CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

>>
Laogang Landfill Gas Utilization and Energy Recovery Project
Document version: PDD ver.1.
Date: 2006/03/5

A.2. Description of the project activity:

>>
The project site is Shanghai Laogang landfill, located in China's municipality of Shanghai. With an area of 3.4km^2, Laogang landfill is facing the East China Sea and approximately 60km away from Shanghai downtown. It is a typical pit-type landfill and 2.5-4.0 meters above the sea level. It is formed by the accumulative soils and sand from the Yangtze River.

The main objective of this project is to collect landfill gas which consists primarily of methane and to generate electricity using the methane, through installation of LFG collection system, gas engine electricity generation system and LFG flaring system in the site.

It is estimated that this project will reduce the total greenhouse gas emissions generated from the site in terms of carbon dioxide approximately 8,484,675tCO_2 from 2007to 2016, based on the IPCC default value 1tCH_4=21tCO_2, and will produce total 1,137,048 MWh electricity during this period of time.

This project will not only bring environmental benefits locally even nationally and globally, but also make a demonstration of a CDM project for LFG recovery and electricity generation in China. The project will successfully promote the sustainable development in the following aspects:

・**Greenhouse effect reduction**
Constructed in 1989, Laogang landfill has been operating for more than 16 years. Up to now, it has accepted more than7.9 million tons of wastes generated in the Municipality of Shanghai. The methane, the main content of LFG produced from the landfill, emits to the atmosphere without any treatment or recovery. With the project activities, methane in LFG will be recovered and utilized so that the amount directly emitting to the atmosphere will be reduced, resulting in the positive impact on global climate.

・**Landfill safety**
If the methane concentration in the air rises up to 5~15% by volume, the risk of explosion is very high. In China, landfill explosion usually happens due to unsuccessfully venting landfill gas. At present, many venting pipes and wells have been installed for LFG emitting in order to avoid the accumulation of LFG and the risk of explosion at Laogang landfill site.

・**Energy potential**
In terms of methane, it is an ideal fuel. Considering each cubic meter of methane is able to generate heat (around 36,800J), LFG recovery and utilization are important to relief the current situation of energy shortage that Shanghai is facing.

・**Capacity building**

The project will be designed, constructed and operated using local resources, supported by international experts.

・**Demonstration**
Up to now, some countries, like Brazil and South Africa, have operated many projects of landfill gas recovery and utilization as CDM projects. Recently, Beijing Anding landfill project in China is also applying as a CDM project. With overseas and domestic experiences, Laogang LFG-to-energy project is supposed to proceed successfully with little risks, aiming at improving landfill gas utilization, saving energy and protecting environment, and become a successful demonstration of a LFG-to-electricity CDM project in China.

A.3. Project participants:

>>

Name of Party involved(*) ((Host) indicates a host Party)	Private and/or public entity(ies) project participants(*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People's Republic of China (Host)	Shanghai Chengtou Environment Industry Development Co., Ltd.	No
Japan	Japan Engineering Consultants Co., Ltd	No

The participants involved in this project are:

・**Shanghai Chengtou Environment Industry Development Co., Ltd.**
Chengtou belongs 100% to SMG and got from SMG all rights for Laogang landfill site. It is here representative of SMG and the sponsor of the Laogang LFG-to-energy project. Besides, Chengtou will commission a company for the implementation, collection, maintenance and operation of Laogang project through bidding procedures.

• Japan Engineering Consultants Co., Ltd
Japan Engineering Consultants Co., Ltd is a comprehensive construction consultant handling the areas such as road/transportation, urban development, waste disposal, environment/energy and disaster prevention. It also provides international technical cooperation in foreign countries through provision of social overhead capital (consulting service for road/transportation, environment, waste disposal and so on). It is the sponsor of this project.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

>>

A.4.1.1. Host Party(ies):

>>
People's Republic of China

A.4.1.2. Region/State/Province etc.:

>>

Municipality of Shanghai

A.4.1.3. City/Town/Community etc:

>>

Laogang town in Nanhui county

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

>>

The project is located at Shanghai Laogang landfill site in China. Situated 31.4 degrees north latitude and 121.29 degrees east longitude, Shanghai is in the middle of China's mainland coastline, and Yangtze River's entrance to the sea. Covering an area of 6,340 km^2, and with a population of more than 17.4 million, it has an oceanic and monsoon climate in the subtropical zone. With an area of 3.4 km^2, Shanghai Laogang landfill is formed by the accumulative soils and sands from the Yangtze River and then been enclosed, expanding 60-70 meters annually to the East Sea

Laogang landfill Phase 1 started in the year 1989, which was completed and commissioned in April of 1991. Since then, Project Phases 2 and 3 have also been completed, and later reconstructed and expanded with a total investment of more than 320 million RMB. Laogang landfill mainly accepts wastes generated in Shanghai central districts and its outskirts Nanhui County. These wastes account for 2/3 of the total amount generated in the Municipality of Shanghai, ranging from several hundred tons per day at the beginning to the current several thousand tons per day. Up to now, more than 7.9 million tons of wastes have been disposed at the Laogang landfill. The wastes are usually transported to Laogang landfill site by barges on Huangpu River and Dazhihe River, and finally disposed on the site. The waste height in the most landfill cells is 4 meters above sea level. The landfill was divided into many small cells with silty clay. The leachate produced in the landfill is partially collected through perforated pipes at the bottom of each cell. The landfill gas is vented through pipes and wells. Because of the landfill location along the East Sea, the underground water is salty. No liners are installed in all cells' bottom layers. The average height from the surface of underground water to cell's bottom layer is about 17 meters. These cells have no daily cover due to lack of soil and the financial support.

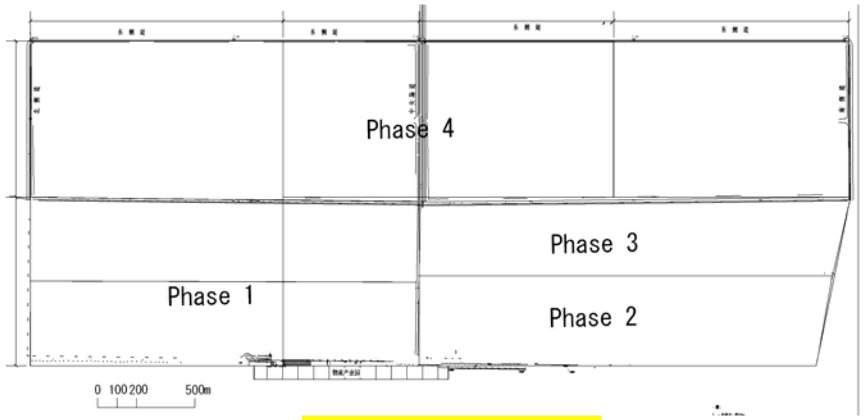

Figure A-1 Location map

A.4.2. Category(ies) of project activity:

>>
No.4 Energy industry(renewable and non-renewable sources)
No.13 waste handling and disposal

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

>>
The project activities involve the reconstruction of the landfill and set up of LFG recovery systems in selected cells, including LFG collection, pre-treatment, electricity generation and flaring.

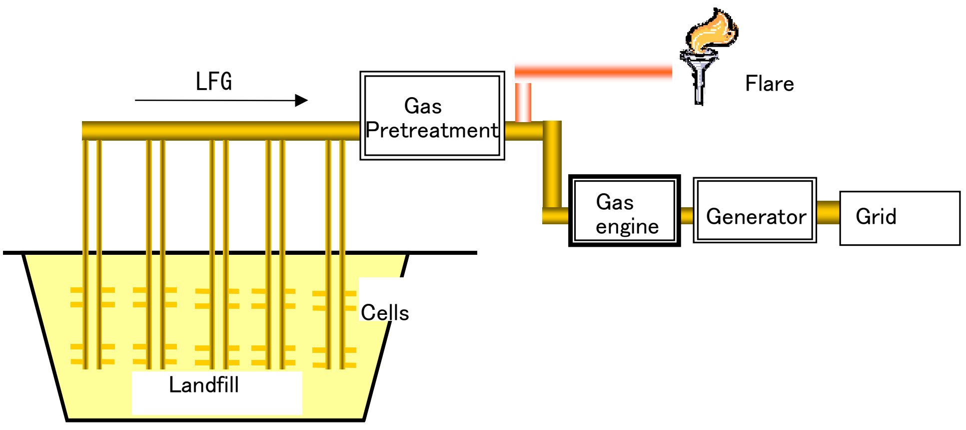

Figure A-2 Outline of Laogang Landfill Gas Utilization and Energy Recovery Project.

- **Landfill covering**

The current closure cover is 30cm-in-thickness clay due to the shallow type of Laogang landfill, which makes an easy escape of LFG from landfill possible. In order to collect more LFG and avoid its escaping, a proper surface layer sealing is necessary as a closure cover. The project proposes the final closure as Figure A-3 shows.

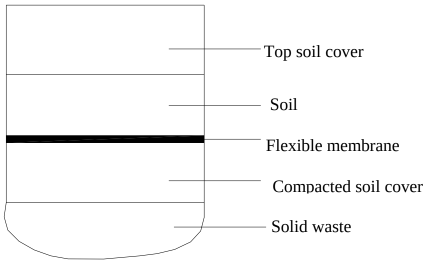

Figure A-3 Final closure cover of landfill site

This structure has 2~3 meters clay as cover layer, with a certain slope for drainage surface water. Geomembrane on top layer is installed to prevent soils entering the drainage layer and flexible membrane layer to avoid LFG emitting to the outside, which is benefit for gas collection and recovery, at the same time, the installation also meets China's requirements for newly constructed sanitary landfills. The project activities include covering the LFG-collection cells with 1.0mm high density polyethylene (HDPE) membrane, on and under the geomembrane, and 20~30cm soil on impermeable layer.

