Asian Development Bank

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opportunities for the CDM in the Energy Sector
The People’s Republic of China

Appendix D:
Small-Scale Clean Development Mechanism
Project Handbook

March 2004

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Prepared for:
Beijing, Government of the People’s Republic of China
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## ACRONYMS

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<thead>
<tr>
<th>Acronym</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
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<tr>
<td>CDCF</td>
<td>Community Development Carbon Fund</td>
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<tr>
<td>CDM</td>
<td>Clean Development Mechanism</td>
</tr>
<tr>
<td>CDM EB</td>
<td>Clean Development Board Executive Board</td>
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<tr>
<td>CER</td>
<td>Certified Carbon Credits</td>
</tr>
<tr>
<td>COP</td>
<td>Conference of Parties</td>
</tr>
<tr>
<td>DOE</td>
<td>Designated Operational Entity</td>
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<td>DNA</td>
<td>Designated National Authority</td>
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<tr>
<td>EIA</td>
<td>Environment Impact Assessment</td>
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<td>GEF</td>
<td>Global Environment Facility</td>
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<tr>
<td>GHG</td>
<td>Greenhouse Gas</td>
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<tr>
<td>GWh</td>
<td>Gigawatt Hour</td>
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<tr>
<td>IFC</td>
<td>International Finance Corporation</td>
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<tr>
<td>JI</td>
<td>Joint Implementation</td>
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<td>KP</td>
<td>Kyoto Protocol</td>
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<tr>
<td>MSW</td>
<td>Municipal Solid Waste</td>
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<td>PCF</td>
<td>Prototype Carbon Fund</td>
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<tr>
<td>PDD</td>
<td>Project development document</td>
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<tr>
<td>PRC</td>
<td>People’s Republic of China</td>
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<tr>
<td>SSC CDM</td>
<td>Small-scale Clean Development Mechanism</td>
</tr>
<tr>
<td>SSC PPD</td>
<td>Small-scale Project Design Document</td>
</tr>
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UNEP  United Nations Environment Program
UNDP  United Nations Development Program
UNFCCC  United Nations Framework Convention on Climate Change
WB  The World Bank
INTRODUCTION

Background to the Handbook

The basis for this Handbook is the Kyoto Protocol. The Kyoto Protocol was drafted in 1997 at the third Conference of the Parties to the United Nations Framework Convention (UNFCCC) on Climate Change. Article 12 of the Kyoto Protocol establishes the Clean Development Mechanism (CDM) as a project-based instrument. One of the purposes of the CDM is to facilitate investments in greenhouse gas emissions (GHG) reduction projects in developing countries. In addition, in accordance with the Kyoto Protocol, CDM projects must contribute to sustainable development in the developing country that “hosts” the project and simultaneously assist developed countries to achieve their emissions reduction obligations under the Protocol.

The rules and procedures for the CDM have been designed to ensure that all projects can demonstrate a positive contribution to greenhouse gas reduction and sustainable development. The rigor of the standard CDM procedures means that most CDM projects will likely incur substantial indirect transaction costs; this creates a bias in favor of larger companies that have the capacity and financial resources to implement large-scale emissions reduction projects. The Conference of Parties (COP) to the Climate Change Convention recognized the bias against small-scale CDM (SSC CDM) investments and have taken steps to establish streamlined procedures to promote SSC CDM.

In early 2003 a set of simplified modalities and procedures for SSC CDM project activities was released by the CDM Executive Board. These simplified modalities and procedures focus on the use of standard methodologies and default values to calculate emissions reductions, thereby reducing the cost and time of preparing a project while also minimizing the risk and uncertainty in determining a project’s eligibility under the CDM.

The Government of the People’s Republic of China (PRC) is taking an active role in promoting CDM project investment and is in the process of setting up the institutional framework to promote CDM projects. The potential for CDM projects in the PRC is significant and the Government has indicated that SSC CDM projects in particular are a priority as they have significant economic, social, environmental and sustainable development benefits for the country, particularly in the underdeveloped rural areas and Western Provinces. One of the challenges for SSC CDM projects in China and other countries is overcoming the lack of knowledge and information about the basic procedures for designing such projects.

1 See http://cdm.unfccc.int for a copy of the latest small-scale project guidelines.
This Handbook is designed to be the initial source of information for individuals and organizations operating in the PRC with an interest in identifying, developing and implementing SSC CDM projects. The Handbook builds upon existing official documents and explains in a clear and concise manner the activities that will need to take place in China for 1) project proponents to develop and validate small-scale projects, 2) relevant government officials to support the process, and 3) domestic and international investors to identify attractive project opportunities.

The Handbook provides users with basic information on:

- Identifying the types of projects eligible for SSC CDM;
- Evaluating and screening proposed projects for SSC CDM eligibility;
- Preparing relevant project documentation;
- Developing and implementing SSC CDM projects to earn Certified Emission Reduction Credits (CERs);
- Financing options for SSC CDM project costs;
- Finding partners to help develop and finance SSC CDM projects; and
- Finding opportunities for SSC CDM projects in the PRC.

The Handbook is not designed to be a stand-alone document, but rather to introduce the process of how to identify, develop and implement SSC CDM projects in the PRC. It provides links to detailed information, resources and organizations that are available to assist in the process of developing SSC CDM projects. It will also assist readers to quickly determine if a project will qualify for SSC CDM.

**Target Users of the Handbook**

The target audience for the Handbook is:

- Project owners, developers and proponents at the local and provincial level in the PRC;
- Provincial and national government officials responsible for promoting and approving CDM projects in the PRC;
- Domestic or foreign partners seeking to invest in SSC CDM projects in the PRC.

All three of these groups are essential to successful implementation of a CDM project and the Handbook is designed to familiarize these key players with the steps of the small-scale CDM project cycle. A Handbook
that targets these different stakeholders in the CDM project cycle will create conditions for more consistent, efficient and productive communication and interaction among them.

**Handbook Organization**

This Handbook is organized into three principal parts. The first part, consisting of Sections 1 & 2, presents a brief introduction to the Kyoto Protocol and a more detailed discussion of the basic rules and procedures governing SSC CDM. Specifically, Section 2 presents the organization and the role of key players in the CDM. It also discusses the key features of the simplified “modalities and procedures” governing SSC CDM projects and the special rules for bundled and multiple component projects.

The second part of the report, consisting of Section 3, presents a detailed eight step process from identifying potential SSC CDM projects, through evaluating, screening, selecting, developing, validating and implementing the projects as well as producing, monitoring, verifying, certifying and monetizing the resulting GHG emission reduction units.

The third part of the report presents information on project financing and partnering opportunities. Options for financing SSC CDM projects are discussed in Section 4. Section 5 provides a brief guide on finding partners for SSC CDM projects. Section 6 presents a guide for domestic or foreign partners seeking to invest in SSC CDM projects in the PRC. Finally, Section 7, list key sources of information on CDM in general and specifically for SSC CDM projects.
1 OVERVIEW OF THE KYOTO PROTOCOL

This section presents a few of the key elements of the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol in order to provide a clearer context for the CDM. Readers interested in a detailed description of the Convention and Protocol are directed to consult the Climate Change Secretariat’s “Guide to the Climate Change Convention and its Kyoto Protocol” available through the world wide web2.

1.1 The Climate Change Convention

The UNFCCC is an international agreement first introduced in 1992 that proposes stabilization of greenhouse gases in the earth’s atmosphere at a level that would prevent changes in climate. A total of 186 countries have ratified the Convention, which entered into force in 1994. The Convention divides countries into two main groups, referred to as Annex I and non-Annex I countries. A total of 41 industrialized countries are listed in the Convention’s Annex I including the wealthy industrialized countries that are members of the Organization for Economic Co-operation and Development (OECD), plus countries with economies in transition, which includes the Russian Federation. All other countries, including the People’s Republic of China (PRC), are described as “non-Annex I” countries for purposes of the Convention. The division of the countries into Annex I and non-Annex I parties is to allow for the principle of common but differentiated responsibilities toward achieving the objectives of the UNFCCC. For example, Annex I countries have a number of responsibilities including quantified emission reduction targets which are specified in the Kyoto Protocol. Non-Annex I countries, while not having specified emission reduction targets are nevertheless expected to institute policies and practices that will help mitigate their GHG emissions.

1.2 The Conference of Parties

The Parties to the UNFCCC meet annually at the Conference of the Parties (COP) with the primary objective of monitoring implementation of the Convention and progress of the Parties in achieving their commitments under the Convention. The COP comprises all the states that have ratified or acceded to the Convention. The COP is the only entity with the authority to adopt new country or global commitments through amendments and protocols to the Convention. This is precisely what happened in December 1997 when the COP adopted the Kyoto Protocol containing binding emissions targets for

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2 http://unfccc.int/resource/guideconvkp-p.pdf
developed countries. The COP to the Climate Change Convention also serves as the meeting for the Parties to the Kyoto Protocol. This means that the COP is responsible for officially approving the procedures and modalities that govern the Kyoto Protocol.

1.3 The Kyoto Protocol

The Kyoto Protocol was adopted in 1997 at the third meeting of the COP to the UNFCCC. The Protocol regulates six greenhouse gases (GHG) including carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), perfluorocarbons (PFCs), hexafluorocarbons (HFCs) and sulfur hexafluoride (SF₆). These emissions originate principally from the generation and use of energy, industrial processes, municipal waste, and land use activities such as deforestation. For reporting and tracking purposes, the “global warming potential (GWP)” in the atmosphere of each gas is converted to a carbon dioxide equivalent. Methane, for example, has a GWP that is 21 times that of carbon dioxide.

The Protocol’s major contribution to the climate change issue is the introduction of “assigned amounts” or allowances of greenhouse gas emissions for 39 of the Parties included in Annex I to the Convention. These “assigned amounts” are specified in Annex B of the Kyoto Protocol. For those Annex I countries that ratify the Protocol, their assigned amounts in Annex B of the Protocol act as a legally binding ceiling on carbon dioxide emissions during the first commitment period of 2008 to 2012. All the countries with specific emissions reduction commitments are listed in Annex B to the Kyoto Protocol. The average emissions reductions of Annex B countries is 5.2% below 1990 levels and must be achieved on average during the first commitment period of 2008-2012.

The Kyoto Protocol’s Annex B countries are expected to achieve most of their reductions through domestic activities and regulation. However, the Kyoto Protocol also established three “Flexibility Mechanisms” to facilitate economic efficiency in the achievement of the Convention’s goals. The flexibility mechanisms allow Parties to pursue opportunities to cut emissions or sequester carbon more cheaply abroad than what it may cost domestically. The flexibility mechanisms include a process referred to as Emissions Trading (i.e., the trading of “assigned amount units” or AAUs). Emissions Trading (ET) is limited to only countries listed in Annex B. The PRC is not eligible to participate in ET. The other two flexibility mechanisms are project-based approaches. The first approach called Joint Implementation (or JI, as defined in Article 6 of the Protocol) is also limited to only Annex I countries. The second approach is called the Clean Development Mechanism (CDM) (as defined in Article 12 of the Protocol). The CDM is intended to assist and encourage the non-Annex I countries (i.e., the developing countries) to implement projects that are “additional”, contribute to sustainable development and reduce GHG emissions. The resulting emission reductions can be transferred to Annex I countries to assist these countries in meeting their agreed-to commitments for reducing GHG emissions.

It is important to note that although more than 100 countries have ratified the Kyoto Protocol; it has not yet entered into force. As a result, the emissions commitments of individual countries are not legally binding at this point in time (April 2004). In order to enter into force, the Protocol specifies that (1) at
least 55 of the Parties to the UNFCCC must ratify the Protocol, and (2) the ratifying countries must represent at least 55% of the 1990 CO₂ emissions of the Parties included in Annex I. The second condition has not yet been met as ratifying countries represent only 44% of the 1990 CO₂ emissions for the Annex I Parties. Despite the delay in ratification of the Protocol, the COP to the UNFCCC have developed the modalities and procedures and established the institutions that are required to support the CDM. Additionally, many countries and organizations are already working on projects and procedures to implement the CDM.

The PRC is a signatory to the Kyoto Protocol but does not have a specific emissions reduction commitment for the 2008-2012 period. The PRC is nevertheless very well positioned to become a major “host” country for CDM projects. CDM projects are attractive because they involve investments in technologies and land use activities that can reduce GHG emissions and contribute to sustainable development.

1.4 The Clean Development Mechanism (CDM)

The Clean Development Mechanism is one of three market-based flexibility mechanisms established to help meet the goals of the Kyoto Protocol. It is defined in Article 12 of the Kyoto Protocol. When the Protocol enters into force, the CDM will constitute a legally recognized international framework for development and transfer of project based emission reductions from non-Annex B countries to Annex B countries. The Protocol calls these credits “Certified Emissions Reductions”, or CERs, and allows Annex B countries to use these CERs to help meet their domestic emissions reduction commitments under the Protocol. CERs are also often referred to as “carbon credits”. These terms are used interchangeably in this handbook.

The major challenge to generating carbon credits from a CDM project is the ability to demonstrate that the project results in lower greenhouse gas emissions. It is essential that a CDM project meet the following four fundamental criteria to be eligible to receive CERs:

♦ **CDM projects must demonstrate that they result in real, measurable and long-term benefits related to the mitigation of climate change.** The main concern is to ensure that projects will have a lasting effect on reducing greenhouse gas emissions. For example, simply suspending operation of a thermal power plant for one year (to avoid emissions) is not an eligible CDM activity. Replacing thermal power with renewable energy is much more likely to meet CDM project criteria.

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3 A CER unit is defined as one ton of carbon dioxide equivalent (CO₂e). For non-CO₂ greenhouse gases such as CH₄, N₂O, PFCs, HFCs and SF₆, their CO₂ equivalence is calculated using the global warming potential (GWP) values assigned by the International Panel for Climate Change (IPCC). See Annex 5 for GWP of different gases.
CDM projects must result in reductions in emissions that are “additional” to the baseline emissions that would occur in the absence of the project. This is the most difficult criterion to satisfy and requires project developers to prepare a “baseline” that describes the future expected emissions if the project is not implemented. Moreover, it has to be tested whether the project had to overcome barriers; projects that are commercially viable (i.e., financially attractive), are generally not eligible for CDM unless it can be convincingly demonstrated that there are other barriers that are inhibiting the implementation of the project. The SSC CDM project documentation procedures, discussed in Section 3, have been devised to simplify and standardize, to the extent possible, the baseline preparation process.

- Only project activities that have begun after January 1, 2000 are eligible. CDM projects that contribute to emissions reductions during the first commitment period of 2008-2012 (see Section 1.3) cannot begin before January 1, 2000. The project “beginning” date should be based on the date of financial closure for the project (i.e., the date on which a loan or other form of project financing has been approved).

- CDM projects must contribute to sustainable development in the country where the project occurs. It is the responsibility of the project “host” country to determine if the project contributes to sustainable development. For this reason, all host countries must establish procedures for reviewing and approving CDM projects.

**Box D-1: What is a carbon credit?**

In a typical business transaction, a project owner receives compensation for producing a good or service, such as electricity. A carbon credit, in contrast, is compensation for something that you do not produce. Specifically, it is a credit for avoiding current or planned greenhouse gas emissions. Take the example of a small, remote town that decides to build a small hydropower facility to replace the power from a diesel generator. The only way to receive a carbon credit for this project is to demonstrate that the diesel generator will not operate once the hydropower plant is operational. If the diesel generator continues to operate, in addition to the small hydropower plant, then there is no change in greenhouse gas emissions and no carbon credits can be sold unless there is convincing evidence that another diesel generator would have been installed if the hydropower plant were not built. Additionally, it must also be demonstrated that the hydropower plant was not planned nor is it the least-cost option for power supply for the town.

This example illustrates the inherent complexity of the rules and procedures that govern the Kyoto Protocol and the CDM. These rules place the burden of proof on the owner of the project to demonstrate that the hydropower plant will either reduce or eliminate the emissions from the diesel generator. In this example, the diesel generator represents the “business as usual”, or baseline practice that makes economic sense to continue. To receive a carbon credit, project developers must show that the investment will result in a change in the business as usual scenario by reducing long-term greenhouse gas emissions. If this can be done, the developer can sell the carbon credit to a government or company interested in buying credits to offset its emissions.
2 SMALL-SCALE CDM (SSC CDM) BASICS

The previous section introduced readers to the basic rationale for the CDM and the criteria that projects must meet to be eligible under the CDM. The first part of this section familiarizes readers with the institutions involved in the CDM. The second half of section 2 then describes the specific modalities and procedures that apply only to SSC CDM projects.

2.1 CDM institutions

Considerable time and effort has been devoted to defining the rules, procedures and institutions that will be applied in order to ensure CDM projects meet all eligibility criteria defined in the Protocol. Developers of CDM projects will, in the course of project design and sale of the carbon credits, interact with three distinct institutions – the CDM Executive Board (EB), the Designated National Authority (DNA) of the host country national government, and an independent private company called a Designated Operational Entity (DOE) that is accredited by and registered with the CDM Executive Board (EB) to provide CDM project validation and emissions reduction verification and certification services.

2.1.1 THE CDM EXECUTIVE BOARD (CDM EB)

Section 1.2 already explained that the COP to the UNFCCC is the final authority for approving the objectives and procedures for the Kyoto Protocol, including for the CDM. However, the COP only meets once a year and cannot effectively manage the CDM on a daily basis. In November 2001 the COP voted to create a CDM EB and gave it the authority for implementing and supervising the CDM. The COP elects the ten members of the EB and retains the authority to take decisions (i.e., vote and approve) on the recommendations made by the CDM EB.

The CDM EB meets four times a year and is supported by the Secretariat to the Climate Change Convention, based in Bonn. Table 1, below, compares the responsibilities of the COP and the EB. One of the responsibilities of the EB is to develop the procedures for SSC CDM projects.

2.1.2 DESIGNATED NATIONAL AUTHORITIES (DNA)

One of the eligibility requirements for CDM is that the “host” country must ratify the Kyoto Protocol and establish a designated national authority, or DNA, to review and approve CDM projects. The DNA’s structure and functions are not standard for all countries. It is the responsibility of the
government of each host country to define the mandate of its DNA. The Government of the PRC has designated the National Climate Change Coordinating Committee (NC4), under the auspices of the National Development and Reform Commission (NDRC), as the DNA for the PRC.

According to CDM rules, the DNA has two mandatory functions. The DNA is responsible for issuing a written statement, on behalf of the government, confirming that (a) the country’s participation in a project is “voluntary” and that (b) a project activity assists in achieving sustainable development and is consistent with national priorities. In addition to these core tasks, some other functions of a DNA might include:

- **Information dissemination**: Informing potential project developers in the country about the opportunities presented by CDM and, specifically, the detailed qualification requirements;

- **Project identification and screening**: Developing procedures and providing assistance for identifying attractive candidate projects and screening out projects that are not viable for the CDM at an early phase of CDM project preparation process;

- **Technical assistance**: Providing technical guidance and support for the preparation of CDM Project Design Documents (PDDs), baselines and emission reduction monitoring and reporting requirements;

- **Base financing/marketing CERs**: Assisting in obtaining base financing for projects deemed to be attractive candidates for CDM and in identifying potential buyers or selling CERs that the CDM projects generate.

### 2.1.3 Designated Operational Entities (DOE)

All CDM projects must follow a well-defined series of steps and calculations in order to earn certified emissions reductions (CERs). Project developers must submit their project to an independent, third party organization, called a Designated Operational Entity (DOE). The DOE is expected to review the project documents and “validate” the project if it satisfies all the necessary conditions for project eligibility stipulated by the CDM Executive Board. This is a necessary prerequisite for a project to receive CERs. The DOEs are similar to accounting auditors. They must be independent and cannot benefit, in any way, from the outcomes of a CDM project. The DOE is required to perform the following essential services in the CDM project cycle:

- **Validation** that the project design, as proposed by the project developer, meets all the requirements of the CDM. The project validation work is carried out before the project is submitted to the CDM EB. The DOE’s project review will include an assessment of the following issues:
  - All parties are voluntarily participating in the project;
- Stakeholders’ comments were received and taken into account;
- An analysis of the environmental impacts – and if necessary, an environmental impact assessment (EIA) – was conducted;
- The project will lead to a real and measurable reduction in greenhouse gas emissions;
- The baseline and monitoring methodologies conform to CDM EB guidelines; and,
- The host country has given a written confirmation that the project meets its sustainable development criteria.

Table D-1: Comparison of the Responsibilities of the Conference of Parties (COP) and CDM Executive Board (CDM EB)

<table>
<thead>
<tr>
<th>Conference of Parties</th>
<th>CDM Executive Board</th>
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<tbody>
<tr>
<td>Provides guidance to the executive board by taking decisions on:</td>
<td>Make recommendations to the COP/MOP on further modalities and procedures for the CDM;</td>
</tr>
<tr>
<td>The recommendations made by the executive board on its rules of procedure;</td>
<td>Make recommendations to the COP/MOP on any amendments or additions to rules of procedure for the executive board;</td>
</tr>
<tr>
<td>Other recommendations made by the executive board for implementation of the CDM;</td>
<td>Report on its activities to each session of the COP/MOP;</td>
</tr>
<tr>
<td>Designates the operational entities accredited by the executive board and takes appropriate decisions to promote accreditation of such entities from developing countries;</td>
<td>Approve new methodologies related to project baselines, monitoring plans and project boundaries;</td>
</tr>
<tr>
<td>Reviews annual reports of the executive board;</td>
<td>Review provisions with regard to simplified modalities, procedures and the definitions of small scale project activities and make recommendations to the COP/MOP;</td>
</tr>
<tr>
<td>Reviews the regional and subregional distribution of designated operational entities</td>
<td>Be responsible for the accreditation of operational entities, in accordance with agreed accreditation standards, and make recommendations to the COP/MOP for the designation of operational entities.</td>
</tr>
<tr>
<td>Reviews the regional and subregional distribution of CDM project activities and seeks to ensure their equitable distribution across regions;</td>
<td>Develop, maintain and make publicly available the approved rules, procedures, methodologies and standards for the CDM;</td>
</tr>
<tr>
<td>Assist in arranging funding of CDM project activities, as necessary.</td>
<td>Develop and maintain the CDM registry to ensure accurate accounting of carbon credits generated – this includes issuance of certified emissions reductions;</td>
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</table>

- **Registration** of the CDM project with the EB. Project proponents cannot submit projects directly to the Board. The CDM rules state that the DOE is responsible for submitting projects to the Board. This requirement exists to ensure that the CDM EB only receives documentation on projects that have already been “validated” by a DOE.

- **Verification** of the emissions reductions that occur as a result of the project. Verification work is done after the project starts and at fixed intervals. With the exception of SSC CDM projects, verification must be done by a different DOE than was used to validate the project.

- **Certification** of emissions reductions. The DOE that carries out the verification of emission reductions is responsible for submitting a letter to the CDM EB recommending the issuance of certification for the verified emissions reductions of the project.
As the above list of responsibilities demonstrates, the DOE is an important intermediary between project developers and the CDM EB. When performing validation and verification activities, the DOE may choose to conduct on-site inspections of projects, including discussions with project proponents, local stakeholders, and government authorities. The DOE may also request additional data from the project developer/manager in order to reach a decision and the DOE has the right to request changes to project monitoring methods. Section 3 provides more information on the specific timing and modalities for project validation and registration and emissions reduction verification and certification.

2.1.4 PROJECT PROPONENTS

Project proponents include, by definition, the “host” government of the country where the project is implemented, and the private or public entities that are directly involved in the project. This definition leaves open the possibility for both government, public and private entities to develop and implement CDM projects. The project proponent(s) that initiate, develop and implement a project, generally referred to as the project developers or proponents, bear the greatest responsibility for demonstrating that the project is eligible for CDM, including:

- Designing, obtaining normal approvals and licenses, financing and implementing the project;
- Preparing the required CDM project design document (PDD) and other supporting documents or analyses, as needed;
- Submitting the PDD to the national designated authority (DNA) for approval;
- Selecting and hiring the designated operational entities (DOEs) to undertake the validation and verification work, as described in Section 2.1.3;
- Monitoring and reporting on the emissions reductions resulting from the project;

Project proponents are also expected to resolve project financing requirements. For all this hard work, project proponents are the recognized holders of the “rights” to a project’s emissions reductions. Project proponents have the authority to negotiate the sale, or the commitment to sell, the project’s carbon credits.

Readers should note that three different terms are often used to describe involvement in a CDM project namely, “developer”, “participant” and “proponent”. The developer has primary responsibility for the project. This is the entity that often has the greatest financial commitment in the project and is responsible for the day-to-day implementation of the project (analogous to “project promoter”). The CDM EB defines participant as parties or private/public entities that take decisions on the allocation of CERs from the project activity under consideration. Thus, in addition to the developer, this group would include equity stakeholders, lenders, and buyers of CERs. Project proponent refers to private/public entities that are interested in expanding CDM activities in a region. This would include public agencies.
that are vested with the responsibility of encouraging CDM activities (at international, national and local levels), the designated national authority (DNA), various stakeholders and the project developer. These terms have been used interchangeably in this handbook except in cases where a reference is being made to a specific group in which case, it has been duly noted.

The sale, or monetization, of carbon credits is sometimes negotiated in parallel to project development. This is often done in situations where the project proponent needs to include the cash flow from the carbon credits to make the project financially viable, or uses a carbon credit sales agreement to secure a loan. When a commitment to sell the carbon credits to an external buyer is established prior to project implementation, it is referred to as a “bilateral” CDM project. “Unilateral” CDM refers to cases where the project proponent has no pre-implementation commitment to sell a project's carbon credits. Section 4 looks more closely at the process and options for structuring a carbon credit transaction.

### 2.2 Small-scale CDM guidelines

Since the inception of the CDM, the COP recognized the need to establish simplified procedures to encourage the development (and reduce the cost) of small-scale projects. Accordingly, in 2002 the CDM Executive Board (EB) produced the document “Recommendations for Simplified Modalities and Procedures for Small-Scale CDM Project Activities.” The modalities and procedures were adopted at the eighth meeting of the Conference of Parties (COP8) in November 2002. Section 2.2.1 presents some of the key attributes that distinguish the small-scale procedures from large-scale CDM.

