expected date of approval

Key contracts and expected date of signing

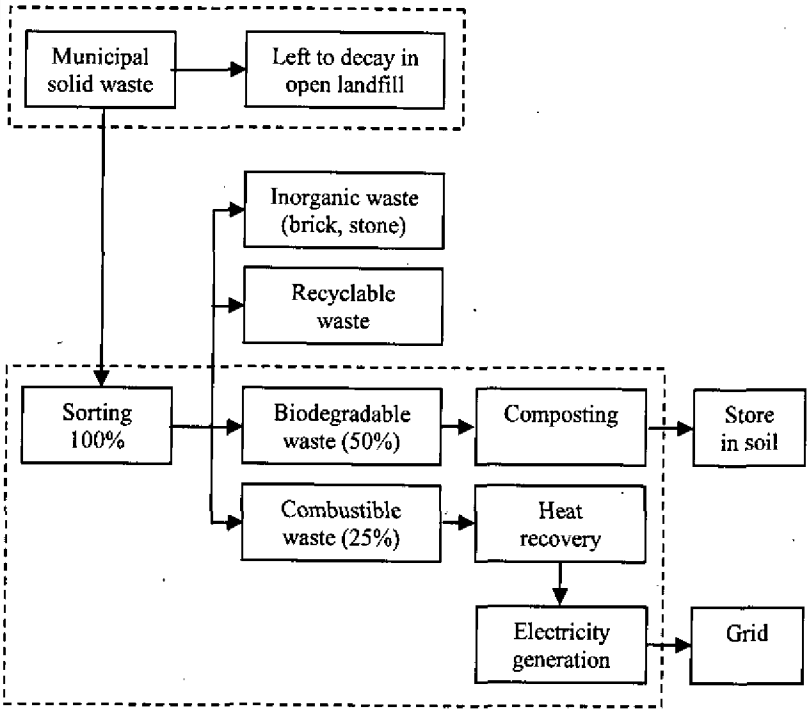
Risks during project implementation and operation

The project activities are construction and operation of a waste treatment plant (includes waste recycling, composting and waste combusting for power generation). The plant is built in Son Tay town, Ha Tay province. Its capacity is about 200 tons of fresh waste per day (72,000 tons/year) which is equivalent to the amount of waste collected in Son Tay town and surrounding daily. Waste is collected by Urban environmental company and transported to the factory. The annual factory's yield will be:
- About 18,000 tons of compost used as fertilizer in agriculture;
- 11,250 MWh of electricity generated and connected to the national electricity grid.

When the project is put into operation, it will treat all the domestic waste of Son Tay town and surrounding area instead of dumping as usual. The project will reduce the greenhouse gas emission in different ways. Firstly, avoid the methane emission from anaerobic disintegration of organic waste in the landfill. Secondly, the composting process will generate fertilizer products which store carbon in soil and crop plants instead of emitting to environment under the form of CH_4 and CO_2. Thirdly, the energy generation from gross calorific value of waste substitutes the exploitation and usage of fossil energy resources.

Project benefits include: product sales (recycled product, electricity), waste treatment fee and income from CER.

The below diagram shows the production process of the project:



The project includes two main technologies: composting and electricity generation.

The applied technology, in turn, includes technological components which were patented under the name of SERAPHIN, belonging to the SERAPHIN Green Environment Technology JSC and other technological components from joint implemented foreign partners.

D 3 Technical aspects	
	The main core process is as followed: • Waste sorting line system (SERAPHIN technology). This technology will divide the wastes into four categories, namely recyclable materials (plastic, metal, glass, rubber); specific non-organic waste (brick, stone); organic waste and combustible materials (paper, cloth). • Biodegradable waste fraction about 50% (food and green waste) will be treated by composting methods, the vertical reactor will be operated under good controlling of biological processes and exhaust gas. Therefore, it will reduce the time of treatment and occupied space. The compost product have high carbon ratio which will be used as fertilizer to store in soil and crops plant. • Combusting the high energy content waste (fraction about 25% including paper, textile, wood, straw and other polymer etc. .) to produce electricity and heat. Using the combusting furnace with type of "Mass burn", collecting thermal energy under two types: hot air will be used as inlet source for furnace and other drying processes, overheated water steam will be used for turbine operation and electricity generator to generate electricity. After combusting, exhaust gas will be cleaned at diffirent level to guarantee the environmental standards before discharging. (This component will be supplied by foreign partners). Risks assessment of project. • The CDM project is not approved and implemented in time • Skill of Operation, maintenance and management are not high and training is required before implementation. Currently, the project construction has begun in Xuan Son commune, Son Tay town, Ha Tay province. The area where the waste treatment plant is constructed near the old landfill, that is easy to transport waste for treatment. Moreover, the infrastructure is very good for plant construction with electricity grid and road available.

E PROJECT ORGANISATION

E 1 Project team	
Project-specific qualifications and experiences *The essential qualifications and experiences should be briefly presented; details should be enclosed with the PIN*[3].	Project team should include: • SERAPHIN Joint Stock Company • Vietnam Cleaner Production Centre • URENCO Ha Tay • People's Committee of Ha Tay • Other foreign partners.

E 2 Schedule	
Current project status	○ Project idea ☒ Planning ○ Implementation
Status of financing	Under Implementation
Status of negotiations with the Host Country	Under Implementation
Status of permission procedures of authorities	Under Implementation
Project preparation	From: March 2006 to August 2006
Construction/assembly	From: August 2006 to Dec 2007
Project lifetime	From: 2008 to 2037
Generation of ERUs/CERs	From: 2008 to 2017
Other milestones	
Effect of PIN acceptance on the time schedule of the project	Effect of the PIN acceptance which is in time as forecasted: • The project moves smoothly to PDD and final approval by EB • Give a good belief for the local people, partners, suppliers, etc., • Avoid the effect of capital investment rising. Effect of the PIN acceptance which is not in time as forecasted: • Give a not good belief for the project partner • Emission credit period will be changed and affect the additional benefit. • Cause serious environmental pollution by uncontrolled domestic waste disposal.

[3] In this context please refer to Appendices 4 and 5 of the Call for Expression of Interest.

E 3 Financial aspects	
Costs of project development (EUR) *Please give figures and briefly explain (background of) calculations.*	It is estimated that the cost for development of PIN, PDD and other CDM transaction cost is about 100,000 EUR
Costs of project implementation (EUR) *Please give figures and briefly explain (background of) calculations.*	• Cost for sorting, recycling and composting plant (including infrastructure) ~ 1,600,000 EUR • Cost for Mass burn system to generate electricity ~ 2,100,000 EUR • Total investment cost ~ 3,700,000 EUR
Estimated annual operating costs (EUR) *Please give figures and briefly explain (background of) calculations.*	Annual operating and maintenance cost is calculated as 10% of total investment = 3,700,000 x 10% = 370,000 EUR
Estimated annual revenues (EUR) *Please give figures and briefly explain (background of) calculations.*	The total investment cost of the project is about 3.7 million EUR, operation and maintenance cost is estimated as 10% of total investment cost, total input waste per year is at 72,000 ton. For the purpose of PIN development, we have considered 02 scenarios for financial analysis; CDM case (with mentioned project activities as above and revenue from CER) and a Reference case (called Ref. case, including the mentioned project activities but neglect the revenue from CER). Assuming that CER revenue will be received in 10 years, the first five year 2008-2012, CER price is at 6.5 USD/tons and it would become only half price in the next five years. Besides of that, the financial analysis is also based on other assumptions listed in the appendix at the end of this PIN. Financial indicators of the proposed project as follows: • NPV_0 (at Ref case) ~ -695,557 EUR (IRR_0 ~ 8.33%) • NPV_1 (at CDM case) ~ 66,949 EUR (IRR_1 ~ 12.36%) It can be seen from the above results that NPV_0 is negative while that become positive of 66.9 million EUR when CERs revenue is taken into account, this make the CDM project become profitable.
Financing sources (equity/debt capital, financing institutions)	• About 1.6 million EUR is contributed by SERAPHIN Company; • The remaining part will be provided by financial funds for incentive investment in Vietnam or by foreign investment.
Proposed ERU/CER price (EUR) *Please explain calculation.*	CER price is 5.2 EUR • Reference from PIN/PDD which is accepted by Vietnam's DNA • Reference from ASEAN countries market • Reference from the "Report of Investment Development for CDM projects in Cambodia, Laos and Vietnam" April 2006

F GREENHOUSE GAS EMISSION REDUCTIONS

Only projects resulting in emission reductions of greenhouse gases listed in table F1 can be accepted as JI or CDM projects. All emissions and/or emission reductions must be stated in metric tonnes of CO_2 equivalent.

F 1 Greenhouse gases	
Greenhouse gases to be reduced by the project	☒ CO_2 ☒ CH_4 ○ N_2O ○ HFCs ○ PFCs ○ SF_6

The Project Boundary shall encompass all anthropogenic emissions by sources of greenhouse gases under the control of the project participants that are significant and reasonably attributable to the project activity.

F 2 Project Boundary	
Description of Project Boundary	The project boundary is the site where: • The municipal solid waste would have been landfilled without methane recovery. • The treatment of municipal solid waste takes place, through separation of all organic matters and treatment by composting and controlled combustion. • The treatment site is close to landfill site, so the transportation of waste is not counted but the transportation of produced compost occurs.

F 3 Project emissions	
Description and estimation of project-specific greenhouse gas emissions within the Project Boundary	Project emission includes the emissions from electricity and fuel usage on-site and the emissions from composting and combustion process.
	Project emissions PEy = PEelec,y + PEfuel,y + PEcomp,y + PEcomb,y *where:* PEy 5,244.43 tCO2e/y Project emissions during the year PEelec,y 894.24 tCO2e/y Emissions from electricity use in-site due to the project activity, see the calculation below PEfuel,y 319.51 tCO2e/y Emissions from fuel use in-site due to the project activity, see the calculation below PEcomp,y 736.68 tCO2e/y Emissions during the composting process, see the calculation below PEcomb,y 3,294.00 tCO2e/y Emissions from the combustion process, see the calculation below

Emissions from electricity use in-site

PEelec,y = MWhe,y * CEFelec

where:

MWhe,y	1,490.40	MWh/y	Amount of electricity use in-site in the year, follow the estimation in the project activity
CEFelect	0.60	tCO2e/MWh	Carbon emissions factor for electricity generation in the project activity, used default value

Emissions from fuel use in-site

PEfuel,y = Fuel,y * NCVfuel * EFfuel

where:

Fuel,y	118,800.00	L/y	Amount of fuel use in-site in the year, follow the estimation in the project activity
NCVfuel	36.30	MJ/L	Net caloric value of the fuel
EFfuel	7.41E-05	tCO2e/MJ	CO2 emissions factor of the fuel

Emissions from composting activity

PEcomp,y = PEcomp_N2O,y + PEcomp_CH4,y

where:

PEcomp_N2O,y	239.94	tCO2e/y	N2O emissions during the composting process in the year, see the calculation below
PEcomp_CH4,y	496.74	tCO2e/y	CH4 emissions during the composting process due to anaerobic conditions in the year, see the calculation below

PEcomp_N2O,y = Pcomp,y * EFcomp_N2O * GWP_N2O

where:

Pcomp,y	18,000.00	tons/y	Amount of compost produced in the year, follow the project information
EFcomp_N2O	4.30E-05	tNO2/ tCompost	Emission factor for N2O emissions from the composting process, use default value
GWP_NO2	310.00	tCO2e/tNO2	Global Warming Potential of nitrous oxide

PEcomp_CH4,y = MBcomp,y * GWP_CH4 * Sa,y

MBcomp,y = Qcomp,y * IPCC_CH4

where:

MBcomp,y	1,182.72	tCH4/y	Methane that would be produced in the landfill in the absence of the composting activity in the year
Qcomp,y	36,000.00	tons/y	*Quantity of composting organic waste per year, follow the* project information
IPCC_CH4	0.03		IPCC CH4 emission factor for decaying organic waste in the region of project, see above
GWP_CH4	21.00	tCO2e/tCH4	Global Warming Potential of methane
Sa,y	2.00	%	Share of the waste that degrades under anaerobic conditions in the composting plant during the year, use default value (max 5 - 7%)

Emissions from combustion process

PEcomb,y = PEcomb_CO2,y + PEcomb_N2O,y

where:

PEcomb_CO2,y	2,736.00	tCO2e/y	CO2 emission from waste combustion based on fossil carbon in the year, see the calculation below
PEcomp_N2O,y	558.00	tCO2e/y	N2O emission from waste combustion in the year, see the calculation below

PEcomb_CO2,y = Qcomb,y * CCW * FCF * EFcomb * 44/12

where:

Qcomb,y	18,000.00	tons/y	Quantity of combustion organic waste per year
CCW	0.40		Fraction of carbon content in the waste, use default value (30 - 50%)
FCF	0.40		Fraction of fossil carbon in the waste, use default value (30 - 50%)
EFcomb	0.95		Efficiency of waste combustion of incinerator, use default value (95 - 99%)

PEcomb_N2O,y = Qcomb,y * EFcomb_N2O * GWP_N2O

where:

Qcomb,y	18,000.00	tons/y	Quantity of combustion organic waste per year
EFcomb_N2O	1.00E-04	tN2O/ tWaste	Aggregate N2O emissions factor for the wate, use default value for grate incinerator
GWP_N2O	310.00	tCO2e/tN2O	Global Warming Potential of nitrous oxide

A Baseline is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the project ("business-as-usual-scenario"). By comparing the Baseline with the project emissions the emission reductions generated can be calculated.[4]

[4] Additionally, Leakage has to be taken into account.

F 4 Baseline

Outline of considered Baseline methodology/scenario and estimation of Baseline emissions within the Project Boundary

The baseline methodologies applied are **AM0025** and **ACM0002.**

The baseline scenario is the situation where, in the absence of the project activity, organic fraction in the municipal solid waste is left to decay within the project boundary and methane is emitted to the atmosphere without recovery.

Baseline emissions include methane emissions from organic waste that would be decayed in the landfill without project activities (landfill baseline emissions) and emissions in cases where electricity would be generated in the absence of the project activity (electricity generation).

Baseline emissions

BEy = BE_landfill,y + BE_elect,y

where:

BE,y	44,005.68 tCO2e/y	Baseline emissions in the year
BE_landfill,y	37,255.68 tCO2e/y	Emissions from organic waste that would be decayed in the landfill without project activities in the year, see the calculation below (landfill baseline emissions)
BE_elect,y	6,750.00 tCO2e/y	Emissions in cases where electricity would be generated in the absence of the project activity in the year, see the calculation below (electricity generation baseline emissions)

Baseline emissions from lanfilling

BE_landfill,y = MBy * GWP_CH4

MBy = Qtreated,y * IPCC_CH4

Qtreated,y = Qcomp,y + Qcomb,y

where:

MBy	1,774.08 tCH4/y	Methane produced in the landfill in the absence of the project activity, use IPCC default method
GWP_CH4	21.00 tCO2e/tCH4	Global Warming Potential of methane (tCO2e/tCH4)
Qtreated,y	54,000.00 tons/y	Quantity of organic waste treated under the project activity
IPCC_CH4	0.03	IPCC CH4 emission factor for decaying organic waste in the region of project, see the calculation below
Qcomp,y	36,000.00 tons/y	Quantity of composting organic waste per year, follow the project information above
Qcomb,y	18,000.00 tons/y	Quantity of combustion organic waste per year, follow the project information above

IPCC_CH4 = (MCF * DOC * DOCf * F * 16/12)

where:

MCF	0.40	Methane correction factor (fraction), used default for unmanaged lanfill - shallow < 5m waste
DOC	0.16	Degradable organic carbon (fraction), used default (maximum 0.21)
DOCf	0.77	Fraction DOC dissimilated to landfill gas, used default
F	0.50	Fraction of CH4 in landfill gas, used default

Baseline emissions from electricity generation

BE_elect,y = Pelect,y * CEFelect

where:

Pelect,y	11,250.00 MWh	Amount of electricity produced in the project activity in the year, follow the project information above
CEFelect	0.60 tCO2e/MWh	Carbon emissions factor for the displaced electricity source in the project scenario, use default value

Leakage is defined as the net change of anthropogenic emissions by sources of greenhouse gases which occurs outside the Project Boundary, and which is measurable and attributable to the project activity.

F 5 Leakage	
Description and estimation of Leakage	Leakage is the emissions from off-site transportation of compost product to the users

Leakage
L,y = Lt,y
where:

Ly	87.14 tCO2e/y	Leakage emission in the year
Lt,y	87.14 tCO2e/y	Emission from off-site transportation of compost to the users, see the calculation below

Lt,y = Ntrans,y * km * VFcons * CVfuel * EFfuel
where:

Ntrans	1,800.00 trips	Number of transportation trip of compost in the year, follow the estimation in the project based on amount of compost produced in the year
km	120.00 km	Average distance travelled by vehicle for one trip, follow the estimation in the project
VFcons	0.15 L/km	Vehicle fuel consumption in litres per kilometre
CVfuel	36.30 MJ/L	Calorific value of the fuel
EFfuel	7.41E-05 tCO2e/MJ	CO2 emissions factor of the fuel

F 6 Emission reductions	
Crediting period	5 years from 2008 to 2012 5 years from 2013 to 2017
Estimated annual and total abatement of greenhouse gas emissions in tonnes of CO_2 equivalent in comparison to the Baseline scenario (taking into *account Leakage)*	Annual green house gas emission is: 38,674 tons CO_2e/year Total emission in the crediting period: 38,674 x 5 = 193,370 tons CO_2

Emission Reduction
ERy = BEy - PEy - Ly
where:

ERy	**38,674.11 tCO2e/y**	**Emissions reduction in the year**
BEy	44,005.68 tCO2e/y	Baseline emission in the year
PEy	5,244.43 tCO2e/y	Project emission in the year
Ly	87.14 tCO2e/y	Leakage emission in the year

G (ADDITIONAL) ECOLOGICAL, SOCIO-ECONOMIC AND/OR DEVELOPMENT EFFECTS

G 1 Expected environmental effects	
Expected global/local environmental effects (positive and negative) of the project[5]	The project complies with the specific applicable regulations of the host country in regard to Environment Impact Assessment (EIA). The EIA follows the regulations for EIA system set in Vietnam. During the construction and operation stage, the only significant impact is related to the loss of habitat for the aquatic fauna and flora. All the impacts were identified and mitigation measures will be implemented in order to avoid any erosive process and landscape alteration after construction stage. When the project goes into operation, it will treat most of the household waste generated daily in Son Tay town and surrounding area. The project also helps to reduce the land occupation and environmental pollution by landfill and avoids the green house gas emitted to the atmosphere.

G 2 Socio-economic and development aspects	
Expected social and economic effects of the project	Domestic waste treatment plant intends to make certain that it will substantially contribute to the well being of the local communities. Many local people can buy compost product for agriculture at reasonable price. Other local residents will be involved during plant construction as construction workers and civil work subcontractors and during plant operation as skilled and unskilled operating and maintenance staffs. The list of specific local economic development impacts includes: • *Creation of construction and plant operating jobs (all constructors and suppliers to the project are mandated to give preference to local labour).* • Training and professional development (training in equipment operation and computers, internet access will be available for workers). • Increased employment opportunities in rural areas (people may choose to work locally, instead of moving to urban centres for employment). • Increased economic activity is expected in the local communities at all plant sites to meet transportation, housing, and catering needs.
Project-related employment structure	○ Employees under 14 years ☒ Employees over 14 years
Do any of the listed effects occur due to the project?	○ Resettlement ○ Restriction of access to essential resources ○ Compulsory purchase of land

[5] Abstraction of ground water or surface water may in no event be larger as the natural water influx.

H ADDITIONALITY AND SUSTAINABILITY EFFECTS

H 1 Additionality	
Presentation of the Additionality of the project *Please explain briefly how and why the project is additional and therefore not the (considered) Baseline scenario. Please describe why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances.*	The scenario of Business As Usual (BAU) or baseline project is collecting waste and dumping to the open landfill. That is not business project. CDM project is using domestic waste for producing compost and generating electricity and selling CO2 emission. CDM project has two additionalities compared to baseline project, namely: financial additionality and environmental additionality (GHG emission reduction). The selected baseline scenario for calculation is landfill avoiding by composting and Electricity of Vietnam grid. In case there is no CDM project (power and compost plant) that means EVN has to invest in other power plants using fossil fuel to generate electricity. Moreover, if there is no CDM project, it means all collected domestic waste will be dumped in the open landfill so the green house gas emission reduction does not occur. When the project goes into operation, it will treat all the Son Tay's domestic waste and surrounding area instead of landfill as usual. This will reduce the green house gas in many ways: • Avoiding methane emission from anaerobic disintegration of organic waste at landfill. • Composting process will create fertilizer product to capture carbon (C) in land and trees. • Regenerating energy from waste which has high calorific value to reduce fossil fuel exploitation and usage. The project will also help: • Improve the knowledge for personnel. • Raising awareness on environmental protection for communities. • Having positive effects on other sectors as agriculture, energy, industry, etc., • Furthermore, the success of the project will provide good opportunities to duplicate this model and create a new environmental improvement in general and waste management and treatment, in particular in Vietnam. Moreover, this project is considered a CDM project because of the following reasons: • At present, the treating methods of household waste regarding to the methods described in this project is not obligated. And even the method of landfill in order to collect CH_4 is also not forced to implement. • The economic benefits in the Ref. case (without CER revenues) are not atractive investors (negative NPV), the new technologies still have many risks and lack of practical experiences.

H 2 Sustainability Effects	
Summarizing description of the project's contribution to the sustainable development of the Host Country	Currently the energy consumption in general and electricity consumption in particular in Vietnam is still low; the electricity consumption in 2005 is only 550 kWh/person. Together with industrialization and modernization, electricity demand will estimated to significantly increase with the growth average annual rate of 12-14%. Much more hydro, thermo (coal and gas) based power plants will be built creating impact into environment. The usage

	of coal for thermo-electricity generation will result in higher CO_2 emission of power system. The project does not only use waste material to generate electricity instead of fossil fuel but also eliminates the environmental pollution in the area. Moreover, the project produces a product as compost from the waste for agriculture using and reduces the land occupation for landfill.

Appendix 1: Assumptions for project financial analysis

ITEMS	UNIT	Reference Case	CDM
Invest cost 1 (Composting)	USD	2,000,000	2,000,000
Invest cost 2 (Combustion)	USD	2,625,000	2,625,000
CDM project development cost	USD		125,000
Total investment	USD	4,625,000	4,750,000
Annual operation and maintenance cost (8% of total investment cost)	USD	462,500	471,500

Input waste per year	ton/yr	72,000	72,000
Waste treatment fee	USD/ton	3.44	3.44
Income from waste treatment fee	USD/yr.	247,500	247,500

Annual amount of produced electricity	MWh	11,250	11,250
Electricity sale-price	USD/MWh	28.13	28.13
Income from electricity sale	USD/yr	316,406	316,406

Annual amount of produced compost	tons/yr	18,000	18,000
Compost sale-price	USD/ton	25.00	25.00
Income from compost sale	USD	450,000	450,000

Emission reductions per year	t-CO2/yr		38,674
CO2 sale-price	USD/ton		6.5
Income from CO2 sale	USD		251,382

Total income per year	USD	1,013,906	1,265,287
Annual revenues	USD	551,406	790,287
Project life time	year	15	15
Discount rate	%	12	12
NPV_15	USD	-869,447	83,686
IRR_15	%	8.33%	12.36%

2.2 Portfolio of Project Idea Notes (PIN)

Gas conversion project for the oil-fired Hiep Phuoc power plant

Table of Contents

I. Introduction

The Project Idea Note (PIN) is the first general information on the project and enables the Programme Management to assess the basic eligibility of a potential JI or CDM project.
It comprises details on the following subjects:

- Project identification;
- Project participants;
- Host Country;
- General project information;
- Project organisation;
- Greenhouse gas emission reductions;
- (Additional) ecological, socio-economic and/or development effects; and
- Additionality and sustainability effects.

Chapter II contains the PIN template.[1]

[1] It focuses on "directly" emission-reducing projects. In the case of sink projects the template has to be adapted and used accordingly.

II. Template for the Project Idea Note (PIN)

A PROJECT IDENTIFICATION

A 1 Project summary	
Title of project activity	Gas switch project for the oil-fired Hiep Phuoc Power Plant
Applicant	Hiep Phuoc Power Company
Host Country	Viet Nam
Project type	Clean Development Mechanism
Category of project activity	Power Generation
Generation of emission reductions	From: January 2008 to: December 2017
Estimated emission reductions *(in t CO_{2e} up to 2012)*	Annual (average): ~ 258,014 tons of CO_2 Total: 1,290,068 tons for the first 05 years 2008-2012
Crediting Period	From: 2008 to: 2017
Offered amount of emission reductions	○ Joint Implementation: ERUs: _____ AAUs ("early credits"): _____ ☒ Clean Development Mechanism: CERs: _____
Proposed ERU/CER price (EUR)	5.2 EUR/ton CO_2
Date of submission of Expression of Interest:	March 2005

B PROJECT PARTICIPANTS

B 1 Applicant	
Name	Hiep Phuoc Power Co. Ltd
Type of organisation *Please also describe the ownership structure.*	Independent Power Plant Hiep Phuoc Power Company belongs to The Central Trading & Development (CT&D) Group originating from Taiwan. The purpose of the company is to ensure an adequate supply of electricity to CT&D Group's various development projects and their surrounding area. If producing surplus power, it can be sold to the national power grid. This project, which is a B.O.O project, obtained the investment license in June 1993. It is the first 100% foreign owned company in Vietnam that has its own power plant and exclusive power supply territory.
Other functions of the Applicant within the project	○ Sponsor ○ Intermediary ○ Technical consultant ☒ Other: Project Owner
Main activities, knowledge and experience	The installed capacity of the plant is 375 MW which consists of 3 x 125 MW generation units. The construction work was started since September 1994. From February to July of 1998, all three units have been commissioned and connected to the national power grid. The power generated by Hiep Phuoc power company is distributed by four 110 kV transmission lines. Since its entry in operation, the power plant operates under stable conditions thanks to continuous efforts and improving activities. The annual generation has been increasing and has reached 2 billion kWh. The operation of Hiep Phuoc Power Plant does not only ensure an adequate supply of electricity to CT&D various development projects in Vietnam, but also eases the acute power shortage in Southern Vietnam.
Name of contact person	Mr. Henry Lin, Vice President
Address	Hiep Phuoc Village, Nha Be Dist., HoChiMinh City
Phone/fax	84.8.7818023/84.8.7818020
E-mail	hppc@hcm.vnn.vn

B 2 Project developer	
Name	Vietnam Cleaner Production Centre (VNCPC)
Type of organisation	Government Organisation
Other functions of the project developer within the project	○ Sponsor ○ Intermediary ☒ Technical consultant ○ Other: _____
Main activities, knowledge and experience	Viet Nam Cleaner Production Centre was established in 1998, as a member of the UNIDO/UNEP network of national cleaner production centres.