- **Gas collection system**

Furthermore, the proposed project will be newly installed branch pipes, main pipes, trunks and ditch for LFG collection, as shown in Feasibility Study of Laogang Landfill Gas Utilization and Energy Recovery Project.

- **Gas pretreatment system**

Before electricity generation and flaring, LFG needs to be collected and pre-treated to remove its impurities and moisture, H2S gas, etc., in order to protect the electricity generation system and flaring system and to be anticorrosive. The proposed project recommends the following LFG pre-treatment system, shown in Figure A-4.
There are total 3 pre-treatment systems, each having 2 gravel filters, 1 condenser, 2 smaller gravel filters and 1 gas regulator.

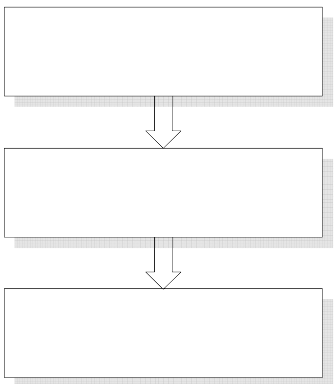

Figure A-4 Gas pre-treatment system

• **Electricity generation system**

The electricity generated with LFG is not only for on-site use but also for sale to the grid. The different types of electricity generators are designed to be installed in three phases separately in Laogang landfill site in order to use LFG efficiently, 1,000kW in Phase 1 area, 200kW in Phase 2, 2,000kW in Phase 3 and 14,800kW in Phase 4 area.

• **Flaring system**

The LFG, which will not be used for electricity generation, will be flared. Once methane converts into carbon dioxide, the greenhouse effect caused by methane will be reduced by a factor of 21, which meets the requirements for CDM projects. The main works include the installation of auto-ignition flare platforms, each with maximum heat loading 40,000kcal/h and flaring efficiency 99%.

The LFG capture technology was demonstrated by the gas venting system in waste disposal site in Japan and is often used in Japanese disposal sites of general waste and industrial waste of controlled type. And, recently, for adequate closing of the existing disposal sites, gas wells are installed in many cases to promote air venting within landfill site, as the earlier stabilization measure.

The first to third phases at the Laogang landfill project didn't meet the international environmental criteria because of financial and technical problems. These existing sites currently cause soil, seawater and air pollution. To counter the problems, this project suggests a way of covering the surface of the existing landfill sites to mitigate such environmental negative impact. It is expected that surface covering which controls rainfall infiltration will reduce the amount of leachate which causes soil and seawater pollution, leachate treatment cost and risks of leachate and leakage. Besides, it also can prevent the scattering of waste, which will lead to inhibition of insanitary insect infestation. The covering materials include clayey soil and membrane. The clayey soil is less expensive but can't provide a complete covering. Therefore, this project applies the high-density polyethylene (HDPE) membrane.

The proposed project will use technology which is not state of the art in China and is not a well-known technology and knowledge in China. Laogang project will be an example for a new technology, so that other cities in China can follow this example easily. Laogang will take the leading role in China in this kind of technology.

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 is based on two complementary activities:

- The collection and flaring of combustion of landfill gas, thus converting its methane content into CO_2, reducing its greenhouse gas effect; and,
- The generation and supply of electricity to the regional grid, thus displacing a certain amount of fossil fuels used for electricity generation.

In China the government encourages landfills to sanitary treatment of municipal solid waste, however, restricted by the reality, the Chinese legislation does not require landfill operators to flare or recover landfill gas and it is unlikely to introduce such regulation in the foreseeable future. The only requirement is to passively vent the landfill gas in order to avoid the risk of explosion.

Within the country, especially Shanghai city and its three neighboring provinces suffer from lack of the primary energy. Their coal reserves account for only 3% of the nation. And the rate of water power development already reaches at 56%, which means there are few resources to be further developed. Therefore, the thermal power generation as their main power resource requires the enormous amount of coal import from outside the areas. Shanghai city and its three neighboring provinces, which are now making remarkable economic growth, are in difficulties to secure electricity and conducting power restriction.

Implementation of this project needs a high cost for investment, operation and maintenance. This project has significant environmental benefit, however, because based on the financial analysis the net present value of this project without carbon revenue is negative and not an economic attractive course of action. Without carbon revenue, the most economical and reasonable way for the landfill is to freely discharge landfill gas; therefore, no emission reduction would happen.

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

>>

Year	The estimation of emission reductions (tCO_2e)
2007	620,212
2008	730,518
2009	872,151
2010	884,098
2011	896,260
2012	906,229
2013	907,064
2014	915,073
2015	916,037
2016	837,033
The estimation of total emission reductions (Tonnes CO_2 e)	8,484,675
Total number of crediting years	10
The estimation of annual average emission reductions in crediting period (Tonnes CO_2 e)	**848,468**

A.4.5. Public funding of the project activity:

>>

There is no public funding available in the Laogang LFG-to-energy project activities.

SECTION B. Application of a baseline methodology

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

>>

ACM0001 Consolidated baseline methodology for landfill gas project activities

ACM0002 Consolidated baseline methodology for grid-connected electricity generation from renewable sources

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

>>
The project meets all the applicability criteria as set out in the methodologies.

ACM0001 is applicable to the following situations in regards to LFG activities where:
a) The captured gas is flared; or
b) The captured gas is used to produce energy (e.g. electricity/thermal energy), but no emission reductions are claimed for displacing or avoiding energy from other sources; or
c) The captured gas is used to produce energy (e.g. electricity/thermal energy), and emission reductions are claimed for displacing or avoiding energy from other sources.

As previously described, the Project is based on two complementary activities, as follows;

- The collection and flaring of combustion of LFG, thus converting its methane content into CO
- , reducing its greenhouse gas effect; and,
- The generation and supply of electricity to the regional grid, thus displacing a certain amount of fossil fuels used for electricity generation.

The project activity accords to situation a) and c) above and is therefore applicable to ACM0001.

ACM0001 says that in the case of c), the ACM0002 “Consolidated Methodology for Grid-Connected Power Generation from Renewable” shall be applied.

ACM0002 is applicable to grid-connected renewable power generation project activities amongst others under the following conditions:
Applies to grid connected electricity generation from landfill gas capture to the extent that it is combined with the approved “Consolidated baseline methodology for landfill gas project activities”(ACM0001).

The project activity accords to situation described above and is therefore applicable to ACM0002.

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

>>
The project activity extracts landfill gas and combusts it in a flare or in gas engines for electricity generation. The baseline scenario is totally atmospheric release of LFG.
The emission reductions will be calculated as follows:

$$ER_y=(MD_{project,y}-MD_{reg,y})*GWP_{ch4}+EG_y*CEF_{electricity,y}+ET_y*CEF_{thermal,y}$$

Where：

ER_y = Emission reduction in tCO2e equivalent during year y
$MD_{project,y}$ = The methane destroyed by the project activity in tCH4 in year y
$MD_{reg,y}$ = The methane that would be destroyed in the baseline in tCH4 in year y
GWP_{ch4} = The approved Global Warming Potential of methane (21 tCO2/tCH4)
EG_y = The net quantity of electrical energy displaced during the year

$CEF_{electricity,y}$ = CO2 emissions intensity of the electrical energy displaced in the grid
ET_y = Quantity of thermal energy displaced during the year, which for this project 0
$CEF_{thermal,y}$ = CO2 emissions intensity of the thermal energy displaced, which for this project is irrelevant since ETy = 0

The above equation is that of the Consolidated Methodology for Landfill Project ACM0001

Baseline emissions for the electricity generation component will be calculated as follows:

$$BE_y = EG_y * EF_y$$

Where:

BE_y = The baseline emissions;
EG_y = The electricity supplied by the project activity to the grid;
EF_y = The baseline emissions factor.

$$EF_y \text{（tCO2/MWh）} = W_{OM} \times EF_{OM,y} + W_{BM} \times EF_{BM,y}$$

W_{OM} = ***The weights is 0.5***
$EF_{OM,y}$ = ***Operating Margin Emissions Factor***
W_{BM} = ***The weights is 0.5***
$EF_{BM,y}$ = ***Build Margin Emissions Factor***

The above equation is that of the Consolidated Methodology for Grid-Connected Electricity Generation From Renewable Sources ACM0002

The detail information and data can be found in the tables of Annex 3.

[Data source]:

China Electricity Yearbook : Electricity generation by coal, hydro, nuclear, others and in total in East China grid in 2001 and 2003, electricity installation capacity by coal, hydro, nuclear, others and in total in East China grid in 2001 and 2003

China Energy Statistical Yearbook : Energy consumption in East China grid from 2001 to 2003, in terms of raw coal, other washed coal, crude oil, diesel oil, fuel oil, refinery gas, natural gas.

IPCC guidance : oxidation factor, net calorific values, emission factor of coal and heavy oil.

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 proposed project is not that type of project starting before the date of registration and prior to the start of the crediting period.

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

1a. Define alternative to the project activity:

Alternative 1: Business as usual

The current status is maintained. The LFG is neither collected nor utilized but left to be emitted into the atmosphere.

Alternative 2: Flaring

The LFG generated from the site is collected and flared for environmental protection and safety. (not utilized for energy)

Alternative 3: LFG-to-energy-project

This project is implemented. The LFG generated from the landfill site is collected, and the electricity is generated with gas engine and supplied to the grid.

