JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 – in effect as of: 15 June 2006)

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Annexes

SECTION A. General description of project

A.1. Title of the project:

"Landfill gas recovery in Moscow – landfill site DMITROVSKIJ"

Document version number: 01

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A.2. Description of the project:

Purpose of the project:

The project proposes to build and operate a landfill gas (LFG) recovery and flaring system in order to reduce CH_4 emissions at the landfill site named "Dmitrovskij" (Dmitrovskij District, Moscow oblast) for the benefit of global climate, and thus to generate Emission Reduction Units (ERUs).

Some basic information about the landfill follows:

The landfill is called DMITROVSKIJ and is located in the Dmitrovskij District of the Moscow Oblast in the near the city of Moscow.

Landfill owner:	Moscow city		
Owner of the property/ territory:	Moscow Oblast		
Operator of the landfill:	State Enterprise (GUP) Ekotechprom		
Legal form:	State Enterprise (GUP) Ekotechprom is the operator and tenant of the property / territory over a period of 49 years.		
Yearly dumped waste:	approx. about 1 000 000 tons		
Totally dumped waste according to the figures of ECOTECHPROM (State 01.01.2006):			
	MSW	5.697.100	tons
	BR (bulky refuse)	436.100tons	
Free capacity:	approx.	4.800.000	tons
Type of waste:	90 % Municipal Solid Waste (MSW) 7 % bulky refuse (BR)		
Covering material:	Soil, Clay, from the area		
Ground water:	level under bottom of the landfill		

Operation of the landfill:

Waste comes to the landfill in two forms. Either loose in common garbage trucks or already in the form of pressed solid waste briquettes loaded into specially adjusted garbage trailers. The solid waste briquettes have a specific weight of 0,8 tons/m³. A part of the refuse is delivered as briquettes in order to save transportation costs.

At the landfill the loose waste from the garbage trucks is unloaded and piled up to a layer of 0,5 m. This layer is then compacted with special compactors. The procedure is repeated until the compacted waste layer attains a level of 2 meters. Then the waste layer is covered with a 0,25 m insulation layer of clay, which builds the basis for the next waste layer of 2 m height. The solid waste briquettes are unloaded from the trailers with special grabbing equipment. Then they are piled up in 3 horizontal rows till they attain a level of 3,3 m. The spaces between the briquettes are filled up with waste to form a compact and homogenous waste body. Afterwards the 3,3 m waste layer is covered with a 0,25 m insulation layer of clay, which builds the basis for the next layer of briquettes.

The landfill with a total size of 63,5 ha consists of 4 parts. The central part, the northern part and the south eastern part are in service at the moment. Construction of the western part has been finished recently. At the moment between the south eastern part and the central part of the landfill another section (compartment 5) is under construction.

The following Table 1 shows the size of the different compartments and the type of utilisation (in service or not).

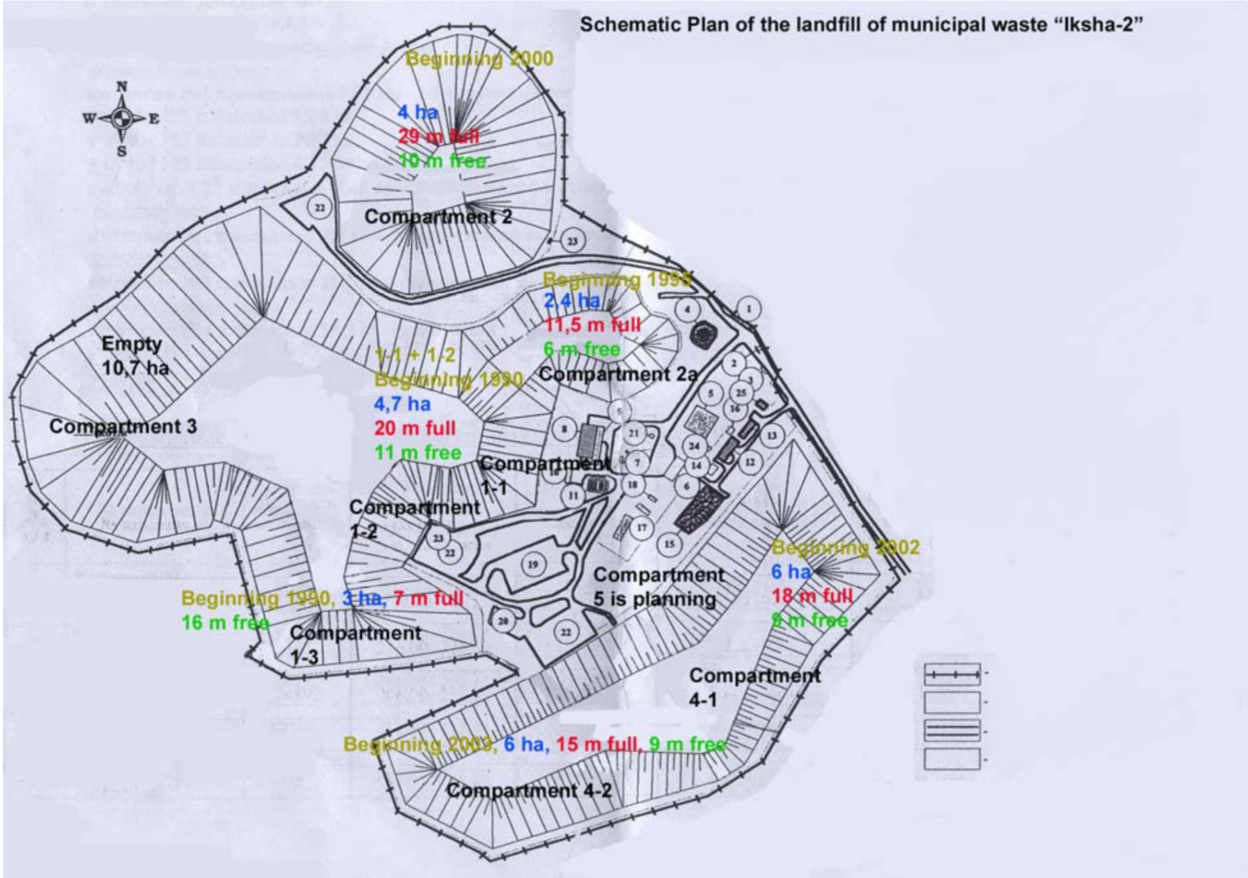
Table 1: Size of the different sections and the type of utilisation (in service or not).

compartments	Area [ha]:	type of utilisation
compartment 1-1	6,26 ha	closing
compartment 1-2	3,97 ha	in service
compartment 1-3	4,35 ha	in service
compartment 2a	3,48 ha	closing
compartment 2	7,9 ha	in service
compartment 3	10,7 ha	construction recently finished, not in service now
compartment 4-1, 4-2	7,2 ha / 7,1 ha	in service
compartment 5		under construction, not in service now

Timetable of expected date of closure:

- compartment 2a 31.06.2006
- compartment 1-1 31.06.2006
- compartment 2 31.05.2007
- compartment 4.1 01.01.2008-31.05.2008
- compartment 4.2 31.05.2008-31.05.2009
- compartment 5 31.05.2008-31.05.2009
- compartment 3 end of 2009

The following view presents the different compartments of the landfill site Dmitrovskij in detail:



The compartments 1-2 to 1-3 and the recently finished new compartment 3 are envisaged to be filled from east to the west.

The landfill DMITROVSKIJ is in operation since 1990, GUP EKOTECHPROM is the operator since 1996. Dumping of waste has not started so far on compartment 3 and on compartment 5, which is still under construction. The official waste amounts disposed by the operator of the landfill site GUP ECOTECHPROM are presented in the following Table 2.

Table 2: Official waste amounts disposed on the landfill site DMITROVSKIJ

Year	MSW (municipal solid waste) [1000 tons]	BR (bulky refuse) [1000 tons]
1996	82,1	2,2
1997	216,0	28,3
1998	265,5	16,7
1999	455,0	20,7
2000	543,3	27,2
2001	599,6	36,0
2002	735,5	51,5
2003	958,8	76,7
2004	990,9	89,2
2005	850,4	87,6
2006 (envisaged)	1.200,0	
2007 (envisaged)	1.200,0	
2008 (envisaged)	1.200,0	
2009 (envisaged)	1.200,0	

The dumping technique is in conformity with the standard of the Russian Federation (waste filling technology worked out by the K. D. Pamfilov Academy for Communal Services).

The remaining landfill capacity (according to figures from GUP EKOTECHPROM) (State: 01.01.2006) is about 4 800 000 tons of waste.

Feeding electricity into the grid has not been taken into account for the proposed JI – project activity.

It is envisaged that a small part of extracted landfill gas will be converted into electricity and heat by combined heat and power gas engines and it is used for own needs of the landfill itself, according to the wishes of the landfill operator. But no emission reductions are claimed for displacing or avoiding energy from other sources.

The project will be financed through the sales of ERUs generated from the collected and mitigated landfill gas (methane).

The landfill gas collection and utilisation equipment, which will be installed by an experienced company, will be a proven technology, including a piping and well network, blowers and flaring system and will represent the state of the art.

The project will result in greenhouse gas emission reductions by combusting of the recovered methane contained in the landfill gas. It is estimated that the project will generate about **2.143.368** tons CO_{2eq} (ERUs) within the commitment period.

The volume of landfill gas to be extracted during the first commitment period of the Kyoto Protocol is calculated at approx. 6.400 to 7.750 Nm^3/hour.

<u>Contribution of the project activity to sustainable development:</u>

The long-term strategic objective of the project is to contribute to better waste management and to capture GHG-emissions from the landfill site in Dmitrovskij. By this way, emissions of other gases, such as H_2S, mercaptenes and other odorous compounds are reduced too, which leads to a cleaner environment in the surroundings of the landfill. Proven by scientific research, today it is well-known that after closure of landfills, emissions of landfill gas to the atmosphere do not stop but continue. Only organized and careful landfill gas collection and utilization can reduce the unwished local and global impact and can improve the ecological situation by guarantying:

- Abatement of methane emissions;
- Elimination of odorous gas emissions that affect the public health and quality of life. Bad odours can cause local health problems, negatively affect investment in the surrounding communities and lower property values and their socio economic status;
- Reduction of explosion and fire risks.
- Reduction of methane migration destroying vegetation near or on the rehabilitated landfill compartments and compartments in operation.
- Improvement of mineralisation of the waste body leading to reduction of leachate generation and decrease of leachate seeping into the ground.

The proposed project faces a number of market barriers, of which economic unattractiveness, lack of technical know-how and lack of availability of equipment are the most important. The implementation of this project will assist the Russian Federation in demonstrating the practice of landfill gas recovery.

Important elements are:

- Demonstrating the practice of landfill gas recovery in the Russian Federation;
- Demonstrating how trading in emission reductions via the mechanisms of the Kyoto Protocol could support and assist in making the practice of landfill gas recovery economically viable;
- Transferring the necessary technology and know-how to the Russian Federation, including:
  - making available the required equipment for landfill degasification (at this moment there are no companies in the Russian Federation having long-term experience in producing state of the art landfill gas recovery equipment);
  - building of local know-how about the technology of LFG extraction through the involvement of Russian partners in the project;
  - additionally, building of local know-how about correct landfill site management for the time after closing, i.e. covering systems contributing to the reduction of the risk of waste slides at the site (covering of the landfill strongly accelerates the settlement of the waste);
  - carry over of technical knowledge about possible LFG utilisation methods, such as electrical power and heat generation.

