The UNEP project CD4CDM

Guidebook to Financing CDM Projects

UNEP

ECO SECURITIES

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CD4CDM
CAPACITY DEVELOPMENT FOR THE CLEAN DEVELOPMENT MECHANISM

EcoSecurities BV
Environmental Finance Solutions
Kettingstraat 21-A
2511 AM Den Haag
The Netherlands
Tel: +31 70 365 4749
Fax: +31 70 365 6495
E-mail: nl@ecosecurities.com
Web site: www.ecosecurities.com

Capacity Development for CDM
(CD4CDM) Project
UNEP RISOE Centre,
DK-4000, Roskilde,
Denmark
Tel: +45-4632 2288
Fax: +45-4632 1999
www.uneprisoe.org
www.cd4cdm.org

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Preface

The CDM market has witnessed dramatic progress in the past few months, with more than 1,700 projects in the pipeline by March 2007. However, CDM project development still faces barriers that prevent a much larger potential expansion in the number of CDM projects worldwide. Many project developers identify lack of access to financing as one of the key reasons why numerous CDM project concepts never materialise. This has been the case especially for Africa and for other parts of the developing world. At the same time, local financial intermediaries in developing countries continue to play a limited role in financing CDM projects. Lack of knowledge about CDM modalities and procedures and about approaches for financial appraisal of CDM projects are among the reasons for this lack of participation in the CDM by local banks in host countries.

UNEP's Capacity Development for CDM (CD4CDM) Project has collaborated with EcoSecurities, a CDM project development and consultancy firm, to produce this Guidebook with the objective of closing the communication gap between financial intermediaries in host countries and project developers. The Guidebook attempts to demystify the CDM for the banking community in host countries while also aiming to build the capacity of host country project developers in understanding financial and economic factors related to CDM project structuring. We hope the Guidebook will contribute to financial intermediaries in host countries playing an increased role in the CDM.

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Sami Kamel
Project Manager,
Capacity Development for CDM Project

Denmark, May 2007

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1. Introduction

One of the challenges facing Clean Development Mechanism (CDM) projects today is their limited ability to secure financing for the underlying greenhouse gas emission reduction activities, particularly in the least developed countries. Among the key reasons for this is the fact that most financial intermediaries in the CDM host countries have limited or no knowledge of the CDM Modalities and Procedures. Moreover, approaches, tools and skills for CDM project appraisal are lacking or are asymmetrical to the skills in comparable institutions in developed countries. Consequently, developing country financial institutions are unable to properly evaluate the risks and rewards associated with investing or lending to developers undertaking CDM projects, and therefore have, by-and-large, refrained from financing these projects. In addition, some potential project proponents lack experience in structuring arrangements for financing a project.

This Guidebook – commissioned by the UNEP Risoe Centre as part of the activities of the Capacity Development for CDM (CD4CDM) project (http://www.cd4cdm.org) – addresses these barriers by providing information aimed at both developing country financial institutions and at CDM project proponents.

It should be noted that while the Guidebook was developed particularly with the CDM in mind, most sections will also be relevant for Joint Implementation (JI) project activities. For more detailed information on JI modalities and procedures please consult: http://ji.unfccc.int

The purpose of this Guidebook is two-fold:

1. To guide project developers on obtaining financing for the implementation of activities eligible under the CDM; and
2. To demonstrate to developing country financial institutions typical approaches and methods for appraising the viability of CDM projects and for optimally integrating carbon revenue into overall project financing.

The target audiences for the Guidebook are therefore, primarily:

1. CDM project proponents in developing countries, including but not limited to utilities, private and public sector entities, municipalities, and other specialised consultancies and intermediaries; and
2. Credit officers and other decision-makers within banking institutions and financial intermediaries in developing countries.

1.1. Structure of the Guidebook

The Guidebook is structured as follows:

- Section 2 provides an introduction to carbon finance and the Clean Development Mechanism.
- Section 3 provides a general introduction to financing a conventional project (for the project proponent in particular).
- Section 4 provides a general introduction to the conventional financial assessment process (for the project proponent in particular).
- Section 5 provides more detailed information on the ways in which a CDM project may be financed.
- Section 6 considers the specific issues that must be considered in the financial assessment of a

CDM project, and the risk assessment and management options applicable to CDM projects.

- Section 7 provides information on potential sources of finance for CDM projects.

In addition, Annex 1 contains references and sources for further information; a list of abbreviations is supplied in Annex 2.

2. Carbon Finance and the Clean Development Mechanism

2.1. Introduction

This section provides a brief overview of the carbon finance market and its relationship to the Clean Development Mechanism (CDM). It addresses the political background to the carbon market, describes the key features of the CDM and provides illustrative examples of CDM project types. The various sources of demand for emission reduction credits from CDM projects (known as Certified Emission Reductions, or CERs) are identified, together with an overview of the supply of these credits.

2.2. Political Background

The United Nations Framework Convention on Climate Change (UNFCCC) (available at: http://unfccc.int) was one of the key outcomes of the United Nations Conference on Environment and Development (UNCED), in Rio de Janeiro in 1992. It entered into force in March 1994 and has to date (December 2006) been ratified by 190 countries.

The stated objective of the Framework Convention was to stabilise greenhouse gas (GHG) concentrations in the atmosphere at levels that would prevent dangerous human interference with the climate system. To achieve this objective, all countries accept a general commitment to address climate change, adapt to its effects, and report their actions to implement the Convention. The Convention divides countries into two groups: Annex I Parties, the industrialised countries who have historically contributed the most to climate change, and non-Annex I Parties, which include primarily the developing countries. The principles of equity and 'common but differentiated responsibilities' contained in the Convention require Annex I Parties to take the lead in reducing their greenhouse gas emissions.

The Parties to the Convention meet once a year at the Conference of Parties (COP) to discuss and negotiate measures against global climate change. To further the goals of the UNFCCC, the Kyoto Protocol was adopted at the third Conference of Parties (COP-3) held in Kyoto, Japan, in 1997. At this historic meeting, the Parties to the Convention negotiated a set of legally binding quantitative targets for 38 industrialised countries (including 11 emerging market economies). These targets, usually measured as a percentage change on 1990 levels, are to be achieved on average over the first five-year 'commitment period' of 2008–2012. The national emission targets range from -8% (e.g. for the 15 Member States of the European Union at that time) to +10% (Iceland), with the total reduction adding up to around -5%.

However, the Protocol did not become legally binding until 16 February 2005, after ratification by Russia surpassed the collective threshold level required for entry into force. All countries that have now both ratified the Kyoto Protocol and are listed in Annex B[1] to the Protocol are therefore legally bound to limit their national emissions to the specified target levels, on average over the period 2008–2012. With ratification of the Protocol, the COP, meeting as the Meeting of the Parties (COP/MOP) to the Protocol, is now the supreme decision-making body for its implementation.

The Kyoto Protocol recognises six main greenhouse gases, each with different impact on the global climate. The common 'currency' of the Kyoto Protocol targets is one metric tonne of carbon dioxide equivalent (tCO_2-e). Each of the other greenhouse gases can be expressed in this form (on a

1 Annex B to the Kyoto Protocol should not be confused with Annex I to the Convention, although the two lists are similar. Annex B comprises all Annex I countries with the exception of Belarus and Turkey, plus Croatia, Liechtenstein, Monaco and Slovenia, which are not listed in Annex I. All Annex B countries have ratified the Kyoto Protocol with the exception of Australia and the United States.

weight-for-weight basis) by multiplying by its Global Warming Potential (GWP), as shown in Table 1 below.[2]

Table 1: Greenhouse gases and their respective Global Warming Potential

Greenhouse Gas	GWP (100 years)
Carbon dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous oxide (N_20)	310
Hydro-fluorocarbons (HFCs)	150–11,700
Perfluorocarbons (PFCs)	6,500–9,200
Sulphur hexafluoride (SF_6)	23,900

Based on the principle that the effect on the global environment is the same regardless of where GHG emissions reductions are achieved, countries may meet their targets through a combination of domestic activities and use of the Kyoto Protocol 'Flexibility Mechanisms,' which are designed to allow Annex I countries to meet their targets in a cost-effective manner and to assist developing countries in particular to achieve sustainable development. There are three Kyoto Protocol Flexibility Mechanisms:

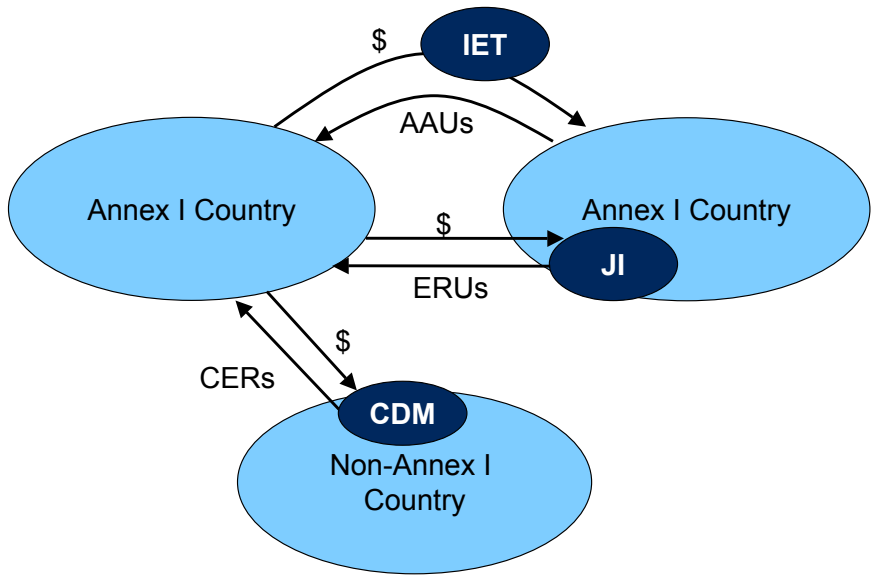
- Joint Implementation - JI (Article 6);
- Clean Development Mechanism - CDM (Article 12); and
- International Emissions Trading - IET (Article 17).

Both JI and CDM are 'project-based' mechanisms which involve developing and implementing projects that reduce GHG emissions, thereby generating carbon credits that can be sold on the carbon market. JI is a mechanism that allows the generation of credits (known as Emission Reduction Units or ERUs) from projects within Annex I countries, whereas the CDM allows the generation of credits known as Certified Emission Reductions (CERs) from projects within non-Annex I countries (i.e. developing countries). Finally, International Emissions Trading allows trading directly between Annex I Parties in the units in which each country's target is denominated, known as Assigned Amount Units (AAUs). All of these different units (ERUs, CERs and AAUs) are effectively permits allowing an Annex I Party to emit one tonne of carbon dioxide equivalent (1 tCO_2-e).

While these are the most common forms of carbon credits, it should be noted for completeness that Annex I countries may also issue Removal Units (RMUs) on the basis of land-use, land-use change and forestry (LULUCF) activities that remove greenhouse gases from the atmosphere, and that either temporary or long-term CERs (tCERs or lCERs) can be issued from LULUCF project activities undertaken in non-Annex I countries via the CDM.

2 The GWPs shown here are taken from Table 2.9 in IPCC (1995). Although some GWPs were updated in IPCC (2001), the updated values have not yet been accepted by a COP and are therefore not to be used.

Figure 1: The Kyoto Flexibility Mechanisms



The main advantages for countries hosting CDM or JI emission reduction projects are the attraction of foreign investment, the transfer of technology, and the contribution to the country's sustainable development.

The basic rules on how the 'project-based' mechanisms are to function in detail are defined in the Marrakesh Accords, agreed to by COP-7 in October-November 2001. These rules are known as the CDM Modalities and Procedures (sometimes abbreviated as M&P). The rules are constantly evolving and will be further developed in subsequent COP meetings (all documentation on COP meetings is available at: http://unfccc.int).

2.3. The Clean Development Mechanism

The Clean Development Mechanism (CDM) is a mechanism whereby an Annex I party may purchase emission reductions which arise from projects located in non-Annex I countries. The carbon credits that are generated by a CDM project are termed Certified Emission Reductions (CERs)[3], expressed in tonnes of CO_2 equivalent (tCO_2-e).

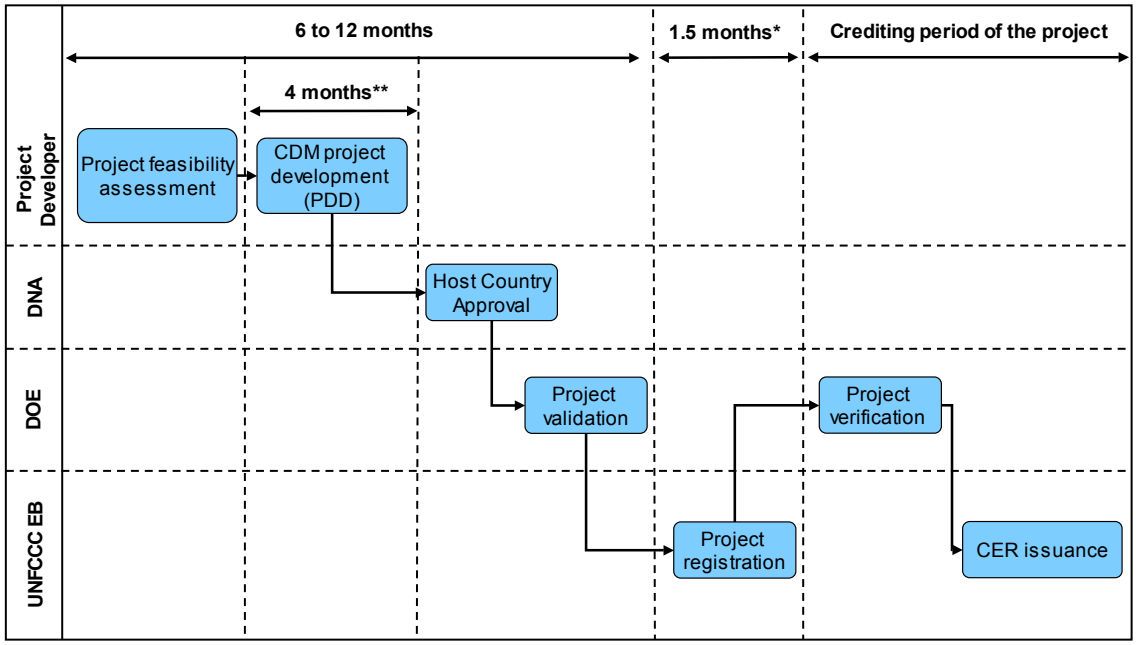
In order for a project to generate CERs, it must undergo a rigorous process of documentation and approval by a variety of local and international stakeholders, as specified under the CDM Modalities and Procedures. The key stages in the CDM project cycle (shown in Figure 2 below) are the initial feasibility assessment, development of a Project Design Document (PDD), host country approval, project validation, registration, emission reduction verification and credit issuance. The figure shows the interdependencies of the activities that need to be undertaken as part of the process, and which stakeholders are responsible for carrying out each activity. These stakeholders include the CDM project developer and the CDM Executive Board (EB), as well as the Designated Operational Entity (DOE), responsible for validation and verification of the project, and the Designated National Author-

3 Credits gained by CDM projects sequestering carbon in forestry projects are referred to as 'temporary CERs' (tCERs) or 'long-term CERs' (lCERs) depending on how they are accounted for.

ity (DNA), which has the authority to grant host country approval for the project. More information on the various stakeholders is provided at section 5.4 below.

The figure also provides a broad indication of the time required for each step in the project cycle. However, it must be noted that these timescales can vary significantly according to project specific circumstances.

Figure 2: The CDM project cycle



*** can be extended depending on the EB decision**
**** for each submission and additional to normal process**

Once the project is registered, CERs may be issued at any time, following verification by a DOE and a formal request for issuance to the CDM EB.

The CDM EB supervises the CDM under the authority and guidance of the Conference of the Parties. The EB's core tasks are the following:

- Accreditation of independent auditors (DOEs) for validation and verification;
- Review of validation reports and PDDs;
- Approval of new baseline and monitoring methodologies;
- Registration of projects; and
- Issuance of CERs.

All CDM projects must satisfy certain requirements specified in either the Kyoto Protocol or the Marrakesh Accords. These include requirements that the project:

- Complies with the eligibility criteria (e.g. sustainable development criteria) of the host country and other parties, and receives project **approval by the host country**;
- **Provides real, measurable, and long-term benefits related to the mitigation of climate change using an approved baseline and monitoring methodology;**
- Delivers reductions in emissions that are **additional** to any that would occur in the absence of the project activity;
- Does not result in significant **environmental impacts** and undertakes **public consultation**; and
- Does not result in the diversion of **official development assistance** (ODA).

Each of these requirements is dealt with in greater detail below.

Host country approval

Obtaining host country approval is a critical step in the CDM project cycle: without it, a project is not eligible for the CDM. In order for a CDM project to receive formal host country approval, the host country must have ratified the Kyoto Protocol and have nominated a Designated National Authority (DNA) to the UNFCCC.

The DNA is formally responsible for managing the CDM approval process in the host country. This approval should be provided in writing, in the form of a Letter of Approval (LoA). Such a letter must include:

- Confirmation that the host country has **ratified** the Kyoto Protocol;
- A statement that the host country's participation in the CDM is **voluntary**; and
- A statement that the project contributes to the host country's **sustainable development**.

It is up to each DNA to specify rules and procedures for obtaining host country approval, including setting any criteria that will be applied in determining whether or not the project contributes to the host country's sustainable development. The term 'sustainable development' is not defined in the Marrakesh Accords and the host country has the sole mandate to determine if a particular CDM project will meet its sustainable development criteria.

Baseline and monitoring methodology

At the heart of CDM project development is a baseline study which quantifies the emissions reduced and therefore the carbon revenue potential of a project. The determination of a baseline is defined in a baseline methodology. Related to this, the procedures for the measurement of the actual emissions reduced by a project over time are defined in a monitoring methodology. A CDM project can only be submitted for validation if it has been developed in accordance with an approved baseline and monitoring methodology.

A baseline methodology describes each of the steps that must be taken to characterise baseline emissions, and ultimately to calculate the project emission reductions. To facilitate project development, the EB has set out a process through which methodologies developed for one project can be used for similar activities.

The EB has approved a number of methodologies that can be applied to a variety of project activities (see the UNFCCC CDM website http://cdm.unfccc.int for an updated list of these methodologies). Methodologies can be divided into three categories, as described in Table 2 below.

Table 2: Methodology categories and their characteristics

Approved large-scale methodologies (AM)	Approved consolidated methodologies (ACM)	Approved small-scale methodologies (SSC)
• Largest group of methodologies; • Initially developed by project proponents for a specific project, but may then be used for other similar projects meeting specified applicability conditions; • Generally no upper limit on size and capacity of installations and emission reductions; • Comprehensive in comparison to small-scale; • Stronger emphasis placed on monitoring in comparison to small-scale.	• Consolidation of a number of large-scale methodologies for similar or related project types into a single methodology; • Consolidation by UNFCCC Methodology Panel, rather than by project proponents; • Broader focus/ less project-specific.	• Applicable small-scale projects may not exceed certain defined thresholds (for example, defined in terms of electricity generation capacity, energy savings, or emission reductions). In comparison to large-scale methodologies, SSC methodologies have the following advantages: • Identical project components may be bundled under one project activity; • PDD requirements are reduced; • Baseline calculation and monitoring procedures are simplified to reduce costs; • Same DOE may validate and verify the same project.

Project developers have two options regarding the use of a methodology for their project:

- **Use an approved methodology (AM, ACM, SSC):** If a methodology exists that is already approved by the EB and that is applicable to the project, it can be used. The project developer should justify the choice of applying an approved methodology and describe how it is applied, in the PDD.
- **Propose a new methodology (NM):** If none of the previously approved methodologies are applicable to the project activity, or the project developer does not want to apply an approved methodology, a new methodology must be developed and proposed to the EB for consideration and approval. Developing a methodology usually takes around a year and the track record shows that many methodology proposals are unsuccessful in the first round and drafts frequently require revision. Once a methodology has been approved it is available for use to the general public.

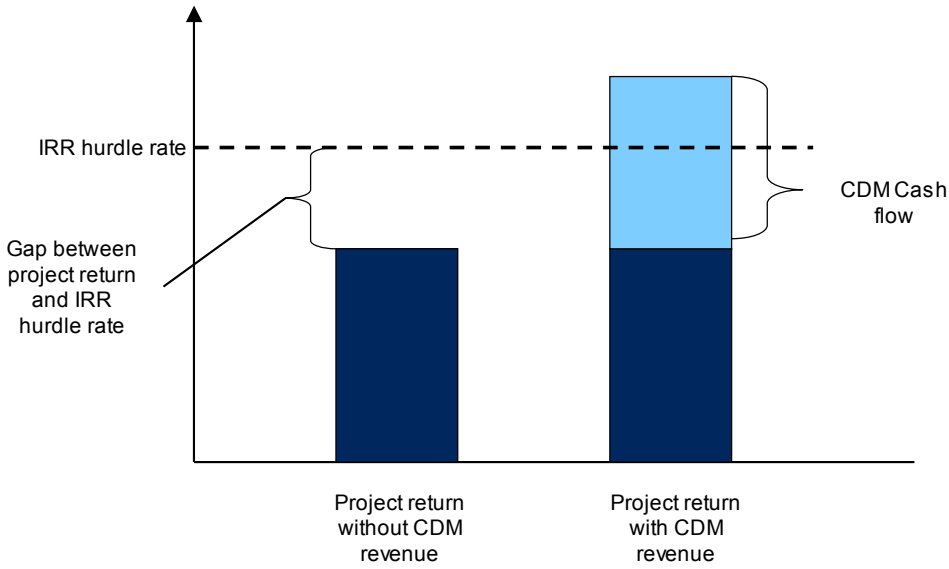
Project additionality

It is important to note that not all projects are eligible for the CDM. The key eligibility requirement, as set out in the Kyoto Protocol, is 'additionality'. Reductions in emissions must be additional to any that would occur in the absence of the certified project activity (the 'business-as-usual' scenario). In other words, a CDM project should be something that would not have happened anyway, in the absence of the CDM. Methods to demonstrate additionality have been developed by the CDM EB.

For large-scale methodologies, the 'Tool for the demonstration and assessment of additionality' (available at: http://cdm.unfccc.int/Reference/Guidclarif/index.html) provides project developers with a step-by-step approach for establishing whether their intended activity is additional.

A crucial and frequently applied step to demonstrate the additionality of large-scale projects is the use of an Investment Analysis (Step 2 of the 'Additionality Tool'). Using one of three different techniques prescribed in the 'Tool', the project developer will have to demonstrate that the CDM revenue from selling CERs is required in order to put the required return of the project above the investment threshold, the Internal Rate of Return (IRR) hurdle rate, and thus demonstrate that the project is additional (see Figure 3). Projects with an IRR that exceeds the hurdle rate even without the CDM cash flow are, by definition, commercially attractive without the CDM and are therefore non-additional – unless other non-financial barriers can be shown to prevent commercial implementation.

Figure 3: Demonstrating financial additionality



Diversion of Official Development Assistance

If a project is financed (even partly) by sources of public funding, this must not result in a diversion of Official Development Assistance (ODA). Put more simply, development aid should not be diverted into the CDM: any public funding from Annex I countries going into CDM projects should not have been taken away from other funding obligations. Where the project is financed by public funds, the project developer is required to provide information to confirm that the public funding of the CDM project has not resulted in any diversion of ODA. In addition, the project developer should be able to demonstrate that the funding of a CDM project is not counted towards the financial obligations of any donor to the country hosting a CDM project.

Environmental Impact Assessment and consultation exercise

As part of the PDD, information on the environmental impacts of the project has to be provided, a local public stakeholder consultation exercise (which can include local authorities, individuals, groups or communities affected, NGOs, Government officials, etc.) has to be carried out prior to PDD submission, and it has to be demonstrated that the project allowed for public comments on the PDD during the formal CDM validation process.

The CDM consultation process is not intended to be a substitute for any legally required consultation procedures, for example as part of the Environmental Impact Assessment process. Rather it should be in addition. The participation of stakeholders is an effective and essential means of increasing the transparency of the CDM process. It also facilitates communicating the project's contribution to the host country's sustainable development.

2.4. Examples of CDM Projects

The nature of CDM projects can vary widely. Since the inception of the market the global CDM portfolio has diversified significantly. The UNFCCC distinguishes the CDM categories detailed below, and a number of possible examples of CDM projects are provided for each category. At the time of writing, approved methodologies are available for some, but not all of these categories. It should be noted, however, that as the market develops further, the number of differing project types and methodologies under each category is likely to continue to grow (see http://cdm.unfccc.int for an up-to-date list of methodologies).

Energy industries (Renewable and Non-renewable sources)

- CDM projects in the renewable energy industry involve the generation of zero-emission energy (electricity or heat) from renewable sources such as wind, wave/tidal, solar, hydro, biomass or geothermal energy. In such projects, emission reductions occur if the zero-emission energy would otherwise have been provided by fossil fuels. The energy industry can also mitigate emissions through fossil fuel switching or supply-side energy efficiency. Fuel switch projects involve the substitution of one fossil fuel with another which has lower emissions through its lifecycle, e.g. a switch from coal to gas-fired power generation. Supply-side energy efficiency projects involve an improvement to increase the efficiency of a power or heat generation plant, for example changing from open cycle to combined cycle gas turbines.

Energy distribution

- There is potential for emission mitigation in the distribution of energy. This category includes projects which improve energy efficiency in the transmission and distribution of electricity. Such energy efficiency results in a reduced need for fossil fuel generated electricity. At the time of writing only one methodology was available for this category.

Energy demand

- Reductions in energy demand have the potential to reduce direct consumption of fossil fuels such as coal or gas or the indirect consumption of fossil fuel generated electricity. Examples of such projects include increasing the efficiency of steam production or energy efficiency of specific technologies, buildings or agricultural facilities.

Manufacturing industries

- Manufacturing industries can reduce emissions in a number of ways. An example from the cement industry would be the substitution of clinker with an alternative product such as volcanic ash. Emissions are reduced due to avoided production of clinker, which is highly energy intensive and based on the use of fossil fuels.

Chemical industries

- One example of reducing emissions in a chemical industry can be found in the nitric acid production process. By destroying the N_2O waste gas of the facility the GHG potential of the gas is significantly reduced. Given the high GHG potency of the gas, N_2O projects yield a high volume of emission reductions.

Construction

- At the time of writing, there were no examples of CDM projects in this category, or approved methodologies available. However, it is likely that a number of options to reduce GHG emissions in the construction sector exist and may eventually be developed under the CDM.

Transport

- CDM projects in the transport sector may include projects that aid the improvement of public transport services and thus reduce emissions from cars. Projects may also focus on the use of energy efficient vehicles or the use of lower emission fuels, such as bioethanol or biodiesel. As the consumption of petrol and diesel for transport decreases so will the related GHG emissions. At the time of writing only one large-scale methodology was available for this category.

Mining and mineral production

- This project category includes methane emissions from coal beds and mines. The methane which is captured as part of a CDM project may be flared or used for electricity generation. Emission reductions occur due to avoided leakage of methane to the atmosphere, and (for electricity generation projects) the substitution of electricity generated by other fossil fuel sources. At the time of writing only one large-scale methodology was available for this category.

Metal production

- PFCs produced as a result of the 'anode effect' at an aluminium smelting facility can be reduced through various control measures. This is one example of a CDM project in this category.

Fugitive emissions from fuels (solid, oil and gas)

- Examples of projects in this category include the recovery and utilisation of gas flared from oil wells or reductions in fugitive emissions from leaking gas pipelines. Projects to reduce fugitive emissions arising from coal mining and from various agro industrial activities are also included in this category.

Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride

- This includes the destruction of HFCs where they occur as waste streams in production. Given the high GHG potency of HFCs, these projects yield high emission reductions.

Solvent use

- At the time of writing, there were no examples of CDM projects in this category, or approved methodologies available. However, it is likely that a number of options to reduce GHG emissions in the sector of solvent use exist and may eventually be developed under the CDM.

Waste handling and disposal

- This category includes liquid industrial waste such as wastewater from palm oil or starch producers or animal farms. Methane is extracted from the waste streams and used as a biogas to supply heat and/or electricity on- or off-site, or simply burned (i.e. flared) in order to reduce its GWP. Furthermore, the management of solid municipal waste is also included. When municipal solid waste is deposited in landfills, methane is generated due to the anaerobic decomposition of the waste. CDM projects in this category involve the capture of this gas in order to flare it or use it for the generation of electricity and/or heat.

