Clean Development Mechanism as a mitigation opportunity at urban level: issues and challenges

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  - CDM Statistics
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  - Municipal Solid Waste Management
    - Landfill projects
  - Wastewater treatment and Water treatment & distribution
  - Transport
  - Energy efficiency
  - Renewable energy application
- Issues
- Outlook
- Acknowledgements
KYOTO PROTOCOL

Flexible Mechanisms

Joint Implementation (“JI”)

INDUSTRIALIZED COUNTRIES (ANNEX I, PART A) \[\rightarrow\] INDUSTRIALIZED COUNTRIES (ANNEX I, PART B)

Clean Development Mechanism (“CDM”)

INDUSTRIALIZED COUNTRIES (ANNEX I) \[\rightarrow\] DEVELOPING COUNTRIES (NON-ANNEX I)

Emissions Trading

INDUSTRIALIZED COUNTRIES (ANNEX I) \[\rightarrow\] INDUSTRIALIZED COUNTRIES (ANNEX I)
**CONDITIONS FOR CDM PROJECT**

- Project activity GHG emissions should be lower than would happen in the absence of the project

Project emissions < Baseline

Emission reductions = Baseline – Project emissions - Leakage

- Demonstrate ADDITIONALITY
  Project activity should not be “business as usual”

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Overview: CDM Procedure

CLEAN DEVELOPMENT MECHANISM

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# CDM Project Scope

<table>
<thead>
<tr>
<th>Scope</th>
<th>Number Of Methodologies* (Large-scale (AM, AR-AM) , Small-scale (AMS, AR-AMS) , Consolidated (ACM) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy industries (renewable - / non-renewable sources) (1)</td>
<td>19</td>
</tr>
<tr>
<td>Energy distribution (2)</td>
<td>1</td>
</tr>
<tr>
<td><strong>Energy demand (3)</strong></td>
<td>6</td>
</tr>
<tr>
<td>Manufacturing industries (4)</td>
<td>9</td>
</tr>
<tr>
<td>Chemical industries (5)</td>
<td>4</td>
</tr>
<tr>
<td>Construction (6)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Transport (7)</strong></td>
<td>2</td>
</tr>
<tr>
<td>Mining/mineral production (8)</td>
<td>1</td>
</tr>
<tr>
<td>Metal production (9)</td>
<td>1</td>
</tr>
<tr>
<td>Fugitive emissions from fuels (solid, oil and gas) (10)</td>
<td>4</td>
</tr>
<tr>
<td>Fugitive emissions from production and consumption of halocarbons and sulfur hexafluoride (11)</td>
<td>1</td>
</tr>
<tr>
<td>Solvent use (12)</td>
<td>0</td>
</tr>
<tr>
<td><strong>Waste handling and disposal (13)</strong></td>
<td>17</td>
</tr>
<tr>
<td>Afforestation and reforestation (14)</td>
<td>4</td>
</tr>
<tr>
<td>Agriculture (15)</td>
<td>5</td>
</tr>
</tbody>
</table>

**Total: 74 methodologies**

23 applicable to the urban environment

There is potential for more methodologies, in sectors such as transport, construction, energy efficiency for the service or building sector.

* A methodology can be linked to more than one scope
CDM Statistics

Volume of CERs from registered projects

Average Annual Reductions (tCO2e/y)

- Brazil, 13,691,823, 16%
- Chile, 2,007,633, 2%
- China, 36,665,416, 44%
- India, 10,272,312, 12%
- Malaysia, 1,034,217, 1%
- Mexico, 3,976,915, 5%
- Republic of Korea, 11,075,612, 13%
- Argentina, 1,701,122, 2%
- Viet Nam, 681,306, 1%
- Other, 3,064,314, 4%

Sources: UNFCCC (http://cdm.unfccc.int)

(Retrieved on August 2006)
Number of CERs per region

Number of CDM projects in Asia by country

- India: 61%
- China: 21%
- Indonesia: 2%
- Thailand: 2%
- Others: 4%
- South Korea: 3%
- Malaysia: 3%
- Philippines: 4%
- Others: 15%

Number of CDM projects in Latin America by country

- Brazil: 49%
- Mexico: 18%
- Argentina: 3%
- Chile: 7%
- Honduras: 5%
- Ecuador: 3%
- Others: 15%

UNEP Risoe CDM Database August 2006

1st Int. Conference on Carbon Management at Urban and Regional Levels: Connecting Development Decisions to Global Issues
Volume of CERs till 2012 per region

