

SOLID WASTE & CARBON FINANCE EXPERIENCE AND MOVING FORWARD

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The World Bank

Landfill Methane Outreach Program

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Presentation Topics

- ◆ Introduction to the World Bank
- ◆ World Bank and waste management
- ◆ Carbon Finance
- ◆ LFG Strategy in Brazil



The World Bank

Short Overview

- ◆ Founded in 1944 for post-war reconstruction
- ◆ Poverty alleviation and sustainable development focused on developing countries
 - ◆ Poverty: earn less than \$2 per day
- ◆ Organization
 - ◆ International Bank for Reconstruction and Development (IBRD)
 - ◆ International Development Association (IDA)
 - ◆ International Finance Corporation (IFC)
 - ◆ Multilateral Investment Guarantee Agency (MIGA)
 - ◆ International Centre for Settlement of Investment Disputes (ICSID)

SWM: Main issues and challenges

- ◆ Considerable environmental and social impacts
- ◆ Lack of appropriate regulatory and institutional frameworks
- ◆ Poor cost-recovery mechanisms
- ◆ Despite interest, problems with privatization process
- ◆ Minimal investments in the sector
- ◆ Lack of capacity to prepare projects
- ◆ Great potential for "economies-of-scale" and carbon finance opportunities through LGF projects

The World Bank

Municipal Waste Management

- ◆ Improve quality of life and reduce risks of improper waste disposal
- ◆ Poverty reduction - social inclusion of waste pickers
- ◆ Technical assistance and financing of projects
- ◆ World Bank loan portfolio, ex:
 - ◆ Brazil
 - ◆ China, Tianjin
 - ◆ Columbia
 - ◆ Jordan, Amman
 - ◆ Maldives
 - ◆ Morocco
 - ◆ Nigeria, Lagos
 - ◆ Uzbekistan, Tashkent
- ◆ Carbon Finance



The Kyoto Protocol

Clean Development Mechanism

- ◆ **Kyoto Protocol** – Clean Development Mechanism (CDM), Provision for sale of emission reductions in developing countries to buyers in developed countries
- ◆ Methodologies to measure reduction in GHG approved by UNFCCC
- ◆ Carbon finance, payment tied to documented performance
- ◆ Conditions include
 - ◆ Baseline: GHG emissions in the absence of action (Business as Usual).
 - ◆ Additionality: ERs that would be achieved with project
 - ◆ Barriers – Investment, technical, common practice



The World Bank in Brazil

Solid Waste Management

- ◆ Highly urbanized country
 - ◆ Cities with population >100,000: 251
 - ◆ Total population in these cities: 96.5 million (49% of Brazil's population)
 - ◆ 80% collection in urban areas
 - ◆ Disposal methods
 - ◆ Landfill: 39%
 - ◆ Controlled landfills: 32%
 - ◆ Open dumps: 30%



SWM: Projects Loans/Carbon Finance

- ◆ Make municipal SWM projects viable
- ◆ Implement sanitary landfills and close open dumps
- ◆ Develop integrated waste management plans
- ◆ Minimize waste: reuse, recycle and compost
- ◆ Integrate social and environmental aspects
- ◆ Rely on private sector for service provision
- ◆ Encourage financing through user fees
- ◆ Build capacity within public sector

The World Bank in Brazil

Landfill Gas Projects in Brazil

- ◆ Registered by Nov 2009: 123
 - ◆ 6.4% of total registered projects
- ◆ Brazil
 - ◆ Registered landfill gas projects: 24
(11 recover energy – electricity)
 - ◆ Highest number of LFG projects in a country

World Bank in Brazil

Solid Waste & CDM Projects

- ◆ Nova Iguaçu Landfill Project in Rio de Janeiro Metro
 - ◆ 1,500 tons/day
- ◆ Itaoca Landfill Project in Rio de Janeiro Metro
 - ◆ 800 tons/day
- ◆ Candeias Landfill in Recife Metro
 - ◆ 700 tons/day
- ◆ Macaúbas Landfill in Belo Horizonte
 - ◆ 4,000 tons/day
- ◆ Gramacho Landfill in Rio de Janeiro Metro
 - ◆ 9,000 tons/day
- ◆ Brasilia Landfill (old and new)
 - ◆ 3,000 tons/day

