

LANDFILL GAS RECOVERY: THE LOW HANGING FRUIT FOR CARBON CREDITS TRADING IN THE DEVELOPING COUNTRIES

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SUMMARY: The enactment of the Kyoto Protocol has provided a new stimulus for commercial landfill gas recovery projects in developing countries through the Clean Development Mechanism (CDM). The CDM is an enabling mechanism through which developed countries can invest in sustainable projects, such as landfill gas projects, in the developing world through the purchase of Certified Emission Reductions (CERs). The CERs can be used by the developed countries to help meet their Kyoto greenhouse gas reduction targets. Therefore, the sale of CERs, also known as carbon credits, can significantly increase the financial viability of landfill gas-recovery projects in developing countries. Landfill gas projects have a major role in Kyoto trading because emission reductions can be readily quantified and the technology has been fully commercial for three decades. There is now a window of opportunity to develop landfill gas recovery projects in developing countries to contribute to cost-effective global climate change mitigation.

1. INTRODUCTION

Under the Kyoto Protocol (the Protocol), industrialized countries, also known as Annex I countries, are legally bound to meet quantitative targets for reducing their greenhouse gas emissions. The entry into force of the Protocol on 16 February 2005 means the international carbon trading market is now a legal and practical reality. The Protocol lays the groundwork for the world's first market-based trading system for greenhouse gas emissions that are, open, efficient, accountable and consistent across national boundaries.

The Protocol specifically allows businesses in Annex I countries to meet their emission reduction targets by utilizing carbon credits purchased from projects in the developing world through the Clean Development Mechanism (CDM). Landfill methane recovery projects have proved to be particularly attractive to buyers. They also benefit sellers in the developing world as the sale of carbon credits can significantly increase the financial viability of such projects. These projects can generate revenue, contribute to sustainable development, and be a cost-effective global climate change mitigation mechanism.

Structured properly, these projects may be viewed as low hanging fruit for the creation and sale of carbon credits while providing environmental and energy benefits to local project owners and surrounding communities. The success of landfill gas projects in the emerging global carbon credits markets will depend on the development of projects that are attractive to both investors and potential buyers of carbon credits. In addition to Kyoto regulatory requirements, there are also site-specific technical and non-technical issues that must be considered by any landfill gas project in the developing world; these include realistic projections of gas quantity and quality; suitability of the site for vertical or horizontal gas collection systems; definition of gas ownership rights and liabilities; credit enhancement possibilities for the seller of carbon credits; and the development of multi-party contractual arrangements among landfill owners, operators, gas recovery contractors, gas users, and financiers and buyers of emission reductions. Some of these were discussed in previous papers with specific reference to CDM projects in South Africa (Lee et al., 2004; Bogner et al., 2004; Bogner and Lee, 2005).

There are now over 1100 commercial landfill gas recovery projects worldwide (Willumsen, 2003). We know from experience that the successful development of these projects is complex and includes both technical and non-technical factors that must be taken

into consideration in the early stages. From the pre-feasibility stage, these projects require a multi-disciplinary approach. The technical considerations include potential gas production and recovery estimates, testing and evaluation of gas quality for specific utilization options, design and installation of gas treatment as needed, existing site engineering and management practices, and proximity to potential gas users or electrical customers. The non-technical issues that are critical to project success include land ownership, gas rights, regulatory responsibilities, evaluation of gas customers and markets, and the complex multi-party contractual relationships typically associated with landfill gas recovery projects (land owner, land filling contractor, gas recovery contractor and gas or electricity customer). In addition, it is essential that the project sponsor be aware of the requirements of the CDM process, often referred to as the carbon asset creation.

2. KYOTO PROTOCOL

In 1982, over 180 countries adopted the United Nations Framework Convention on Climate Change (UNFCCC), which was established as the legal structure to begin stabilizing greenhouse gases (GHGs) in the atmosphere. The three major GHGs are carbon dioxide, methane, and nitrous oxide. All parties to the Climate Change Convention agreed to compile inventories of their greenhouse gas emissions and submit reports indicating the steps they are taking to implement the Convention.

The parties to the Climate Change Convention adopted the Protocol in 1996. The Protocol establishes a legally binding commitment for 39 countries, called Annex I countries, to reduce their GHG emissions by an average of 5.2% below 1990 levels, between 2008-2012. Annex I countries are the industrialized countries and countries with Economies in Transition. The Protocol entered into force on 16 February 2005. As of 19 February 2005, 154 countries had signed the Protocol representing 61.6% of the world's greenhouse gas emissions. The issue of emissions targets for developing countries has generated a great deal of debate. While developing countries are not currently subject to timetables and targets to

reduce their GHG emissions like the Annex I countries, they are expected to limit the growth rate of their GHG emissions and to report on their actions to address climate change.