**Volume of CERs until 2012 in Asia by country**
- India: 31%
- China: 50%
- South Korea: 12%
- Thailand: 1%
- Malaysia: 2%
- Philippines: 0%
- Indonesia: 1%
- Others: 3%

**Volume of CERs until 2012 in Latin America by country**
- Brazil: 51%
- Argentina: 9%
- Ecuador: 1%
- Honduras: 1%
- Chile: 9%
- Mexico: 17%
- Others: 12%

**UNEP Risoe CDM Database August 2006**
CDM Statistics

Volume of CERs requested vs. issued

Amount of CERs expected and obtained are different due:

# monitoring issues (lack of data or unable to prove the emission reduction)

# modeling issues (difference between estimated emissions and actual emissions)

Sources: UNFCCC (http://cdm.unfccc.int) (Retrieved on August 2006)
Opportunities at urban level

- Municipal Solid Waste Management
- Water treatment and distribution
- Wastewater treatment
- Transport
- Energy efficiency
- Renewable energy
Opportunities at urban level

- Municipal Solid Waste Management
  - Landfill gas flaring
  - Electricity generation from landfill gas
  - Composting
  - Biogasification
  - Incineration

- Water treatment and distribution
  - Energy efficiency in water pumping

- Wastewater treatment
  - Substitution of anaerobic lagoons by aerobic or anaerobic system
  - Sludge treatment

- Transport
  - Modal change
  - Fuel change

- Energy efficiency
  - Housing
  - Service Sector

- Use of solar energy
Municipal Solid Waste Management CDM projects
Mostly landfill gas collection projects
Some landfill projects include electricity generation
## LANDFILL PROJECTS

### Number of landfill projects per country

<table>
<thead>
<tr>
<th>Country</th>
<th>Registered</th>
<th>Req. registered</th>
<th>At validation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Brazil</td>
<td>9</td>
<td>0</td>
<td>12</td>
<td>21</td>
</tr>
<tr>
<td>Chile</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>China</td>
<td>3</td>
<td>0</td>
<td>6</td>
<td>9</td>
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<tr>
<td>Egypt</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ivory Coast</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Mexico</td>
<td>1</td>
<td>1</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>Peru</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
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<td>South Africa</td>
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<td>0</td>
<td>2</td>
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<td>South Korea</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>India</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>2</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>TOTAL</td>
<td>27</td>
<td>5</td>
<td>48</td>
<td>80</td>
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</table>

### Other countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armenia</td>
<td>1</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>1</td>
</tr>
<tr>
<td>Bolivia</td>
<td>1</td>
</tr>
<tr>
<td>Colombia</td>
<td>1</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>1</td>
</tr>
<tr>
<td>Ecuador</td>
<td>1</td>
</tr>
<tr>
<td>El Salvador</td>
<td>1</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1</td>
</tr>
<tr>
<td>Israel</td>
<td>2</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>1</td>
</tr>
<tr>
<td>Malaysia</td>
<td>2</td>
</tr>
<tr>
<td>Moldova</td>
<td>1</td>
</tr>
<tr>
<td>Philippines</td>
<td>1</td>
</tr>
<tr>
<td>Tanzania</td>
<td>1</td>
</tr>
<tr>
<td>Thailand</td>
<td>1</td>
</tr>
<tr>
<td>Tunisia</td>
<td>2</td>
</tr>
<tr>
<td>Uruguay</td>
<td>1</td>
</tr>
<tr>
<td>Other countries</td>
<td>Total</td>
</tr>
</tbody>
</table>
Volume of CERs from landfill projects by 2012 per country

Total CERs till 2012: 131 million ton CO2e

Landfill projects are considered the “easy” fruit to pick up!
Bandeirantes Landfill

- Landfill info:
  - Opened in the 1970s
  - Area: 1.35 million m²
  - Since the 1990’s it receives around 1.5~1.8 million ton/yr MSW (Total 36 million ton)

- Electricity generation since 2003 by the private sector
- Installation of 24 engines for power generation from landfill gas, with a total capacity of 22MW
- Investment for gas capture: ~ 8 million USD

- CDM info:
  - Expected mitigation of 7,5 million tCO2e in the period 2004-2010
  - Sharing CERs 50% municipality
  - CERs were sold to a German company
  - Monitoring issue: need to monitor both the amount of gas flared and gas combusted for power generation
# Landfill CDM Projects in China