#### 2.2.1 Definition of eligible small-scale project activities

The CDM EB currently recognizes 14 distinct categories of small-scale projects that fall within one of three project types; the rules for forestry projects remain to be defined. The key feature that is utilized to distinguish small-scale from large-scale CDM projects is the definition of a maximum allowable capacity rating and/or the emissions level of a project. The three project types are:

- **Type I: Renewable energy projects with a capacity of up to 15 megawatts**

  Type I projects are separated into the following four categories:
  - I.A: Electricity generation by the user;
  - I.B: Mechanical energy for the user;
  - I.C: Thermal energy for the user; and
  - I.D: Renewable electricity generation for a grid
Type II: Energy efficiency improvement projects that reduce energy consumption up to the equivalent of 15 gigawatt/hours per year;

Type II projects include the following five categories:

- II.A: Supply side energy efficiency improvements in transmission and distribution
- II.B: Supply side energy efficiency improvements – generation
- II.C: Demand-side energy efficiency programs for specific technologies
- II.D: Energy efficiency and fuel switching measures for industrial facilities
- II.E: Energy efficiency and fuel switching measures for buildings

Type III: Other project activities that both reduce emissions by sources and directly emit less than 15 kilotonnes of carbon dioxide equivalent annually.

The type III project categories include:

- III.A: Agriculture
- III.B: Switching fossil fuels
- III.C: Emission reductions by low-greenhouse gas emitting vehicles
- III.D: Methane recovery and avoidance

Type IV: Afforestation and reforestation that sequesters less than 8 kilotonnes of carbon dioxide equivalent annually.

2.2.2 SMALL-SCALE PROJECT DESIGN DOCUMENT (SSC PDD)

All SSC CDM projects should be prepared for validation by the DOE prior to submission to the EB using the simplified small-scale project design document (SSC PDD). It is critical that project developers adhere strictly to the format and content of the simplified SSC PDD. Although the SSC PDD format is standard for all 13 small-scale project categories introduced in Section 2.2.1, the data requirements and data calculation methodologies vary across the project categories types. Section 3 of the Handbook explains these variations in calculation methodologies and data requirements and describes the information expectations for the simplified PDD.

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See Annex 2 for a copy of the official SSC PDD published by the CDM EB.
2.2.3 EMISSIONS BASELINES AND PROJECT “ADDITIONALITY”

The emissions baseline for a CDM project is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases that would occur in the absence of the proposed project activity. It is the responsibility of project developers to identify, define and justify the emissions baseline. Specifically, the project developer must demonstrate that under normal circumstances the project would not occur and that the “baseline” activity will result in higher future GHG emissions.

The project “additionality” criterion is based on the notion that one or more barriers may exist that prevents the project from being the preferred investment option. The procedures and modalities for SSC CDM projects insist that project developers use at least one of the following barriers\(^5\) to demonstrate why the proposed project would not occur and is therefore not part of the baseline.

- **Investment barrier:** “A financially more viable alternative to the project activity would have led to higher emissions.” A typical example of an investment barrier is to demonstrate that the technology proposed in the CDM project has a higher marginal cost per kilowatt hour produced compared to the “business as usual” technology. An additional cause for an investment barrier may be the higher capital requirements associated with the CDM project. Where there is a capital scarcity, access to capital may be limited and pose a barrier to such projects. Many renewable energy projects have higher capital requirements than conventional energy projects even though they may have lower O&M costs. In spite of their lower “levelized costs” per unit of output, these projects are not able to secure financing because investors/banks are risk averse and therefore unwilling to provide a large or long-term capital investment.

- **Technological barrier:** “A less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions.” For example, a solar energy technology can be shown to involve a high risk and have low market share compared to a more traditional electricity source such as a diesel generator. Additional technological barriers may include lack of trained personnel to install and operate the alternative technology or lack of infrastructure to accommodate the alternative technology. For example wind energy turbines may need specially trained engineers and high access cranes for construction.

- **Barrier due to prevailing practice:** “A prevailing practice or existing regulatory or policy requirement would have led to implementation of a technology with higher emissions.” Some projects may fall into this category when government policy tightly controls energy and

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\(^5\) The project additionality barriers are listed in Attachment A to Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities. This document can be found online at: http://cdm.unfccc.int/EB/Meetings/007/eb7ra06.pdf.
electricity generation. This can sometimes be used to justify why otherwise financially viable projects are not considered in the baseline.

♦ **Other barriers:** “Without the project activity, for another reason identified by the project proponent, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.”

There is no hierarchy in choosing among the four types of barriers. The modalities and procedures for SSC CDM recognize each barrier as entirely valid options for demonstrating additionality. Section 3 of the Handbook identifies specific types of information that should be collected in order to demonstrate the existence of one or more of the above-mentioned barriers.

### 2.2.4 PROJECT VALIDATION, VERIFICATION AND CERTIFICATION

The procedures for project validation, verification and certification for SSC CDM is nearly identical to those used for large-scale CDM projects. All three steps are *required* for SSC CDM projects. The only modification of standard CDM procedures to accommodate small-scale projects is the ability of DOEs (see Section 2.1.3) to perform both validation and verification work. The steps to validation, verification and certification are addressed in more detail in Section 3 of the handbook.

### 2.2.5 SPECIAL REQUIREMENTS FOR BUNDLED PROJECTS

One of the eligibility criterion applied to SSC CDM is the determination if the project involves a “debundled” set of activities of a larger project. Debundling is defined as the fragmentation of a large project into smaller parts. Under this definition a project that is developed in consecutive small-scale tranches is not eligible under the small-scale procedures. For example, consider a project proponent who is planning a 20 MW capacity windfarm. Under current SSC CDM rules, the maximum equipment capacity rating for a small-scale renewable energy project must be 15 MW or less; the 20 MW windfarm exceeds the maximum capacity rating and is therefore not eligible for submission as a small-scale project.

What if the project proponent submits two PDDs, each one describing a 10MW project? Are these PDDs eligible under the SSC CDM?

To deal with this example and others that are likely to arise, the EB developed a **decision tree** (see Figure D-1) that should be applied to identify cases of project debundling. The decision tree uses debundling criteria including project ownership, location and investment. Using the decision tree, the two 10 MW wind farm “projects” described above are likely to be rejected because they involve the same participant and they share the same location and construction timeframe.

Note that this debundling is performed to ensure that larger projects are not artificially fragmented in order to register a project using the simplified small-scale procedures. Projects can, in fact, be bundled...
under the condition that the combined projects remain under maximum acceptable size, capacity or output allowed for small-scale projects. Thus, for example, it is permitted to bundle multiple small-hydro projects in one PDD as long as the combined output is no more than 15 MW.

Figure D-1: Decision Tree to analyze project debundling

![Decision Tree Diagram]

Source: CDM EB (2003) 6

A debundling analysis is also required in cases where projects have multiple components. Again, there is no rule against bundling components in a project as long as the basic size limitations are respected, i.e. the whole bundle remains below the thresholds specified above. The debundling analysis should be used in situations where the project proponents decide to submit only one component of a multiple component project.

2.2.6 PROJECT BOUNDARIES AND EMISSIONS LEAKAGE

All CDM projects, large and small, are required to identify the relevant physical and market boundaries for calculating emissions reductions. The project boundary should be determined based upon an assessment of all the anthropogenic emissions of greenhouse gases that are under the control of the project proponents and are (a) significant (in terms of volume of emissions) and (b) reasonably attributable to

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6 For more details on debundling, see http://cdm.unfccc.int/pac/howto/SmallScalePA/sscdebund.pdf
the CDM project activity. In the absence of any guidance from the CDM EB, project developers are expected to explain in the PDD how they interpret and define the terms “under the control of”, “significant” and “reasonably attributable.” In practice, SSC CDM project boundaries are expected to correspond directly to the actual physical, geographical site of the equipment, technology or facility to be used in the project.

**Leakage** is defined as the net change of anthropogenic emissions by sources of greenhouse gases which occurs outside the project boundary, and which is measurable and attributable to the SSC CDM project activity. For example, if a project proposes transferring solar home systems equipment from an existing use at one location for use at another location, then project proponents will need to calculate how the transfer influences greenhouse gas emissions at the site where the equipment was originally located.

The EB has already issued guidance on how to determine the boundaries and leakage associated with SSC CDM projects. The specific methodologies are described in Section 3.
3 Steps in Developing and Implementing a Small-Scale CDM Project (SSC CDM)

One of the challenges in successfully designing a SSC CDM project is to ensure that all of the relevant eligibility criteria are met and that documentation is complete. Many good project ideas run into difficulties attracting carbon credit buyers because they fail to address all the rules of the SSC CDM project modalities and procedures. This Section presents readers with a nine-step process beginning with small-scale project identification and ending with the sale of carbon credits from the project. At each step in the process, readers will learn what information and issues must be addressed in order to proceed to the next step.

Box D-2: Nine steps from project identification to sale of carbon credits

**Step 1:** Identify eligible small-scale CDM (SSC CDM) project opportunities
- Classify the project according to the pre-defined SSC categories
- Ensure project does not exceed maximum size limit definitions

**Step 2:** Collect technical information to screen a project
- Specifications on fuels and equipment performance
- Energy conversion and efficiency factors
- Plant capacity factors, system losses, etc.

**Step 3:** Conduct preliminary screening for SSC CDM eligibility
- Calculate project emissions reductions
- Define baseline and determine additionality
- Assess conformity with national and local legal and regulatory requirements and contribution to sustainable development

**Step 4:** Develop a detailed project design document (PDD)

**Step 5:** Submit the PDD for national approval

**Step 6:** Validate and register project with CDM Executive Board (CDM EB)

**Step 7:** Secure financing and implement project

**Step 8:** Monitor, verify and certify project emission reductions (CERs)

**Step 9:** Monetize (sell) and transfer the project CERs

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7 The most recent version of the small-scale project procedures and modalities can be found at: http://cdm.unfccc.int/EB/ Panels/ssc/ProjectActivities/sscmp7add3.pdf. The CDM EB does periodically update that information and change relevant items. For example, the baseline rules for renewable electricity generation for a grid were changed in November 2003. For the most recent version of SSC project guidance, readers should consult the EB website: http://cdm.unfccc.int. Information on small-scale projects can be found in the “Reference” and “CDM Project Cycle” sections of the website.
3.1 Step 1: Identify Eligible Small-Scale CDM Project Opportunities

The first step to successfully developing a SSC CDM project requires the project proponent to identify a project that clearly fits within one of the 14 recognized project categories (see Section 2.2.1) and respects the size limit criteria for small-scale projects. For small-scale energy projects the project categories are grouped, according to the guidelines provided by the EB, into the following broad types:

♦ **Type I:** Renewable energy projects with a maximum output up to 15 MW

Type I projects are investments in renewable energies with a maximum electricity output capacity according to manufacturer's specification of up to 15 megawatts (or an appropriate equivalent) that displace the use of a fossil fuel. The “appropriate equivalent” refers to cases where the technology’s rating is expressed in terms of its “peak” capacity (e.g., for solar panels under specific climate conditions), or in terms of thermal output. In Type I projects, renewable energy technology can be used to generate electricity (for individual users or for an electricity grid) or to produce mechanical or thermal energy. Examples include solar home systems, solar water pumps, water mills, wind power, small and mini-hydropower, and biomass for heating. Under certain circumstances (discussed later in the Handbook), several smaller projects can be “bundled” together in one project design document, as long as the 15 MW maximum is respected. Where necessary the SSC CDM guidelines allow the project proponent to apply an appropriate conversion factor to MW of electricity. Load factors should be disregarded for purposes of calculating equipment capacity.

♦ **Type II:** Energy efficiency

Type II energy efficiency projects involve investments on the supply or demand side or combination of measures that do both. Examples include improvements in energy transmission and distribution or generation (supply side), adoption of more energy efficient equipment, and efficiency improvements for industrial facilities and buildings. Eligibility for Type II projects is limited to activities whose total impact is no more than 15 gigawatthours (GWh) per year.

The CDM Board applies the following definitions for energy efficiency and energy consumption:

- Energy efficiency is the improvement in the service provided per unit power, that is, project activities which increase unit output of traction, work, electricity, heat, light (or fuel) per MW input are energy efficiency project activities;

- Energy consumption is the consumption reduced and measured in watt-hours with reference to an approved baseline. Lower consumption as a result of lower activity shall not be taken into consideration.
For demand-side energy efficiency projects, the activity must result in a reduction in energy use of a maximum 15 gigawatt hours (GWh) per year. The Board uses the following illustration to show how to estimate the maximum allowable size of a small-scale energy efficiency project.

**Type III**: other project activities that both reduce anthropogenic emissions by sources and directly emit less than 15 kilotonnes of CO₂ equivalent annually

Type III includes a wider range of project activities than those grouped in categories I and II and it is perhaps the most complicated category to understand. As the title implies, type III projects must lead to a reduction of human-induced emissions by sources and directly emit less than 15 kilotonnes of carbon dioxide equivalent per year. The five recognized Type III project categories include agriculture (as a result of sequestration of CO₂), switching of fossil fuels in existing applications, introduction of low-greenhouse gas emission vehicles, and methane recovery and avoidance.

**Figure D-2: Type II energy efficiency small-scale CDM projects**

![Figure D-2: Type II energy efficiency small-scale CDM projects]

To be eligible as a Type III small-scale project, the participant must demonstrate that two complimentary outcomes will occur. First, the project must result in a quantifiable reduction in the level of emissions. Second, the total emissions at the project site, after implementation of the emissions reduction activity, must be less than 15 kilotonnes (15,000 tons) of CO₂ equivalent per year. The Board uses the following diagram to illustrate eligibility under Type III projects.

**Figure D-3: Type III “other” small-scale CDM projects**

![Figure D-3: Type III “other” small-scale CDM projects]
These project categories are meant to be mutually exclusive. According to rules of the CDM EB, if a project activity includes more than one component, each component must individually meet the relevant threshold criterion for small-scale. For example, a project with both a renewable energy and energy efficiency component, the renewable energy component must meet the criterion for renewable energy and the energy efficiency component must meet the criterion for energy efficiency. If a project contains activities (components) that cover more than one category, the participant may submit one PDD that covers all categories and components. This is most likely to occur for Type III projects that also generate electricity for distribution to a grid.

If a project idea does not fall into one of the 14 categories, participants can submit to the CDM EB a proposal to create a new project category. The project design document should only be submitted to the Board after a decision is made on how to categorize the project.

### 3.1.1 The small scale project “reference guide” to eligibility

As the previous discussion makes clear, the definition of “small scale” CDM varies across the recognized project types. The table on the following pages serves as a reference guide to readers for quickly categorizing a project idea within one of the recognized SSC CDM project categories. The last column in the table summarizes the key small-scale project size criteria for each project category.
### Table D-2: Reference guide to “small scale” eligible activities

<table>
<thead>
<tr>
<th>Small-Scale Project Category</th>
<th>Technology Definition</th>
<th>Examples of eligible technologies</th>
<th>Technology “size” limit criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type I – Renewable Energy projects with a total capacity of 15 MW or less.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>I.A. Electricity generation by the user</strong></td>
<td>Renewable energy technologies that supply a small amount of electricity to individual households or users. A user under this category includes whole buildings such as homes, schools, health centers, offices, stores, etc.</td>
<td>Solar home systems Solar water pumps Wind battery chargers Pico-hydro generators</td>
<td>The maximum electricity output cannot exceed the equivalent of 15 megawatts (MWe) defined as the manufacturer’s reported installed/rated capacity of the equipment.</td>
</tr>
<tr>
<td><strong>I.B. Mechanical energy for the user</strong></td>
<td>Renewable energy technologies that supply a small amount of mechanical energy to individual households or users for use on-site. A user under this category includes whole buildings such as homes, schools, health centers, offices, stores, etc.</td>
<td>Wind-powered pumps Water mills Wind mills</td>
<td>The project technologies may have a capacity that is less than 15 MW, according to manufacturer’s capacity rating or the estimated diesel-based electricity required for the same service must be less than 15MWe. For irrigation pumps, the cumulative rating of diesel pumps shall not exceed 15 MW.</td>
</tr>
<tr>
<td><strong>I.C. Thermal energy for the user</strong></td>
<td>Renewable energy technologies that supply a small amount of thermal energy to individual households or users. This category includes co-generating systems that produce heat and electricity for use on-site. A user under this category includes whole buildings such as schools or health centers.</td>
<td>Solar thermal water heaters/crop dryers Solar cookers Biomass for heating or drying</td>
<td>Where generation capacity is specified by the manufacturer, it must be less than 15 MWe. Biomass thermal systems that qualify must result in total energy output not to exceed 45 MW; thermal (assumes a thermal to electric conversion efficiency of 0.33).</td>
</tr>
<tr>
<td><strong>I.D. Renewable electricity generation for a grid</strong></td>
<td>Renewable technologies that supply electricity to an electricity distribution system that is currently, or scheduled to be, supplied by at least one fossil fuel or non-renewable biomass fired generating unit. This category includes biomass combined heat and power for grid-based electricity but does not include methane gas recovery systems.</td>
<td>Grid connected solar photovoltaics Hydropower Tidal/wave Windpower Geothermal power Renewable biomass power</td>
<td>For a unit with both renewable and non-renewable components (e.g. a wind/diesel unit), the 15MW capacity limit applies only to the renewable component. For technologies that co-fire [non]-renewable biomass and fossil fuel, the capacity of the entire unit cannot exceed 15MW.</td>
</tr>
</tbody>
</table>
### Opportunities for the CDM in the Energy Sector – Final Report

<table>
<thead>
<tr>
<th>Small-Scale Project Category</th>
<th>Technology Definition</th>
<th>Examples of eligible technologies</th>
<th>Technology “size” limit criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type II. Energy Efficiency improvements up to 15GWh per year.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| II.A. Supply side energy efficiency improvements in transmission and distribution | Measures or equipment that improves energy efficiency of an electricity or district heating transmission and distribution system. The project can be implemented for improving an existing system or can be part of expansion of the system. | Upgrading voltage  
Replacing a transformer  
Increasing pipe insulation in a district heating system                                                                         | The improvements in energy efficiency cannot exceed the equivalent of 15 GW\(\text{h}\) per year.                   |
| II.B. Supply side energy efficiency improvements – generation | Measures or equipment to improve the efficiency of fossil fuel generating units that supply electricity or thermal power. The project can be implemented to improve existing systems or can be part of a new facility. | Improvements of power stations  
Improvements of district heating plants  
Improvements of co-generation plants\(^8\) | The improvements in efficiency of the fossil fuel units cannot exceed 15 GWh per year.                                    |
| II.C. Demand-side energy efficiency programs for specific technologies | Involves programs that encourage the adoption of energy-efficient equipment in place of existing or planned equipment.                                                                                                         | Lamps  
Ballasts  
Refrigerators  
Motors  
Fans                                                                                                                   | The aggregate energy savings of a single project cannot exceed 15GW\(\text{h}\) per year.                          |
| II.D. Energy efficiency and fuel switching measures for industrial facilities | Investments in energy efficiency and fuel switching efforts at a single industrial facility. Note that projects that primarily involve fuel switching probably fall into category III.B. (below). | Efficient motors  
Switch from steam to electricity  
Switch from compressed air to electricity  
Process improvements such as paper drying, tobacco curing, etc.                                                      | The aggregate energy savings of a single project cannot exceed 15GW\(\text{h}\) per year.                          |
| II.E. Energy efficiency and fuel switching measures for buildings | Investments implemented at a single building such as commercial, institutional or residential, or at a similar group of buildings.                                                                                                               | Efficient appliances  
Better insulation  
Switch from oil to gas                                                                                                     | The aggregate energy savings of a single project cannot exceed 15GW\(\text{h}\) per year.                          |
| **Type III – Other Project Activities**                                                                                                                                                                                                 |
| III.A. Agriculture | The Board has not yet issued the simplified modalities and procedures for this category.                                                                                                                                  | Not yet defined.                                                                                                                                                                   | Not yet defined.                                                                                                                                                                      |

\(^8\) Except for biomass, which should be considered under Activity I
<table>
<thead>
<tr>
<th>Small-Scale Project Category</th>
<th>Technology Definition</th>
<th>Examples of eligible technologies</th>
<th>Technology “size” limit criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>III.B. Switching fossil fuels</td>
<td>Activities to switch fossil fuels used at existing industrial, residential, commercial, institutional or electricity generation applications. Projects in this category are primarily focused on fuel switching but may also result in improved efficiency.</td>
<td>Equipment retrofits that have lower emissions, such as: Biomass gasifiers Gas or oil in place of coal</td>
<td>Project must reduce total emissions down to a level no more than 15 kilotonnes of CO₂ equivalent per year.</td>
</tr>
<tr>
<td>III.C. Emission reductions by low-greenhouse gas emitting vehicles</td>
<td>Introduction of vehicles (e.g., cars, trucks, tractors, buses and others) that have low greenhouse gas emissions</td>
<td>Low or zero emission vehicles use alternative fuels or energy sources including: Electricity LPG Natural gas Hydrogen Other….</td>
<td>Project must reduce total emissions down to a level no more than 15 kilotonnes of CO₂ equivalent per year. If electricity is being used to replace fossil fueled vehicles, it is important to ensure that there is no leakage by the need to generate more electricity with fossil fuels at the supplying power plant.</td>
</tr>
<tr>
<td>III.D. Methane recovery and avoidance</td>
<td>Capture of methane gas that is a by-product of another activity. Note: If the methane is used for electricity generation, project is also eligible under category I.D.; if recovered methane is used for heat generation, it is also eligible under category I.C.</td>
<td>Coal mines Landfill gas Wastewater treatment facilities Agro-industries</td>
<td>Project must reduce total emissions down to a level no more than 15 kilotonnes of CO₂ equivalent per year.</td>
</tr>
</tbody>
</table>
3.2 Step 2: Collect Technical Information to Screen Projects

After completing Step 1, the project proponent should be confident that the project clearly fits into one of the 13 categories for small-scale CDM and meets the relevant criteria on maximum size and/or capacity. The second step is to collect basic information that is used to estimate a project’s impact on GHG emissions. This information must be collected for both the proposed alternative or CDM project and the expected baseline project. The following checklist covers the standard technical information requirements to calculate GHG emissions.

♦ Fuel type
♦ Fuel net calorific value
♦ Fuel carbon content
♦ Equipment technical specifications (e.g., generation capacity)
♦ Equipment performance specifications (conversion and combustion efficiencies)
♦ Plant operational characteristics including capacity factor, load factor, hours of operation, etc.

3.2.1 Step 2A: Identify Fuel Type and Carbon Content

Fuel type and its carbon content is one of the most critical determinants of a project’s GHG impact. Fuels differ in their carbon contents and therefore in the associated carbon dioxide emissions when these fuels are utilized. When a fuel is combusted, the carbon in the fuel combines with oxygen in the air in an exothermic reaction, which results in the production of heat and CO₂. Fossil fuels with low carbon-to-hydrogen ratios such as natural gas produce less GHGs per unit of energy than heavier carbon fuels such as diesel and coal. Renewable energy resources such as wind and solar power have no direct GHG emissions because they involve no fuel combustion. Sustainably grown (closed-loop) biomass is also considered to be a near zero-GHG fuel, because the carbon dioxide emitted upon the burning of biomass is exactly offset by the carbon dioxide sequestered during plant growth.

Fuel carbon content values are typically expressed in tons of carbon per terajoule (tC/TJ). The following box provides default values for a selection of commonly used fuels.
Box D-4: Average carbon content of selected fuels

<table>
<thead>
<tr>
<th>Primary Fuels</th>
<th>Carbon Content t C/TJ</th>
<th>Secondary Fuels</th>
<th>Carbon Content t C/TJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil</td>
<td>20.0</td>
<td>Gasoline</td>
<td>18.9</td>
</tr>
<tr>
<td>Natural Gas (dry)</td>
<td>15.3</td>
<td>Natural Gas (pure methane) (a)</td>
<td>14.5</td>
</tr>
<tr>
<td>Natural Gas Liquids</td>
<td>15.2</td>
<td>Jet Kerosene</td>
<td>19.5</td>
</tr>
<tr>
<td>Anthracite</td>
<td>26.8</td>
<td>Other Kerosene</td>
<td>19.6</td>
</tr>
<tr>
<td>Coking Coal</td>
<td>25.8</td>
<td>Gas/Diesel Oil</td>
<td>20.2</td>
</tr>
<tr>
<td>Other Bituminous Coal</td>
<td>25.8</td>
<td>Residual Fuel Oil</td>
<td>21.1</td>
</tr>
<tr>
<td>Sub-bituminous Coal</td>
<td>26.2</td>
<td>Liquefied Petroleum Gas</td>
<td>17.2</td>
</tr>
<tr>
<td>Lignite</td>
<td>27.6</td>
<td>Ethane</td>
<td>16.8</td>
</tr>
<tr>
<td>Peat</td>
<td>28.9</td>
<td>Naphtha (b)</td>
<td>22.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bitumen</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lubricants (b)</td>
<td>27.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Petroleum Coke</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Refinery Feedstocks (b)</td>
<td>20.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other Oil (b)</td>
<td>29.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Coke</td>
<td></td>
</tr>
</tbody>
</table>

(a) Computed by the authors.
(b) The IPCC did not have access to specific carbon contents values for these fuel types.

Lastly, there may also be a need to convert data on annual fuel consumption expressed in units of volume or mass into terajoules. To perform this conversion to terajoules, multiply the net calorific value of the fuel (TJ/unit of volume) by the annual fuel consumption (unit of volume). The net calorific default values for a wide range of fuels are provided on the following page.

