**JOINT IMPLEMENTATION**
**PROJECT DESIGN DOCUMENT (JI-PDD)**
**Version 02 – 9th January 2006**

## CONTENTS



## Annexes

## SECTION A. General description of project activity

### A.1 Title of the project activity:

Hungarian programme for rehabilitation of landfills through mitigation of methane gas emissions.

### A.2. Description of the project activity:

A recent investigation has shown that there are 3.200 landfills in Hungary and approx. two third of them do not meet the EU legislation and will have to be modernized or closed. The policy of the Hungarian Government is to end the operation of these landfills in accordance with the environmental requirements. Finances for closing the old landfills is available on limited scale. It is estimated that the amount of GHG released into the atmosphere from existing landfills in Hungary is estimated at approx. 90.000 tonnes $CH_4$/year.(Source: Hungary's National Communication to the UNFCCC-secretariat).
The project proposes to build and operate installations for extraction of methane gas at 2 landfills in Hungary: Nagykanizsa and Baja.

The project will be financed through the sales of ERUs and electricity generated from the collected biogas. The consortium of Supplier Hydrostab BV with its partners has large experience in landfill gas recovery in the EU, Central Europe and elsewhere. The project envisages establishing a Hungarian Fund for rehabilitation of landfills in order to facilitate the compliance with EU standards.

The volume of landfill gas to be extracted during the Kyoto period is calculated at approx.1.200 – 1.600 $Nm^3$/hour.

For successful application of the technology it is important that waste disposal methods will be improved:

- Disposal in compartments;
- Disposal with intermediate covering;
- Compacting of the waste;
- Re-circulation of percolate water;
- Final covering.

The Project will develop landfill gas extraction solutions that are appropriate to the Hungarian situation. There are a number of technical and financial problems to be solved:

- The disposal of waste does not always take place in so-called "compartments". Biogas extraction will necessitate modification of current disposal techniques;
- The composition of the biogas that is now released from the landfills is very little known. The project foresees to install modern monitoring equipment for biogas ($CH_4$, $CO_2$, $N_2$, $O_2$ etc.);
- Because of poor economical situation of the municipal budgets in Hungary generating incomes from taxes and charges on wastes is weak. Therefore it is difficult to finance the extraction and utilization of the landfill gas from local budgets. According to the expectations the proposed investments will be accelerated by the sales of AAUs and ERUs;
- The target value accepted by Hungary in the Kyoto Protocol is 92.624 Gg (i.e. -6%). The linear trend from 1994 predicts an annual 100.621 Gg for the period 2008-2012. The project assumes an opportunity to reduce GHG emissions from one of the most significant pollution-sources in the country.

Project goals:
The long-term strategic objective of the project is to contribute to better waste management and the capturing GHG-emissions from landfill sites in Hungary. In this way emission of other gases, such as $H_2S$, mercaptenes and other odorous compounds will also be reduced, which will lead to cleaner environment in the country.

By supplying GHG-neutral electricity from landfills, thus by use of local resources, Hungary will be using a domestic source for generating electric power, making the country less dependent on fossil fuels and the import of energy carriers.

The project will lead to increased economic activities in the Project regions and the country as the whole given that the construction materials and labour will be purchased locally in Hungary. Numerous local direct and indirect employments will be created during the construction time framework of approx. 36 months, increasing the overall quality of life.

Further problems in controlling and monitoring of the landfill gas extraction and utilization, and additional monitoring pollution of water, soil and air at the Project landfills, will be set up by competent staffs of the Supplier.

Hungarian old waste disposals are low-standard landfills with still insufficient gas recovery capacity. Before 1998 no measures for landfill gas extraction have been implemented. The release of biogas forms thus a fire danger and hence might eventually spread to the usually green surroundings. This is the main reason of scarcity of the zoning plans for closed/intended to be closed landfill sites. De-gasification will give an opportunity for further re-cultivation of the waste storage places and their appropriating for civil works.

Release of biogas is also a serious health risk to the operators of the landfill. Risk factors include both the existence of explosive conditions ($CH_4$ and air) as well as the presence of toxic compounds ($H_2S$).

The Project Sponsor is closely working with the Focal Point at the Government of Hungary (Ministry of Environment and Water), which is currently the operational agency responsible for climate change and JI. The Hungarian Focal Point in Budapest has indicated that a great support will be provided for the development of landfill gas projects in Hungary and that in general, landfill gas projects are eligible as a JI project. It is expected that the development of the Hungarian landfill gas project as a JI project will facilitate the development of other GHG mitigation projects in Hungary under the JI framework.

Purpose of the Project:
The purpose of the Project is to capture and process biogas from 2 landfills in Hungary. The project aims to invest into biogas collection systems and biogas recovery systems with generation of electricity at these sites.

The Project is expected to provide a long-term benefit to the reliability and environmental soundness of the Hungarian waste sector.

The Project will substantially contribute to reduction of greenhouse gases from the country.

## A.3. Project participants:

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## A.4. Technical description of the project activity:

### A.4.1. Location of the project activity:

Nagykanizsa and Baja Landfill Sites

#### A.4.1.1. Host Party(ies):

Hungary

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

Adequately Zala and Bacs-Kiskun Districts

#### A.4.1.3. City/Town/Community etc:

Adequately Nagykanizsa and Baja Cities

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

The Project landfill in Baja is fully owned by the municipality. The landfill located in Nagykanizsa is jointly owned and operated by local government and a private company Saubermacher-Ryno Kft. The

local government owns 51 percent of the Joint Venture. The facility itself is owned exclusively by the local government.[1]

The landfills included in the Project are provided with waste from larger regions. They will remain open for a longer period and the management of the landfills recognise the necessity for an upgrade of the quality of the landfills, including the investments in gas collection and utilisation.

The table below gives the site locations and present sizes of the landfills:

| Location in Hungary | Present size of landfill site (tonnes) |
|---|---|
| NSR Nagykanizsa | Approx. 1.000.000 |
| Baja Varosuzemeltetes | Approx. 900.000 |

These sites are well controlled and are provided with up-to-date management. The Supplier has developed plans for landfill gas extraction and utilization at the landfill sites.

Landfill site Nagykanizsa:
Collected waste comes from the city Nagykanizsa and 73 villages in the region. After the forming of the macro-regional waste management system in Hungary the increasing of the served householders and therefore collected waste in Nagykanizsa, is expected. There is still no pre-selection of the disposed waste.


*The top of the old part of the landfill site.*

At the existing landfill there is no bottom layer or drainage for sewage water. In 2001 there were some gas domes installed by stapling barrels.. However, the quality of the gas wells needs to be examined. The disposed wastes are compacted very well, what has a positive influence on biogas production. A biogas production at the landfill site has been observed.