<table>
<thead>
<tr>
<th>Title</th>
<th>ktCO2/yr</th>
<th>Credit start</th>
<th>MW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anding Landfill Gas Recovery and Utilisation Project</td>
<td>75.6</td>
<td>Jan-05</td>
<td>0.0</td>
</tr>
<tr>
<td>Nanjing Tianjingwa Landfill Gas to Electricity Project</td>
<td>214</td>
<td>May-05</td>
<td>6.0</td>
</tr>
<tr>
<td>Meizhou Landfills Gas Recovery and Utilization as Energy</td>
<td>287</td>
<td>Sep-05</td>
<td>2.0</td>
</tr>
<tr>
<td>Shenzhen Xiaping Landfill Gas Collection and Utilization Project</td>
<td>574</td>
<td>Feb-06</td>
<td>8.0</td>
</tr>
<tr>
<td>Wuxi Taohuashan Landfill Gas to Electricity Project</td>
<td>73</td>
<td>Oct-05</td>
<td>1.9</td>
</tr>
<tr>
<td>Jinan Landfill</td>
<td>326</td>
<td>Apr-06</td>
<td>3.0</td>
</tr>
<tr>
<td>Tianjin Shuangkou Landfill Gas Recovery and Utilization Project</td>
<td>165</td>
<td>Jan-08</td>
<td></td>
</tr>
<tr>
<td>Kunming - Wuhua Landfill Gas to Energy Project</td>
<td>143</td>
<td>Sep-06</td>
<td>3.3</td>
</tr>
<tr>
<td>Jiaozishan Landfill Gas Recovery and Utilization Project</td>
<td>163</td>
<td>Jun-06</td>
<td></td>
</tr>
</tbody>
</table>
Landfill issues

1. Political:
   1. Limited collaboration from municipalities (misunderstanding about the process and market)
   2. CER ownership / contracts

2. Technical risk:
   1. Low verified Emission Reduction
   2. High costs to increase landfill gas collection
## Other MSW Management Projects

<table>
<thead>
<tr>
<th>Title</th>
<th>Host country</th>
<th>2012 ktCO2</th>
<th>MW</th>
<th>Technology / Resource</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pullihue Composting Project, Chile</td>
<td>Chile</td>
<td>2,903</td>
<td></td>
<td></td>
</tr>
<tr>
<td>USINAVERDE: Incineration of urban solid wastes (Golden Standard PDD)</td>
<td>Brazil</td>
<td>32</td>
<td>0.44</td>
<td>MSW incineration (Biomass energy)</td>
</tr>
<tr>
<td>50 TPD Biomethanation plant using Municipal Solid Waste at Timarpur, Delhi</td>
<td>India</td>
<td>479</td>
<td></td>
<td>Gasification</td>
</tr>
</tbody>
</table>

Composting in Dhaka, Bangladesh (AM0025)
Other municipal solid waste management projects, such as composting and incineration, are less attractive for investors and private project developers due to:

- higher costs
- concerns about technology

MSW biodigestion pilot plant
Water treatment and distribution
Wastewater treatment
Wastewater Treatment and Water Distribution projects

- Due lack of sewage infrastructure, low potential for sewage treatment projects
- Most of the projects on wastewater treatment were developed in industries
- Methodology available for water pumping improvement
Transportation CDM project activities

Modal change
Fuel change
TRANSPORTATION CDM PROJECTS

Issues (1)

- Difficulties for monitoring
- Baseline determination (baseline is not constant)
- Only one methodology so far approved for modal change:
  - AM0031 - Baseline Methodology for Bus Rapid Transit Project
  - Mexico BRT project has submitted a methodology (applicable to rolling-stock and infrastructure projects that directly affect the operation of vehicles on well-defined routes)
  - Sao Paulo Metro is preparing a methodology for the new subway line
- Difficulties for implementation / management (need for a central organization with power to control the public transport, infrastructure development, and routes)
TRANSPORTATION CDM PROJECTS

Issues (2)

- Fuel change projects
  - Double counting issue (specially biodiesel)
  - CERs ownership
- Some large scale methodologies submitted for biodiesel production
Bus Rapid Transit (BRT) Systems

Emission reduction due to following changes:
- Improved efficiency through new and larger buses.
- Mode switching due to having a more efficient and attractive public transport offer.
- Load increase by having a centrally managed organisation dispatching vehicles.
- Potentially a fuel switch to low GHG fuels.

