ANNEX 3 - CDM PROCESS AND DETAILED ANALYSIS OF CDM CASES

1.1 INTRODUCTION ON THE CLEAN DEVELOPMENT MECHANISM

What is CDM?

• Project undertaken in developing country generating reductions in greenhouse gas emissions
• Accrueing Certified Emission Reductions (CER) credits (equal to 1MT of CO2 equivalent)
• The credits can be used to contribute to the emission reduction commitments of industrialized countries
• A project based activity between developed and developing countries (Govt. / private sector)

⇒ Reduction at lower cost by investing in developing countries where, in principle, marginal cost of abatement of GHGs is lower.

Where is CDM applicable?

Renewable energy
• Wind power
• Solar
• Biomass power
• Hydel power

Fuel switching (from fossil fuel to green fuel like biomass)

Energy efficiency measures related to
• Boiler
• Pumps
• Turbines
• Efficient cooling systems
• Back pressure turbines etc.

Waste management
• Capturing of landfill methane emission to generate power
• Utilization of waste for generation of energy and energy efficiency projects

Transport
• IC (Internal Combustion) engines at micro level
• Fuel switch from gasoline and diesel to natural gas
• Modal shift from air to train, road to train at macro level
• Replacement of shipment of certain raw materials through pipelines

Afforestation/ reforestation /Carbon sequestration

1.2 GLOSSARY

"Attributable"
See "Measurable" and "attributable".

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 paragraph 48 (a) to (c) of the CDM modalities and procedures be the only ones applicable to CDM project activities which 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, 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 any 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 implicitly choose 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 a description of the project activity and 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 and made publicly available along with relevant guidance. Approved methodologies are made available at http://unfccc.int/cdm or through a written request sent to cdm-info@unfccc.int or Fax: (49-228) 8151999.

Crediting Period:
The crediting period for a CDM project activity is the period for which reductions from the baseline are verified and certified by designated operational entities for issuance of certified emission reductions (CERs). Project participants shall choose the starting date of a crediting period after the first emission reductions 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:
1) Fixed crediting period or 2) Renewable crediting period, as defined in paragraph 49 (a) and (b).

Crediting period – fixed:
"Fixed Crediting Period" is one of two options for determining the length of a crediting period (see this glossary). 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:
"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 (max 21 years), provided that, for each renewal, a designated operational entity determines and informs the Executive Board that the original project baseline is still valid or has been updated taking account of new data where applicable (paragraph 49 (a) of the CDM modalities and procedures). The length and starting date 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 (CER):
A "certified emission reduction" or "CER" is a unit issued pursuant to Article 12 and requirements there under, 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. Upon request, the Executive Board may however allow a single DOE to perform all these functions within a single CDM project activity.

Fixed Crediting Period:
See crediting period – fixed.

Host Party:
The Party not included in Annex I where 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.

Issuance of Certified Emissions Reductions:
Issuance refers to the instruction by the Executive Board to the CDM registry administrator to issue a specified quantity of CERs for 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 will, 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 CDM Project Activity:
Monitoring refers to collection and archiving of all relevant data necessary for determining the baseline, measuring anthropogenic emissions by sources of greenhouse gases (GHG) with in the project boundary of CDM project activity and leakage, as applicable.

Monitoring methodology:
A monitoring methodology refers to the method used by project participants for collection and archiving of all relevant data necessary for the implementation of 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 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 a component/aspect of a project undertaken/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 operationalise the terms "under the control of", "significant" and "reasonably attributable", 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:
Project participants are Parties or private and/or public entities that take decision ns 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 issuance.
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.

Renewable crediting period:
See crediting period.

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 CDM Project Activity:
The starting date of a project activity is the date at which the implementation or construction or real action of the project activity begins. Project activities starting as of the year 2000 (1 January 2000) and prior to the adoption of the 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 explicitly explained 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 the 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 however it shall not be longer than the crediting period.

Source: CDM Glossary of terms used in the CDM project design document (CDM-PDD), UNFCCC.

1.3 CDM Procedures

The typical cycle for a CDM project is presented in the figure below.

