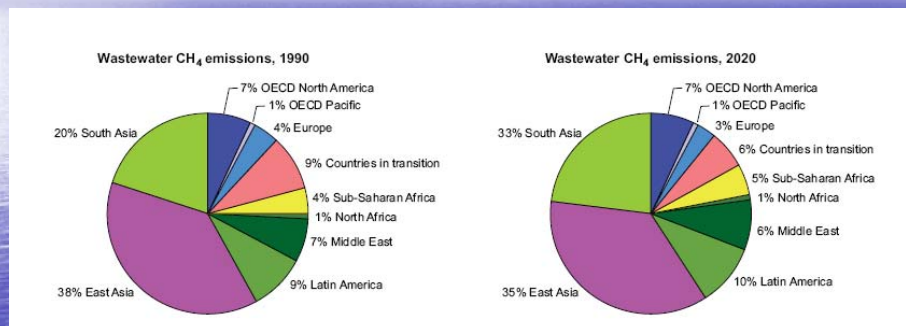


Mitigation of GHG through Solid Waste and Wastewater Management: The World Bank experience in Latin America

Walter Vergara/Seraphine Haeussling

Regional distribution of CH₄ emissions from wastewater and human sewage in 1990 and 2020



IPCC Fourth Assessment Report: Working Group III Report "Mitigation of Climate Change"

Regional climate change strategy in Latin America and the Caribbean

- a) To support low carbon economic growth, in particular for the energy and transport sectors, which represent the bulk of emissions in the region and promote avoidance of deforestation;
- b) To support the process of adaptation, focused on key vulnerabilities; and
- c) To support the linkages between knowledge and capacity building and decision making.

GEF - Global Environmental Facility

OPERATIONAL PROGRAM NUMBER 6
PROMOTING THE ADOPTION OF RENEWABLE ENERGY
BY REMOVING BARRIERS AND REDUCING IMPLEMENTATION COSTS

The objectives of this Operational Program are to:

- (a) remove the barriers to the use of commercial or near-commercial renewable energy technologies (RETs);
- and
- (b) reduce any additional implementation costs for RETs that result from a lack of practical experience, initial low volume markets, or from the dispersed nature of applications, such that economically profitable “winwin” transactions and activities increase the deployment of RETs.

Mexico: Methane Capture and Use in a Landfill (P063463)

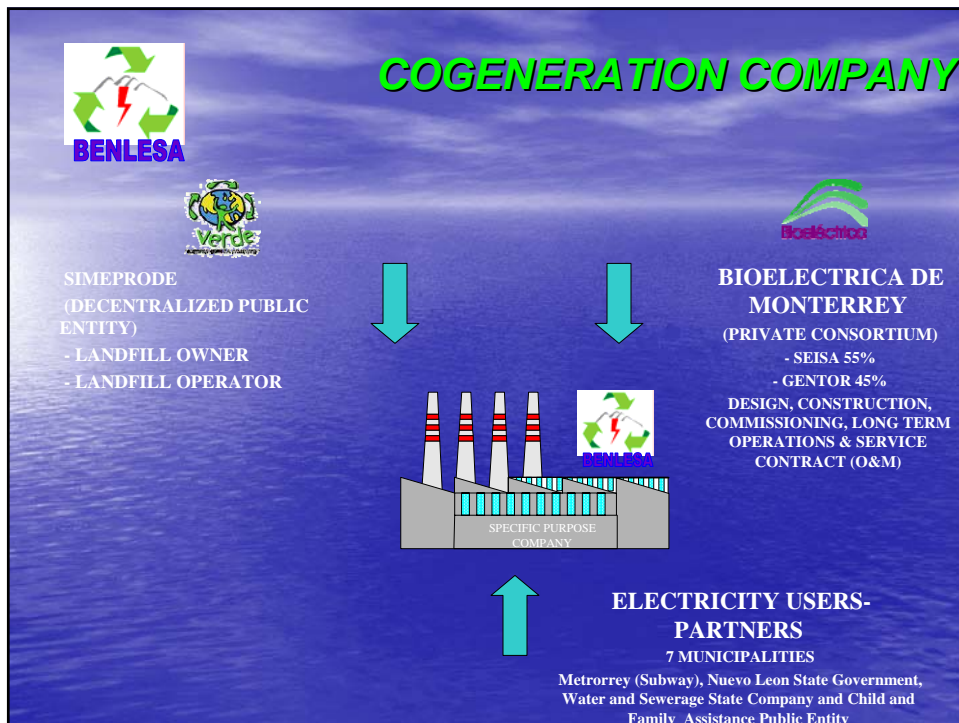
- Formulated in 2001.
- Approved by GEF council: May 2002.
- Approved GEF amount: USD 6.27 million
- Started operation in May 2003.
- Development objective: Demonstrate the technology and address barriers for regional replication

