

Clean Development Mechanism - The Basics

Background

The Greenhouse Effect

The so-called green house gases (GHGs) like carbon dioxide (CO₂), methane (CH₄) etc. form a thermal blanket over earth's atmosphere. These gases absorb the infrared (heat) radiation emitted by earth's surface and then re-radiate part of it back to earth.

The main effect of this greenhouse effect is an increase in the average temperature of the earth leading to global warming and its related effects.

The concentration of GHGs has been constantly increasing since the start of industrial revolution in the mid-nineteenth century mainly due to the usage of fossil fuels. At present, almost 4 billion tonnes of carbon is being added to earth's atmosphere annually. Fig.1 shows temporal increase in the global carbon emissions and its sources.

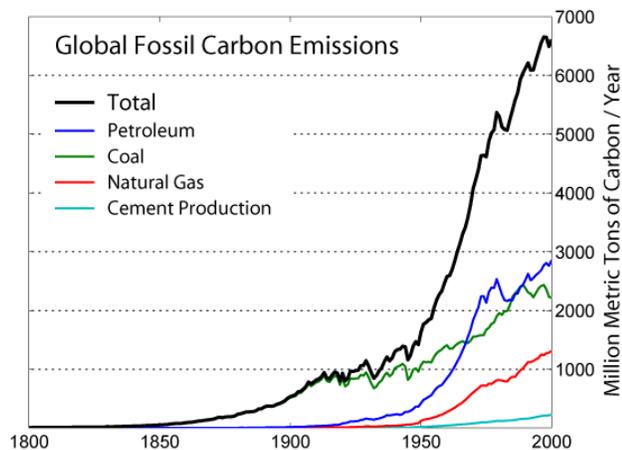


Figure 1 Global fossil fuel based carbon emissions (IPCC)

It has been shown with a very high probability that the root cause for the global warming and related climate change is the anthropogenic GHG emissions due to increasing use of fossil fuels for transport, electricity generation and other applications.

Climate Change Mitigation

There are a number of activities that could help mitigate the greenhouse effect and related climate change. These activities are nicely represented by the wedge concept developed by Carbon Mitigation Initiative (CMI). Figure below shows their concept

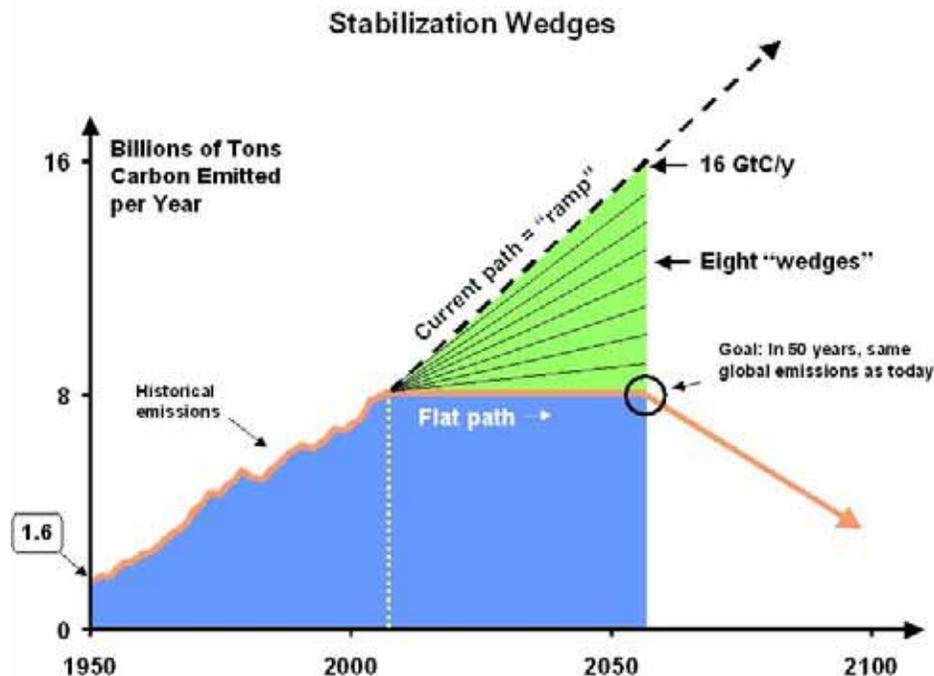


Figure 2 The stabilization wedges¹

A wedge is basically a strategy to mitigate GHG emission. CMI's calculations show that 8 wedges (each worth 26 billion tonnes of carbon) representing different mitigation activities can make the emissions to stabilize. Renewable energy, fuel switching and energy efficiency play a major role in this endeavour.