The Environmental Impact Assessment has been written in 2002, however, the biogas collection system has not been included.

Preparing of the new part of the Nagykanizsa landfill has started. The bottom covering of the landfill is a clay-like soil that forms a hermetic layer. On the top of it there is already partly applied a watertight

[1] U.S. Agency for International Development and The Urban Institute in Washington, January 1999 ***East European Regional Housing Sector Assistance Project - Financial Management in Hungarian Cities: The Case of Nagykanizsa***

membrane with control drainage system for leakage water. In the nearby future there will be gas drainage with control panel applied.

*The bottom layer at the new part of the Nagykanizsa landfill and at the background – the old landfill.*

Landfill site Baja Varosuzemeltetes:
The landfill site takes waste from the city Baja and 29 surrounding villages. It is a low-tech organised waste depositing, without any installation for gas or water collection and no protection of the environment. The waste body is partly covered with a top-layer.

*Landfill site in Baja.*

The wastes are not compacted. There is no selection of waste. One Gypsy family is contracted only for collecting the garbage that is dispersed in the surroundings and for manual labour.

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

The project activity is waste management, where the emission baseline is the amount of methane that would be emitted to the atmosphere during the crediting period in the absence of the project activity. The captured gas is flared. Optionally the gas can be used for production of electrical energy but no emission reductions will be claimed for displacing or avoiding energy from other sources.

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

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 Project Sponsor has applied the technology at more than 70 landfill sites in Europe and elsewhere.

*Typical biogas extraction unit*

The envisaged investment comprises the following hardware:

- gas collection network, comprising permeable pipes, gas domes;
- high temperature gas flares;
- biogas monitoring and control equipment;
- civil works;
- gas engines with gas cleaning equipment (optionally);
- electrical connections and back supply systems from the public grid;
- telemetric and other.

The gas collection system includes a network of vertical gas extraction and horizontal gas extraction drains, de-watering units and HDPE pipelines. 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. The maintenance consists of the control of subsiding and/or distortion of the gas wells and the pipeline system. Local companies execute convalescence of these activities. The gas extraction plant is equipped with blowers, that create a suction pressure in the system necessary for extraction of the LFG. The landfill gas is flared in a 'low emission' with high temperature flare (1.200$^{o}$C, retention time 0,3 s). The projected plants are operated by an electrical control system equipped with a monitoring control system for methane, oxygen, flow, pressure and temperature.

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

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

Hungary generates yearly some 105-110 million tons of waste, of which 4-5 million tons is municipal solid waste, 20 million tons are municipal liquid waste and the rest is industrial, agricultural and other waste. The country's major incinerators are in Budapest and Győr. There are circa 3.200 municipal waste disposals in the country. Most of them are small, uncontrolled and partly illegal. Most waste is disposed

of in landfills, which do not meet environmental standards. Landfill gas extraction does not occur in old deposits.

The reason of lack of landfill gas extraction and utilization in old landfills in Hungary is their relatively small average size and the non-compact deposing of wastes. That makes gas collection less controllable and economically unattractive. In this situation no steps will be taken at the old landfill sites to extract landfill gas to minimize the migration of the LFG to the atmosphere.

Through the proposed degassing and utilization of the LFG the amount of methane not released to the atmosphere can be easily measured. If the amount of extracted and utilized landfill gas, and methane content in the landfill gas is determined, the reduction of its impact on greenhouse effect will be calculated (and converted into tonnes $CO_2$-equivalent).

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

It has been estimated that over the crediting period 280.000 tonnes $CO_2$eq will be reduced (for calculations see section E).

**A.4.5. Public funding of the project activity:**

100% of the project shall be funded by the Project Sponsor.

## SECTION B. Application of a baseline methodology

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

The proposed project uses the approved consolidated baseline methodology ACM0001 "Consolidated baseline methodology for landfill gas project activities".

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

This methodology is applicable to landfill gas capture project activities. The baseline scenario is total atmospheric release of the landfill gas. The project activities include flaring of the extracted landfill gas. Optionally the project can include producing electrical energy where no emission reductions are claimed for displacing energy from other sources. Although all possible financial revenues are taken into account in the business analyses.

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

Baseline scenario determined by applying the ACM0001 methodology:
In order to calculate the baseline emissions, an estimation of the potential landfill gas production has been performed. The quantity of methane projected to be generated during a given year is estimated using as a basis the First Order Decay model for landfill gas generation. The general formula of degradation used in this model depends on several parameters including age of waste, mass, waste composition (concentration in organic carbon) and waste temperature. (For detailed description please go to Section D.)

Project scenario:
The methodology uses economic and financial criteria to determine, whether the proposed project activity is additional. In addition, the regulatory framework should be investigated to see whether any future legal obligation would enforce the project to take place anyway. The proposed JI project consists of:

- Installation of a landfill gas recovery network over the site;
- Construction and implementation of the landfill gas extraction system;
- Drilling of extraction wells and interconnection of drains;
- Installation of flaring capacity;
- Implementation of a landfill gas power generator to supply electricity to the grid (optional).

Because of high organic content in the disposed waste at the landfills, decomposition process is very intensive. The landfill waste tends to produce several gasses relatively quickly, especially methane. Under the proposed project activity over 70% of LFG will be captured and flared. Optionally the gas can be converted into electricity. This option however must still be investigated and no emission reductions for displacing energy from other sources will be claimed.
To determine emissions reductions during the crediting period the amount of extracted and flared gas will be monitored. The amount of flared gas represents the project reductions.

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

The emission reductions generated by the proposed projects meet the CDM Executive Boards definition of additionality by using a step-wise approach:

- Identification of alternatives to the project activity;

- Investment analysis to determine that the proposed project activity is not the most economically or financially attractive;
- Barriers analysis;
- Common practice analysis;
- Impact of registration of the proposed project activity as a JI project activity.

