



WORLD BANK AND LFG PROJECT IN DEVELOPING COUNTRIES

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Waste Generation Rate / Collection



<u>Income Level</u>	<u>kg / capita / day</u>
Low	0.5
Middle	0.7
High	1.6

- Waste collection rate varies greatly
 - Conakry, Guinea: 510 tpd
 - Post Bank project, collection rate: 85%, 430 tpd
 - Pre Bank project, collection rate: 40%, 200 tpd

Waste Collection

Pre-Bank Loan - Uzbekistan



Composition & Moisture Content



<u>Material</u>	<u>Income Level</u>		
	<u>Low</u>	<u>Middle</u>	<u>High</u>
Food	40-85%	20-65%	20-50%
Paper	1-10%	15-40%	15-40%
Recyclables	4-25%	5-26%	11-43%
Fines	15-50%	15-50%	5-20%
Moisture	40-80%	40-60%	20-30%

Disposal Site – Arid Environment Kabul, Afghanistan



Disposal Site - Waste Pickers

Uzbekistan



Landfill Gas Focus

Greenhouse Gas (GHG) - Methane



- 21x global warming potential (GWP) of CO₂
- Methane – 15% of GHG
- Landfills
 - GHG emissions 730 million tCO₂e / year
 - 12%+ global anthropogenic methane emissions
 - 4th largest source of non-CO₂ GHG emissions

World Bank Loans



- Founded 1944 for post-war reconstruction
- Role to alleviate poverty in developing countries
- Bank loans with waste mgt components
 - Collection, transfer stations, landfills
 - Current commitments: \$2.28 billion, 49 active projects
 - Proposed commitments: \$0.95 billion, 12 projects under development

World Bank - Carbon Finance



- First Prototype Carbon Fund established in 1999 to catalyze the market
- In 2007 includes 10 Funds, supported by 13 governments and 56 private and public companies
- Bank Administered Funds: \$1.8 billion (July 2006)
- Payments tied to performance verified by 3rd party
- Contributes to sustainable development and mitigates climate change

World Bank Loans – Waste Mgt Carbon Finance Projects



<u>Country</u>	<u>City</u>	<u>Loan Amount (million US \$)</u>
Gas Recovery		
China	Tianjin & Shanghai	150
Guinea	Conakry	15
Nigeria	Lagos	150
Composting		
Afghanistan	Kabul	25
Uzbekistan	Tashkent	16

Disposal Site Conakry, Guinea



LFG-to-Electricity (1 MW)

Durban, South Africa



International Climate Bodies



- Intergovernmental Panel on Climate Change (IPCC)
- UN Framework Convention on Climate Change (UNFCCC), voluntary program (1994)
- Kyoto Protocol, legally binding pact, ratified 2004
 1. Clean Development Mechanism (CDM),
 2. Joint Implementation (JI)
 3. International Emissions Trading (IET)

Approved CDM Methodologies



Methodology	Reference	Applicability	Baseline
Landfill Gas Projects	ACM0001	Capture / Flaring or Energy Recovery	Business as Usual
Grid Connected Electricity Generation	AMS-I.D	Small-scale Power Generation not to exceed 15MW from Renewable Energy (e.g., LFG)	kW Generated times Emission Reduction of Displaced Fuel

Elements of ACM0001



- **Applicability** - capture and flaring of landfill gas and/or energy recovery and use
- **Baseline** - release of landfill gas to the atmosphere with no regulations that require landfill gas recovery
- **Monitoring** - direct monitoring of methane recovered, rationale all methane recovered would have been released without the project

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Project Cycle



- Project Idea Note (PIN)
- Letter of Intent (LOI)
- Project Design Document (PDD)
- Validation
- Emission Reduction Purchase Agreement (ERPA)
- Registration
- Verification / Certification

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Solid Waste Projects – LFG/Other



<u>Status</u>	<u>LFG</u>	<u>Other</u>	<u>TOTAL</u>
ERPA	8	1	9
CFD	4	1	5
PIN	19	5	24
On-Hold	<u>6</u>	<u>2</u>	<u>8</u>
TOTAL	37	9	46



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Solid Waste Projects – Regional Distribution

<u>Region</u>	<u>Projects</u>
Africa	8
E. Asia / Pacific	9
Europe / Central Asia	3
Latin America	15
Middle East / N. Africa	7
South Asia	<u>4</u>
TOTAL	46

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Solid Waste Projects w/ ERPA



million tCO₂e

Landfill Gas

– Alexandria, Egypt	1.10
– Buenos Aires, Argentina	0.13
– Durban, South Africa	0.61
– Liepaja, Latvia	0.39
– Lima, Peru	0.50
– Nova Iguazu, Brazil	2.50
– Tunis, Tunisia	1.12

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Solid Waste Projects w/ ERPA



	<u>million tCO₂e</u>
Landfill Gas (continued)	
– Tunis, Tunisia	1.93
Composting	
– Laguna de Bay, Philippines	<u>0.04</u>
TOTAL	8.32

UNFCCC Pipeline

Landfill Gas Projects



<u>Project Status</u>	<u>Number</u>
Validation	63
Registration *	<u>44</u>
TOTAL	107

* Includes 1 project seeking registration

Methane-to-Markets Countries

Developing Countries / EIT



Landfill Gas Generation – 2010

<u>Country</u>	<u>million m3</u>	<u>Country</u>	<u>million m3</u>
Argentina	580	Mexico	1,220
Brazil	1,210	Nigeria	570
China	9,310	Poland	850
Columbia	320	Russia	2,650
Ecuador	90	Ukraine	1,750
India	840		

THANK YOU VERY MUCH



FOR MORE INFORMATION CONTACT

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Useful References (1)

General Websites on CDM and JI:

- CFU website on CDM methodologies: Carbon Finance at the World Bank: Methodology (www.carbonfinance.org)
- Website of the UNFCCC: CDM: CDM-Home (<http://cdm.unfccc.int/> and <http://ji.unfccc.int/>)
- Website on CDM (and JI) procedures (Ministry of the Environment Japan, Institute for Global Environmental Strategies): <http://www.iges.or.jp/en/cdm/report01.html>
- Website (UNEP, Risø Centre): CDM (and JI) pipeline overview
<http://cd4cdm.org/index.htm>



Useful References (2)

Websites useful for country information and data:

- National Communications (for Annex I and non-Annex I Countries) and National Emissions Inventories (Annex I countries): http://unfccc.int/national_reports/items/1408.php
- IPCC Methodology reports (e.g. National Guidelines for National GHG Inventories) :
<http://www.ipcc.ch/pub/guide.htm>
- Website for energy statistics (International Energy Agency):
<http://www.iea.org/Textbase/stats/index.asp>
- Website on Climate Analysis Indicators Tool (World Resources Institute): <http://cait.wri.org/>
- Website on emissions from oil and gas industry (US EPA Gasstar): <http://www.epa.gov/gasstar/index.htm>