Kyoto Protocol and the Clean Development Mechanism

During the 1992 Earth Summit in Rio (which led to the creation of UNFCCC) it was agreed that efforts were needed to deal with the causes of climate change and these efforts had to be cost-effective. Ensuing consultations among the Parties led to the Kyoto Protocol with an underlying principle of "common but differentiated responsibilities".

The developed (Annex 1) countries were mandated to reduce national emission levels by 5.2% below their 1990 levels. Six GHGs were targeted and emission reductions are

¹ Source: Carbon Mitigation Institute (CMI)

measured in CO₂ equivalent (depends on the global warming potential of the gas²). To make this reduction cost-effective to all parties concerned, three flexible mechanisms were established:

1. **International Emission Treaty (IET)**: Trading of GHG emission reductions (called 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 (called 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 fulfil their binding commitments.

Definition of a CER

A "certified emission reduction" or "CER" is a unit representing one tonne of carbon dioxide-equivalent (CO₂-e) sequestered or abated, using global warming potentials defined by 2/CP.3. CERs are issued to project participants in CDM projects pursuant to Article 12 of the Kyoto Protocol and the CDM modalities and procedures (3/CMP.1, Annex, paragraph 1(b)).

In the present talk, we are concerned only with the third mechanism i.e. CDM. The CDM credo can be summed up as the following:

- Developed countries (Annex 1) with binding emission caps assist developing countries with no emission limits in developing 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.
- The baseline is derived using *methodologies* approved by the CDM Executive Board.
- Overseas Development Aid from an Annex –1 country cannot be used.

Figure 3 shows the concept of CDM in pictorial form.

² The Global Warming Potential (GWP) of a gas is defined as the ratio of its contribution to global warming to that due to same mass of carbon dioxide.

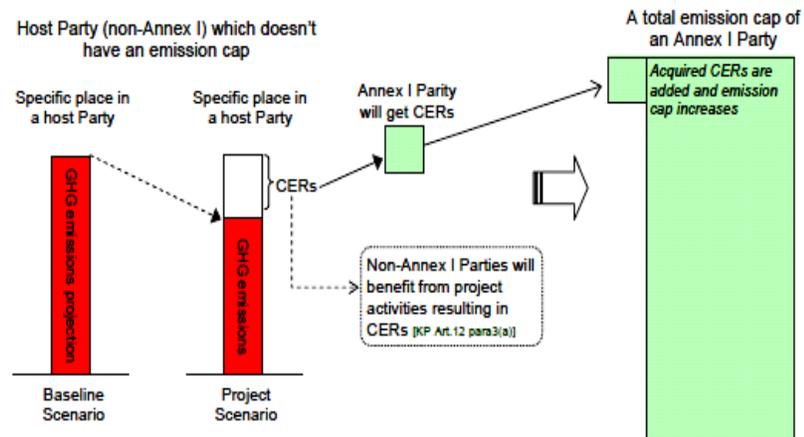


Figure 3 Pictorial representation of CDM concept

As can be seen above, the emission reductions through a CDM project in a non-Annex-1 country are added to the emission cap (set by Kyoto protocol) of the investing Annex-1 country. The initial CDM idea was that an investor from a Annex-1 country would bring in finance and transfer technology to help set-up a emission reduction project and will receive the CERs. However, more commonly, the process involves simply selling/buying of CERs with little technology transfer taking place.

CDM Project Types

The CDM projects can be divided into two main categories:

1. Emission reduction projects: Renewable energy (solar PV systems, hydropower, and wind power development etc.), Energy efficiency projects (CFLs replacing incandescent bulbs) or GHG (CH₄, SF₆ etc.) destruction projects.
2. Afforestation and Reforestation (A & R) projects.

