Clean Development Mechanism (CDM)

The Basics

Atul Raturi

CDM Capacity Building Workshop, January 2011
“We do not inherit the Earth from our Ancestors, we borrow it from our Children.”

~ Native American Proverb ~
Many Components of Climate

Various processes affect our weather and hence the climate

Climate Change: Large changes in weather
Earth’s Energy Balance

(In the absence of Greenhouse gases)

Outgoing radiation > Incoming radiation,

Average Earth temp = \(-18^\circ C\) (A frozen earth)
The Greenhouse Effect

With Greenhouse effect, Earth’s average temperature ~ 13°C
CO₂ Concentrations over the years

“Doubled” CO₂

Today

Pre-Industrial

Glacial

ATMOSPHERE

December 2010
389.69 ppm

Source: Carbon Mitigation Initiative, Princeton U.
Anthropogenic CO$_2$

Fossil Fuel Burning

8 billion tons go in

Ocean

800 billion tons carbon

Land Biosphere (net)

2 + 2 = 4 billion tons go out

Source: Carbon Mitigation Initiative, Princeton U.
Global Carbon Emissions

[Graph showing the trend of global fossil carbon emissions from 1800 to 2000. The graph includes lines for Total, Petroleum, Coal, Natural Gas, and Cement Production, with a steady increase in emissions over time.]
Radiative Forcing Components

[Diagram showing various radiative forcing components, including CO₂, N₂O, CH₄, and aerosols.]
Earth is Warming Up!!

Global Mean Temperature

IPCC
GHH Stabilization through Mitigation

A wedge is a strategy to reduce carbon emissions

Source: Carbon Mitigation Initiative, Princeton U.
Wedge strategies for Mitigation

15 Wedge Strategies in 4 Categories

- Energy Efficiency & Conservation (4)
- Fuel Switching (1)
- CO₂ Capture & Storage (3)
- Nuclear Fission (1)
- Stabilization Triangle
- Renewable Fuels & Electricity (4)
- Forest and Soil Storage (2)

Methane reduction

Source: Carbon Mitigation Initiative, Princeton U.
The Green House Gases

Six main GHGs

1. CO₂: Global Warming Potential (GWP) = 1 CO₂e
2. Methane (CH₄): GWP = 21 CO₂e
3. Nitrous Oxide (N₂O): GWP = 296 CO₂e
4. Hydrofluorocarbons (HFCs): GWP = 6200-7100 CO₂e
5. Perfluorocarbons (PFCs): GWP = 6,500 CO₂e

1 ton CO₂ equivalent reduction = 1 Certified Emission Reduction (CER)
The Beginning

United nations Framework Convention on Climate Change

“...Policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost ”

UNFCCC, Art.3

Earth Summit – Rio 1992
Background

Kyoto Protocol (1997):

“The Common but Differentiated Responsibilities principle”

• Entered into force February 2005.
  – Binding GHG emission reduction targets for Annex I countries (developed countries):
    • 5.2% below 1990 levels by 2008-2012.
    • Reductions in emissions of 6 Greenhouse Gases, measured in CO2 equivalence (CO$_{2e}$).

• Compliance by Annex I countries:
  – Domestic emission reduction through policies and measures.
  – Flexibility mechanisms

Polluters pay

Cost effective
CDM Genesis

Adapted from ADB ‘Kyoto surprise’
CDM Modalities and procedures established

UNFCCC

Second World Climate Conference
1990

1992

COP 3
Kyoto Protocol
First mention of the Clean Development Mechanism (Art 12)

COP 7
Marrakech Accords

Rio +10 Summit

Rio +10 Summit: WSSD

First commitment period begins
2008-2012

COP 16, Cancun, Dec 2010

First commitment period ends

EU commits to ratifying Kyoto
March 2002

UK Emissions Trading Scheme
April 2002

UK ROCs
Aug 2002

COP 8 New Delhi
Oct 2002

EU Emissions Trading Scheme
Dec 2007

COP 13 / MOP 3 Bali
2005

Second World Climate Conference
1990

1992

COP 1 Berlin
1995

1997

COP 4 The Hague
2000

July 2001

COP 6 Genoa Statement
Nov 2001

Second World Climate Conference
1990

1992

COP 1 Berlin
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COP 4 The Hague
2000

July 2001

COP 6 Genoa Statement
Nov 2001
Clean Development Mechanism

Article 12 of the Kyoto Protocol

Two main objectives:

1. Assist host countries achieve sustainable development
2. Provide flexibility to annex-1 investors in reducing their emissions
3 Flexible Mechanisms

There are 3 mechanisms within Kyoto protocol to reduce the emissions in Annex 1 countries

1. **International Emission Treaty (IET):** trading of GHG emission reductions (Assigned Amount Units, AAUs) within Annex 1 countries.