	VNCPC has been carrying out a significant number of projects on the following areas: • Training, in-plant assessments and consulting on cleaner production (CP), technology gap, technology transfer, energy efficiency and recovery, etc. (customers include international projects and more than 100 companies since 1998). • Policy Assessment and Advice. • CDM and climate change issues (organization of training, information dissemination, PIN and PDD development etc.) Under the UNIDO framework, VNCPC has been supported by international and national CDM experts in the identification and development of CDM projects, especially in industrial sectors.
Name of contact person	Mr. Le Thanh Tung, responsible for CDM activities
Address	Vietnam Cleaner Production Centre, 4th Floor C10 Building, Hanoi University of Technology, No 1, Dai Co Viet street, Hanoi, Vietnam
Phone/fax	Phone: (00-84) 4 - 8684849, ext 23 Fax: (00-84) 4 – 8681618
E-mail	tung.lt@vncpc.org

B 3 Other project participants	
Name of project participant	N/A
Type of organisation	○ Governmental body: _____ ○ Private enterprise ○ NGO ○ Other: _____
Function within the project	○ Sponsor ○ Intermediary ○ Technical consultant ○ Other: _____
Name of contact person	
Address	
Phone/fax	
E-mail	

C HOST COUNTRY

C 1 Location of project activity	
Host Country Party(ies)	Socialist Republic of Vietnam
Region/State/Province etc.	Hiep Phuoc Industrial Zone, Nha Be District.
City/Town/Community etc.	Ho Chi Minh City
Brief description of the project location	The Hiep Phuoc power plant/CDM project is located on the riverbank of Soai Rap River, about some 15 km east south of Ho Chi Minh City. The site covers an area of 50 plus hectares.

C 2 Status of Host Country	
Host Country[2]	☒ Signed and ratified, accepted, approved or acceded to the Kyoto Protocol (*) ○ Signed the Kyoto Protocol and has demonstrated a clear interest in becoming a Party in due time ○ Has already started or is on the verge of starting the national accession process
Existing Memorandum of Understanding (MoU) (if Yes, please list the countries)	☒ Yes, Austria and Vietnam have signed a MoU on co-operation for the facilitation of JI/CDM projects implementation. ○ No

(*)

- Viet Nam ratified the UNFCCC on 16 November 1994 and KP on 25 September 2002. The International Cooperation Department of MONRE was designated as Clean Development National Authority (CNA) in Vietnam in March 2003. It plays function as the Designated National Authority (DNA) for CDM in Vietnam.
- CDM National Executive and Consultative Board (CNECB) were established in April 2003. CNECB consists of 12 representatives.
- 02 CDM projects were approved by EB in 2006 and many CDM projects are developing.

[2] *The list of countries which have ratified the Kyoto Protocol is available at* http://unfccc.int/files/essential_background/kyoto_protocol/application/pdf/kpstats.pdf.

D GENERAL PROJECT INFORMATION

D 1 General Information	
Project name	Gas switch project for the oil-fired Hiep Phuoc Power Plant
Project objective	The aim of this project is to reduce the air emission and increase the economic effectiveness of power generation in Hiep Phuoc power plant. The project includes a fuel switch from FO to natural gas and a reduction of its associated emissions in Vietnam and a move towards a cleaner, more sustainable energy source for the country. The use of gas instead of fuel oil will lead to a remarkable reduction in greenhouse gas emissions as well as in localised pollutants and particulates.
Description of project background	Hiep Phuoc power plant was built in 1993 and started its electricity generation in 1998. At that time, the environmental requirements were not as strict as today; the company was not forced to have air emission treatment. The currently approved environmental option consists in increasing the factory's chimney height. During operation, several difficulties have been identified, detailed as: • Economic aspect: The oil price has been increasing strongly, although the company and EVN has agreed that electricity price depends on the oil price, however, the expected electricity amount dispatched by EVN has been reducing. This has a impact on the factory's turnover. • Environmental aspect: For the time being, the company is using the fuel oil with high sulphur content and this causes environmental pollution.
D 2 Category(ies) of project activity	
Project category *Please mark accordingly.*	○ Construction (or retrofitting) of combined heat and power installations; ☒ Fuel-switch projects in energy conversion installations and production plants to renewable energy sources or from energy sources with high carbon content to energy sources with lower carbon content, especially in existing district heating systems; ○ Construction (or retrofitting) of generating plants operated with renewable energy sources (especially wind power plants, biogas or biomass combined heat and power plants as well as hydroelectric power plants); ○ Projects whose purpose is the avoidance or (energy) recovery of landfill gas; ○ Waste management measures which contribute to the avoidance of greenhouse gas emissions, especially through energy recovery from waste, if possible with waste heat utilisation; ○ Energy efficiency projects: projects serving the reduction of end-user energy consumption in residential buildings, public and private office buildings as well as industrial applications and processes (including waste heat potentials);

	○ Other: _____

D 3 Technical aspects	
Technical description *The essential technical aspects should be briefly presented.* *A detailed0 description (max. 3 A4 pages) should be enclosed with the PIN including the following aspects:* *Project purpose* *Applicant's facilities to generate Emission Reductions* *Description of technology employed and associated risks* *Milestones, time schedule and current status of implementation* *Key permits and expected date of approval* *Key contracts and expected date of signing* *Risks during project implementation and operation*	At the present, the FO electricity generation technology is used with a boiler capacity of 375 MW (3 trains x 125 MW each). In the current situation, as the oil price in the world has been dramatically increasing, the electricity production cost has been also continuously escalating while the electricity price is controlled by the government and has not changed. As a result, the company's loss has been worsening. The fuel switch from oil to natural gas is a strategy to reduce loss as well as to meet the existing urgent environmental improvement requirements, namely to minimize GHGs effect and SOx emission which is harmful to people working in the field of paddy or aquaculture cultivation within the area. To achieve the above-mentioned purposes, a fuel switching option from oil to natural gas which requires the addition of gas titanium burner has been identified. Besides, a gas pipeline and a pressure reducing station are also required and a part of the control system needs to be modified, etc. As the natural gas is used, the potential risk of explosion is higher than the existing technology and the design has to strictly follow the related Code and Standards. In addition, the operators need to be re-trained and the Operation Practice needs to be re-regulated to minimize the incident probability. Hiep Phuoc has worked with Petrovietnam on the gas supplying agreement. As planned, by middle 2008, gas will be delivered to Hiep Phuoc industrial zone. Preparation for investment is in progress and everything will be ready for the operation once gas is delivered in 2008.

E PROJECT ORGANISATION

E 1 Project team	
Project-specific qualifications and experiences *The essential qualifications and experiences should be briefly presented, details should be enclosed with the PIN[3].*	*Project team should include the following participants* • *Hiep Phuoc Power Plant* • Other foreigner partners. • Vietnam National Cleaner Production Centre

E 2 Schedule	
Current project status	○ Project idea ☒ Planning ○ Implementation
Status of financing	Under Implementation
Status of negotiations with the Host Country	Under Implementation
Status of permission procedures of authorities	Under Implementation
Project preparation	From: Jan. 2004 to: Dec. 2005
Construction/assembly	From: Jan 2006 to: Dec. 2007
Project lifetime	From: 2008 to: 2022
Generation of ERUs/CERs	From: 2008 to: 2018
Other milestones	
Effect of PIN acceptance on the time schedule of the project	In parallel with PIN, PDD and other CDM approval procedures preparation, the factory is continuously working on the implementation of this project. If PIN is soon verified, PDD will also be completed and sent for approval right after.

[3] In this context please refer to Appendices 4 and 5 of the Call for Expression of Interest.

E 3 Financial aspects	
Costs of project development (EUR) Please give figures and briefly explain (background of) calculations.	Cost of project development includes: 1. Cost of PIN, PDD development and CDM approval, estimated amount of 80,000 EUR 2. Cost for feasibility study, estimated amount of 10,000 EUR 3. And other costs 10,000 EUR Total estimated cost of project development is about 100,000 EUR
Costs of project implementation (EUR) Please give figures and briefly explain (background of) calculations.	Total estimated cost of project implementation is estimated at 6.16 millions EUR of which cost of equipments and technical consultant is 3,2 million EUR and cost of installation is 2,96 million EUR.
Estimated annual operating costs (EUR) Please give figures and briefly explain (background of) calculations.	Annual operating costs ~ 111,200 EUR, estimated based on the current operation of the power plant.
Estimated annual revenues (EUR) Please give figures and briefly explain (background of) calculations.	In this section, two scenarios have been considered for financial analysis, These are BAU case (to be understood as baseline scenario) and CDM case (includes mentioned project activities, CDM transaction cost and CER revenue). It is assumed that the carbon period is for 10 years, for the first 5 year (2008-2012) CER price is at 6.5 USD/tons and for the next 5 years the price of CER would be only half. Besides, other assumptions have been made. They can be found in the appendix at the end of this PIN. The outputs of financial estimation show that NPV under the BAU case is negative 172.9 million EUR which means that the company will suffer losses at this case and when it moves toward the fuel switching option, CDM case, NPV would become positive 150.8 million EUR.
Financing sources (equity/debt capital, financing institutions)	Total required investment is 6,16 million EUR, the financing sources are planned as: - 3.2 million EUR for equipment and technical consultant will be mobilized from commercial bank - The remaining 2.96 million EUR will be equity of the factory.
Proposed ERU/CER price (EUR) *Please explain calculation.*	Price of CER is assumed 5.2 EUR CO_2eq based on: Reference from PIN/PDD which is accepted by Vietnam's DNA Reference from ASEAN countries market Reference from the "Report of Investment Development for CDM projects in Cambodia, Laos and Vietnam" April 2006

F GREENHOUSE GAS EMISSION REDUCTIONS

Only projects resulting in emission reductions of greenhouse gases listed in table F1 can be accepted as JI or CDM projects. All emissions and/or emission reductions must be stated in metric tonnes of CO_2 equivalent.

F 1 Greenhouse gases	
Greenhouse gases to be reduced by the project	☒ CO_2 ○ CH_4 ○ N_2O ○ HFCs ○ PFCs ○ SF_6

The Project Boundary shall encompass all anthropogenic emissions by sources of greenhouse gases under the control of the project participants that are significant and reasonably attributable to the project activity.

F 2 Project Boundary	

F 2 Project Boundary

Description of Project Boundary

The project activity is defined as the addition of natural gas as primary thermal fuel in the boiler for power generation. The project boundary according to the baseline methodology ACM 0009 the emissions relating to the mining and transport of FO as well as fugitive emissions from natural gas pipelines. The flow chart below describes the project boundary.

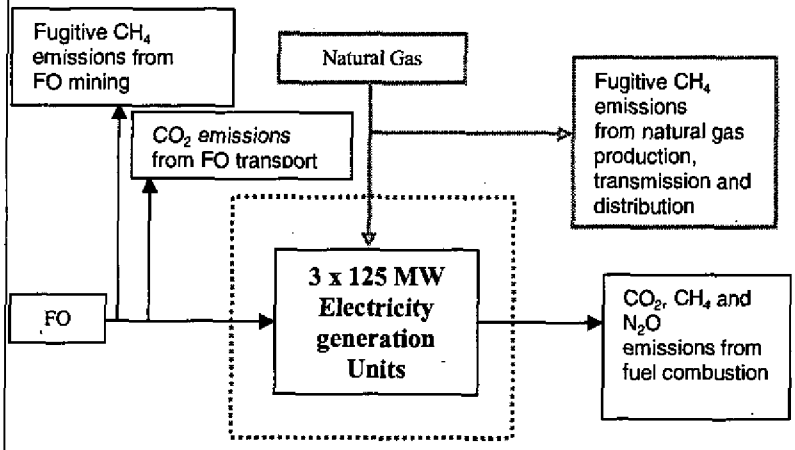


Figure 1: Project boundary for the project indicating fuel and GHG emissions flows for FO (baseline case) and natural gas (project case)

For the purposes of this analysis, the project boundary encompasses the physical, geographical site of the plant. Schematically, Figure 1 shows the project boundary indicating mass flows into the boundary and fugitive methane emissions associated with FO and natural gas. Table 1 shows direct and indirect emissions both on- and off-site with respect to the project boundary shown in the Figure.

Table 1.: Direct and indirect emissions on- and off-site in the project and baseline scenarios

Emissions	Project Scenario	Baseline Scenario
Direct on-site	• CO_2 emissions associated with natural gas combustion at plant site. • Methane (CH_4) and nitrous oxide (N_2O) emissions from natural gas *combustion* at plant site. • Methane (CH_4) emissions from natural gas *leakage* at plant site.	• CO_2 emissions from FO and combustion at plant site in the baseline. • Methane (CH_4) and nitrous oxide (N_2O) emissions from FO *combustion* at plant site in the baseline.
Direct off-site	None.	None.
Indirect on-site	• Power plant CO_2 emissions from *electricity use at the plant site*- excluded, since there is no change, with respect to the baseline, as a result of the project.	• Power plant CO_2 emissions from *electricity use at the plant site*- excluded, since there is no change, with respect to the baseline, as a result of the project.

F 2 Project Boundary			
	Indirect off-site	• Methane (CH_4) emissions from natural gas production, pipeline leakage (natural gas pipeline outside project site). • Other indirect off-site emissions would be associated with gas pipeline construction to bring natural gas to the project site area. This is not included, since there are likely to be many other users as well, and in each case there will be reduced CO_2 emissions from fuel switching. These emissions are excluded.	• Methane (CH_4) emissions related to coal mining, provided the coal originates in a non-Annex 1 party. • CO_2 emissions from coal transport within the country of the project.

F 3 Project emissions	
Description and estimation of project-specific greenhouse gas emissions within the Project Boundary	Within the boundary, in this PIN framework, we have neglected the effect of indirect emission and only considered the direct emission reduction by switching from FO to natural gas is counted, detailed as: A. Total annual amount of CO_2 emission from FO usage for electricity generation (baseline): • FO consumption * CO_2 emission factor of FO ~ 1,603,977 tons of CO_2 B. Total annual amount of CO_2 emission from natural gas usage for electricity generation (after project implementation): • Natural gas consumption * CO_2 emission factor of natural gas ~ 1,345, 963 tons of CO_2 • Total emission reduction is A-B ~ 258,014 tons of CO_2

A Baseline is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the project ("business-as-usual-scenario"). By comparing the Baseline with the project emissions the emission reductions generated can be calculated.[4]

F 4 Baseline	
Outline of considered Baseline methodology/scenario and estimation of Baseline emissions within the Project Boundary	For the consideration of baseline scenarios, the following project justifications have been identified: • The project is set to replace heavy oil with natural gas and improve the production efficiency where possible from its existing 35%. The gas will be supplied from Vietnam's offshore production fields and will replace fuel oil supplied from international market. • In this specific case the lack of a natural gas chain would result in the facility remaining as a fuel-oil power plant. Baseline methodology/scenario in this power plant is considered as the *business as usual case that still using FO for power generation.* For the project activity, baseline methodology **ACM 0009** can be applied for this project. Details on the methodology choice as followings: - No readily available methodology - Two approaching methodologies: o AM00029, "Baseline Methodology for Grid Connected Electricity Generation Plants using Natural Gas", which is applicable power plants, but for new plants only; o ACM0009, "Consolidated baseline methodology for fuel-switching *from coal or petroleum fuel to natural gas", which is applicable to* fuel-switching, but only for industrial facilities (in opposition to power plants) Therefore, for the purpose of this PIN, methodology ACM0009 is chosen. A fully adapted methodology will be used/developed for PDD preparation.

Leakage is defined as the net change of anthropogenic emissions by sources of greenhouse gases which occurs outside the Project Boundary, and which is measurable and attributable to the project activity.

F 5 Leakage	
Description and estimation of Leakage	No significant leakage is anticipated

F 6 Emission reductions	

[4] Additionally, Leakage has to be taken into account.

Crediting period	10 years from 2008 to 2017
Estimated annual and total abatement of greenhouse gas emissions in tonnes of CO_2 equivalent in comparison to the Baseline scenario (taking into account Leakage)	• Annual CO_2 emission is 258,014 tons • Total emission in the crediting period (10 years): 2,580,140 tons CO_2

G (ADDITIONAL) ECOLOGICAL, SOCIO-ECONOMIC AND/OR DEVELOPMENT EFFECTS

G 1 Expected environmental effects	
Expected global/local environmental effects (positive and negative) of the project[5]	The project should be seen as part of Vietnam drive to provide a more efficient, reliable and clean fuel alternative to coal and fuel oil. The use of cleaner gas would lead to a sizable reduction on GHG emissions. As a primary energy source, natural gas produces about two-thirds of the CO_2 emissions associated with fuel oil. Natural gas comprises primarily methane (CH_4) which makes it the "cleanest burning" of all the fossil fuels in view of the low sulphur content and low levels of residual higher hydrocarbons. When burned, natural gas produces low levels of particulates and emissions from gas combustion processes consist of water vapor, carbon dioxide, carbon monoxide and nitrogen oxides. These arise from combustion of a combination of the gas fuel and air. Carbon dioxide is a greenhouse gas which is though to impact directly on climate change but is produced in lower quantities in equivalent energy terms from gas than fuel oil. Emissions of nitrogen oxide (NO), which converts to nitrogen oxide (NO_2) immediately in contact with ambient air or ozone. Nitrogen dioxide has direct impacts on human health and is thought to aggravate the breathing difficulties of asthmatics. Nitrogen dioxide also interacts with unburned hydrocarbons to produce photochemical smog containing ozone, which also affects lung function, and breathing. In addition, nitrogen oxides act as indirect greenhouse gases. The higher operating temperatures of modern gas-fired power generation plant lead to relatively higher levels of NO_x emission. The facility would produce lower SO_x, NO_x and particulate emissions that would be beneficial to local air quality. The use of natural gas would have a reduced effect on the development of acid rain.

G 2 Socio-economic and development aspects	
Expected social and economic effects of the project	At the present, FO price is very high, without price subsidy, the more factories produce, the higher loss they get. Meanwhile, Vietnam has a large potential on natural gas, the usage of gas for electricity generation brings considerable economic benefit to the factory, gas suppliers (who permanently supply gas on a bulk) and the entire economy. Hiep Phuoc power station is one of the key anchor customers for Petrovietnam's onshore pipeline extension to HCMC. The construction of this pipeline is expected to lead to the fuel switching of industrial zones from other fuels to gas.
Project-related employment structure	○ Employees under 14 years ☒ Employees over 14 years
Do any of the listed effects occur due to the project?	○ Resettlement ○ Restriction of access to essential resources ○ Compulsory purchase of land

[5] Abstraction of ground water or surface water may in no event be larger as the natural water influx.

H ADDITIONALITY AND SUSTAINABILITY EFFECTS

H 1 Additionality	
Presentation of the Additionality of the project *Please explain briefly how and why the project is additional and therefore not the (considered) Baseline scenario. Please describe why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances.*	Additionality of the project compared to the baseline scenario: The factory is now using oil for electricity generation; the oil price is very high. The existing technology is out of date, low efficient and brings about high loss. In case of fuel switch, the factory's efficiency does not improve (as there will have a change in burner only), the economic aspect of the project is better than that of the baseline scenario. However, with the economic additionality, CER selling, the project will be more attractive to the investors (IRR= 28%). The project's additionality in terms of GHG emission reduction is obvious: about 258,014 tons CO_2 per year. However the project activities as mentioned could be considered as CDM project because of the following reasons: • This is a new project of the factory, during operation, there will be some risks, especially explosion risks. • The company is not ready for the new investment due to lack of capital • There are still some risks in relation with the gas pipeline that will be connected to industrial part where the power plant located (timing for construction, gas supply stability, price...)

H 2 Sustainability Effects	
Summarising description of the project's contribution to the sustainable development of the Host Country	Currently the energy consumption in general and electricity consumption in particular in Vietnam is still low; the electricity consumption in 2005 is only 550 kWh/person. Together with industrialization and modernization, electricity demand will estimated to significantly increase with the growth average annual rate of 12-14%. Much more hydro, thermo (coal and gas) based power plants will be built creating impact into environment. The usage of coal for thermo-electricity generation will result in higher CO_2 emission of power system. The usage of natural gas for electricity generation is clearly more stable than the usage of imported oil which strongly depends on international economic, politic variations. Vietnam has sufficient gas to supply permanently for the factory.

Appendix 1: Assumptions for project financial analysis

Assumptions	Unit	BAU	CDM
salvaged investment cost	USD	182,000,000[6]	182,000,000
New investment for fuel switching	USD	-	7,825,000[7]
Operation and Maintenance cost	USD	139,000	139,000
Fuel cost			
	USD/MM BTU		4.00
Fuel price	USD/tons FO and USD/m3 of NG	360.0	0.16
Specific fuel consumption	Kcal/kWh	2,457	2,529
Heat rate	Kcal/kg FO and Kcal/m3 NG	10,120	9,840
Product quantity	kWh/year	2,025,000,000	2,025,000,000
Operation times in a year	Hours/year	5,400	5,400

Assumptions	Unit	Values
Project life time	Years	15
Exchange rate	VND/USD	16,000
Internal rate	%/year	12

Assumptions	Values
Electricity generation efficiency from FO	35%
Electricity generation efficiency from NG	34%

Electricity price (USD cent/kWh)		
	Sell to Electricity of Vietnam (EVN)	Sell to other customers
Generation from FO	0.120	0.070
Generation from NG	0.065	0.070

CERs revenue		
Total CO2 emission reduction	t-CO2	258,014
CO2 price	USD/t-CO2	6.50
Revenue from CERs	USD	1,677,088

Market share for Electricity Selling from Hiep Phuoc	
EVN	Others
30%	70%
60%	40%

Financial Indicators	Unit	Baseline	CDM
NPV	USD	-216,161,212	188,602,965
IRR	%	N/a	28.7%
Payback value	Years	>15 years	4.2

[6] Calculated based on total investment cost of the plant is 273 million USD and the projected lifetime is 30 year, the remainging lifetime is estimated at 20 years

[7] Including required investment capital for fuel switching facilities and CDM transaction cost.

2.3 Portfolio of Project Idea Notes (PINs)

Rice husk burning for electricity and steam co-generation in Thot Not district, Can Tho province

Table of Contents

I. Introduction

The Project Idea Note (PIN) is the first general information on the project and enables the Programme Management to assess the basic eligibility of a potential JI or CDM project.
It comprises details on the following subjects:

- Project identification;
- Project participants;
- Host Country;
- General project information;
- Project organization;
- Greenhouse gas emission reductions;
- (Additional) ecological, socio-economic and/or development effects; and
- Additionality and sustainability effects.

Chapter II contains the PIN template.[1]

[1] It focuses on "directly" emission-reducing projects. In the case of sink projects the template has to be adapted and used accordingly.