Afforestation and reforestation

- The Marrakesh Accords stipulate that afforestation and reforestation are the only LULUCF categories that are eligible under the CDM. Afforestation involves planting trees on land which was not previously forested, whereas reforestation refers to planting trees on land which was recently cleared (prior to 1990). For example, degraded land may be restored/reforested as part of a CDM project resulting in the sequestration of carbon from the atmosphere.

Agriculture

- Examples of projects in this category include the avoidance or recovery of methane emissions from agricultural waste processes, be it through controlled combustion of biomass, recovery of gas from wastewater streams or the substitution of an anaerobic waste treatment process with an aerobic process. If methane is recovered it may be flared, used to generate electricity and/or heat, or desulphurised and piped into the gas distribution network.

2.5. CER Demand

CER demand can be divided into two main categories: demand from sovereign states, and demand from non-state entities. Demand from sovereign states arises from their commitments under the Kyoto Protocol, whereas demand from non-state actors may arise from either voluntary or legislative commitments to reduce their GHG emissions, speculation, or a combination of the above.

For general information on the carbon market, see the regularly updated IETA/World Bank publication, *State and Trends of the Carbon Market*, available at http://carbonfinance.org/

Figure 4: Overview of the carbon market during the first Kyoto Protocol commitment period

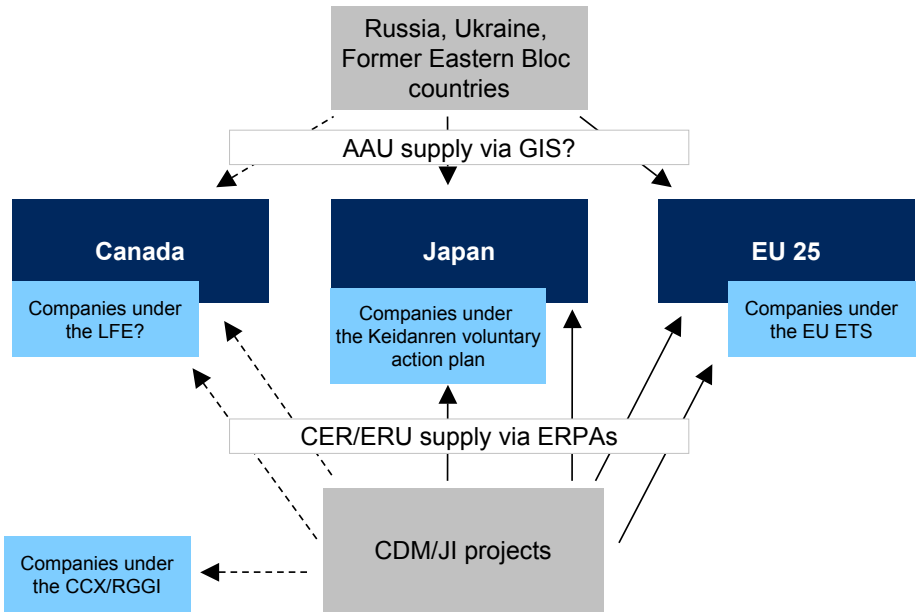


Figure 4 shows the potential sources of carbon credits in the first Kyoto Protocol commitment period. The arrows leading to Canada are dashed as the mode of Canadian compliance has not yet been finalised. Similarly the arrow leading to RGGI and the CCX is dashed as although these systems technically can use CERs, whether or not they will do so in practice is currently unclear.

Sovereign States

The demand from sovereign states will primarily arise from their commitments under the Kyoto Protocol. As such, the window of demand from these states currently ends with the end of the first Kyoto Protocol commitment period (2012) and will only continue in the presence of a new international treaty that recognises the use of CERs as a valid compliance measure.

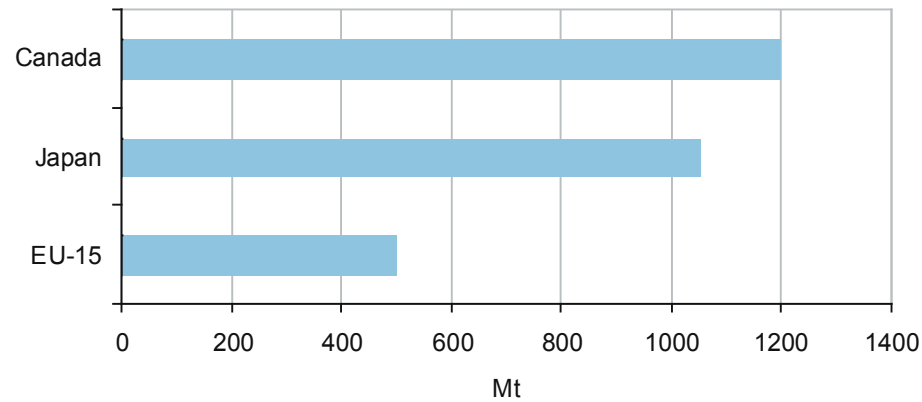
Canada, Japan and the EU15 (the states that were members of the EU prior to the May 2004 expansion, when 10 new Accession States joined the EU) provide the majority of gross global demand for carbon credits, due to the gap between their Kyoto targets and current emission projections.

At the time of writing, Canada's position on the Kyoto Protocol remained unclear. Emissions are projected to be up to 50% over target by 2012, yet there is no clear policy on purchase of carbon credits or emissions trading.

Within the EU15, Spain and Italy have the largest gross gaps between current projections and their Kyoto targets. The new Accession States (including, most recently, Romania and Bulgaria) are projected to achieve their Kyoto targets easily, due to the fact that these targets were based on 1990 levels of economic activity. In nearly all cases, these countries experienced a contraction in economic activity following the collapse of the Soviet Union, leading to lower emissions.

Japan has a challenging Kyoto target and an active carbon credit procurement programme. It is not yet clear how much of Japan's remaining Kyoto gap will be met with further carbon credit procurement, or additional domestic policies.

Figure 5: Gap to the Kyoto target: Japan, Canada, EU15 and others



Source: Adapted from Point Carbon (2006). Kyoto progress update: Improvements on the horizon? *Carbon Market Analyst*. Used by permission.

Figure 5, above, illustrates how far away Japan, Canada, and the EU15 are still projected to be from achieving their Kyoto targets, even after emissions trading schemes, other non-trading emission reduction policies, and government procurement programmes (for the purchase of external credits, such as CERs or ERUs) are taken into account. This provides an indication of how large the gross demand for carbon credits is likely to be over 2008–2012.

Emissions trading schemes

Under emissions trading schemes an overall limit is set on the GHG emissions that the installations falling under the scheme are allowed to emit. This cap is distributed amongst the participants in the form of allowances, or permits to emit. The participants may then choose to use their assigned allowances to cover their emissions or to some degree reduce their emissions and sell excess allowances to other participants.

The European Union Emissions Trading Scheme (EU ETS)
The EU ETS (for more information see http://ec.europa.eu/environment/climat/emission.htm) is currently the largest emissions trading system in operation, and as such is the most significant in terms of generating demand for CERs. The system started operating in January 2005, with the participation of the 15 EU Member States plus the 10 new Accession States which joined the EU in May 2004. The first phase of the EU ETS runs from 2005 to 2007; the second phase coincides with the first commitment period under the Kyoto Protocol (2008-2012).

The scheme covers five main sectors, namely power and heat generation, iron and steel, mineral oil refineries, mineral industry (cement, glass, ceramics), and the pulp and paper sectors. Around 11,500 plants or installations are covered by Phase I of the EU ETS. These sectors account for approximately 45% of the EU's emissions, or over 2 billion tonnes of CO_2 emissions per year.

Each Member State is responsible for allocating EU allowances (EUAs, equivalent to 1 tCO_2-e each) to the installations covered by the EU ETS in that country, such that the allocation is consistent with the country's path towards compliance with its Kyoto Protocol target (as shared out between EU countries under the so-called Burden Sharing Agreement). The allocation is set out in each country's National Allocation Plan (NAP), which is prepared in advance of each phase of the EU ETS.

In order to allow companies to explore fully their comparative advantages, the EU ETS allows companies to trade surplus EUAs between themselves. In this way, companies that are successful in reducing their GHG emissions beyond their target generate a surplus of allowances and can sell them to companies that do not meet their targets.

In addition, companies are able to purchase CERs from CDM projects (and, from 2008 onwards, also ERUs from JI projects) in order to achieve their targets. This has been implemented via separate EU legislation known as the 'Linking Directive.'

The Linking Directive allows companies within the EU ETS to use CERs and ERUs for compliance purposes. The degree to which companies are allowed to do this is to be decided by individual Member States in their Phase II National Allocation Plans (NAPs), as are any restrictions on provenance of credits. When deciding on the limits of the use of CERs and ERUs by companies under the EU ETS, member states have to take into account the concept of 'supplementarity'.

Supplementarity appears in the Kyoto Protocol in Articles 6 and 17 where it is stated that *"any such trading (emissions) shall be supplemental to domestic actions for the purpose of meeting quantified emission limitation and reduction commitments under that Article."* To date there has been no clear quantification from the UNFCCC as to what ratio of domestic action to purchase of external credits constitutes supplemental action. However, the EC has in effect provided its interpretation of this in its decisions on the Phase II NAPs. In a communication on these decisions, the EC specifies that a maximum of 50% of the required reduction in emissions to meet a country's Kyoto target may be met with the use of JI/CDM credits. Government procurement programmes as well as purchases by EU ETS installations must be included in the calculation of the country's 'allowed' use of JI/CDM credits. Recognising that large government procurement programmes might disallow the use of JI/CDM credits by EU ETS installations altogether, the EC allows a minimum 10% threshold allowance in each NAP, reflecting a '*reasonable balance between domestic reductions and giving operators an incentive to invest in projects in developing countries*' (http://ec.europa.eu/environment/climat/2nd_phase_ep.htm).

The Keidanren voluntary action plan
In July 1996, the Japanese business federation, the Keidanren (http://www.keidanren.or.jp/), sought to establish a voluntary basis for industrial action on climate change. This led to the voluntary action plan in 1997 which currently covers 82% of industrial emissions in Japan, embracing 34 industries. The Keidanren set out to reduce CO_2 emissions from the industrial and energy converting sectors in fiscal year 2010 below 1990 levels.

The Keidanren calculates that, without the voluntary action plan, emissions from the industries covered would be 38 Mt above 1990 levels (Keidanren, 2004).

Companies under the Keidanren voluntary action plan have the option of using CERs as an abatement option. There has been considerable interest in the CDM market from Japanese companies under the Keidanren.

The Chicago Climate Exchange (CCX)
The CCX (http://www.chicagoclimatex.com/) is a voluntary scheme based in Chicago, USA, whereby participants agree to reduce their emissions. Although the CCX does allow for the use of CERs, at the time of writing (January 2007) the volumes and prices traded on the CCX market were comparatively low. In the first quarter of 2006, the CCX traded 1.25 Mt of allowances at a value of US$2.71 million. In comparison, the EU ETS traded 202.52 Mt at a value of US$6.5 billion (IETA/World Bank, 2006).

The Regional Greenhouse Gas Initiative (RGGI)
The RGGI (http://www.rggi.org/) is a coordinated effort between seven north eastern and mid-Atlantic states (Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York and Vermont) to implement a cap and trade program to limit GHG emissions in the region.

Regional emissions would be capped at 121.3 million short tons[4] of CO_2 through 2014, and reduced to 10% below this level in 2018. The RGGI will only affect fossil fuel fired power generators of over 25MW capacity, that burn more than 50% fossil fuel.

The RGGI is set to commence on 1 January 2009. It is currently of limited interest to CER vendors as it will only allow the use of CERs when the price of emissions reductions rises above US$10 per tonne. At present, this seems unlikely, given other aspects of the scheme's design.

Other Schemes
There are various other schemes being planned that may become significant in the future. Amongst these is the Canadian Large Final Emitters system (LFE). The LFE has reached an advanced stage of planning, but is currently on hold as the Canadian government decides on its way forward with regards to emission reductions. There is a possibility that the LFE may become active again and start trading as early as 2008. If so, in its last planned form it would allow access to CERs.

Another scheme that may allow access to CERs is the recently announced Californian cap and trade scheme (http://www.climatechange.ca.gov/). Currently the legislation for this scheme does not specifically allow or disallow the use of CERs, and there is some opposition within California to doing so. On balance, however, when the scheme is up and running (from 2012) it will, in all likelihood, allow for the use of CERs.

Voluntary Emission Reductions

An additional source of demand for emission reduction credits is the growing market for voluntary emission reductions (VERs). Due to an increasing interest in the mitigation of climate change, more and more actors, ranging from private individuals to public and private institutions, want to offset their own carbon emissions on a voluntary basis. For example, financial institutions such as HSBC, Credit Suisse and UBS are on their way to becoming 'carbon neutral' operations. Large events such as the 2006 Fifa World Cup, 2006 Winter Olympics and Formula One championships since 1995 also voluntarily offset emissions. Furthermore, any individual is free to purchase emission reduction credits to offset their personal emissions.

To meet this demand for VERs, a number of companies and organisations offer a variety of carbon offsets. While some offer carbon offset units which are not developed under the CDM, others also offer CERs for purchase, which can be retired from the carbon market and thus function as carbon

4 A 'short ton' is an imperial measure used mainly in the United States, equivalent to 0.907 metric tonnes.

offsets. CERs may therefore play a key role in helping individuals and institutions to offset their carbon emissions voluntarily. Although prices paid for VERs are generally lower than for CERs, the voluntary market may in some cases represent a good alternative for certain emission reduction projects that are not eligible under the CDM (e.g. certain LULUCF projects).

2.6. CER Supply

At the time of writing the CDM is primarily an 'Over The Counter' (OTC) market, mainly consisting of primary trades between project developers on the one hand and buyers on the other. Such deals are typically conducted by the project developer selling CERs to a client using a contract format referred to as an Emission Reduction Purchase Agreement (ERPA).[5] Key to this market is the establishment of the International Transaction Log (ITL) of the UNFCCC, which will allow the actual transfer of the CERs. This system is scheduled to be in operation by mid-2007.[6]

A secondary market is slowly emerging and is expected to grow as the infrastructure for transactions develops and a sufficient amount of CERs is issued. An example of secondary CER trading is, for instance, the Carbon Credit Note (CCN or Promissory note) issued by South African asset manager Sterling Waterford, which is listed on the Johannesburg Stock Exchange (JSE), South Africa. Private as well as institutional investors can invest directly in carbon by buying these notes on the exchange. A CCN is a fully underwritten obligation (in the form of a note or bond) to deliver a carbon credit (CER) to the purchaser at a specified future date. It is deemed a derivative because its value derives from the underlying CER. The notes were placed in April 2005 at US$10 (OTC), with a second round at US$14 on the JSE. They expire in 2012, when the holder can be paid in cash or CERs. It enables purchasers to avoid the project specific counter-party risk of non-delivery. Sterling Waterford purchased the credits forward using a modified ERPA from the private sector CDM project developer EcoSecurities.

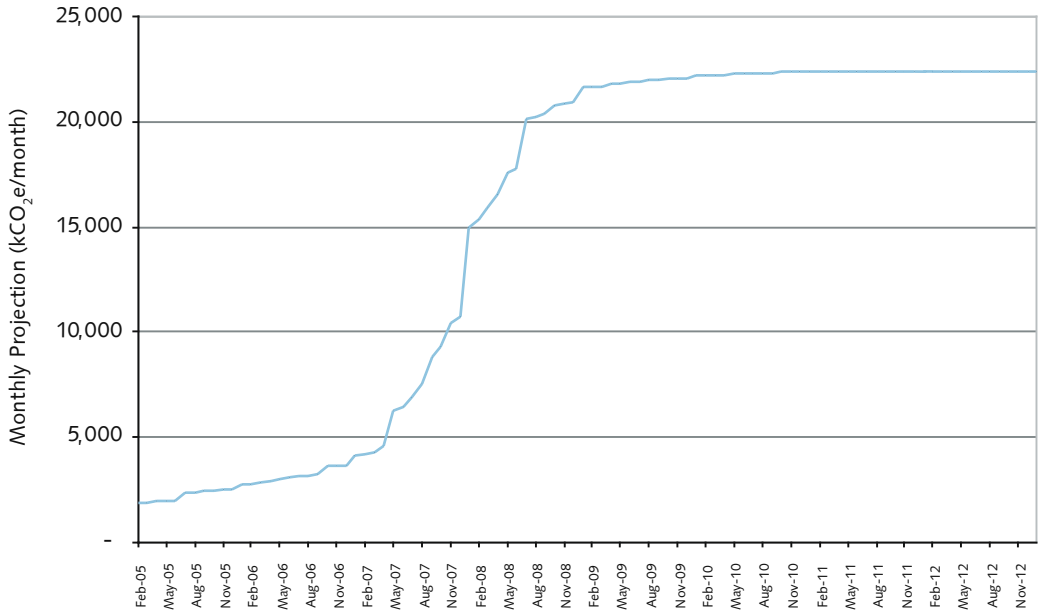
The projected volume of CERs generated has grown significantly since the inception of the carbon market (see Figure 6 below).[7] With a large number of PDDs under development and in the pipeline, the amount of CERs is forecast to grow significantly in order to address demand from Kyoto compliance buyers between 2008 and 2012. It should be noted, however, that numbers underlying the graph below are not risk-adjusted. This means that the actual delivery of CERs from these projects is likely to be lower than is shown here.

5 For more detailed information about the legal framework of ERPAs please consult UNEP Risoe, June 2004, *Legal Issues Guidebook to the Clean Development Mechanism*, available at: http://www.cd4cdm.org

6 UNFCCC Press Release, 14 August 2006, UNFCCC awards contract to finalize electronic Kyoto carbon trading infrastructure, available at: http://unfccc.int

7 UNEP Risoe Centre, CDM Pipeline Overview, 11 January 2007, available at: http://www.cd4cdm.org

Figure 6: Projected monthly issuance of CERs (as of January 2007, 1,523 PDDs)



The distribution of CDM projects is not even across the different sectors (see Figure 7 below). At the time of writing, of all projects that are either under validation, submitted for registration or registered, the main share (by number) is in projects for renewable energy (59%). This is followed by methane reduction (including agriculture, landfill gas and coal mine methane) and energy efficiency projects (13% of total projects).

It should be noted, however, that the amount of CERs issued per sector is not directly related to the number of projects per sector (see Figure 8 below). Due to the varied nature of project categories, there is also a wide variation of GHGs with different GWPs. The projects involving the most potent GHGs such as HFCs, PFCs or N_2O (2% by number of projects) nevertheless lead to the issuance of most CERs (65% at the time of writing). Although about 80% of CDM projects are either renewable energy or methane reduction projects, their emission reductions pale in comparison to HFC and N_2O, with only 33% of total CERs issued.

Figure 7: CDM projects by sector

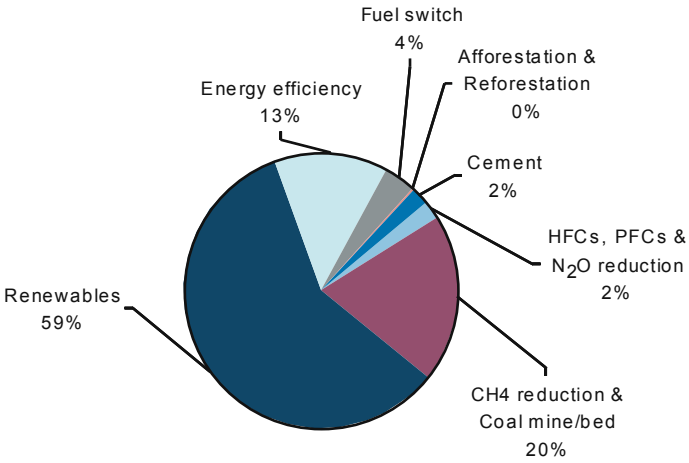
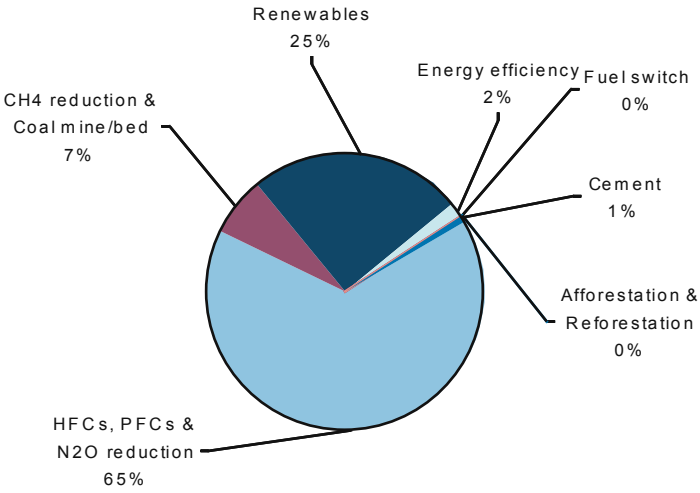


Figure 8: CERs issued by sector



3. Introduction to Financing a Project

3.1. Introduction

This section provides an outline of the types of finance available for conventional projects, the parties involved in financing a project, and typical models used for financing projects. The section is intentionally generic in order to highlight the traditional means that are commonly applied to finance projects. Section 4 below will then focus on the particulars of financing a CDM project.

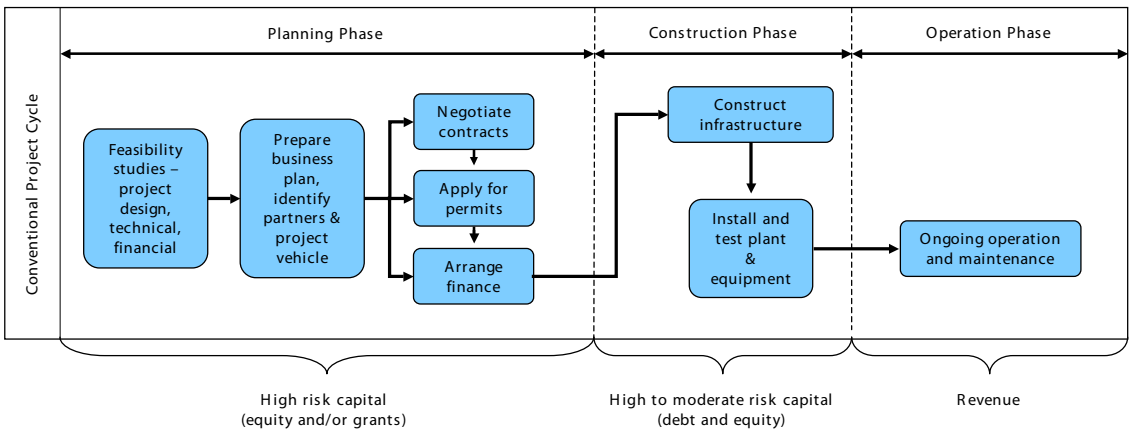
3.2. Key Terms

Project: the planning, development and implementation of any 'significant' engineering works.
Financing a project: the task of obtaining the necessary funds to carry out the project. Usually the largest expenditure is incurred during the construction phase of a project (see section 3.3 below), but it is also relevant to consider how other stages of the project cycle may be financed.
Project Financing: has come to have a specific meaning, associated with financing structures wherein the lender has recourse only to the assets of the project and looks primarily to the cash flows of the project as the source of funds for repayment. This and other financing structures are discussed in greater detail in section 3.7 below.

3.3. The Conventional Project Cycle

The conventional project cycle can be broken down into three phases, with different forms of finance associated with each phase (see section 3.6 below for more information on the different forms of finance available).

Figure 9: The conventional project cycle



Planning Phase

- Feasibility studies:
  - Project design
  - Technical feasibility
  - Financial feasibility
- Business plan
- Identify partners and project vehicle
- Contracts (fuel/technology supply, construction, operation, sales or other performance contracts)
- Permits (planning permission, health & safety, emissions permits and/or other environmental licences, subject to environmental impact assessment, if applicable)
- Finance (identify sources of finance, carry out risk assessment, management and mitigation)

Construction Phase

- Construct associated infrastructure, install and test plant & equipment

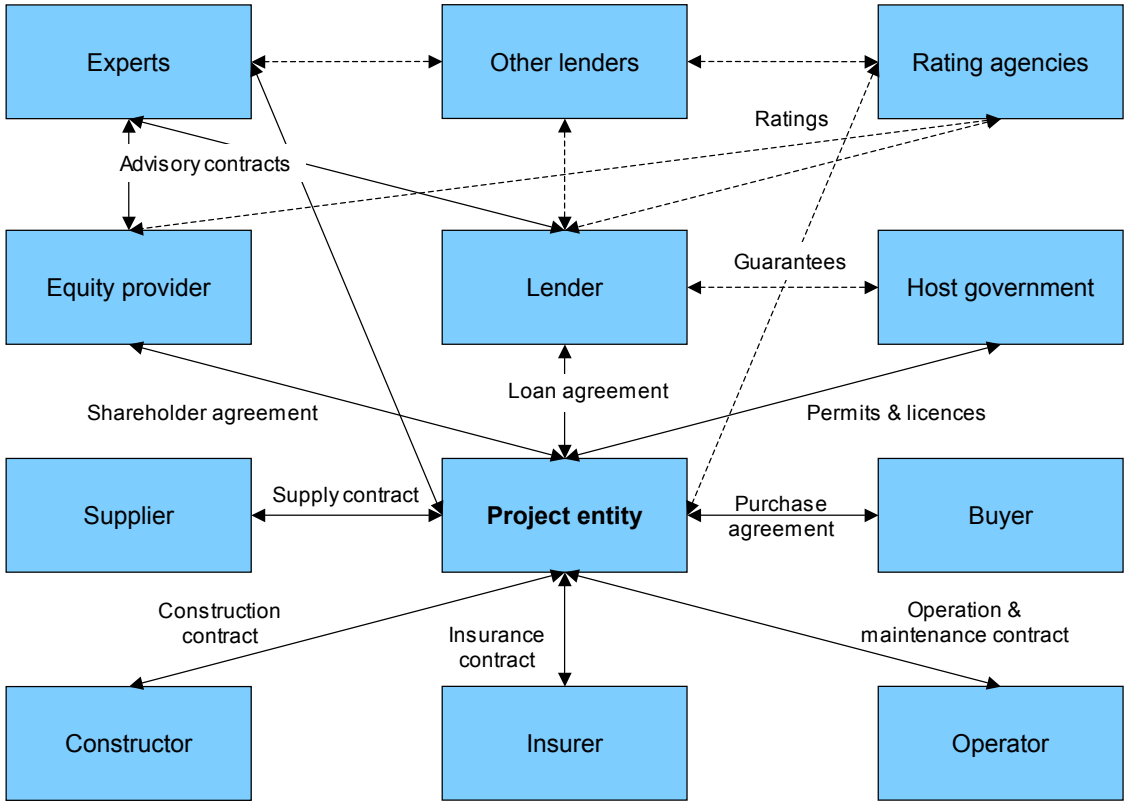
Operation Phase

- Ongoing operation & maintenance

3.4. Parties Involved in Financing a Project

The key parties involved in a project are shown diagrammatically in Figure 10 below. The diagram is highly simplified, and illustrates just one possible financing structure (project financing – for more information see section 3.7 below). Key relationships common to the financing arrangements for most projects are shown with solid lines, with some additional options indicating some of the possibilities with more complex financing arrangements shown with dotted lines. The parties are explained in further detail below.