---

Box D-5: Net calorific values for refined petroleum products

<table>
<thead>
<tr>
<th>Fuel</th>
<th>TJ per 10^3 tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline (aviation and auto)</td>
<td>44.80</td>
</tr>
<tr>
<td>Jet Kerosene</td>
<td>44.59</td>
</tr>
<tr>
<td>Other Kerosene</td>
<td>44.75</td>
</tr>
<tr>
<td>Gas/Diesel Oil</td>
<td>43.33</td>
</tr>
<tr>
<td>Residual Fuel Oil</td>
<td>40.19</td>
</tr>
<tr>
<td>LPG</td>
<td>47.31</td>
</tr>
<tr>
<td>Ethane</td>
<td>47.49</td>
</tr>
<tr>
<td>Naphtha</td>
<td>45.01</td>
</tr>
<tr>
<td>Bitumen</td>
<td>40.19</td>
</tr>
<tr>
<td>Lubricants</td>
<td>40.19</td>
</tr>
<tr>
<td>Petroleum Coke</td>
<td>40.19</td>
</tr>
<tr>
<td>Refinery Feedstocks</td>
<td>44.80</td>
</tr>
<tr>
<td>Other Oil Products</td>
<td>40.19</td>
</tr>
</tbody>
</table>


Box D-6: Selected net calorific values, by fuel and country

<table>
<thead>
<tr>
<th>Fuel</th>
<th>GJ/10^3 tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>China</td>
</tr>
<tr>
<td>Crude Oil</td>
<td>41.87</td>
</tr>
<tr>
<td>Hard Coal (domestic)</td>
<td>20.91</td>
</tr>
<tr>
<td>Lignite/sub-bituminous coal (domestic)</td>
<td>16.90</td>
</tr>
</tbody>
</table>

Source: IPCC good practice guidance, 2000

Box D-7: Net calorific values for selected biomass fuels

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Moisture Content Wet Basis (%)</th>
<th>Typical Heating Value (TJ/10^3 tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood (wet, fresh cut)</td>
<td>40</td>
<td>10.9</td>
</tr>
<tr>
<td>Wood (air dry, humid zone)</td>
<td>20</td>
<td>15.5</td>
</tr>
<tr>
<td>Wood (air dry, dry zone)</td>
<td>15</td>
<td>6.6</td>
</tr>
<tr>
<td>Wood (oven dry)</td>
<td>0</td>
<td>20.0</td>
</tr>
<tr>
<td>Charcoal</td>
<td>5</td>
<td>29.0</td>
</tr>
<tr>
<td>Bagasse (wet)</td>
<td>50</td>
<td>8.2</td>
</tr>
</tbody>
</table>

10See footnote 9.
### Table D-3: Calculating Annual Power Plant Fuel Requirements

<table>
<thead>
<tr>
<th>(Annual Plant Electricity Output kWh/yr X Conversion Factor) x 10^6 J/kWh</th>
<th>(Plant Conversion Efficiency) X (%)</th>
<th>Unit Conversion Factor 1 TJ/10^12 J</th>
<th>Annual Plant Fuel Requirement TJ/yr</th>
</tr>
</thead>
</table>

The preceding formula shows that the higher a plant’s conversion efficiency, the less fuel will be needed to produce a given number of kWh. Conventional utility scale power plants normally have net conversion efficiencies (from fuel in to electricity out) ranging from 30 to 35 percent, meaning that they convert approximately one-third of the energy contained in their fuel source (e.g., coal, diesel, natural gas, biomass) into electricity. Some of the more advanced combined-cycle power plants can achieve net conversion efficiencies in excess of 40 percent. Smaller, off-grid power generators normally have lower efficiencies, ranging from 20 to 30 percent. Cogeneration plants are designed to produce electricity and process heat that can be used in industrial processes. The ability to productively utilize a large fraction of the waste heat that would normally be released to the environment allows cogeneration plants to achieve a higher conversion efficiency of fuel to useful energy. As a result, cogeneration plants can approach conversion efficiencies of 80 percent.

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3.2.2 **STEP 2B: DETERMINE CONVERSION AND EFFICIENCY FACTORS**

GHG offset analysis boils down to accurately calculating the fuel use rate. **Conversion efficiency** is a key determinant of fuel use. This concept, which is normally discussed in power projects, refers to the percentage of energy within a fuel that is transformed into usable energy during the conversion process. It is important that the project developer be consistent in choosing efficiencies and heating values. The relationship between a power plant’s fuel requirement and its conversion efficiency is as follows:

---

**Table D-3: Calculating Annual Power Plant Fuel Requirements**

- Bagasse (air dry) 13 16.2
- Coffee husks 12 16.0
- Rice hulls (air dry) 9 14.4
- Wheat straw 12 15.2
- Maize (stalk) 12 14.7
- Maize (cobs) 11 15.4
- Cotton gin trash 24 11.9
- Cotton stalk 12 16.4
- Coconut husks 40 9.8
- Coconut shells 13 17.9
- Dung cakes (dried) 12 12.0

Source: Gowen 1985.11

---

The number of kWh that a plant will generate in a year is a function of the plant’s annual operational capacity factor. A plant’s capacity factor is defined as the actual output of the plant divided by the maximum rated output of the plant. Thus, the plant’s capacity factor represents a percentage of the maximum or rated output of the plant that is actually achieved by the plant. Although the capacity factor of a plant can vary due to down time for maintenance, repairs, or even lack of demand for the output of the plant, this issue can normally be overlooked for SSC CDM projects.

Table D-4: Calculating Annual Electricity Production

<table>
<thead>
<tr>
<th>Plant Capacity</th>
<th>Conversion Factor</th>
<th>Annual Hours</th>
<th>Plant Capacity Factor</th>
<th>Annual Electricity Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW</td>
<td>$10^3$ kW/MW</td>
<td>8,760 h/yr</td>
<td>(%)</td>
<td>kWh/yr</td>
</tr>
</tbody>
</table>

### 3.3 Step 3: Perform Project Screening

At this point, project proponents should have in hand the data required to screen a project against several criteria for SSC CDM. In Step 3, the developer must (a) estimate emissions reductions, (b) determine/define project “additionality”, and (c) ensure relevant legal and regulatory requirements in the host country are met and that the project contributes to sustainable development.

#### 3.3.1 Step 3A: Estimate the Emissions Reductions

All CDM projects must demonstrate that they will result in a reduction in emissions of greenhouse gases below what would occur without the project. This requires preparing an analysis that compares emissions with the project to the emissions without the project. Baseline emissions describe the future emissions that would occur without the project based on a hypothetical continuation of “business as usual” practices (i.e., that the existing forms of energy continue to be used or possibly even expanded).

Fortunately, the CDM EB has already defined a series of acceptable methods for estimating the baseline emissions for small-scale projects. The major challenge for project proponents is to collect the information required to follow the CDM EB guidelines. Most of this information is either site or technology-specific and is normally available to project developers. Some information, such as the emissions coefficients for different fossil fuels, is not always available to project developers. The following pages present how to calculate the emissions reductions for twelve out of thirteen SSC CDM project categories.12

---

12 Agriculture activities (category IIIA) are not presented here since the CDM EB has not yet defined the scope of the accepted methodologies and procedures for that project category.
Category I.A. – Renewable energy to generate electricity by the user

a. Calculate emissions that would occur in the absence of the project (baseline)

The CDM EB recommends one of two approaches to calculate the emissions offset. Because both options are equally valid methodologies, handbook readers are advised to apply the following methodology to estimate baseline emissions. First, multiply the number of renewable energy units the project will deploy by the annual output capacity of each unit to calculate total project-related annual electricity output. Next, make any adjustments for grid losses, if appropriate. Finally, multiply the adjusted annual electricity output by an appropriate emissions coefficient.

Baseline emissions example: installation of 100 solar energy units

<table>
<thead>
<tr>
<th>Renewable energy units to be deployed</th>
<th>Electricity generation per unit of renewable energy technology installed (kWh/yr)</th>
<th>Total project electricity generation (in kWh/yr)</th>
<th>Adjustment for mini-grid technical distribution losses¹³</th>
<th>Annual Electricity Consumed (kWh)</th>
<th>CO₂ emissions coefficient (kgCO₂/kWh)¹⁴</th>
<th>Annual baseline emissions (kgCO₂/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C = A * B</td>
<td>D = (1 – .2)</td>
<td>E = C / D</td>
<td>F</td>
<td>G = E * F</td>
</tr>
<tr>
<td>100</td>
<td>2000</td>
<td>200,000</td>
<td>0.8</td>
<td>250,000</td>
<td>0.9</td>
<td>225,000</td>
</tr>
</tbody>
</table>

A more sophisticated alternative to the above methodology involves calculating the current electricity consumption (using data collected from meters if possible) of all the users that will adopt the new renewable energy technology.

b. Calculate the emissions that are associated with the proposed project

This includes only those project-related emissions under the direct control of the project developer and include (i) direct emissions from the renewable technology that are within the project boundary and (ii) leakage-related emissions, if any. See Section 3.2.6 for an overview on project boundaries and leakage. A leakage emissions calculation is required if the project involves transfer of equipment from another activity.

c. Calculate the net emissions reductions from the project

To finalize the emissions reduction estimate, subtract the emissions calculated in (b), above, from the emissions in the baseline (a).

Net project emissions reductions = Emissions in the baseline – Emissions associated with the project

¹³ The distribution line losses adjustment applies only to renewable energy projects that will displace electricity from a mini-grid. In other circumstances there may not be a line loss to factor into the calculation. Where line losses are likely, a reasonable default value for distribution losses on a low voltage rural distribution grid could be 20% (0.2).

¹⁴ The CDM EB accepts use of the 0.9 kgCO₂/kWh default value (based on a diesel generation unit). Readers are advised to apply this coefficient for any category I.A. project. Readers still interested in calculating a different emission coefficient can find more information under the methodology for category I.D. projects.
Category I.B. – Mechanical energy for the user

a. Calculate emissions that would occur in the absence of the project (baseline)

Baseline emissions are based on an estimation of the annual fuel consumed by a diesel generator to meet the demand for mechanical energy. There are two options to perform this calculation. The first method, shown in the example below, involves multiplying the estimated diesel fuel consumption per year by an emission coefficient of 2.7 kgCO2 per liter of diesel fuel\(^\text{15}\).

Baseline emissions example: a solar water pump replaces a diesel pump

<table>
<thead>
<tr>
<th>Diesel fuel consumption per hour (liters)</th>
<th>Hours of operation per day</th>
<th>Annual fuel consumption (liters)</th>
<th>Annual baseline emissions (kgCO2/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>(C = (A \times B) \times 365)</td>
<td>(D = C \times 2.7)</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
<td>3650</td>
<td>9855</td>
</tr>
</tbody>
</table>

An alternative method is to multiply the annual power requirements by an emissions coefficient for a diesel generator. However, this method requires an estimation of the load factor on the diesel generator in order to determine the appropriate emissions coefficient. See project type I.D. to select an appropriate emissions coefficient based on the annual power requirements and the load factor.

b. Calculate the emissions that are associated with the proposed project

This includes only those project-related emissions under the direct control of the project developer and include (i) direct emissions from the renewable technology that are within the project boundary and (ii) leakage-related emissions, if any. See Section 3.2.6 for an overview on project boundaries and leakage. A leakage emissions calculation is only required if the project involves transfer of equipment from another activity.

c. Calculate the net emissions reductions from the project

To finalize the emissions reduction estimate, subtract the emissions calculated in (b), above, from the emissions in the baseline (a).

\[
\text{Net project emissions reductions} = \text{Emissions in the baseline} - \text{Emissions associated with the project}
\]

\(^{15}\) This value is converted from the CDM EB-published coefficient of 3.2 kg CO2/kg diesel. Weight of diesel fuel is converted to a volume measure by multiplying 3.2 kg by 0.84, the specific gravity of auto diesel.
Appendix D

Category I.C. – Thermal energy for the user

a. Calculate emissions that would occur in the absence of the project (baseline)

This project category has three baseline emissions methodologies depending upon the type of project: displacement of fossil fuels, of non-renewable biomass, or of electricity.

For displacement of fossil fuels: simplified baseline emissions are estimated using the fuel consumption of the technology that will be replaced times an appropriate emissions coefficient for the appropriate fossil fuel displaced.

Baseline emissions example: solar thermal dryer replaces a diesel fuel heater

<table>
<thead>
<tr>
<th>Diesel fuel consumption per hour</th>
<th>Hours of operation per day</th>
<th>Annual fuel consumption</th>
<th>Annual baseline emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(liters)</td>
<td></td>
<td>(liters)</td>
<td>(kgCO2/year)</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C = (A * B) * 365</td>
<td>D = C * 2.7</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>10,950</td>
<td>29,565</td>
</tr>
</tbody>
</table>

For displacement of non-renewable sources of biomass: simplified baseline is the non-renewable sources of biomass consumption of the technologies times an emission coefficient for the non-renewable sources of biomass displaced.

For displacement of electricity: simplified baseline is the electricity consumption times the relevant emission factor as described in category I.D.

b. Calculate the emissions that are associated with the proposed project

This includes only those project-related emissions under the direct control of the project developer and include (i) direct emissions from the renewable technology that are within the project boundary and (ii) leakage-related emissions, if any. See Section 3.2.6 for an overview on project boundaries and leakage. A leakage emissions calculation is only required if the project involves transfer of equipment from another activity.

c. Calculate the net emissions reductions from the project

To finalize the emissions reduction estimate, subtract the emissions calculated in (b), above, from the emissions in the baseline (a).

Net project emissions reductions = Emissions in the baseline – Emissions associated with the project
Category I.D. – Renewable electricity generation for a grid

a. Calculate emissions that would occur in the absence of the project (baseline)

For fossil fuel fired generating units using fuel oil or diesel fuel, the baseline is the annual kWh generated by the renewable unit times an emission coefficient for a modern diesel generating unit of the relevant capacity operating at optimal load as given in Table below.

Emission factors for diesel generator systems (in kg CO2equ/kWh*)
for three different levels of load factor**

<table>
<thead>
<tr>
<th>Cases:</th>
<th>Mini-grid with 24 hour service</th>
<th>i) Mini-grid with temporary service (4-6 hr/day)</th>
<th>ii) Productive applications</th>
<th>iii) Water pumps</th>
<th>Mini-grid with storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load factors [%]</td>
<td>25%</td>
<td>50%</td>
<td>100%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;15 kW</td>
<td>2.4</td>
<td>1.4</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;=15 &lt;35 kW</td>
<td>1.9</td>
<td>1.3</td>
<td>1.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;=35 &lt;135 kW</td>
<td>1.3</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;=135&lt;200 kW</td>
<td>0.9</td>
<td>0.8</td>
<td>0.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;200 kW***</td>
<td>0.8</td>
<td>0.8</td>
<td>0.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*) Conversion factor of 3.2 kg CO2 per kg of diesel has been used (from revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories)
**) From fuel curves in the online manual of RETScreen International’s PV 2000 model, http://retscreen.net/
*** Default values

For all other systems\textsuperscript{16}, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO2equ/kWh) determined using one of two approaches. The first approach uses the average of the “approximate operating margin” and the “build margin”, where: (i) the “approximate operating margin” is the weighted average emissions of all generating sources serving the system, excluding renewable sources such as hydro, geothermal, wind, low-cost biomass, nuclear and solar generation; and (ii) the “build margin” is the weighted average emissions of recent capacity additions to the system, defined as the lower of most recent 20\% of plants built or the 5 most recent plants. The second approach is to calculate the weighted average emissions of the current generation mix.

b. Calculate the emissions that are associated with the proposed project

Calculate project-related emissions under the direct control of the project developer and include (i) direct emissions from the renewable technology within the project boundary and (ii) any leakage-related emissions.

c. Calculate the net emissions reductions from the project

\[
\text{Net project emissions reductions} = \text{Emissions in the baseline} - \text{Emissions associated with the project}
\]

\textsuperscript{16} For landfill gas, waste gas, wastewater treatment and agro-industries projects, recovered methane emissions are eligible under category III.D. If the recovered methane is used for electricity generation the baseline shall be calculated using the above procedure. If the recovered methane is used for heat generation it is eligible under category I.C.
Category II.A. – Supply side energy efficiency improvements, transmission and distribution

a. Calculate emissions that would occur in the absence of the project (baseline)

The supply side energy efficiency improvement project may be applied to existing transmission or distribution systems or be part of an expansion of a transmission or distribution system. To calculate the emission baseline, energy use baseline is determined first for a project that would have taken place if the efficiency improvement project were not implemented. Use the following guidance for retrofit projects and new facilities.

For retrofit projects, the energy baseline is the technical losses of energy within the project boundary calculated as either: (a) the measured performance of the existing equipment; or (b) the performance of the existing equipment as determined using a standard in accordance with the general Equipment Performance criteria for small-scale CDM projects.

For new facilities, the energy baseline is the technical losses of energy within the project boundary calculated using a performance standard for the equipment that would otherwise have been installed.

The emissions baseline is the energy baseline multiplied by an emission coefficient. If the energy displaced is electricity, the emissions coefficient (in kg CO2equ/kWh) shall be calculated using emission factors given in category I.D. For measures implemented to improve the efficiency of a district heating system, the emissions coefficient is that of the fossil fuel used by the system. IPCC default values for emission coefficients may be used.

b. Calculate the emissions that are associated with the proposed project

This includes only those project-related emissions under the direct control of the project developer and include (i) direct emissions from the project’s energy efficient transmission and distribution system that is within the project boundary and (ii) leakage-related emissions, if any. See Section 3.2.6 for an overview on project boundaries and leakage. A leakage emissions calculation is only required if the project involves transfer of equipment from another activity.

c. Calculate the net emissions reductions from the project

To finalize the emissions reduction estimate, subtract the emissions calculated in (b), above, from the emissions in the baseline (a).

\[
\text{Net project emissions reductions} = \text{Emissions in the baseline} - \text{Emissions associated with the project}
\]
Category II.B. – Supply side energy efficiency improvements – generation

a. Calculate emissions that would occur in the absence of the project (baseline)

The supply side generation efficiency improvement projects include technologies or measures that are applied to existing stations or be part of a new facility. To meet the small-scale CDM project requirement, the energy efficiency improvement of the project cannot be larger than 15 GWh per year. Example projects include efficiency improvements at power stations and district heating plants and co-generation\(^17\).

To calculate the emission baseline, energy use baseline is determined first for a project that would have taken place if the efficiency improvement project were not implemented. The energy baseline is the technical losses of energy within the project boundary.

For retrofit measures, the energy baseline is calculated as the monitored performance of the existing generating unit.

For new facilities, the energy baseline is calculated using a standard for the equipment that would otherwise have been installed. The standard used needs to meet the general Equipment Performance standard given for small-scale CDM projects.

The emissions baseline is the energy baseline multiplied by an emission coefficient for the fuel used by the generating unit. IPCC default values for emission coefficients may be used.

b. Calculate the emissions that are associated with the proposed project

This includes only those project-related emissions under the direct control of the project developer and include (i) direct emissions from the project’s energy efficient generation system that is within the project boundary and (ii) leakage-related emissions, if any. See Section 3.2.6 for an overview on project boundaries and leakage. A leakage emissions calculation is only required if the project involves transfer of equipment from another activity.

c. Calculate the net emissions reductions from the project

To finalize the emissions reduction estimate, subtract the emissions calculated in (b), above, from the emissions in the baseline (a).

\[
\text{Net project emissions reductions} = \frac{\text{Emissions in the baseline}}{\text{Emissions associated with the project}}
\]

\(^{17}\) Efficiency improvements to non-fossil fuel generating units, such as turbine replacement for hydro projects, shall be treated in the same way as renewable energy projects in category I.D.
Category II.C. – Demand-side energy efficiency programs for specific technologies

a. Calculate emissions that would occur in the absence of the project (baseline)

To calculate the emission baseline, energy use of the baseline project is determined first. Demand-side energy efficiency programs can either reduce fossil fuel use directly or reduce the consumption of electricity. If the efficiency improvement project displaces fossil fuel use, the energy baseline is the existing fuel consumption of the baseline project. Then, the emissions baseline is the energy baseline multiplied by an emission coefficient for the fossil fuel that is displaced. The IPCC default values may be used for emission coefficients.

If the efficiency improvement project displaces electricity, the baseline emissions is calculated as follows:

Baseline emission example: efficient light bulbs replace incandescent bulbs

<table>
<thead>
<tr>
<th>Number of incandescent bulbs being replaced</th>
<th>Power rating of incandescent bulb (kW)</th>
<th>Hours of operation per day</th>
<th>Adjustment for mini-grid technical distribution losses18</th>
<th>Annual Electricity Consumed (kWh)</th>
<th>CO₂ emissions coefficient (kgCO₂/kWh)19</th>
<th>Annual baseline emissions (kgCO₂/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D = (1 – .2)</td>
<td>E = A<em>B</em>C*365 / D</td>
<td>F</td>
<td>G = E * F</td>
</tr>
<tr>
<td>1000</td>
<td>0.040</td>
<td>5</td>
<td>0.8</td>
<td>91,250</td>
<td>0.9</td>
<td>82,125</td>
</tr>
</tbody>
</table>

b. Calculate the emissions that are associated with the proposed project

This includes only those project-related emissions under the direct control of the project developer and include (i) emissions from the demand-side efficiency program that are within the project boundary and (ii) leakage-related emissions, if any. See Section 3.2.6 for an overview on project boundaries and leakage. A leakage emissions calculation is only required if the project involves transfer of equipment from another activity.

c. Calculate the net emissions reductions from the project

To finalize the emissions reduction estimate, subtract the emissions calculated in (b), above, from the emissions in the baseline (a).

\[
\text{Net project emissions reductions} = \frac{\text{Emissions in the baseline} - \text{Emissions associated with the project}}{} 
\]

---

18 The distribution line losses adjustment applies only to renewable energy projects that will displace electricity from a mini-grid. In other circumstances there may not be a line loss to factor into the calculation. Where line losses are likely, a reasonable default value for distribution losses on a low voltage rural distribution grid could be 20% (0.2).

19 The CDM EB accepts use of the 0.9 kgCO₂/kWh default value (based on a diesel generation unit). Readers are advised to apply this coefficient for any category I.A. project. Readers still interested in calculating a different emission coefficient can find more information under the methodology for category I.D. projects.
Category II.D. – Energy efficiency and fuel switching measures for industrial facilities

a. Calculate emissions that would occur in the absence of the project (baseline)

To calculate the emission baseline, energy use of the baseline project is determined first. The energy baseline consists of the energy use of the existing equipment that is replaced in the case of retrofit measures and of the facility that would otherwise be built in the case of a new facility.

If the efficiency improvement project displaces fossil fuel use, the energy baseline is the existing fuel consumption of the baseline project. The emissions baseline for this case is the energy baseline multiplied by an emission coefficient for the fossil fuel that is displaced. The IPCC default values may be used for emission coefficients.

If the efficiency improvement project displaces electricity, the baseline emissions is calculated as follows:

**Baseline emission example: efficient motor replaces an old motor**

<table>
<thead>
<tr>
<th>Power rating of old motor (kW)</th>
<th>Hours of operation per day</th>
<th>Adjustment for mini-grid technical distribution losses(^{20})</th>
<th>Annual Electricity Consumed (kWh)</th>
<th>CO(_2) emissions coefficient (kgCO(_2)/kWh)(^{21})</th>
<th>Annual baseline emissions (kgCO(_2)/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C = (1 – .2)</td>
<td>E = A<em>B</em>365 / C</td>
<td>F</td>
<td>G = E * F</td>
</tr>
<tr>
<td>10</td>
<td>8</td>
<td>0.8</td>
<td>36,500</td>
<td>0.9</td>
<td>32,850</td>
</tr>
</tbody>
</table>

b. Calculate the emissions that are associated with the proposed project

This includes only those project-related emissions under the direct control of the project developer and include (i) emissions from the energy efficient or fuel switching measure that are within the project boundary and (ii) leakage-related emissions, if any. See Section 3.2.6 for an overview on project boundaries and leakage. A leakage emissions calculation is only required if the project involves transfer of equipment from another activity.

c. Calculate the net emissions reductions from the project

To finalize the emissions reduction estimate, subtract the emissions calculated in (b), above, from the emissions in the baseline (a).

\[
\text{Net project emissions reductions} = \text{Emissions in the baseline} - \text{Emissions associated with the project}
\]

---

\(^{20}\) See footnote 14.
\(^{21}\) See footnote 15.
Category II.E. – Energy efficiency and fuel switching measures for buildings

a. Calculate emissions that would occur in the absence of the project (baseline)

To calculate the emission baseline, energy use of the baseline project is determined first. The energy baseline consists of the energy use of the existing equipment that is replaced in the case of retrofit measures and of the facility that would otherwise be built in the case of a new facility.

If the efficiency improvement project displaces fossil fuel use, the energy baseline is the existing fuel consumption of the baseline project. The emissions baseline for this case is the energy baseline multiplied by an emission coefficient for the fossil fuel that is displaced. The IPCC default values may be used for emission coefficients.

If the efficiency improvement project displaces electricity, the baseline emissions is calculated as follows:

**Baseline emission example: efficient appliances replace old inefficient appliances**

<table>
<thead>
<tr>
<th>Power rating of old appliance (kW)</th>
<th>Hours of operation per day</th>
<th>Adjustment for mini-grid technical distribution losses</th>
<th>Annual Electricity Consumed (kWh)</th>
<th>CO₂ emissions coefficient (kgCO₂/kWh)</th>
<th>Annual baseline emissions (kgCO₂/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C = (1 – .2)</td>
<td>E = A<em>B</em>365 / C</td>
<td>F</td>
<td>G = E * F</td>
</tr>
<tr>
<td>5</td>
<td>4</td>
<td>0.8</td>
<td>9,125</td>
<td>0.9</td>
<td>8,212.5</td>
</tr>
</tbody>
</table>

b. Calculate the emissions that are associated with the proposed project

This includes only those project-related emissions under the direct control of the project developer and include (i) emissions from the energy efficient or fuel switching measure that are within the project boundary and (ii) leakage-related emissions, if any. See Section 3.2.6 for an overview on project boundaries and leakage. A leakage emissions calculation is only required if the project involves transfer of equipment from another activity.

c. Calculate the net emissions reductions from the project

To finalize the emissions reduction estimate, subtract the emissions calculated in (b), above, from the emissions in the baseline (a).

\[
\text{Net project emissions reductions} = \text{Emissions in the baseline} - \text{Emissions associated with the project}
\]

22 See footnote 14.
23 See footnote 15.
Category III.B. – Switching fossil fuels

a. Calculate emissions that would occur in the absence of the project (baseline)

Fossil fuel switching measures can take place in existing industrial, residential, commercial, institutional, or electricity generation applications. As an example, in electricity generation coal may be replaced by gas or oil in the power plant.

To calculate the emission baseline, emission coefficients for the fuel used by the generating unit before the fuel switch is needed. IPCC default values for emission coefficients may be used.