1b. Enforcement of applicable laws and regulations

Business-as-usual scenario or proposed project scenario must meet the regulatory requirements of Chinese government. At present China has few relevant requirements concerning the landfill gas. But among them only Article 5.1.1 and Article 5.3.3 in Technical specification for operation and maintenance of municipal domestic refuse sanitary landfill (CJJ93-2003) and Article 6.4.4 in Technical specifications for municipal solid waste sanitary landfill (CJJ17-2001) are mandatory that any landfill operators in China must obey.

> *In Technical specification for operation and maintenance of municipal domestic refuse sanitary landfill (CJJ93-2003), Article 5.1.1 indicates that a gas venting system should be installed, operated and maintained at the landfill in compliance with the requirements for the landfill design, while Article 5.3.3 indicates that when methane of LFG is over than 1.25% the safety precautions should be taken immediately.*
>
> *In Technical specifications for municipal solid waste sanitary landfill (CJJ-2001) Article 6.4.4 indicates that at landfill site, methane content is not allowed to exceed 5% in volume, while inside buildings on or near the site shall not to exceed 1.25%.*

Laogang landfill site was initially constructed in 1989 when there were national standards or specifications unavailable. But with the improvement of the environmental policies, laws and regulations, etc., especially in the field of solid waste management, Laogang landfill was required to control its LFG. As a result, many gas venting pipes have been installed for the sake of the landfill safety.

Therefore, there is no legislative requirement to flare or recover landfill gas. It is also highly unlikely that in the foreseeable future the Chinese or a regional authority would require any flaring as LFG emissions do not pose a threat to the local environment. Thus, all the alternatives are in compliance with all regulations and laws. The LFG-to-energy-project is additional to the current legal requirements for Landfill Gas.

Step 2: Financial analysis and selection of baseline scenario

Sub-step 2a:Determine appropriate analysis method

The project will have proceeds from power selling as well as from CER. So either investment comparative analysis or benchmark analysis has to be employed for financial analysis of baseline scenario. Here, the benchmark analysis is selected to be conducted as follows:

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

The benchmark IRR is 6.12%, the long-term (over 5 years) loan rate which Chinese banking institutions have applied since October 29 in 2004.

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

First, Alternative 2: Flaring is analysed, without taking into consideration proceeds from CER in accordance with the Tool for the Demonstration and Assessment of Additionality. For this alternative, the proceeds cannot be expected despite investment, which means it should not be a baseline scenario.

Secondly, Alternative 3: LFG-to-energy-project is analysed, without taking into consideration proceeds from CER in accordance with the Tool for the Demonstration and Assessment of Additionality. The calculated IRR value of this alternative is 3.8%, which is lower than the financial benchmark. Thus it should not be a baseline scenario.

	Project IRR
Without CERs	3.8%
With CERs	16.3%

Sub-step 2d:Sensitivity analysis

China has not established preferential tax treatment for renewable energy at the moment. Therefore, the unit price of CO_2 credit impacts heavily on the profit of CDM projects. The sensibility analysis has been conducted at \$5/t-CO_2, \$7/t-CO_2 and \$10/t-CO_2 and the result shows that a good IRR can be obtained at over \$5/t-CO_2. So the credit of over \$5/t-CO_2 is desirable at the present stage.

CERs price	Without CER	\$5/t-CO_2	\$7/t-CO_2	\$10/t-CO_2
Project IRR	3.8%	16.3%	20.6%	26.4%
Payout period	8	5	5	4

Step 3: Barrier analysis

3a. Identify barriers that would prevent the implementation of type of the proposed project activity:

Step 3 is skipped because Step 2 is selected instead.

Step 4: Common Practise Analysis

In China, the common practice to dispose wastes is open dump, especially in the remote places. With the awareness of the harmful impacts on local area environment and people's health by these dumps, many new policies and regulations have been made to improve the conditions, among which National Action Plan for Recovery and Utilization of Landfill Gas (12/2001) is one of them.

> *At present, in China the municipal refuse is disposed using the technology of traditional landfill, without consideration of recovery and utilization of landfill gas. Almost all landfills do not have landfill gas recovery systems, except a newly built landfills, and the landfill gas is emitted to the atmosphere openly…About 10 sanitary landfills have been set up in a few cities. However, there was no landfill gas recovery system in these sanitary landfills. In 1997, the first system of landfill gas recovery and utilization in China was built is Hangzhou, Zhejiang Province, and the landfill gas is utilized for power generation. However, there is no mechanism and policy to guide the whole country to have landfill gas recovery and utilization systems. Therefore it is still a blank paper for landfill management to establish landfill gas recovery and utilization systems.*

China takes active stance on the improvement of air quality and other environmental issues. By encouraging and advancing the sanitary landfill technology and associated LFG recovery technology, it is firmly believed that the air pollution by the source of LFG will be avoided.

Step 5: Impact of CDM registration

Since November 2003 Chengtou has discussed in various meetings with the Prototypecarbon Fund and the World Bank the feasibility of recovering Laogang landfill with and without carbon revenue. Since the early stage of the discussion it was clear that because of the financial barriers an environmental friendly recovering including a landfill gas collection system would not be feasible and would not attract any investor.

The revenue in selling the Emission reductions from the proposed project makes the LFG-to-energy-project feasible and attracts Chengtou as the investor and also the local banks in supporting the financing of this project.

The LFG-to-energy-project reduces the Emission from Laogang to the atmosphere approximately at around 8,484,675tons CO_2 from what would emit in the absence of the proposed project (until 2017). Additional the project has also other environmental benefits and reduces the environmental impact to the groundwater, seawater, pollution through waste littering and vermins.

Based on the above analysis the proposed project LFG-to-energy project is additional to the baseline scenario.

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

>>

The following Figure B-1 describes the project boundaries comprising all possible elements of the landfill gas collection, flaring and electricity generation systems.

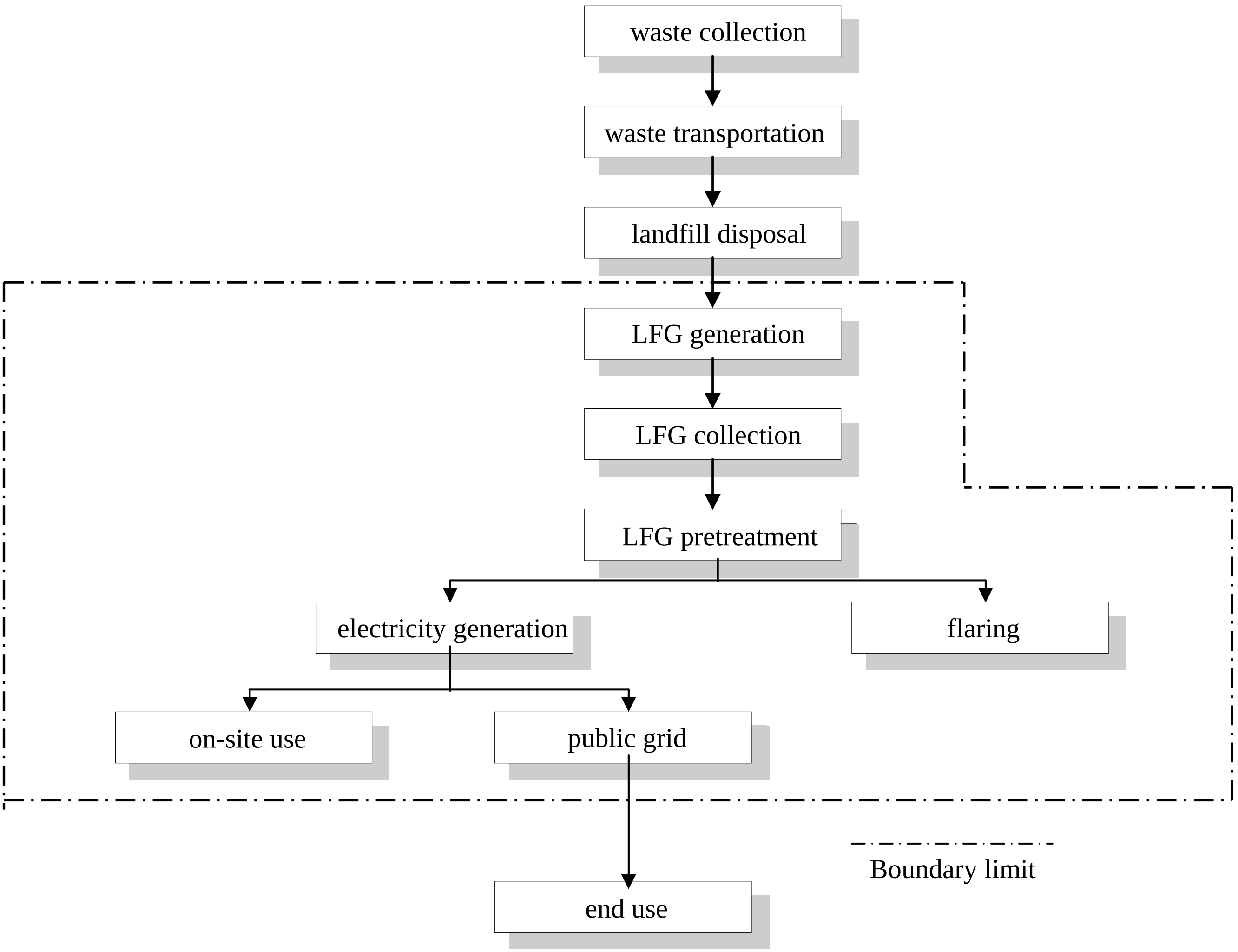

Figure B-1 Laogang LFG-to-energy project boundary

The project boundaries are chosen in a way that they describe not only the geographical boundaries, but also the competence boundaries of the project and the influence the project owner has to change the impacts of the project.