Figure 10: Parties involved in financing a project



Party	Role/responsibility
Project entity	The project entity is often a Special Purpose Vehicle (SPV, also known as a Special Purpose Entity, SPE, or Special Purpose Company, SPC) such as a joint venture company or a limited partnership set up specifically to undertake the project. Creating a Special Purpose Vehicle may be useful in order to keep a project at arm's length from the project sponsors, for legal, tax or financial reasons. Alternatively, the project entity may be an individual, an existing company, a government agency, a charity, NGO or community organisation. A project may also encompass several different entities. In such cases it is critical to have clear contractual arrangements in place specifying how the different entities are going to work together to implement the project.
Sponsor	Sponsors are those individuals, companies or other entities who promote or support a project because they have a direct or indirect interest in the project. Sponsors can include owners of the land on which the project will be situated, contractors, suppliers, buyers of the project's outputs, or other users of the project.
Lender	If the project is financed through debt, one or more banks may be involved in providing this. A loan from a group of banks is known as a syndicated loan. Typically one of the banks will take the lead role in arranging the finance and syndication agreements, while another (called the engineering or technical bank) will monitor the technical aspects of the project. Others may be appointed to deal with other specific aspects such as insurance. Other types of lenders may include individuals, corporations, contractors, community groups and institutional investors such as the World Bank and other international agencies.
Equity provider	Equity may be provided by project sponsors or third party investors. Equity providers will wish to ensure that the project produces a return on their investment as set out in the business plan or prospectus.
Constructor	Construction is usually carried out by specialist contractors who have responsibility for the completion of the works, and often have to assume liability for finishing construction on time and to budget. Lenders will usually require contractors to demonstrate a good track record in completing the same or similar project activities.
Operator	Operation of the project may be carried out by the project entity, one of the sponsors, or a third party appointed to be responsible for the operation and maintenance of the project facilities once completed.
Supplier	Various companies will supply goods and services to the project. Lenders will generally prefer supplier agreements and contracts to be in place for the delivery of essentials such as fuel and equipment. Equipment suppliers will generally be required to have a track record of supplying the relevant equipment and to provide equipment performance guarantees.
Buyer	A project may produce one or more outputs. Lenders will wish to have contracts in place with buyers of the outputs constituting the majority of the project's future cash flow. The nature of these contracts will be subject to particular scrutiny and the terms of a loan may well be dependent upon factors such as the minimum price level in a contract and how various risks are apportioned between the buyer and the project entity. In order for a lender to place any reliance on a purchase agreement as an indication of a project's ability to repay a loan, the lender will need to be satisfied as to the credit-worthiness of the buyer.

Insurer	Insurers can assist in identifying and mitigating risks associated with the project. If a risk is to be mitigated by purchasing insurance, the lender will need to be satisfied as to the track record and credit-worthiness of the insurer.
Rating agencies	The rating agencies (e.g. Moody's, Standard & Poor's, Fitch Ratings) may be involved if the financing of the project involves the issue of securities.
Experts	Project sponsors and lenders will often call upon external experts to advise them on key technical, engineering, environmental and risk aspects of a project. Experts need to be able to demonstrate a track record of expertise in the relevant area.
Host government	The objectives and role of the host government will vary but may involve economic, social and environmental guidelines and issuance of relevant consents, permits and licences. In some countries, the host government may be involved through state owned or controlled companies that may take on any of the above roles in relation to the project.

3.5. Financing Requirements

In general, the largest costs associated with a project are incurred at the construction stage, where even a relatively small engineering project can cost many millions of dollars. At this stage, for a commercially viable project, lenders and investors will only provide finance on the expectation that, on completion of construction and commissioning, the project will go on to generate revenue. This revenue should at least be sufficient to cover ongoing operation and maintenance costs for the operation phase, and also to provide a commercial return to the lenders and investors.

From the perspective of the lender the risk of financing a project does not drop significantly until after the project is commissioned, and this will affect the terms of financing. In some cases, lenders require independent proof of technical completion of the project and/ or proof of financial completion in the form of significant project revenues, in order to adjust financial terms, such as the interest rate of a loan.

During the early stages of planning a project, the chances of the project not proceeding (for example because the necessary permits cannot be obtained), and therefore not generating any future revenue, are significantly higher. Therefore, although the costs associated with the planning stage (typically in the hundreds of thousands of dollars) are much lower than construction costs, the risk is much higher and different forms of finance are required, as shown in Figure 9 above. The different forms of finance available for the planning and construction phases are discussed in further detail below.

Depending on the type of financing, the project sponsor will have to present different kinds of data and documentation to the lender at different stages. For example, for project financing, a minimum requirement for international banks is a business plan which includes at least feasibility studies, financial statements and financial projections. For corporate finance on the other hand, relationship banks may be more focused on collateral and long-term client relationships.

Similarly, there are a number of important milestones that the project sponsor will have to consider. Banks will consider requests for project financing only at a relatively advanced stage of the project cycle. For example, while it is useful to make contact with financial institutions at a pre-feasibility stage to identify potential interest, they will require the project to have feasibility studies completed and essential permits/licences granted before appraising a project for possible financing.

Most international banks require the above mentioned information and financial statements prepared in accordance with international financial reporting standards. The time required to arrange this needs to be factored into the project timeline.

For further information and guidance, see UNFCCC (2006) *Preparing and Presenting Proposals - A Guidebook on Preparing Technology Transfer Projects for Financing*, available at: http://unfccc.int.

3.6. Types of Finance Available

In general, there are three forms of finance that can be used to develop projects: grants, loans (debt) and equity. Most projects will incorporate a varying mix of two or more of these sources of finance.

Grants

A grant is an amount of money provided by a third party to a project, person or organisation that contributes to the objectives of the third party. In general, grants are provided to projects that are commercially marginal, and they do not need to be repaid (provided the stated purpose of the grant funding is achieved). However, in some cases grants may be convertible to loans or equity if the project achieves commercial success (if so, this will be stated in the terms and conditions of the grant).

Grants are typically provided by government organisations and only cover a percentage of project costs, other forms of finance are also therefore required.

Loans (debt)

A loan or debt is an amount of money provided by a third party to a project, person or organisation that must be repaid either during or at the end of its agreed term, plus interest over the period of the borrowing. The majority of loans to projects are provided by banks.

There are many different types of loans, including:

- **Senior loans or debt:** The 'senior' debt is the debt which must be serviced before any other debt or equity in the project. This is generally a precondition of loans by large local or international banks. The debt is usually secured over the assets of the project, which can include the contracts for sale of outputs from the project. However, it may also be secured over the assets of a project sponsor. Because the debt ranks highest in priority for repayment and is secured over assets, it has the lowest risk of the commercial financing instruments, and hence usually represents the cheapest source of capital. The interest rate will typically be based on the interest rates prevailing in the market for the currency in question, plus a margin depending on the perceived risk of the project. Other variables in a loan include fixed or floating interest rates, the term of the loan, 'stepped' interest rates over the term, the repayment schedule, interest and/or repayment 'holidays', and agreed 'trigger points' at which the bank can make certain demands on the borrower to safeguard its investment, culminating in bankruptcy proceedings if necessary.
- **Junior (or subordinate) loans or debt:** The 'junior' or 'subordinate' debt has priority for repayment after senior debt (but still before equity). It is either unsecured, or has a lower priority claim over the assets of the project than senior debt. This type of loan is often used to bridge the gap between what senior debt lenders are willing to provide and the equity that is available for a project. As the risk of non-payment is higher than for senior debt, junior debt requires a higher rate of return (interest rate). Alternatively, lenders of junior debt may expect to share some of the potential 'upside' of a project by holding options to convert the debt to equity if the project exceeds expectations (see explanation of mezzanine finance below).
- **Low interest loans or debt:** Loans at preferential (below market) rates may sometimes be obtained from multilateral banks for projects which meet particular economic, social or environmental objectives.

- **Up-front payments:** For some projects, a buyer of some of the outputs from the project may be willing to pay up-front for future delivery of those outputs. Such up-front payments can be used to finance the project's up-front costs. The advantage of this form of finance is that it does not need to be repaid in cash, only 'in kind'. The disadvantage is that the buyer will typically expect a substantial discount on the future price of the output, in order to reflect both the cost of capital (i.e. the cost of providing cash now rather than at some point in future) and the risk of non-delivery.
- **Lease finance:** Lease finance is similar to senior debt, except that instead of lending cash, the lessor 'lends' (or rather, leases) an asset (e.g. land, buildings or equipment) in return for an agreed cash flow or 'rent'. The lessor continues to own the asset and can reclaim it in the event of non-payment by the lessee. Depending on the terms of the lease, the lessee may or may not have the option to convert the lease to full ownership on payment of a final amount at the end of the lease. Lease financing is often provided by equipment manufacturers in order to facilitate the purchase of an asset by the project.

Equity

Equity is capital raised from shareholders. Shareholders have only a residual claim to the assets of the project company – in other words, they are last in line after other stakeholders such as senior and junior lenders have been repaid. This represents the highest level of risk, and the expected returns for equity holders are accordingly higher than for lenders. From the project developer's point of view, equity has the advantage of not having to be paid back, thereby freeing up cash flow, which is often particularly important during the early years of a project.

Equity providers receive returns through dividends (distributions of cash from after-tax profits), or from the sale of shares. Typically, equity providers will only cover part of a project's total cost, as the rate of return on equity can be increased ('geared' up or 'leveraged') by increasing the amount of debt in the project finance structure (see Box 1 below).

Box 1: Explanation of 'Gearing' or 'Leverage'

The term 'gearing' or 'leverage' is used to describe the way in which the returns to an equity investor can be increased by increasing the amount of debt in a project's capital structure.

This effect arises due to the fact that debt is almost always cheaper than equity. Consider a project with a capital requirement of US$1,000,000 and a project internal rate of return of 15%. If 100% of this capital requirement were provided by equity investors, the equity investors would therefore see a 15% return on their investment. However, if 50% of a project's capital requirement could be borrowed from a bank at an interest rate of 8%, the project would provide a return of 22% to the equity investors (their original return of 15% on US$500,000, plus the 7% return remaining on the other US$500,000, after debt financing costs). From the equity investors' point of view, increasing the amount of debt in the capital structure will always increase the return on their equity investment, provided the debt interest rate is lower than the project IRR (see section 4.3 for explanation of this term).

The above argument ignores any effect of taxation. In fact, in most countries, interest payments on debt are a tax-deductible expense. This further enhances the attractiveness of debt in the capital structure, since the cost of debt is even lower due to the 'tax shield' effect (i.e. the fact that interest payments can offset a tax liability).

Equity can come from many different sources, and different providers will have different expectations as to the degree of control they wish to exercise and the risk and return on their investment. Some of the principal sources of equity for projects include:

- **Project sponsors:** (see section 3.4 above)
- **Venture Capital Funds:** These could help finance a project or series of projects by making an equity investment in a CDM project development company. Venture capital is so named because it is typically invested or 'ventured' in the start-up stage of a company's development, before products and markets are proven, and the capital provided is therefore at high risk. In return, venture capital funds require a high rate of return, which they obtain by taking equity in a number of companies, some of which they hope will be highly successful. Typical venture capital investments are usually in the range of US$1–10 million. It would be unusual for a venture capital fund to invest in a single project (as opposed to a company), although some of the higher return CDM projects (e.g. N_2O or HFC destruction projects) could potentially attract sufficient interest on a single project basis.
- **Private equity funds:** Project developers seeking funding for a CDM project could be supported by a private equity company, which could purchase a proportion of the (non-listed) equity of the company or the SPV.
- **Share issue via a stock market:** Project developers could consider issuing stock on the stock market or consider issuing additional stock to the already listed stock of the company. In general this option is not pursued for individual projects, but may be an option for new companies with a portfolio of similar projects to develop.

Mezzanine Finance

Mezzanine finance bridges the gap between equity and bank debt. As a hybrid product, mezzanine shares characteristics with both bank debt and equity. As such, it can be seen as 'middle-risk – middle-return' financing.

A mezzanine investment can be structured in various forms. Although typically a subordinated loan (see 'junior debt' above), it may also comprise preference shares or convertible bonds. Mezzanine pricing typically comprises two distinct elements. The first is a current yield that the mezzanine investor contractually receives and so is similar to interest on bank debt. The interest margin is typically higher than bank debt, however (the margin may be 3-4%, or higher), and the overall rate can be either fixed or floating. It will usually be paid in cash on specified payment dates, or may be rolled up and paid at some future point. The second component can be a warrant or option on the ordinary shares, or some other mechanism that provides an interest in the equity of the business. Unlike the yield component, the second mechanism does not contractually bind the business into paying any pre-determined amount to the mezzanine investor, and its value (or cost) is only meaningful if the business thrives.

3.7. Typical Financing Models

The most common structures used to finance projects are:

- Project financing (in the specific sense of the term) – also known as limited recourse financing;
- Corporate financing; and
- Lease financing.

We will also discuss less common structures such as:

- Bridge financing;
- Micro-credit;
- Leveraged finance; and
- ESCO/RESCO.

Project Finance

The term 'project finance' (or 'project financing') refers to financing structures wherein the lender has recourse only or primarily to the assets of the project and looks primarily to the cash flows of the project as the source of funds for repayment. The terms 'limited recourse finance' and 'non-recourse finance' are often used interchangeably with 'project finance', although strictly speaking these terms describe different extents of recourse back to the project sponsors.[8] The US Financial Standard FAS 47 defines Project Finance as follows:

> *'The financing of major capital projects in which the lender looks principally to the cash flows and earnings of the project as the source of funds for repayment and to the assets of the project as collateral for the loan. The general credit of the project entity is usually not a significant factor, either the entity is a corporation without other assets or because the financing is without direct recourse to the owner(s) of the entity.'*

The technique of project financing was pioneered in the construction of the Panama Canal, as well as the early development of railroads and oilfields in the US and UK – large-scale, capital-intensive projects with long payback periods. In recent decades it has become the financing model of choice for most large infrastructure, energy and other industrial and public service projects.

Under project financing, an SPV is usually established to undertake the project and to clearly define the legal limits of the project entity. The SPV enters into contracts with suppliers and buyers, and with companies to provide construction, operation and other specialised services. A simplified diagram of the relationship between the various parties in project financing is shown in Figure 10 above.

The principal advantages of the project finance structure are:

- **Ability to raise large amounts of capital:** The structure enables large amounts of debt to be raised for capital-intensive projects.
- **Limited recourse** to assets of project sponsors: since the lenders only have recourse to the assets and cash flows of the project, rather than the general resources of the sponsors.

The disadvantages of the project finance structure include:

- **Set-up costs:** The costs of setting up the project finance structure can be significant, and can generally only be justified for larger scale projects (e.g. US$20 million plus).
- **Project-specific risk assessment and management:** Both lenders and equity providers must pay particularly close attention to the project-specific risks, and how those risks will be managed. This is in contrast with conventional lending, where the lender would primarily be concerned with the overall credit-worthiness of the borrower.

8 In practice, strict non-recourse financing is rare, and there is usually some limited recourse back to the project sponsor, for example through the provision of guarantees or other undertakings to cover specific risks (Denton Wilde Sapte, 2004).

As a general principle, project sponsors and other equity providers will wish to minimise the amount of equity in the project, as this will increase the rate of return on their investment. The lender, on the other hand, will want to ensure that the equity providers have a sufficiently large financial interest in the project to ensure that they will not abandon it – the larger the equity commitment, the lower the lender's risk will be. Through the process of financial assessment (described in greater detail in section 4 below), the lender carefully evaluates the project economics, risks and risk management options for the project, before deciding on whether to finance the project, and if so, to what extent and at what cost (interest rate).

A successful outcome is more likely to be achieved if project sponsors work closely with the lender through the financial assessment process to ensure that both parties share a common understanding of the project risks and agree on mutually acceptable risk management solutions. There may be trade-offs between the amount and cost of debt and the cost of risk management options for the project sponsor. For example, a lender will prefer the project to have a purchase agreement in place that guarantees a certain minimum price for the output of the project. However, obtaining such a purchase agreement may cost the project sponsor much of the potential 'upside' in the price of the output. Therefore the project sponsor may wish to negotiate to maintain a floating purchase price in return for increasing the amount of equity in the project (i.e. reducing the debt required from the lender).

A typical project finance structure in an industrialised country would consist of 10–30% equity, 60–90% senior debt, and 0–15% junior debt (Swiss Re, 1999). In developing and emerging markets, a project finance structure will usually consist of more equity and less debt. Whether or not any junior debt is required to bridge the gap between equity and senior debt essentially depends upon the level of risk associated with the project – riskier projects will find it more difficult to raise senior debt, and hence are more likely to experience a funding gap.

Box 2: Example

Project Financing of an Independent Power Producer

Project finance is often used for Independent Power Producer (IPP) projects. For example, a project to develop a 500 MW gas-fired power station (combined cycle gas turbine) might require an initial outlay of around US$2 million for the project design, feasibility studies and approvals (i.e. the planning phase), followed by construction costs of around US$300 million.

The project sponsors would establish an SPV to carry out the project. The initial US$2 million for the planning phase would be provided by the project sponsors as an equity investment. The SPV would enter into a long-term (e.g. 15-year) Power Purchase Agreement (PPA) with an electricity off-taker, for example a national electricity utility or a large electricity consumer. The SPV would also seek to enter into some form of long-term gas supply arrangement, or at very least to hedge its exposure to increases in gas prices (for example by linking the price paid for electricity under the PPA to a gas price index). The SPV would also enter into contracts with a construction company to construct the plant, an insurer to provide various forms of insurance and a company to provide operation and maintenance of the plant.

This 'package' of contracts could then be taken to a bank, which, after conducting all of its due diligence, might offer the SPV a loan of (say) 70% of the capital (US$210 million) at an interest rate of 8% and a loan term of 15 years. Interest and loan repayments (assuming fixed, 'mortgage style' combined interest and loan repayments) would then be around US$24.5 million/year.

The output from the project could be expected to be around 2.85 TWh/year (assuming an average load factor of 65%). At a sale price of (say) US$60/MWh, this would generate annual revenue of around US$171 million. Fuel costs would use up around 60% of this, leaving US$68.3 million/year. Annual operating costs of around US$30 million/year would result in an EBITDA of around US$38.3 million/year, or 1.56 times debt service. The annual profit over the first 15 years would be around US$14 million, thus providing a 12% return (over 15 years) on the US$92 million in equity (US$90 million for construction plus $2 million for the planning phase) provided by the project sponsors. However, assuming that the plant continues to operate under similar conditions for a further 10 years beyond the end of the 15-year loan term, this would increase the equity IRR to 17% (see Section 4.3 for further discussion of EBITDA, IRR and debt service cover ratio).

Corporate Financing

Corporate financing, also known as on-balance sheet financing, is the use of internal company capital to finance a project directly, or the use of internal company assets as collateral to obtain a loan from a bank or other lender.

The advantages of corporate financing over project financing include:

- **Faster access to capital:** A company's internal capital allocation procedures should, in theory, be quicker at coming to a decision as to whether or not to invest in a project than an external lender, and even if external debt is required, a decision based on the credit-worthiness and assets of the company will be achieved more rapidly than a decision that depends on the due diligence of the cash flows and assets of a project.
- **Confidentiality:** Keeping the financing of a project internal, or at arms-length by corporate borrowing rather than project financing, may help if the project sponsor is concerned about potential leaks of information about the project to competitors (or any other parties).

- **Availability:** Quite simply, corporate financing may be one of the only financing options available for projects which are too small, too risky, or which involve counterparties which are not creditworthy for project financing to be possible.

The disadvantages of corporate financing include:

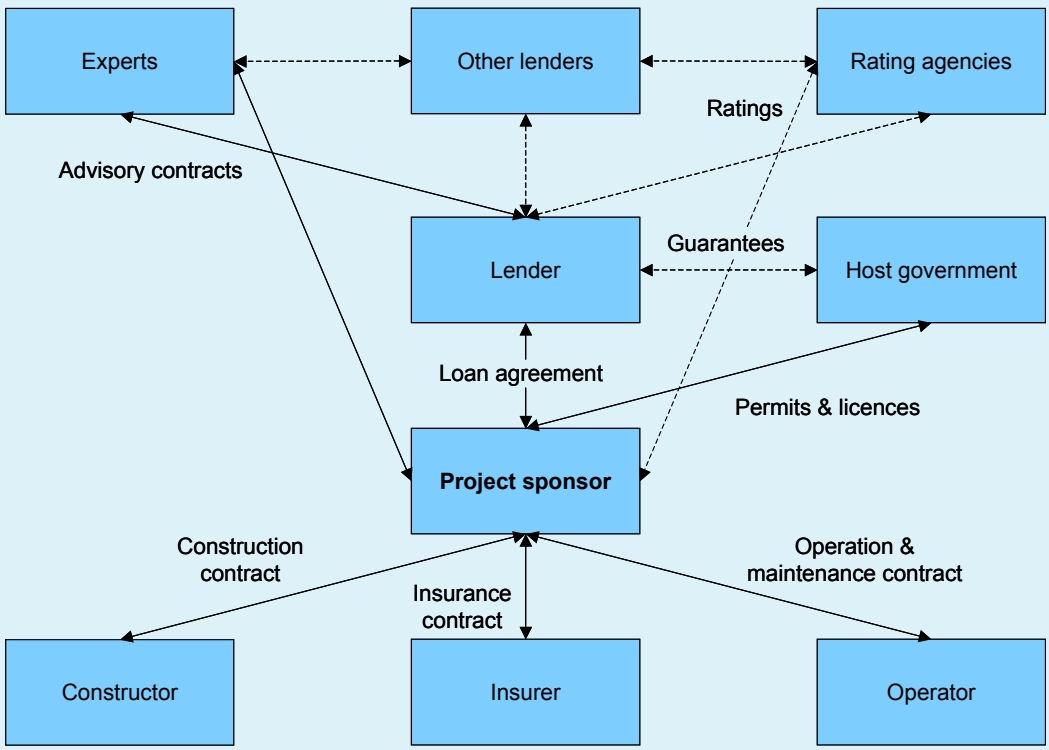
- **Liability:** The company is liable for any failure of the project and both internal capital and assets may be at risk if the project fails to perform to expectations.
- **Funding limits:** The amount of capital available will be limited either by internal budget constraints or by the company's ability to borrow (e.g. 60–90% of the company's assets).
- **Limited ability to transfer risks:** There may be less scope to transfer risks to other parties.

Box 3: Example

Corporate Financing of an Industrial Energy Efficiency Project

Company X owns and operates a large industrial plant such as an oil refinery or chemicals plant. An opportunity might exist to improve the energy efficiency of one of the processes by installing a new piece of equipment, costing say US$10 million. Implementing the project will save the company money (reducing energy costs, say by US$1 million/year). If the investment is well planned and the company sufficiently large, the company might be able to finance such a project entirely from its own reserves. Alternatively, the company could borrow part of the capital from a bank (or syndicate of banks), with its broader assets as collateral for the loan – provided the company is sufficiently credit-worthy.

In such a scenario, several roles which would be distinct under a project financing model are collapsed into one. Company X, the project sponsor, is also the project entity, the 'supplier' of the industrial process the project is based upon, and the 'buyer' of the energy savings 'produced' by the project. It could also be the constructor and operator of the new equipment.



Lease financing

Leasing essentially involves the supplier of an asset financing the use and possibly also the eventual purchase of the asset, on behalf of the project sponsor. Assets which are typically leased include land, buildings, and specialised equipment. Ownership of the asset remains with the lessor unless purchased by mutual agreement at the end of the lease. A lease may be combined with a contract for operation and maintenance of the asset. It may also be a sub-set of a broader financing model (e.g. project finance or corporate finance).

The advantages of leasing include:

- **Less stringent requirements:** The requirements for entering into a lease are relatively less onerous than those for obtaining bank debt.
- **Limited liability:** The total liability to the project entity is generally significantly less than the total cost of the asset (depending on the terms of the lease – for example, the penalty for breaking a lease before full term could vary from the full cost of the remainder of the lease to a fraction based on a minimum notice period).

The disadvantages of leasing include:

- **Need for minimum level of credit-worthiness:** Lease finance is only possible when the project entity can establish a minimum level of credit-worthiness to satisfy the lessor. A 'bond' or up-front deposit may be required, and the lease payments will include (whether implicitly or explicitly) a 'risk premium' determined by the lessor to compensate for both their cost of capital and the risks involved in having their assets in the hands of a third party.

Box 4: Example

Lease finance for automobiles

Automobile manufacturers and retail outlets often offer customers a range of financing options, from personal loans (usually provided by a third party financing company) to 'hire purchase' or leasing schemes. Under a hire purchase scheme, the customer pays a monthly rental fee, with ownership transferring to the customer at the end of the contract, usually on payment of a final lump sum.

Bridge Financing

Bridge financing is a form of loan which, as the name suggests, is used to bridge the gap between times when other forms of finance are available. For example, bridge financing may be used during the construction period of a project, to provide short-term cash (albeit at a relatively high interest rate), which is then replaced with lower-cost sources of financing (e.g. long-term senior debt) once the project is up and running. Bridge financing is more likely to be available from local financial institutions in developing countries, which may have short-term liquidity but not sufficient long-term liquidity to offer a long-term loan.

The principal advantage of bridge financing is:

- **Availability of cash at short notice:** This model is suitable for borrowers who have a need for short-term cash and can be sure that within a limited time, the capital required to repay the loan will become available.

The disadvantages of bridge financing include:

- **Higher interest rate:** Due to the short-lived nature of a bridge finance loan (usually less than one year), the interest rate the bank charges on the loan is usually higher. The principal is usually paid back in a lump sum at the end of the bridge financing period, once the funds to cover the loan are available.
- **Secured over assets:** A bridging loan is generally secured over the project sponsor's assets, which would then be at risk if the loan could not be repaid.

Micro-credit

Micro-credit is similar to traditional bank debt, but aimed at providing very small amounts of credit to lenders with limited ability to pay, particularly in rural areas of developing countries. Some micro-credit models rely on peer group lending – borrowers form a group that then applies for the loan, and the entire group is responsible for payment of the loan. Many focus on women as the primary lenders, having found that women are generally a good credit risk and that loans to women tend to benefit the whole family. One of the most successful examples of a micro-credit institution, Grameen Bank in Bangladesh, has, since the mid-1970s, issued over US$5 billion in loans to several million small borrowers, and is famous for its 94% collection rate on loans, 96% of which have been issued to women. The Grameen Bank has branched out into financing other projects that benefit the poor, such as irrigation, telecommunications and energy projects.

Leveraged Finance

Although the term 'leveraged finance' can mean different things, it generally includes two main products – leveraged loans and high-yield bonds. Leveraged loans, which are often defined as credits priced 125 basis points (i.e. 1.25%) or more over a benchmark rate such as the London Inter-Bank Offer Rate (LIBOR), are essentially loans with a higher rate of interest to reflect a higher risk posed by the borrower. High-yield or 'junk' bonds are those that are rated below 'investment grade', i.e. less than triple-B.

Leveraged finance essentially means funding a company or business unit with more debt than would be considered normal for that company or industry. More-than-normal debt implies that the funding is riskier, and therefore more costly, than normal borrowing. As a result, levered finance is commonly employed to achieve a specific, often temporary, objective: to make an acquisition, to effect a buy-out, to repurchase shares or fund a one-time dividend, or to invest in a self-sustaining cash-generating asset. A key instrument in much leveraged finance, particularly in leveraged buy-outs, is mezzanine debt.

ESCO/RESCO

An ESCO is an Energy Service Company, whereas a RESCO is a Renewable Energy (or Rural Electrification) Service Company. Both are based on a similar concept, being a model of service provision to a customer.

ESCOs are typically used to deliver demand-side energy efficiency projects, where the result of an investment is energy savings for a customer. Since the customer may not have the will (or the financial capacity) to make the energy-saving investment, an ESCO can offer to undertake the project, receiving revenue from the customer in proportion to energy savings, as set out under an Energy Performance Contract. The performance contract may establish a baseline level of energy consumption and identify savings as deviations below this level, or it may establish other parameters, such as a guaranteed minimum indoor air temperature level, which it then has an incentive to meet at least cost.

RESCOs are typically used to provide rural electrification services in developing countries, using renewable energy. The RESCO makes the investment and continues to own and operate the equipment such as a wind/solar photovoltaic hybrid system for a small village (although operation and maintenance is often contracted to local villagers). The users usually pay a fixed fee to the RESCO (because the cost of individual metering would be prohibitive), which covers the cost of the equipment and ongoing operation.

The ESCO/RESCO itself is usually a subsidiary of a large energy company. In order to obtain finance from either lenders or equity investors on the basis of the revenues from customers under Energy Performance Contracts or rural electrification fees, the sponsors of the ESCO must be highly creditworthy and have a track record in delivering similar projects. The financing of the ESCO company therefore usually comes under the description of corporate financing provided above.

4. Financial Assessment of a Project

4.1. Introduction

This section provides a general introduction to a typical financial assessment process conducted by financial intermediaries, broadly applicable to any project. In section 6 below, we will consider the specific issues that must be considered in the financial assessment of a CDM project, in particular the risk assessment and management options applicable to CDM project risks.