**Baseline emissions example: coal is replaced with gas in power generation**

<table>
<thead>
<tr>
<th>Power Plant Capacity (MW)</th>
<th>Hours of operation per day</th>
<th>Plant Capacity Factor (%)</th>
<th>Electricity Generated per year (MWh)</th>
<th>CO₂ emissions coefficient (tonne CO₂/ MWh)²⁴</th>
<th>Annual baseline emissions (tonne CO₂/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D = A* B* C* 365</td>
<td>E</td>
<td>F = D * E</td>
</tr>
<tr>
<td>1</td>
<td>24</td>
<td>90</td>
<td>7,884</td>
<td>1.04</td>
<td>8,199</td>
</tr>
</tbody>
</table>

b. Calculate the emissions that are associated with the proposed project

This includes only those project-related emissions under the direct control of the project developer and include (i) direct emissions from the project that are within the project boundary after the fuel switch and (ii) leakage-related emissions, if any. See Section 3.2.6 for an overview on project boundaries and leakage. A leakage emissions calculation is only required if the project involves transfer of equipment from another activity.

c. Calculate the net emissions reductions from the project

To finalize the emissions reduction estimate, subtract the emissions calculated in (b), above, from the emissions in the baseline (a).

\[
\text{Net project emissions reductions} = \text{Emissions in the baseline} - \text{Emissions associated with the project}
\]

²⁴ Approximated CO₂ emission coefficient for coal fired power plant that operates at 33% efficiency using IPCC emission coefficients.
Category III.C. – Emission reductions by low-greenhouse gas emitting vehicles

a. Calculate emissions that would occur in the absence of the project (baseline)

The baseline is the energy use per unit of service for the vehicle that would otherwise have been used times the average annual units of service per vehicle times the number of vehicles affected times the emission coefficient for the fuel used by vehicle that would otherwise have been used.

b. Calculate the emissions that are associated with the proposed project

This includes only those project-related emissions under the direct control of the project developer and include (i) direct emissions from the low-greenhouse gas emitting vehicles that are within the project boundary and (ii) leakage-related emissions, if any. See Section 3.2.6 for an overview on project boundaries and leakage. A leakage emissions calculation is only required if the project involves transfer of equipment from another activity.

c. Calculate the net emissions reductions from the project

To finalize the emissions reduction estimate, subtract the emissions calculated in (b), above, from the emissions in the baseline (a).

\[
\text{Net project emissions reductions} = \text{Emissions in the baseline} - \text{Emissions associated with the project}
\]
Category III.D. – Methane recovery and avoidance

a. Calculate emissions that would occur in the absence of the project (baseline)

The emission baseline is the amount of methane that would be emitted to the atmosphere during the crediting period in the absence of the project activity. The baseline shall cover only the capture and flaring that would not have happened in the absence of the project activity.

In the case of landfill gas, waste gas, waste water treatment and agro-industries projects:

- If the recovered methane is used for electricity generation, the project activity is also eligible under category I.D.

- If the recovered methane is used for heat generation it is also eligible under category I.C.

In these cases project proponents may submit one single project design document for all of the components of the project activity.

b. Calculate the emissions that are associated with the proposed project

This includes only those project-related emissions under the direct control of the project developer and include (i) direct emissions from methane recover and avoidance project that are within the project boundary and (ii) leakage-related emissions, if any. See Section 3.2.6 for an overview on project boundaries and leakage. A leakage emissions calculation is only required if the project involves transfer of equipment from another activity.

c. Calculate the net emissions reductions from the project

To finalize the emissions reduction estimate, subtract the emissions calculated in (b), above, from the emissions in the baseline (a).

\[
\text{Net project emissions reductions} = \text{Emissions in the baseline} - \text{Emissions associated with the project}
\]
3.3.2 **STEP 3B: ASSESS PROJECT ADDITIONALITY TO THE BASELINE**

Section 2.2.3 introduced readers to the four standardized categories of barriers to SSC CDM projects that may be used to demonstrate that a project is additional to the baseline scenario. Project proponents shall provide an explanation to show that the project activity would not have occurred due to at least one of the following barriers:

- **Investment barrier:** a financially more viable alternative to the project activity would have led to higher emissions;

- **Technological barrier:** a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

- **Barrier due to prevailing practice:** prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

- **Other barriers:** without the project activity, for another specific reason identified by the project proponent, such as institutional barriers, limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

In the absence of explicit rules on how to interpret these criteria, Table D-5 offers guidance and suggestions to project developers on possible interpretations of the additionality aspects of a SSC CDM project.

<table>
<thead>
<tr>
<th>Barrier type</th>
<th>The SSC project may be additional if...</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investment barrier</strong></td>
<td>The project has a higher life-cycle cost per kWh compared to the technology in the baseline.</td>
<td>Discounted costs per kWh of a wind plant are higher than those of coal plant and there is no higher feed-in tariff for renewables to offset these higher costs.</td>
</tr>
<tr>
<td></td>
<td>The project developer cannot access financing at a reasonable cost or in an appropriate currency.</td>
<td>Banks are unwilling to lend to hydro, wind and solar power plants or only willing to lend at prohibitively high interest rates.</td>
</tr>
<tr>
<td></td>
<td>The project technology is not well known and investors/lenders are unwilling to finance the project.</td>
<td>The perceived risks of biomass gasifiers make it difficult to attract investors.</td>
</tr>
<tr>
<td><strong>Technological barrier</strong></td>
<td>The project technology is not yet well developed and may even be a prototype.</td>
<td>Tidal and wave power technology is not well established and considered risky investments.</td>
</tr>
<tr>
<td></td>
<td>The project technology may be known but is proposed for a new application.</td>
<td></td>
</tr>
<tr>
<td><strong>Barrier due to prevailing practice</strong></td>
<td>The project deploys a well-established technology which is not yet common in the region or country.</td>
<td>Venting of methane from coal mines is an accepted and required practice. Capturing and utilizing coal mine methane requires convincing coal mine operators to establish a new practice as they fear increased risks for mine safety.</td>
</tr>
<tr>
<td><strong>Other barrier</strong></td>
<td>Assorted policy or legal barriers can create resistance to the adoption or financing of projects.</td>
<td>Subsidies for kerosene for diesel fuel in rural areas may prevent the adoption of solar photovoltaic or micro-hydro for lighting and small-scale electricity needs.</td>
</tr>
</tbody>
</table>
3.3.3 Step 3C: Assess Conformity with National and Local Legal and Regulatory Requirements and Contribution to Sustainable Development.

This step essentially requires the project proponent to ensure that the proposed SSC CDM project does not violate any local or national legal or regulatory requirements and that it contributes to sustainable development. This requires that the project proponent be aware of potential legal or regulatory issues that may be associated with the proposed project including project siting regulations, technical standards, environmental standards, labor regulations etc. In addition, the project proponent should be aware of any negative impacts on any indigenous residents or the habitat of any endangered or protected species, and propose mitigation measures. For example, a small hydropower that requires water storage may be in violation of water use rights associated with the stream or river on which the project is to be built. Alternately, it may be damage the habitat of a protected species.

Generally, in the processing of undertaking a normal project EIA, the project proponent will have to address many of the key issues associated with conformance with national and local legal and regulatory requirements. Similarly, when applying for a project construction and operation license, the project proponent will have to demonstrate compliance with all applicable regulations.

If the project falls within one of the 13 defined SSC CDM project categories, it is likely to be assessed to contribute to sustainable development. Nevertheless, the project proponent should be prepared to demonstrate that the proposed project contributes to sustainable development by either utilizing a renewable resource or by conserving and efficiently utilizing non-renewable resources.

3.4 Step 4: Prepare the Project Design Document

This section explains the type of information that should be incorporated into each heading of the small-scale project design document, or SSC PDD. Project developers can download the template for the SSC PDD from the UNFCCC website. Note that the SSC PDD differs from the PDD for large-scale projects.

25 http://cdm.unfccc.int/Reference/Documents Also see Annex 2 for a copy of the official version of the SSC PDD.
Section A: General description of the project activity

The general description provides a snapshot of the project including identification of the project proponents and its physical location, a brief description of the technology and expected outcomes of the project, and a statement on how the project will reduce anthropogenic emissions of greenhouse gases.

Section B: Baseline methodology

Each of the 13 small-scale project types includes a pre-defined baseline methodology. Project proponents also have the option of developing a new baseline methodology if the pre-defined methods are judged unsatisfactory. However, the standard simplified methodologies are strongly recommended as they apply default values and assumptions that can considerably reduce the level of work and cost to project proponents. For example, the baseline methodology for projects in category I.D. (renewable energy generation for a grid) instructs project proponents to select from a range of emission factors for diesel generator systems depending upon the load factor of the system. The same section of the SSC-PDD also provides project proponents with two alternative methods for calculating baseline emissions.

Section C: Duration of the project

There is no difference between the SSC PDD and regular PDD for Section C. In Section C, participants must define the project’s start and end dates and define the length of time that the project will reduce emissions. The choices for duration of the project are limited. Project can be registered for a period of seven years, with possibility of renewing registration for two additional seven-year periods. This option allows project developers the ability to accrue carbon credits for up to 21 years. However, project developers must re-assert the project’s additionality against an updated baseline. Alternatively

Box D-8: Outline of SSC PDD contents

A. General description of project activities
   A.1. Title
   A.2. Description
   A.3. Participants
   A.4. Technical description of project activity
   A.5. Type and category of technology
   A.6. Statement on how GHGs are reduced
   A.7. Public funding
   A.8. Confirmation that SSC is not de-bundled

B. Baseline methodology
   B.1. Title
   B.2. Project category
   B.3. Description of how GHGs are reduced
   B.4. Project boundary
   B.5. Details of the baseline

C. Duration of project activity/Crediting period
   C.1. Duration of the project activity
   C.2. Choice of crediting period

D. Monitoring methodology and plan
   D.1. Name and reference of methodology
   D.2. Justification of methodology choice
   D.3. Data to be monitored (table)
   D.4. Name of entity determining the methodology

E. Calculation of GHG emission reductions by sources
   E.1. Formulae used
   E.2. Table of values

F. Environmental impacts

G. Stakeholder comments
   G.1. Brief description of process
   G.2. Summary of comments
   G.3. Report on due account of comments

Annex 1: Information on project proponents
Annex 2: Information regarding public funding
projects can be registered for a non-renewable, ten-year period. While carbon credits are limited to ten years, the baseline and additionality arguments are only made once.

♦ Section D: Monitoring methodology and plan

The SSC-PDD explicitly defines the monitoring methodology that corresponds with each of the 13 project types and those methodologies directly reflect how the CDM Executive Board expects projects to track the change in emissions against the baseline. Again, this approach eliminates the need for project proponents to invent their own monitoring approach.

♦ Section E: Calculation of greenhouse gas emission reductions

In this section, the project proponents must explain how emissions reductions are calculated and the formulae used to calculate emissions reductions. Step 2 in project design provides guidance on how to estimate emissions reductions. Project developers should ensure maximum transparency when presenting and describing the data used to prepare emissions reduction estimates. For example, when calculating the weighted average emissions of a grid, the PDD should list all relevant power plants and indicate the corresponding conversion efficiencies, heat rates, carbon emission rates, and combustion efficiencies. Clarity and transparency in this section of the PDD can contribute to an easier validation of the emissions calculation.

♦ Section F: Environmental impacts

This section asks participants to document the results of any reviews or assessments of environmental impacts from the proposed project. The CDM EB is not very specific on the expectations for this section. One of the advantages of small-scale projects is that their environmental impacts will be negligible or possibly even positive. Nevertheless, this is an important section for project proponents to complete carefully and accurately. Project developers must be aware of, and respond to any possible environmental assessment laws of local, regional or national authorities. In addition, project developers may have to meet EIA guidelines of interested carbon credit buyers. This is particularly true in the current marketplace that is dominated by public and international donor funding sources.

♦ Section G: Stakeholder comments

Stakeholders mean the public, including individuals, groups or communities affected, or likely to be affected, by the proposed CDM project activity or actions leading to the implementation of such an activity. The CDM EB does not provide detailed guidance on the information required in this Section. Participants are expected to report on the process used to solicit and organize comments received from stakeholders, summarize any significant comments received, and list what measures, if any, were taken to respond to stakeholder comments. Project developers must ensure that any applicable rules or laws of the host country are respected. All efforts to
document and track stakeholder involvement will inevitably help a project developer in selling the carbon credits to an international buyer. The complexity of the stakeholder review process will depend greatly on project-specific conditions.

Project developers must also be familiar with any criteria on sustainable development prepared by the national government. Host countries will likely take different approaches to setting sustainable development criteria for CDM projects. The Pembina Institute’s Users Guide to the CDM (2003)\(^{26}\) provides a useful checklist of some of the sustainable development criteria already in use in different countries for purposes of screening CDM projects:

- **Social Criteria**
  - Improves quality of life, especially of the very poor
  - Alleviates poverty (e.g., by providing regular incomes)
  - Improves equity (e.g., by improving the income of poor women)

- **Economic Criteria:**
  - Provides financial returns to local entities
  - Results in a positive impact on balance of payments (e.g., through new investment)
  - Transfers new technology

- **Environmental Criteria:**
  - Reduces GHGs and the use of fossil fuels
  - Conserves local resources
  - Reduces pressure on local environments
  - Provides heath and other environmental benefits
  - Meets local renewable energy portfolio standards and other environmental policies

In addition to the project developer’s self-assessment of the project against the above criteria, it may be necessary or advisable to conduct a stakeholder meeting. The following paragraphs offer guidance on the organization and convening of a stakeholder project review meeting. Although this approach may not be necessary for all types of projects, it serves to illustrate the issues that a project developer will want to consider when preparing the stakeholder section of the PDD.

\(^{26}\) Available at: http://www.pembina.org/publications_item.asp?id=148
Organize a hearing to present the project to stakeholders and solicit their comments and questions.

Draft a list of the types of stakeholders (“preliminary list”) to be invited to the stakeholder meeting;

Draft a meeting agenda; and

Prepare a short document (3-5 pages) describing in non-technical terms the Kyoto Protocol and CDM, the project approval process, the project, and the goals of the stakeholder meeting.

♦ Identify a town-level co-sponsor of the meeting. Project developers may experience difficulty in attempting to organize and run a public meeting for project stakeholders. They lack the leverage to compel stakeholders to attend a meeting of this type. One possibility is to identify a town-level institution to co-sponsor the stakeholder meeting. To the extent possible, this institution should be independent and objective, i.e., not one of the project proponents. Candidates include: the town-level governmental authority and the local EPB.

♦ Hold an organization meeting involving the project developer and the co-sponsor. The purpose of this meeting is (a) discuss the draft preliminary list of stakeholders make any revisions deemed necessary; (b) develop a plan for inviting and ensuring the attendance of relevant stakeholders (including a list of specific invitees, and the method of invitation); and (c) set a mutually acceptable date and place for the stakeholder meeting.

♦ Finalize attendee list and invitation plan. Possible meeting attendee could include:

- Government officials (municipal, provincial, county)
- Neighbors of the project and those using affected natural resources (water, trees, soil, air)
- Employees or prospective employees of the project/plant
- Representatives of those involved in construction of project
- Consumers of the project/plant output

♦ Invite participants to the meeting. The project developer and the co-sponsor can share responsibility for issuing invitations. Invitations can be made by mail, by phone, or in person, whatever works. The project developer may wish to offer lunch and a small (monetary) gift to ensure attendance. In this instance, the invitation letter should say that lunch and a small token of appreciation would be provided. If possible, project developers should distribute the short document on the Kyoto Protocol and the project to invitees.
♦ **Stakeholder meeting.** A facilitator should lead stakeholder meetings. After a brief presentation of the project and distribution of the accompanying information note, attendees should be given an opportunity to make a brief statement. This process can be followed by an open discussion. A secretary should be assigned to thoroughly document the meeting. Documentation of the meeting could include (a) getting each attendee to sign a register, (b) taking detailed notes that reflect the contributions of each person who speaks, and (c) a tape recording or videotape of the proceedings (although this may discourage full participation).

The stakeholder meeting agenda might include the following items:

- A description of the Kyoto Protocol and the CDM;
- A brief description of project including how project will reduce carbon emissions and a summary of known social development impacts;
- An explanation of the approval process for CDM projects in China, with a reference to the requirement that project developers must collect comments from stakeholders affected by the project;
- Review of the purpose of the stakeholder meeting. Participants should be informed that their comments would not be attributed to individuals in documents made public.
- Presentation of the project and its impacts;
- Solicitation of input from all parties affected by the project to ensure that the project is structured in a way that provides the greatest benefits. Specifically, attendees could be invited to describe their view of the pros and cons of the project and how it might be modified to increase its benefits. Participants might focus their comments around the following questions:
  - How will the project benefit you?
  - How will the project harm you?
  - How should the project be changed to maximize the benefits and minimize the harms?

♦ **Annex I: Contact information on participants**

Project proponents must provide complete contact information for all entities that are directly involved in the project’s design and implementation or who may be representing the participants for purposes of carbon credit emissions sales. In some instances, project proponents may include the buyers of the carbon credits. Including carbon credit buyers in this annex can become essential in cases where the purchase of the carbon credits is a necessary condition to the successful mobilization of project capital financing.
Annex II: Information regarding public funding

One of the concerns of the Conference of Parties is ensuring that the CDM, because of the potential for direct financial gains, does not result in a diversion of public funding from other uses. Specifically, projects are not eligible under the CDM if they are directly financed from public funds from Annex I countries that had already been committed for support to public or private organizations in the host country. For example, the Dutch government has created several new financing windows to purchase carbon credits from CDM projects. However, those financing windows are designed to be clearly independent of other Dutch government financial support currently being directed to developing countries.

3.5 Step 5: Submit PDD for National Approval

After the PDD has been completed, it needs to be submitted to the Designated National Authority (DNA) for approval. The DNA in China will review the SSC CDM project in accordance with national, regional and sectoral goals that meet sustainable development objectives as well as social and economic development goals. National approval from the DNA should be made in writing. Project proponents are urged to ensure that a DNA approval letter includes the following information:

- The DNA states its authority as a legal representative of the Government;
- The project is well-described (project name, company, location, and any other distinguishing characteristics);
- The Country/State has fulfilled its national obligations in order to become a Party to the Kyoto Protocol and shall accede to the Kyoto Protocol no later than 30 days after the Kyoto Protocol has entered into force;
- The Country/State recognizes the project to be a CDM project in accordance with Article 12 of the Kyoto Protocol and its underlying decisions;
- The Country/State confirms that the CDM project contributes towards realization of the Country/State's sustainable development goals; and
- The Country/State authorizes the Project Company and any future owner of the project to generate CERs, through the completion and operation of the project in accordance with Article 12 of the Kyoto Protocol;

If the project proponent has already negotiated a carbon credit purchase agreement, then it is strongly recommended that the DNA’s approval letter include additional information recognizing that the Country/State accepts and recognizes the terms of the transfer of CERs generated by the project to the
buyer (e.g., percentage of the carbon credits and the period of transfer of those credits) through the issuance of CERs according to the rules and procedures in the Marrakech Accords.

Finally, some buyers may want the DNA to explicitly recognize that in the event that the Kyoto Protocol does not enter into force, it will still accept the transfer of the units of greenhouse gas emission reductions on a bilateral basis with the country of origin of the buyer.

3.6 Step 6: Validate and Register Project with CDM Executive Board

Before proceeding to project validation, a project proponent should have the following information in hand:

♦ A complete PDD.

♦ An approved environmental audit or impact assessment, if required (note that this step may only occur later after project financing is secured).

♦ A summary record of the stakeholder assessment process.

♦ A letter of approval from the DNA of the participating country. In some cases the DNA may request a pre-validation of the project as a precondition for approval. In this case validation can be provided conditional on the receipt of the DNA approval letter and final validation completed after receipt by the DNA approval letter.

If all of the above conditions have been met, project developers can proceed with project validation. Recall from Section 2.2.4, that validation can be only undertaken by a Designated Operational Entity (DOE) (also see Table 4). The DOE is an independent legal entity that has been accredited by and is accountable to the CDM EB. The project proponent is responsible for selecting and paying for the services of a DOE. However, as of December 2003, the CDM EB has not accredited and recommended for designation any entity. The Board is in the process of considering 19 applications from organizations based in Western Europe and Asia. However, the CDM EB will only accept new project submissions from these 19 “Applicant Entities.” The implication is that project developers will have to choose a DOE from the list of applicant entities seeking to be an accredited DOE. Visit the CDM EB website for contact information at the various DOE applicant entities.27 The DOE is responsible for reviewing the Project Design Document (PDD) to confirm that all the legal requirements of a CDM project activity have been met. In particular, the DOE review will assess the following issues:

♦ Did all parties voluntarily participate in the project?

27 http://cdm.unfccc.int/DOE
Did the project developer receive and take account of stakeholders’ comments in the project design?

Have environmental impacts been fully analyzed and, if necessary, was an EIA conducted?

Will the project lead to a real and measurable reduction in greenhouse gas emissions?

Does the small-scale project activity conform to one of the 13 recognized project categories and does it use an approved simplified baseline and monitoring methodology for that project activity category?

Has the host country designated national authority (DNA) issued a written confirmation that the project meets national sustainable development criteria?

**Table D-6: Key players and their roles in the various activities in the small-scale CDM project cycle**

<table>
<thead>
<tr>
<th>Project design and monitoring plan</th>
<th>Project Developer</th>
<th>DOE</th>
<th>COM EB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Validation/Registration</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Verification and certification</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Issuance of CERs</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

If the DOE is satisfied that these conditions have been met, it must (in accordance with CDM rules) make public the PDD (for further stakeholder input) for comments for 30 days. At the end of the 30-day public review period, the DOE considers comments received and makes a final decision whether to validate the project. Once a project is formally validated, the draft PDD and any supporting materials are forwarded to the EB for registration (Figure 4). The EB takes decisions on proposed CDM projects at its quarterly meetings. For the EB to consider a PDD for registration, it first verifies that all relevant documentation has been submitted. The EB also requires project proponents to pay a non-refundable “registration fee” at the time of project submission. The registration fee levels are based on the estimated total emissions reduction of the project, according to the following scale:

**Table D-7: Initial administration fee (“registration fee”) for CDM projects.**

<table>
<thead>
<tr>
<th>Average tonnes of CO₂ equivalent reductions per year over the crediting period (estimated/approved)</th>
<th>US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 15,000</td>
<td>5,000</td>
</tr>
<tr>
<td>&gt; 15,000 and &lt;= 50,000</td>
<td>10,000</td>
</tr>
<tr>
<td>&gt; 50,000 and &lt;= 100,000</td>
<td>15,000</td>
</tr>
<tr>
<td>&gt; 100,000 and &lt;= 200,000</td>
<td>20,000</td>
</tr>
<tr>
<td>&gt; 200,000</td>
<td>30,000</td>
</tr>
</tbody>
</table>

Source: CDM EB.
Figure D-4: Steps involved in the validation and registration of a CDM project

The registration of a project by the EB is deemed final eight weeks after the date of receipt by the EB of the request for registration (this is equivalent to the date of receipt of the registration fee), unless a Party involved in the project activity or at least three members of the EB request a review of the proposed CDM project activity. A project review looks only at issues associated with the validation requirements. To avoid undue delays related to project review, the Board's by-laws require that the review be finalized no later than at the second meeting following the request for review, with the decision and the reasons for it being communicated to the project proponents and the public. Since the Board meets every three months on average, the project review period should not normally exceed six to eight months.
Important note to project developers and participants: A proposed project activity that is not accepted may be reconsidered for validation and subsequent registration, after appropriate revisions, provided that it follows the procedures and meets the requirements for validation and registration, including those related to public comments.

3.7 Step 7: Conclude Financing and Implement Project

This handbook does not explore in detail the approaches and issues in conducting a project financial analysis. Project developers seeking guidance on how to structure and secure project financing can refer to a 2001 UNIDO report, “Financing Issues and Options for Small-Scale Industrial CDM Projects in Asia.” The report, available online at http://www.unido.org/userfiles/PempletP/RASL_UNDP-report.pdf, provides an excellent overview of financing options, including three case studies for projects using biomass, wind and landfill gas to generate power. Section 4.0, below, complements this information with a discussion of the options for financing the additional costs associated with preparing and submitting a SSC-CDM project.

It is therefore assumed that the project developer has already conducted a thorough project financial analysis, possibly in collaboration with any external partners interested in acquiring the project’s carbon credits. If the project developer requires the revenue stream from the carbon credits in order to secure the project’s base financing, then he/she should proceed to finalizing an Emissions Reduction Purchase Agreement (ERPA) with an interested carbon credit buyer.

3.8 Step 8: Monitor, Verify and Certify Emission Reductions (ERs)

Monitoring: 28 The project developer is required to prepare a comprehensive monitoring plan for the proposed SSC CDM project. Monitoring refers to the collection and archiving of all relevant data necessary for meeting the information requirements for verification of the project’s emission reductions as set by the CDM EB. These include monitoring key indicators of the baseline, measuring GHG emissions by source within the project boundary, and monitoring environmental and social impacts. Projects may be required to demonstrate that assumptions behind the baseline continue to remain valid. Emission reductions arising from CDM projects must be real, measurable and long-term, which means that leakage must be monitored (including both activity shifting and market effects). Since the ultimate objective of the CDM process is to foster sustainable development, projects are also required to demonstrate that they are not causing negative social or environmental impacts. Developers should note that while domestic regulation may require the monitoring of some project-related variables including, possibly, GHG emissions; the monitoring plan as required by the CDM EB relates specifically to

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28 This section is partly based on information published on the CDM EB website; http://cdm.unfccc.int/
monitoring data to verify the project’s emission reductions, additionality, leakage and environmental and social impacts.

The monitoring plan should list the variables that would be monitored, the monitoring methodology and frequency, method of archiving information, and the reporting format. Monitoring is distinct from the other activities of validation, verification and certification because it is the responsibility of the developer. While sub-contractors may carry out monitoring and there may be elements of monitoring that require input from independent third parties (e.g. calibration of equipment, power dispatch data from the utility operator, etc.), it is the developer who is ultimately responsible for recording the results of measurement and monitoring activities for the verification process carried out by the DOE.

The following section provides some examples of the type of information and level of detail expected in a monitoring plan.

Example 1: Consider a CDM PDD for a MSW Power Plant to be set up in Guilin city, Guangxi province. The project will comprise of two circulating fluidized bed (CFB) boilers rated at 300 tons per day (tpd) of municipal solid waste and install two 6 MW steam generator units for a total plant rating of 12 MW, with plans to expand capacity if the initial installations are successful. To ensure proper combustion, the project will mix the municipal waste with 20% (by weight) coal. The goal of the project is to avoid the environmental impacts of disposing 600 tpd of municipal waste in the current landfill.