The Marrakech Accords were adopted in November 2001 to clarify the Kyoto Protocol's rules by outlining the specific steps a project must follow to qualify under the Protocol. The adoption of the Marrakech Accords has had a significant impact on the form of the contracts used to sell carbon credits and has stimulated the market substantially.

3. CLEAN DEVELOPMENT MECHANISM (CDM)

The Kyoto Protocol allows Annex I countries to meet their emission reduction targets through mechanisms referred to in the Protocol as “flexibility mechanisms”. One of the mechanisms, the Clean Development Mechanism (CDM), is the only mechanism under the Protocol that involves developing or Non-Annex I countries and is the subject of this paper. The CDM concept was first proposed in Brazil and provides a means for developing countries to receive foreign investment, have access to resources and technology to assist in development of their economies, and achieve their development goals while reducing greenhouse gas emissions. The CDM has two key goals:

- To assist developing countries that host CDM projects to achieve sustainable development; and
- To provide developed countries with flexibility for achieving their emission reduction targets, by allowing them to access credits from emission reduction projects undertaken in developing countries.

The credits, often referred to as carbon credits, are called Certified Emission Reductions (CERs) under Article 12 of the Protocol. The Protocol recognizes that greenhouse gases mix uniformly in the atmosphere; thus a reduction in greenhouse gas emissions anywhere in the world benefits everyone. Under the Protocol, one ton of CO₂ equivalent [CO₂e] is equal to one carbon credit unit [1 ton = 1000 kg]. Because the GWP (Global Warming Potential) of CH₄ (methane) is 21, one ton of CH₄ is equal to 21 tons CO₂e. The Protocol evolved in part from the fact that reducing greenhouse gas emissions in the developing world at an estimated

cost of \$1-\$4/ton of CO₂ equivalent is considerably cheaper than the cost of achieving comparable reductions in developed countries with costs up to US \$15/ton of CO₂ equivalent.

To avoid abuse, the Protocol calls for strict monitoring and oversight of CDM projects before carbon credits can be sold. This oversight is conducted by several bodies as discussed below.

3.1 Conference of the Parties/Meeting of the Parties, Executive Board and Designated Operational entities

The Protocol establishes three bodies to oversee the CDM. They include the Conference of the Parties/Meeting of the Parties (COP/MOP), the Executive Board (EB) and Designated Operational Entities (DOE). The COP/MOP is the annual meeting of all of the parties to the Kyoto Protocol. This year COP 11 and the first COP/MOP will be held from 28 November through 9 December 2005 in Montreal, Canada.

The Executive Board was established in 2001 at COP 7. The EB has ten members and 10 alternates that are serving two and three year terms and were selected to ensure regional balance worldwide. The EB chair and vice chair are elected from the EB members during the first EB meeting of each year and for 2006, Ms. Sushma Gera and Mr. Xuedu Lu are the elected chair and vice chair. As of the date of this writing, the EB has met 19 times to address operational issues, accept or reject proposed CDM project methodologies and continue to refine the CDM rules. The agenda for the EB's 19th meeting, held on 11 - 13 May 2005 in Bonn, Germany, for example, contains issues ranging from accreditation of operational entities to matters related to the CDM registry.

The Designated Operational Entities (DOEs) are entities, domestic or international, that are accredited by the EB to validate and register CDM projects once they meet all the necessary standards. DOEs are formally designated by the COP/MOP based on the recommendation of the EB. A DOE's function is to validate proposed CDM project activities and to assist in EB registration, verification and certification of emission reductions. Validation of a CDM project consists of an independent evaluation by a DOE against the requirements of the CDM on the basis of the Project Design Documents. Project

Design Documents are described in the table below. The registration of a project is the formal acceptance by the EB of a validated project as a CDM project activity. Registration is a prerequisite for the verification and certification of CERs related to that project activity. Verification is the periodic independent review of the monitored reductions in GHG emissions that have occurred as a result of a registered CDM project activity. Certification is the written acceptance by the DOE that a project activity achieved the reductions in emissions of greenhouse gases as verified. DOE's are accredited to perform these functions in specific sectors and only in the last few months were the first provisionally designated DOE's formally accredited. Five DOEs, Det Norske Veritas Certification Ltd., JQA Ltd, JACO CDM Ltd, SGS UK Ltd, and TUV Industrie Service GmbH are accredited to validate "waste handling and disposal" CDM projects, which is the sector that encompasses landfill gas recovery projects.

3.2 CDM Approval Process

Projects must comply with the requirements of the Protocol as defined by the EB and COP/MOP in order to be eligible as CDM projects. The steps required to qualify as a CDM project are detailed below in Table 1.

Table 1. Steps needed to qualify as a CDM project under the Kyoto Protocol.

