

The background image shows an outdoor industrial site, likely a landfill gas treatment plant. In the center, there are several large green metal containers or tanks. A worker in a yellow safety vest is visible near one of the containers. To the left, there is a tall, cylindrical metal structure. The site is surrounded by a fence and is situated in a grassy field under a cloudy sky.

Opportunities for LFGTE Projects in LAC Utilizing International Carbon Financing

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Contents

1. Carbon Finance Business (CFB) at the World Bank and its support for LFGTE projects
2. Regional Initiative to Promote LFGTE Projects in Latin America and the Caribbean (LAC)
3. The LAC Region LFGTE Portfolio and selected Case Studies



1. Carbon Finance Business (CFB) at the World Bank



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Kyoto Protocol & the Carbon Market

- The Protocol establishes GHG emission reduction targets for industrialized countries
 - Emissions 5.2% below 1990 levels by 2012
- Developing countries have no quantitative commitment
- Beyond domestic actions, the Protocol allows countries to meet commitments through:
 - International Emissions Trading (ET) – between industrialized countries
 - Joint Implementation (JI) – creating emission offsets in industrialized countries
 - Clean Development Mechanism (CDM) – selling certified emission reductions (CERs) created by developing country projects



State and Trends in International Carbon Finance

- World Bank study identified 404 project transactions in the Carbon Market since its inception in 1996, totaling emission reductions (ERs) of 300 million tCO₂e
- Volume of ERs more than doubling every year
 - 13 million tCO₂e in 2001
 - 30 million tCO₂e in 2002
 - 78 million tCO₂e in 2003
 - 65 million tCO₂e up to May 2004
- In developing countries, ER prices typically range from \$3 - 6 per tCO₂e
 - Note that the marginal price of an ER in industrialized countries is around \$15 per tCO₂e



Who Buys ERs?

- World Bank Carbon Finance Business (CFB)
 - Prototype Carbon Fund (PCF)
 - Netherlands Clean Development Facility (NCDF)
 - Community Development Carbon Fund (CDCF)
 - BioCarbon Fund
 - The Italian Carbon Fund
 - World Bank Staff Climate Protection Program
- Japan buys 41% of ERs purchased, followed by the World Bank CFB (24%), Netherlands (23%), Canada (3%), the USA (3%), Australia/New Zealand (3%), and other EU (3%)



LFG and Carbon Finance

- LFG projects that collect and destroy or utilize methane can:
 - mitigate 5 kg CO₂e per kWh by combusting CH₄
 - substitute fossil fuel in energy production up to 1 kg CO₂e per kWh (the case of coal)
 - contribute over 1.5 US cents per kWh (at \$3/tCO₂e)
 - boost internal rates of return by over 5%
- LFG represents 25% of international carbon market in 2002-2003, and 18% in 2004
- LFG projects account for 19% of the Bank's \$247 million CFB portfolio of CER purchases in 2003



To access information on Carbon Finance
Business at the World Bank,
please go to:

www.carbonfinance.org



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2. World Bank–ESMAP Landfill Gas-to-Energy Initiative for LAC



Why Latin America?

- Highly urbanized region (over 75% urban)
- 117 cities of over 500,000 population
 - Many potential project sites
 - If only half these cities developed LFGTE projects, could generate 800 MW of electricity
- Landfill practice more advanced than in other regions
- Currently only 3 active LFGTE projects
 - Monterrey, Mexico Salinas Victoria Landfill (7 MW)
 - Sao Paulo, Brazil Bandeirantes Landfill (23 MW)
 - Maldonado, Uruguay Las Rosas Landfill (0.9 MW)

Conclusion: Considerable potential for developing LFGTE projects



The LAC Regional Initiative

- Aims at promoting LFGTE investments in LAC:
 - Regional approach to maximize methane emissions reductions and carbon trading opportunities
- Supported by:
 - Canadian International Development Agency (CIDA)
 - Energy Sector Management Assistance Program (ESMAP)
 - The World Bank LAC Regional Office (IBRD/LCR)
 - Prototype Carbon Fund (PCF)



Scope of Work – Phase I

- Case Studies on existing and emerging LFGTE projects in Brazil, Canada, Chile, Latvia, Mexico, Poland, South Africa, Turkey and Uruguay (2003)
- Handbook for the Preparation of LFGTE Projects (2003)
- Regional launch workshop in Monterrey, Mexico (23-24 October 2003)
- Knowledge network and shared website (2003-04)
- Publication and dissemination of Handbook and Case Studies (2004)