Excluded from the project are the waste collection and waste transportation to the landfill, because this is outside of the responsibility of the project owner and to the fact that in the Laogang landfill Phase 1,2,3 the waste is already disposed. The same for the public grid, the public grid and usage by the end user is not in the project boundaries, but the transmission line from the landfill site to the public grid is included. From the transmission line are no emissions be expected, no resettlement and environmental hurtles appear because of constructing and operating the transmission line.

Emissions from electricity on-site use and flaring are excluded since it is carbon neutral. For both technologies are used, which reduces the emissions to a maximum. Maintenance and Operation are very important to keep the standard.

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:

>>

Date of completing the final draft of this baseline section (*DD/MM/YYYY*): 5/3/2006

Name of person/entity determining the baseline:

Company Name: Japan Engineering Consultant Co., Ltd.
Address: 33-11 Honcho 5-Chome Nakanoku –Ku, Tokyo, Japan
Zip Code: 164-8601
Contact person: Hiroshi Takahashi
Tel: +81-3-5341-5156
Fax: +81-3-5385-8510
Email: takahashi-hi@jecc.co.jp

Company Name: Mizuho Information & Research institute, Inc.
Address: 2-3 Kanda-Nishikicho, Chiyoda-ku, Tokyo, Japan
Zip Code: 101-8443
Contact person: Masao Tomizawa
Tel: +81-3-5281-5457
Fax: +81-3-5281-5443
Email: masao.tomozawa@gene.mizuho-ir.co.jp
Contact person: Kazuya Kajimura
Tel: +81-3-5281-5457
Fax: +81-3-5281-5443
Email: kazuya.kajimura@mizuho-ir.co.jp

Company Name: Shanghai JEC Environmental Consultant Co., Ltd.
Address: 1748 Xinzha Road, Shanghai, China
Zip Code: 200040
Contact person: Beatrix Etzkorn
Tel: +86-21-62711895
Fax: +86-21-62715179
Email: bea.etzkorn@gmx.com

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:

>>
It is expected that the project will start on 1 June 2007

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

>>
10 years

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:

>>
Not applicable

C.2.1.2. Length of the first crediting period:

>>
Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
It is expected that the project will start on 1 June 2007

C.2.2.2. Length:

>>
10 years

SECTION D. Application of a monitoring methodology and plan

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

>>
ACM0001 Consolidated monitoring methodology for landfill gas project activities
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:

>>

It is required that ACM0001, the Consolidated Monitoring Methodology for LFG project, and ACM0002, the Consolidated Baseline Methodology for grid-connected renewable energy project, are utilized in pairs. Also, the section B.1.1 in this PDD demonstrates both baseline methodologies are applicable to this project. Therefore, ACM0001 and ACM0002 are selected for this project.

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

This option is used for the electricity component of the project. Methane emissions from the landfill gas component of the project and baseline scenarios will be calculated using option 2 (see section D.2.2).

D.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.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

Not applicable. The electricity component of the project, being zero-emission activity, does not have any project emissions. Hence no formula is needed to calculate the electricity component emission of the project from raw data.

D.2.1.3. 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 table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

1.EGy	Electricity quantity	Electricity supplied to the grid by the project	MWh	M	Hourly measurement and monthly recording	100%	Electronic till 2 years after last issuance of credits	Electricity supplied by the project activity to the grid. Double check by receipt of sales
2.Ef_y	Emission factor	Statistical data of East China Grid	tCO_2/MWh	C	Yearly	100%	Electronic, till 2 years after last issuance of credits	Calculated as a weighted sum of the OM and BM emission factors
3.$EF_{OM,y}$	Emission factor	Statistical data of East China Grid	tCO_2/MWh	C	Yearly	100%	Electronic, till 2 years after last issuance of credits	Calculated in accordance with the baseline methodology of ACM0002 – Simple Margin.
4.$EF_{BM,y}$	Emission factor	Statistical data of East China Grid	tCO_2/MWh	C	Yearly	100%	Electronic, till 2 years after last issuance of credits	Calculated in accordance with the baseline methodology of ACM0002 – based on a sample of the latest power plant additions to the East China Grid.
5.$F_{i,y}$	Fuel quantity	Amount of fossil fuel consumed in the grid	Mass or volume	M	Yearly	100%	Electronic, till 2 years after last issuance of credits	Obtained from the China Energy Statistical Yearbook
6.$COEF_i$	Emission factor coefficient	IPCC defalt	tCO_2/ mass or volume unit	M	Yearly	100%	Electronic, till 2 years after last issuance of credits	IPPC defaults will be used.
7.GEN j/k/n,y	Electricity quantity		MWh/y	M	Yearly	100%	Electronic, till 2 years after last issuance of credits	Obtained from the China Electric Power Yearbook
8.	Plant name	Identification of power source/ plant for the OM	Text	E	Yearly	100% of set of plants	Electronic, till 2 years after last issuance of credits	Plant by plant information is not publicly available for a grid the size of East China Grid and therefore aggregated data obtained from the China Electric Power Yearbook is used
9.	Plant name	Identification of power source/ plant for the BM	Text	E	Yearly	100% of set of plants	Electronic, till 2 years after last issuance of credits	Plant by plant information is not publicly available for a grid the size of East China Grid and therefore aggregated data obtained from the China Electric Power Yearbook is used

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

Baseline emissions for the electricity generation component will be calculated as follows:

$$BE_y = Eg_y * EF_y$$

Where:

BE_y = The baseline emissions;
EG_y = The electricity supplied by the project activity to the grid;
EF_y = The baseline emissions factor.

$$EF_y \ (t\,CO2/MWh) = W_{OM} \times EF_{OM,y} + W_{BM} \times EF_{BM,y}$$

Where:

W_{OM} = ***The weights is 0.5***
$EF_{OM,y}$ = ***Operating Margin Emissions Factor***
W_{BM} = ***The weights is 0.5***
$EF_{BM,y}$ = ***Build Margin Emissions Factor***

The Operating Margin emission factor ($EF_{OM, simple, y}$) is calculated using option (a) of the approved consolidated methodology ACM0002 (Simple OM) which is applied where low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the 5 most recent years, or 2) based on, long term norms for hydroelectricity production. This is the case for the grid to which this project will be connected. Option (c) (dispatch data analysis) is noticed as there is insufficient data available. The Operating Margin emission factor will be calculated as follows:

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$

Where:

Fi, j, y = the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in year(s) y,j refers to the power sources delivering electricity to the grid, not including low-operating cost and must-run power plants, and including imports[1] to the grid,

$COEF_{i,j\,y}$ = the CO_2 emission coefficient of fuel i (tCO_2 / mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j and the percent oxidation of the fuel in year(s) y, and $GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j.

The Build Margin emission factor (*EF_BMy*) is the weighted average emission factor of a sample of power plants *m*. This sample includes either the last five plants built or the most recent plants that combined account for 20% of the total generation, whichever is greater (in MWh). The Build Margin emission factor will be calculated as follows:

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}}$$

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

This option is used for methane emissions from the landfill gas component of the project. The electricity component of the project and baseline scenarios will be calculated using option 1 (see section D.2.1).

D.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 table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

[1] As described above, an import from a connected electricity system should be considered as one power source *j*.

1. $LFG_{total,y}$	Total amount of LFG collected	Volume	m^3	m	continuous	100%	Electronic, till 2 years after last issuance of credits	Measured by flow meter. Data to be aggregated monthly and yearly.
2. $LFG_{electricity,y}$	Amount of LFG to generators	Volume	m^3	m	continuous	100%	Electronic, till 2 years after last issuance of credits	Measured by flow meter. Data to be aggregated monthly and yearly.
3. $LFG_{flared,y}$	Amount of LFG to flares	Volume	m^3	m	continuous	100%	Electronic, till 2 years after last issuance of credits	Measured by flow meter. Data to be aggregated monthly and yearly.
4. FE	Flare efficiency, determined by 1) the operation hours and 2) the methane content in the exhaust gas	Percentage	%	m/c	1) continuous 2) quarterly, monthly if unstable	n/a	Electronic, till 2 years after last issuance of credits	1) continuous measurement of operation time of flare (e.g. with temperature) 2) periodic measurement of methane content of flare exhaust gas.
5. $W_{CH4,y}$	Methane fraction in the LFG	m^3CH_4/m^3LFG	%	m	Continuous	100%	Electronic, till 2 years after last issuance of credits	Preferably measured by continuous gas quality analyzer
6. T	Temperature of the LFG	Temperature	℃	m	Continuous	100%	Electronic, till 2 years after last issuance of credits	Measured to determine the density of methane D_{CH4}
7. P	Pressure of the LFG	Pressure	Pa	m	Continuous	100%	Electronic, till 2 years after last issuance of credits	Measured to determine the density of methane D_{CH4}

8.	Total amount of electricity and/or other energy carriers used in the project for gas pumping and heat transport (not derived from the gas)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable as the Project will use electricity generated from the landfill gas
9.	CO_2 emission intensity of the electricity carriers in ID 8		tCO_2/MWh	c	annually	100%	Electronic, till 2 years after last issuance of credits	Required to determine CO_2 emissions from use of electricity carriers to operate the project activity
10.	Regulatory requirements relating to LFG projects			n/a	annually		Electronic, till 2 years after last issuance of credits	Required for any changes to the adjustment factor (AF) or directly baseline emission
11. HR	Heat rate of the generator		GJ/MWh	m	Semi-annual, monthly if unstable	n/a	Electronic, till 2 years after last issuance of credits	Data will be used to test and, if necessary, correct the generator's name plate heat rate.