2. **Joint Implementation (JI):** Industrialized countries invest in emission reduction projects in another Annex 1 country and receive carbon credits (Emission Reduction Units, ERUs).

3. **Clean Development Mechanism (CDM):** Annex 1 countries invest in GHG reducing projects in non-annex countries and receive Certified Emission Reductions (CERs) to fulfill their binding requirements.
CDM Credo

• Developed countries (Annex 1) with binding emission caps assist developing countries with no emission limits in activities/projects for GHG reduction.
• The project/activity must contribute to the sustainable development in the host country.
• GHG reductions must create real, measurable and long-term benefits to Climate Change mitigation.
• Be additional to any reductions that would occur in the absence of the proposed project/activity.
• A baseline scenario that represents what would have happened in the absence of the proposed project/activity should be developed.
• This baseline is derived using methodologies approved by the CDM Executive Board.
• ODA cannot be used.
CDM concept

Host Party (non-Annex I) which doesn't have an emission cap

Specific place in a host Party

Specific place in a host Party

Annex I Parity will get CERs

GHG emissions

Baseline Scenario

Project Scenario

CERs

Non-Annex I Parties will benefit from project activities resulting in CERs [KP Art.12 para3(a)]

Acquired CERs are added and emission cap increases

A total emission cap of an Annex I Party

IGES, CDM in Charts
CDM concept & reality

CDM Concept

CDM Reality

Source: ADB
CDM and Technology Transfer

CDM projects with TT

India: 13%, China: 19%, Mexico: 83%
CDM Project Types

Emissions reduction Projects
• Renewable Energy Development
• Energy Efficiency
• GHG destruction

Afforestation and Reforestation (A & R) Projects
## Registered CDM projects – By Type

<table>
<thead>
<tr>
<th>Main Category</th>
<th>Subcategory</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewable energy (to replace fossil fuel)</strong></td>
<td>Hydro</td>
</tr>
<tr>
<td></td>
<td>Biomass</td>
</tr>
<tr>
<td></td>
<td>Wind Power</td>
</tr>
<tr>
<td></td>
<td>Other renewable energy</td>
</tr>
<tr>
<td><strong>Destruction of high global warming potential GHG</strong></td>
<td>Methane gas destruction</td>
</tr>
<tr>
<td></td>
<td>$\text{N}_2\text{O}$ destruction</td>
</tr>
<tr>
<td></td>
<td>HFC/PFC/SF$_6$ destruction</td>
</tr>
<tr>
<td><strong>Efficient use of fossil fuel</strong></td>
<td>Energy Efficiency</td>
</tr>
<tr>
<td></td>
<td>Transportation</td>
</tr>
<tr>
<td><strong>Switch to low carbon intensive fossil fuel</strong></td>
<td>Fuel Switch</td>
</tr>
<tr>
<td><strong>Carbon sink</strong></td>
<td>Afforestation / Reforestation</td>
</tr>
</tbody>
</table>
CDM Project Types

Three Schemes:

• Large Scale CDM projects
• Small Scale CDM projects
• Programmatic CDM projects
Additionality

- A CDM project activity is additional if anthropogenic emissions of GHGs are reduced below those that would have occurred in the absence of the CDM project.

- Show that the project helps overcome financial barriers—would not have happened in the absence of CDM. Not a part of government policy.

- Show that the project helps overcome technical, institutional and other barriers (For small scale projects).
Methodologies

Standardized procedures for the measurement and calculation of GHG reductions.

Main features:

• Formulae used
• Project boundaries
• Leakage
• Monitoring

EB Approval needed for any new methodology proposed.