BRT systems replace conventional public transport systems. The new bus system transports passengers which, in absence of the project, would have used the conventional public transport system or other modes of transport such as passenger cars. A reduction or retirement of a part of the conventional buses is thus required through scrapping, reduction of permits or market based instruments. While the supply reduction is a core issue the methodology does not imply which instrument is used to achieve this goal.

The project measures the success or failure of vehicle retirement through the load factor.
## TRANSPORTATION CDM PROJECTS

### Projects at the pipeline

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
<th>Status</th>
<th>Emissions (ktCO2/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bogota TransMillennium Phase II to IV</td>
<td>Colombia</td>
<td>At validation</td>
<td>265</td>
</tr>
<tr>
<td>Shift to low greenhouse gas emitting vehicles for materials transport to and from Doom Dooma plant of HLL</td>
<td>India</td>
<td>At validation</td>
<td>7</td>
</tr>
</tbody>
</table>
Energy efficiency CDM project activities

- Lightening systems
- Air conditioning
- Heating systems
- Cooking devices
- Materials & Design
EE at households and service sectors

- **Energy efficiency in residential rural areas**
  - CDM COOK STOVE PROJECT Kupang 1, Indonesia (At validation), 45 ktCO2e/y
  - Moldova biomass heating in rural communities project-no.1 and no. 2 (Registered), 18 ktCO2e/y each project

- **Energy efficiency in residential urban areas**
  - Kuyasa low-cost urban housing energy upgrade project, Khayelitsha, South Africa (Registered), 7 ktCO2e/y

- **Energy efficiency in buildings (service sector)**
  - Pão de Açúcar – Demand side electricity management – PDD 1-6, Brazil (At validation) (5-6 ktCO2e/y per project)
  - Improvement in energy consumption in a Hotel, India (At validation) (3ktCO2e/y)
  - Moldova energy conservation and GHG emission reduction (Registered) (12ktCO2e/y)

13 projects
< 15GWh savings
Issues

- Few projects
- No projects/methodologies on design and materials
- Electricity saving measures have “limited” benefit in Latin American countries (hydro matrix → low CEF)
- Monitoring issues / benefit may depend on user
- Need for capacity building
EE at households and service sectors

Submitted large scale methodologies

- Energy savings in food retailers, supermarkets, shopping centres
- EE improvement in boilers for district heat, hospitals, schools and buildings
- Large scale replacement of incandescent lamps by compact fluorescent lamps
- Enhancement of penetration of CFL lamps
- Activities to Increase Market Penetration of Energy Efficient Appliances
- Introduction of a new primary district heating system
Renewable energy application in residential areas

- Solar systems
- Small wind power systems

Projects in the pipeline:

<table>
<thead>
<tr>
<th>Title</th>
<th>Host country</th>
<th>ktCO2 / yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation of 30,000 Solar Home Systems (30-75Wp) in Rural Households</td>
<td>Bangladesh</td>
<td>12</td>
</tr>
<tr>
<td>Solar steam for cooking and other applications</td>
<td>India</td>
<td>0.6</td>
</tr>
<tr>
<td>CDM Solar Cooker Project Aceh 1</td>
<td>Indonesia</td>
<td>3.5</td>
</tr>
<tr>
<td>Photovoltaic kits to light up rural households (7,7 MW)</td>
<td>Morocco</td>
<td>39</td>
</tr>
</tbody>
</table>
Issues on CDM

CDM – related issues
Urban CDM – related issues
CDM related issues

1. Changes in methodologies with a short time for adaptation to them (only 8 weeks)
2. Host country approval (DNA)
3. Costs (development of methodology, PDD, approvals (validation, verification))
Urban CDM related issues

1. Risks
   1. Political: CER ownership / contracts
   2. Technical risk: low verified Emission Reduction
2. Few methodologies / higher cost
3. Latin American vs. Asian projects (CEF, etc.)
Outlook

In order to incentive CDM project activities at urban level, it is necessary:

- Better understanding of CDM process at all levels (national/municipal, public/private) → need of capacity building
- Development of methodologies in sectors such as transport, construction, and energy efficiency in building and housing sectors
- Funding or investments for projects that lead to improvement of sanitary conditions, such as wastewater treatment and waste treatment / CERs’ revenue would cover the running costs (totally or partially)
Acknowledgements

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- Mitsubishi UFJ Securities
- Federal University of Santa Catarina
Muchas Gracias!

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