Phase I is now completed

The Handbook and Case Studies can be
viewed at the project website:

www.bancomundial.org.ar/lfg/



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Scope of Work – Phase II

- Identify new sites for pre-investment studies (2004-05)
 - 24 potential sites submitted letters of interest
 - 10 sites were chosen for pre-investment work
 - 5 sites chosen for additional pump tests
- Help mobilize investment resources for viable sites, including carbon emissions credits financing (2005)
- Conduct sub-regional workshops to help disseminate accumulated experiences and promote other new LFGTE projects (2005)



3. The LAC Region LFGTE Portfolio and Selected Case Studies



LFGTE Project Portfolio in LAC

Global Environmental Facility (GEF)

Grant financing for the first generation LFGTE projects: Mexico (Monterrey) and Uruguay (Maldonado)

Carbon Finance Business (CFB)

Finances LFG capture and LFGTE projects through ER purchase agreements through CDM: Brazil (NovaGerar); Argentina (Olavarria); Mexico Umbrella Project (Leon, Guadalajara, Monterrey); Uruguay (Montevideo); and Peru (Lima)

Energy Sector Management Assistance Program (ESMAP) – LFGTE Regional Initiative

Finances LFGTE pre-investment studies in 10 landfill sites through technical assistance grants: Brazil, Colombia, Mexico, Peru, Uruguay)

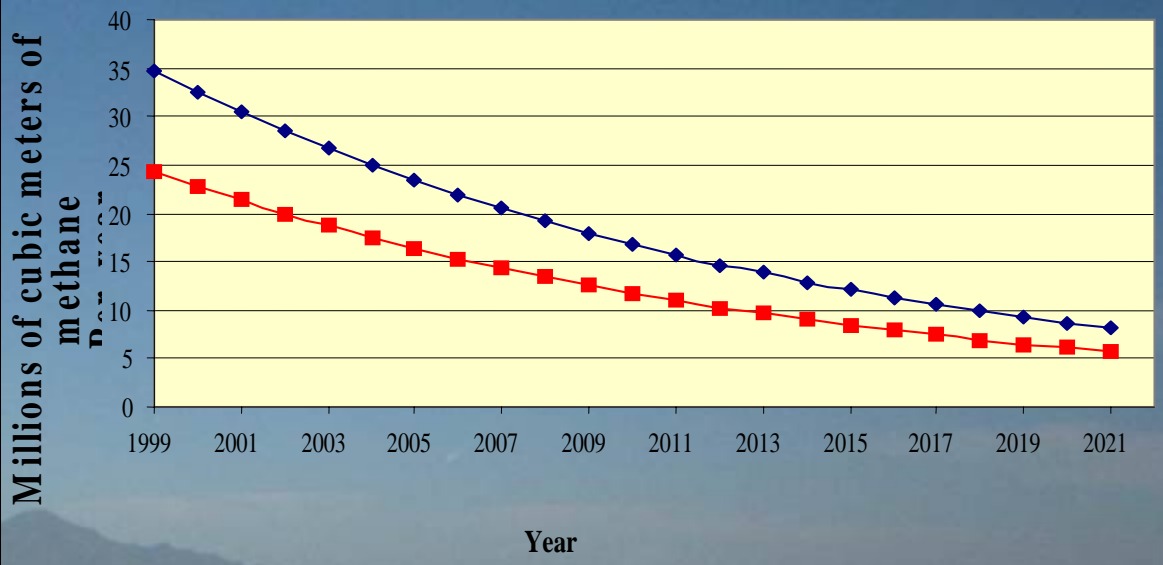


LFGTE Existing Project Summaries

LFGTE Project	Ave. Daily Disposal (tpd)	Power Plant (MW)	ERs (million tCO ₂ e)	ERPA Price* (\$/tCO ₂ e)
Riga (Latvia) Getlini Landfill	700	5	1.95	4.00*
Liepaja (Latvia) Grobina Landfill	120	1.1	0.39	6.35
Durban (South Africa) 3 landfills	2,500	10	4.10	4.00
Monterrey (Mexico) Saliinas Victoria Landfill	4,500	7	0.99	5.00*
NovaGerar (Brazil) Adrianopolis Landfill	4,000	12	2.50	3.35
Maldonado (Uruguay) Las Rosas Landfill	145	0.9	0.47	2.05*
Olavarria (Argentina) Olavarria Landfill	100	Flaring only	0.36	4.50