The economy of the Russian Federation requires new investments from international sources in the sphere of environmental protection. The landfill gas project brings new investments from foreign sources into the country. It is important to stress that these will be local investments in the sphere of waste management and environmental protection which will obviously be made, neither by federal, regional or municipal budgets nor by Russian private investors for the next decade. Furthermore it is envisaged that the project will create a better environment for more future investments of similar nature.

The project increases economic activities in the region. The construction of the landfill gas collection and utilisation equipment will create new jobs for both skilled and unskilled workers in the region. The purchase of materials and equipment from national sources will create better employment opportunities.

Managing and operating landfills under environmental regulations such as landfill collection and utilization is an important tool helping to improve sustainable development of communities neighbouring the landfill. The measures are of utmost importance for health, development and well-being of humans and other species living in the landfill's impact zone.

A.3. Project participants:

A list of the involved parties is indicated below.

Please list project participants and Parties involved in this section and provide contact information in annex 1. Information shall be provided in the following tabular format.		
Party involved *	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Russian Federation (Host Country)	State Enterprise of the city of Moscow „Ekotechprom“	No
Republic of Austria	ECOCOM Climate Protection Umweltschutz GmbH	No
* Please indicate if the Party involved is a host Party.		

The developer of the project Landfill gas recovery in Moscow – landfill site "Dmitrovskij" is the ECOCOM Climate Protection Umweltschutz GmbH. ECOCOM Climate Protection Umweltschutz GmbH is in charge of the project design, project financing and investment, project implementation, project management and operation.

The owner of the landfill site "Dmitrovskij" is the city of Moscow. The Department for the organisation of the Moscow industrial and consumption waste neutralization and treatment responsible for organizing the whole waste management of the City of Moscow including politics on waste tariffs and waste management development has charged and vested the State Enterprise of the city of Moscow „Ekotechprom" with managing and operating the landfill site "Dmitrovskij". For this reason "Ekotechprom" is the legally empowered landfill operator of the "Dmitrovskij" landfill responsible for all operational and legal decision making concerning the landfill. "Ekotechprom" signed a contract (agreement of cooperation) in August 2005 to entrust ECOCOM Climate Protection Umweltschutz GmbH with the collection and utilization of landfill gas from the landfill site "Dmitrovskij". Ekotechprom will provide on site know-how, partly personnel and the necessary construction tools for landfill rehabilitation works.

A.4. Technical description of the project:

A.4.1. Location of the project:

The project activities will take place at the DMITROVSKIJ landfill site located in the in the Dmitrovskij District of the Moscow Oblast, Russian Federation.

A.4.1.1. Host Party(ies):

The host country is the Russian Federation.

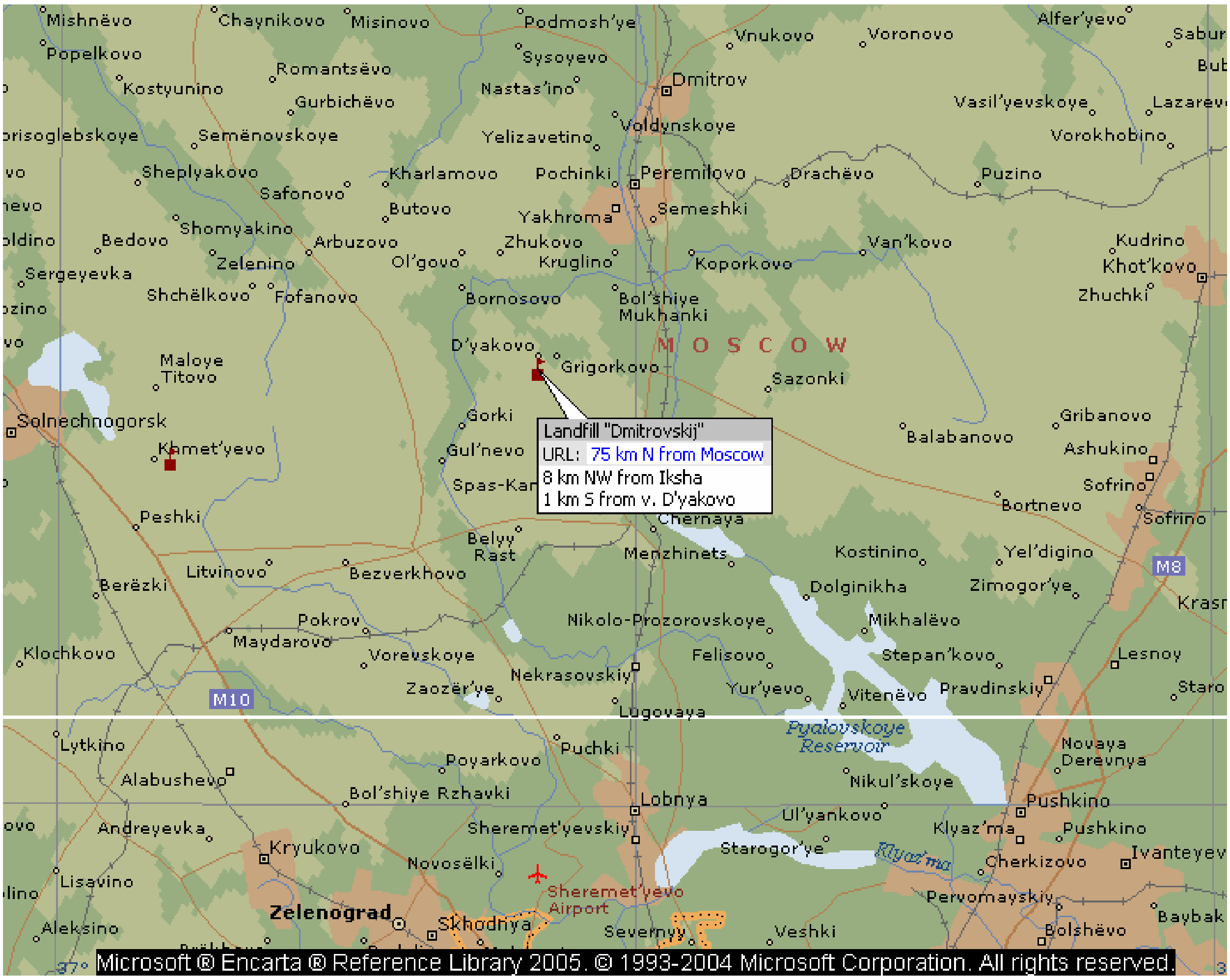
A.4.1.2. Region/State/Province etc.:

The landfill site DMITROVSKIJ is located 75 km north from the city of Moscow in the Moscow Oblast (own subject of the Russian Federation).

A.4.1.3. City/Town/Community etc:

The landfill site DMITROVSKIJ is located 1 km south of the village D'yakovo and 8 km north-west from the City of Iksha (Dmitrovskij District, Moscow Oblast). The owner of the landfill site is the city of Moscow. The owner of the property is the Moscow Oblast.

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



The landfill site DMITROVSKIJ is located 75 km north of the City of Moscow in the Dmitrovskij District of the Moscow Oblast 1 km south of the village D'yakovo and 8 km north-west from the City of Iksha. The Moscow Oblast surrounds the city of Moscow.

A.4.2. Technology to be employed, or measures, operations or actions to be implemented by the project:

The technology that will be used to capture and destroy the methane currently generated at the landfill site Dmitrovskij consists of an active LFG collection and utilisation system, which is the most effective means of LFG collection.

The technology proposed for the extraction and utilisation of biogas can be regarded as standard technology. It is the most up-to-date technology that is fully in compliance with EU-legislation.

The basic operation principle is the generation of vacuum in the waste mass allowing extraction of landfill gas. The main components of the active collection system to be installed are the ***gas extraction wells*** and ***collection piping***, ***the gas pumping equipment*** represented by mechanical blowers, which create a suction pressure in the system necessary for extraction of the LFG, **the *gas treatment unit*** including the condensate and flaring system, the ***monitoring and control system*** and the ***gas utilisation unit*** (production of electricity).

- ***The LFG extraction wells*** and collection piping will be installed around the perimeter and in the centre of the landfill. Gas extraction wells will be connected to a master pipe that will carry the LFG to the blower facility. The gas collection system includes a network of vertical gas extraction wells dewatering units and HDPE pipelines.

- ***The LFG pumping equipment*** will include pipeline header system and blowers. A pipeline header system conveys the flow of collected LFG from the well system to the blower facility. The blowers to be installed will be single-stage centrifugal type blowers. The blowers will be used for transportation of the landfill gas from the landfill to the gas engines, under correct suction and pre-pressure. Capacity and pressure will be adjusted through frequency controlled electro motors. Moreover, the blowers will be equipped with all the necessary safety equipment, including a noise reducing housing.

  On the pressure side of the degassing installation, all kinds of gas analyzing and gas measuring instruments will be present. These instruments are very important for safety, process and operating purposes.

- ***Gas treatment unit***: The landfill gas will be cooled down when transported from the landfill site, resulting in a production of condensate. This has to be drained to condensate shafts, to be placed nearby the gas pipes. Once in the degassing installations, the landfill gas will be cooled again to remove moisture. This is a very important step in the gas treatment process, since the condensate, which contains silicium components, could block the gas pipes and also damage gas engines, due to the silicium.

  Considering demoisturing is fundamental for the energy generation, as per the reasons mentioned above, a demister will be installed for extra safety reasons. The demistor is a stainless steel high density filter, which separates liquid particles (small amounts of condensate) from the landfill gas. This liquid has to be drained off to a condensate shaft as well.

  A closed flare will be installed to burn the LFG in a controlled environment to destroy methane and other harmful constituents and discharging them safely to the atmosphere. LFG will be flared in a 'low emission' with high temperature flare (>1000^{o}C).

- ***The monitoring and control system*** will be used to measure actual LFG flow and composition to avoid the intrusion of ambient air into the extraction wells and thereby optimize the extraction of gas.

  The projected plant is operated by an electrical control system equipped with a monitoring system for methane, oxygen, flow, pressure and temperature.

  The control activities for this system consist of periodic adjusting of the gas wells by means of measuring equipment. The gas flow, the methane content and the oxygen content are very important parameters. For the implementation of these activities local operators must be trained. Using the telephone helpdesk of the supplier the trained operators can always ask for technical support. Experts of the supplier execute the maintenance works every half year.

  The maintenance works mainly consist of controlling subside and/or distortion of the gas wells and the pipeline system. In case subside, distortion or flaws are detected, local companies will execute repair and refitting works.

- After above described treatment, analyzing and measurement, a small amount of the landfill (LFG) gas will be transported as a fuel to the ***gas engines***. These will drive electrical generators in order to generate electrical power for ***on site*** use. The main part of the landfill gas will be burned off by the flares installed.

Typical biogas extraction unit.

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

Greenhouse gas (GHG) emissions from the "business as usual case (BAU)" currently employed by the Dmitrovskij municipal landfill site will be reduced through the collection of the landfill gas and the subsequent destruction of the methane component in a closed flare or in a gas engine, as described in Section A.4.2.

The current practice at this landfill is to allow the uncontrolled release of LFG into the atmosphere. The LFG generated at the site consists approximately of 50% methane and 50% carbon dioxide, both known GHG's with Global Warming Potentials (GWP) values of 21 and 1, respectively. However, the carbon dioxide portion of landfill gas is considered to be biogenic in origin and part of the natural carbon cycle, and thus not considered as an anthropogenic source of greenhouse gas.

The emission reduction units (ERUs) to be achieved with the proposed project activity will be directly measured according to the Monitoring Plan described in Section D of this document.

The estimated ERUs for the proposed project activity are about **2.143.368** tons CO_{2eq} over the 5-year crediting period starting in 2008.