4.2. The Financial Assessment Process

The financial assessment process is a standard methodology for evaluating a project's financial viability, from an investor's perspective. The financial assessment of a project forms part of an investor's 'due diligence', or the overall process of investigation into the details of a proposed investment. Other aspects of the due diligence process would include an assessment of the ability of the management team to carry out the project, investigation of the technology involved, and ongoing monitoring of the implementation of the project post-financing. Here, however, we focus on the financial assessment process, pre-financing.

The key steps in the financial assessment process are:

- Development of a project model;
- Analysis of financial indicators;
- Sensitivity analysis; and
- Risk assessment and mitigation.

Development of a Project Financial Model

A financial model is the most critical element of the financial assessment process. Most financial models are structured in a similar way and have the following features (whether created as a project-specific spreadsheet model or using an off-the-shelf project finance package):

1. Assumptions – all of the input variables to the model are usually kept together in one worksheet. Assumptions may be based on expert knowledge, forecasts, technical performance specifications, contract prices or other sources. The source of each assumption needs to be clearly identified so that investors can assess whether the assumption is reasonable.
2. Calculations – the input variables are combined in a number of calculations, including tax, depreciation/amortisation, loan balance and interest payments, and revenue and operating costs.
3. Outputs – in general, the outputs of a financial model will include:
    - Cash flow statement;
    - Profit and loss;
    - Balance sheet; and
    - Key financial indicators such as debt and interest ratios, NPV and IRR.

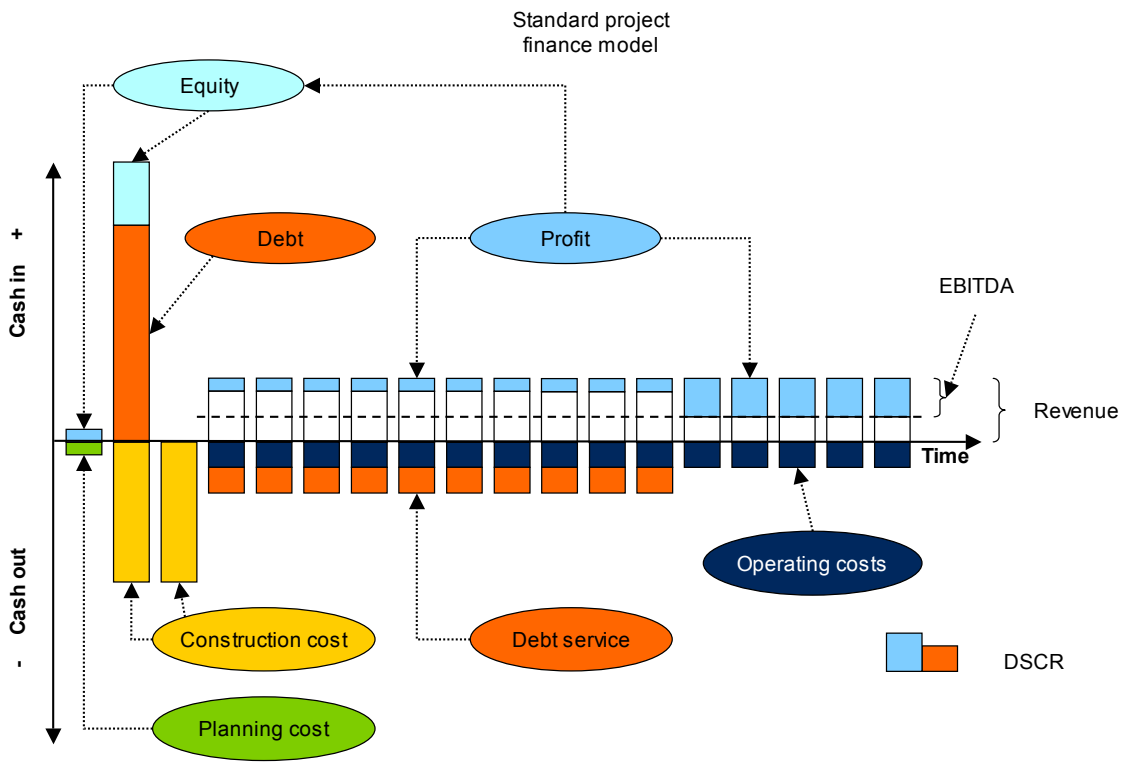
The most important outputs for a lender are the cash flow statement and Debt Service Cover Ratio (DSCR) over the term of the loan. The outputs are usually summarised on a year-by-year basis, but finer detail (e.g. month-by-month figures) may be required for certain projects (particularly where production, demand or prices exhibit seasonal variation).

Project financial models are discussed in greater detail in UNFCCC (2006) *Preparing and Presenting Proposals - A Guidebook on Preparing Technology Transfer Projects for Financing*, available at: http://unfccc.int. Examples and preparation guidelines for business plans in general are available from the US Small Business Administration (SBA), available at: http://www.sba.gov/.

4.3. Key Financial Indicators

While detailed financial model outputs such as a month-by-month cash flow statement provide the necessary information required to assess a project's viability, a number of different indicators may be used to summarise the situation. The relative importance of different indicators differs between providers of debt and equity, although the underlying principles are the same.

Figure 11: Typical project cash flows and key indicators



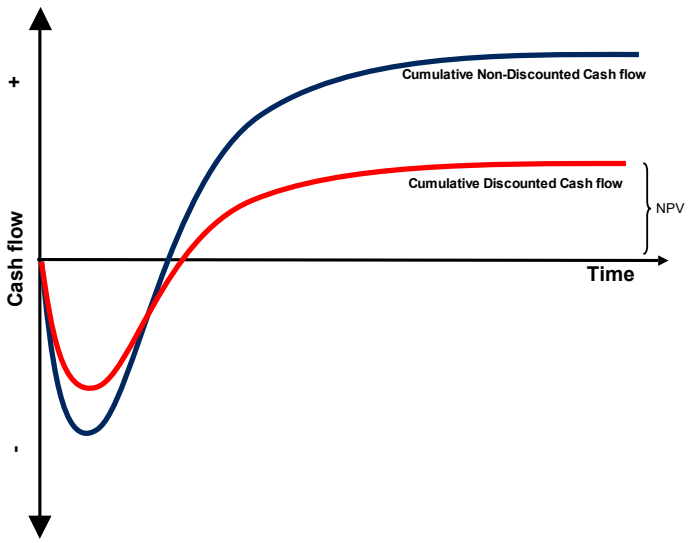
The most important of these indicators are:

1. **Project Net Present Value (NPV) and Internal Rate of Return (IRR):** The NPV of a project is defined as the sum of the future discounted cash flows of the project (before making any assumptions about how the project will be financed). Future cash flows are discounted by an appropriate discount rate reflecting the cost of capital, in order to convert to an equivalent Present Value; these Present Values are then summed to calculate the Net Present Value. Therefore calculating the NPV requires an assumption to be made about the appropriate discount rate (this may be the Weighted Average Cost of Capital for a firm, or a more project-specific discount rate). A positive NPV indicates that (at the assumed cost of capital) the project is a good investment (i.e. will yield a positive return).

The Internal Rate of Return of a project is a related concept, defined as the discount rate for which a project's NPV is equal to zero. Therefore the project IRR can be calculated and compared with either the Weighted Average Cost of Capital for a firm, or the IRR of similar projects. In any case, the project IRR should be higher than the prevailing long-term interest rate in the currency in which the project is being financed (otherwise it would be more worthwhile to put the finance on deposit at that interest rate, which would presumably have lower risk than investing it in the project).

Figure 12 below illustrates the difference between the project's cumulative undiscounted and discounted cash flows. The Net Present Value is equivalent to the cumulative discounted cash flows at the end of the project time horizon.

Figure 12: Cumulative cash flows and NPV



2. **Equity IRR:** The IRR can also be calculated specifically as the rate of return to the equity providers, after deducting loan interest and repayments (this requires assumptions to be made about the financing structure). Equity providers can only receive returns from post-tax profits (or sale of their shares), and the issue of dividends is typically limited by covenants with the lender, to ensure that debt repayment milestones are achieved first. This needs to be taken into account when calculating the equity IRR (since later returns have a lower Present Value).
3. **Earnings Before Interest, Tax, Depreciation and Amortisation (EBITDA):** This is a measure of the cash generating potential of the project. EBITDA is essentially the revenue of the project minus its operating costs. In Figure 11 above, EBITDA is the amount above the dotted line.
4. **Interest Cover Ratio:** This is calculated as EBITDA divided by interest payments and represents the ability of a project to meet its minimum financing costs (not including loan repayments). A minimum interest cover ratio is often applied by a lender, both when assessing a project, and as an ongoing requirement during the loan (after completion of construction and commencement of earning). A normal interest cover ratio requirement would be around 4 or 5 (higher for riskier projects).
5. **Debt Service Cover Ratio (DSCR):** This is calculated as the ratio of EBITDA to all debt servicing requirements (i.e. interest plus loan repayments), shown as the ratio of the blue (EBITDA) to orange (debt service) squares in Figure 11 above. There is usually some flexibility in how the loan

repayments are scheduled, such that the project will meet a minimum DSCR throughout the term of the loan (and in particular, during the first few years), if it achieves a conservative performance forecast. Such flexibility may include interest and/or loan repayment holidays and stepped interest rates and/or loan repayments over the term of the loan. A lender's minimum DSCR requirement is always greater than 1. If the DSCR is less than 1 this means that the borrower cannot service the debt. A lender to a relatively risky project might require a DSCR greater than 2, and the cost of debt would be correspondingly higher.

4.4. Sensitivity Analysis

If a project appears to be financially viable, based on analysis of the relevant financial indicators using conservative or at least 'central case' assumptions, then a more detailed sensitivity analysis will be undertaken.

The objective of the sensitivity analysis is to establish which of the input assumptions to the financial model has the greatest impact on the financial outcome. It is important to understand both which variable *can* have the greatest impact, and which is *most likely* to have the greatest impact, either singly or in combination with other variables.

Specialised software can help with running scenarios to examine the impact of specified changes in assumptions on selected financial indicators. However, while a purely mechanical manipulation of the input variables can identify which has the greatest potential impact (e.g. by comparing the impacts of a ±10% change in each variable), assessing the *likely* range of each assumption (and combinations of assumptions) requires a deeper understanding of the project and market for its outputs. This is one reason why banks prefer to lend only to projects they have experience with. However, for slightly more unusual projects, it may be possible for the bank to rely on independent experts to assist with the financial assessment.

The sensitivity analysis is related to the next stage, risk assessment and management, since many of the key sensitivities can be contractually hedged to reduce the risk to the lender. For example, key supply and purchase contracts may be fixed by volume and price.

4.5. Risk Assessment and Management

Lenders and investors will be particularly concerned to assess all of the risks associated with a project and to agree, with the project sponsors, on appropriate means to manage or mitigate those risks.

Types of Risk

Conventional project risks can be divided into three phases: planning, construction and operation risks. Typically a lender will only commence in-depth financial assessment of a project once the planning phase is completed and the project has the necessary permits and licences to operate. However, they may enter into discussions with a project developer and conduct a preliminary assessment at an earlier stage.

Table 3: Risks during different phases

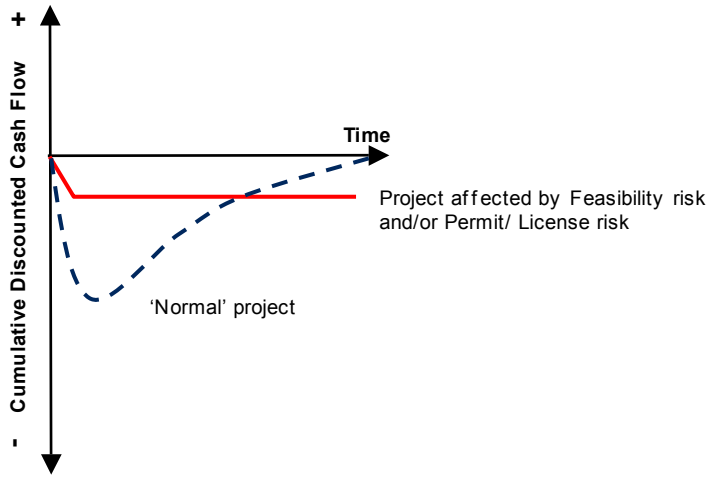
Planning Phase	Construction Phase	Operation Phase
Feasibility risk	Time over-run risk	Technology risk
Permit/ Licence risk	Capital cost over-run risk	Market risk
		Supply risk
		Operating risk
		Political, legal and regulatory risks
		Financial risk
		Counterparty risk

Planning Phase Risks

- **Feasibility risk:** The risk that feasibility studies will find that a project is not feasible. Such a finding should not be viewed as a negative outcome, since it is better to discover a project is not feasible during the planning stage than at any later stage, when much more money has been spent. To some extent the risk may be mitigated by conducting feasibility studies in stages, for example with an initial screening phase to determine whether the project appears to be feasible according to the most important criteria for its success/failure.
- **Permit/licence risk:** The risk that permits or licences essential for the construction or operation of the project will not be granted by the relevant authorities. This risk is often specifically addressed in feasibility studies, for example by commissioning experts with experience of similar projects to provide an independent assessment of the risk. A proper understanding of the relevant regulatory regime is essential and early engagement with the relevant authorities is often desirable.

  Figure 13 below shows the impact of planning risk (i.e. the possibility of finding that the project is not feasible, or cannot obtain a necessary permit or licence) on a project's cumulative discounted cash flow, or NPV. Instead of following the usual pattern of up-front capital expenditure followed by gradual recovery to a neutral cumulative cash position (i.e. where the NPV of the project is equal to zero, represented by the blue line), a project which does not proceed beyond the planning phase does not have a chance to recoup its planning costs and thus always has a negative NPV (the red line).

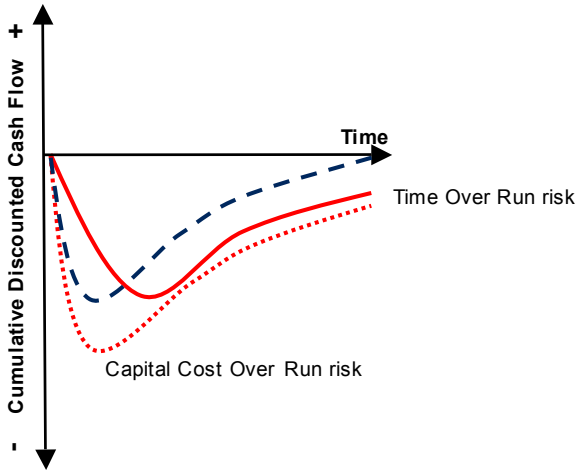
Figure 13: Impact of planning risk on a project



Construction Phase Risks

- **Time over-run risk:** The risk that the project is not commissioned on schedule. Where there is a strong contractor responsible for the construction this risk can be managed through the contracts with the construction company and equipment providers, in the form of incentives (e.g. bonuses for timely completion) and/or penalties (e.g. performance bonds or completion guarantees allowing for monetary damages to be imposed for delays in delivery or completion).
- **Capital cost over-run risk:** The risk that the costs involved in implementing the project are higher than expected. This can be managed through entering into fixed-price contracts for the principal project components.

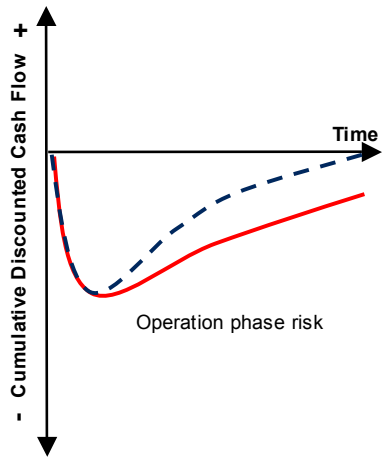
Figure 14: Impact of construction phase risks on a project



Operation Phase Risks

- **Technology risk:** The risk that the equipment installed does not perform to expected specifications. This can be managed through purchasing from a reputable supplier and requiring a performance guarantee, with monetary damages to be imposed for performance shortfall.
- **Market risk:** The risk of price fluctuations for the outputs of the project. Prices may be lower than expected due to lower demand or increased supply from competitors or substitutes. This can be managed through entering into a long-term purchase agreement. At one end of the spectrum is a 'take or pay' fixed-price contract, where the buyer must either take the output or pay for it even if it is not taken. This transfers all market risk to the buyer. At the other end of the spectrum is the spot transaction which leaves the seller fully exposed to the market risk. There are many different options in between these two extremes, and it is up to the buyer and seller to negotiate the most mutually acceptable option.
- **Supply risk:** The risk that supplies of key inputs to the project cannot be maintained, or increase in price. As with market risk, this can be managed through supply contracts fixing some or all of the volume and/or price of key inputs.
- **Operating risk:** The risk that the project as a whole will not perform to expectations, and in particular the risk that the cost of operation and maintenance will be higher than expected. This can be managed through contracts with the operator requiring a certain level of performance and allowing monetary damages to be imposed for poor performance; and also by entering into long-term contracts with an operator to cap the operation and maintenance costs. Operating risk may also be mitigated by purchasing insurance to cover the risk of occurrence of specified events that would affect project performance or costs.
- **Political, legal and regulatory risks:** The risks associated with the country in which the project is situated not being sufficiently stable to ensure the continued operation of the project according to expectations, including the risk of war, revolution, insurgency, terrorism, civil unrest, expropriation, nationalisation, inability to enforce contracts, or changes in the legal or regulatory regime. This risk can be managed at the planning stage by screening the countries in which a project could potentially be situated according to published ratings of political risk, purchasing insurance against specific events, and obtaining guarantees from the host government, export credit agencies and/or international institutions.
- **Financial risks:** The risk that interest rates, inflation, currency exchange rates or other financial variables may adversely affect the financial performance of the project. These risks can be managed through supply and purchase agreements (for example, ensuring that both are in the same currency), or through financial instruments such as interest rate or currency hedges.
- **Counterparty risk:** The risk that a counterparty to a contract will fail to honour that contract. This can occur in relation to any contract at any stage of the project, but is typically most critical in relation to construction contracts and major supply and purchase contracts. This risk can be managed by ensuring that counterparties have a good credit rating.

Figure 15: Impact of operation phase risks on a project



Assessing Risk

The sponsors of the project will typically undertake their own risk assessment early in the project planning process, as they will be exposed to the risks during the planning phase, whereas the lenders will undertake their risk assessment at a later stage, focussing on construction and operation phase risks. At either stage, risk assessment is generally undertaken through the steps described below.

Risk Identification

This step consists of identifying all of the risks associated with a project. Project sponsors may rely on their own knowledge of the project risks, or may commission studies from independent experts. Lenders usually commission expert risk analysts to undertake this (e.g. an insurance company involved in the project).

Risk Matrix

A matrix is drawn up to plot each risk against the phase of the project in which it occurs, its likely impact and the parties affected by the risk, and how it is expected to be mitigated. This can form the basis of negotiations between parties as to the apportionment of the various risks.

Quantitative Risk Assessment

Once the risks have been identified and delineated in terms of which party must bear the risk, a quantitative risk assessment may be carried out on the project as a whole. The output may be a quantitative estimate of the total value at risk, or a comparative risk index (enabling the risk of a project to be compared with the risk of other similar projects).

Absolute risk is a measure of the risk posed by a specific event without countermeasures being taken. It is defined as the product of two factors: the likelihood of an event occurring, and the significance of the impact (if it does occur). Past records and professional judgements may be used to provide quantitative data for both factors. 'Significance' may either be an index (e.g. a scale from 1–10) or a monetary amount (damages).

This assessment may then be modified to discount the absolute risk by a factor reflecting the availability of risk management options to reduce either the likelihood of an event occurring, or its impact.

Managing Risk

There are essentially three options for managing risks:

- **Change the project:** Once a risk has been identified and understood, particularly in the early planning stages, it may be possible to change the project to minimise the risk. For example, it may be possible to seek a purchaser to buy the output of the project in the same currency as the major supply contract for inputs to the project, to reduce exposure to currency risk.
- **Allocate the risk to the most appropriate party:** Generally speaking, the entities best able to manage a risk are those that best *understand* the risk and/or have some degree of *control* over it. In other words, it is usually the entity most closely associated with a risk which can bear that risk at lowest cost. For example, equipment suppliers have the best understanding of and control over the reliability of their equipment. They are, therefore, in the best position to manage technology risk by providing the project with an equipment performance guarantee. Nevertheless, it must be noted that, from an investor's or lender's point of view, allocating a risk to another party does not necessarily eliminate that risk, it simply transforms it into a counterparty risk. Guarantees will only provide effective risk management if the provider has a good credit rating and track record in the relevant activity.
- **Transfer the risk to a third party:** Financial instruments may be used to transfer risks to third parties, for example through hedging, third party guarantees or insurance. Hedging involves the use of derivatives markets, for example to fix future prices of commodities, currencies or interest rates. Third party guarantees may be provided by Export Credit Agencies or international institutions such as the World Bank's Multilateral Investment Guarantee Agency. Insurance involves the transfer of a risk to a third party who is able to bear that risk through diversification, that is, by combining a large number of unrelated (non-systematic) individual risks to reduce the impact on the overall portfolio.

Risk assessment can and should be updated during the course of a project, as the risk profile of a project will change over time. However, it is important to understand that, from a lender's perspective, the risk associated with a project does not drop off substantially until after the project has been commissioned. At that point, a bank may use evidence of technical completion (signified by a positive acceptance report from a qualified inspector) as a trigger for step-down of interest rates, and/or financial completion (signified by receipt of significant revenues), as a trigger for eliminating the requirement for guarantees or project support agreements from a parent company.

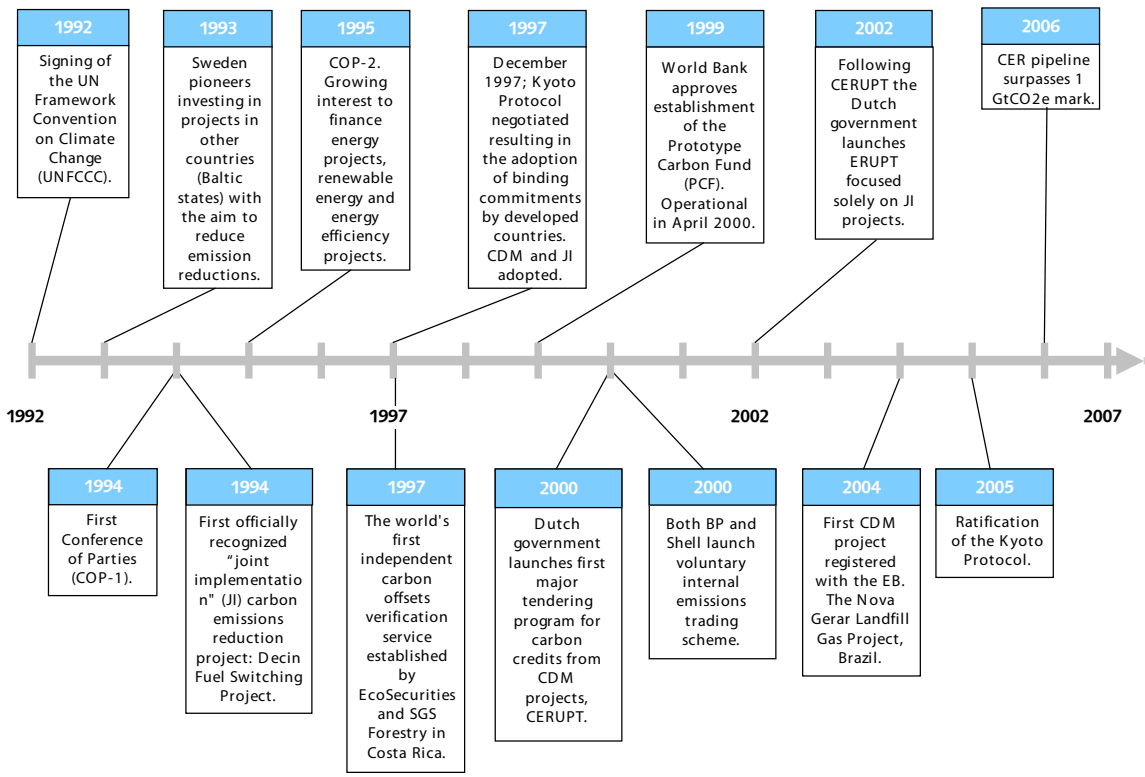
5. Financing a CDM Project

5.1. Introduction

This section deals with the development of the concept of financing emission reduction projects and provides details on the financing requirements and both current and possible future financing models for CDM projects.

5.2. Brief History of Financing Carbon Projects

Figure 16: Key milestones for carbon project finance



From Rio to Kyoto

The market for emission reductions is still very young. It can trace its beginnings to the signing of the UN Framework Convention on Climate Change (UNFCCC) in 1992, which, by adopting a voluntary target to stabilise emissions at 1990 levels by 2000, created the first global incentive for governments to invest in projects to reduce net emissions of anthropogenic GHGs to the atmosphere (see section 2 above). Article 4 (3) of the Convention called upon developed country Parties to provide 'such financial resources, including for the transfer of technology' to developing country Parties to help them to reduce emissions, and article 4 (2) provided for Parties to meet their obligations jointly with other Parties, so providing the first seeds of what would later become the Clean Development Mechanism and Joint Implementation.

Sweden is considered to have pioneered the practice of investing in projects in other countries (renewable energy and energy efficiency in the Baltic states from 1993 onwards) with the specific aim of reducing carbon emissions, although the early schemes were only later officially recognised under the Activities Implemented Jointly pilot phase (see below). The financial model for these investments consisted of investor companies paying for the full cost of the project in return for the promise of carbon credits generated as a result of the activities, should they eventually qualify under a future regulatory framework. The transaction costs of developing these projects were very high and this combined with uncertainty over the possibility of generating or transferring carbon credits resulted in relatively few projects going ahead. On average 3 projects worth a total of US$110 million were committed yearly during the two years from the signing of the UNFCCC in 1992 to the First Conference of Parties (COP-1) in 1994 (EcoSecurities, 2000).

The first officially recognised 'joint implementation' carbon emissions reduction project is generally acknowledged to have been the Decin fuel switching project, launched in 1994 as a bilateral effort between the Czech city of Decin and a coalition of US energy companies, to adapt a large coal power station to run on natural gas. The US companies provided the project with a US$600,000 non-interest bearing loan, in return for a contract to receive a percentage of the plant's emission reduction credits, for use under a possible future emissions trading scheme. The project was officially approved by both the US Initiative on Joint Implementation and the Czech JI programme.

At the First Conference of Parties to the UNFCCC, in 1994, the Activities Implemented Jointly (AIJ) Pilot Phase was established, during which projects were to be conducted with the aim of establishing protocols and experience, but without allowing crediting between developed and developing countries. As the lack of crediting did not create real incentives for investor participation, the annual level of investment in carbon projects dropped from US$57 million to US$14.8 million, although project proposals continued to be developed. A joint call for proposals by the Canadian energy company TransAlta and the World Business Council for Sustainable Development (WBCSD) resulted in many project proposals being submitted.

From 1994 onwards, the Netherlands also began to establish itself as a leading player in the emissions reduction market, financing a number of energy efficiency, fugitive gas capture and fuel switching projects throughout Eastern Europe. Like the earlier Swedish projects, these were undertaken on the assumption that an international system of emissions credit transfer would eventually arise.

In 1995, the US Initiative on Joint Implementation resumed financing energy projects, including the massive Rusagas fugitive gas capture project in Russia (estimated to reduce nearly 31 million tonnes of CO_2-e) and other renewable energy and energy efficiency projects in Central America. Also in 1995, momentum started to build for binding commitments to be placed on developed country Parties, with the recognition at COP-2, in Berlin, that voluntary targets were unlikely to be met.

The increased likelihood of future carbon taxes, quotas, trading schemes, etc. also resulted in wide variety of voluntary climate change related actions across many industry sectors. For example, BP invested US$1 billion in the solar industry and Shell created its Shell Renewables International division, while Toyota and Mercedes Benz invested heavily in low emission vehicles and the Federation Internationale de l'Automobile (FIA), the organisation responsible for Formula One competitions, decided to offset the GHG emissions of their events. The insurance and re-insurance industries also formed a group under the auspices of UNEP and launched the UNEP Statement of Environmental Commitment by the Insurance Industry, which developed into the Insurance Industry Initiative in 1997.

In 1997, Australia formed the Australian Greenhouse Office and began a programme of renewable energy, energy efficiency and fugitive gas capture projects in developing countries in the Asia-Pacific region. A global association of large electricity companies, the E-7, became one of the first industrial coalitions to sponsor multiple AIJ projects, bringing commercial investment to a field that had until then been dominated by government investors.