Step	Description	Responsibility
Host country approval	Approval at the national level by the Designated National Authority, consistent with domestic laws and political priorities.	Project developer
Project design document (PPD)	Identification of a concept and development of the project design documents such as baseline estimate, additionality, sustainable development contributions, monitoring and verification plan and stakeholders' opinion.	Project developer
Validation	Third party validation of baselines and other details to confirm that emissions reductions as claimed by the project are considered realistic.	DOE

Registration	Registration of the project activity with the CDM Executive Board, once the project has received host country approval.	EB on demand of DOE
Financing	Investor providing capital in the form of debt or equity; the investors may or may not be carbon buyers.	Project developer
Implementation	Building, commissioning and initiating operations.	Project developer
Monitoring	During commissioning and further operations, the progress and GHG offsets are to be monitored.	Project developer
Verification	An independent assessment of project performance against the validated design, including the baseline.	DOE
Certification and issuance of CERs	Based on the verification report, the CDM Executive Board certifies and issues CERs.	EB

3.3 Designated National Authority

The Protocol requires that each host country establish a Designated National Authority (DNA) to oversee and manage CDM projects. The DNA is often based in an existing agency or institution in a developing country. Given that one of the Protocol’s two key goals is to assist developing countries to achieve sustainable development, a key and early function of the DNA in each country is to develop “sustainability criteria” that will be used by the DNA to judge whether a proposed CDM project will contribute to the sustainable development in the host country. If such a finding is made, then the project should receive the approval of the host country. This approval is a prerequisite for a CDM project and a factor that investors consider, often waiting for the DNA to issue a Letter of Approval for a project before deciding whether to invest in it.

4. WHAT MAKES LANDFILL GAS RECOVERY THE LOW HANGING FRUIT FOR CDM PROJECTS IN DEVELOPING COUNTRIES?

First, a significant component of CDM project eligibility is the requirement of “additionality”. Article 12.5 of the Protocol states that it supports only “. . . reductions in

emissions that are real, measurable and additional to any that would occur in the absence of the certified project activity”.

Environmental laws and regulations in many developing countries do not require that landfill gas be recovered, flared, or utilized. They allow for landfill methane to be vented to the atmosphere, unless health and safety considerations dictate, on a case-by-case basis, that other measures be taken. Passive venting of gas is the status quo in many developing countries and therefore is considered to be the baseline scenario. As long as a country’s environmental regulations require venting only, any landfill gas that is captured and flared or used for an energy project will constitute a reduction in the baseline emissions scenario and will meet the test for “*additionality*”. It is no coincidence that as of May 2004, landfill gas recovery projects were the second largest suppliers of emission reductions worldwide.

Second, investors and buyers of carbon credits are discovering that landfill gas recovery projects can meet the additionality test, and so there has been a steady escalation of interest in these projects. This explains why a significant percentage of all carbon credits committed in 2004 came from landfill gas recovery projects.

Third, the technologies required for landfill gas recovery and utilization are proven and reliable. As noted earlier, over 1100 projects exist worldwide as this technology has been fully commercial since 1975.

Fourth, the Executive Board has approved a number of different methodologies for calculating the baseline scenario and establishing additionality in landfill gas CDM projects. If a new project follows a methodology already approved by the EB, it increases its chances for approval by the EB. Approximately one year ago, the EB approved a Consolidated Methodology for landfill gas CDM projects and essentially all of the landfill gas recovery projects since then have adopted the approach outlined in the Consolidated Methodology. In addition to the Consolidated Methodology, the EB has approved other landfill gas recovery methodologies for projects in Brazil, Costa Rica, India, Malaysia and Vietnam.

A final factor we will mention is that the EU and some individual countries have moved ahead with their own mandatory trading schemes independent of the Kyoto Protocol. Under the EU Emissions Trading Scheme (EU-ETS), over 15,000 sources are under a legal obligation to reduce their GHG emissions between 2005-2007. The EU Parliament has

adopted a measure, referred to as The Linking Directive, that allows companies in the EU to achieve the required emission reductions through the purchase of carbon credits from projects in the developing world. Developing countries have the potential to establish themselves as prime destinations for investment by EU companies in CDM projects generally and landfill gas recovery projects in particular.

Timing is important. At the moment, the Protocol calls for emission reductions from 2008-2012. The first commitment period under the EU-ETS is 2005-2007. The second commitment period under the EU-ETS overlaps with Kyoto from 2008-2012. The status of reductions after 2012 remains unclear, which may cause investors to react conservatively and has certainly kept the price for post 2012 CERs very low. In other words, many investors will not invest in a project unless they are confident it will be capable of delivering credits during those critical years of 2008-2012. Given the fact that it takes several years to develop a CDM carbon credit project to the point that it is registered and ready to start delivering emission reductions, the window of opportunity is relatively small but there is real potential for landfill gas projects in developing countries in that timeframe.