The emission reductions would not occur in the absence of the project activity due mainly to financial barriers (the lack of economic benefits to develop this type of projects) and national circumstances such as the current legislation that does not require LFG capture and utilisation. These barriers are described in detail as follows:

- LFG recovery is not required under the current legislation established in the Russian Federation.

- The Government's future policy is to close down small landfills and to focus on larger, regional landfill sites. Simultaneously, the policy is to develop waste collection services according to modern standards, such as separated collection of organic wastes, plastics, glass etc.

- In addition to legal matters, for the proposed project activity there is no economic incentive for the capturing and combustion of methane from landfill gas since there will be no revenues from sources such as tax credits or the selling of electricity or thermal energy.

Therefore it is clear, that without the income from the sale of ERUs, the project activity would not be carried out because financing for the necessary investments is hardly available for the municipalities in the Russian Federation.

Based on the previous considerations, the BAU scenario (full release of the LFG to the atmosphere through the surface of the landfill without any treatment) is the most likely scenario without claiming emission reductions through the project activity.

A.4.3.1. Estimated amount of emission reductions over the crediting period:

By direct flaring of LFG generated at the landfill site or/and combustion of a part of the LFG in a gas engine for electricity production for on site use, the proposed project is expected to generate about **2.143.368** tons of emission reductions expressed as tons of CO_{2eq} over the crediting period.

The annual expected amount of emission reductions generated over the crediting period is indicated below:

Table 3: Annual estimation of emission reductions in tons of CO_{2eq} at the Dmitrovskij Landfill site:

Please indicate the length of the crediting period and the length of the period within which ERUs are to be earned and provide estimates of total as well as annual emission reductions. Information shall be provided using the following tabular format.	
	Years
Length of the period within which ERUs are to be earned	5
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2equivalent
Year 2008	407.313
Year 2009	446.725
Year 2010	412.107
Year 2011	456.290
Year 2012	420.933
Total estimated emission reductions over the period within which ERUs are to be earned (tonnes of CO_2equivalent)	**2.143.368**
Total estimated emission reductions over the crediting period (tonnes of CO_2equivalent)	**2.143.368**
Annual average of estimated emission reductions over the crediting period/period within which ERUs are to be earned (tonnes of CO_2equivalent)	**428.674**

A.5. Project approval by the Parties involved:

The Russian Federation fully supports the JI - project “Landfill Gas recovery in Moscow – landfill site Dmitrovskij” and has endorsed the project as a Joint Implementation project.

The Letter of No Objection can be found in the Annex 4 of the PDD: Letter of No Objection; Moscow, February 15, 2005 signed by I. Gretshuchin, Director of the Department of Property and Land Relations, of Natural Resources Management of the Ministry of Economic Development and Trade of the Russian Federation.

The Republic of Austria also fully supports the current project. The KPC (Kommunalkredit Public Consulting), which is working on behalf of the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, intends to sign an ERPA with ECOCOM Climate Protection Umweltschutz GmbH to purchase Emission Reduction Units (ERUs) from this project.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

Title and reference of the approved baseline methodology applied to the project:

The approved baseline methodology applied to this project is the approved **ACM0001** – Consolidated Baseline Methodology for Landfill Gas Project Activities.

Justification of the choice of the methodology and why it is applicable to the project:

ACM0001 was developed as a consolidated document that incorporates all previously-approved methodologies applicable to landfill gas project activities where the baseline scenario is the partial or total atmospheric release of landfill gas and the project activities include situations such as:

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 sources1; 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 generation from other sources. In this case a baseline methodology for electricity and/or thermal energy displaced shall be provided or an approved one used, including the ACM0002 "Consolidated Methodology for Grid-Connected Power Generation from Renewable". If capacity of electricity generated is less than 15MW, and/or thermal energy displaced is less than 54 TJ (15GWh), small-scale methodologies can be used.

This baseline methodology shall be used in conjunction with the approved monitoring methodology ACM0001 ("Consolidated monitoring methodology for landfill gas project activities").

For the proposed project activity, the baseline scenario is the partial total respectively atmospheric release of the gas, it is falling under the above mentioned point a) and b) and thus the **ACM0001** is applicable to the project activity.

The ERUs exchange mechanism provided under JI is considered as a real and concrete incentive in the decision to proceed with the project activity and the project activity will not be initiated without JI.

Description of how the methodology is applied in the context of the project:

According to the adopted methodology **ACM0001**, "the methane destroyed by the project activity ($MD_{project,y}$) during a year is determined by monitoring the quantity of methane actually flared and/or combusted…"

In the proposed project activity, the actual methane destroyed will be obtained from direct measurements of key parameters that in turn will allow calculating the emission reductions.

Following the chosen methodology **ACM0001**, the emission reductions achieved by the project activity during a given year "*y*" (ER_y) will be calculated as the difference between the amount of methane actually destroyed during the year ($MD_{project,y}$) and the amount of methane that would have been destroyed during the year in the absence of the project activity ($MD_{reg,y}$), times the approved Global Warming Potential value for methane (GWP_{CH4}).

$$ER_y = (MD_{project,y} - MD_{reg,y}) \times GWP_{CH4}$$

where:

ER_y	emission reductions [tons CO_{2eq}/year]
$MD_{project,y}$	is the methane destroyed by flaring [tons CH_4/year]
$MD_{reg,y}$	is the methane that would have been destroyed during the year in the absence of the project activity, that is **zero** [tons CH_4/year], because there are currently no legal requirements to capture LFG on landfill sites in the Russian Federation.
GWP	is the Global Warming Potential value for methane 21 [tons CO_{2eq}/ton CH_4]

The methane destroyed by the project activity $MD_{project,y}$ during a year is determined by monitoring the quantity of methane actually flared and combusted in a gas engine:

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

$$MD_{flared,y} = LFG_{flared,y} \times w_{CH4,y} \times D_{CH4} \times FE$$

$$MD_{electricityy} = LFG_{electricity} \times w_{CH4,y} \times D_{CH4}$$

where:

$MD_{flared,y}$	is the quantity of methane destroyed by flaring [ton CH_4/year]
$MD_{electricity}$	is the quantity of methane destroyed by generation of electricity [ton CH_4/year]
$LFG_{flared,y}$	is the quantity of landfill gas flared during the year (see section D.1.2.1. ID2)
$LFG_{electricity}$	is the quantity of landfill gas fed into the electricity generator (see section D.1.2.1. ID3)
$w_{CH4,y}$	is the methane fraction of the landfill gas (see section D.1.2.1. ID7)
D_{CH4}	is the methane density (see section D.1.2.1. ID6)
FE	is the flare efficiency (see section D.1.2.1. ID8)

No leakage effects need to be accounted under this methodology!

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

Greenhouse gas emissions from the chosen municipal landfill will be reduced below those that would have occurred in the absence of the JI project activity through the collection of the landfill gas and the subsequent destruction of the methane in a closed flare or combustion in a gas engine, as technically described in Section A.2.

The emission reductions (ERs) to be achieved with the proposed project activity will be directly measured and then calculated according to the Monitoring Plan described in Section D of this document.

The **ACM0001** methodology requires the use of the *"Tool for the demonstration and assessment of additionality"* to demonstrate and assess additionality, which is a step-wise approach that includes:

- Identification of alternatives to the project activity;
- Investment analysis to determine that the proposed project activity is not the most economically or financially attractive alternative (in the absence of the JI incentive);
- Barriers analysis;
- Common practice analysis and
- Impact of registration of the proposed project activity as a JI project activity.

The "Tool for the demonstration and assessment of additionality (version 2)" (UNFCCC, 28 November 2005) is applied as follows.

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

This step is not applicable since the project participants do not wish to have the crediting period starting prior to the registration of their project activity.

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

Sub-step 1a: Define alternatives to the project activity:

The Table 4 below presents an analysis of different alternatives to the project activity along with a discussion of probable outcome.

Table 4: Alternatives of proposed project activities

Alternatives of proposed project activity	**Probability of scenario**
Alternative 1: No capture of LFG from the landfill site (continuation of the current situation – BAU scenario)	**Most probable**: this is the current situation and is considered as the baseline scenario. There are no regulations requiring the capture and destruction of landfill gas at the site. No economic benefits would be obtained from LFG capture and flare, and no legal bounds are established either.
Alternative 2: LFG capture and flare (project activity) outside JI	**Very low probability**: the high costs for the construction and operation for the LFG recovery plant are difficult to afford without financial assistance. There are no additional revenues (e.g. electricity generation) out of this project activity. Thus it is highly unlikely without significantly increasing waste management fees. Currently, an increase in waste management fees is politically difficult. Besides, currently, there are no legal requirements for LFG capture and flaring in the Russian Federation.
Alternative 3: LFG capture and electricity generation	**Very low probability**: high investment costs of construction and operation of the LFG recovery system and the power plant and low electricity prices make this alternative unlikely.

Since the proposed project activity will not deliver commercial goods or services (i.e. electricity generation or thermal energy) and since there is no incentive of producing energy out of the captured LFG and selling it to the grid and taking into account that the legislation of the Russian Federation does not set legal requirements for landfill gas capture, the current landfill management in Dmitrovskij - with the LFG passively release to the atmosphere - would continue.

As a result, the project activity is the only viable alternative to address the reduction of greenhouse gas emissions at the site.

Sub-step 1b: Enforcement of applicable laws and regulations:

Each of the above alternatives complies with the applicable laws and regulations of the Russian Federation. In terms of the project activity, the active collection and flaring of LFG is not mandatory at the Dmitrovskij landfill site, as such, the site is currently in compliance with all local environmental regulations with respect to air emissions.

It is not expected that in the near future legal directives concerning the landfill gas recovery on landfill sites will take effect.

Moreover, and according to the Monitoring Plan ACM0001, relevant regulations for LFG extraction or combustion (even if these laws and regulations have objectives other than GHG reductions) will be monitored yearly, and any implication on emissions should be taken into account when calculating actual emissions of the project activity.

Step 2: Investment analysis

Sub-step 2.a: Determine appropriate analysis method

The proposed project activity will not generate financial or economic benefits other than JI related income, therefore Sub-step 2b. Option I applies.

Sub-step 2.b: Option I: Apply simple cost analysis

The **BAU** (Business as usual scenario, Alternative 1) doesn’t imply any investment and it is the most probable scenario for the Russian Federation.

The **project activity** (Alternative 2) involves the implementation of a landfill gas collection and flaring system to combust the methane component of the landfill gas. This will require capital expenditures for the gas collection wells and piping, the mechanical instrumentation required to induce vacuum, the analytical instrumentation necessary to monitor landfill gas composition, and the enclosed flare to be used for destruction of the methane component of the landfill gas at the site. Additionally, on-going expenses will occur to operate the facilities and to maintain the system’s components.

The destruction of methane via the project activity would not result in any income other than that derived through revenues generated from the JI exchange mechanism. The project activity is not financially attractive under any scenario except through JI related income.

The total investment to equip the Dmitrovskij landfill site with a **LFG collection system and a power generator** (Alternative 3) will be much higher than the equipment for capture and subsequent flaring. Moreover, taking into account the very low selling price of electricity (approx. 0,015 € / kWh) and the complex regulatory circumstances for power generation the feasibility of electricity generation could not be considered as a baseline.

For this reason the only remaining plausible baseline scenario is Alternative 1 (No capture of LFG from the landfill site).

Step 3: Barrier Analysis

Since the proposed project activity is not financially attractive, Step 4 follows.

Step 4: Common practice analysis

Sub-step 4a: Analyse other activities similar to the proposed project activity

There is no similar project like “Landfill Gas Recovery in Moscow – landfill site Dmitrovskij”, which is being carried out in the Russian Federation at the current date.