Monterrey - Salinas Victoria Landfill



Monterrey – GEF Demonstration Project



Monterrey, Mexico GEF Project

- Salinas Victoria Landfill receives 4,500 tpd of Monterrey MSWM (3 million population)
- LFGTE project developed 44 ha area of landfill that was closed and capped in 1999, containing some 7.7 million tons of waste
- 7 MW plant (7 Jenbacher IC engines) began operating in April, 2003
- Total investment \$11.5 million with \$4.92 million GEF grant



Monterrey...

- Project will capture 214 million m³ of methane, and substitute 127,000 tons of carbon from fossil fuel for power production
 - Estimated ERs = 0.99 million tCO₂e
 - Equivalent incremental price of \$5.00/tCO₂e
- Monterrey users will purchase electricity at 5% below national CFE prices
 - Average price = \$0.088/kWh
- Carbon finance increased project FIRR from 13.4% to 27.6%
- This GEF demonstration activity will lead to expansion on site and LFGTE projects in other major cities under a national umbrella project for carbon financing



NovaGerar - Nova Iguaçu, Brazil Marambaia Open Dump (1/2003)





**New Adrianópolis Landfill
Site Development Plan (2/2003)**

NovaGerar, Brazil PCF Project

- Nova Iguaçu (800,000 population) generates 900 tpd, that was disposed in Marambaia dump until 2002
- LFGTE project includes closure and rehabilitation of Marambaia dump and construction of new Adrianópolis Landfill with 4,000 tpd capacity
- 12 MW capacity (12 Caterpillar IC Engines)
 - 2 MW plant at Marambaia and 34 gas wells
 - 10 MW plant at Adrianopolis expandable to 20 MW
- Total capital expenditure for LFGTE components estimated at \$10.9 million, to be provided by EnerG partner



NovaGerar...

- ERs estimated at 11.8 million tCO₂e over 21 years
- NovaGerar negotiating ERPA with CFB (NCDF) to buy 2.5 million CERs at \$3.35/tCO₂e up to 2012
- Electricity sales at \$0.045/kWh
 - National Program for Promoting Alternative Energy Sources (PROINFA) may purchase future biogas power at incentive price of \$0.057/kWh, through 20 year PPA
- Carbon finance will increase project FIRR from 9.2% to 25.9%
- PCF umbrella project for Brazil expected to follow



Maldonado – Las Rosas Landfill



Maldonado – GEF Demonstration Project



Maldonado, Uruguay GEF Project

- Maldonado has base population of 116,000 that triples during summer tourist season
- Las Rosas Landfill receives average of 145 tpd with capacity to 2007
- 56 gas wells installed
- 0.9 MW plant (2 GUASCOR IC engines) started up in October 2004
- Total LFG project investment of \$1.5 million including a \$975,000 GEF grant



Maldonado...

- ERs estimated at 473,540 tCO₂e over 15 years
 - 398,201 tCO₂e from methane combustion
 - 75,339 tCO₂e from fuel oil substitution
- GEF finance for ERs at an equivalent incremental price of \$2.05/tCO₂e
- Electricity to be purchased by UTE (State Power Utility) at an average price of \$0.027/kWh
- This experience will contribute to the development of a major LFGTE project for the capital city of Montevideo



Olavarria, Argentina CDCF Project

- Methane capture and flaring project in design phase
- Total investment: \$276,100
- Expected ERs: 363,331 tCO₂e over 21 years
- CDCF ERPA: 131,234 tCO₂e @ \$4.50/ tCO₂e
- Operational: May, 2005

Landfill Characteristics:

- Operation started: Oct. 1999
- Expected closing: 2029
- Landfill area: 33 ha
- Filling area: 17 ha
- Daily disposal: 100 tpd
- Waste in place: 120,000 tonnes



Next Steps

- Completion of prefeasibility studies for the 10 selected landfills (expected January 2005)
- Completion of pump tests for 5 out of the 10 selected landfills (expected March, 2005)
- Main findings and results dissemination workshop (expected May, 2005)
- Assist in structuring carbon finance deals for viable sites (ongoing in 2005)



Thank you!



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