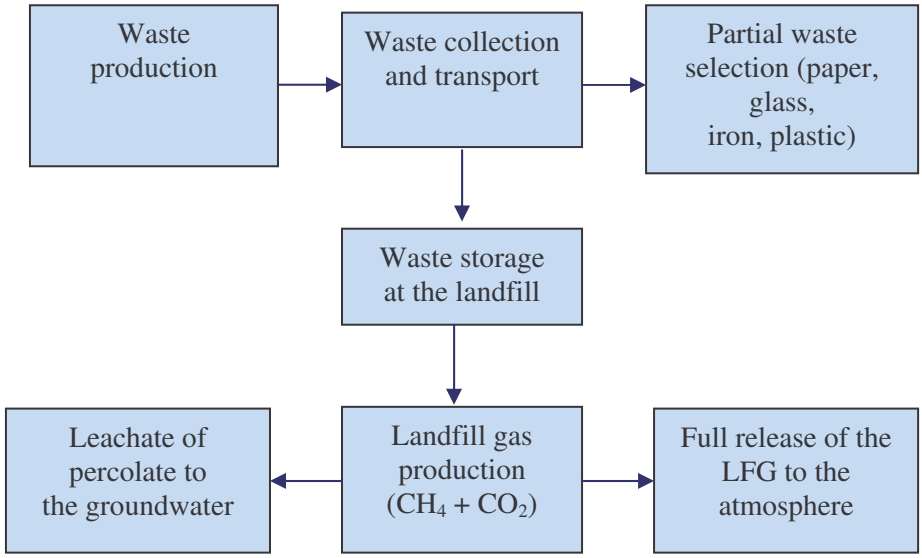
Identification of alternatives to the project activity:

| Alternative to the proposed Project | Probability |
|---|---|
| Biogas recovery does not take place | **Most probable:** Currently the technical, organisational, legal, economic and financial conditions for landfill gas recovery are not in place in Hungary |
| A modified amount of LFG is extracted | **Not probable:** This option is even more economically unattractive given the high upfront investment costs of recovery of any LFG. Also from technical point of view it is highly improbable that this kind of investment would be realised |
| Air or $O_2$ injection in the landfill takes place (= alternative technology) | **Not probable:** Given the absence of enabling conditions for LGF this option is even less attractive. It is more expensive than LFG recovery and does not produce LFG, hence does not generate economic revenues from LFG collection |
| Composition of disposed waste will significantly change or recycling will strongly increase | **Not probable:** only long-term effects will be notable (after 10-15 years); recycling has to be still developed in Hungary. |
| Different use of LFG off site | **Not probable:** alternative use would be, for example, upgrading to natural gas quality and feed it into gas pipeline, which is extremely expensive for the biogas volumes at all landfills (not economic) |
| The project is deferred with five years (delay) | **Not probable:** Lack of enabling conditions makes it not likely that LFG recovery will take place before 2012 without carbon revenues |

The most likely scenario is full release of the landfill gas to the atmosphere.

At present controlled extraction of the landfill gas does not occur at the project landfill sites. Due to the poor economical situation in the municipalities, there is lack of financial means to invest in modernisation of the waste management. It can therefore be concluded, that the project is additional.

The flow chart below presents the most likely scenario for the baseline:




Investment analysis:
The proposed project has been developed as a financially sound operation. The investments to be done will result into proper returns. This will guarantee the maximum certainty that the envisaged ERUs and AAUs will be delivered to the buyer.

Calculated Internal Rate of Return (IRR) is based on investment costs in years 2006-2012 and on incomes from sales of minimal amounts of AAUs and ERUs (280.000).

IRR calculations for the scenario Without Carbon Credits are made on basis of the baseline scenario: no gas extraction will occur, there are therefore no investments and no revenues. Internal Rate of Return is zero.

| **Scenario** | **Calculated IRR** |
|---|---|
| Without Carbon Credits | 0 % |
| With Carbon Credits (AAUs and ERUs) | +/- 16% |

It can be easily concluded that the project is not economically available without the sales of carbon credits and thus additional.

Barriers analysis:
*Risks related to the disposal of wastes*
Hungary generates yearly some 105-110 million tons of waste, of which 4-5 million tons is municipal solid waste, 20 million tons are municipal liquid waste and the rest is industrial, agricultural and other waste. The country's major incinerators are in Budapest and Győr.
There are circa 3.200 municipal waste disposals in the country. Most of them are small, uncontrolled and partly illegal. Most waste is disposed of in landfills, which do not meet environmental standards. Landfill gas extraction does not occur in old deposits.

According to the statistics, the position of the average population has deteriorated. Since 1990, with the exception of 1994, real wages have fallen, while the income of a small minority of the population (10%) has increased and their property position has greatly improved. This successive economic growth causes constant increasing of consumption and thus a greater amount of waste per capita. Therefore, it is expected that the production of waste per capita will increase with some 30-50% by the year 2012 in case recycling of municipal wastes will not be implemented.

Economic factors will have a "positive" influence on the production of waste per capita and will result into greater amounts of waste disposed. The result will be an increased production of biogas from the landfills.

*Technological risks*
Another risk related to the disposal of waste has to do with the disposal techniques, the compaction of waste and the covering of the landfills in order to prevent the escape of the biogas into the atmosphere. As these factors might influence the collection of biogas, during design phase much attention will be paid to these factors.
We estimate that these technical measures might create a deviation from the prediction gas productions by –10% for the negative case and + 25% for the positive case.

The essential factor for the calculation of the future emission reduction is the prediction of the biogas quantity hat will be produced during the crediting period.

The following can be stated on the technical basis for the calculation of the emissions during the period 2008-2012:
(1) Waste quantities. The basis for the calculation is the amount of disposed waste. In the model the prediction of the quantities is based on (i) experience from the period 1995-2006, (ii) long-term contracts between Hydrostab België BVBA and the Nagykanizsa Municipality and the JV in Baja.
The project Sponsor has received guarancy, that the predicted waste quantities will indeed be disposed as they are based on specific commercial contracts.
(2) Calculation model. The model used for calculation is based on the guidelines provided by IEA and German norms. The model used by the Consortium is proprietary and is applied for the calculation of commercial projects. As such, it is a conservative model.
The Sponsor has a long track record and has realised a large number of landfill gas extraction projects and knows therefore the risks and limitations of the model. The guarantee of a minimum delivery of 280.000 ERUs and AAUs is therefore reliable and can be regarded as a conservative level.

*Institutional risks*
Future changes in the organic content of the waste influence the potential generation of methane. For example, separated collection of organic waste will usually result into a lower fraction of organic material in the landfill. On the other hand scale factors, such as the growth of the supermarket business will result into to higher quantities of disposed wastes.
The effects, however, of these possible changes will be very limited for the Project. These macro-economic effects usually become visible only after a number of years. We therefore estimate, that any change in organic content of a landfill will not be more than 1-2 %.

*Physical conditions of the landfill*
An explosion or fire may occur at the landfill before the gas installation is applied. To mitigate this risk a temporary top covering is applied. In this way the flow of oxygen into the landfill body is restrained. Later, the gas extraction system will allow for optimum oxygen content in the landfill gas and will therefore raise the fire risk to the minimum.

*Gypsies*
Successive Hungarian governments have struggled to tackle the enormous problems facing the country's estimated 700.000 Roma people. These include almost full unemployment in some areas and a high level of discrimination from the Hungarian site. Improvements in the fate of the Gypsies have not been made a precondition for Hungary joining the EU, but officials stress that human rights of minorities are an important part of the political criteria for accession.
The activities of Gypsies are however not relevant at the project landfills. As far as Gypsies are involved in landfilling, they work usually under supervision of the Municipalities. Their main scope is to collect valuable materials, such as iron, steel, wood etc. Their activities do not influence the production of biogas form the waste.