In 1995/96 the Dutch “Senter Novem” Bank financed the construction of two landfill gas collection and utilization systems in the Moscow Region. One of them was the “Kargashino” LFG to energy project and the other one the “Dashkova” LFG collection and utilization system. The systems which were installed consist of several vertical gas wells and a horizontal landfill gas collection system, which is connected to the gas wells. The landfill gas was either burned in a flaring system or in a gas engine depending on its quality.

The “Kargashino” LFG to energy system is situated not far away from the city of Mytishi (Mytishi District, Moscow Oblast). It was in operation from 28.02.96 to 16.10.96, all in all it worked 2769 hours and extracted 140.801 m³ of landfill gas by using three landfill gas extraction wells installed on a waste mass of 61.041 tons. The recovery rate was 60% and the gas generation potential of the degassed landfill part was assessed with 742.396 m³ per year. (*Source: GUP MO “Ekosistema”: Emission assessment for GHG and other harmful substances from landfills of the Moscow Region, 2005 – Volume 2, pp. 31-33)*

The “Dashkova” LFG collection and utilization system situated in the south-west of the city of Serpuchov (Moscow oblast) was in operation from 17.01.95 to 13.12.96, all in all it worked 9616 hours and extracted 310.980 m³ of landfill gas out of a waste mass of 62.250 tons. The recovery rate was 40% and the gas generation potential of the degassed landfill part was assessed with 708.242 m³ per year. (*Source: GUP MO “Ekosistema”: Emission assessment for GHG and other harmful substances from landfills of the Moscow Region, 2005 – Volume 2, pp. 34-36)*

After successful implementation of the LFG collection and utilization systems the systems worked between half a year and two years without mayor problems and were turning landfill gas to electricity. The electricity was used for operational needs of the landfill territory itself and supplied to the village situated next to the landfill.

Due to operation costs and maintenance works in connection with the very low tariffs for electricity in the Russian Federation the whole landfill gas collection and utilization systems were stopped after half a year and two years of successful operation. The main problem was that the grant used for financing the LFG collection and utilization systems financed only construction of the systems but not their operation and due to the low feed in tariffs for electricity and the problems occurring with maintenance works the operation of the systems became unattractive for the operators.

From this point of view the JI mechanism of the Kyoto Protocol gives a far more and stronger incentive to operate the installation from 2008-2012 as it generates income from selling ERUs.

It can be concluded that LFG recovery is not required in the Russian Federation. Therefore it is not considered as common practice in this country. There is just little local technology available and there are just few experts in the field to apply knowledge in actual projects.

Sub-step 4b: Discuss any similar options that are occurring

Considering there are no similar activities widely observed and commonly carried out, right now it is not necessary to perform an analysis at this point.

Step 5: Impact of JI

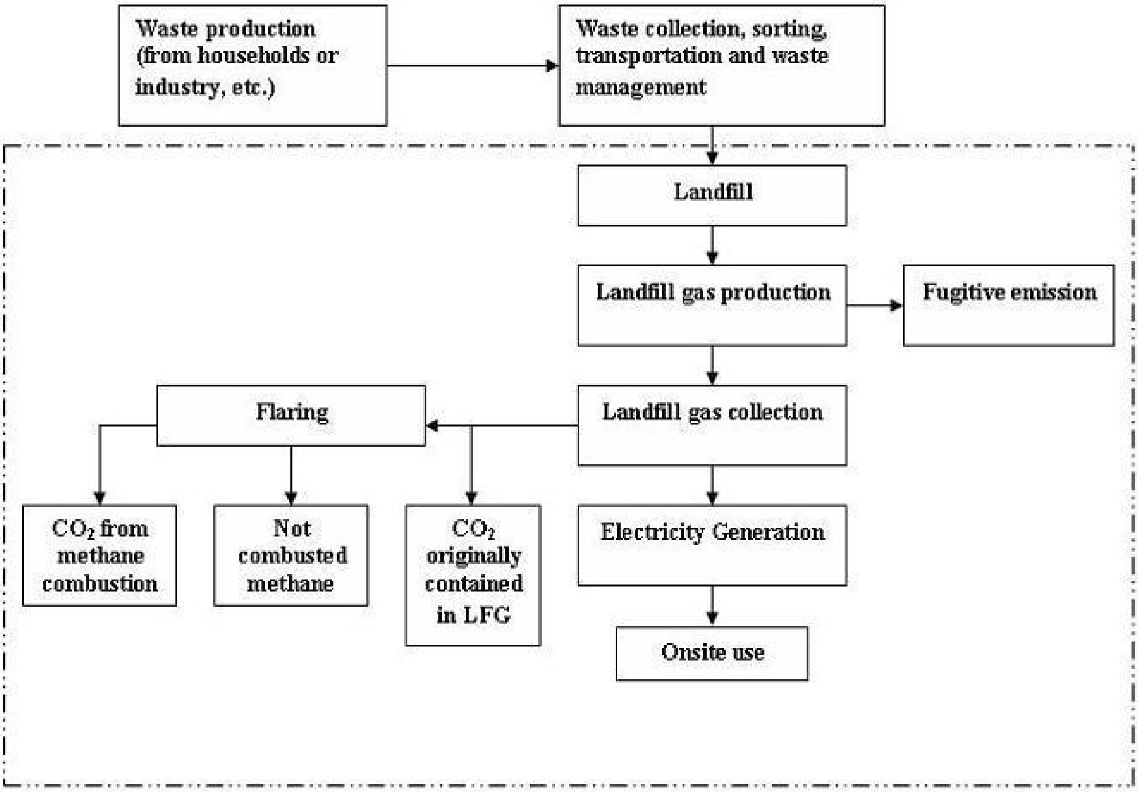
The proposed activity will reduce greenhouse gas emissions, thereby generating emission reduction units (ERUs). The income generated from the ERU sales will make it possible to eliminate the financial barriers preventing the implementation of this project. By participating in the carbon market through JI, the project becomes economically viable.

The project will also deliver local community benefits related to the creation of new jobs during the construction, operation and maintenance stages of the LFG recovery plant and to the possibility of using the captured LFG as renewable energy resource in future economic enterprises.

Besides, the replication of the project activities in other regions, cities and towns around the country will trigger environmental awareness related to waste management, renewable energy resources and climate change in the involved communities.

B.3. Description of how the definition of the project boundary is applied to the project:

The following figure shows the basic operations involved in the MSW management on the landfill site in "Dmitrovskij" including the proposed project activity. The dashed line defines the project boundary.



According to the approved consolidated baseline methodology **ACM0001** under the title Project Boundary, CO_2 emissions from the combustion of the methane shall not be accounted for as well as the emissions of CO_2 originally contained in LFG.

B.4. Further baseline information, including the date of baseline setting and the name(s) of person(s)/entity(ies) setting the baseline:

Date of Completion: The baseline study was completed on 15/09/2006.

Name of Entities Determining the Baseline: The baseline was determined by the Energy Changes Projektentwicklung GmbH. Contact information is presented below:

Energy Changes GmbH

Zip code + city postal address:	Kirchengasse 43/11, 1070 Vienna
Country:	Austria
Telephone number:	+43/664/164 62 05
Fax number:	+43/1/994 99 69 - 40
Email:	christian.praher@energy-changes.com
URL:	www.energy-changes.com

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

The construction of the LFG equipment is envisaged to take place in spring 2007, but not later than summer 2007. The landfill gas extraction and flaring system will be operative in autumn 2007.

C.2. Expected operational lifetime of the project:

20 years

C.3. Length of the crediting period:

5 years (1st January 2008 – 31st December 2012)

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The Monitoring Plan (MP) for the Project "Landfill Gas Recovery in Moscow – landfill site Dmitrovskij" was developed according to the approved consolidated monitoring methodology **ACM0001**: ***"Consolidated monitoring methodology for landfill gas project activities".***

Justification of the choice of the methodology and why it is applicable to the project:

ACM0001 was developed as a consolidated document that incorporates all previously-approved methodologies applicable to landfill gas activities where the baseline scenario is the partial or total atmospheric release of landfill gas. Scenarios contemplated by the methodology ACM0001 include the case, where the management of the LFG collected at the site includes direct flaring for emission reductions, which forms the basis of the project activity.

The monitoring methodology is based on direct measurement of the amount of landfill gas captured and destroyed at the flare platform and the electricity generating energy units, to determine the quantities. The Monitoring Plan for the proposed project activity provides for direct measurement of the quantity and quality of LFG flared. The main variables that need to be determined are the quantity of methane actually captured ($MD_{project,y}$) and the quantity of methane flared ($MD_{flared,y}$) and the quantity of methane used to generate electricity ($MD_{electricity,y}$) for onsite use.

To determine these variables, the following parameters will be monitored:

- The amount of landfill gas generated (in m³, using a continuous flow meter), where the total quantity ($LFG_{total,y}$) as well as the quantities fed to the flare ($LFG_{flare,y}$) and to the generation unit ($LFG_{electricitye,y}$) will be measured continuously.

- The fraction of methane in the landfill gas ($w_{CH4,y}$) will be measured with a continuous gas analyzer. The continuous gas analyzer is the preferred option because the methane content of landfill gas captured can vary by more than 20% during a single day due to gas capture network conditions (dilution with air at wellheads, leakage on pipes, etc.).

- Temperature (T) and pressure (p) of the landfill gas will be measured to determine the density of methane in the landfill gas. No separate monitoring of temperature and pressure is necessary when using flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters.

- The flare efficiency (FE), measured as the fraction of time in which the gas is combusted in the flare multiplied by the efficiency of the combustion process. For this purpose, the methane content of the flare emissions should be analysed on a yearly basis, with the first measurement to be made at the time of installation. The combustion efficiency is initially assumed at 97% and will be periodically verified through laboratory analysis to determine the methane content in the flare emissions.

- The quantities of electricity or any other fuels required to operate the landfill gas project, including the pumping equipment for the collection system.

- Relevant regulations for LFG project activities will be monitored. Changes to regulation will be converted to the amount of methane that would have been destroyed/combusted during the year in the absence of the project activity ($MD_{reg,y}$).

Please, refer to the tables in section D 1.2 (Option 2) for detailed data measurement and recording frequency.

D.1.1. Option 1: - Monitoring of the emissions in the project scenario and the baseline scenario:

The section was left blank on purpose. **Option 2 was selected**. (N/A)

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2)*	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.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent)

The section was left blank on purpose. **Option 2 was selected**. (N/A)

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources 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.2)*	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

The section was left blank on purpose. **Option 2 was selected**. (N/A)

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent)

The section was left blank on purpose. **Option 2 was selected**. (N/A)

D. 1.2. Option 2: - Direct monitoring of emission reductions from the project (values should be consistent with those in section E.)