II. Template for the Project Idea Note (PIN)

A PROJECT IDENTIFICATION

A 1 Project summary	
Title of project activity	Rice husk burning for electricity and steam co-generation in Thot Not district, Can Tho province
Applicant	People's committee of Thot Not District, Can Tho province
Host Country	Vietnam
Project type	Clean Development Mechanism
Category of project activity	
Generation of emission reductions	From: 2008 to 2012
Estimated emission reductions *(in t CO_{2e} up to 2012)*	Annual (average): 22,976 tons CO_2 Total: 114,880 tons CO_2
Crediting Period	From: 2008 to 2017
Offered amount of emission reductions	☐ Joint Implementation: ERUs: _____ AAUs ("early credits"): _____ ☒ Clean Development Mechanism: CERs: 22,976 tons annually
Proposed ERU/CER price (EUR)	6.5 USD ~ 5.2 EUR
Date of submission of Expression of Interest	N/A

B PROJECT PARTICIPANTS

B 1 Applicant	
Name	People's Committee of Thot Not District, Can Tho Province
Type of organization *Please also describe the ownership structure.*	State management organization which directly belongs to Can Tho city's People Committee
Other functions of the Applicant within the project	☒ Sponsor ☐ Intermediary ☐ Technical consultant ☐ Other:
Main activities, knowledge and experience	Administrative Management
Name of contact person	Mr. Nguyen Minh Toai Head of Economic Department of People's committee of Thot Not District, Can Tho province
Address	Thoi Thuan Commune, Thot Not District, Can Tho province
Phone/fax	Phone: (00-84) - 071-851208 Fax: (00-84) - 071-855091
E-mail	N/A

B 2 Project developer	
Name	Vietnam Cleaner Production Centre
Type of organization	Governmental Organization
Other functions of the project developer within the project	☐ Sponsor ☐ Intermediary ☒ Technical consultant ☐ Other:
Main activities, knowledge and experience	Viet Nam Cleaner Production Centre was eshtablished in 1998, a member of the UNIDO/UNEP network of national cleaner production centres. VNCPC has been carrying out a lot of projects on the following areas: • Training and in-plant assessment on cleaner production (CP); technology gap, technology transfer, energy efficiency and recovery etc (with more than 100 companies has been participated since 1998). • Policy Assessment and Advice. • CDM and climate change issues (organization of training, information dissemination, PIN and PDD development etc.) Under the Unido framework, VNCPC has been supported by Unido international/national CDM experts in the identification and development of CDM projects especially in industrial sectors.
Name of contact person	Mr. Le Thanh Tung, responsible for CDM activities
Address	Vietnam Cleaner Production Centre, 4th Floor C10 Building, Hanoi

B 2 Project developer	
	University of Technology, No 1, Dai Co Viet street, Hanoi, Vietnam
Phone/fax	Phone: (00-84) 4 - 8684849, ext 23 Fax: (00-84) 4 - 8681618
E-mail	tung.lt@vncpc.org

B 3 Other project participants	
Name of project participant	N/A
Type of organization	☐ Governmental body: _____ ☐ Private enterprise ☐ NGO ☐ Other:
Function within the project	☐ Sponsor ☐ Intermediary ☐ Technical consultant ☐ Other:
Name of contact person	
Address	
Phone/fax	
E-mail	

C HOST COUNTRY

C 1 Location of project activity	
Host Country Party(ies)	Vietnam
Region/State/Province etc.	Mekong River Delta
City/Town/Community etc.	Can Tho city, Thot Not district
Brief description of the project location	**I. Particular trait** Thot Not district belongs to Can Tho city and is contiguous to 3 provinces, namely An Giang, Dong Thap and Kien Giang. In 2003 Thot Not was separated into two districts: Thot Not and Vinh Thanh. After the adjustment of administration border to establish Vinh Thanh district, Thot Not has natural areas of 21,230.04 ha and 213,067 population, including: Thot Not town; communes: Thuan Hung, Trung Nhut, Tan Loc, Thoi Thuan, Trung Kien, Trung Hung, Trung An, Trung Thanh; Thot Not is bordered by Omon district to the east, Vinh Thanh district and An Giang province to the west and Vinh Thanh, Co Do to the south and Dong Thap to the north. **II. Infrastructure:** *1. Transportation roads system:* *a. Roadway:* Thot Not has inter-provincial roads as road number 91. Thot Not is 40km, 18km, and 70 km far from Can Tho city, An Giang; and Kien Giang, respectively. Therefore, the transportation condition is favorable with all Mekong river delta provinces. *b. Waterway*: Thot Not locates in the bank of Hau river which is part of Mekong river running through 6 nations. High load ships (above 1,000 tons) can move to other countries and to Thot Not easily. *c. Airway*: 30 km away from Thot Not, Tra Noc airport is under upgrading and expansion to become an international airport. *2. Electricity, water and telecommunication system:* Almost all communes and towns in Thot Not dispose of electricity and water supply. Thot Not post office can supply the connection to all the countries in the world. ADSL internet service is very popular in Thot Not, which makes favorable condition for local people in approaching with high technology. **III. Industrial and export processing zones** Thot Not industrial zone: construction area in the first phase is 22.5 ha, and second phase is 31.5 ha. Currently 25 investors are registered for land renting. In the future, this will be the third dynamic industrial zone in Can Tho which follows Tra Noc and Hung Phu.

C 2 Status of Host Country	
Host Country[2]	☒ Signed and ratified, accepted, approved or acceded to the Kyoto Protocol (*) ☐ Signed the Kyoto Protocol and has demonstrated a clear interest in becoming a Party in due time ☐ Has already started or is on the verge of starting the national accession process
Existing Memorandum of Understanding (MoU) (if Yes, please list the countries)	☒ Yes, Austria and Vietnam have signed a MoU on co-operation for the facilitation of JI/CDM projects implementation ☐ No

(*)

- Viet Nam ratified the UNFCCC on 16 November 1994 and KP on 25 September 2002. The International Cooperation Department of MONRE was designated as Clean Development National Authority (CNA) in Vietnam in March 2003. It plays function as the Designated National Authority (DNA) for CDM in Vietnam.
- CDM National Executive and Consultative Board (CNECB) were established in April 2003. CNECB consists of 12 representatives.
- 02 CDM projects were approved by EB in 2006 and many CDM projects are developing.

D General Project Information

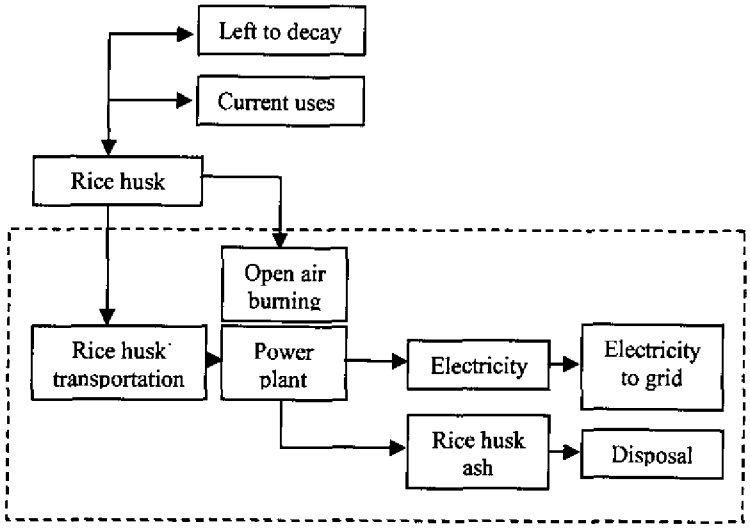
D 1 General Information	
Project name	Rice husk burning for electricity and steam co-generation in Thot Not industrial park, Can Tho province, Vietnam
Project objective	The project is aimed at electricity and steam generation by using rice husk that would otherwise be burned in the open air or left to decay. It involves the construction and operation of a rice husk power plant in Thot Not - Can Tho (Vietnam) with a nominal capacity of approximately 6 MW electricity and 7,500 tons of steam per year for rice drying in the raining season. Electricity will be sold under 25 year power purchasing agreements (PPAs) with Electricity of Vietnam (EVN). The project will support Vietnam's sustainable growth by providing electricity through biomass power production without relying on fossil fuel combustion.
Description of project background	Vietnam is one of the biggest rice exporting countries in the world and its main rice production region consists of provinces in Mekong river delta, including Can Tho province. In Thot Not district (belonging to Can Tho) there are 37 rice husking plants with capacity from 13 to 200 tons/day. In average, there are 20 rice husk plants with capacity of 200 tons/day. The average amount of rice grinded in Thot Not is: 200 tons/day x 20 plants = 4,000 tons/day. It is estimated that the rate of the rice husk is about 20% of the total rice grinded so the total rice husk is 800 tons/day.

[2] The list of countries which have ratified the Kyoto Protocol is available at http://unfccc.int/files/essential_background/kyoto_protocol/application/pdf/kpstats.pdf.

	Another rice husk source contributing to the project is 30 km far from Thot Not: Vinh Thanh district has 16 rice husk plants with average capacity of 100 tons/day. These amounts present a high availability of biomass in this area, and one of its utilization is to use rice husk for electricity generation to meet the demand of the region, to reduce the use of electricity from grid and avoid the burning or leaving to decay.

D 2 Category(ies) of project activity	
Project category *Please mark accordingly.*	☐ Construction (or retrofitting) of combined heat and power installations; ☐ Fuel-switch projects in energy conversion installations and production plants to renewable energy sources or from energy sources with high carbon content to energy sources with lower carbon content, especially in existing district heating systems; ☒ Construction (or retrofitting) of generating plants operated with renewable energy sources (especially wind power plants, biogas or biomass combined heat and power plants as well as hydroelectric power plants); ☐ Projects whose purpose is the avoidance or (energy) recovery of landfill gas; ☒ Waste management measures which contribute to the avoidance of greenhouse gas emissions, especially through energy recovery from waste, if possible with waste heat utilization; ☐ Energy efficiency projects: projects serving the reduction of end-user energy consumption in residential buildings, public and private office buildings as well as industrial applications and processes (including waste heat potentials); ☐ Other: _____

D 3 Technical aspects	
Technical description *The essential technical aspects should be briefly presented.* *A detailed description (max. 3 A4 pages) should be enclosed with the PIN including the following aspects:* *Project purpose* *Applicant's facilities to generate Emission Reductions* *Description of technology employed and associated risks* *Milestones, time schedule and current status of implementation* *Key permits and expected date of approval* *Key contracts and expected date of signing* *Risks during project implementation and operation*	The objective of the project is to use rice husk for electricity and heat generation and to contribute to sustainable economical development in the provinces of Mekong river delta. Moreover, using rice husk for electricity generation is the best solution for the reduction of environmental pollution problem as rice husk is currently not used and it is discharged in open dump (with subsequent production of CH_4) or burned in open air. The project management office is People's Committee of Thot Not district, Can Tho province. Thot Not district will establish a PMU to manage and operate the power plant to generate electricity and connect to EVN (Electricity of Vietnam) grid. This PMU will also collect rice husk and sign the contract with big rice husk suppliers such as the big rice grinders. Currently, Thot Not has 37 rice grinding units in the area with radius of 5-10 km, they are working 24 hours/day with a capacity of 150 tons/day for small units and 300 tons/day for big units. In more details, there are 20 units with capacity of 150 tons/day; 4 units with 300 tons/day; 13 units with 20 tons/day. They work 9 months per year on the average. In average, the rice husk generated per day is: 160 tons/day x 20 units = 3200 tons/day = 640 tons of rice husk/day = 192,000 rice husk/year (300 days). Calorific value of rice husk = 0.01360 TJ/ton rice husk Available amount of energy = 192,000 tons/year x 0.01360 TJ/ton = 2,611.2 TJ/year The efficiency of boiler is 90% so the total available amount of energy is: : = 2,611.2 x 0.9 = 2,350 TJ/year Assuming that the plant will convert approximately 30% of the heat generated in the boiler to electrical power, the potential energy supply is: = 2,350 x 0.3 = 705 TJ/year The amount of electricity generated is: = 705 TJ/year : 1TJ/MJ x 1,000,000 : 3600 MJ/MWh = 195,833 MWh/year = 22 MW (300 days) Therefore, in theory the power capacity can reach 22 MW. However, we firstly select a plant capacity of 6MW. It is not only to guarantee the sustainability of raw material resources but also to meet the investment capital and operation skill in local area. The amount of rice husk needed for power generation to get 6MW is: 6MW x 24h x 300 days x 3600 MJ/MWh : 1,000,000 : 0.3 : 0.9 : 0.0136 = 42,353 tons/year. The baseline of emission reduction was calculated based on the baseline of Vietnam electricity grid. Within the power plant 6 MW so that the amount CO_2 reduction is: 6 MW x 24 h x 300 days x 0.6 ton CO_2/MWh x 0.7 (load factor) ~ 18,144 tons CO_2/year.



Note: The dotted line is project boundaries.

In the Thot Not's centre for agricultural product, they need an amount of 50 tons of steam per day x 150 days/year = 7,500 tons steam to dry rice per year. The steam generated from rice husk would replace steam from coal.

Risks assessment of project.

- Rice husk price is not stable, so the project should sign the commitment or contract with big rice husk suppliers before implementation.
- Rice husk quality for burning is not consistent because some rice grinding units apply "tulo" technology (rice will be located in the middle of two rubber conveyers, each conveyer will move to different direction to husk the rice)in which the rice husk will be broken into small particles and thus would not be suited for burning.
- Skills of operation, maintenance and management are not high and training should be provided before implementation.

Currently, the project is under feasibility study phase and it's intended to construct the power plant in or near the Thot Not Centre for agriculture products to salvage the rice husk from the grinding units. Moreover, this zone is a cleared space and the space available is 24 ha. Following the plan, the centre would be put into operation in middle of 2007. So it could be constructed, installed from middle 2007 and start operating in the first quarter of 2008.

The best time for approval is end of 2006. After that, the contract signing will be implemented in the beginning of 2007.

E PROJECT ORGANIZATION

E 1 Project team	
Project-specific qualifications and experiences *The essential qualifications and experiences should be briefly presented; details should be enclosed with the PIN*[3].	Project team should include the following partners: • People Committee of Can Tho city • People Committee of Thot Not district • Vietnam National Cleaner Production Centre • Other foreign partners.

E 2 Schedule	
Current project status	☒ Project idea ☐ Planning ☐ Implementation
Status of financing	Not yet
Status of negotiations with the Host Country	Discussed
Status of permission procedures of authorities	Not yet
Project preparation	From: March 2006 to August 2006
Construction/assembly	From: Jan 2007 to January 2008
Project lifetime	From: 2008 to 2033
Generation of ERUs/CERs	From: 2008 to 2017
Other milestones	
Effect of PIN acceptance on the time schedule of the project	Effect of the PIN acceptance which is in time as forecasted: • The project moves smoothly to PDD and final approval by EB • Give a good belief for the local people, partner, suppliers, etc., • Avoid the effect of price rising. Effect of the PIN acceptance which is not in time as forecasted: • Give a not good belief for the project partner • Emission credit period will be changed and affect the additional benefit. • Cause serious environmental pollution by uncontrolled rice husk disposal (open air burning or decay).

[3] In this context please refer to Appendices 4 and 5 of the Call for Expression of Interest.

<table>
<tr><th>E 3 Financial aspects</th><th></th></tr>
<tr><td>Costs of project development (EUR)

Please give figures and briefly explain (background of) calculations.</td><td>It is estimated that the cost for development of PIN, PDD and other documents and paying fee for CDM submission is about 100,000 EUR.</td></tr>
<tr><td>Costs of project implementation (EUR)

Please give figures and briefly explain (background of) calculations.</td><td>The considered technology is cogeneration system. Base on the suppliers' quotation, the specific investment cost of cogeneration is about 560 EUR/kW.

Therefore, the total investment is about:
• For the power plant construction: 6000 kW x 560 = 3.36 million EUR
• For electricity grid connection = 0.51 million EUR

Therefore, total cost of project implementation is estimated at 3.87 EUR</td></tr>
<tr><td>Estimated annual operating costs (EUR)

Please give figures and briefly explain (background of) calculations.</td><td>The annual operation and maintenance cost is estimated as 4% of the total investment ~ 154,810 EUR</td></tr>
<tr><td>Estimated annual revenues (EUR)

Please give figures and briefly explain (background of) calculations.</td><td>With the assumptions on the investment and maintenance cost as above, we have made financial analysis for 2 cases that are CDM case (with mentioned project activities and revenue from CER) and a Reference case (called Ref. case, including the mentioned project activities but neglect the revenue from CER). The detailed assumptions are attached in the appendix. Some financial results of the considered projects as followings:

<table><tr><th>Financial analysis</th><th>Unit</th><th>Ref. Case</th><th>CDM case</th></tr><tr><td>NPV</td><td>EUR</td><td>83,544</td><td>418.598</td></tr><tr><td>IRR</td><td>%</td><td>12.5</td><td>14.5</td></tr></table>
It can be seen from the above table that NPV in the both two cases are greater than zero NPV and IRR are significantly higher with the contribution of CER revenue. It will make the project more profitable and attractive to foreign investors.</td></tr>
<tr><td>Financing sources (equity/debt capital, financing institutions)</td><td></td></tr>
<tr><td>Proposed ERU/CER price (EUR)
Please explain calculation.</td><td>CER price is 5.2 EUR
- Reference from PIN/PDD accepted by Vietnam's DNA
- Reference from ASEAN countries market
- Reference from the "Report of Investment Development for CDM projects in Cambodia, Laos and Vietnam" April 2006</td></tr>
</table>

F GREENHOUSE GAS EMISSION REDUCTIONS

Only projects resulting in emission reductions of greenhouse gases listed in table F1 can be accepted as JI or CDM projects. All emissions and/or emission reductions must be stated in metric tonnes of CO_2 equivalent.

F 1 Greenhouse gases	
Greenhouse gases to be reduced by the project	☒ CO_2 ☒ CH_4 ☐ N_2O ☐ HFCs ☐ PFCs ☐ SF_6

The Project Boundary shall encompass all anthropogenic emissions by sources of greenhouse gases under the control of the project participants that are significant and reasonably attributable to the project activity.

F 2 Project Boundary	
Description of Project Boundary	See project boundaries diagram in D3. Direct on-site emissions for the project activity are: • Methane emissions from controlled combustion of rice husk • Green house gas (GHG) emissions from the combustion of supplementary (fossil) fuel. • GHG emissions from on-site transportation Direct off-site emissions for the project activity are: • GHG emissions from off-site transportation The project boundary encompasses the following emission sources to account for the displacement of baseline emissions by the project activity: • Grid electricity generation • Steam production using conventional fuels

F 3 Project emissions	

Description and estimation of project-specific greenhouse gas emissions within the Project Boundary

I. Direct on-site emission

I.1. GHG emissions from rice husk combustion

Consistent with IPCC Guideline12[4], CO_2 emission from rice husk combustion at power plant, being the release of the CO_2 absorbed on a sustainable basis by rice as it grows annually, are not counted as project emission.

The same treatment is not extended to methane emissions. When rice husk is combusted in a well-controlled environment at power plants, methane emissions are small in quantity but still not zero.

According to the IPCC Guidelines[5], on the power plant the boiler will burn approximately 42,353 tons rice husk a year with a calorific value of 42,353 x 0.01360 TJ/ton rice husk = 576 TJ. On the basis of the IPCC default factor of 30 kg/TJ, the combustion at power plant will result in methane emissions of:

576 TJ/year x 30 kg/TJ x 1 ton/1000 kg = 17.28 tons/year

In terms of CO_2 equivalent, the emission is: 17.28 t CH_4/year x 21 = 362.88 tons CO_2/year.

I.2. GHG emissions from fuel oil combustion

In start-up operations, 150-200 litres of fuel oil will be used several times a year. Assuming conservatively as many as 5 start-up operations a year, the total fuel oil consumption for this purpose will amount to about 1000 litres per year.

Based on the IPCC Guidelines, it is calculated that in a warm climate, where bunker oil has the density of 0.97 kg/litre. The CO_2 emission for 1 litre oil using is:

0.97 kg/litre x 40.19 TJ/10^6kg x 21.1 x 10^3 kgC/TJ x 3.67 =

Density of bunker oil | Calorific value of bunker oil[6] | Carbon emission factor of bunker oil[7] | Conversion factor C→CO_2

= 3.0 kg CO_2/litre

Total emission of oil using per year = 1000 x 3 = 3 tons CO_2/year

II. Direct off-site emission

II.1. Transportation of rice husk to power plant

For the transportation rice husk from the rice grinder plants to power plant, the boat is used because this means are popular and convenient in Mekong river area. In calculation, the highest oil consumption mean chosen is heavy truck.

Data/estimates

(1) Rice husk supply needed	42,353 tons/year
(2) Approx. Load for 1 trip	15 tons/truck
(3) Average distance between supplying mills and power plant	30 km
(4) Emission factor for heavy truck transportation[8]	1.097 kg CO_2/km

	Calculations (5) Number of trip needed for power plant: (1) : (2) = 2,823 trips/year (6) Total distance travelled[9]: (3) x (5) x 2 = 169,380 km/year (7) Total transport emissions: (4) x (6) : 1000 = ~ 186 tons CO_2/year Total project emission = direct on-site emission + direct off-site emission = 362.88 + 3 + 186 = **551.88 tons CO_2/year.**

A Baseline is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the project ("business-as-usual-scenario"). By comparing the Baseline with the project emissions the emission reductions generated can be calculated.[11]

F 4 Baseline	
Outline of considered Baseline methodology/scenario and estimation of Baseline emissions within the Project Boundary	The baseline methodology is **ACM0006.** The selected baseline scenario is the case that do not use rice husk for electricity and heat generation. In this case Electricity of Vietnam (EVN) has to invest to other sources for electricity generation. Other energy types will be used for heat generation. Therefore, Baseline emission within the project boundary is estimated as following: **1. Electricity generation baseline** The annual electricity generation baseline emissions for the project are calculated as: Annual amount of electricity sold to EVN (MWh) x 0.6 (ton CO_2/MWh) (average carbon intensity of EVN grid power generation) x 0.7 (operation coefficient) - = 38,880 MWh x 0.6 x 0.7 = 21,772 tons CO_2/year **2. Steam baseline emissions** Thot Not's agricultural product needs to have 7,500 tons steam at 6 bar per year for rice drying. Steam table shows that steam at 6 bar has the energy of 659 kcal/kg. For 7,500 tons/year, the total energy of the steam at Thot Not power plant supplied is calculated as follows: 7,500 tons x 1000 (kg/ton) x 659 kcal/kg = 4.9 x 10^9 kcal/year. In term of terajoules: 4.9 x 10^9 kcal/year x 4.18 kJ/kcal x (1TJ/10^9kJ) = 20.5 TJ/year Base on the energy efficiency of 90% given in the specifications for boiler, bunker oil combustion in the boiler needs to supply: 20.5 TJ/year x (1/0.9) = 22.7 TJ/year. The IPCC Guidelines[12] put the carbon emission factor of bunker oil at 21.1 tons carbon/TJ. The emission amount is: 21.1 x 22.7 = 479 tons carbon/year ~ 1,756 t-CO_2e/year Total baseline emission ~ 21,772 + 1,756 ~ **23,528 t-CO_2e/year**

Leakage is defined as the net change of anthropogenic emissions by sources of greenhouse gases which occurs outside the Project Boundary, and which is measurable and attributable to the project activity.

F 5 Leakage	
Description and estimation of Leakage	No leakage of significance is anticipated

F 6 Emission reductions	
Crediting period	10 year, first commitment period 2008-2012 and other 5 years later 20013-2017
Estimated annual and total abatement of greenhouse gas emissions in tonnes of CO_2 equivalent in comparison to the Baseline scenario (taking into account Leakage)	**Emission reduction = Project emission – Baseline emission** = 23,528 - 552 = **22,976 tons CO_2 per year,** for the 10 years (from 2008 to 2017) period the total CO_2 emission will be 229,760 t-CO_2e

G (ADDITIONAL) ECOLOGICAL, SOCIO-ECONOMIC AND/OR DEVELOPMENT EFFECTS

G 1 Expected environmental effects	
Expected global/local environmental effects (positive and negative) of the project[13]	The controlled combustion of rice husk burning in a modern facility such as Thot Not power plant will eliminate serious environmental consequences that arise from the usual methods of rice husk disposal, i.e. dumping or open-air burning. Other points noted for Thot Not power plant are as follows: • SO_2 emissions will be minimized. NO_x emissions will be kept within the standards prescribed by Ministry of Science and Technology. • Particulates and fly ash will be captured in an electrostatic precipitator for controlled removal. • Wastewater will not be permitted to leave the plant sites. Instead, it will be first treated and then evaporated from and evaporating pond. • Ash will be disposed of safety. The total ash per year is about 42,353 x 17.75% = 7,518 tons rice ash/year. It can be buried on-site, thereby preventing it from escaping into the atmosphere or entering the local waterways via runoff. • The large size of the sites combined with tree plantings at each plant will buffer ambient noise.

G 2 Socio-economic and development aspects	
Expected social and economic effects of the project	Thot Not power plant intends to make certain that it will substantially contribute to the well being of the local communities. Many locals have become stakeholders in the Thot Not power plant project. Rice miller and truckers, many of whom are residents in communities in the vicinity of power plant site, have entered into fuel supply and fuel transport agreements. Other local residents will be involved during plant construction as construction workers and civil work subcontractors and during plant operation as skilled and unskilled operations and maintenance personnel. The list of specific local economic development impacts includes: • Creation of construction and power plant operation jobs (all constructors and suppliers to the project are mandated to give preference to local labor). • Training and professional development (training in equipment operation and computers, internet access will be available for workers). • Increased employment opportunities in rural areas (people may choose to work locally, instead of moving to urban centres for employment). • Increased economic activity is expected in the local communities at all plant sites to meet transportation, housing, and catering needs. • Increased prices for rice paddy (since the project requires very large quantities of rice husk, the newly created market will likely drive up prices paid to rice traders, as well as to farmers).
Project-related employment structure	☐ Employees under 14 years ☒ Employees over 14 years
Do any of the listed effects occur due to the project?	☐ Resettlement ☐ Restriction of access to essential resources ☐ Compulsory purchase of land

H ADDITIONALITY AND SUSTAINABILITY EFFECTS

H 1 Additionality	
Presentation of the Additionality of the project *Please explain briefly how and why the project is additional and therefore not the (considered) Baseline scenario. Please describe why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances.*	The scenario of Business as usual (BAU) is the case without using rice husk for electricity and steam generation. In this case, rice husk is used as fuel for alcohol, brick production, and cooking in households. However, the rice husk for these activities is very small about 100 tons/day and 1,200 tons/year. One part of remaining rice husk was illegal poured to river causes a serious pollution for the river which adverse effects to human health and aquaculture production. CDM project is using rice husk for generating electricty and steam with CERs revenue. The implementation of the CDM project will face some barriers which are the stability of rice husk supply, lack of local investment sources, lack of local expertise ..etc. Therefore, the project is very unlikely to take place. CDM project has two additionalities as compared to BAU, namely: financial additionality and environmental additionality (Reference case: IRR =12.5%, becoming 14.5% at CDM case; total GHGs emission reduction of 22,976 t-CO2/year. Therefore, CDM will make the project financially more attractive to Thot Not province and help overcome the technical barriers.