The world's first independent carbon offsets verification service was established by EcoSecurities and SGS Forestry in 1997 in Costa Rica, underpinning the Costa Rican national programme for the sale of the world's first carbon denominated securities (Certified Tradable Offsets, or CTOs), resulting from the sequestration of carbon in Costa Rica's forests. The first CTOs were purchased by the Norwegian government for US$10/tCO$_2$ and subsequent trades were handled through the Chicago Board of Trade.

In December 1997, the Kyoto Protocol was negotiated, resulting in the adoption of binding commitments by developed countries and the 'flexible mechanisms' of emissions trading, joint implementation (JI) and the Clean Development Mechanism, which effectively superseded AIJ.

After the Kyoto negotiations

The conclusion of the Kyoto Protocol negotiations in late 1997 led to a massive increase in carbon emission reduction project activity, in both the public and private sectors. The Dutch government launched the first major tendering programme for carbon credits from CDM projects, CERUPT, in 2000, followed by ERUPT, aimed at JI projects only, in 2002. In 1998, BP announced a target to reduce its emissions from internal activities to 10% below 1990 levels by 2010, together with a pilot emissions trading scheme across 12 of its business units. The scheme was rolled out across the entire company in 2000. Shell also introduced a voluntary internal emissions trading scheme in 2000. New South Wales State Forests concluded sales of carbon sequestered in plantation forests to Australian power companies in late June 1998. In 1999 the World Bank approved the establishment of the Prototype Carbon Fund (PCF), which became operational in April 2000 as a coalition of seventeen private sector companies and six governments, with a capitalisation of US$180 million.

In late 2004 the first CDM project was registered with the EB: the Nova Gerar Landfill Gas project in Brazil. The project was implemented as a joint venture between the private sector CDM project developer EcoSecurities and the management of the landfill operations, S.A. Paulista. Nova Gerar signed an agreement with the British landfill-gas-to-power company EnerG for leasing and operation of the gas collection devices and the power plants. The funding for the project was drawn principally from two major sources. First, EnerG facilitated the deployment of the energy generation equipment, which accounted for a significant part of the project investments, through a leasing arrangement. Second, a long-term ERPA was signed with the Netherlands Clean Development Mechanism Facility, managed by the World Bank. This ERPA served as a financial guarantee for the leasing contract between NovaGerar and EnerG.

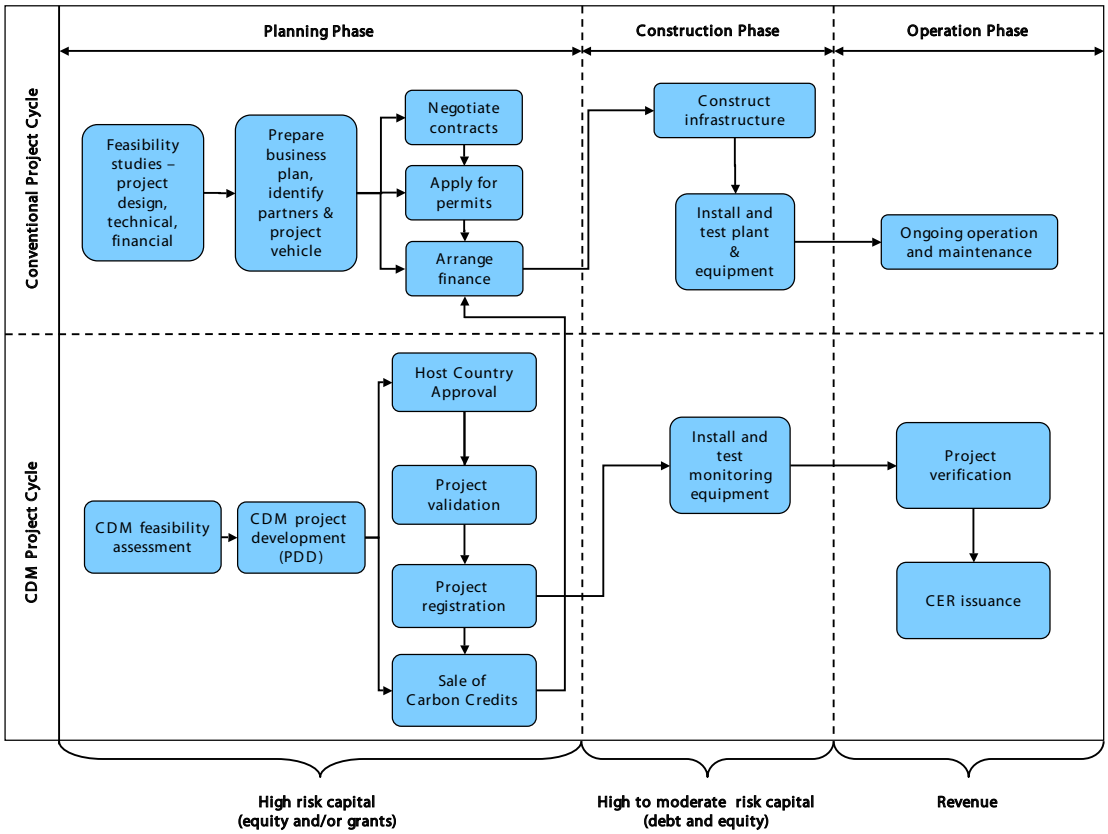
Since then an ever-increasing number of CDM projects has been developed and registered with the EB and, in 2006, the volume of emission reductions in the UNFCCC pipeline passed the 1 billion tonnes mark (of total projected emission reductions by 2012). With the exponential growth in the CDM market, the number of participants has also expanded rapidly, both in terms of the number of companies involved in developing CDM projects around the world, and in the number of financial stakeholders in the market.

In summary, the carbon market has evolved from the early days of direct investments in emission reduction projects by a small number of leading governments and private sector companies, to a semi-mature market in which projects can draw from a range of different financing options, due to the existence of CERs as a globally recognised, tradable commodity.

5.3. The CDM Project Cycle

A CDM project can be thought of as a conventional project with an additional CDM-specific component. The figure below compares the CDM project cycle with the conventional project cycle.

Figure 17: CDM project cycle compared with conventional project cycle



It is worth noting, however, that in reality it is possible that the various actions and events will not fall neatly into the three phases set out above. For example, it may be possible to commercialise the carbon credits even before a PDD has been fully developed, provided a buyer is willing to take on the risks associated with passing the various hurdles of host country approval, validation and registration. On the other hand, a project may be put through the CDM project cycle *after* it has already been constructed, provided that evidence can be provided that the incentive from the CDM was seriously considered in the decision to go ahead with the project.[9]

Figure 17 shows that the same broad types of finance are typically applicable to the three phases of a CDM project and a conventional project. The planning phase is very high risk and therefore only suitable for equity or grant funding. The risk associated with the construction phase is high to moderate, and remains so until technical and financial completion can be demonstrated, making this phase suitable for a combination of debt and equity. The costs associated with ongoing operation and maintenance are typically covered by the project's revenues, and the risk associated with this phase is much lower.

9 It should be noted that the crediting period for a project can only begin after registration, even if the project itself started before registration (exceptions apply only to projects registered before 31 December 2005).

5.4. Parties Involved in Financing a CDM Project

The parties involved in financing a CDM project are essentially the same as the parties involved in financing a conventional project (see section 3.4 above), with the following unique elements:

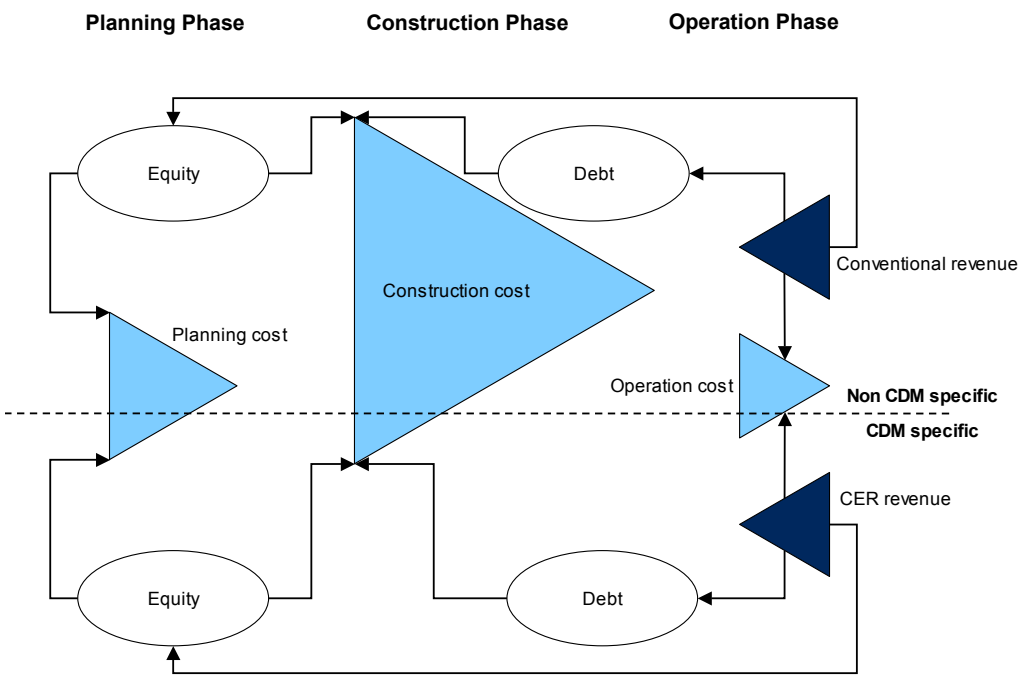
Entity	Role/responsibility
Project host	The project host is the entity providing the land, facilities or resources that are required to undertake the CDM project in the developing country location of the project. There may be more than one project host – for example, for a wind farm project, one party may own the land and another may install and own the wind turbines. Project hosts may be individuals, companies, or government institutions.
CDM project developer	The CDM project developer is the entity responsible for driving the project through the CDM project cycle. The project host may take on this role, or it may be provided by a specialised CDM project developer company.
CDM project participant	'Project participant' has a specific meaning under the CDM. A project participant is either a Party to the Kyoto Protocol (i.e. a government) involved in the project, or a private entity authorised by a Party involved to participate in the project. Decisions on the distribution of CERs from a project may only be taken by project participants. The project participants may agree between themselves (and declare in a document filed with the CDM Executive Board at the time of registration, known as the Modalities of Communication) for one or more of the project participants to be the Focal Point(s). In this case, only the Focal Point(s) decide on the distribution of CERs from the project.
Focal Point	The Focal Point for a CDM project is the project participant or participants named in the Modalities of Communication as the Focal Point for the project.
CER buyer	In theory, any entity may purchase CERs from a project. However, in order to be able to use the CERs for compliance under the Kyoto Protocol or any mandatory scheme linked to the Kyoto Protocol, the purchaser of the CERs must either be an Annex I Party or be authorised by an Annex I country Designated National Authority, in order to be able to transfer CERs from a CDM project into an account in the registry of the country of the purchaser.
Designated Operational Entity (DOE)	The DOE is required to validate the project prior to registration as a CDM project, and to verify the emission reductions of a project prior to issuance of CERs. Essentially, it plays the role of independent auditor.
Designated National Authority (DNA)	The DNA of the developing country in which the project is located is required to authorise the project (by issuing a Letter of Approval) prior to validation. DNAs of Annex I countries are required to approve any Annex I project participants.
CDM Executive Board (EB)	The CDM Executive Board is responsible for administering the procedures relating to the registration of projects and issuance of CERs.

5.5. Financing Requirements of a CDM Project

The financing requirements of a CDM project can vary tremendously, depending on the project type. For example, the capital costs of renewable energy projects can vary from around US$1,000/MW for generation of electricity from landfill gas to US$10,000/kW for solar home systems using photovoltaic cells. Likewise, the costs during the planning of a CDM project can vary significantly depending on specific feasibility studies that may be required (e.g. at least 12 months of wind resource monitoring for a wind turbine project), as well as country-specific, technology-specific and location-specific requirements for permits and licences, environmental impact assessment and stakeholder consultation. Finally, costs during operation can vary from very low levels for some renewable energy projects using free resources such as the sun and wind, to relatively high levels for projects dependent upon purchase of fuel or other inputs.

The diagram below illustrates a number of general points about the financing requirements of a CDM project over the three project phases, and how these requirements are typically met.

Figure 18: Financing requirements of a CDM project



The following general observations may be made (while recognising that the diversity of CDM projects means that there are exceptions to virtually any general rule):

- The CDM-specific project costs are usually smaller than the non-CDM specific project costs;
- The largest cost is incurred at construction (including purchase of plant and equipment, etc);
- Annual operation costs are usually low in relation to construction costs, although they may exceed construction costs over the lifetime of the project;
- Costs during the planning stage are usually financed by equity;

- Costs during construction may be financed in a variety of ways (explained further in section 5.7 below) – for example by various combinations of equity and debt, as shown here;
- CDM projects may have 'conventional' revenue streams (such as electricity sales, or sales of other outputs) in addition to CER revenues;
- Costs during operation are covered by the conventional revenue (if any) and CER revenue of the project;
- Remaining conventional and CER revenues are used first to repay debt (if any) and lastly to provide a return on equity.

CDM-specific Project Costs

In addition to the costs that would be incurred by a project regardless of whether or not it was registered as a CDM project, certain specific costs are associated with the various stages of the CDM project cycle, as set out in Table 4 below:

Table 4: Specific costs associated with CDM stages

Activity	Cost (large-scale, US$)	Cost (small-scale, US$)	Type of cost
Planning Phase			
Initial feasibility study, i.e. Project Idea Note (PIN)	5,000–30,000	2,000–7,500	Consultancy fee or internal
Project Design Document (PDD)	15,000–100,000	10,000–25,000	Consultancy fee or internal
New methodology (if required)	20,000–100,000 (incl. US$1,000 UN registration fee)	20,000–50,000	Consultancy fee or internal
Validation	8,000–30,000	6,500–10,000	DOE fee
Registration fee (advance on SOP-Admin – see below)	10,500–350,000[1]	0–24,500[2]	EB fee
Total CDM-specific costs – planning phase	**38,500–610,000**	**18,500–117,000**	
Construction Phase			
Construction, plant & equipment	Variable, depending on project type		Contractors fees
Installation of monitoring equipment	Usually minimal relative to total plant & equipment cost		Contractors fees
Total CDM-specific costs – construction phase	**Usually minimal relative to total plant & equipment cost**		

Operation Phase			
UN Adaptation Fund Fee	2% of CERs	2% of CERs	EB fee
Initial verification (incl. system check)	5,000–30,000	5,000–15,000	DOE fee
Ongoing verification (periodically)	5,000–25,000	5,000–10,000	DOE fee
Share of Proceeds to cover administration expenses (SOP-Admin)	The fee paid at registration is effectively an advance that will be 'trued up' against actual CERs issued over the crediting period (if different to emission reductions projected at registration). SOP-Admin is not capped.		EB fee
Total CDM-specific costs – operation phase	**Variable – minimum 2% of CERs plus 5,000/year (if verification undertaken annually)**		

1 US$0.10/CER for the first 15,000 CERs per year and US$0.20/CER for any CERs above 15,000 CERs per year (max US$350,000). The minimum shown here has been calculated as 15,000 CERs/year over a single 7-year crediting period.
2 As for large scale, unless total annual average emission reductions over the crediting period are below 15,000 tCO2-e, in which case no fee is payable. Maximum calculated as 25,000 CERs/year over 7-year crediting period.

Sources: CCPO, 2005; UNEP, 2004 and EcoSecurities market information

In addition to the costs shown above, a number of governments may charge a fee for the approval of a CDM project. For example, China charges 65% of CER revenue for HFC projects or 2% of CER revenue for energy efficiency projects.

While most of the costs listed above are one-off costs incurred during the planning phase of the project, the costs of ongoing verification and the SOP Admin fees are incurred whenever issuance of credits for a project is required.

It should be noted that the upper ends of the cost ranges, in particular for large-scale PDDs and new methodologies, represent a 'worst case' scenario where an extremely large, complex project is being developed. On the other hand, the upper end of the range for registration costs represents a project with annual emission reductions of 182,500 tCO_2-e/year over a 10-year crediting period, which is not unusual and is far exceeded by some of the larger projects. Therefore, for large projects with emission reductions beyond this level, SOP-Admin fees will eventually exceed the up-front registration fee.

5.6. Types of Finance Available for a CDM Project

It has been observed that the majority of the CDM-specific project costs occur during the planning phase. They must therefore be regarded as high risk, since they will not be recovered if the project fails to be implemented. Such costs must therefore be covered by 'risk capital' – either equity or grants, which do not have to be repaid if the project does not eventuate.

The main sources of finance for these CDM-specific project costs during the planning phase are:

- **Government tenders and carbon funds:** which will often pay a proportion of these costs in return for a contract to purchase some or all of the resulting CERs (see section 7 below for information on both government and private sector funds);

- **Private sector CDM project developers:** who may cover part or all of the CDM-specific costs in return for a contract to purchase some or all of the resulting CERs; and
- **Project hosts:** either public or private sector entities which provide their own internal funds to develop projects with which they have an association as, for example, landowner, fuel supply provider, or off-taker of the non-CER outputs of a project.

The situation is more complex with regard to the costs incurred during the construction phase. As noted elsewhere, these costs are generally much larger than the planning phase costs, yet CDM projects are still relatively 'small' (typically under US$20 million). Nevertheless, the potential sources of finance include:

- **Lenders:** who may provide limited recourse debt to relatively large projects with secure revenue streams and relatively low risks, or to other projects with recourse to a financially strong sponsor;
- **Private sector CDM project developers:** who may be able to finance (usually smaller) projects with their own equity;
- **Project hosts:** who may be able to finance (usually smaller) projects from their own internal funds;
- **Equipment suppliers:** who may provide assets on lease or credit; and
- **CER buyers:** who may provide up-front payments against future CER deliveries.

5.7. Financing Models for CDM Projects

In this section we provide details on the financing models known to have been applied to actual CDM projects which have successfully obtained financing for both planning and construction phases. In section 5.8 we will discuss future financing models that might be applied in future.

At the time of writing, 491 CDM projects had been registered with the CDM Executive Board. Clearly, all of these projects have obtained financing of one kind or another to cover their CDM-specific planning phase costs, but it is not known what proportion of these have successfully obtained financing for construction. In addition, there is no general requirement for CDM projects to make public any information on how they have obtained financing. The financing models described below are therefore based on the information available to the authors and may not necessarily cover all relevant examples in the market.

Project proponents will want to assess the various possible financing structures and sources of finance to find the best balance of risk and price. For example, if they wish to monetise (i.e. borrow against) the ERPA, they will want to be careful about how risks are shared in that contract, and especially whether they are required to offer any delivery guarantees. Doing so may create uncovered contingent liabilities that financial institutions are unwilling to lend against, thus ruling out certain forms of finance. The advantages and disadvantages of the most common financing models used for CDM projects are set out in the following sections and case study boxes.

More information on financing models for CDM projects is available at: http://carbonfinance.org.

Conventional project financing

CDM projects face a number of structural challenges in obtaining any form of financing, and particularly bank debt. Projects are typically relatively small; climate-friendly technologies such as renewables are usually more capital intensive than fossil fuel alternatives; and lenders to developing country projects often require higher interest rates or repayment over shorter loan terms than the project's

revenues can support (Bishop, 2004). In addition, the CDM-specific risks can be significant: it was not until the entry into force of the Kyoto Protocol in February 2005, for example, that one major source of CDM-specific uncertainty (i.e. the legal foundation of the entire market) was eliminated. All of this has led to a relative scarcity of bank debt in CDM projects to date. Nevertheless, there are some exceptions, for example those described in the case studies below.

The advantages of conventional project financing for a CDM project (from the point of view of the project sponsor) include:

- **Ability to raise large amounts of capital:** generally speaking, banks have access to far larger amounts of capital than equity providers;
- **Improved rate of return on equity:** by financing a proportion of the project with debt (which has a lower cost of capital than equity) the equity providers improve the rate of return on their contribution to the project; and
- **Limited or no recourse to the assets of the project sponsors:** should the project fail, the assets of the project sponsors would not be at risk.

The disadvantages include:

- **Costs and time taken to obtain finance:** lenders will need to undertake extensive due diligence before deciding whether or not to offer a loan to a project, which can be time-consuming and costly;
- **Contracts must be with credit-worthy counterparties:** since the lenders only have recourse to the cash flows of the project, they will want to be sure that the contracts for the major outputs of the project are with reliable counterparties; and
- **Delayed returns on equity:** lenders will require to be repaid first, before any return is made to equity providers. This may delay any return on equity for some years.

Registration as a CDM project can increase the financial attractiveness of a project in two ways: CER revenue can simply increase the project IRR, and also help to mitigate risks by virtue of providing a relatively long-term revenue stream denominated in hard currency (euro or US$), often backed by a highly rated counterparty. This can help a project to obtain bank debt through a conventional project financing structure.

The World Bank PCF helped to pioneer this approach, through offering ERPAs for 10 or more years, denominated in US$, with the World Bank as trustee of the PCF, as described in the case study below.

Box 5: Case Study

Project Financing of Plantar Project in Brazil

The Plantar project involved the establishment of eucalyptus plantations in degraded areas that would be harvested after seven years and converted to charcoal for use in the pig-iron industry. The project would reduce emissions by displacing the use of coal for the same purpose in the pig-iron industry.

The PCF entered into a contract to purchase Verified Emission Reductions from the project, with the hope that the project could eventually be registered as a CDM project and generate CERs. The PCF therefore took on all CDM risk. The PCF also agreed to pay for the emission reductions during the growth of the trees, rather than at the point of displacement of coal in the pig-iron industry. This resulted in revenue to the project starting in the project's second year, rather than the eighth year (when non-CER revenue would also start from the sale of charcoal to the pig-iron industry).

This highly secure revenue stream, starting in the second year of the project, allowed the project to obtain a loan from Rabobank Brazil, under which the repayment schedule was structured to match the expected payments from the PCF. As an added precaution, the payments from the PCF were made directly to the lender rather than to the project sponsor. This enabled Rabobank to consider the transaction 'country risk free' and eliminated the need to purchase country risk insurance, which was unavailable for Brazil at the time. The project therefore became bankable. Structuring the loan repayments to match the emission reduction payment schedule also enabled Rabobank to increase the loan term from two years without carbon finance to five years with carbon finance (Bishop, 2004).

Lessons learned:

- An ERPA with a highly rated counterparty can help to mitigate risks associated with non-payment.
- Denomination of the ERPA in a hard currency can help to eliminate currency risk.
- In this case the agreement to make payments directly to Rabobank further decreased the risk to the lender.
- Structuring the loan repayments to match the emission reduction payments schedule (or vice versa) can increase a lender's willingness to finance a project and/or allow them to extend the term of a loan.

However, the financing model outlined in the Plantar case study above is, unfortunately, still unusual for CDM projects (Bishop, 2004). This is due to a combination of factors, including the inherent financing challenges outlined at the beginning of this section, and also the fact that the size of the loan that would be required by the average project is often too small to justify the investment by a bank in the institutional capacity required to consider the CDM-specific risks associated with a CDM project. The exceptions have generally involved banks or other financial intermediaries which have taken a strategically pro-active approach to the CDM market. Two such examples are provided in the case studies below.

Box 6: Case Study

Project Financing of a Biomass Electricity Generation CDM Project in Asia

The project involved the construction of a 20 MW (net electricity output) plant burning biomass to produce electricity that is supplied to the project host country's electricity grid. The project generates CERs because it (a) displaces grid electricity generated from fossil fuels and (b) eliminates methane emissions from the biomass, which previously was left to rot in the sun.

The key features of the project were as follows:

- Capital requirement approximately US$40 million;
- Electricity output approximately 150 GWh/year;
- Relatively high emission reductions due to avoided methane emissions (GWP=21) plus displaced grid electricity (emissions factor around 0.5tCO2-e/MWh);
- Single buyer for electricity output (national electricity utility, AA-rated);
- Additional revenue from sale of ash to cement plants; and
- Reliant for fuel supply (500 tonnes/day) on large number of small primary producers.

Project financing was considered for this project because the capital requirement was sufficiently large to interest a bank (particularly because a number of similar projects were planned to follow), and because the project had several revenue streams, including the possibility of a long-term power purchase agreement with a reliable off-taker. The country was also one in which project financing for independent power producer (IPP) projects was well established.

As with traditional project finance arrangements, a special purpose vehicle (SPV) was created in order to take the financial risk off the balance sheet of the project sponsors and limit recourse to the parent companies. 64% of the capital was provided in the form of senior debt by two banks, one local and the other international; the remaining 36% was equity provided by a group of project sponsors. A number of agreements were signed between the SPV and other project stakeholders to facilitate the project financing, including:

- A 25-year power purchase agreement (PPA) with the off-taker for the energy;
- An ERPA to 2012 with a European buyer;
- A turn-key engineering, procurement and construction agreement with an international contractor;
- An operations and maintenance contract;
- A fuel supply agreement with the local suppliers of biomass;
- An implementation agreement with the host government;
- Credit agreements with the lenders;
- A contribution agreement with third party investors; and
- Insurance policies.

The project finance structure was constructed so as to mitigate the risk involved in the project by distributing the risk and contractual liabilities (penalties and liquidated damages) between the stakeholders and to ensure repayment of the loan. Loan repayment was based solely on the project's cash flow, with the project's assets and contractual rights and interests serving as secondary security or collateral. The loan term was 12 years, with one year's grace period to allow for construction and commissioning of the plant.

Lessons learned:

- Project development was very long (8 years from conception to commissioning). Setbacks included the 1997 Asian financial crisis and the withdrawal of a major equity investor at an advanced stage (for reasons unrelated to the project activity itself).
- The senior debt provision was based only on the electricity revenue and not on any CER revenue or revenue from sales of ash to cement plants. Nevertheless, the intention for future projects based on this model is that debt will be secured on CER and ash revenue streams as well as electricity.
- The possibility of CER revenue did, however, contribute to the interest of the equity investors in the project and helped to justify the long (and costly) project planning phase.
- The project has experienced delays with the CDM approval process. However, the fact that senior debt was obtained on the basis of conventional revenue and not CER revenue meant that this did not delay the construction of the plant.
- Due to the rural, decentralised nature of the biomass providers, more fuel supply agreements were entered into than were strictly required, in order to provide a contingency in case some of the millers failed to deliver. The fuel supply agreements were for 7 years and covered the transport of the biomass and the way in which the value of biomass was assessed before and after transportation.
- The fact that a share of the project debt was in an international currency, whereas the major revenue (electricity and ash sales) was in local currency, meant that the project was exposed to currency risk. Some of the risk of the unstable local currency of the host country may be mitigated since the CER revenue stream will be in US$, helping to match the debt service payment currencies to the revenue streams.

Box 7: Case Study

Project Financing of a Hydro Electricity Generation CDM Project in Central America

The project involved the construction of several small run-of-river hydro electricity generation facilities (less than 15 MW total capacity). The primary project sponsor was a local entity. The project generates CERs because it displaces grid electricity generated from fossil fuels.

The key features of the project were as follows:

- Phased capital requirements totalling some US$17 million;
- Long-term power purchase agreement with local utility;
- Difficult local financing environment with banks charging high interest rates and requiring loan guarantees; and
- Emission reduction purchase agreement with the World Bank PCF.

The first phase of the project was financed with a senior loan (approx US$250,000) from a non-profit organisation specialising in providing small loans to sustainable energy projects. The loan was provided on commercial terms and took revenue from emission reductions (via a contract with the PCF) into account. Equity was provided by the project sponsor.

For later phases, a syndicate of 5 banks provided 70% of the total capital requirement as senior debt. The project sponsor contributed 11% as equity, and two mezzanine finance providers contributed the remaining 19% in the form of preferred shares (paying a specific dividend, paid before other equity shareholders). The most recent phase of the project involves an additional US$2 million, required to implement efficiency improvements to the existing infrastructure. This is being provided by further mezzanine finance in the form of preferred shares. These preferred shares are subordinated to the previously issued preferred shares and pay both a specific dividend and an equity 'kicker' (i.e. enabling the lender to share in dividends to ordinary shareholders).

Lessons learned:

- The project took over 3 years to secure finance, but was eventually successful both in obtaining finance and in registering as a CDM project.
- Project construction costs over-ran, and this additional cost had to be covered by the project sponsor.
- The participation of the specialised lender was essential to the project's success.