D.1.2.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to table D.2)*	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
ID 1 $LFG_{total,y}$	Total amount of LFG captured	On-Line LFG flow meter	m^3	m	Continuously	100%	Daily: electronic Monthly: paper	Data will be aggregated monthly and yearly! Measured by a flow meter!
ID 2 $LFG_{flare,y}$	Amount of LFG flared	On-Line LFG flow meter	m^3	m	Continuously	100%	Daily: electronic Monthly: paper	Data will be aggregated monthly and yearly! Measured by a flow meter!
ID 3 $LFG_{electricity,y}$	Amount of LFG combusted in the power plant	On-Line LFG flow meter	m^3	m	Continuously	100%	Daily: electronic Monthly: paper	Data will be aggregated monthly and yearly! Measured by a flow meter!
ID 4 T	Temperature of the LFG	Temperatur e sensor	^oC	m	Continuous	100%	Daily: electronic Monthly: paper	Measured to determine the density of methane D_{CH4}! No separate monitoring of temperature is necessary when using flow meters that automatically measure temperature and pressure, expressing LFG volumes in

								normalized cubic meters.
ID 5 p	Pressure of the LFG	Pressure sensor	Pa	m	Continuous	100%	Daily: electronic Monthly: paper	Measured to determine the density of methane D_{CH4}! No separate monitoring of temperature is necessary when using flow meters that automatically measure temperature and pressure, expressing LFG volumes in normalized cubic meters.
ID 6 D_{CH4}	Methane density of the LFG	Calculation	Ton CH_4/m^3 CH_4	c	Daily	100%	Daily: electronic Monthly: paper	Data will be used to calculate the methane destroyed!
ID 7 $w_{CH4,y}$	Methane fraction in the landfill gas	On-Line LFG analyzer	m^3CH_4 $/m^3LFG$	m	Continuous	100%	Daily: electronic Monthly: Paper	Measured by continuous gas quality analyser!
ID 8 FE	(1) flare availability / (2) combustion efficiency	Timer Samples	%	m/c	(1) continuously (2) Enclosed flares shall be monitored yearly, with the first measurement to be made at the time of installation	100%	Daily: electronic Monthly: Paper	(1) The flare operation shall be continuously monitored by continuous measurement of operation time of flare using a run time meter connected to a flame detector or a flame continuous temperature controller, irrespective of whether the flare efficiency is monitored. (2) Periodic measurement of methane content of flare exhaust gas. (3) The enclosed flares shall be

								operated and maintained as per the specifications prescribed by the manufacturer.
ID 9	Total amount of electricity and/or other energy carriers used in the project for gas pumping	Electricity meter	MWh	m	Bi-monthly	100%	Electronic/ paper	Required to determine CO_2 emissions from use of electricity or other energy carriers to operate the project activity. The records of any electricity imported in the baseline too should be recorded at the start of project.
ID 10	CO_2 emission intensity of the electricity and/or other energy carriers in ID10	Calculated	tCO_2/ MWh	c	Annually	100%	Daily: electronic Monthly: paper	Required to determine CO_2 emissions from use of electricity for the project activity!
ID 11	Legislation and regulatory requirements relating to LFG projects	Local regulatory framework	Test	n/a	Annually	100%	Periodically	Required for any changes to the adjustment factor (AF) or directly $MD_{reg, y}$!

It is noted that items related to electricity or thermal energy output in approved consolidated monitoring methodology ACM0001 are not components of the proposed project activity. Additionally, all data will be archived during the crediting period and for two years after.

D.1.2.2. Description of formulae used to calculate project emissions (for each gas, source etc.; emissions/emission reduction in units of CO_2 equivalent):

Not applicable. In this project and according to ACM0001, project emissions will not be monitored nor measured, instead emission reductions will be directly measured, as explained in section D.1.4.

D.1.3. Treatment of leakage in the monitoring plan:

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:

ID number *(Please use numbers to ease cross-referencing to table D.2)*	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

No leakage effects need to be accounted under methodology ACM0001.

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent)

No leakage effects need to be accounted under methodology ACM0001.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission in units of CO_2 equivalent):

Following the chosen methodology **ACM0001**, the emission reductions achieved by the project activity during a given year "*y*" (***ERy***) will be calculated as the difference between the amount of methane actually destroyed during the year ($MD_{project,y}$) and the amount of methane that would have been destroyed during the year in the absence of the project activity ($MD_{reg,y}$), times the approved Global Warming Potential value for methane (GWP_{CH4}), plus the net quantity of electricity displaced during the year (EG_y) multiplied by the CO_2 emissions intensity of the electricity displaced ($CEF_{electricity,y}$), plus the quantity of thermal energy displaced during the year (ET_y) multiplied by the CO_2 emissions intensity of the thermal energy displaced ($CEF_{thermal,y}$).

$$ER_y = (MD_{project,y} - MD_{reg,y}) \times GWP_{CH4} + EG_y \times CEF_{electricity,y} + ET_y \times CEF_{thermal,y}$$

where:

ER_y	emission reductions [tons CO_{2eq}/year]
$MD_{project,y}$	is the methane destroyed by flaring [ton CH_4/year]
$MD_{reg,y}$	is the amount of methane, that would have been destroyed during the year in the absence of the project activity [ton CH_4/year] $MD_{reg} = MD_{project} * AF$, where for the proposed project activity AF is **zero**, because there are currently no legal requirements to capture LFG on the landfills in the Russian Federation.
GWP	is the Global Warming Potential value for methane 21 [ton CO_{2eq} / ton CH_4]
EG_y	is net quantity of electricity displaced during a given period t, measured in [MWh];
$CEF_{electricity,y}$	is the CO_2 emissions intensity of the electricity displaced, measured in [ton CO_{2eq}/MWh];
ET_y	is the quantity of thermal energy displaced, measured in TeraJoules [TJ];
$CEF_{thermal,y}$	is the CO_2 emissions intensity of the thermal energy displaced, measured in [ton CO_{2eq}/TJ].

It is noted that while the terms for electricity and thermal energy have been included to be consistent with the overall formulation stated in ACM0001, energy displacement is not a component of the proposed project activity. As a result, the above equation is reduced to the following form for the project activity:

$$ER_y = (MD_{project,y} - MD_{reg,y}) * GWP_{CH4} - E_{project.activity}$$

For the proposed project activity, $MD_{electricity} (EG_y \times CEF_{electricity,y}) = MD_{thermal} (ET_y \times CEF_{thermal,y}) = 0$, as there is no energy displacement component of the project. $MD_{reg,y} = 0$ because of AF = 0. As a result, the total actual quantity of methane captured and destroyed will be metered *ex post* once the project activity is operational, and:

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

and

$$MD_{flared,y} = LFG_{flared,y} \times w_{CH4,y} \times D_{CH4} \times FE$$

$$MD_{electricity} = LFG_{electricity} \times w_{CH4,y} \times D_{CH4}$$

where:

$MD_{flared,y}$	is the quantity of methane destroyed by flaring [ton CH_4/year]
$MD_{electricity}$	is the quantity of methane destroyed by generation of electricity [ton CH_4/year]
$LFG_{flared,y}$	is the quantity of landfill gas flared during the year (see section D.1.2.1. ID2)
$LFG_{electricity}$	is the quantity of landfill gas fed into the electricity generator (see section D.1.2.1. ID3)
$w_{CH4,y}$	is the methane fraction of the landfill gas (see section D.1.2.1. ID7)
D_{CH4}	is the methane density (see section D.1.2.1. ID6)
FE	is the flare efficiency (see section D.1.2.1. ID8)

The volumetric flows of landfill gas (***$LFG_{flared,y}$***) to the flare and to the gas engine (***$LFG_{electricity}$*****)**, as well as the methane content in the landfill gas (**$w_{CH4,y}$**) are continuously measured. The density of the methane can be calculated from the equation

$$D_{CH4}(T, p) = D_{CH4}(T_0,p_0) \times (p_1 - p_0) / (T_1 - T_0),$$

where $D_{CH4}(T_0, p_0) = 0.0007168\ t_{CH4}/m^3_{CH4}$ (Density of methane at normal temperature and pressure T_0 = 273.15 K, p_0 = 101300 Pa)

The Flare efficiency FE is measured as the fraction of time the flare is functioning (burning the gas) multiplied by the efficiency of the flaring process.

$FE = T_{flare} \times (1-\eta_{flare})$, *where*

T_{flare} = *Flare operating time in %*

η_{flare} = *Measured flare combustion efficiency as of amount of CH_4 left in the flare gas from the amount going into the flare in %.*

It is envisaged that the electricity needed for operation of the landfill gas recovery equipment will be produced by combustion of LFG in the gas engine. During shutdown periods the electricity has to be taken from the grid. The emissions caused by the consumed electricity taken from the grid will be calculated as:

$E_{project.activity} = EG_y \times CEF_{electricity}$, where

EG_y ***(ID9)*** = the electricity consumption from the grid measured in MWh

$CEF_{electricity}$ ***(ID10)*** = CO_2 emission intensity of the electricity consumed in tCO_2/MWh

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

According to the responsible ministry for JI Projects (Ministry for Economic Development and Trade) in the Russian Federation the there are no requirements of monitoring environmental impacts of the project.

D.2. 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.
Table D.1.2.1 ID 1-3	Low	Flowmeter will be subject to regular maintenance according to the technical specifications from the manufacturers to ensure accuracy and good performance.
Table D.1.2.1 ID 4-5	Low	Temperature and pressure sensors will be subject to regular maintenance according to the technical specifications from the manufacturers to ensure accuracy and good performance.
Table D.1.2.1 ID 7	Low	Gas analysers (LFG quality) will be subject to regular maintenance and calibration procedures according to the technical specifications from the manufacturers to ensure accuracy and good performance.
Table D.1.2.1 ID 8 (combustion efficiency)	Medium	Regular maintenance will ensure optimal operations of the flare. Flare efficiency will be checked annually to verify deviation from the estimated value.
Table D.1.2.1 ID 8 (flare availability)	Low	Timer device will be subject to regular maintenance to ensure accuracy.
Table D.1.2.1 ID 9	Low	Calibration of equipment as per manufacturer specifications to ensure validity of data measured.
Table D.1.2.1 ID 10	Low	Not applicable.

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

All continuously measured parameters (LFG flow, temperature, pressure, CH_4 concentration and flare operating hours) will be recorded electronically via a data logger, which will have the capability to aggregate and print the collected data at the frequencies as specified above.

Before commencement of the O&M phase, a training and quality control program will be enacted to ensure that good management practices are ensured and implemented by all project operating personnel in terms of record-keeping, equipment calibration, overall maintenance, and procedures for corrective action. An operations manual will be developed for the operating personnel. The procedures for filling data and calculations to be performed by the LFG management operator will be included in a daily log to be placed in the main control room.

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

Name of Entities Determining the Monitoring plan: The Monitoring plan was determined by the Energy Changes Projektentwicklung GmbH. The details of the Monitoring plan are provided in Annex 3 contact information is presented below:

Energy Changes GmbH

Zip code + city postal address:	Kirchengasse 43/11, 1070 Vienna
Country:	Austria
Telephone number:	+43/664/164 62 05
Fax number:	+43/1/994 99 69 - 40
Email:	christian.praher@energy-changes.com
URL:	www.energy-changes.com

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

The anthropogenic emissions that would occur within the boundary of the project when the project activities (LFG capture and destruction) are in operation can be described as follows:

1. methane emissions due to not captured LFG *(1-RE)*
2. methane emissions in the flare due to the flare efficiency *(1-FE)*
3. CO_2 emissions in the flare due to the CO_2 contained in the captured LFG that remain unchanged during the combustion process
4. CO_2 emissions in the flare due to the combustion of methane
5. CO_2 emissions resulting from electricity used by LFG pumping equipment

The sources of emissions (3. and 4.) are part of the natural CO_2 biological cycle and considered neutral to the atmosphere; therefore these CO_2 emissions are not considered in this project.