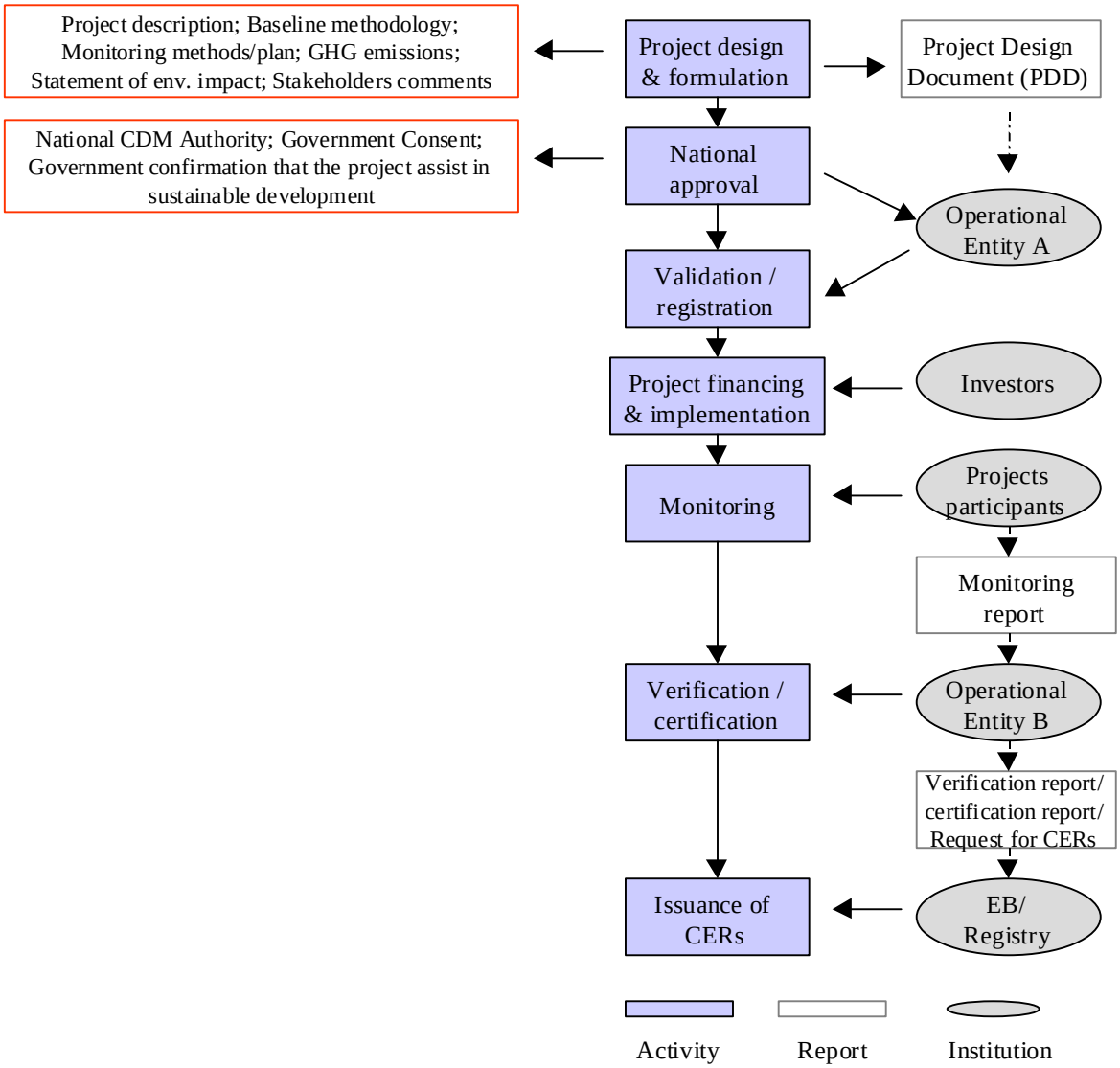


Figure 1: Project cycle of CDM.

Validation of CDM Projects

Validation is a process of independent evaluation of a project activity by a Designated Operational Entity (DOE) against the requirements of the CDM on the basis of the PDD.
Steps and indicative timing of the validation phase are detailed in the figure on the next page.

Registration

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

Project Participants, as part of the PDD provide a monitoring plan:

- Based on previously approved methodology/new methodology
- Determined by DoE as appropriate to circumstances of the project activity

- Reflects good monitoring practice

A monitoring report in accordance with monitoring plan is to be submitted to the DOE for verification