H 2 Sustainability Effects	
Summarising description of the project's contribution to the sustainable development of the Host Country	Currently the energy consumption in general and electricity consumption in particular in Vietnam is still low; the electricity consumption in 2005 is only 550 kWh/person. Together with industrialization and modernization, electricity demand will estimated to significantly increase with the growth average annual rate of 12-14%. Much more hydraulic and thermal (coal and gas) based power plants will be built creating impact into environment. The usage of coal for thermo-electricity generation will result in higher CO_2 emissions. In sustainable development program of Vietnam (Vietnam agenda 21), energy reduction is considered as one of priorities. The considered project belongs to the group of energy efficiency improvement projects, contributing to traditional energy consumption reduction, greenhouse gases reduction, which is aligned with national development criteria. The project does not only use biomass material (rice husk) to generate electricity instead of fossil fuel but also eliminates the environmental pollution in the area.

Appendix

Item	Unit	Reference Case	CDM Case
Total Investment	USD	4,838,000	4,963,000
Operation and Maintenance cost	% total invest	5	5
Fuel cost			
Rice husk price	USD/kg	0.025	0.025
Efficiency	%	50%	50%
Rice husk consumption	Kcal/kWh	1,720	1,720
Calorific value	Kcal/kg	3,250	3,250
Production yield	kWh/year	36,288,000	36,288,000
Operation time	hour/year	8,640	8,640
Project life	Year	15	15
Exchange rate	VND/USD	16,000	16,000
Discount rate	%/year	12	12
Product sales price	Cent USD/1kWh	4.06	4.06

Item	Unit	Values
Emission rate	kgCO2/1kwh	0.60
Total CO2 reduction	t-CO2/year	22,976
CO2 price	USD/t-CO2	6.50

2.4 Portfolio of Project Idea Notes (PINs)

Building a new and modern biomass boiler in Bai Bang pulp and paper company (Bapaco), using in-site biomass residue from pulping production

Table of Contents

I. Introduction

The Project Idea Note (PIN) is the first general information on the project and enables the Programme Management to assess the basic eligibility of a potential JI or CDM project.
It comprises details on the following subjects:

- Project identification;
- Project participants;
- Host Country;
- General project information;
- Project organisation;
- Greenhouse gas emission reductions;
- (Additional) ecological, socio-economic and/or development effects; and
- Additionality and sustainability effects.

Chapter II contains the PIN template.[1]

[1] It focuses on "directly" emission-reducing projects. In the case of sink projects the template has to be adapted and used accordingly.

II. Template for the Project Idea Note (PIN)

A PROJECT IDENTIFICATION

A 1 Project summary	
Title of project activity	Building a new and modern biomass boiler in Bai Bang pulp and paper company (Bapaco), using in-site biomass fuel generating from pulping production.
Applicant	Bai Bang Pulp and Paper company - Bapaco
Host Country	Vietnam
Project type	Clean Development Mechanism
Category of project activity	
Generation of emission reductions	From: January 2008 to: December 2017
Estimated emission reductions *(in t CO_{2e} up to 2012)*	Annual (average): 40,010 Total: 200,050 up to 2012
Crediting Period	From: 2008 to: 2017
Offered amount of emission reductions	○ Joint Implementation: ERUs: _____ AAUs ("early credits"): _____ ☒ Clean Development Mechanism: CERs: 40,010 tons CO_2 annually
Proposed ERU/CER price (EUR)	USD 6.5/ ton of CO_2 reduction ~ 5.2 EUR
Date of submission of Expression of Interest	N/A

B PROJECT PARTICIPANTS

B 1 Applicant	
Name	Bai Bang Pulp and Paper Company - Bapaco
Type of organization *Please also describe the ownership structure.*	State-owned company
Other functions of the Applicant within the project	○ Sponsor ○ Intermediary ○ Technical consultant ☒ Other: Project Owner
Main activities, knowledge and experience	Bapaco is one of the largest and most modern paper mills in Vietnam. The mill was built with non-return aid granted by the Swedish Government and people. Inaugurated in 1982, with a design capacity of 55,000 tons of paper per year, the Mill has been delivering to the domestic market a significant volume of high quality paper enjoying great favor from customers and its products have also gained a share of the regional market covering Malaysia, Thailand, Singapore, Sri Lanka, Hong Kong, Taiwan... BaiBang Paper Mill is a closed process system from tree planting, raw material processing, electricity and chemicals producing, pulp and paper producing to maintenance and transportation stages. The company includes 16 afforestation yards, 5 enterprises, 4 factories located in Phu Tho, Vinh Phuc, Tuyen Quang, Ha Giang, Quang Ninh provinces and 3 branches in Hanoi, Da Nang, Ho Chi Minh City. Bai Bang Paper Company has applied successfully the Scandinavian management style and has a staff of 6,000 people who are qualified engineers and skilled workers. The main products are writing and printing papers which are produced on a modern production lines and by advanced process. Since 2004, Bai Bang Paper Company has upgraded and expanded production to an annual output of 100,000 tones of paper and 61,000 tones of pulp with international competitive quality and environment performance improved to the national standards. The company has just completed its feasibility study for the second phase expansion project: Installing a new pulp mill with an annual output of 250,000 tons with product quality and environmental protection to the international standards.
Name of contact person	Mr. Nguyen Cong Hong, Deputy Director, Bai Bang Paper Company
Address	Bapaco- Phong Chau District - Phu Tho Province – Vietnam
Phone/fax	84-210-829259/84-210-829177
E-mail	bapacopn@hn.vnn.vn

B 2 Project developer	
Name	Vietnam Cleaner Production Centre- VNCPC
Type of organization	Consultant, Government Organisation
Other functions of the project developer within the project	○ Sponsor ○ Intermediary ☒ Technical consultant ○ Other: _____
Main activities, knowledge and experience	Viet Nam Cleaner Production Centre was established in 1998, as a member of the UNIDO/UNEP network of national cleaner production centres. VNCPC has been carrying out a significant number of projects on the following areas: • Training, in-plant assessments and consulting on cleaner production (CP), technology gap, technology transfer, energy efficiency and recovery, etc. (customers include international projects and more than 100 companies since 1998). • Policy Assessment and Advice. • CDM and climate change issues (organization of training, information dissemination, PIN and PDD development etc.) Under the UNIDO framework, VNCPC has been supported by international and national CDM experts in the identification and development of CDM projects, especially in industrial sectors.
Name of contact person	Mr. Le Thanh Tung, responsible for CDM activities
Address	Vietnam Cleaner Production Centre, 4th Floor C10 Building, Hanoi University of Technology, No 1, Dai Co Viet street, Hanoi, Vietnam
Phone/fax	Phone: (00-84) 4 - 8684849, ext 23 Fax: (00-84) 4 – 8681618
E-mail	tung.lt@vncpc.org

B 3 Other project participants	N/A
Name of project participant	
Type of organisation	○ Governmental body: _____ ○ *Private enterprise* ○ NGO ○ Other: _____
Function within the project	○ *Sponsor* ○ Intermediary ○ Technical consultant ○ *Other:* _____
Name of contact person	
Address	
Phone/fax	
E-mail	

C HOST COUNTRY

C 1 Location of project activity	
Host Country Party(ies)	Socialist Republic of Vietnam
Region/State/Province etc.	Phu Tho Province
City/Town/Community etc.	Phong Chau District
Brief description of the project location	The project is situated in a hilly region in Phu Tho, a northern province of Vietnam, 100km northward of Hanoi

C 2 Status of Host Country	
Host Country[2]	☒ Signed and ratified, accepted, approved or acceded to the Kyoto Protocol (*) ○ Signed the Kyoto Protocol and has demonstrated a clear interest in becoming a Party in due time ○ Has already started or is on the verge of starting the national accession process
Existing Memorandum of Understanding (MoU) (if Yes, please list the countries)	☒ Yes, Austria and Vietnam have signed a MoU on co-operation for the facilitation of JI/CDM projects implementation ○ No

(*)

- Viet Nam ratified the UNFCCC on 16 November 1994 and KP on 25 September 2002. The International Cooperation Department of MONRE was designated as Clean Development National Authority (CNA) in Vietnam in March 2003. It plays function as the Designated National Authority (DNA) for CDM in Vietnam.
- CDM National Executive and Consultative Board (CNECB) were established in April 2003. CNECB consists of 12 representatives.
- 02 CDM projects were approved by EB in 2006 and many CDM projects are developing

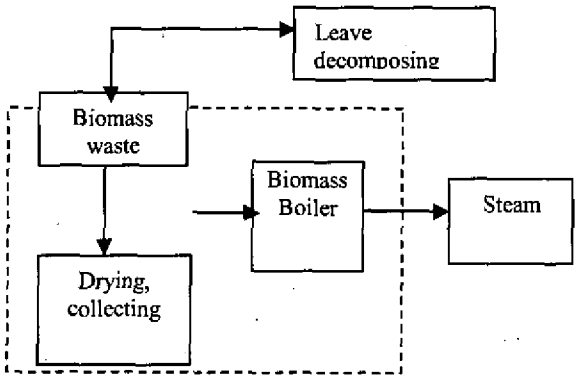
[2] The list of countries which have ratified the Kyoto Protocol is available at http://unfccc.int/files/essential_background/kyoto_protocol/application/pdf/kpstats.pdf.

D GENERAL PROJECT INFORMATION

D 1 General Information	
Project name	Building a new and modern biomass boiler in Bai Bang pulp and paper company (Bapaco), using in-site biomass fuel generated from pulp production.
Project objective	To generate steam and electricity from existing biomass, which is continuously generated from pulping to substitute the equal amount of coal consumption in the current coal boiler
Description of project background	At the moment, all the biomass generated from pulping is left decomposing. The quantity of biomass is at least 14,200[4] tons of dry matter per year. The idea is to use this biomass as an alternative fuel for coal.

D 2 Category(ies) of project activity	
Project category *Please mark accordingly.*	○ Construction (or retrofitting) of combined heat and power installations; ○ Fuel-switch projects in energy conversion installations and production plants to renewable energy sources or from energy sources with high carbon content to energy sources with lower carbon content, especially in existing district heating systems; ☒ Construction (or retrofitting) of generating plants operated with renewable energy sources (especially wind power plants, biogas or biomass combined heat and power plants as well as hydroelectric power plants); ○ Projects whose purpose is the avoidance or (energy) recovery of landfill gas; ☒ Waste management measures which contribute to the avoidance of greenhouse gas emissions, especially through energy recovery from waste, if possible with waste heat utilization; ○ Energy efficiency projects: projects serving the reduction of end-user energy consumption in residential buildings, public and private office buildings as well as industrial applications and processes (including waste heat potentials); ○ Other: greenhouse gas emission avoidance

[4] Total clarified amount of biomass waste is 14,200 tons/year; with calorific factor 4,500 kcal/kg. Most of biomass is chip dust, which counts for 90% of total biomass residue.

D 3 Technical aspects	
Technical description *The essential technical aspects should be briefly presented.* *A detailed description (max. 3 A4 pages) should be enclosed with the PIN including the following aspects:* *Project purpose* *Applicant's facilities to generate Emission Reductions* *Description of technology employed and associated risks* *Milestones, time schedule and current status of implementation* *Key permits and expected date of approval* *Key contracts and expected date of signing* *Risks during project implementation and operation*	Currently, Bapaco has 2 boilers: a main coal boiler and a black liquor recovery boiler with steam production capacities of 145 tons/hr. and 45 tons/hr. respectively. The main coal boiler efficiency is about 60%. These boilers supply average pressure steam (73 at) to turbines, which in turn generate electricity used for company internal use and partly for national grid (in case of excess output), and produce low pressure steam for production processes. The new biomass boiler will be connected to the existing energy system, producing approximately 15 tons of average pressure steam per hour with the efficiency of at least 80%. The main coal boiler will consecutively produce 15 tons of steam less down from its 145 tons/hour output. This leads to 14,299 tons of coal saving every year. **Project purpose** Greenhouse gas reduction, including: 1- Electricity and steam generation by using biomass waste as alternative fuel for coal, 2- Methane emission avoidance by preventing biomass waste from decomposing, **Applicant's facilities to generate Emission Reductions** In the project, a new and efficient biomass boiler will be built. The average pressure steam will be integrated into current steam system, which leads to turbines to produce electricity and low pressure steam used for production process. The project also includes a biomass collection system: conveyors, storehouse, drying ground and silos. The biomass boiler and it facilities will be built next to the current chip drying ground. The biomass waste comes from 3 resources: bio mud (600 tons/year), chip dust (13,600 tons/year) and bark (quantity not yet calculated). Total clarified amount of biomass waste is 14,200 tons/year; with average calorific factor of 4,500 kcal/kg. If this biomass waste is used, it will replace the equal amount of 14,299 tons of coal, currently burnt in the main coal boiler. Currently, the biomass waste generated from pulping process is left decomposed, emitting methane.  **Description of technology employed and associated risks** The technology employed is modern biomass burning technology. The electricity generated will be used mostly for the company's internal

	demand. However, in case of sudden stop of the production line, the surplus output must go to the national grid. At the moment, EVN (Electricity of Vietnam) exclusively determines the electricity price, which can be relatively low. (about 2.5 cents per kWh) **Milestones, time schedule and current status of implementation** There is no concrete time schedule for the biomass boiler implementation in Bapaco at the moment. The CDM project is under consideration. During last few years, Bapaco had an intention of installing a boiler using their biomass waste. But all the efforts have been made without their awareness of CDM potential and the project didn't prove enough advantageous for the company management. A meeting was held in July 2006, discussing about how to develop a CDM project on the current biomass waste for cogeneration. After the meeting, VNCPC and Bapaco agreed to further study the feasibility of the project and the study result will be presented to a top management committee. **Key permits and expected date of approval** n/a **Key contracts and expected date of signing** n/a ***Risks during project implementation and operation*** If a new biomass boiler is put into operation, the main coal boiler will have to reduce its output. The decline is equal to the biomass boiler output, which is approximately 15 tons/hour. The current output of the coal boiler is 145 tons/hour. Thus the coal boiler output would be down to 130 tons/hour, which might result in a slight efficiency reduction.

E PROJECT ORGANISATION

E 1 Project team	
Project-specific qualifications and experiences *The essential qualifications and experiences should be briefly presented, details should be enclosed with the PIN*[5].	Project team should include the following partners: - Bapaco - VNCPC - Foreign investors

E 2 Schedule	
Current project status	☒ Project idea ○ Planning ○ Implementation
Status of financing	Not yet available
Status of negotiations with the Host Country	Discussed
Status of permission procedures of authorities	N/a
Project preparation	From: March 2006 to: Dec. 2006
Construction/assembly	From: Jan. 2007 to: Dec. 2007
Project lifetime	From: 2008 to: 2033
Generation of ERUs/CERs	From: 2008 to: 2017 (period of 10 years, the CERs price can be renegotiate)
Other milestones	N/a
Effect of PIN acceptance on the time schedule of the project	- First achievement that encourage project partners to gain the final goal - Proves the CDM potential and project feasibility - Initial insurance of the whole project schedule - Precondition for the remaining activities

[5] In this context please refer to Appendices 4 and 5 of the Call for Expression of Interest.

E 3 Financial aspects	
Costs of project development (EUR) *Please give figures and briefly explain (background of) calculations.*	100,000: This includes all cost and fee for: feasibility study, contact, travel, registration fee.
Costs of project implementation (EUR) *Please give figures and briefly explain (background of) calculations.*	1,600,000: This includes equipment purchasing, construction and commissioning. The equipment to be installed is: boiler, fuel silo, drying system, conveying system, electrostatic precipitator. This cost also includes CDM project development.
Estimated annual operating costs (EUR) *Please give figures and briefly explain (background of) calculations.*	80,000 Operating, maintenance and CDM monitoring (estimated as 5% of total cost)
Estimated annual revenues (EUR) *Please give figures and briefly explain (background of) calculations.*	Assumptions used for financial analysis are attached at the appendix. In this section, 02 scenarios for financial analysis have been considered; CDM case (with mentioned project activities and revenue from CER) and a Reference case (called Ref. case, including the mentioned project activities but neglecting the revenue from CER) Based on these assumptions the annual revenues of the project in the 02 scenarios (Ref. Case and CDM) are 285,980 EUR and 494,032 EUR (for first 5 years) respectively. Similarly, IRRs are 11.2% (Ref. case) and 21.8% (CDM case). Besides of that, NPVs in the 02 cases are also considered, NPV is negative at Ref. case while it becomes 652,049 EUR in CDM case. It can be observed from the above results that revenue from CER is a very sensitive and important factor for the project profitability.
Financing sources (equity/debt capital, financing institutions)	
Proposed ERU/CER price (EUR) *Please explain calculation.*	Price of CER is assumed 6.5 USD/ton CO_2 based on - Reference from PIN/PDD which is accepted by Vietnam's DNA - Reference from ASEAN countries market - Reference from the "Report of Investment Development for CDM projects in Cambodia, Laos and Vietnam" April 2006

F GREENHOUSE GAS EMISSION REDUCTIONS

Only projects resulting in emission reductions of greenhouse gases listed in table F1 can be accepted as JI or CDM projects. All emissions and/or emission reductions must be stated in metric tonnes of CO_2 equivalent.

F 1 Greenhouse gases	
Greenhouse gases to be reduced by the project	☒ CO_2 ☒ CH_4 ○ N_2O ○ HFCs ○ PFCs ○ SF_6

The Project Boundary shall encompass all anthropogenic emissions by sources of greenhouse gases under the control of the project participants that are significant and reasonably attributable to the project activity.

F 2 Project Boundary	
Description of Project Boundary	Direct on-site emissions for the project activities are: • *GHG* emissions from on-site fossil fuel combustion • GHG emissions from on-site electricity consumption for biomass transportation and preparation • GHG emissions from off-site transportation of biomass. • GHG emissions from biomass burning in the boiler. The project boundary encompasses the following emission sources to account for the displacement of baseline emissions by the project activity: • CH_4 emission from biomass waste natural decomposing • Steam production using coal in current coal boiler

F 3 Project emissions	
Description and estimation of project-specific greenhouse gas emissions within the Project Boundary	**Project emissions** Project emissions include CO_2 emissions from on-site fossil fuel and electricity consumption that is attributable to the project activity ($PE_{CO2,FF,y}$ and $PE_{CO2,EC,y}$), CO_2 emissions from off-site transportation of biomass residues that are combusted in the boiler(s) to the project site (PECO2,TR,y), and, if included in the project boundary, CH_4 emissions from combustion of biomass residues for heat generation ($PE_{CH4,BF,y}$): $PE_y = PE_{CO2,FF,y} + PE_{CO2,EC,y} + PE_{CO2,TR,y} + GWP_{CH4} \cdot PE_{CH4,BF,y}$ Where: PE_y = Project emissions during the year y (tCO_2/yr) $PE_{CO2,FF,y}$ = CO2 emissions from on-site fossil fuel combustion attributable to the project activity (tCO_2/yr) $PE_{CO2,EC,y}$ = CO_2 emissions from on-site electricity consumption attributable

F 3 Project emissions	
	to the project activity (tCO_2/yr) $PE_{CO2,TR,y}$ = CO_2 emissions from off-site transportation of biomass residues to the project site (tCO_2/yr) GWP_{CH4} = Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4). GWP_{CH4}=21. $PE_{CH4,BF,y}$ = CH_4 emissions from combustion of biomass residues in the boiler(s) (tCH_4/yr) ***a) CO2 emissions from on-site fossil fuel combustion (PECO2,FF,y)*** CO_2 emissions from on-site fossil fuel combustion that is attributable to the project activity ($PE_{CO2,FF,y}$) are calculated by multiplying the fossil fuels consumption with appropriate net calorific values and CO_2 emission factors, as follows: $$PE_{CO2,FF,y} = \sum_i FC_{on-site,i,y} \cdot NCV_i \cdot EF_{CO2,FF,i}$$ Where: $PE_{CO2,FF,y}$ = CO_2 emissions from on-site fossil fuel combustion attributable to the project activity (tCO_2/yr) $FC_{on-site,i,y}$ = Quantity of fossil fuel type i combusted at the project site for purposes other than heat generation as a result of the project activity during the year y (mass or volume unit). In the project activity, the only fossil fuel combusted on-site is diesel oil used for engines (cranes, trucks..) during the construction and erection. The total FO consumption is approximately 500 tons. NCV_i = Net calorific value of the fossil fuel type i (GJ / mass or volume unit). For diesel oil, NCV_i = 10,500 kCal/kg, or NCV_i = 43.964 GJ/ton of DO $EF_{CO2,FF,i}$ = CO_2 emission factor for fossil fuel type i); For DO, $EF_{CO2,FF,i}$ = 0.06938 tCO_2/GJ Thus: $PE_{CO2,FF}$ = 500 tons x 43.964 GJ/ton x 0.06938 tCO_2/GJ = 1,525 tons of CO_2 As the construction and erection activities happen only in the first year, the yearly emission is calculated in 10 years of project period: $PE_{CO2,FF,y}$ = 1,525/10 = 152.5 tons of CO_2/year ***b) CO_2 emissions from on-site electricity consumption ($PE_{CO2,EC,y}$)*** CO_2 emissions from on-site electricity consumption ($PE_{CO2,EC,y}$) are calculated by multiplying the electricity consumption by an appropriate grid emission factor, as follows: $$PE_{CO2,EC,y} = EC_{PJ,y} \cdot EF_{grid,y}$$ Where: $PE_{CO2,EC,y}$ = CO_2 emissions from on-site electricity consumption attributable to the project activity (tCO_2/yr) $EC_{PJ,y}$ = On-site electricity consumption attributable to the project activity during the year y (MWh). The total on-site electricity consumption is approximately 200MWh/year for biomass preparation and transportation. $EF_{grid,y}$ = CO_2 emission factor for electricity used from the grid (tCO_2/MWh). The emission factor for electricity in Vietnam is 0.7 tCO_2/MWh $PE_{CO2,EC}$ = 200 Mwh x 0.7 tCO_2/MWh = 140 tons of CO_2/year ***c) CO_2 emissions from transportation of biomass residues to the project site (PETR,CO2,y)***

F 3 Project emissions	
	Emissions are calculated based on the actual quantity of fossil fuels consumed for transportation. $PE_{CO2,TR,y} = \sum_i FC_{TR,i,y} \cdot NCV_i \cdot EF_{CO2,FC,i}$ Where: $PE_{CO2,TR,y}$ = CO_2 emissions from off-site transportation of biomass residues to the project site (tCO_2/yr) $FC_{TR,i,y}$ = Fuel consumption of fuel type *i* in trucks for transportation of biomass residues during the year *y* (mass or volume unit). For Bapaco project, biomass is picked by bulldozers and tranported by trucks inside the plant. Diesel oil consumption is about 2.2 tons of DO/year. NCV_i = 43.964 GJ/ton of DO $EF_{CO2,FF,i}$ = CO_2 emission factor for fossil fuel type *i* (tCO_2/GJ), For DO, $EF_{CO2,FF,i}$ = 0.06938 tCO_2/GJ Thus, $PE_{CO2,TR,y}$ = 2.2 tons of DO x 43.964 GJ/ton of DO x 0.06938 tCO_2/GJ = 6.71 tons of CO_2/year ***d) CH_4 emissions from combustion of biomass residues in the boiler(s) ($PE_{CH4,BF,y}$)*** If this source has been included in the project boundary, emissions are calculated as follows: $PE_{CH4,BF,y} = EF_{CH4,BF} \cdot \sum_k BF_{PJ,k,y} \cdot NCV_k$ Where: $PE_{CH4,BF,y}$ = CH_4 emissions from combustion of biomass residues in the boiler(s) (tCH_4/yr) $EF_{CH4,BF}$ = CH_4 emission factor for the combustion of the biomass residues in the boilers (tCH_4/GJ). This factor is chosen based on Methodology AM0036 for wood waste (30kg CH_4/TJ) with Conservativeness factor (1.37). $EF_{CH4,BF}$ = 0.03 x 1.37 = 0.0411 ton of CH_4/TJ $BF_{PJ,k,y}$ = Quantity of biomass residue type *k* used for heat generation as a result of the project activity during the year *y* (tons of dry matter or liter). Quantity of biomass in Bapaco project is 14,200 tons of dry matter per year. NCV_k = Net calorific value of the biomass residue type *k* (GJ/ton of dry matter or GJ/liter). Bapaco biomass calorific value is 4,500 kCal/kg, or 18.8415 GJ/ton of dry matter. Thus $PE_{CH4,BF,y}$ = 0.0411 ton of CH_4/TJ x 14,200 tons of biomass x 18.8415 GJ/ton x 10^{-3} = 10.996 tons of CH_4 Convert from CH_4 to CO_2 emission: 10.996 tons of CH_4 x 21 = 230.92 tons of CO_2/year **Total project emission** PE_y = 152.5 + 140 + 6.71 + 230.92 = 530.13 tons of CO_2/year

A Baseline is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the project ("business-

as-usual-scenario"). By comparing the Baseline with the project emissions the emission reductions generated can be calculated.[6]

F 4 Baseline	

[6] Additionally, Leakage has to be taken into account.