The methane emissions due to the not captured LFG (1.) can be estimated from the following equation:

$$PE_{y1} = CH_{4,y} \text{ x } D_{CH4} \text{ x } (1-RE) \text{ x } GWP_{CH4}$$
$$PE_{y1} \text{ (in ton } CO_{2eq}\text{/year)}$$

The methane emissions in the flare due to the flare efficiency (2.) can be estimated from the following equation:

$$PE_{y2} = CH_{4,y} \text{ x } D_{CH4} \text{ x } RE \text{ x } (1-FE) \text{ x } GWP_{CH4}$$
$$PE_{y2} \text{ (in ton } CO_{2eq}\text{/year)}$$

Sum of above mentioned CH_4 - Emissions

Both sources of anthropogenic GHG are defined as the project emissions *(PE_y)* and can be estimated from de following equation:

$$PE_y = CH_{4,y} \text{ x } D_{CH4} \text{ x } (1-RE) \text{ x } GWP_{CH4} + CH_{4,y} \text{ x } D_{CH4} \text{ x } RE \text{ x } (1-FE) \text{ x } GWP_{CH4} = PE_{y1} + PE_{y2}$$

PE_y	estimated project emissions from non captured and due to non combusted methane in [tons CO_{2eq}]
$CH_{4,y}$	is the total methane generated at the landfill in [m^3 of CH_4] and is obtained by using the FOD model explained in section E 4
D_{CH4}	is the methane density in [kg/m³ of CH_4]
RE	is the recovery rate of the LFG
FE	is the flare efficiency (combustion of the methane) and
GWP_{CH4}	is the global warming factor of methane (GWP = 21).

Table 5 (below) presents the MSW waste tonnage accepted at Dmitrovskij landfill site (according to figures from the GUP "ECOTECHPROM") and the methane emission estimates based on the FOD model described below in section E.4. It is noted that the values presented in Table 5 represent modelled quantities of methane generation for the stated time period.

According to the description of the project activity under section A.2 there is still a free capacity of the landfill site of about 4.800.000 tons of MSW (State: 01.01.2006).

The actual amount of GHGs reduced will be calculated based on the actual quantities of LFG collected and flared.

Table 5: Methane Emissions Estimate for the Dmitrovskij Landfill site

Waste		***Emissions***
Quantity		tons CH_4/year
Year	***(tons)***	
1995		
1996	82.100	
1997	216.000	
1998	265.500	
1999	455.000	
2000	543.300	
2001	599.600	
2002	735.500	
2003	958.800	
2004	990.900	
2005	850.400	
2006	1.200.000	
2007	1.200.000	
2008	1.200.000	40.034,8
2009	1.200.000	43.903,9
2010	0	40.504,5
2011	0	37.368,3
2012	0	34.474,9
Sum		**196.286,5**

The total methane emissions in the absence of the project activity during the crediting period (2008 – 2012) are calculated as **196.287** tons of methane (CH_4) for the landfill site Dmitrovskij. This is equal to **4.122.016** tons of CO_{2eq} over the crediting period.The figures above are calculated under assumption that generated LFG is composed of 50% methane.

The landfill gas collection system will capture only a portion of the generated landfill gas. The other part is one source of methane project emissions due the not-captured LFG [(*1-RE*) (1.)]. Due to the fact, that parts of the landfill site will still be in operation at the beginning of the commitment period a conservative estimate of 50% LFG collection was applied for the years 2008 to 2010 and a still conservative estimate of 60% LFG collection was applied for the years 2011 to 2012 of the estimated amount of produced LFG (see section E.4.). During operation phase, no landfill gas recovery systems will be installed on those parts, because of the danger of breakdowns of piping systems.

Table 6 illustrates the quantities of methane captured and not captured (depending on the recovery rate RE) by the project activity during the crediting period.

Table 6: Estimated quantities of methane captured and not captured by the LFG collection system

Year	*Percentage of Methane Captured (RE)*	*Amount of Methane Captured by Project Activity*	*Amount of Methane Not Captured by Project Activity*	*Amount of Methane Captured by Project Activity*	*Amount of Methane Not Captured by Project Activity*
		(tons CH_4/year)	(tons CH_4/year)	(tons CO_{2eq}/year)	(tons CO_{2eq}/year)
2008	50%	20.017,4	20.017,4	420.366	420.366
2009	50%	21.952,0	21.952,0	460.991	460.991
2010	50%	20.252,3	20.252,3	425.297	425.297
2011	60%	22.421,0	14.947,3	470.841	313.894
2012	60%	20.685,0	13.790,0	434.384	289.589
Sum		**105.327,7**	**90.959,0**	**2.211.879**	**1.910.137**

The total methane captured on the landfill site Dmitrovskij during the crediting period is estimated as **105.328** tons of methane (CH_4), which is equal to **2.211.879** tons of CO_{2eq}.

The flare efficiency (FE) is assumed to be approximately 97 %. A second source of project emissions is the not combusted methane in the flare. These project emissions can be described as (*1-FE*) [(2.)] As required, not combusted methane will be measured and accounted for according to the requirements set forth in methodology ACM0001.

In case of combusting landfill gas (LFG) in gas engines a flare efficiency must not be considered. Since *ex ante* the amount of LFG, which is flared is not known, it was estimated that all of the LFG will be flared. This represents a conservative estimation.

Project activity emissions from not combusted methane are summarized in Table 7.

Table 7: Emissions resulting from not combusted methane in the project activity

Year	*Destruction Efficiency of Enclosed Flare*	*Amount of not combusted methane* (tons CH_4/year)	*Amount of not combusted methane in* (tons CO_{2eq}/year)
2008	97%	600,5	12.611,0
2009	97%	658,6	13.829,7
2010	97%	607,6	12.758,9
2011	97%	672,6	14.125,2
2012	97%	620,5	13.031,5
2008-2012		**3.159,8**	**66.356,3**

As a result, the total emissions attributed to this source of project emissions are estimated as **66.356,3** tons CO_{2eq} for Dmitrovskij landfill site over the duration of the crediting period.

It is envisaged that the electricity needed for operation of the landfill gas recovery equipment will be produced by combustion of LFG in the gas engine. During shutdown periods of the gas engine the electricity has to be taken from the grid.

In order to stay on the conservative side it was assumed that the electricity has to be taken from the grid during the whole year. By choosing this approach, the CO_2 emissions resulting from electricity used by LFG pumping equipment [(5.)] were estimated based on an electricity consumption of 876 MWh/year (100kW, 8760 h) and the emission factors of the electricity grid for the Russian Federation. (*Source: ERUPT 4: Guidelines – Volume 1 Table B1:2008)*. The calculation yields project emissions of **2.155** tons of CO_{2eq}. These project emissions are summarized in Table 8 below.

Table 8: Emission factors and estimated project emissions from LFG pumping equipment for the Dmitrovskij landfill site

Emission factor for the Russian federation for JI projects generating electricity		Estimated emissions from the project activity on site
Year	$kgCO_2/MWh$	$tonsCO_2/year$
2008	504	442
2009	498	436
2010	492	431
2011	486	426
2012	479	420
2008-2012		**2.155**

Table 9 shows the summary of all the Project emissions (E1) mentioned above:

Table 9: Summary of the project emissions (E1)

Year	*Amount of Methane Not Captured by Project Activity* (tons CO_{2eq}/year)	*Amount of not combusted Methane in* (tons CO_{2eq}/year)	*Estimated emissions from the project activity on site* (tons CO_{2eq}/year)	*Sum of all the project emissions in* (tons CO_{2eq}/year)
2008	420.366	12.611,0	442	433.418
2009	460.991	13.829,7	436	475.257
2010	425.297	12.758,9	431	438.487
2011	313.894	14.125,2	426	328.445
2012	289.589	13.031,5	420	303.041
Sum	**1.910.137**	**66.356,3**	**2.155**	**1.978.648**

E.2. Estimated leakage:

No leakage effects need to be accounted under methodology ACM0001 (E.2 = 0).

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

Table 10 presents the total project activity emissions, attributable to non captured methane emissions, not combusted methane release and emissions associated with electrical consumption during the crediting period. As mentioned above E.2 = 0. Therefore Table 10 is equivalent to Table 9 in section E.1.

Table 10: Total Project Activity Emissions

Year	*Amount of Methane Not Captured by Project Activity* (tons CO_{2eq}/year)	*Amount of not combusted Methane in* (tons CO_{2eq}/year)	*Estimated emissions from the project activity on site* (tons CO_{2eq}/year)	*Sum of all the project emissions in* (tons CO2eq/year)
2008	420.366	12.611,0	442	433.418
2009	460.991	13.829,7	436	475.257
2010	425.297	12.758,9	431	438.487
2011	313.894	14.125,2	426	328.445
2012	289.589	13.031,5	420	303.041
Sum	**1.910.137**	**66.356,3**	**2.155**	**1.978.648**

E.4. Estimated baseline emissions:

The GHG emissions by sources of the baseline are represented by the amount of methane contained in the landfill gas ($CH_{4,y}$) that is currently released to the atmosphere.

The model which is chosen for the landfill gas potential calculation is the approved FOD (First Order Decay) methodology for Emission Calculation of „Residual Waste of Tabasaran - Rettenberger".

There are some reasons for choosing the methodology of „Residual Waste of Tabasaran - Rettenberger":

1. The methodology contains just 3 main parameters, which have to be verified (DOC, Temperature and k-value).

2. The Tabasaran - Rettenberger approach shows conservative results in comparison to the IPCC and EPA First Order Decay model.

$$G_p = 1{,}868 * DOC * (0{,}014 * T + 0{,}28)$$

$$G_t = Gp * (1 - 10^{(-kt)})$$

$$G_t' = Gp * (1 - 10^{(-kt)}) * M$$

G_p	landfill gas potential [m^3/t of humid waste]
G_t	accumulated landfill gas after t years / ton of waste [m3/t of humid waste]
G_t'	accumulated landfill gas after t years for the whole amount of disposed waste [m^3 humid waste]
DOC	bio-degradable organic carbon content of deposited waste [kg C/t of humid waste]
T	mean temperature of disposal site [^oC]
k	degradation constant [$year^{-1}$]
t	age of the waste in years [a]

Estimated input parameters for the calculation: (Assumptions are chosen in a conservative manner!)

M	total amount of disposed waste [tons/year] (Only the waste amounts since 1996 were considered, although the landfill site is in operation since 1990)
DOC	**160 kg/ton** of humid waste (conservative assumption) (Taking the waste composition for MSW in the Russian Federation and calculating the DOC after the equation according to IPCC the results are laying between 160 kg/ton and 230 kg/ton). The IPCC default value for the Russian Federation is **170 kg/ton.**
T	**30°C** (conservative assumption) (The IPCC default value is 35°C, which corresponds to a default value of DOC_F = 0,77)
k	**0,035** (conservative assumption) (The IPCC suggests to use a k- value of 0,05 (a half life time of 14 years) as default value, if no exact data on types of waste are available.) (The most likely decay time for St. Petersburg is approx. 10 to 15 years, which corresponds with k – values of 0,046 to 0,07 according to the source mentioned below.) *Source: Sampi Lappalainen, Petri Kuovo: Evaluation of Greenhouse gas emissions from St. Petersburg area – utilization in energy production, METGAS, Lappeenranta University of Technology, Northern Dimension Research Centre; P.O.Box 20; FIN-53851 Lappeenranta; Finnland*

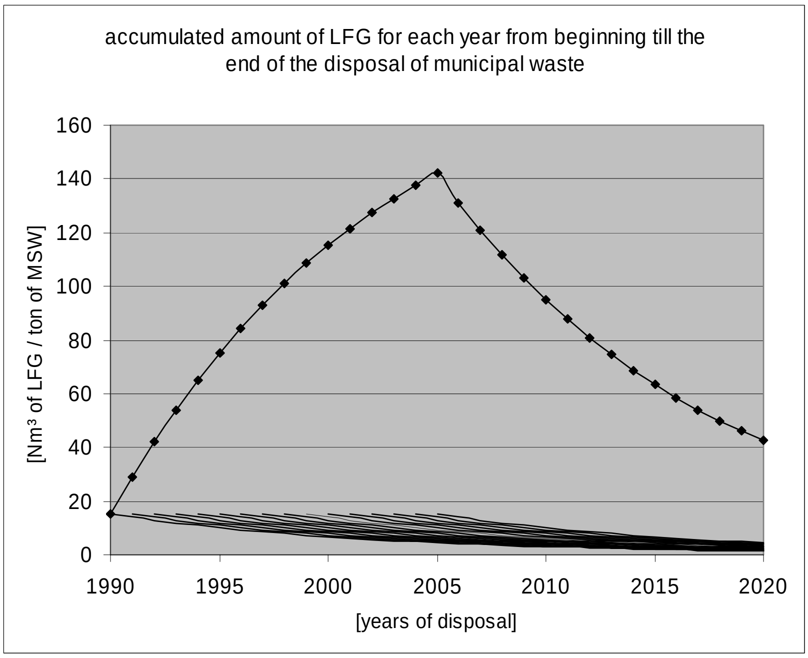
To determine the total amount of landfill gas emissions for a specific year, the amounts of LFG generated from waste, which has been disposed in the years before the specific year must be added to the amount of LFG generated from waste of the specific year.