100% equity investment by a private sector CDM project developer

A more common financing model involves specialised CDM project developers investing directly in CDM projects in return for part or full ownership of the resulting CERs. The advantages of this form of financing include:

- **Speed:** a specialised CDM project developer has the expertise to assess a project rapidly and a strong incentive to maximise the secure CER output by implementing a project as rapidly as possible.
- **Simplicity:** there are typically fewer contracts to be negotiated. At one extreme, a private sector developer may offer a project host a single turnkey contract to deliver all aspects of a project, in exchange for a fixed rental or revenue share. However, the project host may still wish to contract some elements of the project separately.
- **Low risk to the project host:** typically, the CDM project developer takes on all of the project risks, with the project host simply providing land or other inputs to the project.

The disadvantages of this model are:

- **'Loss of control' over the project:** from the project host's point of view, they may 'lose control' over a project they could potentially have developed themselves. Project hosts need to assess their capability to develop CDM projects realistically and balance the potential pay-offs against the costs and risks involved in developing a project. It is also important to realise that practical aspects of 'control' over a project are negotiable when a contract is being entered into with a third party CDM project developer. For example, the contract may provide for certain rights of access and entry (to either party's facilities), or for a CDM project to be operated in a certain way to fit with the needs of the host facility, or for the entire facility to be transferred back to the ownership of the project host upon completion of an agreed operating period.
- **High cost of finance:** using 100% equity is the most expensive way to finance a project, as equity providers require a high rate of return, which will be reflected in the terms offered to the project host (e.g. the value of lease payments, percentage of CER revenues, or fixed price per CER). The high cost of finance must be balanced against the advantages set out above.

Two variations on this approach are illustrated in the following case studies.

Box 8: Case Study

100% Equity Financing of a Landfill Gas Capture CDM Project in Central America

The project involves the design, construction and operation of a landfill gas collection and flaring system on an urban landfill in a Central American host country. The project generates CERs because it avoids the methane from the landfill being vented directly to the atmosphere. In a later stage, the collected landfill gas will be used for electricity generation, thereby generating further CERs from the displacement of grid electricity generated from fossil fuels.

The key features of the project were:

- Landfill owned and operated by local municipal authority;
- No legal requirement to capture flared gas and revenues from captured gas insufficient to justify capital expenditure of around US$1.5 million;
- Electricity generation potential 2–4 MW (with additional investment of US$2–4 million); and
- Emission reduction potential 100,000–200,000 tCO_2-e/year.

The project was developed by an unincorporated joint venture between three companies with expertise in gas collection and flaring, electricity generation and CDM project development. All finance was provided by the joint venture partners (including a significant amount of in-kind support). The joint venture partners also provided all technical, operational and CDM expertise, and took on all of the risks associated with these aspects of the project.

A contract was signed with the local authority, providing for a royalty fee to be paid from the sale of CERs. The design, installation and testing of the gas collection and flaring equipment took place in parallel with the preparation of CDM documentation. The result was that the project was registered and commenced gas flaring within 7–8 months from the date of signing the contract with the local authority.

Lessons learned:
The following success factors were identified as critical reasons why this model was capable of delivering a project in record time:

- Contract negotiations with the local authority were relatively rapid, as the project developer offered a single contract to deliver all aspects of the project at no up-front cost to the local authority, with the added attraction of a future royalty revenue stream. While the local authority might have developed the project on its own, the net benefit (after taking into account internal costs, external costs, opportunity costs due to a longer project development timetable, and technical, operational and CDM risks) would almost certainly have been lower.
- The joint venture partners involved in each aspect of the project – gas collection and flaring, the CDM project cycle and electricity generation – were each experts in the field and wholly responsible for delivering that aspect, rather than relying on sub-contractors. This ensured that each party had a full incentive to make that aspect of the project work, and to ensure delivery as rapidly as possible.

- The developers focused on achieving gas collection and flaring first, with electricity generation to follow. Electricity generation requires negotiation of a PPA with a third party, as well as additional approvals from the government or regulator, and this would have taken an additional 6–12 months. As the volume of landfill gas is difficult to predict accurately in advance of implementing gas collection, the developers would also have been at a disadvantage in negotiating an early PPA (which typically rewards firm generation commitments and penalises uncertainty). Focusing on gas collection first also helps accelerate payback – due to the high GWP of methane, and low cost of collection equipment – which can enable sponsors to use cash flows from methane destruction to help finance subsequent capital expenditure, and will enable the sponsors to scale the power generation equipment to the actual, measured volumes of gas, rather than to an unreliable estimate.

Box 9: Case Study

Build-Own-Operate-Transfer (BOOT) of a Biogas CDM Project in Asia

The project involves the construction and operation of an anaerobic digester and associated facilities to produce biogas from the wastewater stream and biomass arising from the production process of a company (the 'host company') producing starch from tapioca. The project generates CERs because it avoids the methane emissions associated with the current waste disposal system, plus the biogas produced will be used to displace emissions from the combustion of heavy fuel oil in the company's burners.

The key features of the project were:

- A single host company provides the necessary inputs (wastewater and biomass) and takes the outputs (biogas) of the project, thus necessitating integration with the existing production site; and
- Relatively low capital expenditure requirement (around US$1 million).

The solution proposed to the host company was a Build-Own-Operate-Transfer (BOOT) business model. Under this model, a CDM project developer offered to develop, finance, construct, own and operate the required infrastructure for a period of 10 years, after which the project's assets would be transferred to the host company for a purely nominal sum and the host company's staff trained in the operation of the facility. The project developer therefore took on all financial, technical, operational and CDM risks associated with the project. In addition, the project developer invested 100% equity in the project in order to avoid any delays which could have been caused by identifying other lenders to the project.

The host company took on very few risks and commitments. It agreed to supply the land required for the development of the project (for a nominal rental) and to make its waste stream and biomass available over the 10-year period of the contract. In order to ensure that the methane generation potential of the anaerobic digester was met, the quantity of the wastewater stream and its characteristics were pre-defined in a contract with the project developer.

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In addition, the host company agreed to purchase the biogas produced by the project at a favourable price, pegged to the current prices for the heavy fuel oil which it replaces. This link between the two commodities ensures that the discount will remain significant, while a ceiling and floor price are defined to ensure a certain price range for the host company and the project developer. The amount of biogas required by the company in order to fire its boiler is pre-defined in the contract and the project guarantees delivery of the defined amount of gas. All excess biogas which is produced by the project will be delivered to the company for free rather than being flared.

In return, the project developer takes full ownership of the CERs generated by the project, paying the host company a fixed royalty per CER, to be paid after issuance of the CERs.

Lessons learned:

- This model is capable of delivering a project rapidly, as it relies solely on a relatively simple contractual agreement between two parties. However, this assumes that the project developer has all the necessary technical, financial, operational and CDM expertise required to provide all these inputs to the project. If elements of this expertise have to be outsourced, the costs and time taken to develop the project are likely to be much higher than when a single project developer can provide all the necessary inputs.
- The BOOT model is suitable for a project which is integrated into another site, particularly where the lifetime of the asset is likely to exceed the CDM crediting period of the project (and therefore the period of interest to the project developer).

Corporate financing by project host

In essence, corporate financing by the project host is much the same as 100% equity financing by a CDM project developer, the difference being that the project host assumes the role of the CDM project developer.

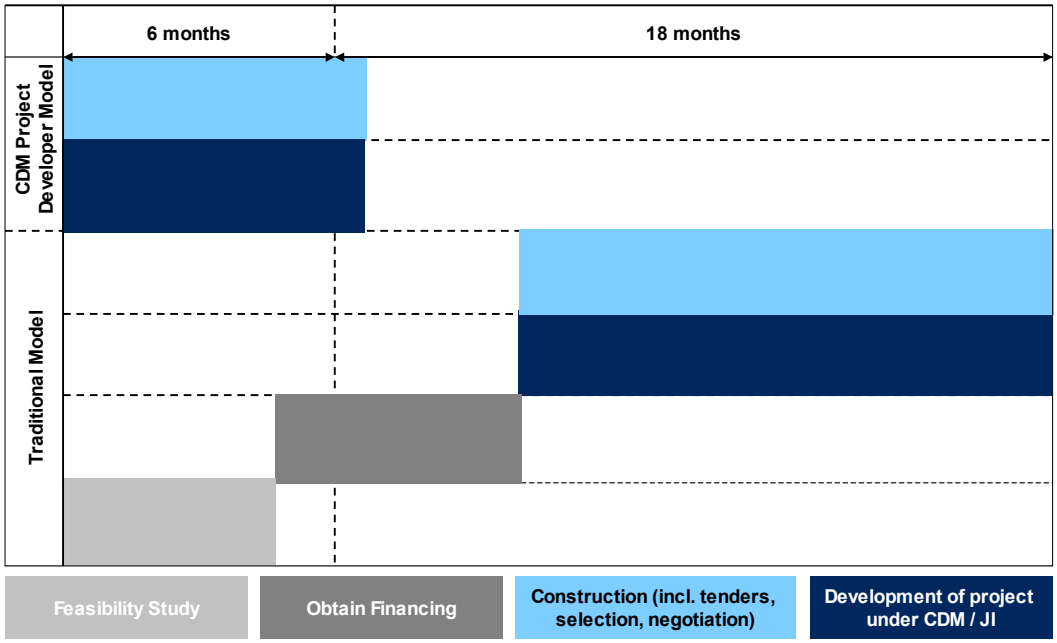
The advantages of this approach include:

- **Project host retains all of the CER revenue from the project.**
- **Financing may be raised more rapidly** (if the project host is credit-worthy or has sufficient cash reserves of its own).

The main disadvantage is:

- **Lack of expertise:** It is unlikely that the typical project host would have all elements of the highly specialised expertise required, and it would therefore be obliged to outsource elements of the project (e.g. CDM project documentation and installation of plant and equipment). This would increase project costs and development time. The figure below provides an illustrative comparison of the typical difference in timescales between the conventional approach to developing a project, and the approach taken by a specialised CDM project developer.

Figure 19: Comparison of project development timelines



Source: EcoMethane

Equipment lease financing

The supplier of equipment – often a large percentage of the total up-front capital expenditure of a CDM project – can be a potential source of finance for a project. Some suppliers of specialised equipment, particularly where the equipment has value to the supplier even after its use by the customer, may be willing to lease the equipment to a project host or developer, rather than selling it outright. This is effectively a loan from the equipment supplier, secured over the equipment itself (which remains in the ownership of the equipment supplier, until and unless sold to the project host or developer at an agreed stage in the contract).

The cost of this form of finance depends very much on the type of equipment involved, the credit-worthiness of the project host/developer, and whether any other products or services (such as maintenance) are included in the contract. For a highly credit-worthy project host leasing a long-lived asset (e.g. a hydro turbine) from a supplier familiar with leasing their equipment, the effective cost of capital under an equipment lease might be little more than the cost of a conventional bank loan taken out to purchase the equipment outright (after allowing for depreciation of the asset). However, for less credit-worthy project hosts leasing less durable assets, the cost of capital might be much higher.

The advantages of equipment lease financing include:

- **Reduced up-front expenditure and closer match between lease payments and project revenue:** By definition, lease payments are made during the operation of the equipment (although some up-front deposit is almost invariably also required), and therefore are more likely to match the project's revenue stream.
- **Management of equipment performance risk:** Usually, the terms of the lease would provide for the lessee to withhold payment in the event of an equipment failure (unless due to the actions of the lessee). The equipment supplier therefore has an incentive to provide reliable equipment.

The disadvantages include:

- **Limited ability to make modifications to equipment:** Since the project host/developer does not own the equipment, it will have limited scope to make any modifications during the term of the lease.
- **Relatively high cost of capital.** The cost of capital is usually higher than an equivalent bank loan.

Supplier credit

Supplier (or vendor) credit is similar to equipment lease financing, insofar as it involves financing provided by suppliers of goods and services to the project. In its simplest form, supplier credit can consist of the interval between submission of an invoice for the supply of a good or service and the time at which the invoice must be paid. However, some suppliers will offer more sophisticated credit facilities, which are essentially loans for part or all of the value of the goods or services provided. Such loans are generally secured only by the equipment (not by the company's other assets) and therefore generally have a higher cost of capital than conventionally secured debt. However, where the supplier is effectively subsidised by a bilateral export credit agency, the cost of capital may be lower. The availability of credit is likely to depend on the credit rating of the project host/developer.

The advantages of supplier credit include:

- **Widespread availability:** Most suppliers offer some form of supplier credit, even if it consists only of payment in phased instalments, or a payment period (e.g. 14–30 days) for invoices.
- **Deferred payment for up-front capital expenditure.**

The disadvantages include:

- **Relatively high cost of capital:** Supplier credit is rarely the cheapest form of capital, unless subsidised by an export credit agency.

Up-front payments

The buyer of the CERs is another potential source of finance for a CDM project. Normally, there is a mismatch between the needs for up-front investment for construction and the periodic payments for emission reductions, which usually occur only after completion of the project and periodic verification of the emission reductions (Kossoy, 2004). This mismatch can be reduced if a CER buyer is prepared to make an up-front payment for future delivery of CERs from a project.

This is effectively a loan provided by the CER buyer. If it is secured only against future delivery of CERs (as set out in an ERPA), it is high risk, as it is exposed to all of the same risks as any conventional loan at the same stage, but without the ability to seize the assets of the project (other than having legal title to the CERs) in the event of non-payment. Consequently, most CER buyers would apply a relatively high discount rate to the future value of the CERs when formulating offers for up-front payment. In financial terms, this would be equivalent to charging a high interest rate for the loan provided by the CER buyer. Alternatively, the CER buyer may require a guarantee or other security (for example, a letter of credit from an investment-grade bank), in which case the cost of the guarantee must be taken into consideration.

As a method of financing, therefore, up-front payment typically comes at a relatively high cost.[10] However, it has the advantage that CER buyers are generally very well informed about CDM-specific risks and are able to conduct the necessary due diligence and make decisions on a CDM project relatively quickly and at low cost (compared with a less well-informed lender). A CER buyer may take a less conservative view than a conventional lender of the risks associated with a CDM project, which would reduce the difference between the interest rate a conventional lender would apply to a loan

10 There are exceptions. For example, in certain circumstances where the project developer can demonstrate that it is absolutely necessary, the World Bank Carbon Finance Unit may pay up to 25% of the value of an ERPA up-front, undiscounted (http://carbonfinance.org/Router.cfm?Page=ProjDev&ItemID=4).

and the discount rate applicable to an up-front payment offer from a CER buyer.

With the growing maturity of the CDM market and increasing involvement of well-informed CER buyers, up-front payment for CERs is becoming more common. Up-front payment options offered by different CER buyers vary according to the stage in the project cycle when up-front payment(s) may be made (typically after registration), the percentage of projected CERs a buyer is willing to pay for up-front, the discount rate applicable and any other safeguards or guarantees required by the buyer.

Finally, it is worth noting that in practice, up-front payment rarely entirely solves the problem of obtaining finance for the most expensive stage of the project cycle (construction). This is because it is rare for any buyer to be willing to pay up front *before* a project is both registered and ready to commence generating CERs (i.e. after completion of construction). However, by bringing forward any proportion of a project's cash flows to any extent (for example by a year, if up-front payment is made at the project start date, rather than after verification a year later), up-front payment can assist the project host or developer with obtaining any other form of finance that rewards early repayment (such as a bank loan or supplier credit).

In summary, the advantages of this model include:

- **Repayment of up-front capital expenditure can be brought forward:** By receiving up-front payments based on a future flow of CERs some of the financial difficulty of covering the initial capital expenditure of the project may be alleviated.
- **Relatively rapid and low cost due diligence by CER buyers:** This source of finance may be obtained rapidly, relative to a conventional loan.
- **(Possibly) less conservative view of CDM-specific risks:** A CER buyer may take a less conservative view of the CDM-specific risks, due to having better information or being better able to mitigate these risks (for example through portfolio diversification). This reduces the cost of capital (which may nevertheless remain higher than a conventional loan, due to other factors such as the lack of collateral).

The disadvantages include:

- **Risk allocation towards buyer:** The buyer of CERs will bear all the risk associated with the performance, verification and issuance of any CERs which have been paid for up front.
- **Lower net CER revenue for project host/developer:** The project host/developer will receive a lower net CER revenue due to the discount rate that the buyer will apply to the future value of the CERs.
- **May not solve problem of obtaining finance for construction:** Up-front payment options vary between different CER buyers, but most will not pay before registration and completion of the project.

Low interest loans or debt

There are a number of development banks with lending programmes in the non-Annex I countries that can function as 'lenders of last resort' to projects which would otherwise have difficulty obtaining finance. Examples of such institutions include the World Bank, Asian Development Bank, African Development Bank, the Inter-American Development Bank, the European Bank for Reconstruction and Development and others. With the aim of supporting poverty reduction and economic growth in developing and transition economies, these institutions are sometimes able to provide loans at lower interest rates than are generally available in the host countries. In many cases such funding is complementary to funding from other local or international sources of finance. A number of banks and bilateral funding bodies also offer support to develop the CDM components of eligible projects. This can include the provision of grants and direct assistance in developing CDM related documents.

For a list of some institutions which offer such assistance, see section 7 below.

The advantages of low interest loans include:

- **Lender of last resort:** Development banks focus their loans on countries which have trouble attracting finance due to the fragile nature of their economy.
- **Stable currency:** The low interest loan is in a stable currency (e.g. euro or US dollars).
- **Support with CDM component:** In addition to offering low interest loans the institutions may also provide assistance for the development of the CDM component.

The disadvantages include:

- **Loans must fit the objectives of the lending programme:** In many cases a loan provided by such an institution needs to fit the wider context of the country's development plan and the specific objectives of the lending programme. These plans usually focus on supporting and developing specific sectors of the economy. If a project proposal does not fit in this wider context of the overall development plan it may be more difficult for the project to receive the loan.
- **Stringent due diligence:** Projects selected for finance by the development bank are usually subject to stringent due diligence in order to assess their long-term viability, impact on economic development of the country or region, and environmental sustainability. In addition to the administrative effort and cost this entails, project lead times can therefore be rather lengthy.

Box 10: Case Study

Low Interest Loan from a Development Institution

The project involved a European based development bank providing a five year loan of €1.1 million to a project host company in Central Asia for the construction of a mini-hydro project. The host company used the loan to install a second turbine which, while only working for limited amount of time per year, will increase the company's total electricity production by 23%. The electricity will be sold to the host country's government, under guarantees lasting until 2016, at prices negotiated once a year.

The company had experienced difficulties in attracting bank loans for the project: interest rates were high and banks were reluctant to take on the risk of investing in a small-scale hydro project. The project host company had even approached the turbine supplier to help identify sources of finance but was unsuccessful. It approached the development bank and they negotiated a €1.1m loan at a 9% interest rate, significantly lower than the rate offered by the domestic banks.

Being the sole lender to the project, the bank accepted all of the risk involved in the project. The bank also carried all costs of the development of the CDM component for the project. If the project is successfully registered, it will be the first mini-hydro project registered under the CDM in the host country. Registration will improve the viability of the project, as carbon credits will be paid for in hard currency. By assisting with the development of the carbon component the bank expects to demonstrate that the country can benefit from small-scale renewable energy projects and the international emissions trading market.

Lessons learned:

- Development banks can function as lenders of last resort if no other financing options are available to the project developer.
- Development bank funding is compatible with the CDM, provided it can be sufficiently demonstrated that no official development assistance has been diverted.

Micro-credit

Micro-credit is similar to traditional bank debt finance, but aimed at providing very small amounts of credit to lenders with limited ability to pay, particularly in rural areas of developing countries. Finance is provided by local institutions, referred to as micro finance institutions (MFIs) that have local presence and experience in rural areas. In terms of CDM projects, micro-credit is typically applicable to (very) small scale CDM projects, particularly those that involve many individual end users purchasing specific items of equipment (e.g. solar water heaters, bio-digesters, more efficient cook stoves).

The advantages of micro-credit include:

- **Access to finance:** Micro-credit is often the only alternative to personal capital expenditure (which is limited, for obvious reasons, in rural areas of most developing countries), for projects involving capital expenditure of up to a few hundred dollars per item. Often no collateral is required, or collateral may be shared between a group of borrowers. Micro-credit thus provides access to financing and aids in the development of CDM projects that would otherwise not have been developed.

The disadvantages include:

- **Limited scale:** One of the strong arguments in favour of micro-credit (access to financing for micro scale projects) is also a major constraint, as MFIs are usually not able to provide financing on a large scale. In many cases there may be a financing gap between the micro-credit scale and availability of conventional credit.
- **High interest rate:** Although many MFIs have found that micro-credit models such as peer group lending can reduce the risk of default, the risk remains relatively high and this, combined with high transaction costs, means that MFIs need to charge a relatively high interest rate on micro-credit loans.

Box 11: Case Study

Micro-credit for Biogas plants under the CDM in Asia

The project involves the placement throughout the host country of a potential 1.9 million small anaerobic digesters producing biogas. The digesters will capture biogas from latrines and animal waste that can be burnt to generate thermal energy for cooking. The capacity of the installed biogas plants ranges from 1.16 kW to 2.32 kW. Emission reductions result from a displacement of conventional fuel sources for cooking, such as fuel wood and kerosene. In addition, the project mitigates N_2O and CH_4 emissions due to the waste management procedures, and the remaining bio slurry may be used instead of chemical fertiliser. At the same time, sanitation in households can be improved. Capacity building for micro finance institutions (MFIs) and energy companies for this project was supported by an international development institution.

150,000 of the potential 1.9 million biogas plants have been installed so far. Micro credit is used as a means of finance to allow the poorest households access to and use of this technology by covering the upfront cost of plant construction. On average a plant costs US$340 but the price may vary depending on size, location and availability of local construction materials. Approximately US$90 of the total cost is financed by a government subsidy. The plant owners contribute around US$40 either in cash or in the form of unskilled labour. The micro credit is designed to cover the remaining US$210 to finance the average plant.

Number of Plants	Average Construction cost (US$)	Average Government Subsidy (US$)	Owner's equity (US$)	MFI Loan (US$)
1 plant	340	90	40	210
5000 plants	1,700,000	450,000	200,000	1,050,000

More than 150 MFIs are currently financing biogas projects in the host country as a result of this endeavour. Due to the high public demand for such loans, one of the major constrains in the micro financing of biogas plants on a large scale is that MFIs in the rural areas do not have adequate funds to satisfy the demand for loans. MFIs are therefore seeking wholesale loans from commercial banks. A revolving fund of €2.5 million to provide wholesale loans to MFIs is managed by an alternative energy promotion centre. These loans typically last for 2–3 years at a 6% interest rate. Other MFIs receive loans from commercial banks or use their own funds.

Terms and conditions for a loan for a biogas plant may vary from one MFI to another. Generally borrowers receive a loan for 18–24 months. Cooperatives usually collect quarterly instalments while other MFIs collect monthly instalments. The interest rate varies between 12–16% on a declining balance.

MFIs situated in rural areas where biogas clients live can have distinct advantages over commercial banks, which are usually located in urban areas. Dealing with such a small loan may not be profitable for commercial banks with offices far from the clients. Commercial banks also require collateral, which poor farmers cannot provide at all or which is too time-consuming and costly for a bank to evaluate. For this reason commercial banks are reluctant to provide loans for small-scale biogas projects.

By comparison, MFIs are strategically located in the rural areas and do not require collateral. Their processing time is faster and more convenient for rural farmers, with whom they can establish a direct relationship.

For the implementation of the projects under the CDM, the emission reductions from the different digesters are bundled into a number of large-scale projects. 5000 biogas plants which were financed by MFIs as a result of this project are reducing approximately 23,000 tCO_2-e annually, at the rate of 4.6 tCO_2-e per plant. The revenue from these projects will be useful in two ways:

- A share of the CER revenue can be used to contribute to the revolving loan fund, which provides wholesale loans to MFIs.
- Another share of the CER revenue can be used to build the capacity and confidence of MFIs to provide biogas loans and enable them access to funds from commercial sources.

Lessons learned:

- Micro-credit may help finance especially small CDM projects.
- Revenue from different project sites may be bundled to form a more significant CER stream.

5.8. Alternative Financing Options

The largest source of capital potentially available for CDM projects is bank debt. However, there are three main factors preventing wider use of bank debt to finance CDM projects:

- **Small project size:** The typical small size of CDM projects means that bank overheads would make up a larger proportion of the total loan, thereby increasing the cost of bank debt and/or making it less appealing for banks to allocate resources to loans to CDM project developers.
- **Need for speed:** Project developers are in need of capital at relatively short notice. Because the existence of a market for CERs is currently only guaranteed until the end of 2012, every month of delay to a project reduces the overall return. However, banks require a certain amount of time to assess the different risks associated with financing a project.
- **Risk:** The principle of additionality dictates that, in most circumstances (the only exceptions being where insurmountable non-financial barriers can be demonstrated), CDM projects are not financially viable without CER revenue. Therefore the CDM-specific risks are of critical importance. Because the carbon market is still relatively young, experience and understanding of the CDM has not percolated widely into the financial community, and many institutions refrain from financing CDM projects simply because they have no experience in 'pricing in the risk'.

Nevertheless, a number of more innovative approaches can address these issues. Small-scale projects can be 'bundled', thereby increasing the size of loans required, without a corresponding increase in the CDM-specific risks. Increasing familiarity of lenders with the CDM can be expected to decrease times required for due diligence, and a number of innovative approaches can reduce CDM project risks, including:

- **Establishing escrow accounts outside the host country:** For deposit of payments for CERs from a buyer, thereby safeguarding the revenue stream for debt service while also mitigating currency risk. This approach has been pioneered by the PCF, for example in the Plantar case study.
- **Partial risk guarantees to insure against host country non-compliance:** For some projects, lenders may require assurances from the host government, over and above project-specific Letters of Approval, before agreeing to finance a project. For example, a lender might require assurances that the government will not seek to 'nationalise' CERs or attempt to re-negotiate prices agreed in ERPAs. Alternatively, a lender might require a commitment from the government as to the price or availability of key inputs to the project (e.g. waste to a landfill site), or future electricity or heat tariff increases that are required to make the project financially viable. Various private, bilateral and official insurers may be able to offer such guarantees. However, where such guarantees are not available, donors such as the World Bank may be willing to consider developing partial guarantee instruments for specific project types or countries where they are most necessary (Bishop, 2004).
- **CER derivatives:** An alternative to up-front payment for CERs would be for the project developer to sell a call option on delivery of a certain amount of CERs at an agreed price, on an agreed future delivery date. This would mean that the developer would have an obligation to sell that volume of CERs to the buyer, at the agreed price, if the buyer should choose to exercise the option at the delivery date. The buyer has the right but is under no obligation to exercise the option. To date, most CERs have been sold under forward contracts, under which no cash actually changes hands until the agreed delivery date (unless some form of up-front payment has been agreed). A call option differs from this because it has a current value (i.e. the buyer pays the writer of the option – the project developer – an option price now, in return for the right to exercise the option later). Therefore, in theory, the sale of call options could help to raise the cash required for up-front capital investment. In practice, the option value is usually small in relation to the underlying CER value, so the amount of capital raised would, in most cases, be small in relation to the total capital requirement. In addition, the transaction costs involved in developing a specific financial instrument such as this would be high, and in a bilateral transaction between buyer and CER developer, the developer's credit rating would be of critical importance. The use of options may develop as the CDM market matures (by way of comparison, the first exchange-traded option transaction on EU ETS carbon allowances was only concluded on the largest exchange for EUAs (the European Climate Exchange) in October 2006 – and the EU ETS is a far more developed market than the CDM, at present).
- **Securitisation of CERs:** Another option for alternative financing could be to 'securitise' a supply of CERs by forming an SPV which owns the legal title to the CERs, and issuing bonds on the SPV to individual investors (usually done with the help of an investment bank or specialised securities company). This would only be viable for very large projects, or 'pools' of CERs from smaller projects. The value of the bonds issued would depend on the value and conditions of the CERs in the 'pool'. Matsuhashi et al. (2002) suggest using CDM bonds as a tool to diversify investment in various sectors and countries, thereby reducing baseline risk, certification risk and country risk. Bishop (2004) mentions that the World Bank Community Development Carbon Fund (CDCF) is working with private insurers to provide credit enhancement in the form of a non-recourse ERPA monetisation product, which would facilitate financing of some CDCF projects which require advance payments due to their inability to find financing because of their size and the fact that they serve the rural poor, in some of the least developed countries.