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

>>

The only emission from the project is the combustion of landfill gas in which the methane is fully combusted into CO2.
According to the IPCC Good Practice Guidance the CO2 emissions from landfill gas combustion are of biogenic origin and are therefore are not considered as a GHG gas.
Hence no formula is needed to calculate the landfill gas component emission of the project from raw data.

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. 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 table 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.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

No leakage is to be considered in this project.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

>>

The emission reductions of the project will be calculated as follows:

$$ER_y=(MD_{project,y}-MD_{reg,y})*GWP_{ch4}+EG_y*CEF_{electricity,y}+ET_y*CEF_{thermal,y}$$

Where :

$\boldsymbol{ER_y}$ = Emission reduction in tCO2e equivalent during year y
$\boldsymbol{MD_{project,y}}$ = The methane destroyed by the project activity in tCH4 in year y
$\boldsymbol{MD_{reg,y}}$ = The methane that would be destroyed in the baseline in tCH4 in year y
$\boldsymbol{GWP_{ch4}}$ = The approved Global Warming Potential of methane (21 tCO2/tCH4)
$\boldsymbol{EG_y}$ = The net quantity of electrical energy displaced during the year
$\boldsymbol{CEF_{electricity,y}}$ = CO2 emissions intensity of the electrical energy displaced in the grid
$\boldsymbol{ET_y}$ = Quantity of thermal energy displaced during the year, which for this project = 0
$\boldsymbol{CEF_{thermal,y}}$ = CO2 emissions intensity of the thermal energy displaced, which for this project is irrelevant since ETy = 0

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

Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.2.2.1-1. $LFG_{total,y}$	Low	Flow meters will be subject to a regular maintenance and testing regime to ensure accuracy.
D.2.2.1-2. $LFG_{electricity,y}$	Low	Flow meters will be subject to a regular maintenance and testing regime to ensure accuracy.
D.2.2.1-3. $LFG_{flared,y}$	Low	Flow meters will be subject to a regular maintenance and testing regime to ensure accuracy.
D.2.2.1-4. FE	Medium	Regular maintenance should ensure optimal operating of flares. Flare efficiency should be checked quarterly, with monthly checks if the efficiency shows significant deviations from previous values.
D.2.2.1-5. $W_{CH4,y}$	Low	The gas analyser should be subject to a regular maintenance and testing regime to ensure accuracy.
D.2.1.3-1	Low	
D.2.1.3-2 to 9	Medium	

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

>>

Chengtou, as the project sponsor, will designate a project operator through a bidding process, who will be responsible for all monitoring activities to assure that all activities of the Monitoring Plan. (Please refer to Monitoring Plan of Laogang LFG-to-energy project.)

Monitoring will be handled by the safety management department of the project operator.

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

>>

Company Name: Japan Engineering Consultant Co., Ltd.
Address: 33-11 Honcho 5-Chome Nakanoku –Ku, Tokyo, Japan
Zip Code: 164-8601
Contact person: Hiroshi Takahashi
Tel: +81-3-5341-5156
Fax: +81-3-5385-8510
Email: takahashi-hi@jecc.co.jp

Company Name: Shanghai JEC Environmental Consultant Co., Ltd.
Address: 1748 Xinzha Road, Shanghai, China
Zip Code: 200040
Contact person: Beatrix Etzkorn
Tel: +86-21-62711895
Fax: +86-21-62715179
Email: bea.etzkorn@gmx.com

Company Name: Shanghai JEC Environmental Consultant Co., Ltd.
Address: 1748 Xinzha Road, Shanghai, China
Zip Code: 200040
Contact person: Ou Yuanyang

Tel: +86-21-62172233-129
Fax: +86-21-62715179
Email: oyy@shjec.cn

Company Name: Mizuho Information & Research institute, Inc.
Address: 2-3 Kanda-Nishikicho, Chiyoda-ku, Tokyo, Japan

Zip Code: 101-8443
Contact person: Masao Tomizawa
Tel: +81-3-5281-5457
Fax: +81-3-5281-5443
Email: masao.tomozawa@gene.mizuho-ir.co.jp
Contact person: Kazuya Kajimura
Tel: +81-3-5281-5457
Fax: +81-3-5281-5443
Email: kazuya.kajimura@mizuho-ir.co.jp

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

>>

The only emissions from the project is the combustion of landfill gas in which the methane is fully combusted into CO2. According the IPCC Good Practice Guidance the CO2 emissions from landfill gas combustion are of biogenic origin and are not considered as a GHG gas. Therefore the project activity emission is = 0.

E.2. Estimated leakage:

>>

No leakage is to be considered in this project.

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

>>

The sum of E.1 and E.2 is equal to 0 per year.

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

>>

In the Consolidated Methodology for Landfill Project ACM0001, the emissions reduction is immediately calculated, not by deducting project emissions from baseline emissions.
The emission reductions of the project will be calculated as follows:

$$ER_y=(MD_{project,y}-MD_{reg,y})*GWP_{ch4}+EG_y*CEF_{electricity,y}+ET_y+CEF_{thermal,y}$$

Where：

ER_y = Emission reduction in tCO2e equivalent during year y
$Md_{project,y}$ = The methane destroyed by the project activity in tCH4 in year y
$Md_{reg,y}$ = The methane that would be destroyed in the baseline in tCH4 in year y
GWP_{ch4} = The approved Global Warming Potential of methane (21 tCO2/tCH4)
EG_y = The net quantity of electrical energy displaced during the year
$CEF_{electricity,y}$ = CO2 emissions intensity of the electrical energy displaced in the grid
ET_y = Quantity of thermal energy displaced during the year, which for this project = 0
$CEF_{thermal,y}$ = CO2 emissions intensity of the thermal energy displaced, which for this project is irrelevant since ETy = 0

$$Md_{reg,y} = Md_{project,y} * AF$$

Where:

AF = Adjustment Factor

AF is set as zero, because neither collection nor destruction of methane is implemented in Laogang Landfill and also because there is no law requiring collection and destruction of methane in China.

$MD_{project,y} = MD_{flare,y} + MD_{electricity,y}$

$MD_{flare,y} = LFG_{flare,y} * W_{CH4,y} * D_{CH4} * FE$

$MD_{electricity,y} = LFG_{electricity,y} * W_{CH4,y} * D_{CH4}$

Where：

$MD_{flare,y}$ = quantity of methane destroyed by flaring (tCH_4)
$LFG_{flare,y}$ = quantity of landfill gas flared during the year measured in cubic meters (m^3CH_4)
$W_{CH4,y}$ = average methane fraction of the landfill gas as measured during the year and expressed as a fraction (in m^3CH_4/m^3LFG)
D_{CH4} = the methane density expressed in tones of methane per cubic meter of methane (tCH_4/m^3CH_4)
FE = flare efficiency(the fraction of the methane destroyed)
$MD_{electricity,y}$ = quantity of methane destroyed by generation of electricity (tCH_4)
$LFG_{electricity,y}$ = quantity of landfill gas used for electricity generation during the year measured in cubic meters (m^3CH_4)

ACM0001 requires that a project proponent provides an ex ante estimate of emissions reductions.
So the generation of methane ($Q_{y,k}$) is estimated with the following Methane generation model (the First Order Decay Model of the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Greenhouse Gas Inventories, Reference Manual):

$$Q_{y,k} = k R_x L_0 e^{-k(T-x)}$$

Where:

$Q_{y,k}$ = the amount of methane generated in the current year (T) by the waste Rx
k = methane generation rate constant (1/yr)
R_x = the amount of waste disposed in year x (Mg)
L_0 = methane generation potential (m3/Mg of refuse)
x = the year of waste input
T = current year

year	(1)	(2)	(3)=(1)+(2)	Project	Landfill gas

	Methane combustion by power generation (m^3)	Methane combustion by flaring (m^3)	Project methane destroyed (m^3)	methane destroyed (t)	emission reductions (tCO2)
1	23,492,477	14,469,626	37,962,103	27,211	571,436
2	26,429,036	18,428,963	44,857,999	32,154	675,238
3	43,461,082	8,362,827	51,823,909	37,147	780,095
4	43,461,082	9,156,525	52,617,607	37,716	792,042
5	44,048,394	9,293,253	53,341,647	38,235	802,941
6	44,048,394	9,943,077	53,991,471	38,701	812,723
7	40,524,522	14,019,695	54,544,217	39,097	821,043
8	40,524,522	14,551,726	55,076,249	39,479	829,052
9	37,587,963	17,940,322	55,528,285	39,803	835,856
10	37,587,963	12,691,877	50,279,839	36,041	756,852
total	381,165,434	128,857,890	510,023,325	365,585	7,677,279

The Operating Margin emission factor ($EF_{OM, simple, y}$) is calculated using option (a) of the approved consolidated methodology ACM0002 (Simple OM) which is applied where low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the 5 most recent years, or 2) based on, long term norms for hydroelectricity production. This is the case for the grid to which this project will be connected. Option (c) (dispatch data analysis) is noticed, as there is insufficient data available.

$$EF_{OM,simple,y} = \frac{\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}}{\sum_{j} GEN_{j,y}}$$

The Operating Margin emission factor of East China Power Grid was **0.871 tCO_2 / MWh** (see details in Annex 3)

The Build Margin emission factor (*EF_BM$_y$*) is the weighted average emission factor of a sample of power plants *m*. This sample includes either the last five plants built or the most recent plants that combined account for 20% of the total generation, whichever is greater (in MWh).