F 4 Baseline	
Outline of considered Baseline methodology/scenario and estimation of Baseline emissions within the Project Boundary	The baseline of CO_2 emission calculation is based on the scenario without CDM (AM0036 Methodology (title: Fuel switch from fossil fuels to biomass residues in boilers for heat generation)). In the current situation, the company's GHG emission is generated from 2 main sources: (1) coal burning as fuel for average-pressure steam generation, which creates CO_2 (2) CH_4 emission from biomass natural decomposition. This biomass comes from wood processing and chip dust. In CDM scenario, instead of using coal, the available biomass is used for steam generation. **Baseline emission** According to the AM0036 Methodology (title: Fuel switch from fossil fuels to biomass residues in boilers for heat generation), the volume of CO_2 emission from coal combustion in the boiler in the absence of the project activity and CH_4 emissions from the decay of biomass residues is calculated as follows: $BE_y = BE_{HG,y} + BE_{BF,y}$ Where: BE_y = Baseline emissions during the year y (t-CO2e/yr) $BE_{HG,y}$ = Baseline emissions from fossil fuel combustion for heat generation in the boiler(s) (t-CO_2 /yr) $BE_{BF,y}$ = Baseline emissions due to uncontrolled burning or decay of the biomass residues (t-CO_2e/yr) ***a) Baseline emissions from fossil fuel combustion in boiler(s) for heat generation (BEHG,y):*** $BE_{HG,y}$ can be calculated as follows: $BE_{HG,y} = \frac{HG_{PJ,biomass,y} \cdot EF_{FF,CO2,y}}{\eta_{boiler,FF}}$ Where: $BE_{HG,y}$ = Baseline emissions from fossil fuel combustion for heat generation in the boiler(s) (tCO_2e /yr) $HG_{PJ,biomass,y}$ = Heat generated with incremental biomass residues used as a result of the project activity during the year y (GJ/yr) $EF_{FF,CO2,y}$ = CO_2 emission factor of the fossil fuel type displaced by biomass residues (tCO_2e /GJ) $\eta_{boiler,FF}$ = Average net efficiency of heat generation in the boiler(s) when fired with fossil fuels However, in the case of Bapaco, the biomass residue will be burnt in new boiler with efficiency of at least 80%. This heat quantity will replace the same amount generated by current coal boiler, whose efficiency is 60%. Therefore, the biomass quantity burnt in new biomass boiler can be converted to equivalent coal as follows: 14,200,000 (kg of biomass/year) x 4,500 (KCal/kg) x 0.8 = 51.12 x 10^9 KCal in steam The quantity of CO2 generated by equivalent coal burnt in coal boiler: 51.12 x 10^9 (KCal in steam)/6,500 (KCal/kg of coal HG4a)/0.6 = 13,107,692 kg of HG4a coal (The calorific value of HonGai 4a coal displaced by biomass = 6,500 Kcal/kg) CO_2 emission factor of HG4a coal is 2.248 tons of CO_2/1ton of HG4a Therefore:

F 4 Baseline	
	$BE_{HG,y}$= 13,107,692 x 2.248 = 29,466,092 kg of CO_2 = 29,466.1 tons of CO_2/year ** In the calculation, the calorific values of fuel are in calories, not in joule* ***b) Baseline emissions due to uncontrolled burning or decay of the biomass residues*** $$BE_{BF,y} = GWP_{CH4} \cdot \sum_k BF_{PJ,k,y} \cdot NCV_k \cdot EF_{burning,CH4,k,y}$$ Where: $BE_{BF,y}$ = Baseline emissions due to uncontrolled burning or decay of the biomass residues (tCO_2e/yr) GWP_{CH4} = Global Warming Potential of methane valid for the commitment period (tCO_2e/tCH_4); GWP_{CH4} = 21 $BF_{PJ,k,y}$ = Quantity of biomass residue type k used for heat generation as a result of the project activity during the year y (tons of dry matter or liter); $BF_{PJ,k,y}$ = 14,200 tons/year NCV_k = Net calorific value of the biomass residue type k (GJ/ton of dry matter or GJ/liter); NCV_k = 4,500 kCal/kg biomass = 18.8415 GJ/ton of dry biomass. $EF_{burning,CH4,k,y}$ = CH_4 emission factor for uncontrolled burning of the biomass residue type k during the year y (tCH_4/GJ); Combining with convervativeness factor, $EF_{burning,CH4,k,y}$ = 0.73 x .0027 = 0.001971 Thus: $BE_{BF,y}$ = 21 x 14,200 x 18.8415 x 0.001971 = 11,074.13 tons of CO_2/year **Baseline emission:** $$BE_y = BE_{HG,y} + BE_{BF,y}$$ BE_y = $BE_{HG,y}$ + $BE_{BF,y}$ = 29,466.1 + 11,074.13 = 40,540.23 tons of CO_2/year

Leakage is defined as the net change of anthropogenic emissions by sources of greenhouse gases which occurs outside the Project Boundary, and which is measurable and attributable to the project activity.

F 5 Leakage	
Description and estimation of Leakage	No significant leakage is identified $LE_y = 0$

F 6 Emission reductions	
Crediting period	*5 years from 2008 to 2012*
Estimated annual and total abatement of greenhouse gas emissions in tonnes of CO_2 equivalent in comparison to the Baseline scenario (taking into account Leakage)	Annual green house gas emission is: Emission reductions are calculated as follows: $ER_y = BE_y - PE_y - LE_y$ = 40,540.23 + 530.13 - 0 = 40,010.1 tons of CO_2 per year Total emission in the crediting period: = 40,010.1 x 5 = 200,050.5 tons CO_2

G (ADDITIONAL) ECOLOGICAL, SOCIO-ECONOMIC AND/OR DEVELOPMENT EFFECTS

G 1 Expected environmental effects	
Expected global/local environmental effects (positive and negative) of the project[7]	The biomass boiler is a modern facility. This helps to eliminate serious environmental consequences that arise from the natural biomass waste disposal. Other points noted for the project are as follows: • SO_2 emissions will be minimal. NO_x emissions will be kept within the standards prescribed by Ministry of Science and Technology. • Particulates and fly ash will be captured in an electrostatic precipitator for controlled removal. • Waste water will not be permitted to leave the plant sites. Instead, it will be first treated and then evaporated from an evaporating pond. • Ash will be disposed of safely. The total ash per year is about 14,200 x 22% = 3,124 tons of fly ash/year. It can be buried on-site, thereby preventing it from escaping into the atmosphere or entering the local waterways via runoff.

G 2 Socio-economic and development aspects	
Expected social and economic effects of the project	The project will substantially contribute to the well being of the company's employees. Most of the Bai Bang town residents benefit from the company. They either work for Bapaco or live on the services and/or products which is provided to Bapaco employees. The list of specific local economic development impacts includes: • Creation of construction jobs (all constructors and suppliers to the project are mandated to give preference to local labor). • Better income for Bapaco employees resulting from higher company's income. • Increased economic activity is expected in the local communities at all plant sites to meet transportation, housing, and catering needs. • Increased prices for wood chip with high percentage of bark. This helps farmers to raise their income
Project-related employment structure	○ Employees under 14 years ☒ Employees over 14 years
Do any of the listed effects occur due to the project?	○ Resettlement ○ Restriction of access to essential resources ○ Compulsory purchase of land

[7] Abstraction of ground water or surface water may in no event be larger as the natural water influx.

H ADDITIONALITY AND SUSTAINABILITY EFFECTS

H 1 Additionality	
Presentation of the Additionality of the project *Please explain briefly how and why the project is additional and therefore not the (considered) Baseline scenario. Please describe why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances.*	The BAU is also understood that the company only upgrade the current energy sytem which will increase a part of energy efficiency of the system and CO_2 emission reduction. CDM project is to use biomass for generating electricty and steam with selling CO_2 emission. CDM project has two additionalities compared to BAU project that are: financial additionality and environmental additionality (GHG emission reduction). Therefore, CDM project with the considertation of CERs revenue (payback period = 3.9 years) much more attractive than that scenario without CERs revenue (payback period = 7.11 years). While Bai Bang Company has envisaged the installation of a biomass boiler previously, it has not done so far for two main reasons: the project's payback period is not favourable (7.11 years) and the company is currently expanding its production and focuses its investment potential on that purpose. With CER revenues, however, the project's payback period goes down to 3.9 years making it potentially interesting for the company's management even in the current situation. Moreover, the company does not currently face legislative pressure to avoid decomposition of its biomass residue, nor is it expected that they will face it in the near future. They will thus not switch to biomass boiler in the current circumstances without the technical support and financial benefits gained from doing it as a CDM project.

H 2 Sustainability Effects	
Summarizing description of the project's contribution to the sustainable development of the Host Country	Currently the energy consumption in general and electricity consumption in particular in Vietnam is still low; the electricity consumption in 2005 is only 550 kWh/person. Together with industrialization and modernization, electricity demand will estimated to significantly increase with the growth average annual rate of 12-14%. Much more hydraulic and thermal (coal and gas) power plants will be built, creating impact into environment. The usage of coal for thermo-electricity generation will result in higher CO_2 emissions. The project does not only use biomass material to generate electricity instead of fossil fuel but also eliminates the environmental pollution in the area caused by biomass waste decomposing.

Appendix 1: Assumptions for project financial analysis

Assumptions	Unit	Ref. Case	CDM Case
Investment cost	VND	30,000,000,000	32,000,000,000
Operation and Maintenance cost	% of total cost	5	5
Considered project life time	Years	15	15
Exchange rate	VND/USD	16,000	16,000
Discounted rate	%/year	12	12
Annual coal saving	tons/year	14,299	14,299
Coal Price	VND/ton	400,000	400,000
Total saving from coal consumption reduction	VND/year	5,719,600,000	5,719,600,000

Emission coefficient of coal substituted	kg-CO2/1kg	2.248
Total CO_2 emission reduction	t-CO2/ year	40,010
CER price	USD/t-CO2	6.50
Total CER revenue	VND/year	4,161,040,000

2.5 Portfolio of Project Idea Notes (PIN)

Energy efficiency and co-generation system (Cogen) in Sao Vang Rubber Company

Table of Contents

I. Introduction

The Project Idea Note (PIN) is the first general information on the project and enables the Programme Management to assess the basic eligibility of a potential JI or CDM project.
It comprises details on the following subjects:

- Project identification;
- Project participants;
- Host Country;
- General project information;
- Project organisation;
- Greenhouse gas emission reductions;
- (Additional) ecological, socio-economic and/or development effects; and
- Additionality and sustainability effects.

Chapter II contains the PIN template.[1]

[1] It focuses on "directly" emission-reducing projects. In the case of sink projects the template has to be adapted and used accordingly.

II. Template for the Project Idea Note (PIN)

A PROJECT IDENTIFICATION

A 1 Project summary	
Title of project activity	The investment of energy efficiency and co-generation system (Cogen) in Saovang Rubber Company
Applicant	Saovang Rubber Company
Host Country	Viet Nam
Project type	Clean Development Mechanism/Gold Standard
Category of project activity	Energy efficiency in industrial sub-sector
Generation of emission reductions	From 2008 to 2017
Estimated emission reductions *(in t CO_{2e} up to 2012)*	Annual (average): 9,600 tons Total: 48,000 tons for the first period 2008-2012
Crediting Period	From: 2008 to: 2017
Offered amount of emission reductions	○ Joint Implementation: ERUs: _____ AAUs ("early credits"): _____ ☒ Clean Development Mechanism: CERs: 9,600 tons per year
Proposed ERU/CER price (EUR)	5.2 EUR ~ 6.5 USD per tons of CO_2
Date of submission of Expression of Interest	N/A

B PROJECT PARTICIPANTS

B 1 Applicant	
Name	Saovang Rubber Company
Type of organisation *Please also describe the ownership structure.*	State-owned Company
Other functions of the Applicant within the project	○ Sponsor ○ Intermediary ○ Technical consultant ☒ Other: Project owner
Main activities, knowledge and experience	Saovang Rubber Company (SRC) is a State-owned Company, established since 1960 directly under Vietnam National Chemical Corporation (VINACHEM) belonging to the Ministry of Industry (MOI). The main products are: tires and tubes for Aircraft, Automobile, Tractor, Motorcycle, Bicycle and other Technical rubber products (Conveyor belt, V-belt, rubber hose, coating pool or lining packing protecting metal equipments from corrosion...). Saovang Rubber Company dispopses of a direct import/export licence for equipments, materials and rubber products . For the past 40 years of production, join venture and development, at present Saovang has been a big group with more than 300 staffs including: technical experts and well-experience staffs. This company is the centre of technical with much experience in the following fields: • Designing rubber products • Blending rubber composition • Technically processing the rubber products • Testing and analysing the quality for manufacture material and rubber products • Designing and creating mould, equipment and processing machinery for rubber products. The traditional products of Saovang - Saovang Tire and Tube – the company has always studied and designed to make them suitable to the transportation condition, road condition and the climate condition. Tire and tube of Saovang are mainly made of natural rubber that has valuable characteristics including the toughness elastic and high adhesion. With special materials combination such as: synthetic rubber (abrasion, heat - resistant oil...) chemical, nylon cord, valve... imported from advance industrial countries as: German, Japan, South Korea, Taiwan...). In the past, Saovang has invested and innovated the technological science, as well as enhance the quality of production and extend manufacturing line to support the industrialization and modernization of Vietnam. The quality of Savang"s products have been certificated ISO 9001: 2000 quality assurance system issued by Bureau Veritas (BVQI) • Saovang has been awarded with Golden Medal of Environmental and Technological Science Ministry - The Medal for Vietnamese quality. • Saovang has also received the award VIFOTEC of tire and tube for aircraft researching project.

	• *Continuous period of five years (from 1995 to 1999) the company have* been chosen as one of the "TOPTEN" by Customers - High quality products of Vietnam.
Name of contact person	Le Van Cuong, Vice Director of company
Address	231 Nguyen Trai Str. - Hanoi - Vietnam
Phone/fax	Tel: +84.4.8583656 – Fax: +84.4.8583644
E-mail	caosusaovang@hn.vnn.vn

B 2 Project developer	
Name	Vietnam Cleaner Production Centre
Type of organisation	Government Organisation
Other functions of the project developer within the project	○ Sponsor ○ Intermediary ☒ Technical consultant ○ Other: _____

Main activities, knowledge and experience	Viet Nam Cleaner Production Centre was established in 1998, as a member of the UNIDO/UNEP network of national cleaner production centres. VNCPC has been carrying out a significant number of projects on the following areas: • Training, in-plant assessments and consulting on cleaner production (CP), technology gap, technology transfer, energy efficiency and recovery, etc. (customers include international projects and more than 100 companies since 1998). • Policy Assessment and Advice. • CDM and climate change issues (organization of training, information dissemination, PIN and PDD development etc.) Under the UNIDO framework, VNCPC has been supported by international and national CDM experts in the identification and development of CDM projects, especially in industrial sectors.
Name of contact person	Mr. Le Thanh Tung, Responsible for CDM activities
Address	Vietnam Cleaner Production Centre, 4th Floor C10 Building, Hanoi University of Technology, No 1, Dai Co Viet street, Hanoi, Vietnam
Phone/fax	Phone: (00-84) 4 - 8684849, ext 23 Fax: (00-84) 4 – 8681618
E-mail	tung.lt@vncpc.org

B 3 Other project participants	
Name of project participant	
Type of organisation	○ Governmental body: _____ ○ Private enterprise ○ NGO ○ Other: _____
Function within the project	○ Sponsor ○ Intermediary ○ Technical consultant ○ Other: _____
Name of contact person	
Address	
Phone/fax	
E-mail	

C HOST COUNTRY

C 1 Location of project activity	
Host Country Party(ies)	Viet Nam
Region/State/Province etc.	Nguyen Trai Street - Thanh Xuan District
City/Town/Community etc.	Ha Noi City
Brief description of the project location	The company is located in the newly established Thanhxuan district of Hanoi, Nguyen Trai Str., which is the main road connecting Hanoi and its twin city Hadong. Surrounding company is mainly low-rise row houses with low density. Hanoi, estimated population 3,083,800 (2004), is the capital of Vietnam now and was the capital of North Vietnam from 1954 to 1976. Before that, it had been as the capital of the entity now known as Vietnam from at least the 11th century until 1802 (with a few brief interruptions). The city is located on the right bank of Red River. Hanoi is located at 21°2' North, 105°51' East (21.0333, 105.85).

C 2 Status of Host Country	
Host Country2	☒ Signed and ratified, accepted, approved or acceded to the Kyoto Protocol (*) ○ Signed the Kyoto Protocol and has demonstrated a clear interest in becoming a Party in due time ○ Has already started or is on the verge of starting the national accession process
Existing Memorandum of Understanding (MoU) (if Yes, please list the countries)	☒ Yes, Austria and Vietnam have signed a MoU on co-operation for the facilitation of JI/CDM projects implementation ○ No

(*)

- Viet Nam ratified the UNFCCC on 16 November 1994 and KP on 25 September 2002. The International Cooperation Department of MONRE was designated as Clean Development National Authority (CNA) in Vietnam in March 2003. It plays function as the Designated National Authority (DNA) for CDM in Vietnam.
- CDM National Executive and Consultative Board (CNECB) were established in April 2003. CNECB consists of 12 representatives.
- 02 CDM projects were approved by EB in 2006 and many CDM projects are developing.

[2] The list of countries which have ratified the Kyoto Protocol is available at http://unfccc.int/files/essential_background/kyoto_protocol/application/pdf/kpstats.pdf.

D GENERAL PROJECT INFORMATION

D 1 General Information	
Project name	The investment of energy efficiency and co-generation system (Cogen.) in Sao Vang Rubber Company
Project objective	To improve energy efficiency of company, thereby reducing production costs and air emissions.
Description of project background	At the present, the company uses 4 FO-fired boilers and 2 coal-fired boilers with the capacity of about 6 tons steam/hour each to produce steam for thermal process. The total steam consumption is about 30 tons/hours. In the company, there are a lot of motors with high capacity. Some of them are in underload operation, so the electricity efficiency is not very high. Total energy consumption in a year is: - Electricity: 13,195 MWh/year - Fuel: 439,000 Gj/year It was estimated in an energy assessment project that the company can reduce its electricity and fuel consumptions by 36% and 26% respectively, if energy efficiency (EE) improvements suggested by the project are applied. However, the company has applied only a few EE options for improving energy efficiency due to lack of fund.

D 2 Category(ies) of project activity	
Project category *Please mark accordingly.*	☒ Construction (or retrofitting) of combined heat and power installations; ○ Fuel-switch projects in energy conversion installations and production plants to renewable energy sources or from energy sources with high carbon content to energy sources with lower carbon content, especially in existing district heating systems; ○ Construction (or retrofitting) of generating plants operated with renewable energy sources (especially wind power plants, biogas or biomass combined heat and power plants as well as hydroelectric power plants); ○ Projects whose purpose is the avoidance or (energy) recovery of landfill gas; ○ Waste management measures which contribute to the avoidance of greenhouse gas emissions, especially through energy recovery from waste, if *possible with waste heat utilisation;* ☒ Energy efficiency projects: projects serving the reduction of end-user energy consumption in residential buildings, public and private office buildings as well as industrial applications and processes (including waste heat potentials); ○ Other: _____

D 3 Technical aspects	
Technical description *The essential technical aspects should be briefly presented.* *A detailed description (max. 3 A4 pages) should be enclosed with the PIN including the following aspects:* *Project purpose* *Applicant's facilities to generate Emission Reductions* *Description of technology employed and associated risks* *Milestones, time schedule and current status of implementation* *Key permits and expected date of approval* *Key contracts and expected date of signing* *Risks during project implementation and operation*	The objective of the mentioned project is to improve energy efficiency and reduce GHGs emission of the Sao Vang Rubber company by: • Transforming the current FO boilers into a co-generation system (Cogen) to produce electricity and steam for meeting energy demand inside company. • Improving energy efficiency of the thermal network: condensate recovery. Moreover, energy efficiency is the best solution for the company in environmental pollution controlling because of air emission reduction. At the moment, Saovang Rubber Company uses FO and coal-fired boilers to produce steam for thermal process with a total demand of approximately 30 tons of steam/hour. These boilers are working about 5,000 hours/year. If the company replaces this boiler with a Cogen system, it can produce electricity of about 2.5 MW for electricity demand inside the company. Condensate recovery is a good way to save fuel (fuel savings are estimated at about 700 tons FO/year). It is estimated in section F3 that the total amount of CO_2 reduction is about: 7,500 + 2,100 = 9,600 tons CO_2/year Risks assessment of project activities: • Significant noise pollution from Cogen system. • The company may be relocated to industrial zone outside Hanoi. It depends on the government policy applied to companies located inside Hanoi. • Lack of skilled employees for operation, maintenance and management and the employees should be trained before the system is put into operation.

E PROJECT ORGANISATION

E 1 Project team	
Project-specific qualifications and experiences *The essential qualifications and experiences should be briefly presented; details should be enclosed with the PIN3.*	The project team should include the following partners: - Saovang Rubber Company - Vietnam National Cleaner Production Centre - Other foreign partners related to project financing, CDM and technical aspects.

E 2 Schedule	
Current project status	☒ Project idea ○ Planning ○ Implementation
Status of financing	Not yet
Status of negotiations with the *Host Country*	Not yet
Status of permission procedures of authorities	Not yet
Project preparation	From: March 2006 to: August 2006
Construction/assembly	From: June 2007 to: January 2008
Project lifetime	From: 2008 to: 2027
Generation of ERUs/CERs	From: 2008 to: 2017
Other milestones	N/A
Effect of PIN acceptance on the time schedule of the project	At the present, the Cogen system investment and above-mentioned energy efficiency options are in the initial study. Once the PIN is approved, it will encourage the company to carry out further study and thus, they can make the decision, because it is lacking capital for Cogen system investment. Besides, the approved PINs also helps the project to attract the foreign investors. PDD is also be completed and submitted to EB in an appropriate time and be ready for project implementation.

[3] In this context please refer to Appendices 4 and 5 of the Call for Expression of Interest.

E 3 Financial aspects	
Costs of project development (EUR) Please give figures and briefly explain (background of) calculations.	The estimated cost for PIN, PDD and other documents development and CDM submission fee is 100,000 EUR
Costs of project implementation (EUR) Please give figures and briefly explain (background of) calculations.	In this case, the main selected technology is cogeneration system. Based on the quotation of different suppliers, the investment for cogeneration systems is about 700 USD/kW. Therefore, the total investment is about: 2,500 kW x 700 = 1,750,000 USD ~ 1,400,000 EUR. The investment for other energy efficiency measure is thermal system which cost about 25,000 USD. Total investment cost is 1,750,000 + 25,000 = 1, 775,000 USD ~ 1,420,000 EUR.
Estimated annual operating costs (EUR) Please give figures and briefly explain (background of) calculations.	The annual operation and maintenance cost for the mentioned components is estimated as 4% of total investment cost that is ~ 1,775,000 USD x 4% ~ 71,000 USD ~ 56,800 EUR annually.
Estimated annual revenues (EUR) Please give figures and briefly explain (background of) calculations.	To estimate the financial indicators of the project we have made some conservative assumptions attached at the appendix of this PIN, assuming that CER revenue will be given in 10 years, the first five year 2008-2012, CER price is at 5.2 EUR/tons and it would be only half price in the next five years. Two cases have been considered, CDM case (with mentioned project activities and revenues from CER) and a Reference case (called Ref. case, including the mentioned project activities but without the revenues from CER). The results of financial calculation as followings: ☞ NPV of the project without CERs revenue is - 128,668 EUR while that of NPV with CERs revenue: 53,391 million EUR. ☞ The IRR of the project with consideration of CER revenue would be 10.3 % (CDM project) higher than that in the case without CER revenue (12.7 %). It can be seen from the above results that with CDM application the project become profitable while that it would get loss in the Reference case.
Financing sources (equity/debt capital, financing institutions)	
Proposed ERU/CER price (EUR) *Please explain calculation.*	*For the PIN development, the price of CER is 5.2 EUR CO_2 is used as :* • Reference from PIN/PDD which accepted by Vietnam's DNA • Reference from ASEAN countries market • Reference from the "Report of Investment Development for CDM projects in Cambodia, Laos and Vietnam" April 2006

F GREENHOUSE GAS EMISSION REDUCTIONS

Only projects resulting in emission reductions of greenhouse gases listed in table F1 can be accepted as JI or CDM projects. All emissions and/or emission reductions must be stated in metric tonnes of CO_2 equivalent.

F 1 Greenhouse gases	
Greenhouse gases to be reduced by the project	☒ CO_2 ○ CH_4 ○ N_2O ○ HFCs ○ PFCs ○ SF_6

The Project Boundary shall encompass all anthropogenic emissions by sources of greenhouse gases under the control of the project participants that are significant and reasonably attributable to the project activity.

F 2 Project Boundary	
Description of Project Boundary	Direct on-site emissions for the project activity are: • Green house gases (GHGs) emissions from the combustion of supplementary (fossil) fuel. The project boundary encompasses the following emission sources to account for the displacement of baseline emissions by the project activity: • Grid electricity generation. • Steam production using conventional fuels.

F 3 Project emissions	
Description and estimation of project-specific greenhouse gas emissions within the Project Boundary	See F4 and F5

A Baseline is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the project ("business-as-usual-scenario"). By comparing the Baseline with the project emissions the emission reductions generated can be calculated.[4]

F 4 Baseline	
Outline of considered Baseline methodology/scenario and estimation of Baseline emissions within the Project Boundary	The considered baseline scenario here is use coal or FO boilers to maintain the necessary steam of 30 tons/hour for the process heat requirement. Besides that, the steam distribution system will be repaired, economizer and powerboss (for electricity saving in motor) would be installed etc. The baseline methodology, ACM 0002 is used to estimate total greenhouse gases emission reduction based on the emission of Vietnam electricity National grid in the case the factory is able to produce electricity from Cogen system. Methodology AMS-II.B can also be chosen for the calculation of GHGs emission from other energy efficiency options. The baseline emission is estimated based on the energy consumption of the company as following: • Electricity: 13,195 MWh/year • Fuel: 439,000 Gj/year

Leakage is defined as the net change of anthropogenic emissions by sources of greenhouse gases which occurs outside the Project Boundary, and which is measurable and attributable to the project activity.