Since projects are required to demonstrate that assumptions behind the baseline continue to remain valid, the monitoring plan should contain details on the data that would be collected to track baseline emissions throughout the project period. The baseline of the project consists of the following two parts as shown in Figure D-5:

- The methane emissions (measured in kg CO₂equ/kWh) from anaerobic decomposition of land filled municipal solid waste in the Waste Landfill that would otherwise be emitted if the MSW were not incinerated for electricity generation by the proposed project activity. The Guilin Municipal Waste Power Plant will prevent 165,000 tons per year of municipal waste from being land filled. Since only the macro statistics of the emission of methane are necessary, the IPCC-recommended formula can be used as the basis for the calculation. See Section 3, step 3a, for details on emission calculation for different categories of projects.

- The weighted average CO₂ emission of per kWh of net power generation from the current Guangxi power grid. This is estimated using the IPCC methodology, which provides the most conservative estimate of the baseline electricity emissions.
Figure D-5: MSW power plant project (Guilin City): Project baseline GHG emission sources

The next step is to provide details on how the emissions that are associated with the proposed project would be monitored (Figure D-6). The approved monitoring methodology is as specified for Small-scale Project Type I.D: Renewable electricity generation for a grid shall be used for that portion of the proposed project activity. Monitoring shall consist of metering the electricity generated by the Guilin Municipal Waste Power Plant. Because the renewable energy technology is new equipment that will be installed only for this project activity, no leakage calculation (or monitoring of leakage) is required. For the portion of the project based on avoidance of methane emissions from a landfill, a new monitoring methodology is proposed that will measure the amount of municipal waste that is consumed in the power plant as well as other relevant parameters.

As this small-scale project activity will avoid the generation of methane that would otherwise be generated by disposal of the waste in the landfill, the following measures of the project activity will be monitored:

- The amount of municipal waste consumed by the project will be measured, as the avoided methane emissions will be proportional to this amount.

- The amount of the co-fired coal and the heating value of the coal will be monitored to allow calculation of the coal-based CO₂ emissions from the plant.

- The organic fraction of the waste will be monitored to allow calculation of the MSW-based CO₂ emissions from the plant.

- The amount of electricity provided to the Guangxi power grid by the plant will be monitored to allow calculation of the amount of baseline power grid CO₂ emission are avoided by the plant.
The data to be monitored is shown in Table D-8. The amount of municipal waste delivered to and consumed by the Guilin Municipal Waste Power Plant will be measured on a daily basis. The organic content of the delivered municipal waste will also be periodically sampled and measured on a monthly basis.

**Table D-8: MSW power plant project (Guilin City): Data to be monitored during crediting period of the project**

<table>
<thead>
<tr>
<th>ID no</th>
<th>Data type</th>
<th>Data variable</th>
<th>Data unit</th>
<th>Measured (m), calculated (c), estimated (e)</th>
<th>Recording frequency</th>
<th>Proportion of data to be monitored</th>
<th>How will the data be archived? (electronic/paper)</th>
<th>For how long is archived data to be kept?</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Municipal waste</td>
<td>Amount</td>
<td>Tons M</td>
<td>Daily</td>
<td>All</td>
<td>Electronic</td>
<td>5 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Municipal solid waste</td>
<td>DOC</td>
<td>%C M</td>
<td>Monthly representative samples</td>
<td>Electronic</td>
<td>5 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Municipal solid waste</td>
<td>NON-DOC</td>
<td>%C M</td>
<td>Monthly representative samples</td>
<td>Electronic</td>
<td>5 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Coal</td>
<td>Amount</td>
<td>Tons M</td>
<td>Daily</td>
<td>All</td>
<td>Electronic</td>
<td>5 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Coal</td>
<td>Caloric value</td>
<td>kgce/kg M</td>
<td>Daily</td>
<td>representative</td>
<td>Electronic</td>
<td>5 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Electricity</td>
<td>Net amount</td>
<td>MWh M</td>
<td>Yearly</td>
<td>All</td>
<td>Electronic</td>
<td>5 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Example 2:** Consider another CDM PPD for 10,000 Biogas Digesters for Poor Households. This project would be classified as a Type I.C: Thermal energy for the user, and a Type III. D: Methane recovery and avoidance. The project only comprises biogas digesters; there is no electricity generating equipment. As in the previous example, the monitoring plan needs to provide details on how both baselines emissions and project emissions would be calculated and recorded. The project boundary of
the project activity is comprised of the physical areas surrounding the biogas digesters at the 10,000 poor households.

In this case, the emission baselines for the proposed project activity are calculated in three parts: (1) the amount of CO₂ that is released from the current wood-fired cook stoves, which consume unsustainably harvested fuel wood; (2) the CH₄ emissions from the wood stoves that results from incomplete combustion of the wood; and (3) the methane that is currently emitted to the atmosphere from the rural manure cesspools.

The GHG emission baseline for the proposed project activity consists of two components.

♦ The CO₂ emissions from a wood cook stove are calculated based on an average annual unsustainable wood consumption of 1.24 tons.

♦ The average rural household possesses three pigs, and the CH₄ emission factor for pig manure in warm area of China is calculated according to IPCC-recommended methodology.

This project proposes to use the approved monitoring methodology for Type I.C projects with emission reductions of less than 5 tons per year, which allows for a survey of the system use. For the Type III.D project activity, the proposed project will use the approved monitoring methodology, which requires measurement of the amount of methane that is generated in the cesspools. The proposed survey methodology will determine if the number of households with operating biogas digesters and the performance of the systems over the monitoring period. This information is sufficient to calculate the overall emission reductions for the project. Please see Section 3, step 3a for details on how to calculate the amount of emissions.

The monitoring plan for this proposed project activity consists of two components. The first component comprises data that are collected for each and every biogas digester system installed. The second component of the monitoring plan comprises data that are collected periodically from a survey sample of households. The data set for the first component of the monitoring plan is identified in Table D-9. These data are collected only once at the time of system installation.

<table>
<thead>
<tr>
<th>ID no</th>
<th>Data type variable</th>
<th>Data unit</th>
<th>Measured (m), calculated (c), estimated (e)</th>
<th>Recording frequency</th>
<th>Proportion of data to be monitored</th>
<th>How will the data be archived? (electronic/paper)</th>
<th>For how long is archived data to be kept?</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Series Number of System</td>
<td>SN</td>
<td>Number M System installation</td>
<td>All</td>
<td>Electronic</td>
<td>10 years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Number of persons in household</td>
<td>NPH</td>
<td>Number M System installation</td>
<td>All</td>
<td>Electronic</td>
<td>10 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Table D-9: Biogas digesters project: Monitoring plan data for every system collected at the time of installation |

IRG/ Resources for the Future and Tsinghua University Global Climate Change Institute
The second component of the monitoring plan is the data collected from the survey households. The data from the total list of households will be used to develop a set of survey households that comprise at least 1% of the total households. The survey set will be characteristic of the total set of systems in terms of household income, location and occupation of the lead income earner. The second data set, shown in the table below, will be collected annually (or semi-annually).

### Table D-10: Biogas digesters project: Monitoring plan data from the survey households

<table>
<thead>
<tr>
<th>ID no</th>
<th>Data type</th>
<th>Data variable</th>
<th>Data unit</th>
<th>Measured (m), calculated (c), estimated (e)</th>
<th>Recording frequency</th>
<th>Proportion of data to be monitored</th>
<th>How will the data be archived? (electronic/paper)</th>
<th>For how long is archived data to be kept?</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Household income</td>
<td>HIN</td>
<td>Yuan/yr</td>
<td>E</td>
<td>System installation</td>
<td>All</td>
<td>Electronic</td>
<td>10 years</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Location</td>
<td>Loc</td>
<td>Place</td>
<td>M</td>
<td>System installation</td>
<td>All</td>
<td>Electronic</td>
<td>10 years</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Occupation</td>
<td>Occ</td>
<td>Type</td>
<td>M</td>
<td>System installation</td>
<td>All</td>
<td>Electronic</td>
<td>10 years</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Baseline Firewood use</td>
<td>BFWU</td>
<td>Tons/yr</td>
<td>E</td>
<td>System installation</td>
<td>All</td>
<td>Electronic</td>
<td>10 years</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Typical number of pigs</td>
<td>NPig</td>
<td>Number</td>
<td>E</td>
<td>System installation</td>
<td>All</td>
<td>Electronic</td>
<td>10 years</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Date Installed</td>
<td>SDate</td>
<td>Date</td>
<td>M</td>
<td>System installation</td>
<td>All</td>
<td>Electronic</td>
<td>10 years</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>System function</td>
<td>SysF</td>
<td>Yes or no</td>
<td>M</td>
<td>Annually or semi-annually</td>
<td>All</td>
<td>Electronic</td>
<td>10 years</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>System operation</td>
<td>OPER</td>
<td>Months</td>
<td>E</td>
<td>Annually or semi-annually</td>
<td>All</td>
<td>Electronic</td>
<td>10 years</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Firewood use</td>
<td>SFWU</td>
<td>Tons</td>
<td>E</td>
<td>Annually or semi-annually</td>
<td>All</td>
<td>Electronic</td>
<td>10 years</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Number of Pigs</td>
<td>NPig</td>
<td>Number</td>
<td>M</td>
<td>Annually or semi-annually</td>
<td>All</td>
<td>Electronic</td>
<td>10 years</td>
<td></td>
</tr>
</tbody>
</table>

Based on the survey results an average household emission reduction can be calculated, and the total project emission reductions can be calculated as the number of operating household systems times the average household emission reduction.

**Verification:** This refers to the periodic independent review by the DOE of the monitored reductions of anthropogenic emissions by sources of GHGs that have occurred as a result of a registered CDM project.

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29 This section is partly based on information published on the CDM EB website; http://cdm.unfccc.int/
project activity. By definition, this is a review of the quantitative estimation procedure that is conducted during project implementation. Verification is the written assurance by the designated operational entity that, during a specified time period, a project activity achieved the reductions in anthropogenic emissions by sources of greenhouse gases as monitored and reported. The CDM EB allows developers of SSC CDM projects to use the same DOE for carrying out validation (see Step 6) and verification activities.

The primary activities of the DOE in carrying out the verification include:

♦ Determine whether the submitted documentation of emission reductions is in accordance with the requirements of the registered project design document and relevant provisions assumed for validation as a CDM project.

♦ Conduct on-site inspections, and as deemed appropriate conduct, a review of performance records, interviews with project participants and local stakeholders, collection of measurements, observation of established practices and testing of the accuracy of monitoring equipment;

♦ Review monitoring results and verify that the monitoring methodologies for the estimation of reductions in anthropogenic emissions by sources have been applied correctly and their documentation is complete and transparent;

♦ Recommend to the project participants appropriate changes to the monitoring methodology for any future crediting period, if necessary;

♦ Determine the reductions in anthropogenic emissions by sources of greenhouse gases that would not have occurred in the absence of the CDM project activity, based on the data and information derived from the above activities using calculation procedures consistent with those contained in the registered project design document and in the monitoring plan;

♦ Identify and inform the project developers of any concerns related to the conformity of the actual project activity and its operation with the registered project design document. Project developers are required to address the concerns and supply relevant additional information;

♦ Provide a verification report to the project participants, the Parties involved and the Executive Board. This report shall be made publicly available.

**Certification:** Certification is the written assurance by the DOE that during a specified time period, a project activity did achieve the reductions in anthropogenic emissions by sources of greenhouse gases as verified, and that these reductions would not have occurred in the absence of the CDM project activity. It shall inform the project developers, parties involved and the EB of its certification decision in writing immediately upon completion of the certification process and make the certification report publicly available.
The issuance of certified emission reductions (CERs) shall be considered final 15 days after the date of receipt by the EB of the request for issuance, unless a party involved in the project activity or at least three members of the EB request a review of the proposed issuance of CERs. Such a review shall be limited to issues of fraud, malfeasance or incompetence of the DOE. Upon receipt of a request for such a review, the EB at its next meeting shall decide on its course of action. If it decides that the request has merit it shall perform a review and decide whether the proposed issuance of CERs should be approved. The EB is required to complete its review within 30 days following its decision to perform the review and inform the project participants of the outcome of the review, and make public its decision regarding the approval of the proposed issuance of CERs and the reasons for it.

Upon being instructed by the EB to issue CERs for a CDM project activity, the CDM registry administrator, working under the authority of the Executive Board, will issue the specified quantity of CERs into the pending account of the Executive Board in the CDM registry. Upon such issuance, the CDM registry administrator would then transfer the CERs to the registry accounts of Parties and project participants involved, in accordance with their request after deducting the quantity of CERs corresponding to the share of proceeds to cover administrative expenses. 30

3.9 Step 9: Monetize CERs

Once the CDM EB transfers the CERs, the developer has three options. The developer can either sell the CERs on the open market to a suitable buyer or hold onto the CER for sale at a future time (“bank” the CERs). In the event that a forward contract has already been signed with a buyer, the developer would then merely transfer the CER to the buyer who would then register it domestically and the CDM EB would duly note the transaction. Since buyers of CERs are generally interested in obtaining large numbers of CERs, some form of bundling of CERs from small-scale projects is desirable, as it will help reduce transaction costs. This bundling could be based on technology (e.g. wind, biogas), location (e.g. Western provinces, Southern provinces) or on some other basis. This suggests that developers of unilateral SSC CDM projects who have not secured forward-contracts for their entire production of CERs would face obstacles in selling their small consignment of CERs in the open market. Currently, most of CER purchases is being undertaken by large carbon funds (e.g. PCF, CERUPT of Netherlands). In the future, host country CDM funds may aggregate CERs from a several SSC CDM projects into a portfolio, which would then be offered to large buyers. Overall, the carbon market is in its infancy and the modalities of pricing, ownership and asset structure are being worked out.

30 As on date (December 2003), the administrative fees schedule has not been formalized. It is likely that the fees would be set at a percentage of the total market value of the CERs. CDM Projects in least developed countries (LDCs) are to be exempt from the 2% levy to be used towards adaptation activities.
4 Financing Options for Small-Scale CDM Project Costs

Three categories of costs\textsuperscript{31, 32} are relevant to developers of SSC CDM projects, namely, the base project costs, the costs that may be associated with the additionality of CDM projects and transaction costs for processing CDM projects.

4.1 Base project costs

Base project costs are similar to those that would normally apply for the development and implementation of any project. These include capital costs for land, machinery, buildings, permits, licenses, etc.; operational and maintenance costs for labor, fuels, raw materials, replacement parts, repairs, etc.; and other costs such as taxes, management expenses, inspection fees, license fees, etc. The base project costs are relatively easy to assess and more certain as the prices for these goods and services are derived from local markets. However, CDM projects may require some project costs that is additional to what is normally expected for similar projects. These costs are referred to as additionality costs. For example, use of new technology that may deliver the GHG emission reduction may require an investment in additional land or specific machinery, specialized expertise, unique equipment that may impose additional costs for the project. Similarly, a perceived higher risk associated with the use of new, untested technology or the relative inexperience of the project promoter, may result in an increased cost of capital or demands by the lender for additional risk guarantees.

Base project costs can be financed in various ways (Table D-11). In some cases, developers may decide to self-finance the entire project costs using retained earnings or cash reserves. In most cases, however, project promoters may prefer to go in for debt financing through either the on-balance sheet (corporate finance) approach or the project finance approach. In most cases, corporate finance would be raised from debt at a price that reflects the corporate creditworthiness rather than from the issue of shares or bonds or internal reserves. In the case of the project finance approach, funds are borrowed based on the creditworthiness of the project rather than of the corporate sponsor. All project assets would be pledged in support of the loan, with the project finance lender relying on the project itself for repayment. Given that lenders normally perceive renewable energy

\textsuperscript{31} The discussion on sources of funds for SSC CDM costs draws from Gonzales (2001); Most et al. (2003); and websites of various organizations and other publicly available information.

and GHG projects to have relatively high risks and may demand additional security arrangements, it is likely that most of the financing that would be available would be in the form of corporate finance\(^{33}\).

Several options are available to project developers to meet their additionality costs. In addition to self-financing or debt, promoters can avail of vendor credit. Vendors of renewable energy or new technology systems may extend credit to projects to help close financing shortfalls and in the process secure their sales. Often lenders are amenable to lowering their risk perception if equipment vendors are able to back their products financially. In some cases, targeted project credits and grants are available from multilateral finance institutions, which are often routed through national and local banks for renewable energy projects. Such funds help national and local banks build capacity in assessing renewable energy projects while assisting project developers overcome the “no prior experience” financial barrier often faced by new and untested technologies.

<table>
<thead>
<tr>
<th>Table D-11: Types and sources of funds for small-scale CDM project development</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of funds</strong></td>
</tr>
<tr>
<td>Base project cost</td>
</tr>
<tr>
<td>Equity</td>
</tr>
<tr>
<td>Primary debt</td>
</tr>
<tr>
<td>Subordinate debt</td>
</tr>
<tr>
<td>Additionality costs</td>
</tr>
<tr>
<td>Equity</td>
</tr>
<tr>
<td>Debt</td>
</tr>
<tr>
<td>Supplier credit</td>
</tr>
<tr>
<td>Forward contracts(^{4})</td>
</tr>
<tr>
<td>Transaction costs(^{5})</td>
</tr>
<tr>
<td>Pre-project costs</td>
</tr>
<tr>
<td>Project implementation</td>
</tr>
<tr>
<td>Monetizing CERs</td>
</tr>
</tbody>
</table>

\(^{1}\) Can be corporations, NGOs or private CDM funds.

\(^{2}\) These are likely forms of support that may be provided by institutions that may be formed in the future.

\(^{3}\) Can be either multilateral funds (e.g. WB PCF) or those established by governments (e.g. CERUPT of the Netherlands).

\(^{4}\) These are contracts for buying part or all of the CERs that will be available at a future date. The price is pre-determined.

\(^{5}\) Bilateral donors will often offer supplier credit for technologies produced by domestic manufacturers (e.g. DANIDA will offer credit for buying Danish wind technology).

\(^{6}\) Refers only to the portion of transaction costs that relate to the CDM component of the project.

In cases where the promoter has fully financed the project including both project and additionality costs and seeks to sell the CERs to foreign buyers once they become available, it is referred to as the unilateral CDM model.\(^{34}\)

Under the bilateral CDM model, project developers would meet project costs by inviting equity participation from a variety of sources. A list of potential partners and their contact information is provided in Section 5.0. Multinational corporations and other private companies in Annex I countries that have an interest in offsetting their emissions and/or commercial gain may make a direct investment in SSC CDM projects. Entities that are most likely to directly invest in projects are those that have prior experience with investments in China. Private CDM funds are another source of funds. These funds aim to invest in diverse CDM projects in developing countries, aggregate these projects into portfolios and sell them to investors. In return for their investment, investors will receive a pro-rata share of the CERs that accrue. Such funds have an advantage in that they use the portfolio approach to pool the risks related to CER quality and quantity. Other potential sources of equity are the bilateral and multilateral investment funds that are aimed at financing renewable energy initiatives. An example of one such fund is the Finnish Fund for Industrial Cooperation Ltd (FINNFUND), which provides equity and debt to private ventures in developing countries and is focused on combined heat and power (CHP) plants, biomass based generation and energy efficiency. The Renewable Energy and Energy Efficiency Fund (REEF) established by the International Finance Corporation (IFC) aims to invest in renewable energy and energy efficiency projects in the form of equity and convertible or subordinate debt with equity options. Also relevant in this context are some private institutional sources including foundations, NGOs and commercial banks. For example Nuon, a Dutch utility has initiated overseas investments in wind farms, rural electrification and solar home systems in developing countries.

In the case of bilateral SSC CDM projects, additionality costs may be met by the project promoters themselves that includes the developed country partners or from any of the sources of funds that are applicable in a unilateral context. An important source of funds for meeting additionality costs is the forward contracts for CERs that the promoters may sign with either institutional buyers or CDM funds such as the Prototype Carbon Fund (PCF) of the World Bank. The promoter may either obtain an advance payment for a portion of the sale or can use the sale contract to raise debt from commercial lenders within the host country. This method of financing additionality costs can also be used in the case of unilateral SSC CDM if the host country promoter sets up forward contracts for purchase of CERs.

### 4.2 CDM Transaction Costs

Transaction costs are those costs that arise during the initiation and completion of transactions, and may not be directly related to the production of the good or service in question. Commonly applicable transaction costs include search and information costs, bargaining costs and policing and enforcement costs. Search and information costs are the costs of determining that the required good is available on the market and the likely variation in price. Bargaining costs are the costs required to come to an acceptable agreement with the other party to the transaction, and policing and enforcement costs are the costs of making sure the other party adheres to the terms of the contract.

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34 The Marrakech Accords (COP-7) allows for the implementation of unilateral CDM projects.
While transaction costs are relevant to all business activities, they are especially relevant to SSC CDM projects because of the need to adhere to the strict information and procedural requirements of the CDM registration process, and the need to obtain the approval of several government and independent entities. Transaction costs can occur at different stages in project cycle (pre-project phase, implementation phase and the monetizing stage) and at different administrative levels (project level, local government, national government, and international entities). A list of transaction cost components relevant to SSC CDM projects is provided in Table 10. It should be noted that the level of uncertainty and associated risks vary among the different types of transaction costs, with the pre-project stage posing the greatest uncertainty. Once a CDM project is validated and registered, the CDM related transaction costs tend to be more certain and easier to assess.

Transaction costs could have a significant impact on whether CERs add to the viability of a project. Recent studies indicate that transaction costs for small projects can account for between 2-15 percent of total capital expenditures, compared to only 0.2-0.3 percent for large projects. Other studies suggest that these costs can be even higher. While recent efforts to streamline project preparation procedures and ongoing national efforts by the Chinese government to streamline the approval process can be expected to lower transaction costs, these costs will be continue to be a critical matter of consideration for project developers. Undertaking a project under the CDM framework will only be viable if the costs of transacting the CERs are substantially lower than the revenue they will generate.

### 4.3 Options for Financing CDM Transactions Costs

For large projects, where the potential gains from participation in the CDM can justify the cost, it is reasonable to expect the developer to assume full responsibility for the transaction costs associated with processing a CDM project. However, for small-scale projects, the situation is different. Even with the streamlined processes established for small-scale CDM projects, developers are likely to face significant difficulties in preparing PDDs and in general processing their project for the CDM.

A range of multilateral, bilateral and national sources have established funds or programs to help CDM developers overcome transaction costs. The eligibility and conditions for assistance vary considerably according to the objectives of the supplier of the funds. In some cases, they are in the form of specific technical assistance grants that may require repayment when the project reaches financial closure. A list of funding sources and contact information is provided in Section 5.0. The WB, Asian Development Bank (ADB) and the United Nations Development Program (UNDP) all have in place programs and mechanisms to assist in preparation of projects for the CDM. For example, the Community Development Carbon Fund Plus (CDCF plus) program within the CDCF is specifically designed to provide technical and financial assistance to SSC CDM developers. This can be in the form of partial funding for conducting social and

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36 Michaelowa, Axel, Stronzik, Marcus; Eckermann, Frauke; Hunt, Alistair (2003)
environmental due diligence, identifying and selecting community benefits and for the creation of the PDD. Similarily, assistance may also be available from the proposed CDM facility at the ADB which is aimed at assisting member countries source funds for emission reductions, assist in processing CDM requirements for projects, and provide information and advice on the emerging CER market.

Assistance is also available in various forms from bilateral donor agencies. The principle of financial additionality stipulates that Annex B government funding for CDM projects must be additional to regular overseas development aid (ODA). However, with an increasing demand for emission reduction and CERs, it is quite likely that governments may set aside funds to directly assist CDM developers or assist domestic entities (corporations, NGOs etc.) that are actively interested in pursuing bilateral CDM projects. For example, the Canadian government through the Canada Climate Change Development Fund made available additional ODA to mitigate GHG emissions and foster sustainable development in developing countries. Grants from the fund will be available for preparation of PDDs, institutional support and technical assistance services. Other governments may potentially follow this lead.

Table D-12: Transaction costs components for small-scale CDM projects

<table>
<thead>
<tr>
<th>Transaction cost components</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pre-project stage</strong></td>
<td></td>
</tr>
<tr>
<td>Search and information costs</td>
<td>Costs incurred by developers and investors as they seek out partners for mutually advantageous projects</td>
</tr>
<tr>
<td>Negotiating costs</td>
<td>Costs incurred in negotiations with various stakeholders including buyers, local authorities etc. Also includes public consultations with key stakeholders</td>
</tr>
<tr>
<td>Costs of preparing a project development document including baseline determination and a monitoring protocol</td>
<td>Hiring consultants, identification, definition and justification of the emissions baseline and method to monitor project emission reduction.</td>
</tr>
<tr>
<td>Approval costs</td>
<td>Costs of processing authorization from host country</td>
</tr>
<tr>
<td>Project validation and registration.</td>
<td>Costs imposed by the involvement of a designated operational entity (DOE).</td>
</tr>
<tr>
<td>Registration costs</td>
<td>Registration by the CDM Executive board (EB).</td>
</tr>
<tr>
<td><strong>Project implementation stage</strong></td>
<td></td>
</tr>
<tr>
<td>Monitoring and verification costs</td>
<td>Data collection and reporting costs imposed by the DOE.</td>
</tr>
<tr>
<td>Certification costs</td>
<td>Issuance of CERs by the CDM EB.</td>
</tr>
<tr>
<td>Enforcement costs</td>
<td>Administrative and legal costs involved in enforcing the contracted transaction.</td>
</tr>
<tr>
<td><strong>Monetizing CERs</strong></td>
<td></td>
</tr>
<tr>
<td>Transfer costs</td>
<td>Brokerage costs</td>
</tr>
<tr>
<td>Registration costs</td>
<td>Costs of holding an account in the national registry</td>
</tr>
</tbody>
</table>

Source: adapted from Michaelowa et al. (2003)38

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Bilateral sources may also provide more traditional forms of support. For example national export promotion agencies such as Export Development Canada have been a supplier of various risk insurance and credit guarantees for exporters. In time, these entities may also develop SSC CDM-specific forms of support. Partners in Annex I countries can access this support and make it a part of their contribution to bilateral SSC CDM projects.