Common practice analysis:
*Waste management and old waste dumps*
At present Hungarian waste management is re-structured and undergoes modernization. The overall aim of the Hungarian Government is to create regional landfill site that meet National and EU standards and are in compliance with the national and European legislation.
The policy of Hungarian Government is to close the small landfills and to focus on the large ones. Therefore, in September 2003, a process of forming the macro-regional waste management has started. The operators still face enormous technical and financial problems to meet these requirements and therefore they are quite depended on investments from private sector. Because of high investment costs it is still not a common practice in Hungary to develop gas extraction and utilisation systems in the old smaller landfills.

*Energy*
Currently, energy from communal waste is produced at the Budapest Waste Incinerator only. Furthermore, supported by strong state subsidy practically all Hungarian settlements have been supplied in natural gas. The prices of the gas are till now centrally regulated and are sold to the residents on a beneficial price (under market price). Under these conditions there is no stimulation from the market site to convert into renewable energy production or use. Nowadays, especially due to the current gas conflict between Ukraine and the Russian Federation[2], the Hungarian government must recognise its dependency on energy supply from abroad and the necessity of extended use of renewable energy. However, compared to the tasks to be solved, financial situation in the country can create only relatively small funds for renewable energy development. It can be therefore assumed that production of renewable energy in Hungary is still considerably behind in comparison with the EU[3].

Impact of registration of the proposed project activity as a JI project activity:
The combination of lack of access to finance, institutional and regulatory barriers, and perceived risks of the selected technology, clearly demonstrate that the proposed LFG extraction and utilization projects are additional and therefore not the baseline scenario.

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[2] NOS News, 02 January 2006: due to the conflict between Russian Federation and Ukraine concerning price for the natural gas, the amount of the supplied to Ukraine gas has been cut. Through Ukraine streams the majority of the gas from Russia. Many European countries and among others Hungary are depended on Ukrainian connection. As an indirect effect of that action, Monday the 2nd January 2006 was almost 40% less gas registered by the Hungarian energy suppliers.
[3] The 3rd National Communication for the UNFCCC, 2002

The approval and registration of the project activity as a JI activity, and the benefits and incentives derived from the project activity, will alleviate the financial hurdles and other identified barriers and thus enable the projects to be undertaken.

Registering the project as a JI project will attract foreign investors that bring capacity to operate successfully on the Hungarian electricity power market. This will enable Hungary to make its energy production system more sustainable by duplicating this kind of projects.

JI registration results in reducing inflation/exchange rate risk affecting expected revenues and attractiveness for investors. Transaction risk is the risk that the value of a cash flow in foreign currency, measured in the company's functional currency, will change due to a change in exchange rate. This definition indicates that this involves cash flow in a foreign currency, where the value of this cash flow in the functional currency can fluctuate between the moment the cash flow is announced and the moment the transaction actually takes place. This is especially important since most of the equipment used is imported.

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

All the relevant emissions for the baseline, have been analysed in the table below. Emissions that are likely to be less than 1% of the total project emission's impact will be classified as "insignificant" and be further ignored in the project.
The table below presents the summary of all emissions by source that are significant for the baseline.

| Emissions | Baseline scenario | Significance |
|---|---|---|
| Direct onsite emissions | Emissions of methane form the biogas extracted from the landfill and its further use onsite | Significant |
| | Emissions from the venting of biogas (no flaring or incineration) | Non-existing - Emissions from the venting of biogas will not occur thank to protection against failures by an automatic feedback control system. In emergency situation the venting of biogas from the landfill body will be automatically stopped. |
| | Emissions $CO_2$ from processing equipment (electricity use of ventilators, instruments etc.) | Insignificant |
| | Energy supply for transport or processing of the landfill gas on site (metering electricity) | Insignificant – electricity will be purchased from the public grid. |
| | Emissions from the co-fired fuel $CO_2$ | Non-existing - There will be no co-firing of other fuel than biogas. |
| | Emissions from back-up gas ($CO_2$) engines | Non-existing - There will be no back-up units for electricity production.)* |

| | | |
|---|---|---|
| Direct offsite emissions | Emissions $CO_2$ from transport of equipment to the project site | Insignificant - Major part of equipment and materials for construction will be purchased locally. It is envisaged that there will be one transport of special equipment from The Netherlands to Hungary.)** |
| Indirect onsite emissions | Emissions of methane from increased biogas production as result from biogas extraction | Non-existing - Although landfill can be regarded as a bioreactor, "process feed-back" does not occur; in other words: the fact that biogas is extracted from the bioreactor will not result into a higher biogas production rate of the landfill body (expressed in $m^3$ per tonne waste). |
| Transport of waste to the landfill site | $CO_2$ from trucks etc. | Insignificant )*** |

All emissions included within the system boundaries will be taken into account and included in the calculation of the baseline and the project monitoring. Emissions, that are not included in the boundary system, will not be included in the baseline calculations and the monitoring.