Different for large scale and small scale projects.
CDM Methodologies

Approved methodologies by scope

- Energy Industry – 56
- Energy demand – 17
- Energy distribution – 2
- Manufacturing – 27
- Chemical – 19
- Transport – 11
- Waste handling and disposal – 21
- A/R – 17
- Agriculture – 7

http://cdm.unfccc.int (c) 19.01.2011 03:07
Small Scale (SS) Projects

A Small-Scale CDM project is defined as:

Type 1: Renewable energy systems with < 15MW electricity or 45 MW thermal capacity

Type 2: Energy Efficiency projects with a saving of < 60 GWh per year

Type 3: Any other project reducing < 60 Kilo tonnes CO$_2$ per year.

Simplified Procedures for SS CDM
Bundling

Several small-scale GHG reduction projects can be combined to form a ‘Bundled’ CDM project

Bundling can be done across countries and regions
CDM Process: Institutional Framework

- Project participant 1: Developing Country, Project developer
- Project participant 2: Annex 1 Country: Investor, Buyer
- National Approval: Designated National Authority (DNA)
- Designated Operational Entity (DOE I): Verifier of prerequisites
- Designated Operational Entity (DOE II): Certifies emission reductions
- CDM Executive Board (EB): CER issuer
CDM Project Activity

Activity: Project Identification & Formulation
- National Approval
- Validation
- Registration
- Project financing
- Monitoring
- Verification/Certification
- Issurance of CERs

Output: PDD
- Letter of Approval
- Validation Report
- Monitoring Report
- Verification/Certification Report
- CERs

Responsibility:
- pp
- DNA
- DOE A
- CDM-EB
- Investor
- pp
- DOE B
- CDM-EB

Source: UNEP
Project Timeline

Indicative Timelines and Transaction Costs under CDM

- Project completion
- Preparation and review of the Project
  - Upstream Due Diligence, carbon risk assessment and documentation: $40K
- Periodic verification & certification
  - Verification: $15-30K
  - Supervision: $15-30K
- Baseline: $20K
- Monitoring Plan: $20K
- Validation process
  - Contract, Processing and documentation: $30K
- Construction and start up
  - Initial verification at start-up: $25K
- Project Appraisal and Negotiation

Complete transaction costs for:
- 1 time 10 years CER period: 165,000 USD
- 3 times 7 years CER period: 195,000 USD

Source: World Bank
Unilateral CDM Projects

- No declared investor - only host country
- Nearly half the registered projects are unilateral
- Reduced transaction costs
- Increased price of CERs
- Good for small-scale projects
- In-country capacity building required
- Less technology transfer
- Example: Majority CDM projects in India
Unilateral vs. Other projects

Figure III-2. Number of projects entering the pipeline by year and the extent of unilateral projects (as of 30 June 2010)

- Total new projects
- Percent of new projects that are unilateral at time of publication
- Percent of overall projects with project participants from Annex I Parties

UNFCCC
Projects Registered – Country (18th Jan 2011)

Registered project activities by host party. Total: 2,767

- China (42.72%)
- India (22.05%)
- Brazil (6.65%)
- Mexico (4.52%)
- Malaysia (3.14%)
- Indonesia (1.99%)
- Republic of Korea (1.84%)
- Others (17.09%)

Total 2,767

http://cdm.unfccc.int (c) 18.01.2011 14:53
Registered projects By Scale

Registered projects activities by scale. Total 2764

LARGE (56.48%)

SMALL (43.52%)

http://cdm.unfccc.int (c) 18.01.2011 14:53
Projects by scope

Distribution of registered project activities by scope

- Energy industries (renewable plus non-renewable sources) (65.03%)
- Manufacturing industries (4.75%)
- Construction (0.00%)
- Chemical industries (2.11%)
- Construction (0.00%)
- Mining/mineral production (1.16%)
- Transport (0.12%)
- Energy demand (1.10%)
- Energy distribution (0.00%)
- Fugitive emissions from fuels (solid, liquid and gas) (4.67%)
- Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride (0.75%)
- Solvent use (0.00%)
- Waste handling and disposal (15.47%)
- Afforestation and reforestation (0.55%)
Average annual CERs

Expected average annual CERs from registered projects by host party. Total: 427,748,880

China: 266,865,547
India: 47,013,490
S.Korea: 17,058,605
Mexico: 9,823,776
Malaysia: 5,242,897
S.Africa: 2,965,077
Sri Lanka: 210,168
Programmatic CDM (p-CDM)