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \cdot COEF_{i,m}}{\sum_{m} GEN_{m,y}}$$

The Build Margin emission factor of East China Power Grid was **0.571 tCO_2 / MWh** (see details in Annex 3)

The $CEF_{electricity,y}$ for the grid will be calculated according to the equations for "Consolidated methodology for the grid-connected electricity generation from renewable sources" ACM0002 which is applied for determination of the emission factor of the grid ***(EF_y)***.

$$EF_y \ (tCO_2/MWh) = W_{OM} \times EF_{OM,y} + W_{BM} \times EF_{BM,y}$$

Where:

W_{OM} = ***The weights is 0.5***
$EF_{OM,y}$ = ***Operating Margin Emissions Factor***
W_{BM} = ***The weights is 0.5***
$EF_{BM,y}$ = ***Build Margin Emissions Factor***
The emission factor of East China Power Grid was **0.721 tCO_2 / MWh** (see details in Annex 3)

Year	Generation capacity (KW)	Power generation (KWh)	Power consumption (KWh)	Power selling to the grid (KWh)	CEF ($kgCO_2$/KWh)	Grid Electricity Displacement Emission Reductions (tCO_2)
1	8,000	70,080,000	2,430,000	67,650,000	0.721	48,776
2	9,000	78,840,000	2,170,000	76,670,000	0.721	55,279
3	14,800	129,648,000	1,970,000	127,678,000	0.721	92,056
4	14,800	129,648,000	1,970,000	127,678,000	0.721	92,056
5	15,000	131,400,000	1,970,000	129,430,000	0.721	93,319
6	15,000	131,400,000	1,710,000	129,690,000	0.721	93,506
7	13,800	120,888,000	1,580,000	119,308,000	0.721	86,021
8	13,800	120,888,000	1,580,000	119,308,000	0.721	86,021
9	12,800	112,128,000	920,000	111,208,000	0.721	80,181
10	12,800	112,128,000	920,000	111,208,000	0.721	80,181
Total	129,800	1,137,048,000	17,220,000	1,119,828,000		807,396

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:
>>

Year	Landfill gas emission reductions	Grid Electricity Displacement Emission Reductions (tCO_2)	Emission Reductions (tCO_2)
1	571,436	48,776	620,212
2	675,238	55,279	730,518
3	780,095	92,056	872,151
4	792,042	92,056	884,098
5	802,941	93,319	896,260
6	812,723	93,506	906,229
7	821,043	86,021	907,064
8	829,052	86,021	915,073
9	835,856	80,181	916,037
10	756,852	80,181	837,033
Total	7,677,279	807,396	8,484,675

E.6. Table providing values obtained when applying formulae above:
>>

Year	Project Activity	Baseline Emission	Leakage	Emission

	Emission (tCO_2)	(tCO_2)	(tCO_2)	Reductions (tCO_2)
1	0	620,212	0	620,212
2	0	730,518	0	730,518
3	0	872,151	0	872,151
4	0	884,098	0	884,098
5	0	896,260	0	896,260
6	0	906,229	0	906,229
7	0	907,064	0	907,064
8	0	915,073	0	915,073
9	0	916,037	0	916,037
10	0	837,033	0	837,033
Total	0	8,484,675	0	8,484,675

SECTION F. Environmental impacts

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

>>

According to the procedures for applying for a construction project in China, Environmental Impact Assessment (EIA) is a must. The objective of the EIA is to identify the effects of the project activities on both the environmental and socio-economic aspects of the community located near Laogang landfill, and to provide proper measures and procedures to mitigate its possible negative impacts.

· **Environmental Impact**

In the Laogang landfill Phases 1,2&3 projects, lacking of finance and technology, LFG collection and energy recovery system had not been constructed according to international environmental standards. Currently the existing landfill phases have tremendous impact on the environment, because of ground- and seawater contamination, air pollution, odor and littering. These impacts will be reduced partially through covering the surface, which is one part of the proposed project. Because of the reduction of rainwater inlet, the leachate will be reduced and less leachate will leak to the groundwater and seawater. Through the side dams the leaching will also be minimized. The littering of old waste will completely disappear and through the landfill gas collection the air pollution in means of odor and hazardous components will be reduced by a maximum.

Through uncontrolled emitting of LFG, uncontrolled gas accumulation in the solid waste disposal body, gas explosions and fire was a common problem on the old landfill site and was not only harmful for the environment, but also for the health of workers and garbage pickers.

The proposed project will bring obvious environmental benefits globally and locally. From the Laogang landfill project:

◇ Reducing the uncontrolled discharging of LFG, (including Methane, carbon dioxide and more than 150 trace components)

◇ Decrease and eventually stopping of leakage of polluted leachate to the ground- and seawater

◇ No contact of waste with open air meaning no contamination nor risk to public health

◇ Reducing the odor nuisance

◇ Reducing vermin

◇ Reducing spreading of litter.

◇ Production of electrical power

On the other side, LFG generators produce emissions, depending on the type of generator, operation and maintenance. Flaring generates trace amounts of organic and toxic emissions like mercury and dioxins. Compared with the Environmental Impact without the project these emissions are minimal, and will be minimized and controlled by high standard in monitoring and maintenance measurements.

· **Social Impact**

Currently more than 600 people are working on the Laogang Landfill site. The existing landfill management will still be in charge of many business areas such as operation the wharves, transportation of garbage and maintenance of Laogang Phases 1,2,3. The Resettlement Action Plan and the Terms on Concession show that because of a new management and a new approach in the operation, some of these workers would lose their jobs in near future (the concession will influence 100 old Laogang employees). The building of a gas excavation system on Laogang, on the old site and re-development of the old landfill area will ensure the jobs of most of them, because more workers for operation, maintenance and monitoring are necessary and will create new employment opportunity for old Laogang landfill area employees.

The Laogang landfill site adjoins the Seaside Township in the south. Seaside Township is a small village, south of Laogang Landfill site. Between Laogang landfill and Seaside Township are more than 500 meters and it complies with the Chinese regulations and the recommended distances between landfills and inhabited areas.
The project covering the Laogang, Phases 1, 2 & 3 will reduce the emissions from this site to the groundwater, air and sea, so that the living standard and economic benefits will increase.

The current status quo of waste disposal in China is ordinary dumping without any sanitary approach, no bottom liner, covering and no compaction of waste. Even in greater Shanghai, more than 200 of these so-called open dumps exist. To ensure that the maximum amount of CERs will be collected, the landfill workers and the management need to be trained in these issues, especially in filling and covering the landfill on a daily bases.

Sanitary land filling, the covering of old landfill sites and the utilization of LFG are until now not state of the art in China. Conducting this project and collecting CERs means to take over a leading role in China and is a good example for other municipalities. Shanghai takes an active role in developing other parts of China, especially in Western China. Through various discussions, workshops and conferences, the results and the experience by doing this project, will be transferred to these municipalities (for example: Workshop at the Annual Shanghai Solid Waste Fair).

· **Sustainable Development**

One regulation of the CDM rules is, that the proposed project has to be in line, comply with and support the Sustainable Development Idea of the host country, China and in particular with Shanghai. According to the 10th Five-year plan and the Shanghai Plan of Action, following criteria have to be fulfilled:

◇ Be beneficial for the transfer of technology

The proposed project will use technology which is not state of the art in China and is not a well-known technology and knowledge in China. Laogang project will be an example for a new technology, so that other cities in China can follow this example easily. Laogang will take the leading role in China in this kind of technology

◇ Provide environmental benefits

See above Environmental Impact

◇ Enhance the health of the public and workers

See above Environmental Impact and Social Impact

◇ Provide social benefits

See above Social Impact

◇ Provide external social benefits, like reduce the reliance on foreign technologies

The proposed project will use as far as possible local technologies, in cases, where no advanced local technology exist, the project sponsor has to use foreign technology. This is a chance for Shanghai and China to learn from foreign technologies. From the experience gained through conducting the proposed project, gives China the opportunity, together with local manufacturers to develop local products. Local products are in general cheaper than foreign products, therefore local products are more affordable and more Chinese municipalities will follow the example and collect landfill gas, which will lead again in increasing environmental and social benefits all over China.

The proposed project is in all requirements in line with the host country's idea of Sustainable Development and has a great positive impact both for the environment and for social conditions.

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:

>>

No significant negative environmental impacts are expected to result from the project activity. On the contrary, the project will upgrade the local waste management practice to a higher standard and will lead to a significant reduction in local pollution along with a significant reduction in GHG emissions as described above.

For further information about the EIA, please contact the project developer (see Annex 1).

SECTION G. Stakeholders' comments

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

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According to the requirement by "Measures for Operation and Management of Clean Development Mechanism Projects in China" and PDD document, the staff of Japan Engineering Consultants had interviewed the local government agencies and local stakeholders of the project. Some interviews and discussions were launched among the participating stakeholders over the possible impacts of this landfill utilization and energy recovery project construction and operation on local economic development, environmental protection and the local people's life.

G.2. Summary of the comments received:

>>

1. With respect to socio-economic development, this landfill gas utilization and energy recovery project is expected to greatly stimulate to utilize waste effectively.