CDM projects are further divided into three types depending on their scale:

1. Large scale projects
2. Small scale projects
3. Programmatic projects.

³ CDM in charts, IGES

Small scale projects

Type 1: A renewable energy project with less than 15 MW electricity (45 MW thermal) capacity.

Type 2: An energy efficiency project with an energy savings of less than 60Gwh/year.

Type3: Any other project saving less than 60 kilo tonnes CO_{2e} per year.

Additionality

One of the most important conditions to be fulfilled by a CDM project is that it should be 'additional'. A project is additional if:

- The anthropogenic emissions are reduced below those that would have occurred in the absence of the CDM.
- The project would not be feasible in the absence of CDM mechanism..
- For small scale projects the additionality condition is satisfied by showing that there are economic, technical and institutional barriers.
- It is important to note that projects with less than 5 MW electricity (or 15 MW thermal) generation power, less than 20 GWh/year energy savings or less than 20 kT/year CO_{2e} reduction do not have to fulfil additionality requirements.

Methodologies

The project proponents have to employ one of the methodologies approved by the CDM board to measure and calculate GHG reductions. A methodology describes the project boundary, formulae applied, leakage and monitoring .There are a number of methodologies available depending on the type of CDM project .For example , at present 56 methodologies for energy sector and 21 for waste handling and disposal have been approved among others.

Bundling

It is possible to bundle several small-scale projects and submit as one project. This helps in saving registration costs. A single Project Design Document (PDD) is prepared. Bundling can be done across countries and regions.

Programmatic CDM

A new type of CDM project was introduced in 2009 during the 47th meeting of the CDM executive board. This type involves a Programme of Activities (PoA) as defined below:

“A programme of activities (PoA) is a voluntary coordinated action by a private or public entity which coordinates and implements any policy/measure or stated goal (i.e. incentive schemes and voluntary programmes), which leads to anthropogenic GHG emission reductions or net anthropogenic greenhouse gas removals by sinks that are additional to any that would occur in the absence of the PoA, via an unlimited number of CDM programme activities (CPAs) (EB 47, Annex 29, paragraph 3).”

A PoA is made up of several CDM Programme Activities (CPA). A CPA is defined as

“A CPA is a single, or a set of interrelated measure(s), to reduce GHG emissions or result in net anthropogenic greenhouse gas removals by sinks, applied within a designated area defined in the baseline methodology (EB 32, Annex 38, page 1).”

It is possible to add additional CPAs during the project lifetime. A programmatic CDM can include CPAs in more than one country provided each participating country DNA issues an approval letter indicating that the activity helps in its sustainable development.

CDM Process: Institutional Framework

The CDM process comprises a number of activities and the following are the main parties involved:

- 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): Registration and CER issuer

The CDM process consists of many steps. Fig. 4. illustrates the different steps involved between the inception of the project and final registration project activity.