6. Financial Assessment of a CDM Project

6.1. Introduction

This section considers the specific issues that must be considered in the financial assessment of a CDM project, and concludes with a detailed examination of risk assessment and management options applicable to CDM-specific project risks.

6.2. Financial Viability of a CDM Project

A CDM project is, in most respects, the same as any other project, and the financial assessment procedures outlined in section 4 above would still apply. However, a number of factors specific to CDM projects also need to be taken into account.

The principal unique feature of a CDM project is that some or all of its revenues may come from the sale of Certified Emission Reductions (CERs), as described in section 5 above. If a project has other revenue streams apart from CERs (such as electricity from a renewable energy project, or forest co-products from an afforestation project), then it may be possible to finance the project solely on the basis of the conventional revenue streams. However, in most cases there will either not be any conventional revenue from the project, or the revenue streams that exist will not be sufficient to make the project financially viable (otherwise it would be difficult to demonstrate that the project was additional), and therefore the revenue from CERs will be critical to the project's financial viability. Consequently, the volume and 'cost of production' of CERs, as well as the price at which they may be sold, are key inputs to a CDM project financial model.

A number of factors affect the volume and 'cost of production' of the CERs that may be generated by a CDM project. The most important variables are:

- The scale of the project;
- The emissions factor applicable to the project activity;
- The capital investment required; and
- The timescale for developing the project.

The price at which CERs may be sold is principally determined by the apportionment of risks between the buyer and seller of the CERs, as set out in the Emission Reduction Purchase Agreement (ERPA). This in turn depends on a number of other factors, including the credit-worthiness of the seller. The price that is agreed upon also depends on the time when the contract is entered into (i.e. when during the project development cycle, and also when in relation to the expected future prices prevailing in the market at that point in time).

Scale

726 out of 1523 projects in the CDM pipeline[11], or around 48%, were small-scale according to the CDM definition of this term (see section 2 above). This generally means that they are also 'small' in terms of the financing required (typically under US$20 million). The smaller the project's financing requirements, the higher the financing transaction costs per unit of finance will be. Within the same project type, larger projects will generate more CERs and also benefit from economies of scale in the 'cost of production' of CERs.

11 UNEP Risoe Centre CDM Pipeline, updated 11 January 2007.

Emissions Factor

The emissions factor applicable to the project activity is critical to the volume of CERs produced, particularly because it is so highly variable. For projects generating electricity for export to a grid, or reducing electricity consumption due to energy efficiency, the emissions factor of the grid will determine the emission reductions of the project. This can in theory be as low as zero (for a grid based on renewable resources such as hydro), but more typically ranges from 0.5 tCO_2-e/MWh for grids based on efficient gas plant, up to around 1 tCO_2-e/MWh for grids dominated by inefficient coal plant.

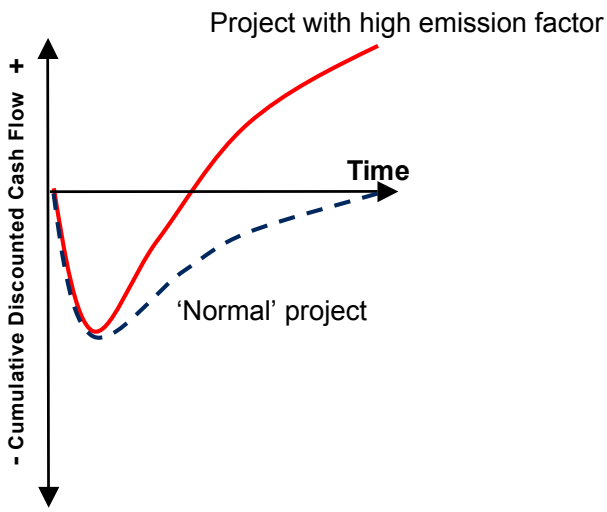
Therefore, for projects that reduce emissions by generating electricity from lower emission sources, the potential carbon revenue ranges from around US$2–8/MWh, for a range of CER prices from US$2–16/$tCO_2$-e, as shown in Table 5 below.

Table 5: Carbon revenue from electricity generation projects (US$/MWh)

Carbon price (US$/$tCO_2$-e)	US$4	US$6	US$8	US$10	US$12	US$14	US$16
Low emissions factor (0.5)	2	3	4	5	6	7	8
High emissions factor (1.0)	4	6	8	10	12	14	16

While an increase in revenue of this order will certainly improve the NPV and IRR of a project, it is not large enough on its own to cover the costs of generation of a typical renewable energy project (minimum US$50–60/MWh). Therefore, carbon finance will only assist projects to become viable that were already marginal (i.e. almost, but not quite, commercially viable). The exception is electricity generation projects that also involve avoided emissions of methane (landfill gas, biogas, coal mine methane, etc), due to the additional emission reductions resulting from the high GWP of methane.

Figure 20: Impact of emissions factor on a CDM project



The variation in emission factors for electricity generation projects pales into insignificance when compared with the difference between Global Warming Potentials (GWP) of different GHGs. Projects reducing emissions of methane (GWP of 21), nitrous oxide (GWP of 310), HFCs (GWP of up to 11,700), PFCs (GWP of up to 9,200) or SF_6 (GWP of 23,900) will clearly generate massive volumes

from relatively small volume reductions in these gases. While it is not *necessarily* the case that the 'cost of production' should be more closely related to the volume of reductions of the source greenhouse gas than the volume of reductions of CO_2-e, there does appear to be some degree of correlation. In other words, projects that reduce emissions of gases with a high GWP generally have a lower capital requirement per CER produced.

Table 6: IRR and GWP of different CDM project types

Project Type	GWP/Emissions factor	Impact on IRR at US$4/tCO2-e (% points)
Hydro, wind, geothermal	0.5–1.0	0.5–3.5%
Crop/forest residues	0.5–1.0	3–7%
Municipal Solid Waste	21	5–60%
HFC-23 destruction	11,700	500+%

Sources: Pinna (2005), Ringius (2006), Acharya (2006)

Capital Investment

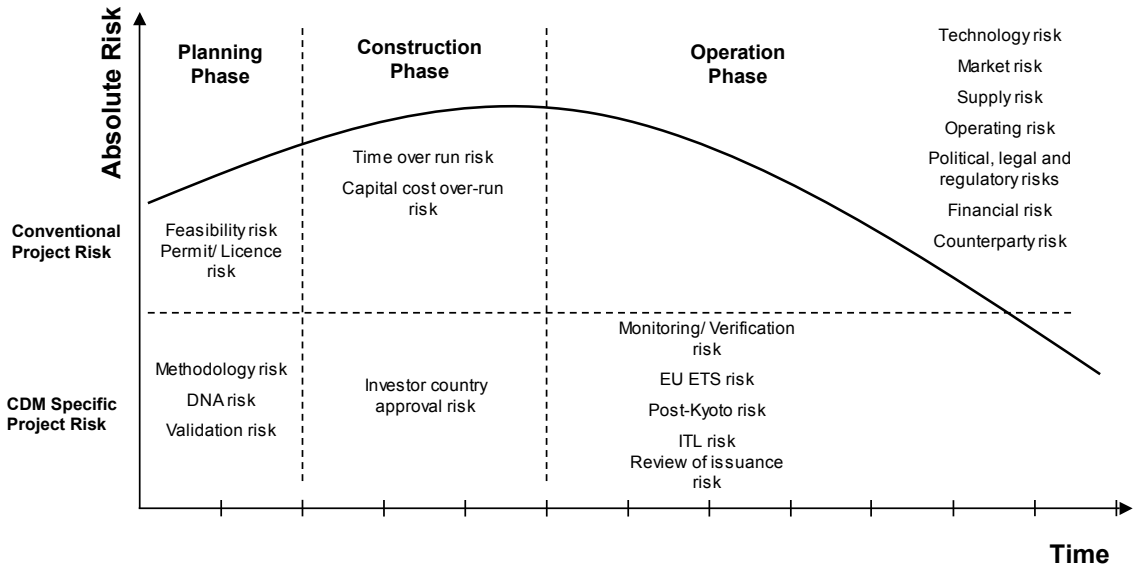
The capital investment required by a project is related to scale (within a project type) but varies considerably between project types. For example, a 15 MW wind farm may cost around US$20 million, whereas a 15 MW anaerobic digestion plant (for flaring only) might cost only US$1–2 million (yet would result in much higher emission reductions because combustion reduces the GWP of methane to that of carbon dioxide). The capital investment is usually the largest cost associated with a CDM project, although the relative importance of operating costs varies and may also be significant for some projects.

Timescale

The time required to implement the project (i.e. to achieve full operation or maximum annual emission reduction potential) is of critical importance due to the politically determined nature of the market for CERs. At present the lack of certainty over the post-2012 political framework is a risk that can only be mitigated in exceptional circumstances (i.e. by finding a buyer willing to take on this risk). Therefore, for most projects the period of 'bankable' CER revenue is limited to the end of 2012. A project that requires several years to implement (such as a wind farm or large hydro scheme) is therefore at a disadvantage relative to a project that may be implemented more rapidly (such as N_2O destruction at adipic acid plants).

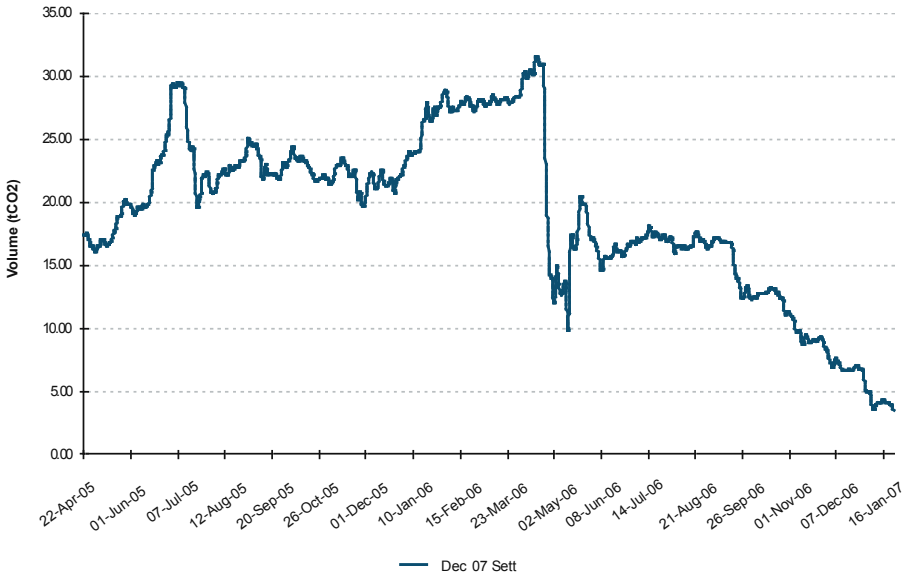
The stage the project is at in the development cycle when the ERPA is signed is also a key determinant of the price the buyer can achieve for future delivery of CERs, since obviously the risk of non-delivery is higher earlier in the project cycle.

Figure 21: Project risk over time



The market view on the future value of CERs is also volatile. Until 2005, the prevailing view was that CERs would be worth no more than around US$5/tCO$_2$-e. However, with the advent of high prices (up to €30/tCO$_2$-e) for allowances in the EU Emissions Trading Scheme in 2005, CDM project developers began to expect correspondingly higher prices for CERs (which may be used for compliance in the EU ETS). The volatility in the EU Allowance (EUA) price has, however, meant that CER contracts closed at different points in time have achieved different values, for reasons which are completely beyond the control of the project developer.

Figure 22: Allowance settlement prices in the EU ETS (for delivery in December 2007)



Source: European Climate Exchange, 29 January 2007

Apportionment of Risks in the ERPA

A contract between a buyer and seller of CERs can be structured in many different ways. The sale may take the form of a spot transaction, a forward sale, or an option. However, the most common form of transaction is a forward sale, with a defined amount of CERs (either a fixed amount or a percentage of the CERs generated by a project) to be sold at defined future delivery dates for a specified price (which may be fixed or linked to a reference price).

As noted above, some of the factors influencing the price of CERs in an ERPA will be beyond the control of the seller of the CERs. However, the seller has a significant degree of control over the apportionment of risks between the buyer and seller, through negotiation of the terms of the ERPA.

The different contract types can therefore be divided into four categories (Eik, 2005):

1. The lowest price is typically paid if the project developer (or seller) does not guarantee delivery of a flexible (non-firm) volume of CERs, while the buyer guarantees to buy, under very few preconditions.
2. The next highest price is paid under the same conditions except that the buyer guarantees to buy only under a number of preconditions as to when the contract is valid.
3. Prices paid are even higher if the seller guarantees to deliver a definite (firm) volume while the buyer guarantees to buy under the same preconditions.
4. The highest prices can be charged if the seller guarantees delivery and agrees to pay for substitute CERs or cash if the emission reductions do not materialise, while the buyer guarantees to buy.

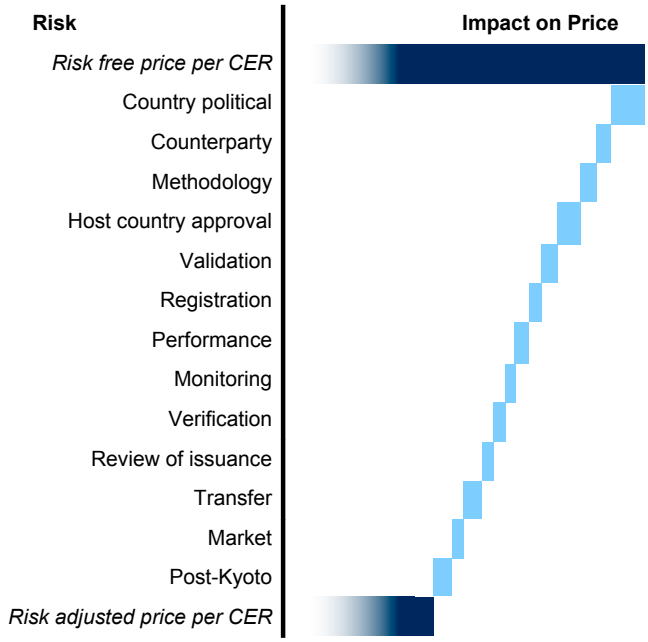
For a CDM ERPA template which includes standardised wording, see the IETA publications available at http://www.ieta.org.

Some of the risks to be apportioned are generic project risks similar to those outlined in section 4 above, but many others are CDM-specific. These are discussed in detail in section 6.3 below.

6.3. Risk Assessment and Management of a CDM Project

Project related risks will affect the ability of a project developer to attract finance for different stages of the project. The risks involved in the project will also influence the price that can be negotiated in a forward contract for the CERs that the project will generate. This section identifies and analyses the risks associated with CDM projects. Furthermore, it addresses to what extent these risks will affect CER prices and thus affect the CDM revenue stream of the project. Two overriding categories of risk can be identified: generic project risks and CDM project specific risks (see below).

Figure 23: CDM project risk profile and its impact on CER price



Generic project risk

Generic project risk is the kind of risk encountered by any project, CDM or otherwise. A number of different risks can be identified within this category.

Country political risk

Country political risk refers to the risk of political and economical instability, of violence or infrastructural disruptions. In general this is related to risks that cause physical or financial damage to the project under 'force majeure', thereby reducing the project's capacity to deliver carbon credits. The risk encountered is frequently a function of political stability and therefore brings into consideration the country in which the project is situated. In one example, intensive planning for a project in a politically unstable Asian country was undertaken with the help of a group of international consultants. When the construction was about to begin the region in which the project was supposed to be implemented was subject to political unrest and the safety of the foreign experts could no longer be guaranteed. With their departure the project ground to a halt, causing considerable delay to its implementation. This example illustrates the fact that country political risk impacts the timing as well as the volume of the CERs, if it disrupts project planning or prohibits implementation of the project altogether. Such a risk may be mitigated by purchasing international political risk insurance.

Counterparty risk

Counterparty risk is a factor that needs to be taken into account in relation to any contract: can the other party be relied upon to deliver? In sections 3.7 and 5.7 above, counterparty risk has been raised as an issue for lenders and investors to consider, in relation to various supply and purchase contracts. In the present context, we are considering the 'counterparty' to be the CER seller, when entering into a forward contract with a CER buyer.

When a CER buyer considers the price it should pay for the promised future delivery of CERs under a forward contract, it will want to assess the credit rating of the CER seller, as an indicator of the counterparty risk. Many CER buyers will have internal credit committees which will impose strict

counterparty credit rating requirements on contract negotiators. Given that many CDM project developers will have poor (or non-existent) credit ratings, they may have to provide credit guarantees in order to satisfy the buyer's credit requirements.

CDM project specific risk

In addition to generic project risk, a variety of CDM-specific risks need to be taken into account, as discussed below.

Methodology risk

To calculate the emission reductions of a CDM project, the project needs to select an approved baseline and monitoring methodology. If a CDM project is able to use an existing approved methodology, this considerably reduces the overall risk profile of the project, since developing a new methodology is costly, time-consuming and risky (with a 50% rejection rate, to date). Nevertheless, even developers using only approved methodologies need to bear in mind the risk that the EB may withdraw or put on hold a previously approved methodology, or make amendments to a methodology which can have a significant impact on a project developer planning to carry out a series of similar projects in future.

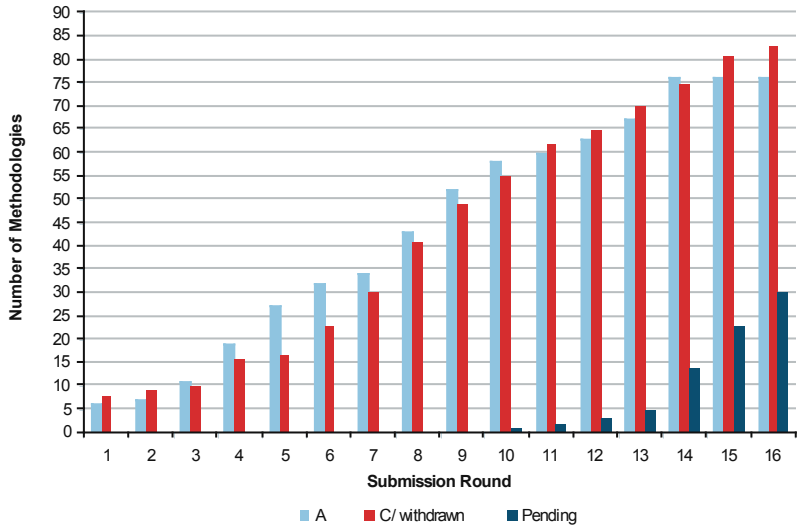
For example, in May 2006 the EB put the methodologies AM0006 - *GHG emission reductions from manure management systems* and AM0016 - *Greenhouse gas mitigation from improved animal waste management systems in confined animal feeding operations* on hold for review and to receive public comments. The methodology was on hold without a substitute for over four months, before a new consolidated methodology was approved (ACM0010).

If an appropriate methodology for the project type in question does not yet exist, a new methodology can be developed. The methodology needs to gain approval by the UNFCC Methodology Panel (Meth Panel) and the EB. The Meth Panel grades the methodology with an A for direct approval, B for required revision and C for rejection. Historic data show that, in many cases, revision of the methodology was required or the methodology was rejected. Furthermore, it took, on average, around 303 days for a methodology to gain final approval.[12] In addition, the Meth Panel faces time pressures. With increasing numbers of methodologies being submitted per submission round, the Panel has less and less capacity to deal with the pending methodologies submitted.

12 UNEP Risoe Centre, CDM Pipeline Overview, 11 January 2007, available at: http://www.cd4cdm.org

Figure 24: Average time to final decision from date of initial methodology submission

Figure 25: Grading of all accumulated methodologies.



For these reasons, the risk for the project developer is related to the timing of the CER flow: if a new methodology needs to be developed, time for development and approval will have to be factored in. If a methodology is put on hold the project developer will have to await the decision made by the Meth Panel and the EB, which will also delay the potential carbon revenue.

Host Country Approval risk

In order for a project to be registered with the EB it must receive host country approval from the Designated National Authority (DNA). If a project is deemed not to comply with the requirements

set out by the DNA, the Authority can choose to reject it, thus rendering it ineligible for the CDM. A risk more frequently encountered is the delay when applying for host country approval. It is known that some DNAs regularly take longer to issue an approval than the official timelines suggest (the average time taken between publication of a PDD for comments and issuance of the required Letter of Approval by the DNA is 4.5 months, but this varies up to a year or more in some instances). Host country approval risk therefore mainly impacts the timing of the CER flow.

Validation & registration risk
Every CDM project has to be validated by a Designated Operational Entity (DOE) in order to be registered with the EB. Depending on the quality and transparency of arguments and calculations presented in the project documents, the DOE will issue a list of corrective action or clarification requests to the project developer. These requests have to be addressed by the project developer. In addition, the DOE will post the document on a website for public comment for 30 days. If comments are received they may also have to be addressed by the project developer. Assuming that the project was planned transparently, the project developer should be able to address validation issues in the short-term. However, the DOE may also detect inconsistencies or mistakes in the documents which cannot be addressed in the short-term (or even at all).

The validation stage adds further time-delay risk: although validation of most projects can be done within two months, it typically takes at least three months, due to the high demand for DOE services, and constraints on DOE capacity.

After validation, the project can be submitted for registration to the CDM EB. The registration by the CDM EB will be deemed final 8 weeks after the date of receipt by the CDM EB of the request for registration. Within this 8 week period, the CDM EB has the right to ask for review of the project. The review of a request for registration of a project must be related to issues associated with the validation requirements. Since 2006, all requests for registration are appraised by the CDM Registration and Issuance Team during the 8-week registration appraisal period. Before the introduction of the RIT, only 2% of projects were reviewed at the registration stage. Since 2006, 26% of requests for registration have resulted in requests for review – representing a substantial increase in the risk factor. The registration stage carries a real risk of outright rejection of a project, as well as time-delay risk.

Performance risk
According to the available information to the end of 2006, issuance of CERs has been only around 50% of projected CERs in the registered PDDs. Therefore it appears that the performance of CDM projects has been consistently and significantly over-estimated.

There are several reasons for this. One is due to continuing time-lags in construction and commissioning of projects. These are not necessarily CDM-specific risks, although the likelihood of delays can be increased if a CDM project involves importation of equipment, or practices that are not common in the host country. Another fundamental reason for high performance risk with CDM projects is that the 'output' in question – emission reductions, measured in tonnes of carbon dioxide equivalent – is something that there is still relatively little experience with. Many factors can affect the performance of a project, including the timing of construction, technology performance, the availability of infrastructure and technology, capacity of staff, number of stakeholders and the control the project has over them. In the waste sector, for example, the performance of a project may suffer if a waste stream coming into an anaerobic digester does not have the characteristics required for the waste to be digested anaerobically. The digester will therefore not produce as much methane as originally planned. Performance risk can affect both the timing and the volume of the CER flow from a project.

Monitoring/ Verification risk
A monitoring protocol is prescribed for every methodology in order to monitor the generated emission reductions. The variables that are monitored must be logged transparently by the project developer. In order for CERs to be issued based on these monitored variables, they must be independently verified by a DOE. There are numerous risks related to the monitoring processes and the monitoring equipment installed which may endanger the quantity of CERs to be issued. For example, the monitoring equipment for a landfill gas capture and flaring project may be installed as required. However, in order to produce adequate results, the equipment also has to be calibrated correctly. If the gas flow is not monitored correctly, the emission reductions generated by the project cannot be verified and therefore CERs cannot be issued. This illustrates that monitoring and verification risk factors can impact on the volume of CER flow. Capacity constraints on DOEs can also introduce a time-delay risk.

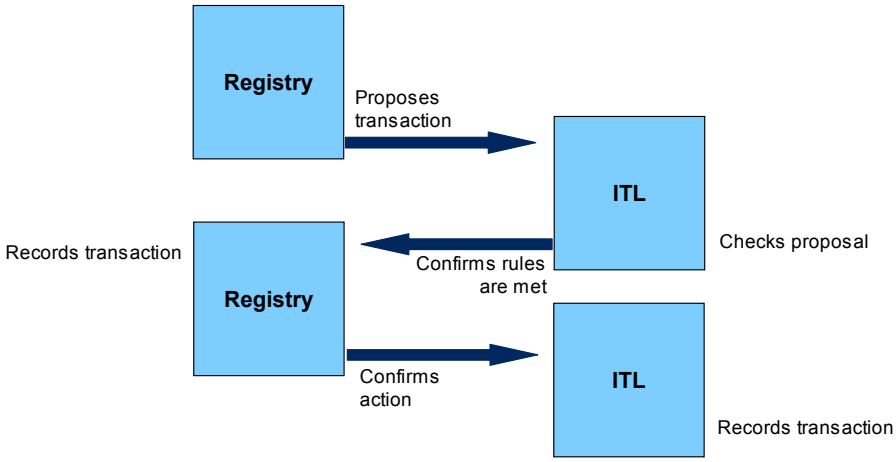
Review of issuance risk
Within 15 days after the date of receipt of the request for issuance, the EB can ask for review of a request for issuance of CERs. Review is limited to issues of fraud, malfeasance or incompetence of the DOE involved in the project. From 2006, the CDM Registration and Issuance Team also appraises all requests for issuance of CERs. If any issues relating to verification and issuance arise, the project may receive less CERs than originally expected (or even none at all). The review of issuance risk will thus affect the volume of CERs generated.

If a request for review is triggered, the EB must decide on its course of action at its next meeting. If it decides to go ahead with a formal review, this must be carried out within 30 days. In total, the possible delay resulting from a request for review can be up to 4 months.

Transfer risk
In order for CERs to be issued, the project developer can choose to develop a project unilaterally, thus assigning the legal rights to the CERs to a project participant from the host country. More commonly, however, the legal rights to the CERs are assigned to a project participant from an Annex I country. Before the CDM EB will issue the CERs for such a project, the project participants will need to inform the Board as to which Annex I party will be involved in the project and seek an investor country approval letter from this Annex I party. Obtaining an investor country letter of approval is therefore a risk which can affect the timing of the CER flow.

Upon certification of the emission reductions, the CERs need to be delivered in the electronic account of the buyer. An international system of registries has been developed to enable such a transfer. A registry is an electronic administration system used by a government to register emission allowances, record transfer of ownership of allowances and reconcile allowance holdings against actual emissions. The International Transaction Log (ITL) is managed by the CDM EB; it logs international transfers of CERs from registry to registry. The ITL provides certainty of delivery to the carbon market and builds up records of holdings and transactions which mirror registries by recording 'transactions' of CERs from the CDM Registry to the national registries of Annex I Parties in accordance with the Kyoto Rules (see Figure 26 below).

Figure 26: Interaction between registries and the ITL



Source: Schmidt, 2005

The contract to build the ITL was awarded in August 2006 and is expected to be complete by April 2007. However, as with any complex IT project, there is risk of time delays.

Market risk

The largest market for CERs is the EU ETS. In this market the freely traded commodity is the European Union Allowance (EUA). Being an openly traded commodity, market prices of EUAs fluctuate over time. However, the EU ETS is regulated by the EU and, hence, EU policy is a key factor in determining its development. Prior to every trading phase, Member States propose allocation levels, which in turn are negotiated with the European Commission. The outcome of these negotiations determines the shortage of allowances in the market, and therefore the demand for additional carbon credits such as CERs. If the allocations are not negotiated and assigned appropriately, more EUAs may be supplied to the market than required, which may cause a drastic fall in the demand for EUAs. This happened during Phase I of the EU ETS (2005–2007) when on 15 May 2006 many EU governments announced that allocations for 2005 had exceeded actual emissions. As a result, the EUA price fell from about €30 to €9 within a few days (see Figure 22 above).

The behaviour of the EU ETS, as well as other markets for CERs (see section 2.5 above) can affect both the price and volume of CER demand. It is common for CER prices in ERPAs to be linked to the EU ETS price at the time of selling, thus exposing the seller to the uncertainty in the EU ETS market.

Post-Kyoto risk

The Kyoto Protocol sets out to reduce emission reductions by 5.2% between 2008–2012. A follow-up to the Protocol and what role the CDM might play under this new regime has not yet been decided. Post-Kyoto risk is therefore due to the uncertain international demand and recognition for CERs beyond 2012. It should be noted, however, that the EU has stated that the EU ETS, the largest potential market for CERs (see section 2.5 above) will remain active even after the end of the Kyoto commitment period in 2012.[13] The post-Kyoto risk relates to CDM projects particularly because project developers can choose CER crediting periods of 10 years (which cannot be renewed) or 7 years (which can be renewed twice). These crediting periods of up to 21 years therefore put the projects well beyond the end of Kyoto in 2012 and, although there may be some continued demand for CERs from the EU, international demand remains far from certain. This risk affects the price and demand for all CERs beyond 2012.