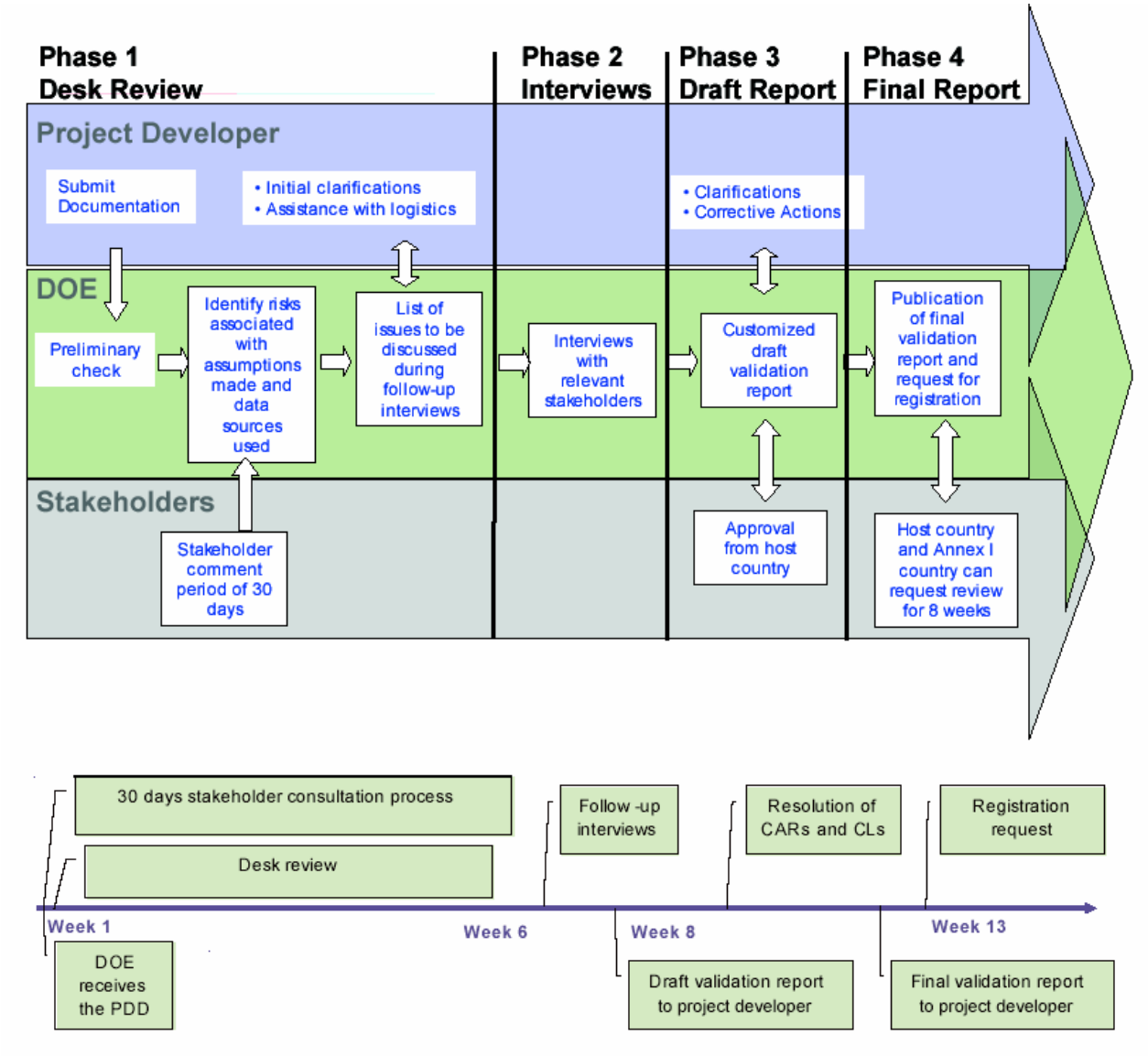


Figure 2: Steps and indicative schedule of Validation Phase.

Verification

Verification is the periodic independent review and determination by DOE (different from the one that has validated the project, but for small-scale projects) of the monitored reductions by sources of greenhouse gases that have occurred as a result of the CDM project activity

Certification

Certification is the written assurance by the DOE that the project activity achieved the reductions in anthropogenic emissions by sources of GHGs as verified

1.4 Status of CDM Process

Projects and emissions reductions

Table1: Status of re gistration

Date	Registered	Requesting registration	Review requested	Under review
18 Nov 2004	1	2	2	0
31 Dec 2004	1	2	2	2
15 Jun 2005	5	5	0	3
13 Sep 2005	19	8	0	1
13 Oct 2005	26	13	1	2
16 Nov 2005	35	24	0	2
03 Dec 2005	46	30	0	0
25 Jan 2006	77	64	1	0
Feb 2006	103			
06 March 2006	142	27		