F 5 Leakage	
Description and estimation of Leakage	No leakage of significance is anticipated

F 6 Emission reductions	
Crediting period	10 years from 2008 to 2017
Estimated annual and total abatement of greenhouse gas emissions in tonnes of CO_2 equivalent in comparison to the Baseline scenario (taking into account Leakage)	**ER1: Direct on-site emission:** GHGs emission reduction from oil saving: by condensate recovery. In normal operations, FO is used as fuel for boilers. Based on the IPCC Guidelines, it is calculated that in a warm climate, where bunker oil has the *density of 0.97 kg/litre. The CO_2 emission for 1 litre oil used is:* 0.97 kg/litre x 40.19 TJ/10^6kg x 21.1 x 10^3 kg-C/TJ x 3.67 = Density of bunker oil / Calorific value of bunker oil / Carbon emission factor of bunker oil / Conversion factor C→CO_2 = 3.0 kg CO_2/litre Total emission of oil saving per year = 700 tons x 3.0 kg CO_2/litre = 2,100 tons CO_2/year

[4] Additionally, Leakage has to be taken into account.

	ER2: Electricity generation savings: from Cogeneration system The annual electricity generation baseline emissions for the project are calculated as: Annual amount of electricity saving (MWh) x 0.6 (ton CO_2/MWh) (average carbon intensity of EVN grid power generation) = 2.5 MW x 5,000h/year x 0.6 tonsCO2/MWh = 7,500 tons CO2/year. **ER: Total emission reduction** ~ 7,500 + 2,100 = 9,600 tons CO_2/year Annual green house gas emission is: 9,600 tons CO_2/year **Total emission in the crediting period: 9,600 x 10 = 96,000 tons CO_2**

G (ADDITIONAL) ECOLOGICAL, SOCIO-ECONOMIC AND/OR DEVELOPMENT EFFECTS

G 1 Expected environmental effects	
Expected global/local environmental effects (positive and negative) of the project[5]	The project activity will reduce greenhouse gases emission by avoiding electricity generation and CO_2 emission from national electricity grid. The total expected CO_2 emission reduction from the proposed project has been estimated at 9,600 t-CO_2/year. Beside of that GHGs emission reduction, SO_2 emissions will be associated minimal.

G 2 Socio-economic and development aspects	
Expected social and economic effects of the project	The project will substantially contribute to the well being of the company's employees. Most of the surrounding company residents benefit from the company. They either work for company or live on the services and/or products which sold to company employees. The list of specific local economic development impacts includes: • Creation of construction jobs (all constructors and suppliers to the project are mandated to give preference to local labour). • Better income for employees resulting from higher company's income. • Increased economic activity is expected in the local communities at all plant sites to meet transportation, housing, and catering needs.
Project-related employment structure	○ Employees under 14 years ☒ Employees over 14 years
Do any of the listed effects occur due to the project?	○ Resettlement ○ Restriction of access to essential resources ○ Compulsory purchase of land

[5] Abstraction of ground water or surface water may in no event be larger as the natural water influx.

H ADDITIONALITY AND SUSTAINABILITY EFFECTS

H 1 Additionality	
Presentation of the Additionality of the project *Please explain briefly how and why the project is additional and therefore not the (considered) Baseline scenario. Please describe why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances.*	In the case business as usual (BAU) is implemented, only some equipment modification such as thermal network upgrading, economizer installing will be implemented, it can not result in high energy efficiency and energy savings. If the project in accordance with CDM is implemented, the equipment modification will be more comprehensive related to application of a newer and more effective and efficient Cogen technology. The initial investment is higher, however, the project obtain additionallity in both greenhouse gases reductiton and cost. CDM approach results in much higher energy savings with the total GHGs reduction of 9,600 tons CO_2 per year. With the consideration of CERs revenue, the investment efficency significantly increases (NPV achieves 53,391 EUR from -128,668 EUR in the Reference case of no revenue from CERs consideration.) which seems very favourable condition for both Vietnamese and international investors.

H 2 Sustainability Effects	
Summarising description of the project's contribution to the sustainable development of the Host Country	Currently the energy consumption in general and electricity consumption in particular in Vietnam is still low; the electricity consumption in 2005 is only 550 kWh/person. Together with industrialization and modernization, electricity demand will estimated to significantly increase with the growth average annual rate of 12-14%. Much more hydraulic and thermal (coal and gas) based power plants will be built creating impact into environment. The usage of coal for thermo-electricity generation will result in higher CO_2 emissions. In sustainable development program of Vietnam (Vietnam agenda 21), energy reduction is considered as one of priorities. The considered project belongs to the group of energy efficiency improvement projects, contributing to traditional energy consumption reduction, greenhouse gases reduction, which is aligned with national development criteria. The project does not only improve company energy efficiency but also eliminate the environmental pollution in the area. The project will stimulate and accelerate the development of cogeneration technology in order to save energy and reduce GHGs emissions.

Appendix 1: Assumptions for project financial analysis

Item	Unit	Value
Total investment cost	Billion VND	28.40
Operation and Maintenance cost	as % of total invest	4

Fuel cost:		
FO price	VND/kg	5,500
Specific FO consumption	Kcal/kg steam	818
	Kcal/kWh	905
Calorific value	Kcal/kg	10,500

Product Capacity per year	Tons of steam/year	150,000
	MWh/year	12,500
Operation time	Hours/year	5,000
Considered project life time	Years	15
Exchange rate	VND/USD	16,000
Discounted rate	%/year	12
Product price	VND/kg steam	455
	VND/1kWh	550.00

Emission Index	kg-CO_2/kwh	0.60[6]
	kg-CO_2/kg FO	3[7]
Total CO_2 reduction	t-CO_2	9,600
CO_2 selling price	USD/t-CO_2	6.50
Annual revenue from CO_2 selling	Million VND	998.40

[6] Followed the Electricity of Vietnam (EVN) estimation based on the Vietnam electricity generation system.

[7] Emission coefficient of FO based on UNEP

Appendix 3

Project Design Document (PDD)

"Building a waste treatment plant to minimize the dumping. Includes waste recycling, composting and energy generation" at Son Tay town, Ha Tay province, Vietnam"

under the project: Support for the Development and Uptake of CDM projects in the Industrial sector: Pilot Project in Co-operation with the Austrian Industry[1]

1 US/GLO/04/096, UNIDO Project No.: US/RER/02/164, Partnerships with business & industry

CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)

Building a waste treatment plant to minimize the dumping includes waste recycling, composting and energy regeneration at Son Tay town, Ha Tay province, VIETNAM

Submitted by Vietnam National Cleaner Production Centre (VNCPC)

CONTENTS

A. General Description of project activity

B. Application of a baseline methodology

C. Duration of the project activity / Crediting period

D. Application of monitoring methodology and plan

E. Estimation of GHG emissions by sources

F. Environmental impacts

G. Stakeholders' comments

SECTION A. General description of project activity

A.1 Title of the project activity:

Building a waste treatment plant to minimize the dumping. Includes waste recycling, composting and energy generation at Son Tay town, Ha Tay province, VIETNAM

A.2 Description of the project activity:

The project objective is the realization of a composting and electricity generating plant for organic wastes on a site in Xuan Son commune, Son Tay town, Ha Tay province of Socialist Republic of Vietnam.

The project comprises the design and building of a composting and combustion facility to generate compost and electricity from wastes from Son Tay town, with a maximum daily input capacity of 200 tons. Apart from compost the project will realize methane reduction by diverting high organic waste from dumping at landfill and greenhouse gas emission reduction by using fossil fuel to generate electricity.

Most of the landfills in Vietnam are poorly controlled with no coverage or landfill gas extraction. Therefore, the baseline is crude waste disposal, without any precaution to avoid the emission of methane.

Based on investigations and calculations the project will realize emission reductions of 193,370 tons of CO_2 equivalent over a 5-year period 2008-2012 (first crediting period). The investment will be realized during the period 2006 till 2007. Delivery of CERs will start from 2008 onwards.

Like other low-income cities of developing countries, waste generated in Son Tay town, Ha Tay province is mostly organic in nature. Over 60% of the solid wastes contain organic substances, which have a very high potential for bio-fertilizer (compost) production. The material is suitable for aerobic composting. As such composting of this waste is an attractive option for resource recovery and environmental improvement. 25% of household wastes are combustible wastes which have high calorific value and it is potential sources for incineration to generate electricity.

Uncontrolled dumping is prevented and electricity generated while the compost can be used to combat soil degradation, a severe problem in Vietnam. The project therefore contributes to a sustainable development. The plant will be semi-mechanised and will create jobs.

This project will be the first CDM project in composting and electricity production in Vietnam on a commercial basis. As a pioneering effort by the project proponent, the project will contribute to the sustainable development of Vietnam. Below are environmental, economic and social benefits achieved through the project implementation:

1. Environmental benefits – Prevent uncontrolled GHG generation and emission from waste that would otherwise have been disposed at the landfill; production of soil enricher (compost) to avoid soil degradation;
2. Economical benefits – commercial composting and renewable energy on this scale is a new industrial activity for Vietnam; foreign expertise and training to facilitate smooth technology transfer; foreign capital inflow for investment by the project proponent;

3. Social benefits –jobs and trainings are provided to local residents.

A.3 Project participants:

Project proponent/Sponsor	SERAPHIN Joint Stock Company
DNA	Government of the Socialist Republic of Vietnam Ministry of Natural Resources and Environment Department of International Cooperation

Annex 1 provides more detail on the project participants.

A.4 Technical description of the project activity:

A.4.1 Location of the project activity:

Xuan Son commune, Son Tay town, Ha Tay province, Vietnam

A.4.1.1 Host Party(ies):

Socialist Republic of Vietnam

A.4.1.2 Region/State/Province:

Son Tay town and surrounding area.

A.4.1.3 City/Town/Community etc:

Son Tay town.

A.4.1.4 Detail of physical location, including information allowing the unique identification of the project activity.

The composting and electricity generation plant will be located in Xuan Son commune, Son Tay town near the existing open landfill.

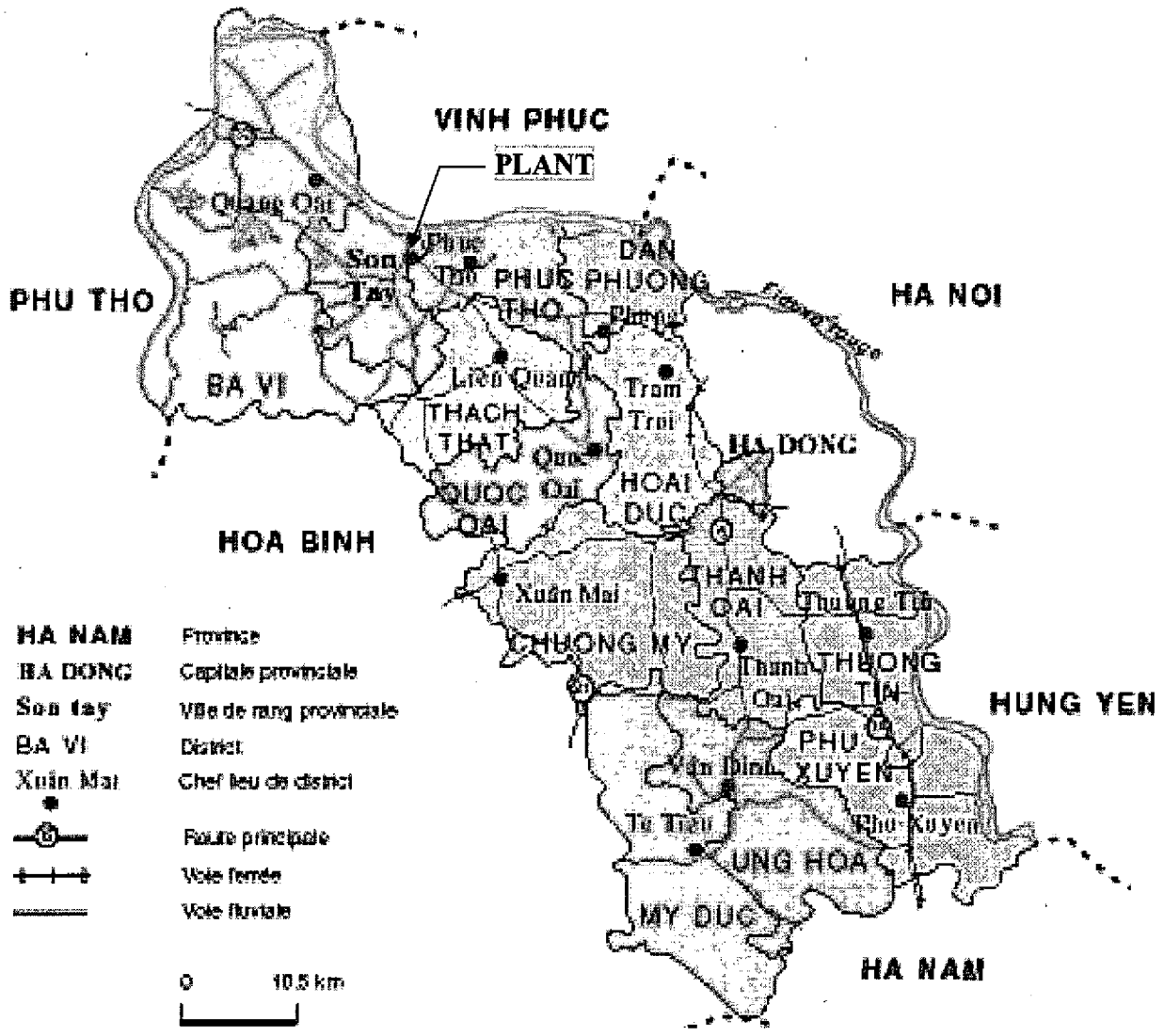


Figure A-1. Map of Son Tay with location of waste treatment plant

A.4.2 Category(ies) of project activity:

Project activity: Waste management measures which contribute to the avoidance of greenhouse gas emissions, especially through energy recovery from waste, if possible with waste heat utilization.

A.4.3 Technology to be employed by the project activity:

The project activities are construction and operation of a waste treatment plant. The plant will integrate waste recycling, composting and waste combusting for power generation. It will be built in Son Tay town, Ha Tay province. The capacity of the plant is about 200 tons fresh waste per day (72,000 tons/year) which is equivalent to the amount of waste collected in Son Tay town and surrounding areas daily. Waste is collected by Urban Environmental Company and transported to the factory. The factory's annual production is about 18,000 tons of compost used as fertilizer in agriculture; 11,250 MWh of electricity generated and

connected to the national electricity grid.

When the project will be put into operation, all the household waste of Son Tay town and surrounding areas will be treated instead of being dumped as usual. The project will reduce the greenhouse gas in different ways. Firstly, it helps to avoid methane emission from anaerobic disintegration of organic waste at landfill. Secondly, fertilizer products which store carbon in soil and crop plants instead of emitting to environment under the form of CH_4 and CO_2 will be generated through the composting process. Thirdly, natural resources and energy will be efficiently used in the electricity generation process. Thus, exploitation, processing, production and manufacturing processes which have potential in GHG CO_2, N_2O emission will be decreased. Energy generation from gross calorific value of waste will substitute fossil material resources and reduce their exploitation.

Project benefits include: products selling (recycled product, electricity), waste treatment fees, and income from CER.

The below diagram shows the production process of the project:

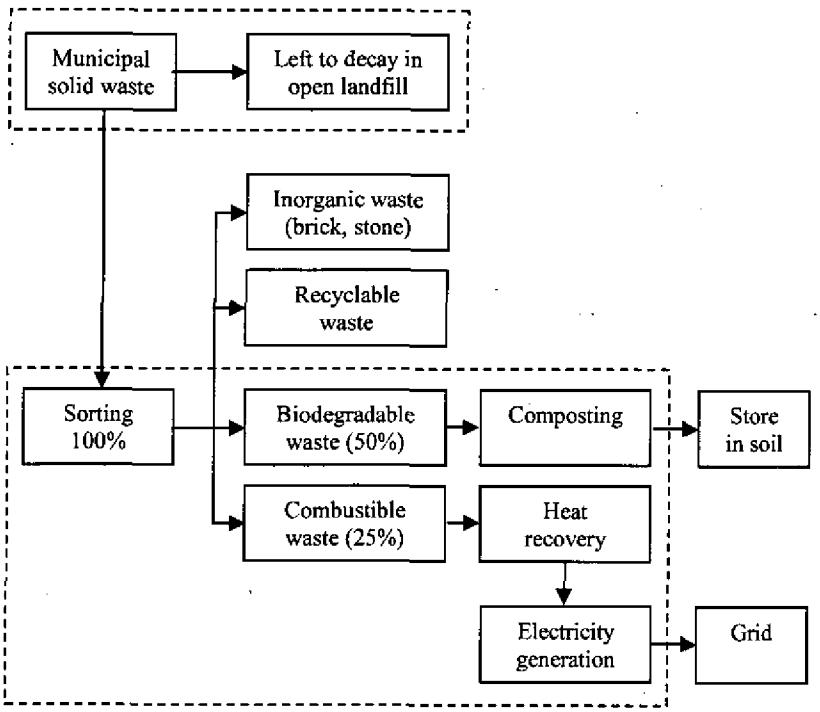


Figure A-2: Project boundary

The project includes two main technologies: composting and electricity generation.

The applied technology includes technological components which were patented under the name of SERAPHIN belonging to SERAPHIN Green Environment Technology JSC and other technological components from joint implemented foreign partner.

The main core process is as follows:

- Waste sorting line system (SERAPHIN technology). This technology will sort the wastes to four categories as recyclable materials (plastic, metal, glass, rubber); specific non-organic waste (brick, stone); organic waste and combustible materials (paper,

cloth).

- Biodegradable waste accounting for about 50% (food and green waste) is treated by composting methods, in the vertical reactor to have a good control in biological processes, exhaust gas; reduce treatment duration and reduce occupied space. The compost product has high carbon ratio which is used as fertilizer for soil and crops plant.
- High energy waste accounting for about 25% (paper, textile, wood, straw and other polymer, v.v.) is combusted to recover thermal energy and transfer it to electrical energy.
- A combusting furnace of "Mass burn" will be used. It will collect thermal energy under two forms: hot air, used as inlet source for the furnace and other drying processes, superheated steam used for turbine operation to generate electricity. After combusting, the exhaust gas will pass through multi-level cleaning operations to comply with the environmental standards before discharging (This component will be supplied by foreign partners). The ashes are collected for further processing.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

The project will divert organic waste from landfilling towards composting and electricity generation plant. Instead of anaerobic conversion, resulting in – amongst others – methane production, the organic waste is aerobically degraded, producing only non-fossil CO_2, into a reusable product (compost). Landfilling results in landfill gas production that emits to the atmosphere in case the landfill is not covered, which is the case in Vietnam.

By converting organic waste from land filling towards composting and electricity generating, landfill 100% of the gas methane emissions are prevented. The prevented methane emission from the landfill that otherwise would occur is claimed as emission reductions (ER's).

Positive Leakage – The produced compost is used in the agriculture (where it is needed to combat soil erosion that is a severe problem in Vietnam), reducing the need for (fossil) fertilizers. The emission reduction from displacing fertilizers and the emissions in the fertilizer production process are not claimed. The CERs related to the increased crop production (CO_2 fixing) thanks to the use of compost are note claimed either. Also the produced electricity is used in the daily life and the emission reduction in the electricity production is not claimed.

In Vietnam there is no legislation enforcing the composting of organic waste. Since it is not obligated to collect the waste for composting or to collect/combust the landfill gas, the approach is to continue disposal of waste and as a consequence landfill gas will be generated and emitted directly into the atmosphere. The project will not be viable unless CDM assistance is acquired. The Project is additional in that emission reductions would not occur in the absence of the proposed CDM activity.

A.4.4.1 Estimated amount of emission reduction over the chosen crediting period:

193,370 CER's over the period 2008-2012 (first crediting period)

SECTION B. Application of a baseline methodology

B.1. Title and reference of the approved baseline methodology applied to the project activity:

The approved methodology AM0025 "avoided emissions from organic waste composting at landfill sites" and ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" are applied.

B.1.1 Justification of the choice of the methodology and why it is applicable to the project activity:

The methodology AM0025 "avoided emissions from organic waste composting at landfill sites" and ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" will be applicable for this project.

The project meets all the applicability criteria as set out in the methodology, see B.2 below. These methodologies "avoided emissions from organic waste composting" and "grid-connected electricity generation from renewable sources" are applicable to the following situations in regards to composting and electricity generating activities:

- The project activity involves a composting process in aerobic conditions.
- The project activity also involves an electricity generating process in controlled incineration conditions
- The proportions and characteristics of different types of organic waste can be determined in order to apply a multiphase landfill gas generation model in estimating the quantity of landfill gas that would have been generated in the absence of the project activity.

The project activity meets the criteria set out above and is therefore applicable. Since there are no regulatory requirements in the Vietnam at present, the baseline scenario is that the waste will be disposed at the landfill and will generate landfill-gas that will be released to the atmosphere due to the lack of a landfill-gas capture system at landfills in Vietnam.

B.2 Description of how the methodology is applied in the context of the project activity:

In this CDM project, two part are included as(two methodologies applied): composting and electricity generating.

B.2.1 Methodology AM0025 "avoided emissions from organic waste composting at landfill sites"

To apply the methodology to this CDM project activity, the below steps are followed.

Step 1: Application criteria

The project activity involves waste originally intended for land filling will be composted hence the project activity avoids methane emissions by diverting organic waste from dumping at a landfill, that would have cause methane emissions by anaerobic processes.

The following conditions are applied:

- The project activity includes a composting process in aerobic conditions
- The proportions and characteristics of different types of organic waste can be determined in order to apply a multiphase landfill gas generation model in estimating the quantity of landfill gas that would have been generated in the absence of the project activity.

The monitoring methodology for avoided emissions from organic waste composting is used to monitor the emission reductions.

As stipulated by NM0090, the "tool for the demonstration and assessment of additionality" is applied in a conservative and transparent manner to show that CDM assistance is required for the project activity to be successfully implemented. Following the preliminary screening process, a convincing justification is provided to demonstrate that there is no plausible baseline scenario except the project activity and the continuation of key present policies and practices. An investment analysis is then presented to demonstrate that the project activity is additional. Next, a common practice analysis will be conducted to double-check the credibility of the investment/barrier analysis. Lastly, an explanation is offered as to how the impact of CDM registration will enable the Project to be successfully implemented.

The following steps from the "tool for the demonstration and assessment of additionality" will be completed below in section B.3.

Step 0 – Preliminary screening based on the starting date of the project activity
Step 1 – Identification of alternatives to the project activity consistent with current laws and regulations
Step 2 – Investment Analysis
Step 4 – Common Practice Analysis
Step 5 – Impact of CDM Registration

Step 2: Selection of baseline scenario

The appropriate baseline scenario shall be determined using Steps 1, 2 and 3 of the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the Executive Board.6[1]. See also D.1 of the New Baseline Methodology.

Step 3: Demonstrate and assess additionality

[1] The latest version of the "Tool for the demonstration and assessment of additionality" is available on the UNFCCC CDM web site: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

To demonstrate that the project activity is additional the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the Executive Board is used. See also B-3.

Step 4: Calculation of emission reductions

The emission reductions are calculated using the following formula:
$ER_y = BE_y - PE_y - L_y$
Where:
ER_y: Emissions Reductions (t CO_2e) in year y
BE_y: Emissions in the baseline scenario (t CO_2e) in year y
PE_y: Emissions in the project scenario (t CO_2e) in year y
L_y: Leakage (t CO_2e) in year y

Step 4a: Emissions in the baseline scenario (BE_y)

To calculate BE_y the formulas as elaborated in the methodology "avoided emissions from organic waste composting" section regarding baseline emissions are used:

$$BE_y = (MB_y - MD_{reg,y}) * GWP_{CH4}$$

Where:
BE,y: the baseline emission in year y (tCO_2e)
MB,y: methane produced in the landfill in the absence of the project activity in year y (tCH_4)
MDreg,y: methane that would be destroyed in the absence of the project activity in year y (tCH_4)
GWP_{CH4}: Global Warming Potential of methane (tCO_2e/ tCH_4)

Determination of MB_y
The amount of methane that is generated each year (MBy) is calculated for each year with the multiphase model, according to the AM0025 methodology for "Avoided emissions from organic waste composting". The model calculates the methane generation based on the actual waste streams Aj,x disposed in the most recent year (y) and all previous years since the project started (x=1 to x=y). The amount of methane produced in the year y (MBy) is calculated as follows:

$$MB = \varphi.\frac{16}{12}.F.DOC_f.MCF.\sum_{x=1}^{y}\sum_{j=A}^{D}A_{j,x}.DOC_j.(1-e^{-k_j}).e^{-k_j(y-x)}$$

Where:
MBy : methane produced in the landfill in the absence of the project activity in year y (tCH4),
φ : model correction factor (default 0.9) to correct for the model-uncertainties
F : is fraction of methane in the landfill gas
DOC_j : is percentage of degradable organic carbon (by weight) in the waste type j
DOC_f : is fraction DOC dissimilated to landfill gas.
MCF : Methane Correction Factor (fraction).
Aj,x : amount of organic waste type j prevented from disposal in the year x (tonnes/year).
kj : decay rates for waste stream type j

j : waste type distinguished into the waste categories (from A to D), as illustrated in table
E7
x : is year during the crediting period; x runs from the first year of the first crediting period
(x=1) to the year for which emissions are calculated (x=y)
y : is year for which LFG emissions are calculated

Calculation of φ (model correction factor)

Accordance to the AM0025, method for 'avoided emissions from organic waste composting', the value for the model correction factor φ will be 0.9.