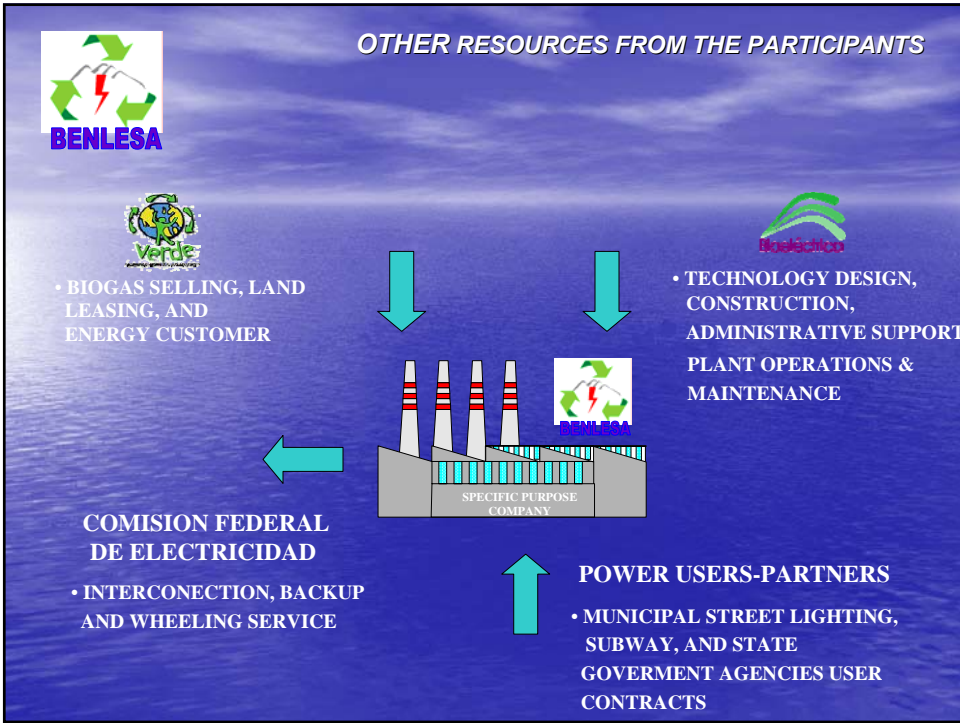
Project development objective

- Demonstrating a cost-effective technology for LFG capture and use in a selected facility
- Demonstrating an institutional structure for the implementation of LFG projects, including private sector participation
- Strengthening the UMS's regulatory policy and social frameworks for the introduction of LFG capture and use in Mexico
- Designing a dissemination strategy to share the lessons learned through project implementation
- Designing strategy to encourage replication

Monterrey is a success

- Demonstrates concept
- Partnership between financier (Mexico), know how (UK), management expertise (Costa Rica)
- Basis for replication elsewhere in the region
- Energy - waste management - climate change
- Provides strong initial steps for replication
- Powers metrorey during day and street lighting at night





PLANT CHARACTERISTICS

Designed with the latest technology, the modular configuration of the integrated gensets make their installation, operation and maintenance easy, providing flexibility in the capacity expansion of the plant.

The total capacity is 7.42 MW

Planned to operate at least for the next 25 to 30 years, depending on the future life of the sanitary landfill, and the waste that will be deposited;
5 employees (2 for the gas field, and 3 to operate and maintenance the engines).

Key Components:

Biogas System

- § 248 Extraction Wells with Monitoring Valves.
- § Collecting Pipes, Conduction and Control (≈ 25 km.)
- § 3 Vacuum Pumps.
- § Filters.
- § 2 Flare Stations for Gas Burning (operates as needed)