2. With respect to environmental protection, some environmental preservation measures are required to be taken, including drainage measure, leachate treatment, litter control of waste and odor control. The environmental impact assessment (EIA) for this project, which will be executed in near future, should examine these environmental impacts.

3. With respect to local people's life, the project operating company will employ at least 15 people. During the construction and operation of this project, the related purchases and consumptions could promote local business and trade, thus increasing local people's income.

To sum up, the stakeholders are all supportive of this project and looking forward to the operation of this useful project as early as possible. (See Appendix 1 in detail)

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

>>

There were no negative commentson the project. The stakeholders, including local government and local residents, support the project very much. Therefore, the adjustment for the project is not needed.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Shanghai Chengtou Environment Industry Development Co., Ltd.
Street/P.O.Box:	30/F, 500 Pudong South Road
Building:	China Development Bank Tower
City:	Shanghai
State/Region:	Municipality of Shanghai
Postfix/ZIP:	200120
Country:	China
Telephone:	+86-21-68885722
FAX:	+86-21-58782731
E-Mail:	hgc@chengtou.com
URL:	www.chengtou.com
Represented by:	
Title:	Deputy Managing Director
Salutation:	Mr.
Last Name:	Hao
Middle Name:	
First Name:	Guangcai
Department:	
Mobile:	+86-21-13601752366
Direct FAX:	+86-21-58782731
Direct tel:	+86-21-68885722
Personal E-Mail:	hgc@chengtou.com

Organization:	Japan Engineering Consultant Co., Ltd.
Street/P.O.Box:	33-11 Honcho 5-Chyome Nakano-Ku
Building:	
City:	Tokyo
State/Region:	
Postfix/ZIP:	164-8601
Country:	Japan
Telephone:	+81-3-5341-5156
FAX:	+81-3-5385-8510
E-Mail:	
URL:	www.jecc.co.jp
Represented by:	
Title:	Project Manager
Salutation:	Dr.
Last Name:	Takahashi
Middle Name:	
First Name:	Hiroshi
Department:	
Mobile:	+81-09068008475
Direct FAX:	+81-3-5385-8510
Direct tel:	+81-3-5385-5156
Personal E-Mail:	takahashi-hi@jecc.co.jp

Organization:	Shanghai JEC Environmental Consultant Co., Ltd.

Street/P.O.Box:	1748 Xinzha Road
Building:	
City:	Shanghai
State/Region:	Municipality of Shanghai
Postfix/ZIP:	200040
Country:	China
Telephone:	+86-21-62172233
FAX:	+86-21-62715179
E-Mail:	shjec@shjec.cn
URL:	
Represented by:	
Title:	Deputy Managing Director
Salutation:	Mr.
Last Name:	Shao
Middle Name:	
First Name:	Jun
Department:	
Mobile:	+86-21-13391024600
Direct FAX:	+86-21-62718460
Direct tel:	+86-21-62714526
Personal E-Mail:	Shaojun@shjec.cn

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding available in this project.

Annex 3

BASELINE INFORMATION

Phase1-3

Year started landfill operation	
Year finished operation	
Lo : methane generation potential (m3/Mg of refuse)	80
k: Methane generation rate constant (1/yr)	0.1
CH4 content of LFG composition	55%
Collection rate of CH4	30%

Year	Waste(t/year)
1999	700,000
2000	1,200,000
2001	1,350,000
2002	1,400,000
2003	1,200,000
2004	1,100,000
2005	950,000

Phase4

Year started landfill operation	
Year finished operation	
Lo : methane generation potential (m3/Mg of	80
k: Methane generation rate constant (1/yr)	0.1
CH4 content of LFG composition	55%
Collection rate of CH4	65%

Year	Waste(t/year)
2005	1,095,000
2006	2,190,000
2007	2,190,000
2008	2,031,225
2009	2,144,375
2010	1,104,125
2011	1,104,125
2012	1,104,125
2013	1,104,125
2014	1,104,125
2015	1,104,125

Basic conditions for power generation and flaring

- Operation period: 10 years
- Annual power generation time: 8760h/y (24h*265day)
- Methane consumption of gas-engine power generator (m_3/kWh): 0.3352

⇒ m^3CH_4/MWh = Heat Rate/ EC_CH_4/D_CH_4= 12/49.94/0.0007168

Heat Rate	12
EC_CH4	50
Flare efficiency	99
D_CH4	0.0007168
m3CH4/MWh	335.2

Table A1		A	B	C	D	E
Data		East China Power Grid Fossil fuel Consumed	Carbon Coefficient, COEFi	Total GHG emissions of the ECPG in 2003	East China Power Grid Generation excluded generation ,	Operating Margin Emissions Factor (EF_Omy)
Units		t	tCO2/tce	tCO2/year	GWh	tCO2/MWh
Source		China Energy Statistical Yearbook	From Table A5	=A*B	From Table A2	=C/(D*1000)
2003	Coal	16901.18	1.9024	32152.80483	38211.2	**0.870**
	Petroleum	360.28	3.0783	1109.049924		
	Natural Gas	0	–	0		
2002	Coal	14345.89	1.9024	27291.62114	32420.4	**0.863**
	Petroleum	218.5	3.0783	672.60855		
	Natural Gas	0	–	0		
2001	Coal	13071.64	1.9024	24867.48794	28946.6	**0.881**
	Petroleum	202.09	3.0783	622.093647		
	Natural Gas	0	–	0		
					Averege	**0.871**

Table A2		A	B	C	D
Data		Generation GENj,y	Excluded sources	Included generation,	Excluded Generation
Units		GWh		GWh	GWh
Source		China Electric Power Yearbook	Baseline Methdology	(=A) if included	(=A) if excluded
2003	Hydro	3198.2	×	−	3198.2
	Thermal	38211.2		38211.2	−
	Nuclear	1492.4	×	−	1492.4
	Other(wind)	8.5	×	−	8.5
	Total	42910.3		38211.2	4699.1
2002	Hydro	3783.5	×	−	3783.5
	Thermal	32420.4		32420.4	−
	Nuclear	561.2	×	−	561.2
	Other(wind)	16.3	×	−	16.3
	Total	36781.4		32420.4	4361
2001	Hydro	3499.9	×	−	3499.9
	Thermal	28943.6		28943.6	−
	Nuclear	247.2	×	−	247.2
	Other(wind)	10.8	×	−	10.8
	Total	32701.5		28943.6	3757.9

Table A3	A	B	C	D	E	F
	Installed Capacity 2001	Installed Capacity 2003	New capacity Additions	Split of New Capacity	Emissions factor	Weighted Axerage Build Margin Emiddions Factor, EF_Bmy
	MW	MW	MW	%	tCO2/MWh	tCO2/MWh
	China Electric Power Yearbook 2001	China Electric Power Yearbook 2003	=B-A	=C / (Total of column C)	From Table A1	=D*E
Hydro	1255.5	1360.25	104.75	11.4%	0	0.000
Thermal	5902.1	6503.65	601.55	65.7%	0.87	0.571
Nuclear	30	240.6	210.6	23.0%	0	0.000
Other(wind)	6.3	5.17	-1.13	-0.1%	0	0.000
Total / % change	7193.9	8109.67	915.77			**0.571**

Table A4		Units	equation or source	
A	Estimated operating margin emission factor	tCO2/MWh	Table A1	0.871
B	Estimated Build margin emission factor	tCO2/MWh	Table A3	0.571
C	Estimated Baseline Emission factor	tCO2/MWh	(=(A+B)/2)	**0.721**

Table A5	Tj /t fuel	tC/Tj	Oxid. Fact(%)	tCO2e /t fuel	Source
Heavy oil	0.04019	21.1	0.990	3.0783	IPCC 1996
Coal	0.02052	25.8	0.980	1.9024	IPCC 1996

Annex 4

MONITORING PLAN

· Daily Monitoring Records
In general, the project operator's working staff take daily gas field and engine readings and send these to central control room. These readings are then checked for any anomalies before being filed for future reference.

· Gas Field Monitoring Records
Taken on a weekly basis or at periods to be determined. The Site Technician walks the gas field taking readings at each gas well and recording them on a form, which is then sent to central control room. These readings are then checked for any anomalies before being filed for future reference. A gas analyzer will be installed to measure methane content in the LFG to see if the content varies from 55%.

· Routine Reminders for Site Technicians
All Site Technicians are issued with a reminder list to guide them through their daily, weekly and monthly routine. The Engineering Manager, Operations Manager and Training and Health & Safety Co-ordinator go through this routine during site visits to ensure all aspects of the role are being performed. In addition paperwork due at central control room is checked to ensure it has arrived. This includes monitoring records, oil sample reports and meter readings.

· Site Audits
The Engineering Manager, Operations Manager and Training and Health & Safety Co-ordinator make regular site visits. In addition to ensuring the site routines are being performed any additional training needs are assessed and an audit is taken of any outstanding task on site.

· Outstanding Works Notice
Following the Site Audit a 'Outstanding Works Notice' is issued to the Site Technician listing all the jobs that the management team consider necessary to be undertaken. This is checked on subsequent site audits to ensure these jobs have been carried out. (Please check the Monitoring Plan.)

· Permit to Work Scheme
The form completed before any work is carried out. This is forwarded to central control room and attached to the service records for each engine. The same form is used for any works associated with the gas field.

· Calibration of measurement equipment
Calibration of measurement equipment will be done periodically according to technical specification and recommendations given by SIDREE and equipment providers.