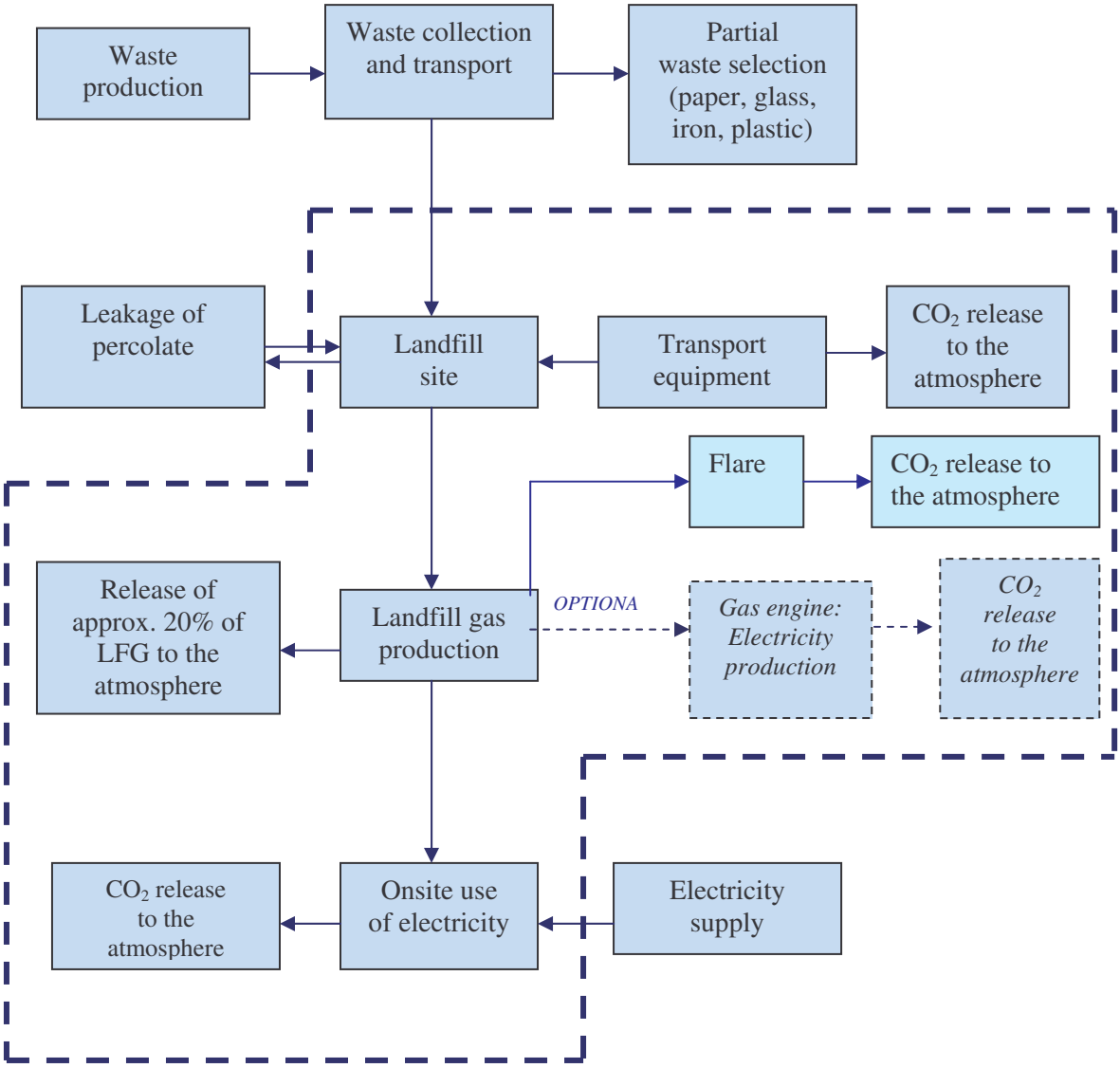
)* Currently there is no back-up gas engine at the landfill. In case of longer than three weeks breaks in the electricity supply during the crediting time, a generator fuelled with landfill gas will be installed. Such a situation is however of very little certain.

)** To minimise those emissions, major part of equipment and materials for construction will be purchased locally. It is envisaged that there will be maximum 2 transports of special equipment from The Netherlands to Hungary (to Nagykanizsa and to Baja).

)*** The fact, that at a given landfill biogas is collected and utilised will not result into a larger disposal of wastes. The amount of waste disposed is primarily determined by the waste collection contracts between the Municipality and the owner of the landfill site and therefore by the amounts offered by households and industries.

The flow chart below provides the project with its main components and connections where the project boundaries are drawn, excluding processes beyond control or influence of the project. The dashed line indicates the project boundaries.

Flow chart: System boundaries with *biogas collection* and *electricity production*.




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

This baseline study was concluded in January 2005, by DUNIN Environmental Consultancy, which is not a participant in this project and Hydrostab België BVBA which is the Sponsor of this project and the main contractor with the Municipalities and a buyer of the credits.

Contact information:
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## SECTION C. Duration of the project activity / Crediting period

### C.1 Duration of the project activity:

#### C.1.1. Starting date of the project activity:

Med 2006

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

Med 2006 till end 2012.

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

#### C.2.1. Renewable crediting period

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

Not applicable.

##### C.2.1.2. Length of the first crediting period:

Not applicable.

#### C.2.2. Fixed crediting period:

##### C.2.2.1. Starting date:

January 2007

##### C.2.2.2. Length:

Six (6) years.

## SECTION D. Application of a monitoring methodology and plan

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

The proposed project uses the approved consolidated monitoring methodology ACM0001 "Consolidated monitoring methodology for landfill gas project activities".

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

The monitoring methodology has been applied to landfill gas capture project activities at the two landfills in Hungary, Nagykanizsa and Baja, where the baseline scenario is total atmospheric release of the methane gas. The captured gas is flared and optionally used to produce electricity where no emission reductions are claimed for displacing energy generation from other sources. This monitoring methodology has been used in conjunction with the approved baseline methodology ACM0001 (for the description of the baseline methodology see Section B.)

The monitoring methodology is based on direct and continuous measurement of the actual quantity of landfill gas flared, the methane content in the flared landfill gas (% - using a continuous analyser) and when using a continuous flow meter, a continuous methane analyser, as shown in the Flow Diagram presented in the Monitoring Plan, Annex 4. The main variables that need to be determined are the quantity of methane actually captured and flared.

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

This option is not applicable. Currently there is no monitoring system of the emissions at the landfill. The baseline scenario is determined by calculations described in Section D.2.1.4.

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

See Section D.2.2.1.

| **D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ID number *(Please use numbers to ease cross-referencing to table D.3)* | Data variable | Source of data | Data unit | Measured (m), calculated (c), estimated (e), | Recording frequency | Proportion of data to be monitored | How will the data be archived? (electronic/ paper) | Comment |
| D.2.1.3.1 | Landfilled Waste | Waste disposal | Metric tonnes | m | Continuous | 100% | Daily: paper<br>Monthly: electronic | Till completion of the crediting period<br>Measured at weightbridge |

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

In order to calculate the baseline emissions, an estimation of the potential landfill gas production has been performed. The quantity of methane projected to be generated during a given year is estimated using as a basis the First Order Decay model for landfill gas generation. The general formula of degradation used in this model depends on several parameters including age of waste, mass, waste composition (concentration in organic carbon) and waste temperature.

The model is driven by the input of the following key parameters:
(1) Total tonnage of disposed waste

(2) Organic carbon content means the total quantity of organic carbon contained in waste and is measured in kg/ton. The organic carbon content depends on the composition of waste.
By using bibliographical data and measurements in laboratory column tests or in instrumented cells, the organic carbon content value can be evaluated for municipal solid waste on 150 kg / Mg wet component.

(3) Methane generation decay rate is specified as an exponential rate of decomposition of the landfill refuse. Its value determines the amount of methane, that is released in a given disposal area during a specified time.

- Methane content in the landfill gas is 50%
- Molecular weight $CH_4$: 16,03
- Gas density of $CH_4$ : 0,72 kg/ $Nm^3$.

(4) Temperature in the refuse is expressed in °C. Temperature has an impact on the biodegradable carbon converted to landfill gas. Temperatures generally observed in landfills range 36°C.