5

Process



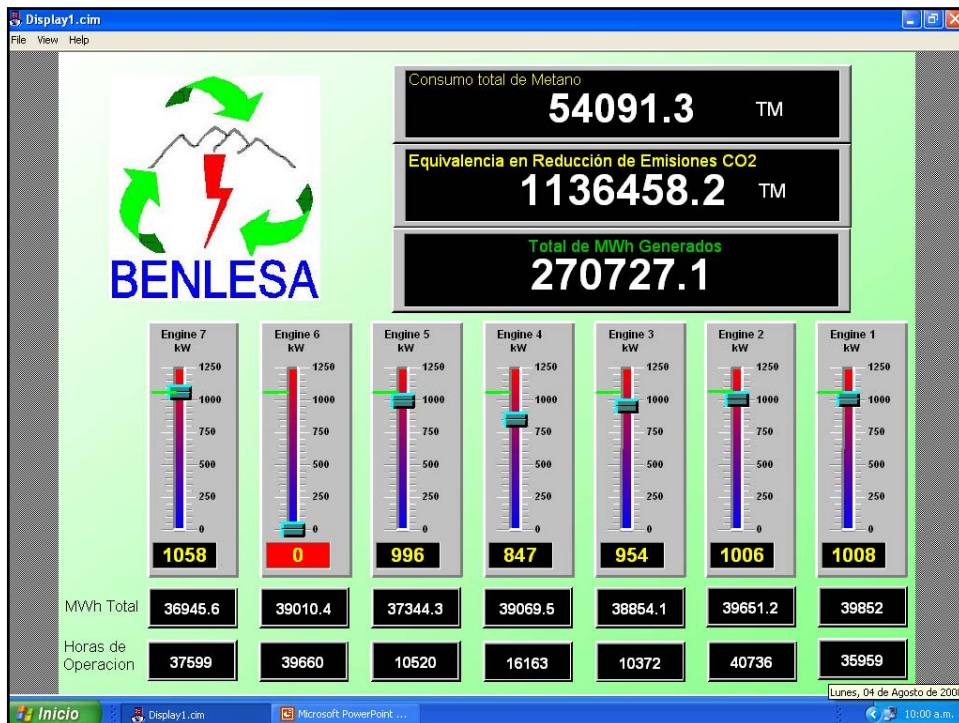
ENVIRONMENTAL AND ENERGY DRIVERS

The plant will deliver the following benefits:

- Destroy the equivalent consumption of 2 million metric tons of carbon (MMTCE basic unit measurement of greenhouse gases) in 20 years.
- 2 million tons of carbon is equivalent to remove 90,000 cars in one year in a metropolitan area like Monterrey.
- Prevent the emission of 68 m³/minute of biogas (50% methane and 50% CO₂)
- 68 m³/ minute of biogas can produce 58'250,000 kWh. of energy per year.
- 58'250,000 kWh. have the capacity to supply energy to at least 16,000 medium-small houses per year.
- Similar flow rates of biogas in one year have the impact to destroy the equivalent benefit of 970 hectares of trees.
- 58'250,000 kWh. Have the capacity to supply 80% of the street lightning of Monterrey city.
- The beneficiated population is equivalent to 730,000 inhabitants in public lightning.
- 10% lower tariff to municipalities, than their official tariff from CFE.



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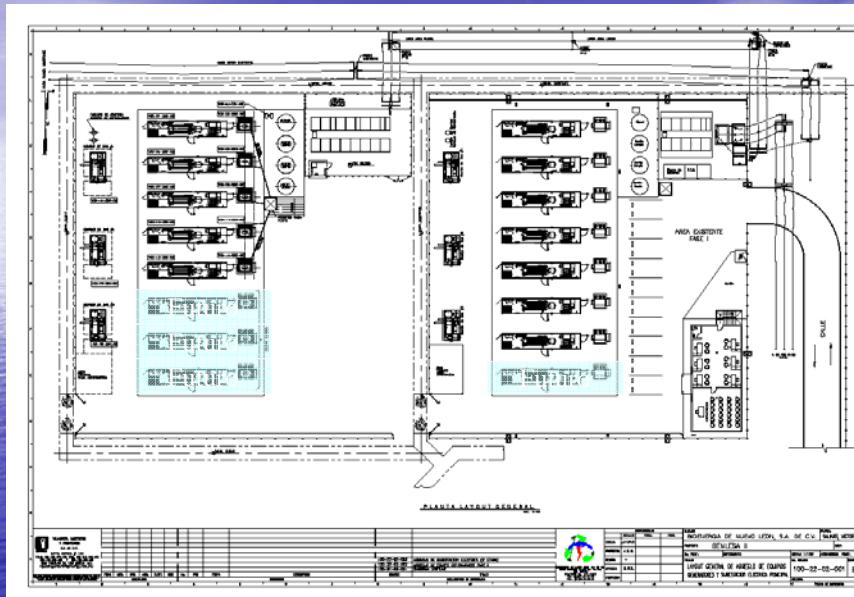