(e.g. Supposing that waste disposal has started in the year 1990, the amount of LFG emissions for the year 1991 consists of the emissions, which waste disposed already in 1990 still produces during the year 1991 and the emissions, which waste disposed in 1991 produces during the year 1991.)

1990: $G_1 = G_{11} = Gp * (1-10^{(-k*1)}) * M_1$
1991: $G_2 = G_{12} + G_{21} = [(1-10^{(-k*2)}) - (1-10^{(-k*1)})] * Gp * M_1 + Gp * (1-10^{(-k*1)}) * M_2$

To determine the total amount of landfill gas emissions during the commitment period the amounts generated between the years 2008 and 2012 and calculated as shown above are to be summed up.

The following figure shows the results of above mentioned approach.



Based on the model projections of total emissions illustrated above, for the Dmitrovskij landfill site the total methane emissions in the baseline scenario (no collection or destruction of methane at the site) for the crediting period are **4.122.016** tons of CO_{2eq}.

Table 11: Estimated emissions due to the baseline scenario (full release of LFG to the atmosphere)

Year	*Estimated baseline emissions in* (tons CH_4/year)	*Estimated baseline emissions in* (tons CO_{2eq}/year)
2008	40.034,8	840.731,4
2009	43.903,9	921.982,5
2010	40.504,5	850.594,7
2011	37.368,3	784.734,4
2012	34.474,9	723.973,5
Sum	**196.286,5**	**4.122.016,4**

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

The total emission reduction of the project activity at the landfill site Dmitrovskij is the difference between E.4 and E.3 and results in an estimated emission reduction of **2.143.368** tons of CO_{2eq} between 2008 and 2012.

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

Table 12 summarizes the net emission reduction associated with the project activity.

Table 12: Total Project Activity Emissions for the landfill site Dmitrovskij:

Year	*Sum of all the project emissions in* (tons CO_{2eq}/year)	*Estimated baseline emissions in* (tons CO_{2eq}/year)	*Estimation of leakage* (tons of CO_{2eq})	*Estimation of Net Emission Reductions* (tons of CO_{2eq})
2008	433.418	840.731,4	0	407.313
2009	475.257	921.982,5	0	446.725
2010	438.487	850.594,7	0	412.107
2011	328.445	784.734,4	0	456.290
2012	303.041	723.973,5	0	420.933
Total (tons of CO_{2eq}**)**	**1.978.648**	**4.122.016,4**	**0**	**2.143.368**

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:

In the baseline situation landfill gas is generated as a result of decomposition of municipal waste under anaerobic conditions. It is mainly composed of carbon dioxide and methane. Carbon dioxide and methane are greenhouse gases, which do not cause harmful effects to the local environment, but rather affect global warming and economic value of the area where the landfill is implemented.

In the baseline situation, emissions of methane from the landfill are associated with the following negative impacts:

- Undesirable odour, nuisance especially for human settlements surrounding the landfill area.
- Methane migration destroying vegetation next to the landfill or on the rehabilitated landfill compartments
- Safety and health risks to landfills staff due to generation of methane concentration above safe limits as well as explosions and fires at the landfill site.
- Potential for landfill fires and the associated release of incomplete combustion products.
- Slowing down of the mineralisation process of the waste body leading to more leachate generation and leachate seeping

A very small percentage of volatile organic compounds (VOCs) is also found in the landfill gas, contributing to the undesirable odour. VOCs emissions are photo chemically reactive, and result in the formation of tropospheric ozone. The latter might cause adverse effects to the respiratory system such as breathing difficulties and aggravated Asthma, and damages to crops and plants. VOCs are also known for their toxicity and carcinogenic effect from chronic exposure. However, since the landfill gas contains a very small percentage of VOCs, impact on air quality is expected to be minimal.

Overall, the project activity leads to positive environmental impacts which contribute to the sustainable development of the area and no significant negative impacts are expected.

The risk from collecting, pumping and treatment of landfill gas can be properly controlled. Controls include equipment safety precautions (such as alarms, safety valves, and automatic shutdown), daily inspection, and fire fighting extinguishers.

In the project activity, flaring of the collected biogas will destroy methane and thus will mitigate the above mentioned negative impacts.

Methane is a greenhouse gas, known for its contribution to global warming. The proposed project main activity is combusting the landfill gas to convert methane to carbon dioxide. Therefore, the project will result in positive environmental impacts where it will lead to a decrease in the amount of greenhouse gases released to the atmosphere.

While the LFG collection and utilization system will minimize explosion risks from methane emissions on the whole landfill site, there are obviously some risks associated with the operation of the flare, similar to any other industrial risks involving a source of fire.

The LFG collection and utilization might also lead to some minor CO, NOx and VOCs emissions. However, thanks to the sophisticated combustion and to the high burning temperature (over 1000°C) an almost total destruction of the gases is ensured. In that way, emissions of CO, NOx and VOCs and other compounds present in the biogas such as ammonia will be minimal, and much lower anyway to what it would occurr in the absence of the project activity.

Overall, the minimum required 10 meters height chimney will ensure for all emitted gases to be properly evacuated and dissolved into the atmosphere, with very limited impacts to the surrounding local environment and population.

Further, the driving force for subsurface migration of landfill gas and landfill gas components is minimized, protecting adjacent buildings and water bodies.

There is minimal visual impact from the flare, and noise and vibration will be limited to the localized site.

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

In the Russian Federation (RE) every project with the mere potential of having an impact on the environment is likely to go through an ecological project assessment procedure, with the aim to obtain project implementation permission.

In fact the whole ecological project assessment procedure consists of three parts which are strongly interconnected. It starts with the Environmental Impact Assessment (EIA), which in Russian administrative law procedure is called "OVOS" (Ocenka Vozdejstvija na Okrujajushuju Sredu). This assessment forms an integral part of any pre- and project documentation. The main task of the EIA is to reveal the environmental situation and all the potential and likely impact before, during and after project implementation. Project documentation without or without a sound EIA is considered incomplete and not accepted by any concerned department during project approval procedure.

Step two and three are combined in the so called Ecological Assessment (EA), which is lead by a specially formed commission with members from all different sides of project interests.

Ecological Assessment (EA) comprises the "State" - Ecological Assessment (SEA) in Russian "Gosudarstvenaja Ekologitsheskaja Ekspertiza (GEE)" and the "Public" - Ecological Assessment (PEA) in Russian "Obshestvenaja Ekologitsheskaja Ekspertiza (OEE).

The PEA is a kind of public hearing, in which civil society through neighbors and NGOs should play an active role. PEA is not in all the cases obligatory and depends mainly on project size and impact risks.

The SEA is obligatory and always taking place. Its main task is to lead the whole assessment project, also the public one and to take into consideration and check the EIA (OVOS) on its soundness, clearness, state-of-the art level and data basis.

In brief, it can be said that the whole process starts with the working out of the EIA, by an scientific institute, which forms an essential part of the project documentation. Then a state commission is formed to asses the project during the so called "State"- Ecological Assessment (SEA). A public hearing (PEA) can take place dependent of the project type and size. The whole process ends with a negative or positive project assessment by the state commission.

The whole procedure finds its legitimacy in the following laws and regulations:

- **"The Federal Law on Environmental Protection** from January 10th 2002", Nr. 7-FZ (with amendments from August 22nd, December 29th 2004 and May 9th, December 31st 2005)

- **"The Federal Law on Ecological Assessment** from November 23rd 1995", Nr. 174-FZ (with amendments form April 15th 1998, August 22nd, December 21st, 29th 2004 and December 31st 2005)

- **"The Regulation on Environmental Impact Assessment of Planed Economical and other Activities in the Russian Federation (2002)"** enacted by an Order of the State Committee for Ecology of the RF on May 16th 2000, Nr. 372.

- Decrees of the Government of the RF as for example the Regulations **"on the State - Ecological Assessment Procedure"** from June 11th 1996, Nr. 698 and **"on the Federal Service for Control in the sphere of Use of Natural Resources"** form July 30th 2004, Nr. 400

- Additional regulations, which were enacted by an Order of the State Committee for Ecology of the RF (Goskomekologija) as for instance the Regulations **"(Reglament) on the State - Ecological Assessment Procedure"** from June 17th 1997 Nr. 280; **"on tariffs of payment for State - Ecological Assessment Documentation"** form April 22nd 1998, Nr. 238; **"on Environmental Impact Assessment of Planed Economical and other Activities**" from May 16th 2000, Nr. 372 (see above).

- And an explicatory interpretation **"On State-Ecological Assessment concerning companies with foreign investment"** proclaimed by the Ministry of Natural Resources of the RF and the Russian Agency for International Cooperation and Development from 19th, 20th May 1993 Nr. 02-12/65-1571, 3.14.2-3/312

- Pure technical documents and materials: Although they are not considered to be legal documents they are taken into consideration during EIA and EA procedures. Mainly they consist of State Standards, and classificatory lists as the well know GOST, SNiP, SP, SanPiN - Rules and Standards. Instructions, methodical documents and recommendations are also part of this group of pure technical documents. These normative-technical documents contain specific quantitative norms, indices and other criteria to control conformity of the proposed solutions with ecological requirements.

Although it can be concluded that the project impact will be positive in any case because it will strongly improve the ecological situation on and around the landfill site, the project activity bears an impact potential, which will have to be assessed. Thus an EA (Ecological Assessment) including the EIA (Environmental Impact Assessment) has to be conducted for the project activity.

Three years ago an Environmental Impact Assessment (EIA) was conducted in order to get the building permit for the erection of the new compartment 3, which is currently not in service yet. This EIA process was finalized in a positive way. Within the scope of the EIA an active landfill gas recovery system was approved as well. Part of the EIA was a neighbourhood participation (stakeholder) process, where comments of the public and people living adjacent to the landfill were taken into account.

Thus both the EIA and the Stakeholder process can be regarded as finalized positively.

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

As mentioned under section F.2. a neighbourhood participation (stakeholder) process was conducted during the Environmental Impact Assessment., where comments of the public and people living adjacent to the landfill were taken into account.

According to the Ministry for Economic Development and Trade (MEDT of RF), there are no guidelines issued by the DNA (Designated National Authority) of the Russian Federation, which specify the stakeholder process for JI - projects. Therefore, the stakeholder process conducted during the EIA can be regarded as appropriate.

Thus both the EIA and the Stakeholder process can be regarded as finalized in a positive way.