(5) Parameters, that have been applied by calculations:

- Parameter of gasification speed: 0,035
- Calorific value of the landfill gas: 5 kW
- Gas density of $CO_2$ : 1,99 kg/ $m^3$
- Heating value of landfill gas: 18 MJ/$m^3$

(6) Extraction efficiency
The recoverable landfill gas depends on the effectiveness of the extraction system. The rate of landfill gas recoverable generally ranges between 50 and 90% of the total production.
It was considered for this calculation that the extraction efficiency is 0% during the filling period and 80% one year after the area is covered and equipped with an extraction system.

(7) Assessment and uncertainties
The main uncertainty in the proposed project is the prediction of future emission levels, LFG production levels and LFG extraction efficiency, which are depending on a large number of practical and operational factors. However, the baseline emissions are in this case determined by measuring the real amount of extracted LFG, so this uncertainty does not affect the choice of the baseline scenario.
The quantity of methane projected to be generated during a given year is estimated using as a basis the First Order Decay model for landfill gas generation:

**GHG = Collectable gas quantity m3/h x Hours per year x Methane content x Spec. mass x 2**1

GHG = GHG emissions [ton $CO_2$e/yr]
21= GWP of methane [ton $CO_2$e/ton methane]

The general formula of degradation used in this model depends on several parameters including age of waste, mass, waste composition (concentration in organic carbon) and waste temperature. At the moment the flaring of the biogas does not occur at the project landfill.

- The actual quantity of methane emitted to the atmosphere is therefore equivalent with the quantity to be captured and flared.

| | | |
|---|---|---|
| ▪ Decayable carbon in refuse | 150 | kg/ton |
| ▪ Lag phase of methane production | 0,7 | year |
| ▪ Half value for decomposing or organics | 3,0-15,0 | year |
| ▪ Average landfill temperature | 30 | $^oC$ |
| ▪ Landfill gas collection efficiency | 70 | % |
| ▪ Methane content in landfill gas | 50 | % |
| ▪ Molecular weight $CH_4$ | 16,03 | -- |
| ▪ Gas density of $CH_4$ at STN | 0,72 | kg/ $m^3$ |
| ▪ Gas density of $CO_2$ at STN | 1,99 | kg/ $m^3$ |
| ▪ Heating value of landfill gas | 18 | $MJ/m^3$ |

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

**D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:**

| ID number *(Please use numbers to ease cross-referencing to table D.3)* | Data variable | Source of data | Data unit | Measured (m), calculated (c), estimated (e), | Recording frequency | Proportion of data to be monitored | How will the data be archived? (electronic/ paper) | Comment |
|---|---|---|---|---|---|---|---|---|
| D.2.2.1.1 | Amount of landfill gas collected from the project wells | $m^3$ | M | Continuous | 100% | Electronic | Till completion of the crediting period | Measured by a flow meter |
| D.2.2.1.2 | Methane fraction in the landfill gas | % | M | Continuous | 100% | Electronic | Till completion of the crediting period | Measured by continues gas quality analyser |
| D.2.2.1.3 | Amount of flared methane | Tonnes $CH_4$ | M | Continuous | 100% | Electronic | Till completion of the crediting period | Measured conform complementary method (LFG temperature and pressure, flare temperature and working hours, %$CH_4$, $Sm^3$LFG/h, oxygen content) |
| D.2.2.1.4 | Total amount of flared methane | Tonnes $CH_4$ | C | Daily | N/a | Electronic | Till completion of the crediting period | -- |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| D.2.2.1.5 | Combustion efficiency | % | M and C | Monthly | N/a | Electronic | Till completion of the crediting period | Methane content of engine exhaust gas |
| D.2.2.1.6 | Combustion temperature | Temperature $^{o}C$ | M | Daily | N/a | Electronic | Till completion of the crediting period | There is a temperature gauge to measure a combustion temperature of the flare. |
| D.2.2.1.7 | Gas pressure in the wells | Pa | M | Daily | N/a | Electronic | Till completion of the crediting period | -- |
| D.2.2.1.8 | Gas flow rate | $m^3/h$ | M | Daily | N/a | Electronic | Till completion of the crediting period | -- |
| D.2.2.1.9 | Integrity of collection system | N/a | N/a | Monthly | N/a | Electronic | Till completion of the crediting period | Visual control. |

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

In the Section B.4. the direct and indirect project emissions have been defined.

Emissions that are likely to be less than 1% of the total project emission's impact are classified as "insignificant" and be further ignored in the project. As total project emission reduction over the 10-year project lifetime are approx. 280.000 tonnes $CO_2$, 1% amounts to 2.800 tonnes $CO_2$.

Equipment will be manufactured circa 1,600 km from Hungary and will be transported with a special truck transport. It has been estimated that diesel engine emits approximately 0,26 kg $CO_2$eq per kilometre. In total transport of the equipment from the Netherlands to Hungary is estimated on 1.600 km x 0,26 t x 2 = 832 $CO_2$eq. Assuming the calculations, emissions estimation for the transport of the equipment will not be higher than 1% of the total baseline emissions.

The power demand of the processing equipment is 15 kWh. Assuming the emission factor of 0,0741 ktonne $CO_2$/TJ, the emission can be calculated as follow:
15 kWh / $10^6$ x 3,6 GJ / MWh x $10^{-3}$ = 0,000054 TJ x 0,0741 ktonne $CO_2$/TJ = 0,000040014 ktonne $CO_2$ x $10^3$= 0,0040014 t $CO_2$
0,0040014 t $CO_2$ x 8760 = 35 t $CO_2$ per year
For 5 years (2008-2012): 35 t $CO_2$ x 5 = 175,26 t $CO_2$

**D.2.3. Treatment of leakage in the monitoring plan:**

No leakages are associated with landfill gas extraction

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

The difference between baseline scenario, which is full release of the LFG to the atmosphere, and the monitored project emissions results in the emission reductions.

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

| Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)* | Uncertainty level of data (High/Medium/Low) | Explain QA/QC procedures planned for these data, or why such procedures are not necessary. |
|---|---|---|
| D.2.1.3.1 | Low | Waste are weighted at the weighbridge before disposing. |
| D.2.2.1.1 | Low | Amount of methane is a reliable indicator subject to routine checks. Calibration is executed monthly through use of calibration gas with exactly 50% of methane content. |
| *D.2.2.1.2* | Low | Amount of methane is a reliable indicator subject to routine checks. Calibration is executed monthly through use of calibration gas with exactly 50% of methane content. |

| | | |
|---|---|---|
| D.2.2.1.3 | Low | Amount of methane is a reliable indicator subject to routine checks. Calibration is executed monthly through use of calibration gas with exactly 50% of methane content. |
| D.2.2.1.4 | Low | Amount of carbon dioxide is a reliable indicator subject to routine checks. |
| D.2.2.1.5 | Low | Data reviewed as part of daily monitoring |
| D.2.2.1.6 | Low | Data reviewed as part of daily monitoring |
| D.2.2.1.8 | Low | Monitoring data used immediately to adjust well vacuum |
| D.2.2.1.9 | Medium | Ensure integrity of collection system |

Monitoring procedures have been formalised as part of documentation for NEN-ISO 9001:2000 certification.