It is probable that with increasing interest in SSC CDM project development, the government of China might establish an institution for providing assistance to project developers including grants for covering transaction costs. This new institution may take the form of a centralized China Carbon Investment Fund (CCIF) that will work with provincial promotion and support centers, or a form similar to the existing China Construction Bank that supports construction activities in China. Such an institution if created will also be a significant source of funds to cover additionality costs.

### 4.4 Risks, Ownership and Legal Aspects

The business of producing and selling CERs is new and continually evolving. Hence, in addition to the usual risks, which apply to every project, SSC CDM projects are characterized by additional risks, which are described below[^39].

**Economic risks:** SSC CDM projects like all other multinational ventures are vulnerable to risks posed by macroeconomic factors such as inflation and interest rate variation, and exchange rate risks.

**Country risks:** Several issues pertaining to the socio-political situation in a host country poses risks. These include economic and political sanctions that may prohibit trade and debt repayments. The government may prohibit transfer of funds due to economic problems. Change in the government may bring into play unfavorable political philosophies that could prevent the implementation of projects or the transfer of CERs.

**Policy risks:** The continuing evolution of the Kyoto process and uncertainties surrounding its ratification by the requisite number of countries poses several risks that could impact demand for CERs. These include:

- A capping of the amount of emission reductions that Annex I countries can avail of through the flexible mechanisms like the CDM

- Uncertainty about which types of energy activities will be eligible for emissions crediting under CDM.

Within the stipulations of the protocol, countries may differ in their individual preferences of host locations, technologies and sectors. This could impact the viability of projects that fall outside those considerations.

**Legal risks:** Similar to all other projects, developers should ensure that they appropriately comply with all relevant legal requirements. The following list is illustrative and developers should undertake a thorough examination of local, regional and national laws that they are required to comply with.

- Adhere to all relevant disclosure laws
- Comply with all relevant standards, codes and licensing requirements (e.g. building standards).
- Fully implement all regulations pertaining to labor, financial accounting and taxation issues.

In addition, the unique characteristic of carbon as a commodity poses additional legal risks. The intangible nature of carbon makes it difficult to exercise clear possession and control. China, like most other countries, has not fully finalized legalities relating to the allocation of carbon property rights, establishment of title and carbon asset sales. This ambiguity poses ownership risks.

**Market risks:** At present no real market for carbon has been established. The prize of carbon on future markets is subject to highly speculative assumptions. Establishing forward-contracts at a pre-determined price can shield the developer from this risk.

**Technological risks:** The project may involve the use of new or unproven technology. For new technology, unless the debt is guaranteed by a large government agency or a large company with excellent credit, lenders may ask for additional support and guarantees from the developer. The developer may transfer some of this risk by requiring guarantees and surety from technology manufacturers.

Associated with technology risks is the risk posed by the renewable fuel in question. A project may not be able to generate CERs at the estimated rate from year to year. For example, in the case of a wind power project, the amount of CERs available for transfer to the buyer may have been calculated assuming that the turbine would operate at 25% annual capacity. In a particular year, poor wind conditions could result in a lower level of utilization and lead to lower than estimated availability of CERs. Similar risks are associated with run-of-river hydropower projects and agricultural based biomass energy projects. Developers can account for this risk by adjusting contracts to reflect this inter-annual variability (e.g. using a figure that is close to the average production of CERs over the project period). Overall, it is important to carry out a thorough assessment of resource availability in the case of wind, solar, hydro and biomass projects using recent, accurate data.
Measurement error can lead to uncertainty in the level of emissions monitored and ultimately certified. The development of a comprehensive monitoring and verification protocol is essential to controlling this risk.

**Transaction risk:** Both the developers and partners should have the resources and skills necessary to effectively implement the project and complete business transactions. The inability of either the developer to produce the CERs in a timely manner and in quantities specified in the contract, or the inability of the partner to either take possession of the CERs or pay for them can pose a considerable transaction risk. Private companies in most countries do not yet have fixed obligations to reduce their carbon emissions. There is the risk of buyers defaulting on their contract to buy CERs. There are various ways in which the capability and commitment of both the developer and partner to the project can be demonstrated to the lenders. The sponsors of the project should be committed to providing equity. The buyers of the CERs may either choose to be an equity participant or make large advance payments on their forward contracts which shows a keen interest in seeing the project through to completion. Alternately, buyers can be requested to provide bank guarantees or letters of credit that would be held by the seller for security of payment.

**Environmental risk:** The project developer must ensure that all environmental consents and approvals have been duly obtained. Any CDM project to be developed in China has to comply with regular environmental impact assessment (EIA) procedures and approvals. The current laws that are relevant to CDM projects in China include: Cleaner Production Promotion Law of PRC (June 2002); Environmental Protection Law of PRC (December 1989); Energy Conservation Law of PRC (November 1997) and Law on the Prevention and Control of Atmospheric Pollution of PRC (September 1987). Also relevant is the Environmental Protection of Construction Project Law (November 1998) and the Environmental Impact Assessment Law (September 2003). Developers need to continually monitor for any potential changes in future environmental local, regional or national regulations, which may pose a risk to project implementation.

Project risks can be managed through allocation to a party in the project structure, or it can be transferred out to third parties through risk mitigation products. The CER asset can also be guaranteed and insured against non-performance or under-performance. In the private insurance sector, companies are now providing carbon credit risk transfer services. In the coming years, more products for risk mitigation in relation to the flexible instruments such as SSC CDM may be offered on the market. It is likely that national export promotion agencies in Annex I countries such as the EXIM bank of the USA may lead in this effort.
5 Finding Partners for Small-Scale CDM Projects

Financial assistance for CDM projects is available through various “partnerships”. A broad range of players are able and interested in financially assisting CDM project developers and proponents to: (a) prepare projects for CDM validation and registration; (b) obtain or provide finance for CDM eligible projects; (c) sell directly the project’s emission reductions; and (d) broker the sale of the project’s emission reductions. A brief summary of some of the key players or “partners” that could assist a small-scale CDM project developer is presented below. Some of these partners are interested in only providing financial support to one of the four areas listed above (e.g., preparing projects for CDM validation and registration or only brokering the sale of the project’s emission reductions). Other players may be interested in all of the above areas (e.g., from assisting in project preparation to directly buying and brokering the sale of the project’s emission reductions). The information provided below identifies key players in each of the four areas for potential financial partnership. This list is growing rapidly and the inventory presented below is therefore partial and focuses only on the most well known players and resources. Readers should also note that given the dynamic nature of the CDM investment market, partners listed here may change the nature and extent of their participation.

5.1 Project Preparation Partners

5.1.1 Multilateral Partners

All the major multilateral institutions that are working in Asia have grant programs and technical assistance initiatives aimed at helping developing countries overcome the information, financial and institutional hurdles involved in preparing a SSC CDM project. Notable among these are the funds available under the plus component of the Prototype Carbon Fund (PCF) and Community Carbon Development Fund (CDCF) of the World Bank (described later in this section). These funds are aimed at lowering transaction costs, assisting in project preparation and offering technical assistance to project developers.

40 This section is based on information gathered in December 2003 from the websites of the featured organizations, publicity information available in the public domain and from discussions with members of the organizations. As the market for carbon credits is rapidly evolving, this section provides only a sampling of the available or interested partners or carbon funds that could be sources of financial support for prospective CDM projects.

41 An excellent reference for climate change project preparation partners is the on-line web site for the Financial Information Engine on Land Degradation (FIELD): http://www.gm-uncid.org/FIELD/Funds.htm
Similarly, the proposed CDM facility at the Asian Development Bank offers similar assistance to developers. The CDM Facility at ADB is set up to assist its member countries address the global climate change issues. The main objectives of ADB’s CDM facility are to

- Promote projects that contribute to poverty reduction and sustainable development;
- Support CDM project identification, development, registration, and implementation;
- Facilitate monitoring and verification of quality ER credits;
- Help find competitive prices for ER credits; and
- Facilitate sourcing of financing for GHG abatement projects.

ADB’s CDM facility expects to fulfill a unique function within the global CDM initiative in three ways

- Assist in project development, allowing ADB to work with DMCs interested in selling ER credits;
- Provide market intelligence on demand and supply of ER credits, prices and other relevant market information, with the CDM facility working as an information exchange to buyers and sellers; and
- Facilitate DMC access to a market for ER credits by allowing seller DMCs to explore and select from multiple buyers.

Both the Global Environment Facility (GEF) and the United Nations Development Program (UNDP) have project development facilities that assist developers to put together proposals for small-scale energy sector projects.

### 5.1.2 Bilateral Partners

There are a number of bilateral sources of funds, that are outside of normal ODA, that are available to assist in developing potential CDM projects. Countries that have established carbon funds that may have resources to assist in project preparation include Austria, Canada, Denmark, Italy, Japan, Norway, Spain, Sweden and Switzerland. Specifics and country eligibility is best obtained from the commercial counselor of the respective countries’ embassies. One example of a bilateral source is the Canada Climate Change

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43 http://www.gefweb.org/

44 http://www.undp.org/
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Development Fund (CCCDF): This fund administered by the Canadian International Development Agency (CIDA) is focused on activities that promote, facilitate, and/or finance the transfer of environmentally sound technologies to developing countries. Activities include capacity building, technical assistance, equipment and products. Currently, projects are underway in four broad areas: emissions reduction, capacity building, carbon sequestration and adaptation. There are clearly many more potential bilateral partners with CDM project preparation funds. The FIELD web site, referenced below, is a good starting point to identify these sources.

5.1.3 NGOs, Private Entities and Foundations

There are a wide range of NGOs, private entities and foundations that can provide funds for development of SS CDM projects. Coverage of all possible sources in this category is beyond the scope of this handbook. One example of a private sector non-profit group assisting in SS CDM project development is E&Co. This group manages funds from multilateral agencies and foundations and is focused on the provision of business development services and seed capital for energy efficiency and renewable energy projects worldwide. E&Co co-manages UNEP’s Rural Energy Environment and Development programs (see www.areed.com) in Africa, Brazil, and China. Contact information: E&Co, USA, Phone: +1 973-680-9100 and Fax: +1 973 680 8066; www.energyhouse.

Another example is the Solar Development Group (SDG): The group consists of two entities: Solar Development Capital Ltd, a commercial investment fund that provides debt and equity, and Solar Development Foundation, a business development support facility for seed finance for solar entrepreneurs. The group focuses on developing countries. Contact information: Solar Development Group, The Netherlands, Phone: +31 30 6936590; Fax: +31 30 6936566; www.solardevelopment.org.

Another interesting source of information is the Global Energy Village Project (GVEP). GVEP is a voluntary Partnership that brings together developing and industrialized country governments, public and private organizations, multilateral institutions, consumers and others in an effort to ensure access to modern energy services by the poor. GVEP can help project developers of SS CDM projects source project preparation funds from members in its partnership. The Global Village Energy Partnership Financing Facilitation module bridges the gap among financiers, entrepreneurs and consumers with the goal of increasing investment in village energy projects and programs by offering two distinct products and services: (1) Financing Facilitation Portal: linking entrepreneurs and consumers with information on investment institutions and the products and services they offer to finance village energy projects. GVEP is developing this service in collaboration with BASE, see www.fse-directory.net for more information; and (2) Training Finance Professionals: training lending officers to evaluate and invest in village energy projects, products and services.

For more information on the Canada Climate Change Development Fund go to: http://www.acdi-cida.gc.ca/cida_ind.nsf/AllDocIds/786C54DA98C01B4F85256D7C0863C1DC?OpenDocument
Al Tayyar Energy, UAE. This fund provides project development assistance funds as well as equity investments. Technologies of interest are biogas, biomass, small hydropower, solar and wind. Investment focus is on developing Asia and Africa. Contact information: Al Tayyar Energy, Abu Dhabi, United Arab Emirates, Phone: 971-2-681-4004; Fax: 971-2-681-4005; www.altayyarenergy.com

5.2 Partners for financing projects

5.2.1 Multilateral Sources

World Bank (WB): The Asia Alternative Energy Program (ASTAE) of the World Bank aims to promote renewable energy and energy efficiency projects in Asia through the World Bank’s power sector lending operations. Financing for GHG reduction projects may also be available from other sectoral lending programs of the Bank such as the Energy Sector Management Program (ESMAP) and the Energy and Water Program (EWDEN). Contact information: The World Bank, Washington DC, USA; www.worldbank.org.

United Nations Development Program (UNDP): The Energy and Environment program of the UNDP is focused on promotion of renewable energy and energy efficiency projects through activities such as the joint UNDP/World Bank Energy Sector Management Program (ESMAP) and the FINESSE (Financing Energy Services for Small-scale Energy Users) program. It also has linkages with the UNDP-GEF unit on energy efficiency, renewable energy, and GHG emission. Contact information: The United Nations Development Program, New York, USA; www.undp.org.

The Asian Development Bank (ADB): The ADB provides grants and loans to renewable energy and energy efficiency projects in member countries through various sectoral lending programs. The proposed CDM facility at the ADB will create links between energy sector lending and the CDM. It will carry out three main functions: (i) assist developing member countries (DMCs), through ADB operations departments, in sourcing funds for emissions reduction (ER); (ii) assist in processing CDM requirements for identified projects including small-scale CDM projects through private sector operations or other intermediaries; (iii) and provide information and advice on the emerging ER markets. In addition, to assist small countries and DMCs with a relatively low capacity to access CDM resources, the CDM facility might explore the establishment of a separate revolving fund that would provide financial support to process ER credits from relevant projects in such countries. Upon the successful implementation of such projects, the initial project development costs could be returned to the revolving fund. Contact information: The Asian Development Bank, Manila, Philippines; www.ADB.org.

46 For more information on GVEP go to: http://www.gvep.org/
The Renewable Energy and Energy Efficiency Fund (REEF): This fund was established by the International Finance Corporation (IFC) to invest in renewable energy and energy efficiency projects in developing countries and in economies in transition. REEF investments can take on the form of common and preferred stock, partnerships and limited liability company interests. Contact information: International Finance Corporation, Washington DC, USA; www.ifc.org.

5.2.2 BILATERAL DONORS/FUNDS

Most industrialized countries have established institutions that provide long-term finance for private sector development in developing countries. In most cases, these institutions prefer to support projects that have the involvement of their domestic firms.

DEG, the German Investment and Development Company: Specializes in long-term project and corporate financing. It advises private companies, structures and finances their investments in Africa, Asia, and Latin America as well as in Central, Eastern and Southeast Europe. DEG invests in profitable, ecologically and socially sustainable projects in all sectors of the economy open to private entrepreneurial initiative. It is one of the largest European development finance institutions. Contact information: DEG – Deutsche Investitions-und Entwicklungsgesellschaft mbH, Germany. Phone: +49 (0) 2 2149 86113, Fax: +49 (0) 2 2149 86105; www.deginvest.de.

Finnish Fund for Industrial Cooperation Ltd (FINNFUND): The Private Energy Market Fund segment of the FINNFUND offers equity investments in developing countries with a near-term focus on central Europe and Asia. Investments are targeted in combined heat and power plants (CHP), biofuels powered plants and in energy efficiency projects. Contact information: FINNFUND, Helsinki, Finland, phone: 09 348 434; www.finnfund.fi.

Netherlands Development Finance Company (FMO): FMO specializes in providing finance to the private sector in emerging markets. Projects need not have a Dutch partner. In addition to providing both equity and debt, FMO also implements a number of government programs, e.g. Small-scale Enterprise Fund, Seed Capital, Investment Promotion and Technical Assistance for Developing Countries. Contact information. FMO, The Hague, The Netherlands; www.fmo.nl.

The government of Netherlands also directly invests in CDM projects through intermediary organizations such as the World Bank (The Netherlands Clean Development Facility), IFC, and Rabobank.

5.2.3 PRIVATE SOURCES

Included in this category are private equity funds, NGO and ethical investment funds, and funds from private corporations that have been earmarked for earning carbon credits. Private equity funds can be of various kinds including those that aim to use carbon credits to enhance the internal rate of return (IRR)
of their investments, those that specifically target CDM projects, and venture capital funds with a potential carbon component.

**The FondElec Group:** The FondElec Latin American and Asian Clean Energy Services Fund ($100-200 million) focuses on energy efficiency, renewable energy and fuel switching projects in select Asian countries. Contact information: www.fecleanenergy.com.

**The Clean Energy Fund:** Sponsored by D & B Capital, this fund is targeted at making investments in clean and renewable energy worldwide. The fund has also received a mandate from the World Solar Commission to help fund the World Solar Program (1996-2005). Contact information: www.cleanenergyfund.org.

**Asia Carbon Fund:** The fund is a multi-purpose project finance and carbon financing fund which aims at mitigating global warming by reducing greenhouse gas emissions. The fund has a target market capitalization (Phase 1) of US$120 million and a target emissions reduction of 200,000 carbon dioxide equivalent tons, based on a portfolio of small-scale, medium-scale and large-scale renewable energy and energy efficiency projects in Asia. Contact information: http://www.asiacarbon.com/asiacarbon/home.php

**Renewable energy and energy efficiency fund (REEF):** Sponsored by the US based EIF group, this fund ($ 65 million) focuses on investments in energy efficiency and renewable energy in emerging markets and developing countries. Contact information: EIF Group, Washington, DC, Tel: (202) 783-4419; Fax: (202) 371-5116.

**West LB, Germany:** West finances renewable energy and energy efficiency activities in Asia and other parts of the world. Contact information: Westdeutsche Landesbank Girozentrale, Germany. Phone: +49 211 826-01; Fax: +49 211 826-6119; www.westlb.de

**Triodos International Fund Management BV, The Netherlands:** This fund makes investments (equity and debt) with a focus on funding renewable energy businesses in both Europe and developing countries. Contact information: Triodos International Fund Management BV; The Netherlands; Phone: +31 30 6936590, Fax +31 30 6936566; www.tridos.com.

**The Solar Development Group:** See description in section on partners for project preparation. A group member, Solar Development Capital Ltd, a commercial investment fund provides debt, and equity for renewable energy projects in developing countries.

**Al Tayyar Energy, UAE.** See description in section on partners for project preparation.

**China Environment Fund, China:** China Environment Fund is a strategic private equity fund whose mission is to generate financial returns by making active investments in companies working to sustain, restore and improve the global environment. The China Fund plans to invest in a core group of Chinese environmental service companies. The Fund will also invest in selected non-Chinese companies with
technologies, products and/or services that are especially well suited and competitive for the Chinese market. Contact information: Tsinghua Venture Capital Co., Ltd, Beijing, Peoples Republic of China, Phone: +86 (10) 6279 1197, Fax: +86 (10) 6278 0287.

**Global Environment Fund, USA:** The fund is dedicated to making investments in companies and projects in North America and the developing world that promote human health and the natural environment. It invests in companies that own and operate critical infrastructure systems. Sectors of particular interest include: clean energy; water/wastewater treatment; sustainable forestry and forest products; efficient transportation; integrated waste management; technology that promotes improved efficiency and safety in energy use. Contact information: Global Environment Fund, USA, Phone: +1 (202) 789-4500; Fax: +1 (202) 789-4508; www.globalenvironmentfund.com.

**Energy Ventures Group, USA.** Energy Ventures Group is an energy investment firm with a focus on emerging technologies in the renewable energy and energy efficiency sectors in developing countries. EVG specializes in venture capital and advisory services. Contact information: Energy Ventures Group, Washington DC, USA, Phone: (202) 625 4395; Fax: (202) 625-4363; www.energyvg.com

**New Energies Invest Ltd (Sarasin & Cie):** New Energies Invest Ltd. is a private equity company founded by Bank Sarasin & Cie and managed by Remaco Merger AG. As of first quarter 2002, New Energies Invest Ltd had a net asset value of CHF 46 million. Investments are made in companies all over the globe that finance, produce, distribute, sell and subsequently trade in renewable forms of energy, as well as in companies that act as consultants in this field, or develop, manufacture, assemble or use the components and equipment required for this purpose. Contact information: Bank Sarasin & Cie, Basel, Switzerland, Phone: +41 (0) 61 2777477, www.sarasin.ch

### 5.2.4 NGO AND ETHICAL FUNDS

Currently, most of these funds are focused on carbon sequestration through land-use and forestry projects. However it is likely that in the near future, they may also include CDM projects. Key funds in this category are the Conservation International Global Conservation Fund (http://www.conservation.org); The Nature Conservancy Investment Fund and Carbon Fund (www.nature.org); and the FFI Arcadia Fund.

### 5.3 Buyers of CERs

The number of interested buyers of CERs is increasing rapidly as a result of expectations that formal markets for the CERs will be established in Europe, Canada, Japan and elsewhere. The parties most interested in buying CERs are buying them either for use towards meeting their own emission reduction commitments or are buying them as brokers for resale to others or for speculation in future CER
markets. A brief summary of the active carbon credit buyers is presented below. This is not a comprehensive list as the present conditions of the market are quite dynamic.

5.3.1 **MULTILATERAL CARBON FUNDS**

**Prototype Carbon Fund, World Bank (PCF):** The PCF was created in 1999 from funds contributed by corporations and governments. PCF uses its resources to support projects designed to produce CERs fully compliant with the CDM regulations. Contributors receive a proportional share of CERs in accordance with carbon purchase agreements reached with the respective host countries. Contact information: www.prototypecarbonfund.org

**Community Development Carbon Fund, World Bank (CDCF):** This fund with a target size of $100 million is specifically focused on small-scale projects. Its operations are similar to the PCF, i.e. participants contribute financial resources, which are used to purchase CERs, which will then be transferred to the participants. In addition to renewable energy and energy efficiency projects, the fund also proposes to support land-use, land-use change and forestry (LULUCF) projects. Contact information: www.communitycarbonfund.org.

In addition to the above, the World Bank manages the Bio Carbon Fund, the Netherlands CDM Facility and the Italian Carbon Fund.

As indicated earlier, the ADB CDM Facility is also involved in the purchase of CERs. However, the ADB CDM facility acts more as the seller’s broker rather than the buyers broker by assisting the seller in identifying potential buyers and completing the transaction.

5.3.2 **BILATERAL CARBON FUNDS**

**Carboncredits.nl:** Through Carboncredit.nl, the Dutch government buys GHG emission reductions from companies investing in renewable energy and energy efficiency in developing countries and countries in Central and Eastern Europe. Transactions are done through CERUPT, the Netherlands Certified Emission Reduction Unit Procurement Tender. **Senter** has been appointed as the tendering authority for CERUPT. Carboncredits.nl has allocated nearly $1.2 billion to acquire carbon credits through the JI and CDM program. Contact information: www.carboncredit.nl.

**KfW Fund:** This is a German government fund that will buy carbon credits from CDM projects and resell them to other buyers seeking credits to meet emission reduction commitments. Contact information: www.kfw.de/EN/Die%20Bank/KfWUpdates60/TheKfWCarb68/Inhalt.jsp
5.3.3 PRIVATE CORPORATIONS

Among potential buyers of CERs are many large global corporations that have committed to GHG reduction targets on a voluntary basis. These include companies such as ABB, Dupont, Entergy, IBM, Shell, Ontario Power Generation, Toyota USA, Marubeni, United Technologies Corp., TransAlta and others. In many cases, these companies are investing in carbon-offset projects in developing and transitional countries where the abatement cost is much lower. While some of these companies have invested in the private equity funds such as FondElec or multilateral institution funds such as the PCF described earlier, it is likely that in the near future, they may get directly involved in the carbon market. For example, corporations and other entities in 7 Midwest States in the US have banded together under the Chicago Climate Exchange to begin trading carbon emission credits. More information on these corporations that are leading the way in terms of developing the carbon market can be gathered from the websites of coalitions and associations such as the Business Environmental Leadership Council47, and the World Business Council for Sustainable Development48.

5.4 Brokers and intermediaries

There are several organizations that offer support services including market information, technical and advisory services, brokering services, and facilitate access to investors by acting as “investment clearinghouses”.

United Nations Environment Program, Sustainable Energy Finance Initiative (SEFI): The scope of SEFI includes renewable energy and energy efficiency investments in both developed and developing countries, including climate change and carbon trading activities. In addition to promoting renewable energy and climate change mitigation activities among the international financial community, SEFI develops and promotes joint FI/UN initiatives and other public-private partnerships; links donor funding with the finance sector to buy down and share risks; and provides incentives for new financial product development that targets regions of the world currently without access to modern energy services. Contact information: http://sefi.unep.org/

CO2e. LLC: An online brokerage and carbon commerce portal formed by the Cantor Fitzgerald group in association with PricewaterhouseCoopers. On offer is a web-based broker-assisted marketplace for the trading of emission reductions and other related services. Contact information: www.co2e.com.

Natsource: An institutional broker and provider of strategic planning and market intermediary services for the carbon finance market. http://www.natsource.com/about/

47 http://www.pewclimate.org/companies_leading_the_way_belc/
The Carbon Trader: This portal provides a suite of services for the carbon finance market related to news and commercial services. This includes tailored financial packages, public relations campaigns, environmental evaluations, certified verifications, and risk management solutions. Contact information: www.thecarbontrader.com

Climate Investment Partnership (CIP): This Switzerland based association of public and private institutions seeks to arrange upfront financing for projects involving renewable energy and GHG reductions. CIP acts as an investment clearinghouse and will work with project developers, investors and specialized service providers to identify, screen, process and finance suitable projects. CIP will coordinate actively with the project finance facility of Swiss Re. Contact information: CIP; 6 Place des Eaux-vives, 1207, Geneva, Switzerland. Tel: 41-78 772-4183. Fax: 41-22-776-5078.

Chicago Climate Exchange (CCX): This self-regulatory exchange that administers a multi-national and multi-sector marketplace for reducing and trading greenhouse gas emissions. Among its key objectives are the building of market institutions and infrastructure and the facilitation of trading with low transaction costs. Contact information: http://www.chicagoclimatex.com/about/

EcoSecurities: A leading environmental finance company providing strategic expertise to businesses on emerging environmental issues. Services provided include identification of strategic business opportunities resulting in industrial and emerging countries, carbon sequestration quantification, emissions trading policy analysis and project development services, and investment evaluation and financial structuring using environmental commodities. Contact information: http://www.ecosecurities.com/200about_us/200about_us.html
6 Finding Opportunities for Small-Scale CDM in China

The PRC has recognized the potential impacts of global climate change on its sustainable development, and in 1990 it established a National Climate Change Coordination Group. In 1998, this Group was renamed as the China Climate Change Policy Coordination Committee and its leadership was changed to the State Development Planning Commission, which is renamed in 2003 to the National Development and Reform Commission (NDRC). In this way, the policies and measures for global climate change and national development planning are closely connected, thus promoting the implementation of national sustainable development strategy in China.