· Corrective actions
Actions to handle and correct deviations from the MP will be implemented as these deviations are observed either by the operator or during internal audits. If necessary, technical meetings amongst the operator, the developer, the sponsor and other relevant participants of the project will be held in order to define the corrective actions to be undertaken.

· Training

The operator personnel will be trained in equipment operation, data recording, reports writing, and operation, maintenance and emergency procedures.

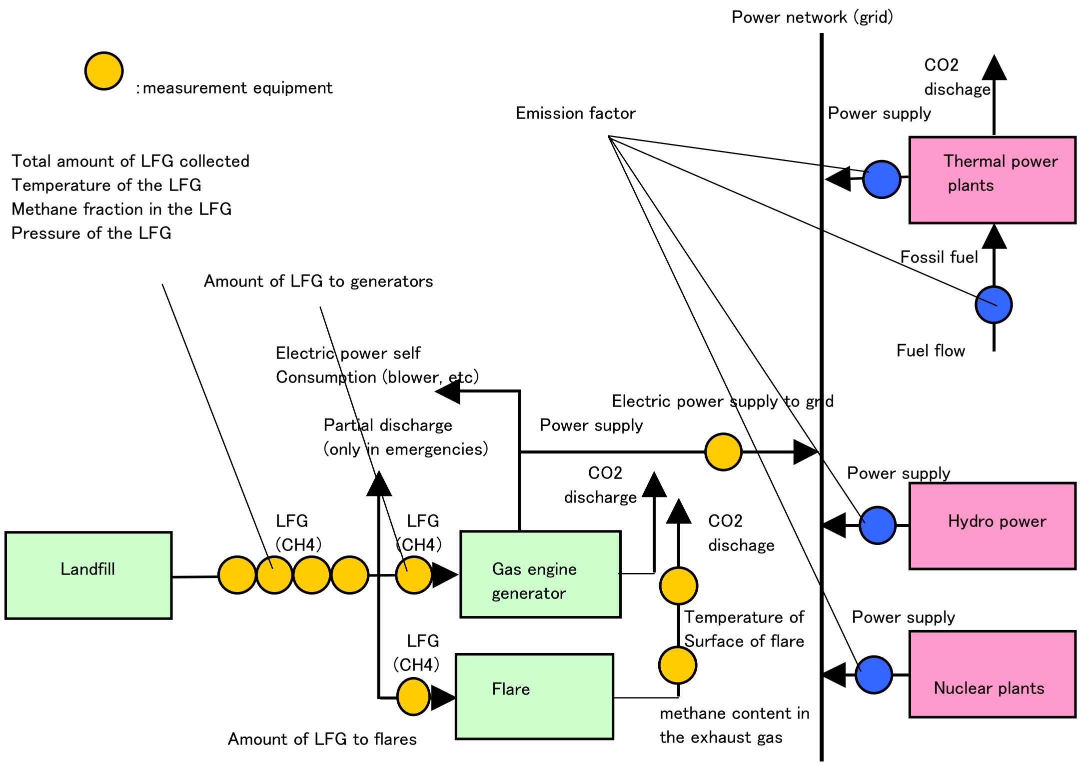

Figure AN-1 Outline of Monitoring Plan.

Appendix 1

Interview Minutes on Stakeholder's Comments on Laogang Landfill Gas Utilization and Energy Recovery Project

Interview 1
Time: September 19, 2005
Venue: Meeting room, Shanghai Laogang Disposal Co., Ltd.
Participants:
Dr. Hiroshi Takahashi and Mr. Taisuke Oodera, from Japan Engineering Consultants Co., Ltd.
Mr. Huang Renhua, from Shanghai Laogang Disposal Co., Ltd.

(1) Comments from the aspect of socioeconomic development
The project can heighten local residents' awareness about recycling of waste for power generation in the landfill site. Implementation of the project can stimulate to utilize waste effectively.

(2) Comments from the aspect of environmental conservation
Some environmental preservation measures are required to be taken, including drainage measure, leachate treatment, litter control of waste and odor control.

Interview 2
Time: September 20, 2005
Venue: Meeting room, Shanghai Chengtou Environment Industry Development Co., Ltd.
Participants:
Dr. Hiroshi Takahashi and Mr. Taisuke Oodera, from Japan Engineering Consultants Co., Ltd.
Mr. Hao Guang Cai, Vice president, Mr. Zhou Cheng, project manager, Ms. LuLu deputy director, from Shanghai Chengtou Environment Industry Development Co., Ltd.

(1) Comments from the aspect of socioeconomic development
LFG flaring is not what Chinese government wants as improvement measure. Such independent improvement plan as this CDM project can be considered a contribution to sustainability of the global environment.

(2) Comments from the aspect of environmental conservation
Rainwater drainage and leachate reduction through surface coating enable to reduce risk of leachate leakage and to improve contamination of seawater and soil. The negative impact on air environment is considered to be largely reduced through mitigation of poisoning by noxious gas contained in LFG and prevention of global warming and odor control by capture of GHGs such as methane.

(3) Comments from the aspect of impact on local residents' life
As for employment development and creation, the project operating company will employ at least 15 people.

Interview 3
Time: September 27, 2005
Venue: Meeting room, Shanghai City Appearance & Environmental Sanitation Administrative Bureau

Participants:
Dr. Hiroshi Takahashi and Mr. Taisuke Oodera, from Japan Engineering Consultants Co., Ltd.
Ms. Zhou Bing , Ms. Qi Yumei, from Shanghai City Appearance & Environmental Sanitation Administrative Bureau

(1) Comments from the aspect of socioeconomic development
Shanghai city aims at the realization of "Zero Landfill of Garbage" by 2010, in its waste disposal master plan. Laogang landfill disposal site which gas the largest capacity among disposing facilities aims to dispose 6,685t/day in 2005, 3,290 t/day in 2007 and 0 t/day in 2010, which, however, seems difficult to be achieved in practice.

(2) Comments from the aspect of environmental conservation
Currently, 6,000 t/day of waste is disposed in Laogang landfill disposal site. This CDM project captures LFG consisting primarily of methane to utilize it as clean energy source for power generation so that it can alternate use of natural resources.

(3) Comments from the aspect of impact on local residents' life
The power demand is now getting stringent in Shanghai and the surrounding areas. This CDM project generates electricity, and so the areas can be provided with electricity.

To sum up, the stakeholders are all supportive of this project and looking forward to the operation of this useful project.

Interview 4

Time: October 19, 2005
Venue: School of Environment Science and Engineering, Tongji University
Participants:
Dr. Hiroshi Takahashi, from Japan Engineering Consultants Co., Ltd.
Professor Zho Youcai from Tongji University.

(1) Comments from the aspect of socioeconomic development
There are approximately 400 landfill sites for municipal refuse in China. LFG capture/utilization system can be operated in those sites.

(2) Comments from the aspect of environmental conservation
In most waste landfill disposal sites in China, methane is emitted in significant quantities, which has extremely serious effects on global environment. The Chinese government attaches great importance to methane capture from LFG and utilization in its CDM policies. The global warming potential of methane is twenty-one times that of CO2 and so the methane is considered to have a very good effect on global warming.

(3) Comments from the aspect of impact on local residents' life
Capping the existing landfill spots enables a mitigation of odor pollution and drainage.
In addition, through appropriate rainwater drainage, the amount of leachate and the negative influence of sewage leakage on the ambient environment can be reduced.

Interview 5

Time: December 14, 2005
Venue: Meeting room, Meeting room, Shanghai Laogang Disposal Co., Ltd.
Participants:
Dr. Hiroshi Takahashi, from Japan Engineering Consultants Co., Ltd.
Five representatives from villages around the site.

(1) Comments from the aspect of socioeconomic development
Shanghai City who suffers from electricity shortage will welcome energy recovery from waste. The results of the questionnaire survey are as below:

- Impact on Shanghai economy: good (80%), very good (20%)
- Major problem on economic development: lack of natural resources (100%), lack of electricity (100%)

(2) Comments from the aspect of environmental conservation
The matters of concern are, on a global basis, methane emission from waste disposal sites and, in the surrounding area, odor pollution and drainage problems. It is expected that capping the existing landfill spots will mitigate such odor and drainage problems. The results of the questionnaire survey are as below:

- Main problem on environment: drainage pollution (100%), air pollution (100%)
- Necessity of environmental protection project: very necessary (100%)
- Contribution of the project to environmental protection: contributive (80%), very contributive (20%)

(3) Comments from the aspect of impact on local residents' life
It is expected that setting up a new company for the project implementation will create a new employment. However, there is also a fear of odor pollution and drainage problems in the site area. It is expected that capping the existing landfill spots will mitigate such odor and drainage problems. The results of the questionnaire survey are as below:

- Impact on economy of the surrounding area: good (60%), very good (40%)
- Impact of the project on environmental improvement of the surrounding area: largely improved (80%), improved (20%)

Interview 6

Time: December 16, 2005
Venue: A hotel in Beijing
Participants:
Dr. Hiroshi Takahashi, from Japan Engineering Consultants Co., Ltd.
Mr. Lu Yingfang from Ministry of Construction of People's Republic of China

(1) Comments from the aspect of socioeconomic development
There are 440 landfill disposal sites across the whole country, according to the data of 2004. The methane capture CDM project at the landfill sites in Beijing city is considered economically feasible. We, the construction department, hope to promote such methane capture CDM project at the landfill sites.

(2) Comments from the aspect of environmental conservation
As for waste disposal, incineration, landfill and compost detoxifying treatment are currently promoted in China. Along with implementation of the CDM project, we hope to provide guidance on implementation of the environmental protection measures including sewage disposal and odor control.