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

To assure the correct service of the equipment en correct monitoring, the training of the Hungarian stuff will be organised. Minimum two persons will be trained on the field of:

- general knowledge about the applied equipment at the landfill;
- reading and recording data;
- calibration methodology;
- emergency situation (for instance by too high oxygen level or electricity breakdown).

Chosen trainees must have a good understanding the processes and technology of the installation of landfill gas extraction. Verification and training starts parallel with preparation works for the installation. At the plant there is also a guidebook on landfill gas extraction and utilisation in English and Hungarian available, where the operator can find an information about:

- operation manual;
- drawings;
- maintenance instructions;
- description of parts of the equipment;
- parameters for landfill gas composition, temperature and pressure.

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

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## SECTION E. Estimation of GHG emissions by sources

### E.1. Estimate of GHG emissions by sources:

| Year | Baja | | Nagykanizsa | | Total | | Gas released to the atmosphere |
|---|---|---|---|---|---|---|---|
| | $m^3$/h of gas produced | Collectable gas quantity $m^3$/h | $m^3$/h of gas produced | Collectable gas quantity $m^3$/h | $m^3$/h of gas produced | Collectable gas quantity $m^3$/h | $m^3$/h |
| 2006 | 447 | **290** | 579 | **347** | 1.026 | **638** | **388** |
| 2007 | 422 | **274** | 592 | **355** | 1.013 | **629** | **384** |
| 2008 | 398 | **259** | 604 | **362** | 1.002 | **621** | **381** |
| 2009 | 376 | **244** | 615 | **369** | 991 | **613** | **378** |
| 2010 | 355 | **231** | 626 | **375** | 981 | **606** | **374** |
| 2011 | 335 | **218** | 636 | **381** | 971 | **599** | **372** |
| 2012 | 316 | **206** | 645 | **387** | 962 | **593** | **369** |
| | | | | | **6.945** | **4.299** | **2.646** |

2.646 $m^3$ /h x 8760 x 50% $CH_4$ x 0,00072 t x 21$CO_2$eq = **175.202 t $CO_2$eq**

*The total amount of gas released to the atmosphere in the project time is 36% of the total quantity of the produced gas. In the baseline scenario the full release of GHG to the atmosphere occurs. It can be therefore concluded that the project contributes to the LFG emissions reductions in 64%.*

### E.2. Estimated leakage:

Not applicable.

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

**175.202 t $CO_2$eq**

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

| Year | Baja - $m^3$/h of gas produced | Nagykanizsa - $m^3$/h of gas produced | Total - $m^3$/h of gas produced |
|---|---|---|---|
| 2006 | 447 | 579 | 1.026 |
| 2007 | 422 | 592 | 1.013 |
| 2008 | 398 | 604 | 1.002 |
| 2009 | 376 | 615 | 991 |
| 2010 | 355 | 626 | 981 |
| 2011 | 335 | 636 | 971 |
| 2012 | 316 | 645 | 962 |
| | | | **6.945** |

6.945 $m^3$ /h x 8760 x 50% $CH_4$ x 0,00072 t x 21$CO_2$eq = **459.937 t $CO_2$eq**

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

459.937– 175.202 = **284.735 t $CO_2$eq**

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

The following should be noted:

- All landfill sites will be provided with flares for burning of biogas;
- Operation of other installations will be on continuous basis (8760 hours per year);
- Avoided $CO_2$ emissions as result of the measuring of landfill gas amount and composition recovered for combustion.
- Installed power for equipment (ventilator, instruments etc.) is approx.15 kWh per landfill;
- For other basic parameters: see Section D.2.1.4.

The following table represents the avoided emissions of GHG by the project activity during the period 2006-2012 resulting from the recovery and combustion of landfill gas. It should however be noted that the amount of AAUs and ERUs will be determined by monitoring the amount of captured LFG and its methane content.

| Year | Collectable gas quantity $m^3/h$ | Hours per year | $m^3$ of gas produced per year | Methane content | Spec.mass. $CH_4$ in tons | Ton $CO_2$eq/ton $CH_4$ | Tons $CO_2$-equivalent /yr |
|---|---|---|---|---|---|---|---|
| 2006 | 638 | 8760 | 5.587.154 | 50% | 0,00072 | 21 | 42.239 |
| 2007 | 629 | 8760 | 5.511.607 | 50% | 0,00072 | 21 | 41.668 |
| 2008 | 621 | 8760 | 5.440.285 | 50% | 0,00072 | 21 | 41.129 |
| 2009 | 613 | 8760 | 5.372.954 | 50% | 0,00072 | 21 | 40.620 |
| 2010 | 606 | 8760 | 5.309.388 | 50% | 0,00072 | 21 | 40.139 |
| 2011 | 599 | 8760 | 5.249.379 | 50% | 0,00072 | 21 | 39.685 |
| 2012 | 593 | 8760 | 5.192.726 | 50% | 0,00072 | 21 | 39.257 |
| **Total** | **4.299** | **52.560** | **37.663.493** | **50%** | **0,00072** | **21** | **284.736** |

## SECTION F. Environmental impacts

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

*Landscape and biotic aspects*

Extraction of several toxic, odorous and GHG gases will have a positive influence on the biotic environment. Sudden vibrations of the ground, as result from activities onsite, and noise may disturb the surrounding wildlife in forests and fields. The presence of birds can lead to the extension of the preying on waste vermin occurrence in the environment.

The project will result into a better structured way of waste disposal with more covering of wastes. This will reduce the presence of birds searching for prey and food. It will therefore decrease he influence of the landfill on the surrounding ecosystems. Due to the elimination of risks of fires or explosions, re-cultivation of the landfill will be possible and the closed landfill will no longer be considered as a barren land. Appropriate closing of the landfill will be favourable for biogas production and will enable the landfill owner to reshape the waste body and make it fit into the landscape.

*Waste*

Because the landfill sites will be covered with a top layer in order to create better anaerobic conditions, there will be no dispersion of waste to the surroundings. The project will also support the decrease of illegal waste dumping.

The project will not result into any increase of waste production. The project foresees the implementation of techniques for compactation of wastes (if not yet applied) and will therefore create a higher disposal capacity of the landfill.