The PRC has been a consistent and active participant in relevant international activities regarding climate change, including development of the CDM. China approved the Kyoto Protocol in August 2002, and the NDRC was assigned as the Designated National Authority for CDM in China. In order to ensure a simple, efficient and transparent administrative system and procedures, NDRC, three levels of organization are being established: (a) National Coordination Committee for Climate Change (NC4), (b) National CDM Review Board (NCRB), and (c) National CDM Project Management Center (NCPMC).

Functions and responsibilities of the three administrative organizations will be: (a) NC4 for the development and coordination of China's climate change strategy, such as policies, regulations and criteria related to CDM activities in China; (b) NCRB for developing of regulations and procedure for CDM program activities, approving CDM projects recommended by NCPMC, reporting CDM project implementation and making suggestions on it, proving NCPMC with guidance etc. and (c) NCPMC for monitoring and managing CDM projects with the mandate of NCRB, accepting applications for CDM projects, screening CDM projects and reporting process status, initiating capacity building activities on CDM and providing technical and consultant assistances, managing and implementing international cooperation projects under the mandate of relevant departments and agencies, finally carrying out other responsibilities assigned by NCRB.

6.1 Working with national proponents

At present there is no formal process established in the PRC to guide external investors in CDM projects or buyers of CERs. There does not exist a “single window” or principal agency that deals solely with interested investors in CDM projects or potential buyers of CERs. The members of the NC4, and principally the Ministry of Science and Technology, all provide varying degrees of assistance to interested
investors in CDM projects or buyers of CERs. However, as these are government agencies, the tendency is that they deal primarily with representatives of international agencies or governments.

There are a number of national institutions such as the Tsinghua University’s Global Climate Change Institute and the Center for Renewable Energy Development of the Energy Research Institute (ERI) that are actively involved in climate change and CDM related activities. These institutions could provide points of contact for external private sector or NGO representatives interested in CDM project development in the PRC. In addition, there are numerous other institutions and private organizations emerging in China that are working on developing and promoting CDM projects in the PRC.

An excellent reference site for information on national proponents of climate change in the PRC is the China Climate Change Info-Net web site: http://www.ccchina.gov.cn/english/

6.2 Working with provincial proponents

Knowledge about project opportunities through the CDM are filtering down to the provincial level. As a result, the level of knowledge and thus the potential proponents for CDM projects at the provincial level varies greatly depending on the previous involvement of the province in a CDM related project. In the case of this ADB sponsored project (ADB TA-3840: Opportunities for the CDM in the Energy Sector), two provinces, Gansu and Guangxi were directly involved in the project. As a result, these provinces have provincial institutions that are familiar with the requirements of CDM projects and are able to provide some support to interested external investors. Specifically, in Gansu it is the Science and Technology Dissemination Center and in Guangxi it is the Guangxi Branch of the China Science and Technology Development Institute. It is possible that in other provinces there are similarly informed provincial institutions. However, this would generally be the result of other technical assistance activities that provided relevant training and capacity building. Notwithstanding, it would be advisable to first work with the established national CDM project proponents who would be in a much more informed position to advise on possible provincial CDM project proponents. It is expected that as the PRC establishes a more formal CDM institutional framework, provincial CDM project proponents will be established.
7 SOURCES OF INFORMATION ON CDM

The following section provides Internet links and references to additional information on CDM that developers may find useful.

7.1 General CDM

♦ The official website of the Clean Development Mechanism: http://cdm.unfccc.int


♦ Climate Change Knowledge Network’s Climate Compendium: Contains information on CDM related to issues under debate, recent CDM articles, reports and publications, CDM web sites and resources. www.cckn.net/compendium/int_cdm.asp


7.2 Small-scale CDM

♦ Introduction to small-scale CDM: http://cdm.unfccc.int/EB/Panels/ssc/ProjectActivities/background.html

♦ The small scale CDM panel of the UNFCCC: http://cdm.unfccc.int/EB/Panels/ssc

♦ Simplified modalities and procedures for small-scale CDM activities from the CDM EB: http://global.finland.fi/english/projects/cdm/SimplifiedM&P.pdf
♦ A note on bundling as a way of lowering transaction costs: Source: Development Alternatives, India. Available at: http://www.devalt.org/newsletter/nov03/of_4.htm

♦ Small-scale CDM projects: opportunities and obstacles. Study conducted by Factor Consulting + Management Ltd, Switzerland for the Swiss Agency for International Development. Available at: http://www.factorag.ch/pdf20files/Small-Scale_CDM_Vol1.pdf

♦ Government of Finland’s CDM/JI activities (includes small-scale CDM activities): http://global.finland.fi/english/projects/cdm/activities.html
ANNEX 1: GLOSSARY OF TERMS USED IN THE CDM PROJECT DESIGN DOCUMENT (CDM PDD)

The following CDM glossary49 intends to assist in clarifying terms used in the CDM PDD and the CDM modalities and procedures in order to facilitate the completion of the CDM PDD by project participants.

Clean development mechanism (CDM)

Article 12 of the Kyoto Protocol defines the clean development mechanism. “The purpose of the clean development mechanism shall be to assist Parties50 not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under article 3”.

At its seventh session, the Conference of the Parties (COP) adopted modalities and procedures for a clean development mechanism (CDM modalities and procedures, see annex to decision 17/CP.7, document FCCC/CP/2001/13/Add.2) and agreed on a prompt start of the CDM by establishing an Executive Board and agreeing that until the entry into force of the Kyoto Protocol (a) this Board should act as the Executive Board of the CDM and (b) the Conference of the Parties (COP) should act as the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (COP/MOP) as required by the Protocol and the CDM modalities and procedures.

Terms in alphabetical order

ATTRIBUTABLE

See “measurable and attributable “.


50 In this glossary, the term “Party” is used as defined in the Kyoto Protocol: “Party” means, unless the context otherwise indicates, a Party to the Protocol. “Party included in Annex I” means a Party included in Annex I to the Convention, as may be amended, or a Party which has made a notification under Article 4, paragraph 2(g), of the Convention.
BASELINE

The baseline for a CDM project activity is the scenario that reasonably represents the anthropogenic emissions by sources of greenhouse gases (GHG) that would occur in the absence of the proposed project activity. A baseline shall cover emissions from all gases, sectors and source categories listed in Annex A (of the Kyoto Protocol) within the project boundary. A baseline shall be deemed to reasonably represent the anthropogenic emissions by sources that would occur in the absence of the proposed project activity if it is derived using a baseline methodology referred to in paragraphs 37 and 38 of the CDM modalities and procedures.

BASELINE APPROACH

A baseline approach is the basis for a baseline methodology. The Executive Board agreed that the three approaches identified in sub-paragraphs 48 (a) to (c) of the CDM modalities and procedures be the only ones applicable to CDM project activities. They are:

♦ Existing actual or historical emissions, as applicable; or

♦ Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment; or

♦ The average emissions of similar project activities undertaken in the previous five years, in similar social, economic, environmental and technological circumstances, and whose performance is among the top 20 per cent of their category.

BASELINE METHODOLOGY

A methodology is an application of an approach as defined in paragraph 48 of the CDM modalities and procedures, to an individual project activity, reflecting aspects such as sector and region. No methodology is excluded a priori so that project participants have the opportunity to propose a methodology. In considering paragraph 48, the Executive Board agreed that, in the two cases below, the following applies:

♦ (a) Case of a new methodology: In developing a baseline methodology, the first step is to identify the most appropriate approach for the project activity and then an applicable methodology;

♦ (b) Case of an approved methodology: In opting for an approved methodology, project participants have implicitly chosen an approach.
BASELINE – NEW METHODOLOGY

Project participants may propose a new baseline methodology established in a transparent and conservative manner. In developing a new baseline methodology, the first step is to identify the most appropriate approach for the project activity and then an applicable methodology. Project participants shall submit a proposal for a new methodology to a designated operational entity by forwarding the proposed methodology in a draft project design document (CDM-PDD), including the description of the project activity and the identification of the project participants. The proposed new methodology will be treated as follows: If the designated operational entity determines that it is a new methodology, it will forward, without further analysis, the documentation to the Executive Board. The Executive Board shall expeditiously, if possible at its next meeting but not later than four months review the proposed methodology. Once approved by the Executive Board it shall make the approved methodology publicly available along with any relevant guidance and the designated operational entity may proceed with the validation of the project activity and submit the project design document for registration. In the event that the COP/MOP requests the revision of an approved methodology, no CDM project activity may use this methodology. The project participants shall revise the methodology, as appropriate, taking into consideration any guidance received.

BASELINE – APPROVED METHODOLOGY

A baseline methodology approved by the Executive Board is publicly available along with relevant guidance on the UNFCCC CDM website (http://unfccc.int/cdm) or through a written request sent to cdm-info@unfccc.int or Fax: (49-228) 815-1999.

CREDITING PERIOD

The crediting period for a CDM project activity is the period for which reductions from the baseline are verified and certified by a designated operational entity for the purpose of issuance of certified emission reductions (CERs). Project participants shall choose the starting date of a crediting period to be after the date the first emission reductions are generated by the CDM project activity. A crediting period shall not extend beyond the operational lifetime of the project activity. The project participants may choose between two options for the length of a crediting period: (i) fixed crediting period or (ii) renewable crediting period, as defined in paragraph 49 (a) and (b) of the CDM M & P.

CREDITING PERIOD – FIXED (ALSO FIXED CREDITING PERIOD)

“Fixed Crediting Period” is one of two options for determining the length of a crediting period. In the case of this option, the length and starting date of the period is determined once for a project activity with no possibility of renewal or extension once the project activity has been registered. The length of
the period can be a maximum of ten years for a proposed CDM project activity. (paragraph 49 (b) of CDM modalities and procedures).

**CREDITING PERIOD – RENEWABLE (ALSO RENEWABLE CREDITING PERIOD)**

“Renewable crediting period” is one of two options for determining the length of a crediting period. In the case of this option, a single crediting period may be of a maximum of seven years. The crediting period may be renewed at most two times (maximum 21 years), provided that, for each renewal, a designated operational entity determines that the original project baseline is still valid or has been updated taking account of new data, where applicable, and informs the Executive Board accordingly (paragraph 49 (a) of the CDM modalities and procedures). The starting date and length of the first crediting period has to be determined before registration.

**CERTIFICATION**

Certification is the written assurance by the designated operational entity that, during a specified time period, a project activity achieved the reductions in anthropogenic emissions by sources of greenhouse gases (GHG) as verified.

**CERTIFIED EMISSION REDUCTIONS (CERs)**

A certified emission reduction or CER is a unit issued pursuant to Article 12 and requirements thereunder, as well as the relevant provisions in the CDM modalities and procedures, and is equal to one metric tonne of carbon dioxide equivalent, calculated using global warming potentials defined by decision 2/CP.3 or as subsequently revised in accordance with Article 5 of the Kyoto Protocol.

**CONSERVATIVE**

See “Transparent and conservative”.

**DESIGNATED OPERATIONAL ENTITY (DOE)**

An entity designated by the COP/MOP, based on the recommendation by the Executive Board, as qualified to validate proposed CDM project activities as well as verify and certify reductions in anthropogenic emissions by sources of greenhouse gases (GHG). A designated operational entity shall perform validation or verification and certification on the same CDM project activity. Upon request, the Executive Board may however allow a single DOE to perform all these functions within a single CDM project activity. COP at its eight session decided that the Executive Board may designate on a provisional basis operational entities (please refer to decision 21/CP.8).
FIXED CREDITING PERIOD

See crediting period – fixed.

HOST PARTY

A Party not included in Annex I to the Convention on whose territory the CDM project activity is physically located. A project activity located in several countries has several host Parties. At the time of registration, a host Party shall meet the requirements for participation as defined in paragraphs 28 to 30 of the CDM M & P.

ISSUANCE OF CERTIFIED EMISSION REDUCTIONS (CERs)

Issuance of CERs refers to the instruction by the Executive Board to the CDM registry administrator to issue a specified quantity of CERs for a project activity into the pending account of the Executive Board in the CDM registry, in accordance with paragraph 66 and Appendix D of the CDM modalities and procedures.

Upon issuance of CERs, the CDM registry administrator shall, in accordance with paragraph 66 of CDM modalities and procedures, promptly forward the CERs to the registry accounts of project participants involved, in accordance with their request, having deducted the quantity of CERs corresponding to the share of proceeds to cover administrative expenses for the Executive Board and to assist in meeting costs of adaptation for developing countries vulnerable to adverse impacts of climate change, respectively, in accordance with Article 12, paragraph 8, to the appropriate accounts in the CDM registry for the management of the share of proceeds.

LEAKAGE

Leakage is defined as the net change of anthropogenic emissions by sources of greenhouse gases (GHG) which occurs outside the project boundary, and which is measurable and attributable to the CDM project activity.

MEASURABLE AND ATTRIBUTABLE

In an operational context, the terms measurable and attributable in paragraph 51 (project boundary) of the CDM modalities and procedures should be read as “which can be measured” and “directly attributable”, respectively.
MONITORING OF A CDM PROJECT ACTIVITY

Monitoring refers to the collection and archiving of all relevant data necessary for determining the baseline, measuring anthropogenic emissions by sources of greenhouse gases (GHG) within the project boundary of a CDM project activity and leakage, as applicable.

MONITORING METHODOLOGY

A monitoring methodology refers to the method used by project participants for the collection and archiving of all relevant data necessary for the implementation of the monitoring plan.

MONITORING METHODOLOGY – APPROVED

A monitoring methodology approved by the Executive Board and made publicly available along with relevant guidance.

MONITORING METHODOLOGY – NEW

Project participants may propose a new monitoring methodology. In developing a monitoring methodology, the first step is to identify the most appropriate methodology bearing in mind good monitoring practice in relevant sectors. Project participants shall submit a proposal for a new methodology to a designated operational entity by forwarding the proposed methodology described in a draft project design document (CDM-PDD), including a description of the project activity and identification of the project participants.

A new proposed methodology will be treated as follows: If the designated operational entity determines that it is a new methodology, it will forward, without further analysis, the documentation to the Executive Board. The Executive Board shall expeditiously, if possible at its next meeting but not later than four months review the proposed methodology. Once approved by the Executive Board it shall make the approved methodology publicly available along with any relevant guidance and the designated operational entity may proceed with the validation of the project activity and submit the project design document for registration. In the event that the COP/MOP requests the revision of an approved methodology, no CDM project activity may use this methodology. The project participants shall revise the methodology, as appropriate, taking into consideration any guidance received.

OPERATIONAL LIFETIME OF A CDM PROJECT ACTIVITY

It is defined as the period during which the CDM project activity is in operation. No crediting period shall end after the end of the operational lifetime (calculated as from starting date)
PROJECT ACTIVITY

A project activity is a measure, operation or an action that aims at reducing greenhouse gases (GHG) emissions. The Kyoto Protocol and the CDM modalities and procedures use the term “project activity” as opposed to “project”. A project activity could, therefore, be identical with or a component or aspect of a project undertaken or planned.

PROJECT BOUNDARY

The project boundary shall encompass all anthropogenic emissions by sources of greenhouse gases (GHG) under the control of the project participants that are significant and reasonably attributable to the CDM project activity. The Panel on methodologies (Meth Panel) shall develop specific proposals for consideration by the Executive Board on how to operationalize the terms “under the control of”, “significant” and “reasonably attributable”, as contained in paragraph 52 and appendix C, paragraphs (a) (iii) and (b) (vi) of the CDM modalities and procedures. Pending decisions by the Executive Board on these terms, project participants are invited to explain their interpretation of such terms when completing and submitting a project design document (CDM-PDD).

PROJECT PARTICIPANTS

In accordance with the use of the term project participant in the CDM modalities and procedures, a project participant is either a Party involved or, in accordance with paragraph 33 of the CDM modalities and procedures, a private and/or public entity authorized by a Party to participate, under the Party’s responsibility, in CDM project activities.

Project participants are Parties or private and/or public entities that take decisions on the allocation of CERs from the project activity under consideration. At registration, a statement signed by all project participants shall be provided clarifying the modalities of communicating with the Executive Board and the secretariat, in particular with regard to instructions regarding allocations of CERs at the point of issuance.

RENEWABLE CREDITING PERIOD

See Crediting period – renewable

STAKEHOLDERS

Stakeholders mean the public, including individuals, groups or communities affected, or likely to be affected, by the proposed CDM project activity or actions leading to the implementation of such an activity.
STARTING DATE OF A CDM PROJECT ACTIVITY

The starting date of a CDM project activity is the date at which the implementation or construction or real action of a project activity begins. Project activities starting as of the year 2000 (1 January 2000) and prior to the adoption of decision 17/CP.7 (10 November 2001) have to provide documentation, at the time of registration, showing that the starting date fell within this period.

TRANSPARENT AND CONSERVATIVE

Establishing a baseline in a transparent and conservative manner (paragraph 45 (b) of the CDM modalities and procedures) means that assumptions are made explicitly and choices are substantiated. In case of uncertainty regarding values of variables and parameters, the establishment of a baseline is considered conservative if the resulting projection of the baseline does not lead to an overestimation of emission reductions attributable to a CDM project activity (that is, in the case of doubt, values that generate a lower baseline projection shall be used).

REGISTRATION

Registration is the formal acceptance by the Executive Board of a validated project activity as a CDM project activity. Registration is the prerequisite for the verification, certification and issuance of CERs related to that project activity.

VALIDATION

Validation is the process of independent evaluation of a project activity by a designated operational entity against the requirements of the CDM as set out in decision 17/CP.7 its annex and relevant decisions of the COP/MOP, on the basis of the project design document (CDM-PDD).

VERIFICATION

Verification is the periodic independent review and ex post determination by a designated operational entity of monitored reductions in anthropogenic emissions by sources of greenhouse gases (GHG) that have occurred as a result of a registered CDM project activity during the verification period. There is no prescribed length of the verification period. It shall, however, not be longer than the crediting period.
ANNEX 2: COPY OF SMALL-SCALE CDM PROJECT DEVELOPMENT DOCUMENT (SSC PDD)

CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL SCALE PROJECT ACTIVITIES (SSC-PDD)\(^{51}\)

Version 01 (21 January, 2003)

Introductory Note

1. This document contains the clean development mechanism project design document for small-scale project activities (SSC-PDD). It elaborates on the outline of information in appendix B “Project Design Document” to the CDM modalities and procedures (annex to decision 17/CP.7 contained in document FCCC/CP/2001/13/Add.2) and reflects the simplified modalities and procedures (herewith referred as simplified M&P) for small-scale CDM project activities (annex II to decision 21/CP.8 contained in document FCCC/CP/2002/7/Add.3).

2. The SSC-PDD can be obtained electronically through the UNFCCC CDM web site (http://unfccc.int/cdm/ssc.htm), by e-mail (cdm-info@unfccc.int) or in print from the UNFCCC secretariat (Fax: +49-228-8151999).

3. Explanations for project participants are in italicized font (e.g. explanation).

4. The Executive Board may revise the SSC-PDD if necessary. Revisions shall not affect small-scale CDM project activities validated prior to the date at which a revised version of the SSC-PDD enters into effect. Versions of the SSC-PDD shall be consecutively numbered and dated. The SSC-PDD will be available on the UNFCCC CDM web site in all six official languages of the United Nations.

\(^{51}\) Source: Appendix A to the simplified modalities and procedures for small-scale CDM project activities as published by the CDM EB. Available at http://cdm.unfccc.int/Reference/Documents/SSC_PDD/English/SCCPDD_en.doc
5. In accordance with the CDM modalities and procedures, the working language of the Board is English. The completed SSC-PDD shall therefore be submitted to the Executive Board in English.

6. Small-scale activities submitted as a bundle, in accordance with paragraphs 9 (a) and 19 of the simplified M&P for small-scale CDM project activities, may complete a single SSC-PDD provided that information regarding A.3 (Project participants) and A.4.1 (Location of the project activity) is completed for each project activity and that an overall monitoring plan is provided in section D.

7. A small-scale project activity with different components eligible to be proposed as a small-scale CDM project activity may submit one SSC-PDD, provided that information regarding subsections A.4.2 (Type and category(ies) and technology of project activity), and A.4.3 (brief statement on how anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity) and sections B (Baseline methodology), D (Monitoring methodology and plan) and E (Calculation of GHG emission reductions by sources) is provided separately for each of the components of the project activity.

8. If the project activity does not fit any of the project categories in appendix B of the simplified M&P for small-scale CDM project activities, project proponents may propose additional project categories for consideration by the Executive Board, in accordance to paragraphs 15 and 16 of the simplified M&P for small-scale CDM project activities. The project design document should, however, only be submitted to the Executive Board for consideration after it has amended appendix B as necessary.

9. A glossary of terms may be found on the UNFCCC CDM web site or from the UNFCCC secretariat by e-mail (cdm-info@unfccc.int) or in print (Fax: +49-228-8151999).

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52 In paragraph 7 of simplified M&P for small-scale CDM project activities, on clarifications by the Executive Board on small-scale CDM project activities, the Board agreed that in a project activity with more than one component that will benefit from simplified CDM modalities and procedures, each component shall meet the threshold criterion of each applicable type, e.g. for a project with both a renewable energy and an energy efficiency component, the renewable energy component shall meet the criterion for “renewable energy” and the energy efficiency component that for “energy efficiency”.
CONTENTS

A. General description of project activity

B. Baseline methodology

C. Duration of the project activity / Crediting period

D. Monitoring methodology and plan

E. Calculation of GHG emission reductions by sources

F. Environmental impacts

G. Stakeholders comments

Annexes

Annex 1: Information on participants in the project activity

Annex 2: Information regarding public funding
A. General description of project activity

A.1 Title of the project activity:

A.2 Description of the project activity:

(Please include in the description
- the purpose of the project activity
- the view of the project participants on the contribution of the project activity to sustainable development (max. one page).)

A.3 Project participants:

(Please list Party(ies) and private and/or public entities involved in the project activity and provide contact information in Annex 1 of this document.)

(Please designate one of the above as the official contact for the CDM project activity.)

A.4 Technical description of the project activity:

A.4.1 Location of the project activity:

A.4.1.1 Host country Party(ies):

A.4.1.2 Region/State/Province etc.:

A.4.1.3 City/Town/Community etc:

A.4.1.4 Detailed description of the physical location, including information allowing the unique identification of this project activity (max one page):

A.4.2 Type and category (ies) and technology of project activity

(Please specify the type and category of the project activity using the categorization of appendix B to the simplified M&F for small-scale CDM project activities, hereafter referred to as appendix B. Note that appendix B may be revised over time and that the most recent version will be available on the UNFCCC CDM web site.

In this section you shall justify how the proposed project activity conforms with the project type and category selected (for simplicity, the rest of this document refers to “project category” rather than “project type and category”).

If your project activity does not fit any of the project categories in appendix B, you may propose additional project categories for consideration by the Executive Board, in accordance with paragraphs 15 and 16 of the simplified M&F for small-scale
Appendix D

CDM project activities. The final SSC-PDD project design document shall, however, only be submitted to the Executive Board for consideration after the Board has amended appendix B as necessary.

(This section should include a description of how environmentally safe and sound technology and know-how is transferred to the host Party, if such a transfer is part of the project.)

A.4.3 Brief statement on how anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity:

(Please state briefly how anthropogenic greenhouse gas (GHG) emission reductions are to be achieved (detail to be provided in section B.) and provide the estimate of total anticipated reductions in tonnes of CO₂ equivalent as determined in section E. below.)

A.4.4 Public funding of the project activity:

(Indicate whether public funding from Parties included in Annex I is involved in the proposed project activity. If public funding from one or more Annex I Parties is involved, please provide information on sources of public funding for the project activity in annex 2, including an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of those Parties.)

A.4.5 Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

(Please refer to appendix C to the simplified M&P for the small-scale CDM project activities for guidance on how to determine whether the proposed project activity is not a debundled component of a larger project activity.)

B. Baseline methodology

B.1 Title and reference of the project category applicable to the project activity:

(Please refer to the UNFCCC CDM web site for the most recent list of the small-scale CDM project activity categories contained in appendix B of the simplified M&P for small-scale CDM project activities.)

B.2 Project category applicable to the project activity:

(Justify the choice of the applicable baseline calculation for the project category as provided for in appendix B of the simplified M&P for small-scale CDM project activities.)

B.3 Description of how the anthropogenic GHG emissions by sources are reduced below those that would have occurred in the absence of the proposed CDM project activity (i.e. explanation of how and why this project is additional and therefore not identical with the baseline scenario)

(Justify that the proposed project activity qualifies to use simplified methodologies and is additional using attachment A to appendix B of the simplified M&P for small-scale CDM project activities.)
Opportunities for the CDM in the Energy Sector – Final Report

(National policies and circumstances relevant to the baseline of the proposed project activity shall be summarized here as well.)

B.4 Description of the project boundary for the project activity:

(Define the project boundary for the project activity using the guidance specified in the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities.)

B.5 Details of the baseline and its development:

B.5.1 Specify the baseline for the proposed project activity using a methodology specified in the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities:

B.5.2 Date of completing the final draft of this baseline section (DD/MM/YYYY):

B.5.3 Name of person/entity determining the baseline:

(Please provide contact information and indicate if the person/entity is also a project participant listed in Annex 1 of this document.)

C. Duration of the project activity and crediting period

C.1 Duration of the project activity:

C.1.1 Starting date of the project activity:

(For a definition of the term “starting date”, please refer to the UNFCCC CDM web site).

C.1.2 Expected operational lifetime of the project activity: (in years and months, e.g. two years and four months would be shown as: 2y-4m.)

C.2 Choice of the crediting period and related information: (Please underline the selected option (C.2.1 or C.2.2) and provide the necessary information for that option.)

(Note that the crediting period may only start after the date of registration of the proposed activity as a CDM project activity. In exceptional cases, the starting date of the crediting period can be prior to the date of registration of the project activity as provided for in paragraphs 12 and 13 of decision 17/CP.7 and in any guidance by the Executive Board, available on the UNFCCC CDM web site.)