Calculation of F

F will be calculated with the following preferences:

1. Measure F on annual basis as a monitoring parameter, at a landfill in the proximity o the composting plant, receiving comparable waste as the composting plant receives.
2. Measure F once prior to the start of the project activity at a landfill in the proximity of the composting plant, receiving comparable waste as the composting plant will receive.
3. In case there is no access to the landfill the project proponent should apply the conservative default value of 0.5 (the lower end of IPCC range of 0.5 – 0.6).

Step 1 and Step 2 are not applicable to the baseline, hence *ex ante* the IPCC default value (0.5) of step 3 will be used. The value F is part of the monitoring plan (see annex 4), hence *ex post* step 1 will be used (measuring of F).

Determination of $MD_{reg,y}$

$$MD_{reg,y} = MB_y * AF$$

Where:
AF = Adjustment Factor in % of MB_y

The Adjustment Factor consists of two elements acknowledging that methane might be captured in the specific situation: (1) to address safety and odour concerns (2) to comply with regulations or contractual requirements:

Re 1: In the Xuan Son landfill situation currently no measures are in place to capture or destroy methane produced.

Re 2: In Vietnam no policies or regulations what so ever are in place that oblige landfill operators to capture or destroy methane (REF)

Hence the AF factor will be 0% for the first crediting period. In accordance with the New Monitoring Methodology the $MD_{reg,y}$ and therefore the AF will be evaluated at the beginning of each crediting period.

Step4b: Emissions in the project scenario

To calculate project emissions PEy the section "project emissions" of baseline methodology is used:

$$PE_y = PE_{elec,y} + PE_{fuel,\ on\text{-}site,y} + PE_{c,\ N_2O,y} + PE_{c,\ CH4,y}$$

Where

PE_y : project emissions during the year y (tCO_2e)

$PE_{elec,y}$: emissions off-site from electricity consumption on-site in year y (tCO_2e)

$PE_{fuel,\ on\text{-}site,y}$: emissions on-site due to fuel consumption on-site in year y (tCO_2e)

$PE_{c,\ N2O,\ yy}$: emissions during the composting process due to N_2O production in year y (tCO_2e)

$PE_{c,\ CH4,y}$: emissions during the composting process due to methane production through anaerobic conditions in year y (tCO_2e)

$PE_{elec,y}$

The project activity will consume electricity. This electricity is taken from the grid. The GHG emission of electricity generation is therefore relevant.

$$PE_{elec} = kWh_e * CEF_{grid}$$

For CEFgrid: To account for emissions of electricity generation the CEF of a diesel generator (0,8 tCO_2e/MWh) shall be used or the EF of the grid calculated according to Methodology ACM0002; "Consolidated baseline methodology for grid connected electricity generation from renewable sources",
For determination of Emission Factor (of the grid) the Approved Consolidated Baseline Methodology ACM0002"Consolidated baseline methodology for grid-connected electricity generation from renewable sources", which was approved on 3 September 2004, shall be applied.
See for the calculated values chapter E.1 and Annex 3.

$PE_{fuel,\ on\text{-}site}$

The emissions within the project boundary are related to vehicles used on-site. The (GHG) emission is calculated from the quantity of fuel used and the specific CO_2-emisison factor of the fuel. As follows:

$$PE_{fuel,\ on\text{-}site} = F_{cons,y} \times NCV_{fuel} \times EF_{fuel}$$

$PE_{fuel,\ on\text{-}site}$: CO_2 emissions due to on-site fuel combustion in year y (tCO_2)

$F_{cons,y}$: fuel consumption on site in year y (l or kg)

CV_{fuel} : caloric value of fuel (MJ/l.)

D_{fuel} : density of fuel (kg//l.) according to IPCC

GWP_{fuel} : Global Warming Potential of fuel (tCO_2e/MJ) according to IPCC

See for the calculated values chapter E.1

N_2O emissions (PE_c, N_2O)

N_2O emissions might be released during the composting process.
In accordance with AM0025, project participant applies a default emission factor of 0.086 kg N_2O per ton of compost and calculates the total N_2O emissions as follows:

$$PE_{c,\ N2O} = M_{compost} * EF_{c,N2O} * GWP_{N2O}$$

Where

$PE_{c, N2O}$: is N_2O emissions from composting in year y (tCO_2e)

$M_{compost}$: is total quantity of compost produced in year y (tonnes/a)

$EF_{c,N2O}$: is emission factor for N_2O emissions from the composting process (t N_2O/t compost)

GWP_{N2O} : is Global Warming Potential of nitrous oxide (tCO_2/tN_2O)

CH_4 emissions (PEc, $CH_{4,y}$)

During composting process, aerobic conditions might not be completely reached in all areas and at all times. Pockets of anaerobic conditions may occur. The emission behaviour of these pockets is comparable with anaerobic situation in the landfill. Through sampling the percentage of waste that degrades under anaerobic circumstances will be determined and calculated in accordance with AM0025 as follows:

$$PE_{c, CH4,y} = MB_y * GWP_{CH4} * S_a$$

Where

$PE_{c, CH4,y}$: project methane emissions due to anaerobic circumstances in the composting process in year y (tCO_2e)

$S_{a,y}$: is share of the waste that degrades under anaerobic circumstances in the composting plant during year y (%)

MB_y : is quantity of methane that would be produced in the landfill in the absence of the project activity in year y (tCH_4)

GWP_{CH4} : is Global Warming Potential of methane (tCO_2e/tCH_4)

Calculation of $S_{a,y}$

To determine oxygen-content during the process, project participant will measure the oxygen content according to a predetermined sampling scheme and frequency. These measurements will be undertaken throughout the crediting period and recorded each year. The percentage of the measurements that show oxygen content below 10% is presumed to be equal to the share of waste that degrades under anaerobic circumstances, hence the emissions caused by this share are calculated as project emissions ex-post on an annual basis:

$$S_a = S_{OD}/S_{total}$$

Where

S_{OD} : Number of samples per year with an Oxygen Deficiency (Oxygen below 10%)

S_{total} : Total number of samples taken per year, where S_{total} should be chosen in a manner that ensures estimation of S_a with 20% uncertainty at 95% confidence level

See chapter E1 for the calculated values.

Step4c: Leakage (Ly)

The only source of leakage to be considered is the CO_2 emission from off-site transportation of waste materials due to a change in transport emissions. This would occur when it is likely that the transport emissions will increase significantly. Project participant will document the following:

- Overview of collection points from where waste will be collected,
- Approximate distance (in km) to the composting facility and existing landfills
- Approximate distance to the nearest end-user

The composting facility will be located at a site close to Son Tay town. Currently waste is collected at Son Tay greater area and transported to Xuan Son, the official disposal site of Son Tay town. Figure A-1 shows the location of the composting site and the Xuan Son landfill. To transport waste to the composting site, compared to the landfill, an average additional distance should be considered and additional CO_2 emission is to be expected.

For transport of the compost to the end-user, additional CO_2 emission is to be expected. Hence the following formula is applied:

$$L_y = \sum_i^n NO_{vehicle,i,y} \times km_{i,y} \times VF_{cons,i} \times CV_{fuel} \times D_{fuel} \times EF_{fuel}$$

Where

L_y : CO_2 emission of vehicles (tCO_2e) in year y
$NO_{vehicles,i,y}$: number of vehicles type i for transport in year y
$km_{i,y}$: average additional distance traveled by vehicle type I compared to baseline in year y
$VF_{cons,i}$: Vehicle fuel consumption per kilometre of vehicle (l/km)
CV_{fuel} : caloric value of fuel (MJ/kg)
D_{fuel} : density of fuel (kg//l)
EF_{fuel} : Emission Factor of fuel (tCO_2e/MJ)

See for the calculated values chapter E.2

B2.2 ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Applying the methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", the implementation of the Son Tay project will reduces on average 6,750 tCO_2 per annum.

Emission Reductions

$$ER1_y = BE1_y - PE1_y - L1_y$$

Where:

ER1 : Emission reduction (t CO_2e)
BE1 : Baseline emissions (t CO_2e)
PE1 : Project Emissions (t CO2e), for most of the renewable energy project, the PE1 = 0
L1 : Leakage emissions (t CO2e), as considered as zero
Y : a given year

Baseline Emissions:

$$BE1_y = GEN_y \times EF_y$$

Where:

BE1 : Baseline emissions (t CO_2e)
GEN : Electricity supplied by the project to the grid (MWh)
EF : baseline emission factor (tCO_2e / MWh)
Y : a given year

EF is baseline emission factor = 0.6 (tCO_2e / MWh)[2]

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:

The determination of project scenario additionality is done using the CDM consolidated tool for demonstration of additionality, which follows the following steps:

Step 0. Preliminary screening based on the starting date of the project activity

The project is only expected to start operation after registration with the UNFCCC. In any case, as it will be demonstrated in the following steps, CDM revenue has been considered from the early stages of development of the project, and it is an integral part of the financial package of the project.

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

Sub-step 1a. Define alternatives to the project activity:
Alternative 1: The proposed CDM project activity: "Organic Waste Composting and Electricity Generating by Incineration", not undertaken as a CDM project activity. Methane production would be avoided by breaking down organic matter through aerobic processes.

Alternative 2: Disposal of the waste on a landfill with electricity generation using the landfill gas captured from the landfill site. In Vietnam there is no legislation enforcing landfill gas extraction with or without utilization or what-so-ever. Since no obligation exists to collect/combust LFG, collecting/combusting LFG will not be viable without CDM-assistance. In case of landfilling the approach is that the emission of LFG directly into the atmosphere will continue.

Alternative 3: Disposal of the waste on a landfill with delivery of gas captured from the landfill site to nearby industry for heat supply. In Vietnam there is no legislation enforcing

[2] Calculated as emission factor for renewable energy in Vietnam by Institute Energy (Vietnam Electricity Corporation)

landfill gas extraction with or without utilization or what-so-ever. Vietnam has relatively large natural gas reserves, which make it a relatively cheap fuel. Hence the investments in collection, cleaning and delivery systems pose large barriers for setting up such activities. Therefore the alternative – without CDM support is seen as not feasible.

Alternative 4: Disposal of the waste on a landfill with flaring of gas captured from the landfill. In Vietnam there is no legislation enforcing landfill gas extraction with or without utilization or what-so-ever. Vietnam has relatively large natural gas reserves, which make it a relatively cheap fuel. Hence the investments in collection and flaring pose large barriers for setting up such activities. Therefore this alternative – without CDM support is seen as not feasible.

Alternative 5: Continuation of the current situation. Currently waste is dumped on the landfill, where organic matter is broken down through uncontrolled anaerobic processes, releasing all produced methane into the atmosphere.

Sub-step 1b. Enforcement of applicable laws and regulations:
All the alternatives comply with the laws and regulatory requirements for the project location.

Step 2. Investment Analysis

Sub-step 2a: Determine appropriate analysis method

According to the methodology for determination of additionality, if the alternatives to the CDM project activity do not include investments of comparable scale to the project, then Option III (of the methodology tool) must be used. As this is the case for the project, Option III is applied here.

Sub-step 2b: Option III - Application of benchmark analysis

The likelihood of development of this project, as opposed to the continuation of its baseline will be determined by comparing its NPV with the benchmark of interest rates available to a local investor, i.e., those provided by local banks in the Host Country, which averages 9.5% (source: economic trends on www.vietcombank.com.vn)

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

The Tables below show the financial analysis for the project activity. As shown, the project NPV (without carbon) is negative, i.e. the project is unattractive compared to the interest rates provided by local banks in the Host Country.

Table B-1. Cash flow of the project without carbon finance, USD

2008	2009	2010	2011	2012	2013	2014	2015	2016
-4,625,000	551,406	551,406	551,406	551,406	551,406	551,406	551,406	551,406

2017	2018	2019	2020	2021	2022

551,406	551,406	551,406	551,406	551,406	551,406

Table B-2. Financial results of the project (Alternative 1) without carbon finance. NPV uses 12% discount rate.

Indicators	Without CER
Net Present Value (USD)	-869,447
IRR	8.33%
Discount Rate	12%

Summary of results of project analysis. Details made available to validator.

The above financial results are estimated based on the following assumptions:

Assumptions	Unit	Value	Note
• Project life time	year	15	In fact, the expectation of life of these investments would be more than 15 years. However, the project life time of 15 years is used for financial estimation only.
• Discount rate	%	12	

Assumptions	Unit	Value	Note
• Invest cost 1- composting	USD	2,000,000	For the compost production facilities
• Invest cost 2 – combustion	USD	2,625,000	For the electricity generation from classified waste.
• Total investment	USD	4,625,000	
• Annual operation and maintenance cost (10% of total investment cost)	USD	462,500	Based on the supplier catalogs
• Input waste per year	ton/yr	72,000	As demand for waste processing in the region.
• Waste treatment fee	USD/ton	3.44	the expectation fee charge to the customers
• Annual amount of produced electricity	MWh	11,250	As calculated from the input waste and applied technologies.
• Electricity sale-price	USD/MWh	28.13	~ 450 VND/kWh, the reasonable price selling to Electricity of Vietnam (EVN)
• Annual amount of produced compost	tons/yr	18,000	As calculated from the input waste and applied technologies.
• Compost sale-price	USD/ton	25.00	The price can be changed depend on local future market (composting producers/customers)

Sub-step 2d: Sensitivity analysis

A sensitivity analysis was conducted by altering the following parameters:

- Increase in project revenue
- Reduction in project capital (CAPEX) and running costs (Operational and Maintenance costs).

Those parameters were selected as being the most likely to fluctuate over time. Financial analyses were performed altering each of these parameters by 10%, and assessing what the impact on the project IRR would be (see Table below). As it can be seen, the project NPV remains negative even in the case where these parameters change in favour of the project.

Scenario	Discount Rate (%)	IRR (%)	NPV (USD) (optional)
Original	12%	8.33	-869,447
Increase in project revenue by 10%	12%	11.27	-178,889
Reduction in project costs by 10%	12%	11.58	-91,944
Original under different discount rate	10%	8.33	-430,960
	14%	8.33	-1,238,170

Note: NPV uses 12% discount rate.

Step 3. Barrier Analysis

Hereafter the relevant key factors are discussed. Each of the factors described below indicates how it influences the baseline development for the Vietnam composting and electricity generation from waste project and the GHG emissions at project activity level.

Key factor 1 – the likely development or adaptation of the Vietnam legislation regarding landfill management

Legal framework

The most relevant parts of the legal framework for disposal of waste in Vietnam are:

- Law on Environmental Protection passed on December 27, 1993 and the Governmental Decree No 175-CP of October 18, 1994, detailing the implementation of the Law on Environmental Protection, In this law, there are no requirements for landfill gas recovery nor for reduction of organic content in waste.
- Vietnam Environment Monitor 2004 and Decision No.152/1999/QD-TTg, July, 1999, of the Prime Minister approving the National Strategy for Solid Waste Management in Industrial and Urban areas until 20020, give definitions, instructions how to handle wastes, emission. In none of these documents landfill gas extraction is required.

Implementation framework

The implementation of the legal framework is determined by three factors: (1) availability of securing necessary financial resources, (2) the adoption and implementation legislation and (3) the resolving of existing market barriers for large–scale composting in Vietnam.

(1) Availability of securing necessary financial resources.

The Vietnam waste sector is mostly municipality driven. Most of the municipal waste in Vietnam is not safely disposed. However, there have been significant improvements by the public urban environmental companies (URENCOs) that are responsible for municipal waste collection and disposal. Although the need for privatisation is recognised, it is not likely that this process will take place soon. Municipalities do not have sufficient knowledge and financial resources to provide the necessary investments into separate collection and subsequent processing (composting), burning classified waste for electricity generation and marketing. The main reasons for this are waste taxes/fees that are still too low and do not generate sufficient income to the municipalities.

- Given the current state of Government (incl. the municipalities) finances it is unlikely that the Government of Vietnam will be able to provide considerable subsidies for the implementation of separate collection systems for (green) organic wastes and composting.
- Currently the energy consumption in general and electricity consumption in particular in Vietnam is still low; the electricity consumption in 2005 is only 550 kWh/person. Together with industrialization and modernization, electricity demand will estimated to significantly increase with the growth average annual rate of 12-14%. Much more hydraulic and thermal (coal and gas) based power plants will be built which requires high intensive investment capital.

(2) Legislation

Although there is a general policy to simulate re-use of wastes in Vietnam there is no legislation enforcing landfill covering, landfill gas extraction, and organic waste composting or what-so-ever.

(3) Market barriers.

Since this is the first large -scale composting and electricity generation from waste project in Vietnam, it faces a number of market barriers. Economic unattractiveness, lack of technical know-how and lack of availability of equipment are the most important. The implementation of this project will assist Vietnam in demonstrating the practice of large scale composting that could assist the country in meeting the objectives regarding re-use of waste.

Key factor 2 – economic developments

Due to population and economic growth in the coming years, the production of wastes will increase and directly result into higher amounts of waste to be disposed. The result will be an increasing pressure on scarce land for land-filling.

Step 4. Common Practice Analysis

To date there has been limited development of composting projects in the Host Country and no data are available on their cost-effectiveness. The compost produced at these plants often contains broken bits of glass and metals, and is therefore difficult to sell. Since centralized composting plants in other Asian countries have failed when relying on mixed municipal waste as their main feedstock, source separation initiatives are being tested in Vietnam. In Hanoi, for example, wastes from markets or separated household wastes from test areas are being used as clean sources of organic matter. In addition, without successful composting, efforts to expand or sustain source separation will be less convincing, although it can still be targeted to recyclable materials and general awareness purposes.

Step 5. Impact of CDM registration

As shown in Step 2 above, the project is unlikely to move forward without the additional financial support of the CDM. If the developer was able to sell emission reduction credits from the project activity at an assumed price of U$ 6.5 dollars per ton of CO2e, the additional revenue generated by carbon sales would be sufficient to make the project go ahead (see Table in Step 2c above).

Table B.4: Impact on CDM registration (entire project duration).

Indicators	**With CER**
Net Present Value (USD)	83,686
IRR	12.36%
Discount Rate	12%

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

The project boundary is the composting and electricity generating by incineration site where waste will be brought in and treated.
The flowchart in the figure A-2 shows the main components and connections including system boundaries of the project.

Table B.1: Overview of emissions sources included or excluded from project boundary and baseline

	Sources	*Gas*		*Justification/Explanation*
Baseline	*Emissions from decomposition of waste at the landfill site*	CH_4	*Included*	*The major source of emissions in the baseline*
		N_2O	*Excluded*	*N_2O emissions are small compared to CH_4 emissions from landfill. Exclusion of this gas is conservative*
		CO_2	*Excluded*	*CO_2 emissions from the decomposition of organic waste are not accounted*

	Sources	Gas		Justification/Explanation
Project activity	On-site fossil fuel consumption due to the project activity	CO_2	Included	May be an important emission source
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Emissions from on site electricity use	CO_2	Included	May be an important emission source
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Direct emissions from the composting process	CO_2	Excluded	CO2 emissions from the decomposition of organic waste are not accounted
		CH_4	Included	The composting process may not be completely aerobic and result in anaerobic decay
		N_2O	Included	May be an important emission source
	Direct emissions from the incinerating process to generate electricity	CO_2	Included	May be an important emission source
		CH_4	Excluded	
		N_2O	Included	May be an important emission source

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

The organizations, persons and entity are listed in Annex 1.

SECTION C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

The time line of the project is as follows:

- Project starting date : May 1st 2006
- Construction starting date : August 1st 2006

- Construction finishing date : February 1st 2007 (first phase), Middle of 2008 (last phase)
- Start operating of equipment : July 5th 2007 (starting with 200 tonnes input per day.

C.1.2. Expected operational lifetime of the project activity:

The composting and power plant will continue to operate up to at least 2027.

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

1/1/2008

C.2.1.2. Length of the first crediting period:

5 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

Methodology AM0025 "avoided emissions from organic waste composting at landfill sites" and ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources".

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

These methodologies are applicable to the following situations in regards to composting and electricity generating activities:

- The project activity involves a composting process in aerobic conditions and electricity generating by waste incineration.

- The proportions and characteristics of different types of organic waste can be determined in order to apply a multiphase landfill gas generation model in estimating the quantity of landfill gas that would have been generated in the absence of the project activity.

The project activity meets the criteria set out above and is therefore applicable. Since there are no regulatory requirements in the Vietnam at present, the baseline scenario is that the waste will be disposed at the landfill and will generate landfill-gas that will be released to the atmosphere due to the lack of a landfill-gas capture system at landfills in Vietnam.

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

D.2.1.1. Data to be collected for composting process

D.2.1.1.1 Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number (Please use numbers to ease cross-referencing to D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1. kWhe	Electricity consumption	KWh meter	kWh	M	continuous	100%	Electronic during the crediting period and two years after	Data will be aggregated monthly and yearly
2. CEFelec	Electricity emission factor	Published data of authorities	tCO2e/Mwh	C	Annually		Electronic	Calculated according to ACM0002 or as diesel default factor
3. Fcons	Fuel consumption	Invoices for fuel purchase	liters	C	continuous	100%	Electronic during the crediting period and two years after	Data will be aggregated monthly and yearly
4. Mcompost,y	Compost produced	Plant records	tonnes	M	Discontinuous	100%	Electronic during the crediting period and two years after	The produced compost will be trucked off from site. All trucks leaving site will be weighed. Possible temporary storage of compost will be weighed as well or not taken in to account for calculated carbon credits.
5. Sa	Share of samples anaerobic		%	C	Weekly	See S_{total}	Electronic	Used to determine percentage of material that degrades anaerobically
6. S_{OD}	Number of samples with oxygen deficiency	Oxygen measurement device	number	M	Weekly	See S_{total}	Electronic	Samples with oxygen content <10%. Weekly measurements throughout the year, but accumulated once per year only.
7. S_{total}	Number of samples		number	M	Weekly	Statistically significant	Electronic during the crediting period and two years after	Total number of samples taken per year, where Stotal should be chosen in a manner that ensures estimation of Sa with 20% uncertainty at 95% confidence level

D.2.1.1.2 Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO2 equ.)

All formulas applied in this PDD are described and explained in Baseline Methodology AM0025 "Avoided emissions from organic waste composting at landfill sites" Therefore reference is made to this Methodology.

D.2.1.1.3 Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number (Please use numbers to ease cross-referencing to D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
8. MD_{reg} or AF	Methane destroyed due to regulatory or other requirements	Local and/or national authorities	% or tonnes	E	Annually	100%	Electronic, during the crediting period and two years after	Changes in regulatory requirements, relating to the baseline landfill(s) need to be monitored in order to update the adjustment factor (AF), or directly MD_{reg} . This is done at the beginning of each crediting period.
9. Ax	Total quantity of Waste supplied to Compost plant in the year x	Weighbridge	tonnes	M	Discontinuous	100%	Electronic, during the crediting period and two years after	Determine fraction of each waste stream of total waste input to the composting plant
10. Pj,x	Share of different types of organic waste	Sampling, sorting, weighing	% of Ax	M	Quarterly	See note below	Electronic, during the crediting period and two years after	Determine fraction of each waste stream of total waste input to the composting facility

11. F	Methane fraction of Landfill gas	Calculated	% methane (CH4) by weight	M	Annually, or at the start of the project	1 measurement per year	Electronic, during the crediting period and two years after	Monitoring depends of the accessibility of this data coming from landfill in proximity of the composting plant. If no suitable landfill data is available, then a default value of 0.5 will be applied

Pj: To adequately determine the share of each fraction of waste, the project proponent should start with 4 samples per year (once every quarter). The size and frequency of sampling should result in a statistically significant mean with a maximum uncertainty range of 20% at a 95% confidence level.

D.2.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO2 equ.)

All formulas applied in this PDD are described and explained in Baseline Methodology AM0025 "Avoided emissions from organic waste composting at landfill sites" Therefore reference is made to this Methodology.

D.2.1.2. Data to be collected for electricity generation process

D.2.1.2.1 Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number (Please use numbers to ease cross-referencing to D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Not applicable

D.2.1.2.2 Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

As the Project is renewable sources generation activity Project emissions are zero.