*Water*

There are often small distances between landfills dumps and inhabited dwellings or agricultural fields. Without any barriers toxic substances extracted from the wastes may flow with the rainwater and ground water from the dump and might be absorbed by crops cultivated for food production. For stimulation of biogas production the leakage water will be re-circulated. In this way infiltration of leakage water into the ground and groundwater will be strongly reduced. It is significant factor improving quality of drinking water, products of agriculture and health and hygiene as well.

New sections of the landfills are provided with bottom liner and will not release pollutants into the groundwater.

*Air & climate*

The project will have a positive effect on the ecosystem due to the reduction of GHG emissions and other gases, such as $H_2S$, mercaptenes and various odorous compounds. Furthermore, reduction of the gases will assist the Hungarian Government in meeting the targets of the Kyoto Protocol.

The only potential source of $CO_2$ emissions will be the transport of machinery to the landfill and other convey machines, on-site installations such as ventilators, measurement equipment. These emissions are insignificant. In order to minimise $CO_2$ emissions from transport and site-installations during the implementation and execution of the project the major part of the equipment and materials will be purchased locally.

*Health & safety*

High concentration of gases in the landfills brings a risk of explosion. Their extraction will reduce the risk to the minimum. It is important not only for safety of inhabitants of the surroundings but also for health of the workers that spend most of the day at the landfill.

The release of toxic compounds such as $H_2S$ presents a serious danger for human health. The extraction of biogas reduces strongly the presence of these compounds.

*Noise*
The installed equipment does not produce any significant noise. It will be placed in closed containers or small buildings that will form a perfect sound-absorbing casing.

Nagykanizsa:

*General situation*
At the old part of the landfill bottom layer or drainage for sewage water is not applied. There are some gas barrels installed in 2001. However, the technical properties of the gas installations needs to be examined. The disposed waste is compacted very well, what has a positive influence on biogas production. Biogas production at the landfill site has been sensually observed.


*The top of the old unit at the Nagykanizsa landfill.*

The Environmental Impact Assessment has been written in 2002, where the biogas collection has not been included. The permit for the old section of the landfill is expired in August 2003.


*The membrane at the bottom of the new unit.*

Preparation of the new part of the Nagykanizsa landfill has been started. The bottom covering of the landfill is a clay-like soil that forms a hermetic layer. On the top of it there is already partly applied a watertight membrane with control drainage system for leakage water. In the nearby future there will be gas drainage with control panel applied.

There is also a leakage water tank that will in the future collect all water from the landfill.

*The leakage water tank.*

The Environmental Impact Assessment has been written in 1994, where the gas extraction has been already included. The operational permit for the landfill is for indefinite period.

*Environmental Impact of the Project*

The implementation of the Project will assist the Municipality in meeting the objectives of the EU Landfill Directive and all regulations from the National Act on Waste Management.

The Project will provide the necessary knowledge and technology for proper closing of the landfill. Further re-cultivation of the storage place will be possible thanks to eliminated fire or explosion danger.

Baja:

*General situation*

*The situation at the landfill site in Baja.*

The landfill site in Baja is a simple but organised waste deposal without any gas or water installation and few protective measures for the environment. The wastes are not compacted and is dispersed into the surrounding environment.

The spontaneous fires at the landfill are a real danger for the green surroundings. The waste body is partly covered with a ground top layer.

The operational permit expires in 2004. The landfill however will be probably not closed. There is namely no EIA for the closing. According to the Act on Waste the landfill must be properly closed and landfill gas extraction is obligated.

Environmental Impact of the Project

The landfill in Baja needs to be closed, but there is no funds to do that properly. The Project will prevent the inappropriate closing of the landfill and therefore will help to fulfil all waste management directives.

The gas extraction and utilisation will reduce their emissions to the air. The odours will be eliminated in this way and the air will be cleaner. The place will be better organised that all light waste will stay at place and won't pollute the surroundings.

Thanks to the Project the health, physical comfort and safety of the workers at the landfill will be much improved.

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

The project will have only positive impact on the environment at local and national scale.

## SECTION G. Stakeholders' comments

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

- The first stakeholders consultations were already held in 2003. On the meetings the purpose of the Project has been discussed and the technical data on the disposed waste has been made accessible. A Letter of Understanding for co-operation has been signed. The owner of the landfill site in Baja has guaranteed a good co-operation with Roma people;
- The Letter of Approval has be released in August 2003 for the programme ERUPT 03;
- In April 2004 BKB with a local partner Green Partners Bt. have visited the stakeholders and the locations of the landfill sites Baja Varosuzemeltetes and Nagykanizsa. The work program included technical investigations of the landfill sites andverification of the data;
- At 14th April 2004 has representative of BKB and Green Partners Bt. visited the Hungarian Ministry of Environment and Water in Budapest. At the meeting the current status of the project (ERUPT3/4) has been discussed;
- The stakeholders on local and National level recognize the importance of the project and provide positive and active support;
- The Project has been submitted to the Hungarian regulations with respect to EIA and operational permits. The landfills provided with EIA have undergone the full stakeholder consultation during the permitting process. Existing documents have been assessed as far as they are relevant for future biogas collection;
- During the year 2005 there were many consultations with the Municipalities with a purpose of informing the local and national Governments about the status of the project.

### G.2. Summary of the comments received:

There were no comments received.

The project has already been validated for ERUPT 04. During the publication period of 30 days there were no comments received.

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

Because there were no comments, no action was undertaken.

Annex 1

## CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

## INFORMATION REGARDING PUBLIC FUNDING

No public funds are involved.

Annex 3

## BASELINE INFORMATION

(1) The Central and Eastern Europe Business Information Centre, 01.03.2000

(2) International Energy Agency *Energy Policies of IEA Countries*, 1999

(3) Workshop on Good Practices in Policies and Measures, 8-10 October 2001, Copenhagen

(4) EU Directive on the landfill of waste. Council Directive 1999/31/EC of 26 April 1999, Official Journal L 182 , 16 July 1999

(5) Senter International *Terms of Reference ERUPT 2003*, Appendix 4, Vol. 2A, Vol. 2B, section III *Land fill gas recovery*, The Hague

*(6)* VROM Baseline Methodology, first order decay model for methane production calculation

(7) Industry Sector Analysis (ISA) *Air Pollution Control*, 23.06.2001, Budapest

(8) Executive Body for the Convention in Long-Range Transboundary Air Pollution *The 2002 Review on Strategies and Policies for Air Pollution Abatement*, May 2002

(9) Air Pollution Abatement (EB.AIR/2002/1 and EB.AIR/2002/1/Add.1)

(10) Hungarian Act LIII of 1995 on the General Rules of Environmental Protection

(11) The 3rd National Communication for the UNFCCC, 2002

(12) U.S. Department of Commerce *National Trade Data Bank*, 3 November 2000

Annex 4

## MONITORING PLAN

- - - - -