13 European Commission, DG Environment, available at: http://ec.europa.eu/environment/climat/emission.htm

From the project developer's viewpoint, the lack of any certainty post-2012 implies a rapidly approaching 'cliff edge' beyond which it will be virtually impossible to raise finance for a new CDM project. This is due to the fact that CDM project development takes at minimum 6 months, and often up to 3 years or longer, and therefore the window of opportunity for a project to at least recover its costs while there is any degree of certainty over CER revenue (i.e. to December 2012) is rapidly narrowing. In practice, this cut-off point will be reached at different times for different project types, depending on their rate of return. It may already have been reached for some project types in which little project developer interest has been shown. Very few CER buyers are prepared to commit to buying CERs beyond 2012, and only then at very low prices. Likewise, any party willing to take on the risk of financing a project that will not recover its costs before 2012 will require a very high rate of return on their investment. Either way, the post-2012 market will be highly constrained until there is some certainty on the post-2012 regime, and this will begin to affect development of CDM projects much earlier than this.

6.4. Risk Mitigation and Management

The above mentioned risks all impact CDM projects. More specifically, they affect the timing of the delivery of emission reduction credits to the buyer and the overall volume of credits that may be generated by a project. Depending on the level of risk associated with a given project, the buyer may be less willing to pay above a certain price (as illustrated by Figure 23 above). While it is not possible to make general statements about the magnitude of the impact of risks on prices, a project specific risk profile can help to determine what the price of a CER from a certain project may be. Therefore, if CDM-specific risks can be reduced, the certainty of supply of CERs from the project developer to the buyer can be improved, thus increasing the premium that can be charged per CER. In this section we address how CDM-specific risks can be reduced and managed.

Planning Phase

Generally, lenders are unlikely to bear any risk involved in the planning and preparation of a project. Instead, the project developer will have to mitigate these risks and re-allocate them as well as possible. The risks encountered in the planning stage of a project, and how they can be managed, are addressed below.

Methodology risk

The project developer is subject to the demanding administrative rules and regulations set out under the Marrakesh Accords. There are relatively few options to mitigate this risk in the early stages of the project cycle. Methodology risk may be mitigated by closely observing the political and regulatory development of the CDM EB, Meth Panel and the different working groups. This can be done by monitoring the minutes of meetings released to the public, or by engaging an experienced consultant to develop any new methodology. If applicable, a project developer may also consider a diversification of its portfolio in order to decrease the dependence on specific regulatory or methodological decisions.

Host Country Approval risk

In order to gain host country approval the project developer depends on the scrutiny and timeliness of the DNA. While this risk varies from one DNA to the next, it can lead to considerable delay or outright rejection of the project. Many carbon funds have signed memoranda of understanding with host country governments in order to reduce such risks. While the project developer may not be able to pass on this risk, adequate preparation should precede project development in order to reduce the risk as much as possible. For example, the DNA may be notified of the application for the project well in advance, in order to identify any possible obstacles it may face. In the case of China, it is even possible to receive a document from the DNA stating that it would grant approval if the project was implemented in the conditions outlined in the project documentation. Although such a document may not remove all risk, it may reduce it considerably. It will, nevertheless, be difficult to anticipate and plan for possible delays caused by the DNA.

Validation & registration risk
While the project developer will have to bear the validation risk, in some cases a lender may take on registration risk. The validation risk can be reduced by adequate preparation by the project developer to deal with any issues that may arise during the validation process. Although all possible comments from the DOE and the public cannot be anticipated, contingency can be planned in order to ensure that all correction requests are addressed adequately, in order for the project to progress to registration.

Depending on the comments from the DOE, the lender to the project may accept to shoulder the registration risk, since the two are closely linked. However, to obtain additional assurance that the project will be registered, the lender may also consider an independent evaluation of the project by an expert.

Construction and Operation Phases

Risks encountered during the construction and operation phases of the project will primarily be borne by the lenders and investors. Generally, lenders will wish to see a project registered or at least validated before issuing funds for construction (unless the project can satisfy debt service requirements on the basis of other revenue streams, regardless of CER revenue).

Monitoring/ Verification risk
This is a technical risk which should be assessed by the lender as part of the due diligence of the project. One way to mitigate the monitoring/verification risk, even after due diligence is completed, is to contract the services of CDM consultants with experience in the specific requirements of monitoring protocols, and with the requirements and practices of auditors of CDM projects, in order to ensure that monitoring procedures are adequate, and hence reduce the verification risk.

Review of issuance risk
The risk that CERs may not be issued due to malpractice during the verification process is another risk which the lender to the project will have to bear. It can be mitigated by taking the necessary precautions when a DOE is selected for project verification, and possibly through liquidated damages clauses in contracts with DOEs. This may also be enforced by conducting independent checks on the work of the DOE on the project.

Transfer risk
Transfer risk can be mitigated by making the CER buyer a project participant (ideally the Focal Point, so that they may instruct the EB when and to which account CERs should be issued). A lender may re-allocate this risk to the project developer by including relevant wording in the ERPA.

The risk that a transfer of CERs may not be possible due to delays in the completion of the ITL can be mitigated through compensation clauses in the ERPA – for example, requiring the seller to provide alternative carbon credits (such as EUAs) as a substitute. However, such arrangements will come at a price.

Market risk
Historic EU ETS prices (see Figure 22 above) show that the risk of market fluctuations can be considerable. The exposure of the buyer and seller to this risk is determined by the choice of pricing structure in the ERPA. At one extreme, the buyer may offer a fixed price, while at the other, the price may be directly linked to the price of a EUA on the day of delivery of the CER. A compromise may involve setting a price floor in order to ensure a minimum revenue stream to the seller, and a price ceiling to ensure the maximum price a buyer will have to pay. Another option to mitigate such a risk is to develop more reliable forecast models of EUA prices.

Post-Kyoto risk
Very few steps can be taken to mitigate this political and regulatory uncertainty of the international carbon market. A lender to the project may reduce this risk by selling CERs to carbon funds (such as

the Community Development Carbon Fund or the BioCarbon Fund) that guarantee some payment for CERs beyond 2012. Another option to manage this risk would be to hedge or 'lock in' future CER prices through financial derivatives. This, however, brings another risk: the fixed contracted price may end up lower than future market values (Spalding-Fecher, 2002). The number of buyers willing to offer firm guarantees to buy beyond 2012 may increase rapidly if there are positive movements in the international negotiations on the post-Kyoto framework. However, at the time of writing, the outlook for the carbon market post-2012 remains highly uncertain.

7. Sources of Finance for CDM Projects

The following sections provide information about potential sources of finance for CDM projects. Multilateral, governmental and private sector carbon funds are listed in sections 7.1 and 7.2 below. Although the list is by no means exhaustive, it provides an indication of the types of funds in existence and their specific characteristics, including whether or not they provide any support for CDM project development. For more information on the different funds, it is recommended to consult the funds' websites (also provided below). A list of multilateral financiers is provided in section 7.3, as well as a link to a list of private financiers, and a brief recommendation is provided on how to make contact with equity providers and specialist private sector CDM developers in section 7.4.

7.1. Multilateral & Government Carbon Funds

Most funds set out in the tables below prefer to contract projects that are well advanced in the planning stage and have already identified underlying finance for the project itself. These funds typically require some form of proof of the economic viability of the project and the technology used. Furthermore, funds prefer projects which have already assessed their applicability under the CDM regulatory framework. This applicability may include the existence of an approved methodology and an initial assessment of the likely emission reductions resulting from the project. In addition, most funds set up by international and national development banks require the projects to meet their own rigorous social and environmental eligibility criteria. A non-exhaustive list of a number of multilateral and governmental funds is provided in the table below. For the most recent and detailed information, it is recommended to consult the funds' websites.

Name of Fund/Website	Management	Type of Projects & Geographic Focus	CDM Project Support & Fund Dates
Austrian JI/ CDM Programme www.ji-cdm-austria.at/en	Kommunalkredit Public Consulting	- All CDM/ JI project types. - Memoranda of Understanding with: Argentina, Bolivia, Bulgaria, China, Colombia, Czech Republic, Ecuador, Estonia, Hungary, Indonesia, Latvia, Mexico, Morocco, New Zealand, Peru, Romania, Slovakia, Tunisia, Vietnam.	- Max. 50% (max. €40,000) of project related documents can be paid by Fund (e.g. baseline study, monitoring plan, validation). - Ongoing calls for projects. - To be fully invested in 2012.
Belgian JI/ CDM Tender www.klimaat.be/jicdmtender/	Belgian Federal Government	- All CDM/ JI projects (excl. LULUCF) types with a preference for: - Small-scale projects in energy efficiency and renewable energy. - Geographic focus: Africa, least developed countries, partner countries of Belgian Development Cooperation.	- Costs related to proposal document preparation will be contributed to (min. €27,500) if project developer exclusively commits to Fund. - First tender for projects closed, second tender to launch late 2006. - Pre-payment of up to 50% of contract possible under certain conditions. - Operational until 2012.

BioCarbon Fund www.carbonfinance.org	World Bank Carbon Finance Group	CDM: -Afforestation/Reforestation. JI: - LULUCF. - Also: plans to purchase credits not applicable under Kyoto.	- Some project related documents can be paid by Fund (baseline study, additionality, verification) but charged to project, if approved. - Fund is expected to stop purchase in 2017.
CAF- Netherlands CDM Facility www.caf.com	Corporation Andina de Fomento (CAF	- CDM projects in energy, mass transport, industry and waste sectors. - Geographic focus: Members of CAF & other Latin American and Caribbean countries,	- 0–100% of project related documents can be paid by Fund, decided on project-by-project basis. - To be fully invested in 2012.
CAF- Spain Carbon Initiative www.caf.com	Corporation Andina de Fomento (CAF)	*Same as CAF- Netherlands CDM Facility*	*Same as CAF- Netherlands CDM Facility*
Community Development Carbon Fund www.carbonfinance.org	World Bank Carbon Finance Unit	- All CDM project types (incl. afforestation, reforestation & LULUCF) that make sustainable contribution to community development. - Large-scale project must yield >50,000 tCO_2-e per year.	- Project related document costs (baseline study, monitoring plan, PDD) are initially covered by Fund but reimbursed via adjustment of CER level after issuance. - Closed to investors. - Operational until 2015.
Danish Carbon.dk Public Procurement Program www.danishcarbon.dk	Danish Environmental Protection Agency (DEPA)	- CDM/ JI projects in renewable energy, fuel switching, energy efficiency, methane capture, industrial emission reductions. - Geographic focus: Central & Eastern Europe, Central Asia, Caucasus. - Large-scale project must yield > 50,000 tCO_2-e per year.	- Accepted proposals may be offered DKK200,000 for further project development. - Fourth tender opened in 2006 with PIN submission deadlines throughout the year. - To be fully invested by 2012.
EcoSecurities/ Standard Bank Carbon Facility www.ecosecurities.com, www.standardbank.com	EcoSecurities, Standard Bank	-CDM/JI (Track 1 & 2) except sequestration projects. -Geographic focus on: Central and Eastern Europe. - Large-scale project must yield > 50,000 tCO_2-e per year.	- Project documents (incl. host country approval) prepared by facility and paid by Danish Government. Project developer carries verification cost. - Operational until 2012 (possibility of prolongation).

Flemish Government JI / CDM Tender www.energiesparen.be/fxm	The Flemish Region	- CDM/JI (Track 2), preference for energy saving, energy efficiency, renewables.	- No support is offered.
Italian Carbon Fund www.carbonfinance.org	World Bank Carbon Finance Unit	- CDM/JI projects esp. in renewables, methane capture, gas flaring & carbon sequestration. - Geographic focus on Mediterranean, Balkans, Latin America, Middle East.	- Project related document costs (baseline study, monitoring plan, PDD) are initially covered by Fund but reimbursed via adjustment of CER level after issuance. - Operational until 2014.
Multilateral Carbon Credit Fund (MCCF) www.ebrd.com	European Bank for Reconstruction and Development (EBRD), European Investment Bank (EIB)	- CDM/JI projects & facilitation of Green Investment Schemes. - Credits will only be purchased from EBRD/EIB financed projects. - Geographic focus on: EBRD lending countries (i.e. Eastern Europe, Central Asia)	NA
Netherlands Carbon Facility (INCaF) www.ifc.org/carbonfinance	International Finance Corporation (IFC)	- CDM projects, focus on renewable energy, energy efficiency, capture and use of Methane, fuel switching, mitigation of potent GHGs.	- Generally CDM project documentation related costs are not paid although it may be requested by client. Costs will have to be reimbursed or are integrated into CER price. - To be fully invested in 2007. - Ongoing IFC activity planned.
Netherlands CDM Facility www.carbonfinance.org	World Bank Carbon Finance Unit	-CDM projects (incl. LULUCF) in: renewables, biomass, energy efficiency, fuel switch, methane recovery, carbon sequestration.	- Project related document costs (baseline study, monitoring plan, PDD) are initially covered by Fund but reimbursed via adjustment of CER level after issuance. - To be fully invested in 2006.
Prototype Carbon Fund (PCF) www.carbonfinance.org	World Bank Carbon Finance Unit	-CDM/ JI projects (incl. LULUCF). - Projects must yield >30,000 tCO_2-e per year.	- Project related document costs (baseline study, monitoring plan, PDD) are initially covered by Fund but reimbursed via adjustment of CER level after issuance. - Operational until 2013 unless participants decide to extend.

Rabobank-Dutch Government CDM Facility www.rabobank.com	Rabobank	- CDM projects (excl. forestry projects) - Geographic focus where Bank is active: preferably China, India, Brazil and Mexico. - Preference for projects with 1Mt of CERs before 2012.	- Project specific. - To be fully invested in 2012.
Spanish Carbon Fund www.carbonfinance.org	World Bank Carbon Finance Unit	- CDM/JI projects with sustainable development component in renewable energy, biomass, agricultural waste, urban waste management, industrial processes. - Geographic focus on Latin America, North Africa and Europe.	- CDM project development costs (baseline study, monitoring plan, PDD) are initially covered by Fund but reclaimed once projects are approved. - Operational until 2015.
Swedish International Climate Investment Program SICLIP 2002 - 2012 www.stem.se	Swedish Energy Agency	- CDM & JI projects with preference for renewable energy, energy efficiency, small-medium sized projects. - Geographic scope: Asia, Latin America, Africa, Central/ Eastern Europe	- Support for document preparation can be provided if requested. Can cover +50% of costs in some cases. - To be fully invested in 2007.

7.2. Private Carbon Funds

The project eligibility criteria for private carbon funds are in many cases similar to the criteria set out for the Multilateral and Governmental Carbon Funds. A non-exhaustive list of a number of such private carbon funds is provided in the table below. For the most recent and detailed information, it is recommended to consult the funds' websites.

European Carbon Fund www.european-carbonfund.com	IXIS Environment and Infrastructure	-CDM/JI projects (excl. LULUCF) - Invests in all carbon assets: CERs, ERUs, EUAs & derivatives. - Projects must yield 50,000-1m tCO_2-e per year.	- CDM project development costs are not covered by Fund but may be advanced. - To be fully invested by 2012.
GG-CAP Greenhouse Gas Credit Aggregation Pool www.natsource.com	Natsource	- CDM/JI projects in agriculture, cement, chemicals, mining, petroleum, pulp and paper, waste management, also: fuel switching, renewable energy and efficiency, fugitive gases, catalytic destruction.	- Project specific. - Operational until 2010.
ICECAP www.icecapltd.com	ICECAP Carbon Portfolio Lim.	- CDM/JI projects. - Projects must yield >100,000 tCO_2-e per year.	- Generally no support for project documentation development, project specific.
Japan Carbon Finance Ltd www.ecosecurities.com, www.jcarbon.co.jp	EcoSecurities, Japan Carbon Finance	- Small-scale CDM projects.	- CDM project documentation development costs as well as validation and verification fees are covered by Fund.
KfW Carbon Fund www.kfw.de/carbonfund	Kreditanstalt fuer Wiederaufbau (KfW)	- CDM/JI projects - Projects must yield >50,000 tCO_2-e per year.	- Generally no support, but loan facility for up to 50% of project documentation development costs (max. €50,000) is available) - To be fully invested in mid-2007

7.3. Multilateral and private financiers

The project eligibility criteria for multilateral and private financiers are in many cases similar to the criteria set out for the multilateral and governmental carbon funds. A non-exhaustive list of a number of multilateral financiers is provided in the table below. For the most recent and detailed information, it is recommended to consult the financiers' websites.

Name of Financier	More information
Asian Development Bank	http://www.adb.org
African Development Bank	http://www.afdb.org/
European Bank for Reconstruction and Development	http://www.ebrd.org
European Investment Bank	http://www.eib.org
Export Import Bank (USA)	http://www.exim.gov
Export Import Bank (Japan)	http://www.jbic.go.jp
Global Environmental Facility	http://www.gefweb.org
Inter American Development Bank	http://www.iadb.org
International Fund for Agricultural Development	http://www.ifad.org
International Monetary Fund	http://www.imf.org
Kreditanstalt für Wiederaufbau (German Bank for Reconstruction and Development)	http://www.kfw.de
North American Development Bank	http://www.nadb.org/
Overseas Economic Cooperation Fund (Japan)	http://www.jbic.go.jp
Swedish International Development Agency	http://www.sida.se/
United States Agency for International Development	http://www.usaid.gov/
World Bank Group (including IBRD, IDA, IFC, and MIGA)	http://www.worldbank.org

For a list of private financiers please refer to the following link which provides an overview of the worlds' commercial banks. http://tfs.xproject.ru/bankwatch/eng/bnksrtd/banks.html

7.4. Equity Providers/ Private Developers

More and more investors who seek to invest equity in CDM projects are joining the carbon market as it has become more established. If CDM project proponents require or are interested in sourcing equity providers or involving private developers in their projects they should research the specific sector in question and attempt to locate and contact developers on an individual basis. As the global profile of the carbon market grows, events, conferences and trade fairs regularly take place around the world, bringing together the key actors in the market. It is recommended to seek out events such as the World Bank/IETA organised Carbon Expo (http://www.carbonexpo.com) or Carbon Expo Asia (http://www.carbonexpoasia.com) as these events are usually frequented by a wide range of CDM stakeholders, including equity providers and private developers.

In future, information may also be available on the UNFCCC/UNEP Risoe Centre CDM Bazaar website, which is expected to be launched in 2007. The aim of the website will be to '*Make publicly available relevant information on proposed CDM project activities in need of funding and on investors seeking opportunities, in order to assist in arranging funding of CDM project activities, as necessary'* (UNFCCC). The site will contain information for project developers, sellers, investors and buyers. This will include contact information, characteristics of project activities seeking funding or of interest to buyers (e.g. type, size, country, etc.), the nature of relationship e.g. buyer, technology provider, equity/debt and the project support documentation at various stages.

Annex 1: References

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Sources of further information

For more information on the CD4CDM capacity building programme, including other guidebooks and the UNEP Risoe CDM Pipeline, see http://cd4cdm.org/

For additional information on the CDM and its developments, as well as for the downloadable spreadsheet containing details of the CDM Pipeline, see the UNEP Risoe 'centre (URC): http://www.uneprisoe.org

For all information on CDM modalities and procedures, methodologies and projects, see the UNFCCC CDM website, http://cdm.unfccc.int/

For information on the EU ETS, see the European Commission's EU ETS web page: http://ec.europa.eu/environment/climat/emission.htm

For EU ETS prices, see the European Climate Exchange (ECX): http://www.europeanclimateexchange.com/

For more information on planning your business and guidance for business plans, see the US Small Business Administration (SBA): http://www.sba.gov/

Project financial models are discussed in greater detail in UNFCCC (2006).

For a list of private financiers please refer to the following link which provides an overview of the Worlds' commercial banks: http://tfs.xproject.ru/bankwatch/eng/bnksrtd/banks.html

For information on World Bank Group work on carbon finance, see: http://carbonfinance.org

Annex 2: Acronyms and Glossary

AAU	Assigned Amount Unit	Unit measured in tonnes of carbon dioxide equivalent, in which Annex I country targets are denominated, under the Kyoto Protocol.
ACM	Approved Consolidated Methodology	Large-scale methodology to calculate emission reductions for a project, approved for public use by the UNFCCC EB. Consolidated from a number of approved methodologies (AMs).
AIJ	Activities Implemented Jointly	Mechanism governing project-level carbon credit activities, in operation between 1995 and 2000.
AM	Approved Methodology	Methodology to calculate emission reductions for a large-scale CDM project, approved by the UNFCCC EB.
Annex I Parties		Countries listed in Annex I to the UNFCCC; developed countries taking the lead in responding to climate change.
BAU	Business As Usual	The continuation of the status quo. In the CDM context it usually refers to a scenario under which an emission reducing activity/ project would not have taken place.
Carbon credit		Generic term for an allowance to emit one tonne of carbon dioxide equivalent.
CCN	Carbon Credit Note	A fully underwritten obligation (in the form of a note or bond) to deliver a carbon credit (CER) to the purchaser at a specified future date.
CDM	Clean Development Mechanism	Mechanism introduced by the Kyoto Protocol governing project-level carbon credit activities in non-Annex I countries.
CEF	Carbon Emission Factor	Factor which expresses the carbon intensity of an energy source.
CER	Certified Emission Reduction	Carbon credit from a CDM project, expressed in tonnes of CO_2 equivalent (tCO_2e).
CO_2	Carbon dioxide	The most common greenhouse gas.
CO_2-e	Carbon dioxide equivalent	Unit in which different greenhouse gases can be measured, based on their GWP.

(First) Commitment Period		2008–2012, the period when Annex I countries must show they have met their Kyoto targets.
CoP	Conference of the Parties	Official meeting of the Parties to the UNFCCC.
DNA	Designated National Authority	Climate change focal point of a member country of the UNFCCC which approves CDM projects in the project host country.
DOE	Designated Operational Entity	Organisation accredited by the EB for validating CDM projects.
DSCR	Debt Service Cover Ratio	The ratio of EBITDA to all debt servicing requirements (i.e. interest plus loan repayments).
EB	Executive Board of the CDM	International authority which supervises the registration of CDM projects and CDM related procedures.
Equity IRR	Equity Internal Rate of Return	The return on an equity investment. This represents the yield of the project for the equity investors, after any debt financing has been taken into account.
ERPA	Emission Reduction Purchase Agreement	Contractual agreement for the purchase of CERs.
ESCO	Energy Service Company	Company which specialises in the provision of energy services, e.g. energy efficiency.
EUA	EU ETS Allowance	Carbon credits created as a tradable commodity under the EU ETS, expressed in tonnes of CO_2 equivalent.
EU ETS	European Union Emissions Trading Scheme	Cap-and-trade scheme for carbon dioxide emissions from major industrial sectors within the EU.
ERU	Emission Reduction Unit	Carbon credit from a JI project, expressed in tonnes of CO_2 equivalent (tCO_2e).
GHG	Greenhouse Gas	Defined by the Intergovernmental Panel on Climate Change as one of a group of six gases (CO_2 - Carbon dioxide, CH_4 – Methane, N_2O - Nitrous oxide, PFCs – Perfluorocarbons, HFCs – Hydrofluorocarbons, SF_6 - Sulphur hexafluoride) which contribute to human-induced climate change.

GIS	Green Investment Scheme	A scheme to promote the environmental effectiveness of AAU transfers between Annex I countries, by earmarking revenues from these transfers for environmentally-related purposes in the seller countries.
GWP	Global Warming Potential	The different potencies of GHGs with regards to their impact on climate change, expressed in comparison to the GWP of carbon dioxide, which is 1.
IET	International Emissions Trading	Mechanism introduced by the KP allowing the trade of emission allowances (AAUs) between Annex I countries.
IPP	Independent Power Producer	Privately owned power producer.
IRR	Internal rate of return	Indicator for the profitability of an investment.
ITL	International Transaction Log	Global electronic transfer system to enable trading of carbon credits under the Kyoto Protocol.
JI	Joint Implementation	Mechanism introduced by the Kyoto Protocol governing project-level carbon credit activities between Annex I countries.
KP	Kyoto Protocol	International legal instrument on climate change containing emission reduction commitments for Annex 1 Parties.
LFE	Large Final Emitters (system)	Proposed Canadian emissions trading scheme for large industrial emitters
LIBOR	London Inter-Bank Offer Rate	Benchmark 'minimum' interest rate.
LoA	Letter of Approval	Letter issued by the DNA in the approval process of a CDM project.
LULUCF	Land use, land-use change and forestry	Kyoto Protocol jargon for terrestrial carbon sink activities (forestry, agriculture, etc.).
M&P	(CDM) Modalities & Procedures	Rules governing the operation of the CDM, as agreed by the Parties to the Kyoto Protocol.
Marrakesh Accords		Rules developed at COP7 with an emphasis on CDM (including the M&P).
MFIs	Micro Finance Institutions	Financing institutions which focus on micro credits. These institutions are typically located in rural areas of less-developed countries.

MoP	Meeting of Parties	With the coming into force of the KP, the CoP started to function as a Meeting of Parties to the Kyoto Protocol.
MP	Methodology Panel	Body of experts under the EB, assigned with the task of assessing new methodology submissions and suggestions for revision.
NAP	National Allocation Plan	Document prepared by each EU Member State in advance of each Phase of the EU ETS, setting out allocations to individual installations in that country for that phase.
NGO	Non-Governmental Organisation	A special interest group with no affiliation to the government.
NM	New Methodology	A new methodology submitted to the MP for approval.
Non-Annex I countries		Countries not listed in Annex I to the UNFCCC; generally developing countries.
NPV	Net Present Value	Sum of the future discounted cash flows of a project.
ODA	Official Development Assistance	Development aid from developed to developing countries.
OTC	Over The Counter	Bilateral trades between a buyer and a seller, not mediated through an exchange.
PCF	Prototype Carbon Fund	Early carbon fund established by the World Bank.
PDD	Project Design Document	Document that needs to be prepared and submitted to the Executive Board through a DOE in order to register a CDM project.
PIN	Project Idea Note	Preliminary CDM feasibility study; not a statutory part of the CDM process but often produced to facilitate host country approval and/or financing of a project.
PPA	Power Purchase Agreement	Contractual agreement for the purchase of electricity generated by a project.
RESCO	Renewable Energy Service Company	Company which specialises in the provision of renewable energy services.
RMU	Removal Unit	Carbon credit from a LULUCF project in an Annex I country, expressed in tonnes of CO_2 equivalent (tCO_2e).

SPV	Special Purpose Vehicle	Legal entity established for a specific purpose, for example to carry out a single project.
SSC	Small-scale methodology	Methodology to calculate emission reductions for a small-scale project, approved by the CDM EB.
tCER	temporary Certified Emission Reduction	Carbon credits from CDM forestry projects with a validity of 5 years.
tCO_2e	tonnes of carbon dioxide equivalent	Common unit for carbon credits.
UNCED	United Nations Conference on Environment and Development	International conference at Rio de Janeiro in 1992, at which UNFCCC was signed.
UNEP	United Nations Environment Programme	United Nations body dealing with matters to do with the environment.
UNFCCC	United Nations Framework Convention on Climate Change	International legal instrument to address climate change, signed in 1992.
VER	Verified Emission Reduction or Voluntary Emission Reduction (n.b. two separate meanings)	Carbon credit which has been verified by an independent third party, but not otherwise approved under the Kyoto Protocol. Carbon credit created specifically for the voluntary offset market.

This Guidebook is part of the CDM knowledge management tools produced by the Capacity Development for CDM (CD4CDM) Project, being implemented by the UNEP RISOE Centre, Denmark. The overall objective of the CD4CDM project is to build capacities of national stakeholders in developing countries in CDM project design, preparation, approval, financing and implementation. This document is produced with the aim of providing a simplified guidance to both bankers and project developers in developing countries on possible approaches to financing a CDM project. Examples of various CDM financing schemes are presented, including a list of possible sources of funding and programs for procurement of emissions reductions from developing countries. An electronic version of this document can be downloaded from www.cd4cdm.org

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Risø National Laboratory
Roskilde
Denmark