Monterrey expansion program

- Official inauguration September 17, 2008
- Capacity : 5.3 MW
- \$US/MW= 1.23 MM
- Expected Emission reductions by 2012: approx. 1 million t CO₂e
- 15% of ER for rural electrification program



Layout of expanded plant



CH₄ and N₂O from wastewater treatment

- Wastewater important source of CH₄
- N₂O is also major concern (310 GWP)
- Only 9% of sewage is treated in the region
- ER revenues can improve economic performance of WWT

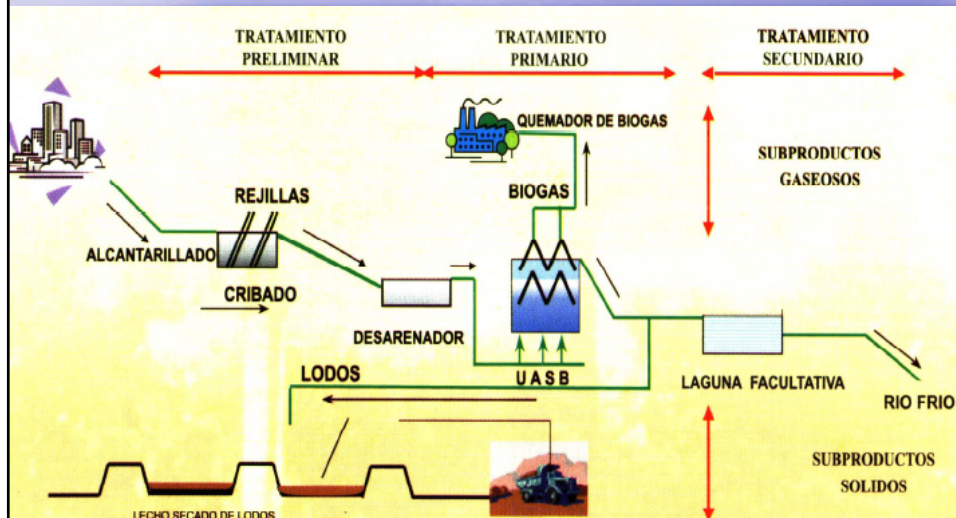
Rio Frio Wastewater Treatment Plant Project Objectives

- Reduce GHG emissions from the Wastewater treatment sector in Colombia through the modernization of the Rio Frio wastewater treatment plant, located in Giron (metropolitan area of Bucaramanga)
- 15% of ER revenues will support a community benefit program

Strategic Value

- The project will constitute a 'proof of concept' with potential to be replicated throughout the region: demonstrate CDM application of CH₄ (21) and N₂O (310) in wastewater treatment
- Project would improve viability of secondary wastewater treatment (only approximately 10% of wastewater is treated in LAC)
- Project preparation included techniques for field measurements of N₂O

Process



Activities

- GHG abatement at the waste water treatment plant. Improvements that will result in the elimination or prevention of GHG emissions (CH₄, N₂O)
- Social program to address overall health conditions and employment among poor segments of local population

Project Parameters

- Target Population: 0.5 million
- Effluent: 90,000 tons/day
- BOD i-o: 350 ppm – 35 ppm
- [Ntotal] i-o: 50 ppm – 20 ppm
- Biogas generated and captively used: 15,000 m³/day
- Aeration power reqmts: 1.5 MWH
- Sludge (biosolid) 13 tons (dry)/day

How to reduce CH₄ emissions

- Improved collection in the UASB (cut fugitive emissions and leaks, better degassing)
- Eliminate emissions from facultative lagoons
- All CH₄ burned to provide mechanical energy

Source of N₂O reduction

- NH₄ released in effluent may result in N₂O emissions through two pathways, as a byproduct of nitrification and denitrification
- IPCC has recognized these emissions and identified a range of between 0.01 – 0.12 N in N₂O/N in N (org)
- Default factor severely undervalued (0.01)

Project cost

• Pretreatment:	10%
• UASB:	20%
• Anoxic/Aerator hybrid	25%
• Clarifiers	15%
• Sludge Treatment	10%
• Others:	20%
• Total	13 US million
• Cost per hab.	USD 26

Optical Remote Sensing



Figure 6. HRPM Configuration Used at the UASB Reactor Area

- Evaluation of Fugitive Emissions of Methane and Nitrous Oxide from the Rio Frio Wastewater Treatment Plant