Nevertheless some kinds of Stakeholder processes were conducted additionally by the project applicant. These processes are shown as follows:

1. Participation and presentation of JI-projects together with GUP "Ekosistema" at the fair "Moscow oblast" 2005. The fair took place from September 28th to October 2nd 2005. The fair was visited and attended by the government of the Moscow oblast, law makers of the Moscow oblast Duma and millions of visitors living in the City of Moscow and the Moscow region (oblast).

   The stand and the round table, where GUP "Ekosistema" and "Ecocom Climate Protection GmbH" presented the JI Projects "Landfill gas recovery in Moscow", were attended on the first and the second day of the fair by:

   - the Governor of the Moscow Oblast – Mr. Gromov .B.V.
   - the Minister of Ecology and Use of Natural Resources of the Moscow Oblast – Mrs. Katshan A.S.
   - the Deputy Minister of Ecology and Use of Natural Resources of the Moscow Oblast – Mr. Karcev J.A.

2. Seminar and JI-project presentation in November 2005 in the conference room of GUP "Ekosistema" in ul. Obrutsheva, d. 46, Moscow, 117342, Russian Federation, which was attended by members of the Moscow oblast Duma's Committee for Environmental Protection, advisors to the Federal Government of the RF and famous and well-known professors of science institutes.

Project participants of the seminar were:

- The General Director of GUP Ekosistema and its whole staff
- Mr. Oliver Kayser from Ecocom Climate Protection Umweltschutz GmbH
- Mr. Lifshits A.B., General Director of Geopolis, which is the only expert in Russia as far as landfill gas collection and utilization is concerned.
- Mr. Tshumakov A.N., Head of Programs for Ecological Improvement of Russian Regions, Member of the Russian Academy of Science
- The Committee for Ecology of the Moscow Oblast Duma

3. Survey and control of all Moscow oblast landfills including JI-project presentation and explications realized by GUP “Ekosistema” together with “Rostechnadzor” (Federal Department for Licensing) in January – February 2006 at the Conference room of GUP Ekosistema.

4. On the 29th of June 2006 a Letter of information with project description of the JI – Projects “Chmetevo” and “Dmitrovskij” plus the PDDs “Chmetevo” and “Dmitrovskij” enclosed to the letter of information were sent to:

    - the Mayor of Moscow – Mr. Lushkov Ju. M.
    - the first Vice-Mayor of Moscow – Mr. Aksenov P. N., responsible for the Moscow City Municipal Service Complex
    - the Chief of the Moscow City Department for the organization of the Moscow industrial and consumption waste neutralization and treatment – Mr. Fjodorov L.G.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organization:	ECOCOM Climate Protection Umweltschutz GmbH	
Street/P.O.Box:	Höhenstrasse 100d/ UGII	
Building:		
City:	Innsbruck	
State/Region:	Province of Tirol	
Postfix/ZIP:	6020	
Country:	Republic of Austria	
Telephone:	+43/512 272921 (Austria)	
FAX:	+43/512 272921 – 3 (Austria)	
E-Mail:	office@ecocom.at	
URL:		
Represented by:	Roland Kayser	Oliver Kayser
Title:		Mag., Bakk.
Salutation:	Mr.	Mr.
Last Name:	Kayser	Kayser
Middle Name:		
First Name:	Roland	Oliver
Department:		
Mobile:	+43/664/4153143	+43/676/6221373 +7/926/5362462 (RF)
Direct FAX:		
Direct tel:		
Personal E-Mail:	r.kayser@chello.at	oliver.kayser@chello.at

Organization:	GUP "Ecotechprom"	
Street/P.O.Box:	ul. B.Poljanka, 42	
Building:	2	
City:	Moscow	
State/Region:	Moscow City	
Postfix/ZIP:	119180	
Country:	Russian Federation	
Telephone:	+7-495-2384000	
FAX:	+7-495-2385710	
E-Mail:	company@eco-pro.ru	
URL:		
Represented by:	Smirnov A.N.	
Title:	General Director	
Salutation:	Mr.	
Last Name:	Smirnov	
Middle Name:	Nikolaevitsh	
First Name:	Aleksandr	
Department:		
Mobile:		
Direct FAX:		
Direct tel:	+7-495-2384934	
Personal E-Mail:		

Annex 2

BASELINE INFORMATION

The baseline scenario for the project activity is the uncontrolled release of landfill gas (LFG) to the atmosphere. The total estimated emissions of landfill gas to the atmosphere in the baseline scenario are estimated as **4.122.016,4** tons of CO_{2eq} during the crediting period from 2008 to 2012 for the landfill site Dmitrovskij. At present there are no measures in place to reduce methane emissions and there are no current or pending regulations that would require the specified site to reduce emissions.

Annex 3

MONITORING PLAN

1.0 Introduction and Objectives

The two primary purposes of a landfill gas monitoring plan are:

- To collect the necessary system data required for the determination and validation of certified emissions reductions (ERUs); and
- To demonstrate successful compliance with established operating and performance criteria for the system, and to verify that the ERUs have been generated.

The operational system data that is collected will be used to support the periodic report that will be required for the auditing and verification of ERUs. The monitoring plan discussed herein is designed to meet or better the UNFCCC requirements.

The routine system monitoring program required for the determination and verification of ERUs is discussed in Section 2, while the additional system data that is collected to ensure the safe, correct, and efficient operation of the landfill gas management system is discussed in Section 3.

An operations and maintenance manual together with general performance guidelines are developed. The expected performance guidelines in accordance with the data collection procedures described below will be provided with trigger levels that will be indicative, if necessary, for any follow-up assessment and possible remedial response measures.

2.0 Monitoring Work Program

The landfill gas monitoring program is a relatively simple, straight forward program designed to collect system operation data required for safe operation of the system and for the verification of ERUs. The data is collected in real time, and will provide a continuous record easy to monitor, review, and validate.

The following sections will outline and discuss following key elements of the program:

- Flow measurement;
- Gas quality measurements;
- Data records; and
- Data assessment and reporting.

2.1 Flow Measurement

The flow of landfill gas collected by the system and subsequently flared or utilized is measured via a flow measuring device suitable for measuring the velocity and volumetric flow of a gas. Two examples for such devices commonly in use are an annubar or an orifice plate. The flow measurements are taken within the piping itself, and the flow sensors are connected to a transmitter capable of collecting and sending continuous data to a recording device such as a datalogger.

The flow sensors are calibrated in accordance to a specified temperature, pressure and gas composition. For this reason the flow actually measured must be corrected according to the actual temperature, pressure and gas composition of the measured gas. The equipment selected will allow dynamic compensation of these parameters in relation to a standard temperature, pressure, and gas composition. For reporting purposes, the flows are generally required to be normalized to 0°C and 1 atm at a standard gas composition of 50% methane and carbon dioxide each by volume.

Specific calibration procedures are dependent on the actual equipment selected. However, calibration of the sensors is required on a regular basis to ensure the quality and validity of the data. The accuracy of a flow meter is dependent on the design of the equipment, and the specific type of sensor used. However, equipment is available that will provide a minimum accuracy of +/- 2% by volume. Again dependent on the equipment selected, the measured flow is aggregated approximately once per second.

All data collected will be recorded to a permanent record. Both electronic and hard copies of the data will be maintained for auditing purposes, and for calculating the ERUs.

2.2 Gas Quality

The two parameters being the most pertinent and important to the verification of ERUs, as well as the safety and efficiency of the operating system are the concentration of methane and oxygen in the gas stream. These two parameters are measured via a common sample line that is run to the main collection system piping. They are measured in real time by two separate sensors, one for methane and one for oxygen.

Although the methane and oxygen sensors do not require compensation for temperature and pressure alterations, the sensors are designed to operate under specified temperature and pressure conditions. Again, specific calibration procedures are dependent on the actual equipment selected. However, calibration of the sensors is required on a regular basis to ensure the quality and validity of the data. Regular calibration of the equipment is of utmost importance, as accuracy of methane and oxygen measurements is best in the gas stream. Equipment is available that will provide an accuracy of +/- 1% by volume. Dependent on the equipment selected gas compositions are aggregated approximately once per second.

2.3 Data Records

Data collected from each of the sensors is transmitted directly to an electronic database on which basis ERU quantity calculations may be carried out, and a hard copy backup of the data may be printed. Electronic data backup may be carried out on a daily basis, and a hard copy of the data may be printed weekly or monthly. As back up will be performed independent from the main recording system, no more than data of one day would be lost at a time due to a system malfunction. Calibration records will be kept for all instrumentation.

2.4 Data Assessment and Reporting

Assessment of the flow and composition data described above in connection with the operating hours of the flare and flare destruction efficiency are used to determine the quantity of ERUs generated. The destruction efficiency of the flare is dependent on internal combustion temperature and resident holding time, which are generally measured by the flare system controller, and recorded for auditing purposes. Comprehensive technical documentation is available documenting the destructive efficiency of the installed drum flares that will be used and which are subject to the flow rate and combustion temperature verification. Destruction efficiency will also be assessed periodically through measurements of emissions of not combusted methane.

As discussed in Section 2.1, flow data is normalized to standard temperature, pressure and gas composition for reporting purposes. The data will be compiled and assessed to produce the required quantification and verification. The annual monitoring report will contain the data required for the verification of the ERUs, and additionally may contain other operational data from the collection and flaring system described below to illustrate that the system is well maintained and operating at peak efficiency. Records of regular maintenance works performed will also be part of the annual report.

3.0 Related Monitoring

Additional operational monitoring of the landfill gas extraction and collection well field is conducted in order to optimize the system and ensure that it is operating both correctly and efficiently. Periodic adjustments to the landfill gas extraction wells will be required to optimize the collection system effectiveness. Such adjustments to the landfill gas extraction wells are undertaken upon a review of their performance history considered in the context of the overall field operation in order to maximize the extraction and collection of methane balanced against the minimization of any oxygen in the system which could introduce unsafe operating conditions. Monitoring of each landfill gas extraction well will consist of the following parameters: valve position, individual well flow, individual well vacuum, and composition of the gas collected, i.e., methane, carbon dioxide, and oxygen, using a portable measuring device.

At the time the definite landfill gas collection and utilization facility will be designed and commissioned, a specific monitoring plan tailored to the collection and utilization technology selected will be developed for this system.

Annex 4

Letter of No Objection (LoNo)

Letter of No Objection

Moscow, February 15, 2005 [sic.!]

Dear Mr. Kayser,

The Russian Federation Ministry of Economic Development and Trade has considered Your application for support of below-mentioned projects aimed at reducing GHG emissions and destined for JI project approval in accordance with Article 6 of the Kyoto Protocol to the United Nations Framework Convention on Climate Change.

- "Landfill gas recovery in Moscow – landfill site Dmitrovskij" – applicant: "Ecocom Climate Protection" GmbH, Russian Federation project partner: "Ekotechprom" GUP (Moscow)
- "Landfill gas recovery in Moscow – landfill site Chmetevo" – applicant: "Ecocom Climate Protection" GmbH, Russian Federation project partner: "Ekotechprom" GUP (Moscow)

This letter confirms the absence of any objections to further implementation of abovementioned projects in consideration of the fact that JI project approval in accordance with Article 6 of the Kyoto Protocol is obtained in compliance with international (adopted by the Parties to the Protocol) and national (adopted by the Russian Federation and the Republic of Austria) proceedings.
After the Russian Federation government has agreed on the documents, regulating consideration and approval procedures for JI projects in accordance with Article 6 of the Kyoto Protocol, the Russian Federation Ministry of Economic Development and Trade will consider the documentation of abovementioned projects and comment on it in proper form.

Yours sincerely,

I. Grečuchin
Director
Department of Property and Land Relations,
of Natural Resources Management