- Called the ‘Future of CDM’- a new concept
- PoA: Bundle and register a number of similar GHG reduction activities (CPA) over a period of time.
- Can be undertaken by public/private entities that follow a goal of anthropogenic GHG reduction.
- Incentive for developing countries to implement policies and measures.
- A number of RE based CPA’s can be bundled to form a PoA.
Programmatic CDM (p-CDM)

- A CPA can be included in a registered PoA any time (within 28 years).
- One time registration fee – no fee for subsequent CPAs.
- Less regulatory risks.
- Different time scales for CPAs.
- More than one country can be included in the PoA – Opportunity for the PICs.
## P-CDM projects: Registered

<table>
<thead>
<tr>
<th>Date registered</th>
<th>Title</th>
<th>Host parties</th>
<th>Other parties</th>
<th>Methodology</th>
<th>Reductions (per annum)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12/01/11</td>
<td>Biomass based heat generation in India</td>
<td>India</td>
<td>UK</td>
<td>AMS-1.C.ver.16</td>
<td>400000</td>
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<tr>
<td>21/08/10</td>
<td>Masca Small Hydro Programme</td>
<td>Honduras</td>
<td>Netherlands</td>
<td>AMS-I.D. ver 13</td>
<td>4395</td>
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<tr>
<td>29/04/10</td>
<td>CFL lighting scheme-Bachat lamp</td>
<td>India</td>
<td></td>
<td>AMS-1.D.ver.3</td>
<td>34892</td>
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<tr>
<td>12/4/10</td>
<td>Municipal waste compost programme</td>
<td>Uganda</td>
<td></td>
<td>AMS –IIIF ver6</td>
<td>83700</td>
</tr>
<tr>
<td>29/10/09</td>
<td>Methane capture from animal waste</td>
<td>Brazil</td>
<td>UK</td>
<td>AMS-III.D.ver.13</td>
<td>591418</td>
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<tr>
<td>31/07/09</td>
<td>Smart use of energy</td>
<td>Mexico</td>
<td>UK</td>
<td>AMS-II.C.ver 9</td>
<td>520365</td>
</tr>
</tbody>
</table>
CDM in the PICs: Fiji Hydro

- Small Scale and bundled projects
- 2 run-of-river hydro projects. Vaturu (3 MW) and Wainikasou (6.5 MW)- displace diesel generation
- Developed by Pacific Hydro and FEA (SEL)
- Combine output: 35 GWh/year
- CDM registration: October 2005
- 24,928 tonnes of CO$_2$ reduction per year
CDM in the PICs: PNG: Geothermal

- **Lihir Gold Mines**: Geothermal plant replacing diesel generation
- 55 MW plant. 411 GWh per year
- First and only CDM project in PNG
- Will reduce 2,789,037 tonnes of CO₂ over 10 years
CDM in the PICs: Kinoya STP CDM Project

Methane Flaring
Supported by ADB APCF
Expected CERs-19,106 per annum
Yet to be registered.
ADB’s Asia Pacific Carbon Fund

• Pay up front for carbon credits
• Technical support for CDM project development
• Transaction costs for CDM development
  PDD costs
  Capacity building for monitoring the emission reductions
  Validation / registration costs
• Transaction costs for CDM development
• small scale projects
• Focus on Pacific
• Bundling and programmatic CDM
• Future carbon fund for post 2012
• Cooperate with other ADB resources (ex Clean Energy Fund)
  ➢ Additional funding
  ➢ Support for DNA establishment

*ADB
UNDP’s Carbon Facility

UNDP Millennium Development Goal Carbon Facility (MDGCF)*

Two goals:

• Providing Carbon Finance to developing countries.
• Promoting emission reduction projects that contribute to MDGs.
• Collaboration between UNDP and Fortis Bank.
• UNDP facility provides technical and financial support for CDM projects.
• Bank will purchase and market the CERs.
• UNDP Charges a cost-recovery fee of USD 250,000.

Sale-Mario and Soriano 2009
CDM in the PICs: Missed the boat?

- Dispersed nature of population: Small projects.
- Low potential for GHG reduction hence low CER generation. **Investors not keen.**
- High transaction costs.
- Lack of awareness, Capacity (institutional, technical, regulatory)
- DNAs not set-up in most of the PICs (Only Fiji, PNG and Samoa).
Free Carbon credits(😊)
THANK YOU FOR YOUR PATIENCE

How green is my fuel?