5. WHO'S BUYING, WHO'S SELLING AND WHAT ARE THEY LOOKING FOR?

The carbon credit market continues to evolve and mature. Prices are rising and the number of trades/month is increasing with 2.5 million tons of carbon/month traded in the last quarter of 2004, 6 million tons in January 2005, and 8 million tons in February 2005.

In early 2005, the Netherlands posted its carbon registry on the Internet to facilitate trades. Norway has established the first carbon allowances exchange, which functions in the same way as other exchanges, which trade in metals, soy or stocks. Traders estimate that within two years, the international carbon trade will be worth 10-15 billion euros per year. The second annual Carbon Expo was held in May 2005 in Cologne, Germany. Much business was transacted at the Expo with project proponents from developing countries around the world presenting actual projects to investors for their consideration. The Expo included a trade fair where parties met to discuss the Kyoto market and process.

The demand for carbon credits remained fairly concentrated in 2004 with Japanese companies constituting the single largest purchaser (41% of the carbon credits sold in 2003-2004). They were followed by the World Bank's Carbon Finance Unit, with the Government of the Netherlands in third place (Lecocq, 2004). These three buyers accounted for almost 90% of the demand in 2003-2004. It is anticipated that Sweden, Finland, Denmark, Austria and Canada will be more active in the future. These countries are buying credits to meet Kyoto targets with the intention of selling or awarding the credits to industries within their borders.

During 1996-2000, both the buyers and sellers for the majority of transactions were from industrialized countries. However, the percentage of contracted emissions reductions from developing countries and transition economies has risen steadily from 38% in 2001 to 60% in 2002, 88% in 2003 and 93% in the first months of 2004.

The majority of the emissions reductions in 2003-2004 came from projects in Asia (51% of the total supply). Latin America was second with 27% of the tons CO₂ equivalent supplied. Developed economies were third followed by Eastern Europe. There are a number of CDM projects in Romania, and when you add the projects in India, Brazil, Indonesia and Chile, these five countries supplied two-thirds of the CDM carbon credits worldwide in 2003-2004. Much of this potential market remains untapped.

6. WHAT DOES THE MARKET WANT?

The potential funders, investors and/or buyers of carbon credits in a CDM project may be governments through government agencies, corporations and other private companies, foundations, multilateral agencies like the World Bank, investment funds and other financial entities or institutions buying either for compliance or for investment and resale. Carbon credit buyers can make financial contributions, take full or partial equity, provide loans or lease financing, pre-pay CERs which pre-payment can be used to fund capital expenditures, simply enter into carbon credit purchase agreements, or utilize other new, creative structures that are emerging to respond to market factors.

It does not require an expert to predict that markets seek low risk, low cost, long-term emission reductions. There are some specific factors, however, that make a project more attractive to buyers and investors. For example, one important issue is that the project must demonstrate clear and unencumbered ownership or rights to both the gas and the real estate. Strong support from the host country will also enhance a project's value and minimize the perception of risk. Some buyers may require a host country Letter of Approval before they will look seriously at a project. Most will want to see a completed and in some cases validated Project Design Document and some will insist on Executive Board registration before committing. The credit rating of the seller is critical and as a result, some project developers are entering into relationships with equipment manufacturers, investors, gas users, brokers and others to enhance the project's credit rating.

Other factors to consider are project size, ownership, reliability of gas quantity and quality for a specific user, environmental compliance record, and community relations. The market generally requires projects of a minimum size. A landfill gas project that cannot guarantee at least 250,000 tons of CO₂e over the term of the contract is unlikely to attract interest. However, investors and buyers are quite receptive to and, in some cases, openly solicit, projects comprised of multiple landfills, especially if they are under common ownership. Gas quality and a reliable gas user are of the utmost importance. Generally, the fewer parties involved, the more interest there will be in a project. On the other hand, a poor

environmental compliance record and the perception of community opposition can put a potential project at risk for attracting investment.

An investor or buyer will want to see a description of the seller of the emission reductions, an assessment of the seller's financial strength using historical financial statements, existing regulatory approval to operate the landfills in the project, and information on the project participants. Buyers will also expect to see detailed breakdowns of projected revenues, required investment and the type of financing to be used. Buyers will generally require financial penalties if emission reductions are not delivered according to contractual provisions. The technology should be proven and operating capability must be established. As with most investments, serious buyers and investors will engage in a thorough due diligence process.

To the extent a developer can control these risk factors and design a project with them in mind, the project will generate more interest and command a higher price among commercial buyers in the international carbon credits market. To date, there is a very small group of experienced and skilled brokers and consultants internationally who can assist projects to find the most appropriate structures, investors and buyers. It is important that any project developer screen carefully before committing to a professional team or investor. The growing CDM market worldwide is offering opportunities to the waste industry in developing countries. Now is the time to seize these opportunities.

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