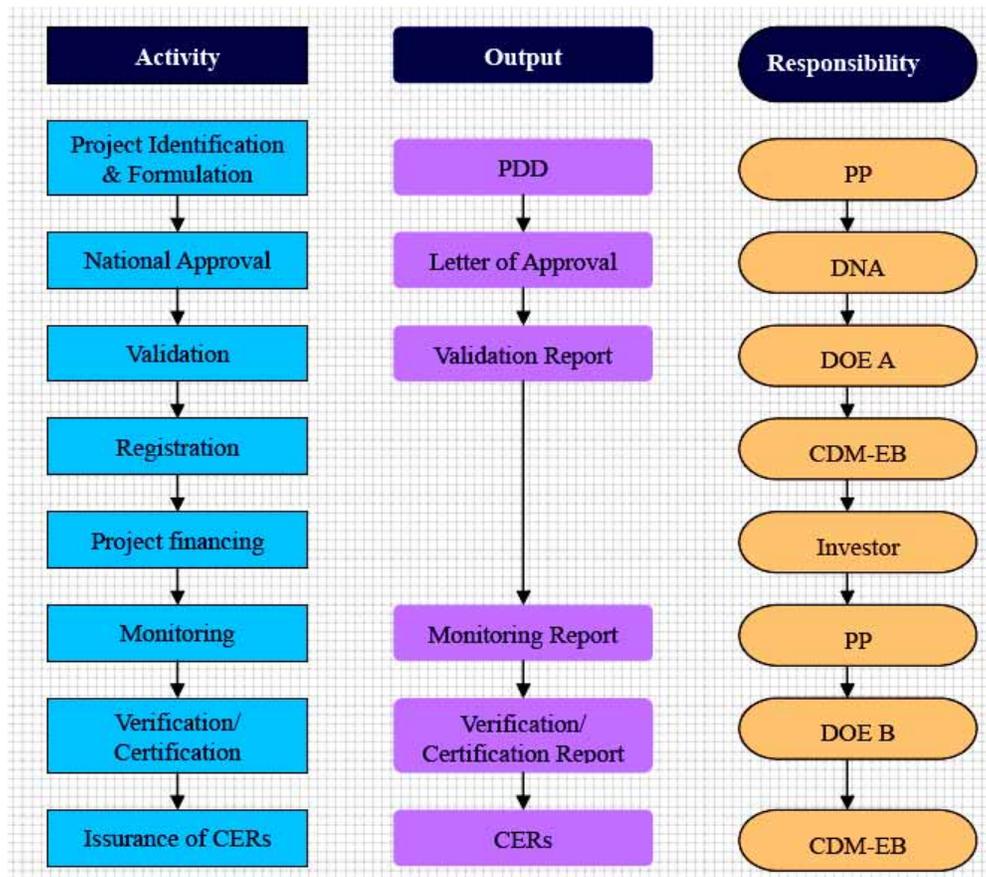


Figure 4 CDM Project Activities (UNFCCC)

Unilateral Projects

It is also possible to establish a CDM project without a participant from an Annex-1 country. The only participant is the host country (also the project proponent) and the CERs sale is negotiated separately with interested buyers. The main advantages of unilateral projects are reduced transaction costs and greater control over CER price. However, in-country capacity building is required and there is very little technology transfer. As shown in fig. 5, the proportion of unilateral projects has increased significantly in recent years reaching almost 95 % in 2010⁴.

⁴ The contribution of Clean Development Mechanism under the Kyoto Protocol to technology transfer, UNFCCC, 2010