C.2.1 Renewable crediting period (at most seven (7) years per crediting period)

C.2.1.1 Starting date of the first crediting period (DD/MM/YYYY):
C.2.1.2 Length of the first crediting period \textit{(in years and months, e.g. two years and four months would be shown as: 2y-4m).}

C.2.2 Fixed crediting period \textit{(at most ten (10) years)}:

C.2.2.1 Starting date (DD/MM/YYYY):

C.2.2.2 Length (max 10 years) \textit{(in years and months, e.g. two years and four months would be shown as: 2y-4m).}

D. Monitoring methodology and plan

\textit{(The monitoring plan shall incorporate a monitoring methodology specified for the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M\&P for small-scale CDM project activities and represent good monitoring practice appropriate to the type of project activity.)}

The monitoring plan shall also provide information on the collection and archiving of the data specified in appendix B of the simplified M\&P for small-scale CDM project activities to:

- Estimate or measure emissions occurring within the project boundary;
- Determine the baseline, as applicable;
- Estimate leakage, where this needs to be considered.

Project participants shall implement the registered monitoring plan and provide data, in accordance with the plan, through their monitoring reports.

Operational entities will verify that the monitoring methodology and plan have been implemented correctly and check the information in accordance with the provisions on verification. This section shall provide a detailed description of the monitoring plan, including an identification of the data to be collected, its quality with regard to accuracy, comparability, completeness and validity, taking into consideration any guidance contained in the methodology, and archiving of the data collected.

Please note that monitoring data required for verification and issuance are to be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

An overall monitoring plan that monitors performance of the constituent project activities on a sample basis may be proposed for bundled project activities. If bundled project activities are registered with an overall monitoring plan, this monitoring plan shall be implemented and each verification/certification of the emission reductions achieved shall cover all of the bundled project activities.

D.1 Name and reference of approved methodology applied to the project activity:

\textit{(Please refer to the UNFCCC CDM web site for the most recent version of the indicative list of small-scale CDM project activities contained in appendix B of the simplified M\&P for small-scale CDM project activities.)}
(If a national or international monitoring standard has to be applied to monitor certain aspects of the project activity, please identify this standard and provide a reference to the source where a detailed description of the standard can be found.)

D.2 Justification of the choice of the methodology and why it is applicable to the project activity:

(Justify the choice of the monitoring methodology applicable to the project category as provided for in appendix B.)

D.3 Data to be monitored:

(The table below specifies the minimum information to be provided for monitored data. Please complete the table for the monitoring methodology chosen for the proposed project activity from the simplified monitoring methodologies for the applicable small-scale CDM project activity category contained in appendix B of the simplified M& P for small-scale CDM project activities.

Please note that for some project categories it may be necessary to monitor the implementation of the project activity and/or activity levels for the calculation of emission reductions achieved.

Please add rows or columns to the table below, as needed)

<table>
<thead>
<tr>
<th>ID no</th>
<th>Data type</th>
<th>Data variable</th>
<th>Data unit</th>
<th>Measured (m), calculated (c) or estimated (e)</th>
<th>Recording frequency</th>
<th>Proportion of data to be monitored</th>
<th>How will the data be archived? (electronic/paper)</th>
<th>For how long is archived data to be kept?</th>
<th>Comment</th>
</tr>
</thead>
</table>

D.4 Name of person/entity determining the monitoring methodology:

(Please provide contact information and indicate if the person/entity is also a project participant listed in Annex 1 of this document.)

E. Calculation of GHG emission reductions by sources

E.1 Formulae used:

(In E.1.1 please provide the formula used to calculate the GHG emission reductions by sources in accordance with the applicable project category of small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities.

In case the applicable project category from appendix B does not indicate a specific formula to calculate the GHG emission reductions by sources, please complete E.1.2 below.)

E.1.1 Selected formulae as provided in appendix B:
(Describe the calculation of GHG emission reductions in accordance with the formula specified for the applicable project category of small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities.)

E.1.2 Description of formulae when not provided in appendix B:

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary: (for each gas, source, formulae/algorithm, emissions in units of CO₂ equivalent)

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities (for each gas, source, formulae/algorithm, emissions in units of CO₂ equivalent)

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the project activity emissions:

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHG’s in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities: (for each gas, source, formulae/algorithm, emissions in units of CO₂ equivalent)

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

E.2 Table providing values obtained when applying formulae above:

<table>
<thead>
<tr>
<th>F. Environmental impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.1 If required by the host Party, documentation on the analysis of the environmental impacts of the project activity: (if applicable, please provide a short summary and attach documentation)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G. Stakeholders comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.1 Brief description of the process by which comments by local stakeholders have been invited and compiled:</td>
</tr>
<tr>
<td>G.2 Summary of the comments received:</td>
</tr>
<tr>
<td>G.3 Report on how due account was taken of any comments received:</td>
</tr>
</tbody>
</table>
Annex 1 (of the SSC PDD)

CONTACT INFORMATION FOR PARTICIPANTS IN THE PROJECT ACTIVITY

*(Please repeat table as needed)*

<table>
<thead>
<tr>
<th>Organization:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Street/P.O.Box:</td>
<td></td>
</tr>
<tr>
<td>Building:</td>
<td></td>
</tr>
<tr>
<td>City:</td>
<td></td>
</tr>
<tr>
<td>State/Region:</td>
<td></td>
</tr>
<tr>
<td>Postcode/ZIP:</td>
<td></td>
</tr>
<tr>
<td>Country:</td>
<td></td>
</tr>
<tr>
<td>Telephone:</td>
<td></td>
</tr>
<tr>
<td>FAX:</td>
<td></td>
</tr>
<tr>
<td>E-Mail:</td>
<td></td>
</tr>
<tr>
<td>URL:</td>
<td></td>
</tr>
</tbody>
</table>

Represented by:

| Title: |  |
| Salutation: |  |
| Last Name: |  |
| Middle Name: |  |
| First Name: |  |
| Department: |  |
| Mobile: |  |
| Direct FAX: |  |
| Direct tel: |  |
| Personal E-Mail: |  |

Annex 2 (of the SSC PDD)

INFORMATION REGARDING PUBLIC FUNDING
ANNEX 3: PREFIXES, UNITS AND SYMBOLS

Units

<table>
<thead>
<tr>
<th>Units</th>
<th>Power of 10</th>
<th>Metric</th>
<th>Prefix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thousand</td>
<td>$10^3$</td>
<td>kilo</td>
<td>(k)</td>
</tr>
<tr>
<td>Million</td>
<td>$10^6$</td>
<td>Mega</td>
<td>(M)</td>
</tr>
<tr>
<td>Billion</td>
<td>$10^9$</td>
<td>Giga</td>
<td>(G)</td>
</tr>
<tr>
<td>Trillion</td>
<td>$10^{12}$</td>
<td>Tera</td>
<td>(T)</td>
</tr>
<tr>
<td>Quadrillion</td>
<td>$10^{15}$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Energy Symbols

SI
- J joule,
- Wh watt-hour

American General
- cal, kcal calorie, kilocalorie ($10^3$ cal)
- Btu, BTU British Thermal Unit
- Q Quadrillion Btu, or Quad ($10^{15}$ Btu)
- toe, TOE Metric tons of crude oil equivalent (defined as 10 kcal--41.868 CJ in statistics employing net heating values)
- tce, TCE Metric tons of coal equivalent (defined as 0.7 x 10 kcal--29.31 GJ in statistics employing net heating values)
- twe Thousand tons of wood equivalent
- boe, BOE Barrels of (crude) oil equivalent (approx. 5.8 GJ)
- bbl, BBL Barrels of oil (crude or products) (equals 42 US gallons)

Power (and Electricity) Symbols

SI
- W Watt
- v, V Volt
- a, A Ampere
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>kVA</td>
<td>kilovolt-ampere</td>
</tr>
</tbody>
</table>

**American/General**

- **BTU/hr**: British Thermal Units per hour
- **hp**: Horsepower
- **bd, b/d**: Barrels of oil per day
- **bdoe**: Barrels of oil equivalent per day
  (Barrels of daily oil equivalent)

**Weights and Measures**

- **g, kg**: Gram (or gramme), kilogram
- **lb, lbs**: Pound, pounds
- **t, te, ton**: Metric tonne, or $10^6$ g (SI)
- **lt, ton**: Long ton (Imperial; 2,240 pounds)
- **st, ton**: Short ton (US; 2,000 pounds)
- **tpa, tpy**: Tons per year
- **m, km**: Meter, kilometer (SI)
- **mi**: Miles
- **sq. m, m²**: Square meter
- **ha**: Hectare ($10^4$ m²)
- **ac**: Acre
- **l**: Liter, litre (SI)
- **cu. m, m³**: Cubic meter
- **gal**: gallon (US or Imperial)
- **SCF, CF**: Standard cubic foot (used for gases at normal temperature and pressure)

**Biomass and Other**

- **od, OD**: Oven dry
- **odt, ODT**: Oven dry ton
- **ad, AD**: Air dry
- **CAI**: Current annual increment
- **mcwb**: Moisture content, wet basis
- **mcdb**: Moisture content, dry basis
- **MAI**: Mean Annual Increment
- **GHV, NHV**: Gross and Net Heating Value
## ANNEX 4: CONVERSION FACTORS

In all cases, multiply by the number in the appropriate cell of the table. The second number is the power of 10 (e.g. +2 = 100, -3 = 10^-3 or .001)

A few examples:
- 2 yd = 2 x 4.9374 x 10^-4 international nautical miles
- 1 acre = 4.0469 x 103 square meters
- 3 miles² = 3 x 4.0145 x 109 square inch.

### Length

<table>
<thead>
<tr>
<th>To convert -- &gt;</th>
<th>m</th>
<th>ft</th>
<th>yd</th>
<th>mile</th>
<th>International NM</th>
</tr>
</thead>
<tbody>
<tr>
<td>meter</td>
<td>1</td>
<td>3.0480</td>
<td>-1</td>
<td>9.1440</td>
<td>1.6093</td>
</tr>
<tr>
<td>foot</td>
<td>3.2808</td>
<td>0</td>
<td>1</td>
<td>3.0000</td>
<td>0</td>
</tr>
<tr>
<td>yard</td>
<td>1.0936</td>
<td>0</td>
<td>33333</td>
<td>-1</td>
<td>1</td>
</tr>
<tr>
<td>statute mile</td>
<td>6.2137</td>
<td>-4</td>
<td>1,8939</td>
<td>-4</td>
<td>5,6818</td>
</tr>
<tr>
<td>international nautical mile</td>
<td>5.3996</td>
<td>-4</td>
<td>1,6458</td>
<td>-4</td>
<td>4.9374</td>
</tr>
</tbody>
</table>

### Area

<table>
<thead>
<tr>
<th>To convert -- &gt;</th>
<th>m²</th>
<th>in²</th>
<th>ft²</th>
<th>yd²</th>
<th>acre</th>
<th>mile²</th>
</tr>
</thead>
<tbody>
<tr>
<td>square meter</td>
<td>1</td>
<td>6.4516</td>
<td>-4</td>
<td>9.2903</td>
<td>-2</td>
<td>8.3613</td>
</tr>
<tr>
<td>square inch</td>
<td>1.5500:</td>
<td>3</td>
<td>1</td>
<td>1.4400</td>
<td>2</td>
<td>1.296</td>
</tr>
<tr>
<td>square foot</td>
<td>1.0764:</td>
<td>1</td>
<td>6.9444</td>
<td>-3</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>square yard</td>
<td>1.196</td>
<td>0</td>
<td>7.716</td>
<td>-4</td>
<td>1.1111</td>
<td>-1</td>
</tr>
<tr>
<td>acre</td>
<td>2.4711:</td>
<td>-4</td>
<td>1.5942</td>
<td>-7</td>
<td>2.2957</td>
<td>-5</td>
</tr>
<tr>
<td>square mile</td>
<td>3.8610:</td>
<td>-7</td>
<td>2.491</td>
<td>-10</td>
<td>3.587</td>
<td>-8</td>
</tr>
</tbody>
</table>

*IRG/ Resources for the Future and*  
*Tsinghua University Global Climate Change Institute*  
*D-109*
### Volume

<table>
<thead>
<tr>
<th>To convert – &gt;</th>
<th>m³</th>
<th>l</th>
<th>ft³</th>
<th>yd³</th>
<th>UK fl oz</th>
<th>UK Pint</th>
<th>UK gal</th>
<th>US fl oz</th>
<th>US Pt</th>
<th>US gal</th>
</tr>
</thead>
<tbody>
<tr>
<td>into</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cubic meter</td>
<td>1</td>
<td>1</td>
<td>2.8317</td>
<td>7.6453</td>
<td>2.8413</td>
<td>5.6826</td>
<td>4.5461</td>
<td>2.9574</td>
<td>4.7318</td>
<td>3.7854</td>
</tr>
<tr>
<td>liter</td>
<td>9.9997</td>
<td>-2</td>
<td>2.8316</td>
<td>7.6453</td>
<td>2.8412</td>
<td>5.6825</td>
<td>4.5460</td>
<td>2.9573</td>
<td>4.7316</td>
<td>3.7853</td>
</tr>
<tr>
<td>cubic foot</td>
<td>3.5315</td>
<td>0.1</td>
<td>1</td>
<td>2.7000</td>
<td>1</td>
<td>1.0034</td>
<td>2.0068</td>
<td>1.6054</td>
<td>1.0444</td>
<td>1.2368</td>
</tr>
<tr>
<td>cubic yard</td>
<td>1.308</td>
<td>0</td>
<td>3.7037</td>
<td>-2</td>
<td>1</td>
<td>3.7163</td>
<td>7.4326</td>
<td>3.8681</td>
<td>6.1889</td>
<td>4.9511</td>
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<tr>
<td>UK fluid ounce</td>
<td>3.5195</td>
<td>4</td>
<td>3.5196</td>
<td>9.9661</td>
<td>2</td>
<td>2.6909</td>
<td>2.0000</td>
<td>1</td>
<td>1.6653</td>
<td>1.3323</td>
</tr>
<tr>
<td>UK pint</td>
<td>1.7598</td>
<td>-3</td>
<td>4.9831</td>
<td>1</td>
<td>1.3454</td>
<td>3.9000</td>
<td>2</td>
<td>8.0000</td>
<td>5.2942</td>
<td>8.3267</td>
</tr>
<tr>
<td>US fluid ounce</td>
<td>3.3814</td>
<td>4</td>
<td>3.3815</td>
<td>9.5751</td>
<td>2</td>
<td>2.5853</td>
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<td>1.0408</td>
<td>1</td>
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<td>US pint</td>
<td>2.1134</td>
<td>3</td>
<td>2.1134</td>
<td>5.9844</td>
<td>1</td>
<td>1.6156</td>
<td>6.0047</td>
<td>1.2009</td>
<td>9.6076</td>
<td>6.2500</td>
</tr>
<tr>
<td>US gallon</td>
<td>2.6417</td>
<td>2</td>
<td>2.6418</td>
<td>7.4805</td>
<td>0</td>
<td>2.0972</td>
<td>7.5059</td>
<td>1.5012</td>
<td>7.8125</td>
<td>1.2500</td>
</tr>
</tbody>
</table>

### Mass

<table>
<thead>
<tr>
<th>To convert – &gt;</th>
<th>kg</th>
<th>t</th>
<th>lb</th>
<th>UK ton</th>
<th>sh ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>into</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kilogram</td>
<td>1</td>
<td>1</td>
<td>4.5359</td>
<td>1.0160</td>
<td>9.0718</td>
</tr>
<tr>
<td>tonne</td>
<td>1.0000</td>
<td>-3</td>
<td>1</td>
<td>4.5359</td>
<td>1.0160</td>
</tr>
<tr>
<td>pound</td>
<td>2.2046</td>
<td>0</td>
<td>2.2046</td>
<td>1</td>
<td>2.2400</td>
</tr>
<tr>
<td>UK ton (=long ton)</td>
<td>9.8421</td>
<td>-4</td>
<td>9.8421</td>
<td>4.648</td>
<td>8.9286</td>
</tr>
<tr>
<td>short ton</td>
<td>1.1023</td>
<td>-3</td>
<td>1.1023</td>
<td>5.0000</td>
<td>1.1200</td>
</tr>
</tbody>
</table>
## ANNEX 5: DIRECT GLOBAL WARMING POTENTIALS (GWP) OF GASES

<table>
<thead>
<tr>
<th>Species</th>
<th>Chemical Formula</th>
<th>Atmospheric Lifetime</th>
<th>Direct Effect for Time Horizons of</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>20 years</td>
<td>100 years</td>
<td>500 years</td>
<td></td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>(a)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Methane (b)</td>
<td>CH₄</td>
<td>12.2±/− 3 (c)</td>
<td>56</td>
<td>21</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>Nitrous Oxide</td>
<td>N₂O</td>
<td>120</td>
<td>280</td>
<td>310</td>
<td>170</td>
<td></td>
</tr>
<tr>
<td>CFC-11</td>
<td>CFCl₃</td>
<td>50+/−5</td>
<td>5,000</td>
<td>4,000</td>
<td>1,400</td>
<td></td>
</tr>
<tr>
<td>CFC-12</td>
<td>CF₂C₁₂</td>
<td>102</td>
<td>7,900</td>
<td>8,500</td>
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<tr>
<td>HCFC-22</td>
<td>CF₂HCl</td>
<td>13.3</td>
<td>4,300</td>
<td>1,700</td>
<td>520</td>
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</tr>
<tr>
<td>HFC-134</td>
<td>CHF₂CHF₂</td>
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<td>3,100</td>
<td>1,200</td>
<td>370</td>
<td></td>
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<tr>
<td>HFC-152a</td>
<td>C₂H₄F₂</td>
<td>1.5</td>
<td>460</td>
<td>140</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>CO</td>
<td>months</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Non-Methane</td>
<td>NMHCs</td>
<td>days to months</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Hydrocarbons</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrogen Oxides</td>
<td>NOₓ</td>
<td>years</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Referenced to the absolute GWP for the Bern carbon cycle model CO₂ decay response and future CO₂ atmospheric concentrations held constant at current levels (based on IPCC 1994 and WMO 1994.) This exhibit was taken from Guidelines for Climate Change Global Overlays (World Bank 1997)\(^{53}\) and updated to reflect IPCC 1996\(^{54}\).

(a) decay of CO₂ is a complex function of the carbon cycle.

(b) Includes the direct effect and those indirect effects due to the production of tropospheric ozone and stratospheric water vapor. The indirect effect due to the production of carbon dioxide is not included.

(c) Represents adjustment time rather than atmospheric lifetime.

---


## Annex 6: Typical Energy Content of Fossil and Biomass Fuels

<table>
<thead>
<tr>
<th>Solid Fuels</th>
<th>Density</th>
<th>Moisture Content Wet Basis (% mcwb)</th>
<th>Typical Net Heating Values a/ (MJ/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biomass Fuels</strong></td>
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* Note: Specific gravity is equivalent to density. The specific gravity is the weight relative to water, where 1m³ of water = 1 tonne.
### Fossil Fuels

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<th>Net Heating Values (MJ/m³)</th>
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### Biomass-Derived

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*a Based on given moisture contents

**Note:** For biomass fuels, these data should be used only as rough approximations.

**Sources:** Leach and Gowen. 1985. Biomass fuels--various (see text) modern/non-traditional fuels--FEA (1977).
## Annex 7: Emissions Factors for Utility and Industrial Combustion Systems

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<td>Coal, pulverized, wall fired</td>
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Notes: values are based on lower heating value, converted from original data in higher heating value using OECD/IEA assumptions (lower heating value is 10% below the higher heating value for natural gas; 5% for coal and oil); CO₂ values for coal represent an average value of sub-bituminous through anthracite; n/a is not available.

* Values for wood fired boilers derived separately; not reported in IPCC/OECD/IEA/UNEP 1995.
# Annex 8: CDM Links

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<td><a href="http://www.climateservices.com/">http://www.climateservices.com/</a></td>
<td>Trexler &amp; Associates</td>
<td></td>
<td></td>
<td>Company</td>
<td></td>
<td>+</td>
<td>No</td>
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<tr>
<td><a href="http://www.ecosecurities.com/">http://www.ecosecurities.com/</a></td>
<td></td>
<td>Provides expertise in emerging environmental markets</td>
<td></td>
<td>Company</td>
<td>Private owned</td>
<td>+</td>
<td>Yes</td>
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<td><a href="http://www.climate-experts.info">http://www.climate-experts.info</a></td>
<td></td>
<td>Various documents</td>
<td></td>
<td>Company</td>
<td>Climate Experts consultancy</td>
<td>NA</td>
<td>Japanese only</td>
<td>No</td>
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<td><a href="http://www.ahkbrasil.com/cdmbralzil/">http://www.ahkbrasil.com/cdmbralzil/</a></td>
<td></td>
<td>Investor's portal for Brazilian CDM projects</td>
<td>Brazil</td>
<td>Company</td>
<td>Brazil-German Chamber of Commerce</td>
<td>0</td>
<td>Just started</td>
<td>No</td>
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<td>NGOs</td>
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<td><a href="http://www.cdmwatch.org">http://www.cdmwatch.org</a></td>
<td>CDM Watch</td>
<td>List of CDM projects and NGO evaluations. Link to validation reports</td>
<td>Worldwide</td>
<td>Company</td>
<td></td>
<td>++</td>
<td>Yes, by invitation</td>
<td></td>
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<td>Address</td>
<td>Name</td>
<td>Content Goal</td>
<td>Region</td>
<td>Type</td>
<td>Who Bylaws</td>
<td>Examples</td>
<td>Assessment</td>
<td>Comment</td>
<td>Periodical subscription possible</td>
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<td><a href="http://www.climnet.org/">http://www.climnet.org/</a></td>
<td>Climate Network Europe</td>
<td>Coordinating office on climate change issues</td>
<td>Europe</td>
<td>Organization</td>
<td>Green NGOs</td>
<td>+</td>
<td>Good library</td>
<td>Yes</td>
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<td><strong>Capacity builders</strong></td>
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<tr>
<td><a href="http://www.cd4cdm.org/">http://www.cd4cdm.org/</a></td>
<td></td>
<td>Information about large CDM capacity building project (4 regions, three countries in each region)</td>
<td>12 countries</td>
<td>Organization</td>
<td>UNEP/RISO</td>
<td>++</td>
<td>No</td>
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<td><a href="http://www.hwwa.de/climate.htm">http://www.hwwa.de/climate.htm</a></td>
<td>Hamburg Institute of International Economics</td>
<td>Publications on climate policy</td>
<td>Worldwide</td>
<td>Organization</td>
<td></td>
<td>+</td>
<td>Good library</td>
<td>No</td>
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<td><a href="http://www.northsea.nl/jia/">http://www.northsea.nl/jia/</a></td>
<td>Joint Implementation Network, the Netherlands</td>
<td>Online issues of Joint Implementation Quarterly, the oldest specialized journal on the Kyoto Mechanisms. Results of PROBASE project on baselines</td>
<td>Organization</td>
<td></td>
<td></td>
<td>+</td>
<td>Good library</td>
<td>Yes</td>
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<tr>
<td><a href="http://www.oecd.org/env/cc/">http://www.oecd.org/env/cc/</a></td>
<td></td>
<td>Contributes to the effective implementation of the UN Framework Convention on Climate Change and the Kyoto Protocol</td>
<td>oecd</td>
<td>Intergovernmental</td>
<td></td>
<td>+</td>
<td>Lots of documents</td>
<td>No</td>
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<tr>
<td><a href="http://cdmsusac.energyprojects.net/">http://cdmsusac.energyprojects.net/</a></td>
<td></td>
<td>to encourage private sector companies in the Annex I countries (essentially OECD countries) to invest in low greenhouse gas (GHG) projects in non-Annex I countries (esp. Africa)</td>
<td>EC (IER, ESD)</td>
<td></td>
<td></td>
<td>+</td>
<td>No</td>
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<tr>
<td><a href="http://www.cdm-connect.org">http://www.cdm-connect.org</a></td>
<td></td>
<td>Newsroom for people interested in CDM. Possibility to define profile</td>
<td>Organization</td>
<td></td>
<td>WBCSD</td>
<td>+</td>
<td>No</td>
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<tr>
<td><a href="http://www.southsouthnorth.org">http://www.southsouthnorth.org</a></td>
<td></td>
<td>Activities to develop two CDM projects each in four countries</td>
<td>Bangladesh, Brazil, Indonesia, South Africa</td>
<td>Organization</td>
<td>NGO consortium</td>
<td>+</td>
<td>No</td>
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<tr>
<td><a href="http://www.unido.org/de/doc/4222">http://www.unido.org/de/doc/4222</a></td>
<td></td>
<td>Project reports</td>
<td>Organization</td>
<td></td>
<td>UNIDO/WBCSD</td>
<td>0</td>
<td>No</td>
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<td><a href="http://www.teriin.org/climate/cdm.htm">http://www.teriin.org/climate/cdm.htm</a></td>
<td>The Energy Research Institute</td>
<td>Publications on CDM</td>
<td>India</td>
<td>Organization</td>
<td></td>
<td>0</td>
<td>Somewhat outdated</td>
<td>No</td>
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<td><a href="http://www.cdmcapacity.org/">http://www.cdmcapacity.org/</a></td>
<td></td>
<td>LULUCF-related case studies</td>
<td>Worldwide</td>
<td>Organization</td>
<td>ECCM, Ecosureties, IIED</td>
<td>0</td>
<td>No</td>
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<td><a href="http://www.cdmmonline.org/allusers/">http://www.cdmmonline.org/allusers/</a></td>
<td>Many (older) documents on CDM</td>
<td>Worldwide, focus Latin America</td>
<td>Organization</td>
<td>Center for Sustainable Development in the Americas</td>
<td>-</td>
<td>Not updated since 2002</td>
<td>No</td>
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<td><a href="http://www.netinform.de/KE/startE.asp">http://www.netinform.de/KE/startE.asp</a></td>
<td>News service and virtual fair for Kyoto mechanisms</td>
<td>Worldwide</td>
<td>Company</td>
<td>TÜV Süddeutschland</td>
<td>+</td>
<td>No</td>
<td>No</td>
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<td><a href="http://www.ens.dk/graphics/publikationer/klima_uk/cdmmanual/pdf/helepubl.pdf">http://www.ens.dk/graphics/publikationer/klima_uk/cdmmanual/pdf/helepubl.pdf</a></td>
<td>CDM user guide dated May 2003</td>
<td>Worldwide</td>
<td>Government</td>
<td>Danish Energy Agency</td>
<td>++</td>
<td>The most detailed of all guides, but 2.2 MB</td>
<td>No</td>
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