World Bank Experience in Latin America

Gas Extraction from Landfills

- ◆ LFG volumes much lower than estimated
- ◆ Latin American Case Studies (2006)

	Bandeirantes	Villa Dominico	SIME PRODESO	Maldonado	Grobina Polygon	Olavarría
Estimated m ³ x 10 ³ LFG/year	215,000	116,500	15,340	1,963	696	3,408
Real m ³ x 10 ³ LFG/year	103,000	13,100	31,230	1,496	561	677
Difference m ³ x 10 ³ LFG/year	-112,000	-103,400	+15,890	-467	-135	-2,731
Difference in %	-48 %	-89 %	+104 %	-24 %	-20 %	-80 %

PDD Forecasts vs. Verification Results

- ◆ Reported ERs to forecast ERs (PDDs): 58.4⁰% (2007)
 - ◆ Positive trend: 40.9% (2006)
- ◆ Over expectation factors, high gas capture rates, high k value
 - ◆ Especially early projects with single k values
 - ◆ Now, multiple k values for different organic waste streams
- ◆ Under performance, high leachate levels
 - ◆ Food waste (moisture), precipitation

World Bank Experience in Brazil and Latin America

Why is LFG Production Lower?

- ◆ LFG production directly related to operational performance
- ◆ Many old dumpsites without any operational practices
- ◆ Many small sites (municipal)
- ◆ Result: Fewer landfill gas projects



World Bank Experience in Brazil and Latin America

Factors for Low LFG Production

- ◆ External Factors
 - ◆ Moisture content of organic waste
 - ◆ Precipitation, especially during wet season
 - ◆ Temperature, high decomposition (need to start quickly)
- ◆ Landfill design and operation
 - ◆ Poor planning: major delays and loss of LFG at its peak
 - ◆ Conflicts between landfill and LFG plant operators
 - ◆ Bottom slope not steep enough (poor drainage)
 - ◆ Cover material is impermeable (clay)
 - ◆ Improper waste compaction



Caixa Economica Federal and the World Bank

Integrated SWM Program in Brazil

- ◆ Caixa: Second largest public bank in Brazil
- ◆ Loan investments
 - ◆ Dump closures
 - ◆ Construction of new landfills
 - ◆ Other treatment facilities
- ◆ Carbon finance
 - ◆ Program of Activities (PoA)
 - ◆ Bundled projects rather than individual projects
- ◆ Technical assistance



The World Bank & Caixa Project in Brazil

Solid Waste & Carbon Finance Project



Strategy Moving Forward

- ◆ Implement regional/metropolitan solutions to SWM problem (economies-of-scale)
- ◆ Technical assistance to address technical, legal, financial and institutional issues
- ◆ Support project preparation, especial by the public sector
- ◆ Reduce risks and create conditions for private sector participation and investments in the sector
- ◆ Maximize the landfill gas and carbon finance opportunities
- ◆ Provide attractive financing for solid waste and landfill gas projects
- ◆ Innovative project financing , blended with carbon finance

Thank You

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Additional Information

- ◆ World Bank's Carbon Finance Unit website: www.carbonfinance.org
- ◆ World Bank's Urban Solid Waste Management website: <http://go.worldbank.org/A5TFX56L50>
- ◆ 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 5: Waste: <http://www.ipcc-nggip.iges.or.jp/public/2006gl/vol5.html>
- ◆ UNFCCC's CDM website: <http://cdm.unfccc.int/index.html>
- ◆ LFG Methodologies
 - ◆ LFG - ACM0001, Consolidated baseline and monitoring methodology for landfill gas project activities: http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_BTH14FSTZKNoWN9PBDUG9D2U83HXBQ
 - ◆ LFG - AMS-III.G, Landfill methane recovery: http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_341FT628YOoPX9D2BW9IDMHSTPY139