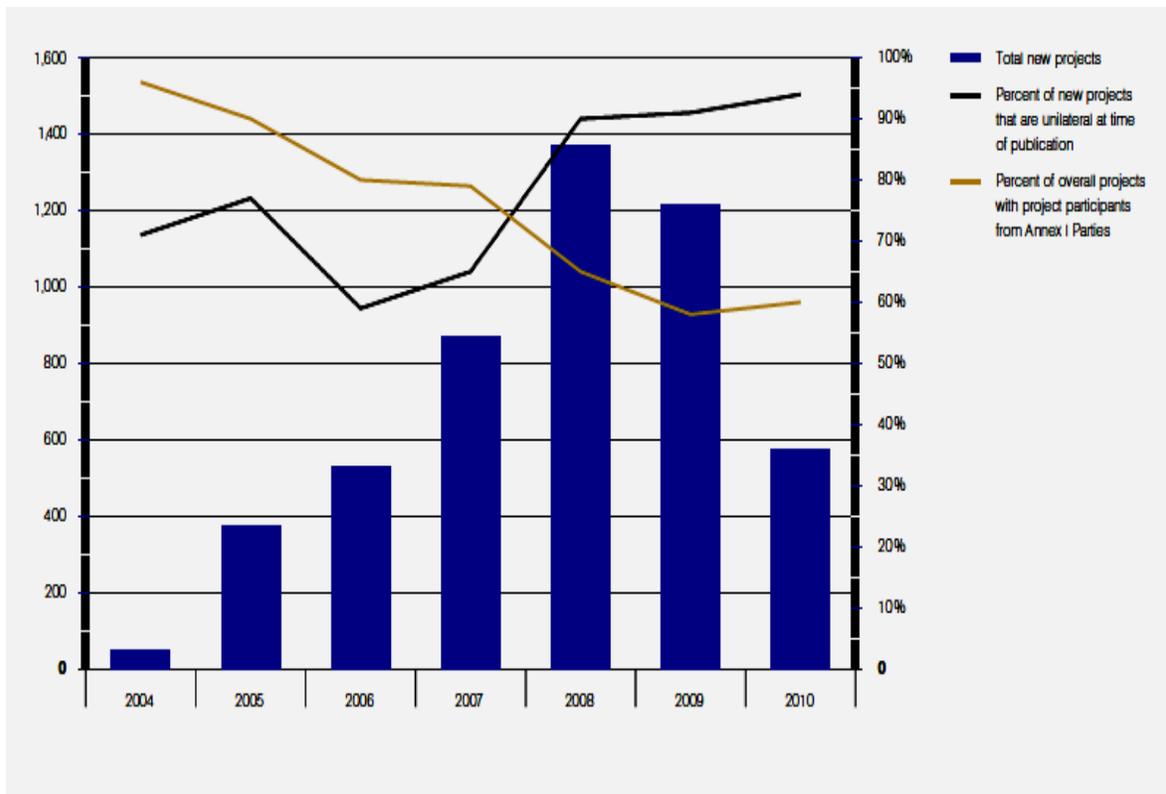


Figure 5 Number of CDM projects entering the pipeline by year and the extent of unilateral projects

CDM projects – current status

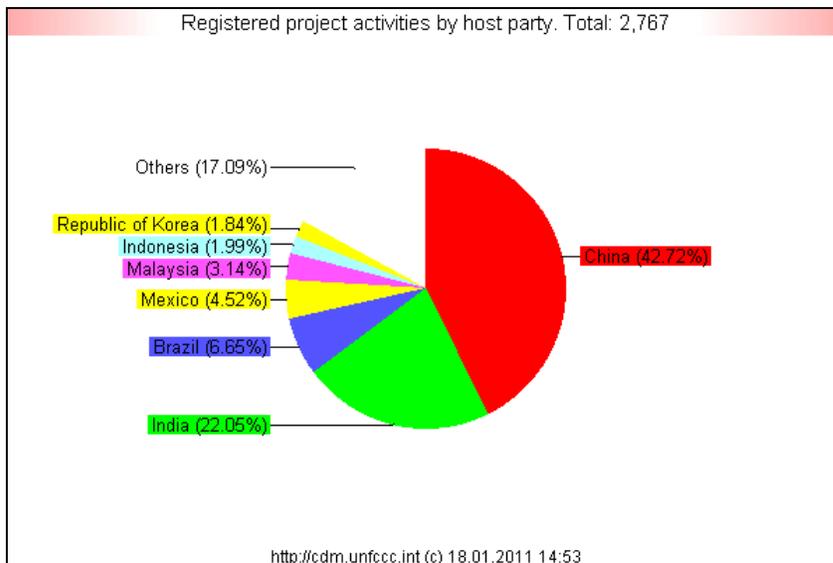


Figure 6 Distribution of registered CDM projects by host countries

By 18th January 2011, 2,767 CDM projects were registered with 42% of the projects in China and 22 % in India. Small scale projects make up approximately 43.5 % of all projects registered with 65% of them in energy sector . 427,748,880 CERs had been issued.

CDM projects in the PICs

There are only 2 CDM projects in the PICs at present.

1. Papua New Guinea: Lihir Geothermal project: A 55 MW plant generating 411 GWh electricity annually. The crediting period is for 10 years and expected to produce 2,789,037 CERs over that period.
2. Fiji: two bundled run of the river hydro projects with a total production of 35 GWh of electricity annually. This project is to generate 2,789,037 CERs per year.

There are two projects under validation:

1. Fiji Kinoya Sewage Treatment Plant (KSTP): Methane flaring project.
2. Fiji: Nadarivatu hydro project

The KSTP project is being supported by the Asia Pacific Carbon ((ABCF) Fund of Asian Development Bank.

CDM in the PICs: Missed the boat?

The lack of CDM projects in the PICs could be attributed to (among other reasons):

- 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

There is a renewed interest in the region, a number of capacity building activities are taking place, and the DNA offices are being set-up. Programmatic CDM mechanism is very attractive for smaller countries and some region-wide CDM project activities can be initiated. A programmatic hydropower CDM project is already under development in Papua New Guinea.