D.2.1.2.3 Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number (Please use numbers to ease cross-referencing to D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1. EG_y	Generation of the Project	Metering system	MWh	m	Hourly Measurement and daily recording	100%	electronic	Electricity supplied to the grid by the Project.
2. $EF_{OM, Dispatch\ Data, y}$	Emission Factor of the grid for each hour Dispatch data, merit order and EF for every power plant in the grid		tCO_2/GWh	c	Hourly	100%	electronic	
3. $E_{OM,y}$	Emissions for operating margin	Dispatch data calculations	tCO_2	c	yearly	100%	electronic	
4. EF_{BM}	Build Margin Emissions factor for the grid	EVN	tCO_2/GWh	c	At the beginning of each crediting period	100%	electronic	

5. EG_h	Hourly generation of the Project	Metering system	MWh	m	Hourly measurement and daily recording	100%	electronic	
6. $EF_{DD,h}$	Hourly generation –weighted average emissions per electricity unit of the set of power plants in the top 10% of grid dispatch order	EVN Dispatch data calculations	tCO_2/MWh	c	Hourly measurement and daily recording	100%	electronic	
7. $F_{i,n,h}$	Hourly amount of fuel consumed by *n* plants	CNE	tonnes	m	hourly	100%	electronic	
8. $COEF_{i,n}$	CO_2 emission factor of each plant by fuel type used	GHG Assessment Handbook	tCO_2/TJ	e	yearly	100%	electronic	
9. NCV_i	Net calorific fuel value per mass or volume unit of a fuel *i*	Node Price Fixation Report by EVN	TJ/tonne	e	yearly	100%	electronic	
10. $OXID_i$	Oxidation factor of the fuel	GHG Assessment Handbook	%	e	yearly	100%	electronic	
11. $GEN_{n,h}$	Hourly generation of electricity delivered to the grid by *n* plants	EVN	MWh	n	hourly	100%	electronic	
12.	Merit order	EVN	text	c	hourly	100%	electronic	
13. EF_y	Emission Factor of the grid in relation to the specific project activity	EVN Dispatch data calculations	tCO2/MWh	c	yearly	100%	electronic	Calculated as weighted sum of the OM and the BM

D.2.1.2.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

See Section B.2.2 for formulae

D.2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected for composting process

D.2.2.1.1 Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number (Please use numbers to ease cross-referencing to D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.2.1.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

Not applicable

D.2.2.2. Data to be collected for electricity generation process

D.2.2.2.1 Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number (Please use numbers to ease cross-referencing to D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

Not applicable

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. Data to be collected for composting process

D.2.3.1.1 If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number (Please use numbers to ease cross-referencing to D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
12. $NO_{vehicles}$	Vehicles per carrying capacity per year	Counting	number	M	discontinuous	100%	Electronic, during the crediting period and two years after	Counter should accumulate the number of trucks per carrying capacity
13. KMy	Additional distance traveled	Expert estimate	km	E	annually	100%	Electronic, during the crediting period and two years after	

D.2.3.1.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

All formulas applied in this PDD are described and explained in Baseline Methodology AM0025 "Avoided emissions from organic waste composting at landfill sites" Therefore reference is made to this Methodology.

D.2.3.2. Data to be collected for electricity generation process

D.2.3.2.1 If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number (Please use numbers to ease cross-referencing to D.3)	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Not applicable

D.2.3.2.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

As describe in Section B.2.2

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO2 equ.)

The emission reductions can be calculated using the following formula:

$$ER_y = BE_y - PE_y - L_y$$

Where:

ER_y : Emissions Reductions in year y (t CO_2e)
BE_y : Emissions in the baseline scenario in year y (t CO_2e)
PE_y : Emissions in the project scenario in year y (t CO_2e)
L_y : Leakage in year y (t CO_2e)

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored

D.3.1. Data monitored for composting process

Data	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1 kWhe	Low	kWh-meter will be subject to regular maintenance and testing to ensure accuracy (in accordance with instructions of the meter supplier). The readings will be double checked by the electricity distribution company
2 CEFelec	Low	Calculated as per ACM0002 at start of crediting period (or take default value for diesel generator)
3 Fcons	Low	The amount of fuel will be derived from the paid fuel invoices (administrative obligation)
4 Mcompost,y	Medium	Weighed on calibrated scale; also cross check with sales of compost
5 Sa	Medium	O2 measurement-instrument will be subject to periodic calibration (in accordance with instructions of instrument supplier). Measurement itself to be done by a standardised mobile gas detection instrument. A statistically significant sampling procedure will be set up that consists of multiple measurements throughout the different stages of the composting process according to a predetermined pattern (depths and scatter) on a daily basis
6 SOD	Medium	
7 Stotal	Medium	
8 MDreg	Medium	Data are derived from or based upon local or national guidelines, so QA/QC-procedures for these data are not applicable.
9 Ay	Low	Weighbridge will be subject to periodically calibration (in accordance with instructions of the weighbridge supplier)
10 Pjx	Low	Regular sorting & weighing of waste (initially quarterly) by project proponent will be carried out. Procedures will be checked regularly by a certified institute/DOE
11 F	Low	Analyser will be calibrated regularly by a certified institute (in accordance with instructions of the meter supplier)
12 NOverhicles	Medium	Number of vehicles must match with total amount of sold compost. Procedures will be checked regularly by DOE
13 KM	Medium	Assumption to be approved by DOE

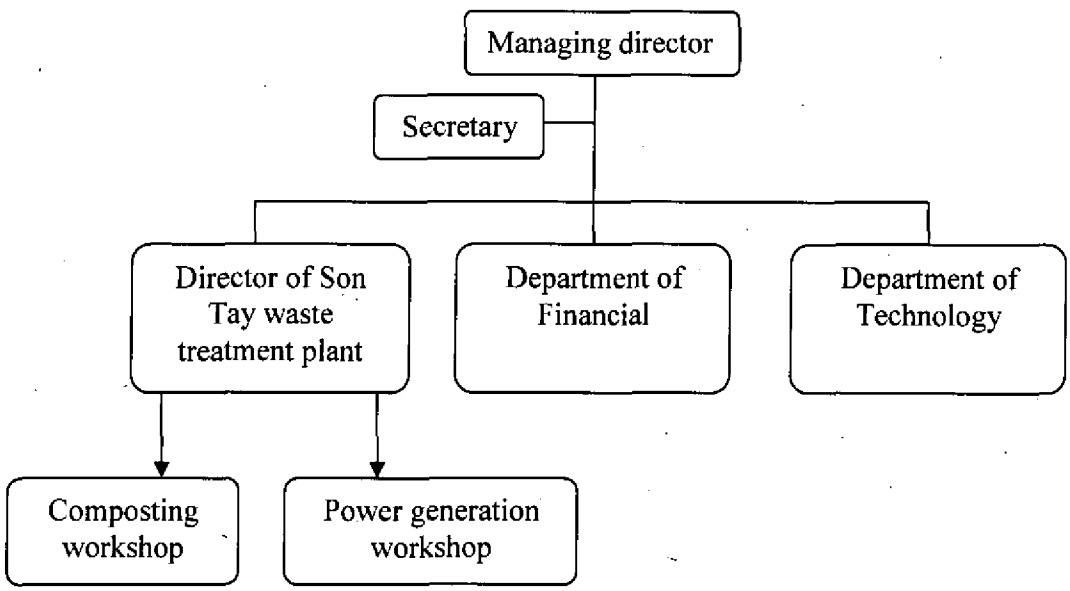
In addition to secure aerobic conditions of the composting process parameters (temperature, oxygen, pH) are monitored. The DOE assess the validity of this procedure.

D.3.2. Data to be collected for electricity generation process

Data	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1. EG_h	*Low*	EIH is monitored continuously. These data will be directly used for calculation of emission reductions. Sales record to the grid and other records are used to ensure the consistency.
12.Merit order	*Low*	Merit order is tracked by Government Authorities and it is publicly available.
Others 2-11, 13	*Low*	Default data (for emission factors) and IEA statistics[3] (for energy data) are used to check the local data.

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

The structure of the company will be as follow:



D.5 Name of person/entity determining the monitoring methodology:

[3] World Energy Outlook 2004 (IEA, 2004)

The person and entity are listed in Annex 1.

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

Reference is made to table B.1 "overview of emissions sources included in or excluded from the project boundary and baseline"

$$PE_y = PE_{elec,y} + PE_{fuel,\ on\text{-}site,y} + PE_{c,\ N2O,y} + PE_{c,}\ CH_{4,y}$$

Where

PE_y : project emissions during the year y (tCO_2e)

$PE_{elec,y}$: emissions off-site from electricity consumption on-site in year y (tCO_2e)

$PE_{fuel,\ on\text{-}site,y}$: emissions on-site due to fuel consumption on-site in year y (tCO_2e)

$PE_{c,\ N2O,\ yy}$: emissions during the composting process due to N_2O production in year y (tCO_2e)

$PE_{c,\ CH4,y}$: emissions during the composting process due to methane production through anaerobic conditions in year y (tCO_2e)

In the following paragraphs these parameters will be calculated:

$PE_{elec,y}$ Project emissions off site from electricity consumption on site

The project activity will consume electricity. This electricity is taken from the grid. The GHG emission of electricity generation is therefore relevant.

$$PE_{elec} = kWh_e * CEF_{grid}$$

For CEFgrid: To account for emissions of electricity generation the CEF of a diesel generator (0.8 t-CO2e/MWh) shall be used or the EF of the grid calculated according to Methodology ACM 0002 "Consolidated baseline methodology for grid connected electricity generation from renewable sources".
For determination of Emission Factor (of the grid) the Approved Consolidated Baseline Methodology ACM0002:"Consolidated baseline methodology for grid-connected electricity generation from renewable sources", which was approved on 3 September 2004, shall be applied.

The emission factor has been calculated for Vietnam. The calculated emission factor (EF) is 0.6, Therefore this value is applied as CEF_{grid}.

Table E-1. Electricity consumption on-site

Machine	Number of machines	Installed electrical capacity [kW]	Load factor	Operating	Electricity consumption [MWh/year]

Machine 1	15	180		360	972,0
Machine 2	24	60		360	518,4

The onsite installed electrical capacities are: (180 x 15 + 60 x 24) x 360 days/1000 = 1,490.4 MWh/year.

PE_{elec} = 1,490.4 MWh x 0.6 tCO2e/MWh = 894.2 tCO_2e/year.

$PE_{fuel, on\text{-}site}$ Project emission from fuel use on site

The emissions within the project boundary are related to any on-site fuel combustion. The emission is calculated from the quantity of fuel used and the specific CO2-emisison factor of the fuel. Below the ex ante calculations:

$$PE_{fuel, on\text{-}site} = F_{cons,y} * NCV_{fuel} * EF_{fuel}$$

Table E-2. Used values for emissions calculation related to vehicles used on-site

Parameter	Description	Value
$F_{cons,y}$	Fuel (diesel) consumption (l.) on site in year y	118,800 l
NCV_{fuel}	Caloric value of fuel (MJ/l.)	36.295 MJ/l (42.7 MJ/kg with 1 l = 0.85 kg),
EF_{fuel}	Global Warming Potential of fuel (diesel) (tCO2e/MJ) according IPCC	0.0000741 tCO2 /MJ

$PE_{fuel, on\text{-}site}$ = 118,800 litre x 36.295 MJ/l x 0.0000741 tCO2 /MJ = 319 tons CO_2

$PE_{c, N2O}$ Project emission from composting

Emissions of N_2O during the composting process

$$PE_{c, N2O} = M_{compost} * EF_{c,N2O} * GWP_{N2O}$$

Table E-3. Used values for N_2O emissions from composting

Parameter	Description	Value
$M_{compost}$	Total quantity of compost produced in year y (tonnes/a)	18,000
$EF_{c,N2O}$	Emission factor for N_2O emissions from composting process	0.000043 t N_2O/tcompost
GWP_{N2O}	Global Warming Potential of nitrous oxide (tCO_2e/tN_2O)	310 tCO_2/tN_2O
$PE_{c, N2O}$		239 tCO_2 e/year

$PE_{c, CH4}$ Project emission from composting

The project methane emissions due to anaerobic circumstances in the composting process in year y are to be calculated with the formula below ($PE_{c, CH4}$ in tCO_2e):

$$PE_{c,CH4} = MB_y * GWP_{CH4} * S_a$$

Where
$PE_{c, CH4,y}$: project methane emissions due to anaerobic circumstances in the composting process in year y (tCO_2e)

Currently no data is available. Ex ante a Sa 2% will be applied in this PDD. Ex post this value will be replaced by the result of actual measurements on site (see instructions in chapter B.2 under calculation of MD_{reg} of this PDD).

Table E-4. Used values for CH_4 emissions from composting

Parameter	Description	Value
MB_y	Quantity of methane that would be produced in the landfill in the absence of the project activity in year y (tCH_4)	Calculated with the multiphase model for each year y
$S_{a,y}$	Share of the waste that degrades under anaerobic circumstances in the composting plant during year y (%)	2%
GWP_{CH4}	Global warming Potential of methane (tCO_2e/tCH_4)	21

E.2. Estimated leakage:

The only source of leakage to be considered is the CO2 emission form off-site transportation of waste materials due to a change in transport emissions. This would occur when it is likely that the transport emissions will increase significantly. Project participant will document the following:

- Overview of collection points from were waste will be collected,
- Approximate distance (in km) to the composting facility and existing landfills
- Approximate distance to the nearest end-user

The composting facility will be located at the Xuan Son site, close to Son Tay. Currently, waste is collected at Son Tay greater area and transported to Xuan Son, the official disposal site of Son Tay town. To transport waste to the composting site, compared to the landfill, an average additional distance should be considered and additional CO_2 emission is expected.

For the transport of the compost to the end-user, additional CO2 emission is to be expected. Hence the following formula is applied:

$$L_y = \sum_i^n NO_i \times km_i \times VF_i \times CV_i \times D \times EF$$

Where

Ly	: CO_2 emission of vehicles (tCO_2e) in year y
$NO_{vehicles,i,y}$	: number of vehicles type i for transport in year y
$km_{i,y}$	: average additional distance travelled by vehicle type i compared to baseline in year y
$VF_{cons,i}$	: Vehicle fuel consumption per kilometre of vehicle (l/km)
CV_{fuel}	: caloric value of fuel (MJ/kg)
D_{fuel}	: density of fuel (kg//l)
EF_{fuel}	: Emission Factor of fuel (tCO_2e/MJ)

The values used are shown in table E.5.

Table E-5. Used values for leakage emissions calculation related to additional transport of waste and to transport of compost

Parameter	Description	Value
$NO_{vehicles}$	number of vehicles used for transport of compost	1,800 vehicles Based on 10 tons/vehicle
KM_{av}	average distance to transport compost (in kilometres to end-user(s))	120
Additional transport of waste		
VF_{cons}	fuel consumption (l.) per kilometre of vehicle	0.15 litre/km
D_{fuel}	Density of fuel (kg//l.)	0.85 kg/l
CV_{fuel}	Caloric value of fuel (MJ/kg)	36.3 MJ/kg
EF_{fuel}	Emission Factor of fuel (kg CO_2e/GJ) according IPCC	74.1 kg $CO_2e/GJ = 74.1 * 10^{-6}$ tCO_2/MJ
L_y	Leakage - CO_2 emission of vehicles (tCO_2e) in year	74.8 t-CO_2

E.3. The sum of E.1 and E.2 representing the project activity emissions:

Sum of project-emissions, calculated under E1 and project leakages, calculated under E2 are indicated in table E.6. The emissions due to anaerobic situation are not included in this list.

Table E-6. Resulting project emissions and leakages in first crediting period t-CO2e

Year	Project emissions				Leakages	Total
	PE_{electr}	PE_{fuel}	$PE_{c,N2O}$	$PE_{c,CH4}$	L_y	
2008	894.24	319.51	239.94	496.74	74.8	2,025.23

Year	Project emissions				Leakages	Total
	PE_{electr}	PE_{fuel}	$PE_{c,N2O}$	$PE_{c,CH4}$	L_y	
2009	894.24	319.51	239.94	496.74	74.8	2,025.23
2010	894.24	319.51	239.94	496.74	74.8	2,025.23
2011	894.24	319.51	239.94	496.74	74.8	2,025.23
2012	894.24	319.51	239.94	496.74	74.8	2,025.23
Total						**10,126**

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

E.4.1 Calculate for composting process

To calculate the emissions in the baseline scenario BEy the formulas as elaborated in baseline methodology are used:

$$BE_{y,comp.} = (MB_y - MD_{reg,y}) * GWP_{CH4}$$

Where:

$BE_{y,comp.}$: the baseline emission in year y (tCO_2e)
MB_y : methane produced in the landfill in the absence of the project activity in year y (tCH_4)
$MD_{reg,y}$: methane that would be destroyed in the absence of the project activity in year y (tCH_4)
GWP_{CH4} : Global Warming Potential of methane ($t\text{-}CO_2e/\ tCH_4$)

Determination of MBy

The amount of methane, expressed in tCH_4, that is generated each year (MBy) is calculated for each year with the multiphase model, according to the AM0025 methodology for "Avoided emissions from organic waste composting" The model calculates the methane generation based on the actual waste streams Aj,x disposed in the most recent year (y) and all previous years since the project started (x=1 to x=y). The amount of methane produced in the year y (MBy) is calculated as follows:

$$MB_y = \varphi.\frac{16}{12}.F.DOC_f.MCF.\sum_{x=1}^{y}\sum_{j=A}^{D} A_{j,x}.DOC_j.(1-e^{-k_j}).e^{-k_j(y-x)}$$

Where:

Parameter	Description	Value
Φ	Model collection factor (default 0.9) to correct for the model-uncertainties	0.9
F	Is fraction of methane in the landfill gas	0.5
DOCj	Percentage of degradable organic carbon (by weight) in the waste type j	See table below
DOCf	Fraction DOC dissimilated to landfill gas	0.77
MCF	Methane Correction Factor	0.8
Aj,x	Amount of waste prevented from disposal	
K	Decay rates for waste type j	See table below
X	Year during crediting period	
Y	Year for which emission are calculated	
j	Waste type distinguished into the waste categories	See table below

Table E-7: Amount of waste, composition (waste type), decay rates and DOCj -values

Parameter	Paper % Textile	Garden & park waste	Food waste	Wood & straw waste
DOCj value	40%	17%	15%	30%
Decay rates	0.023	0.023	0.231	0.023

MB_y = 1,774.08 t CH_4/year

BE_y = (1,774.08 - 0) x 21(tCO_2e/ tCH_4) = 37,255 tCO_2e

E.4.1 Calculate for electricity generating by waste incineration

$BE_{y,elc.}$ = GEN x EF

Where: GEN is electricity supplied by the project to the grid (MWh)
EF is baseline emission factor (tCO2e/MWh)
EF = 0.6 tCO2/MWh (Electricity of Vietnam given factor)
$BE_{y,elc.}$ = 11,250 MWh x 0.6 tCO2/MWh = 6,750 tCO_2e/year

Calculate project emission for combustion

$PE_{comb,y} = PE_{comb\_CO2,y} + PE_{comb\_N2O,y}$

Where:

$PE_{comb\_CO2,y}$: CO_2 emission from waste combustion based on fossil carbon in the year
$PE_{comp\_N2O,y}$: N_2O emission from waste combustion in the year

$PE_{comb\_CO2,y} = Q_{comb,y} * CCW * FCF * EF_{comb} * 44/12$

Where:

Parameter	Value	Unit	Description
$Q_{comb,y}$	18,000	tons/y	Quantity of combustion organic waste per year
CCW	0.40		Fraction of carbon content in the waste, use default value (30 - 50%)
FCF	0.40		Fraction of fossil carbon in the waste, use default value (30 - 50%)
EF_{comb}	0.95		Efficiency of waste combustion of incinerator, use default value (95 - 99%)

$PE_{comb\_N2O,y} = Q_{comb,y} * EF_{comb\_N2O} * GWP_{\_N2O}$

Where:

Parameter	Value	Unit	Description

Parameter	Value	Unit	Description
$Q_{comb,y}$	18,000	tons/y	Quantity of combustion organic waste per year
EF_{comb_N2O}	1.10^{-4}	$tN_2O/tWaste$	Aggregate N_2O emissions factor for the waste, use default value for grate incinerator
GWP_{N2O}	310	tCO_2e/tN_2O	Global Warming Potential of nitrous oxide

$PE_{comb,y} = PE_{comb\_CO2,y} + PE_{comb\_N2O,y}$
$= 2,736 + 558 = 3,294\ tCO_2/year$

E.5 Emission reduction of the project activity

$BE_y = BE_{y,comp} + BE_{y,elc.}$

Where:
$BE_{y,comp.}$: The baseline emission by composting activity in the year y (tCO_2e)
$BE_{y,elec.}$: The baseline emission by waste incinerating to generate electricity in the year y (tCO_2e)
$BE_y = 37,255 + 6,750 = 44,005\ (tCO_2e)/year$

$ER_y = BE_y - PE_y - PE_{comb,y} - L_y$

Where
ER_y : Emission reduction in the year y (tCO_2e)
PE_y, L_y : Calculated as in the table E-6
$PE_{comb,y}$: Calculated in E.4.1

$ER_y = 44,005 - 3,294 - 2,025.23 =$ **38,685 t-CO_2e/year**

SECTION F. Environmental impacts

F.1 Documentation an the analysis of the environmental impacts, including transboundary impacts

The project involves the implementation and operation of a composting and power generating plant in Son Tay town. It does not use any scarce resources (like water); it doesn't produce any solid waste nor emissions to water and soil. The (limited number of) vehicles (one or two dozers) do produce local combustion gases. The main environmental negative component can be NOx that is an acidifying gas. The engines of the vehicles however, will comply with US and Western European emission standards; therefore the amount emitted is very limited. The electricity used on-site was taken from electricity generated from combustion on-site.

Composting can have some local environmental impacts, mainly odour emissions. Odour reduction techniques are applied. The composting plant is envisaged to be located near an existing landfill site. At an existing landfill site, the odour emissions will not contribute significantly.

Soil erosion in Vietnam is a severe problem. Compost can improve the soil condition and will improve crop production. Compost is therefore in great demand and contributes to a better environment.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

In brief, the project might have a slight negative environmental impact during the operational phase: being odour emission. However this emission is compensated by prevented emissions from the landfill.

Environmental legislation

The legislation in force are the Law on Environmental Protection 1993 (EPL '93) and the Implementation Guides for Law on Environmental Protection (IGEP '94) - Decree No. 175/CP issued by Vietnamese Government.

There is a three-tier approach to be followed regarding the Environmental Impact Assessment (EIA).

1. Screening

As per ECR '97, a normative screening procedure is to be followed according to which industries/activities/projects have been divided into five categories:

1. Master plans for regional development, the zoning and plans for development of branches, provinces and cities directly under the Central Government, the planning of urban centres and residential quarters.
2. Projects on economic, scientific, medical, cultural, social, security and defence;
3. Projects invested or funded by foreign organizations or individuals, or international organizations, or built with loans from them or as joint ventures with them on Vietnamese territory;
4. The projects mentioned at Points 1, 2 and 3 of this article which were ratified before the 10th of January 1994, but which have not been evaluated for their environmental effect as required;
5. The economic, scientific, medical, cultural, social, security and defence establishments put into operation before the 10th of January 1994.

All the EIA reports will be implemented in two steps: Initial Environment Examination (IEE) and Detailed EIA.

2. Initial Environmental Examination

All industries/activities and projects in categories have to conduct an IEE which helps in understanding the potential extent of environment changes and in finding ways to mitigate by considering the available information, or past experience or standard operating practices. The steps for conducting IEE are:

- Collection of baseline information in respect of the project and the environmental setting of the project and its site;
- Setting of boundaries of an IEE by identifying the significant issues;
- Impact assessment, suggestion of mitigation measures, Environment management plan (EMP) or alternative or other project modifications;
- In the event that the IEE of the project reveals that further investigation is to be carried out then the developer will have to carry out a detailed EIA;

3. Detailed EIA

The detailed EIA should be focused on addressing the issues, which remains unresolved in the IEE. The steps involved in conducting an EIA are as follows:

a. Baseline studies – this is usually divided into two sections:
   1. Studies related to the project (site selection, mass and energy balances, product storage and transport, list of machinery and equipment emission and ways of treatment etc.);
   2. Impact identification (list of key sources on environment, detailed impacts, etc);

b. Evaluation to determine whether mitigation of pollution or the proposed project will be required;

c. Mitigating measures (changing of site, process, operation, disposal routes etc).

<u>Screening</u>

The composting and power generating project reveals that this type of project is one of the list on ECR'97.

Initial Environmental Examination (IEE)
In section E the project boundaries, the environmental setting of the project and its site are given.
The environmental impact is given above in F-1. Apart from some local combustion emissions of vehicles, the impact might only be odour, noise. This might result in the need for a detailed EIA.

Environmental impact assessment
As mentioned before, for composting and power generating there might be a requirement of a detailed EIA report. The exact site is not yet known; therefore the actual need cannot be addressed. This will be done as soon as this is known.

In case a detailed EIA is required this will be done during the design phase. Any recommendation from the EIA will be implemented in the design.

Reference

1. Law on Environmental Protection, Government of Vietnam, 1993.
2. Decree 175/CP on Instruction for Guiding Implementation of Law on Environmental Protection, Government of Vietnam, 1994.
3. Instruction for Guiding Environmental Impact Assessment to the operating units, No.1420/QD-MTg, Ministry of Science Technology and Environment (Now is MOSTE), 1994.

SECTION G. Stakeholders' comments

G.1. Brief description how comments by local stakeholders have been invited and compiled:

G.2. Summary of the comments received:

G.3. Report on how due account was taken of any comments received:

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization	**SERAPHIN Joint Stock Company**
Address	Room 303, Trung Hoa - Cau Giay Urban area, Hanoi
City	Hanoi
State/Region:	Vietnam
Country	Socialist Republic of Vietnam
Telephone	84-4-2811270
FAX	84-4-2811271
Email	sales@greenseraphin.com; seraphintech@gmail.com
Website	www.greenseraphin.com
Represented by:	
Title	General Director
Salutation:	Mr.
Last Name	Thang
Middle Name	Duc
First Name	Do

Organization	**Vietnam National Cleaner Production Centre (VNCPC)**
Address	4th Floor, Building C10, Hanoi University of Technology, No1 Dai Co Viet street, Hanoi
City	Hanoi
State/Region:	Vietnam
Country	Socialist Republic of Vietnam
Telephone	84-4-8684849
FAX	84-4-8681618
Email	vncpc@vncpc.org; tunglt@vncpc.org
Website	www.vncpc.org
Represented by:	
Title	Responsible for CDM projects
Salutation:	Mr.
Last Name	Tung
Middle Name	Thanh
First Name	Le