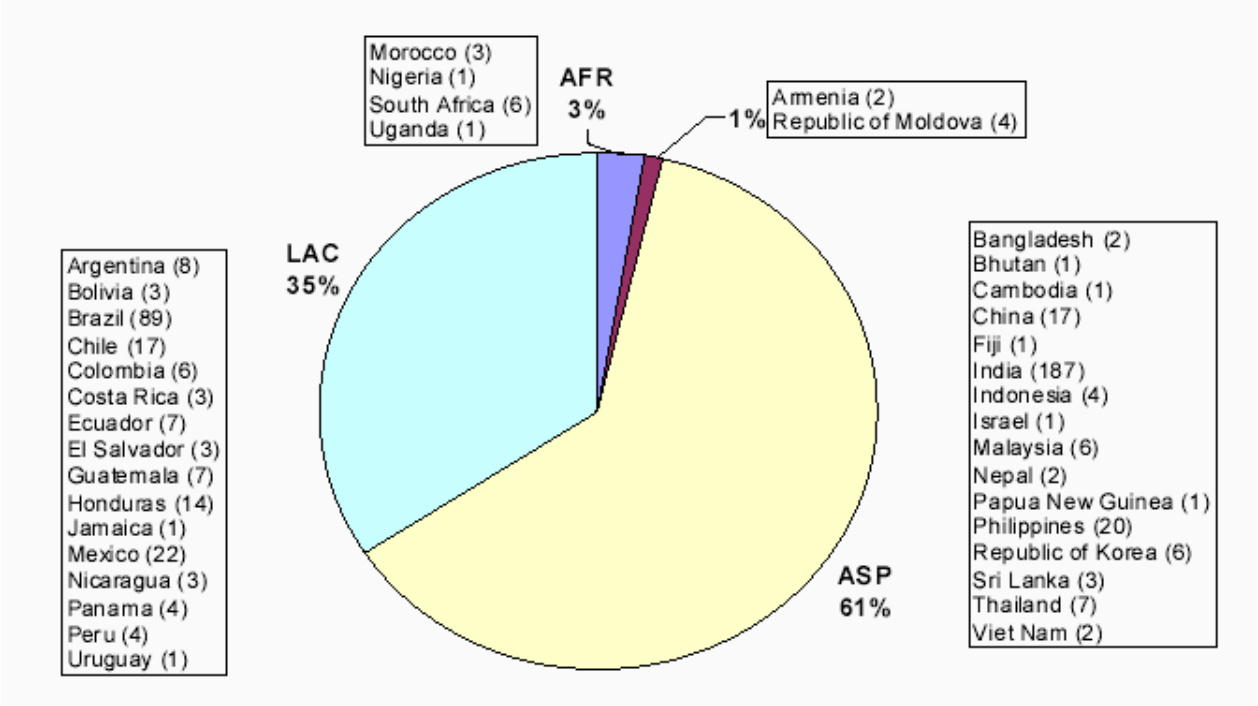


Figure 2: Project activities in the pipeline (validation) by region. Number of projects, 27 November 2005.

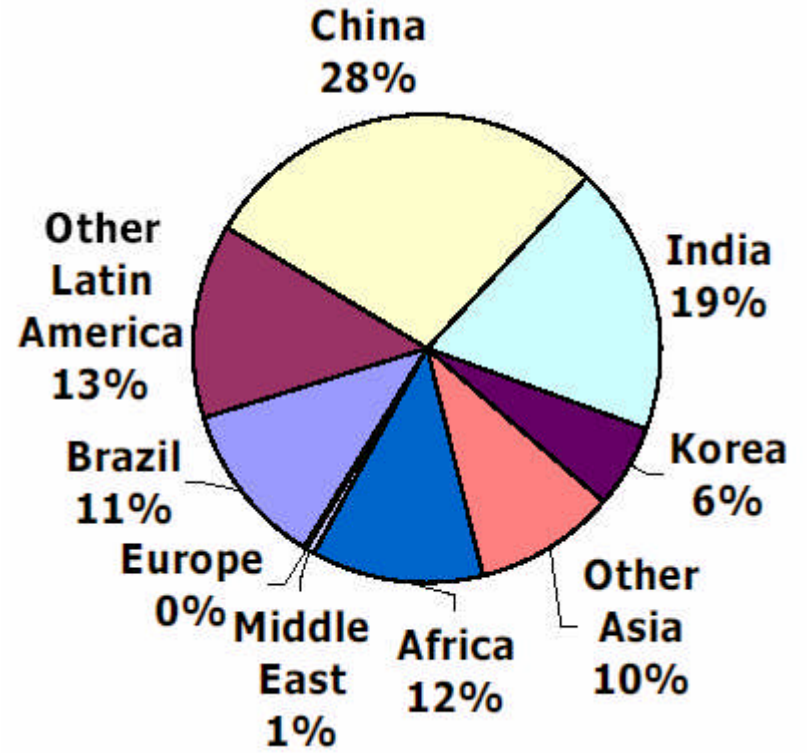


Figure 3: Geographical distribution by CERs generated. March 2006.

Projects for reduction of non-energy-related emissions of higher-GWP gases (i.e., HFC23, N_2O and CH_4) are making up the largest share of CERs (37% for HFC23 and N_2O + 18% for methane). Indeed, expected emission reductions from the 9 proposed F-gas reducing projects are more than the combined emission reductions expected from the 321 renewable electricity projects (**Figure 5**).

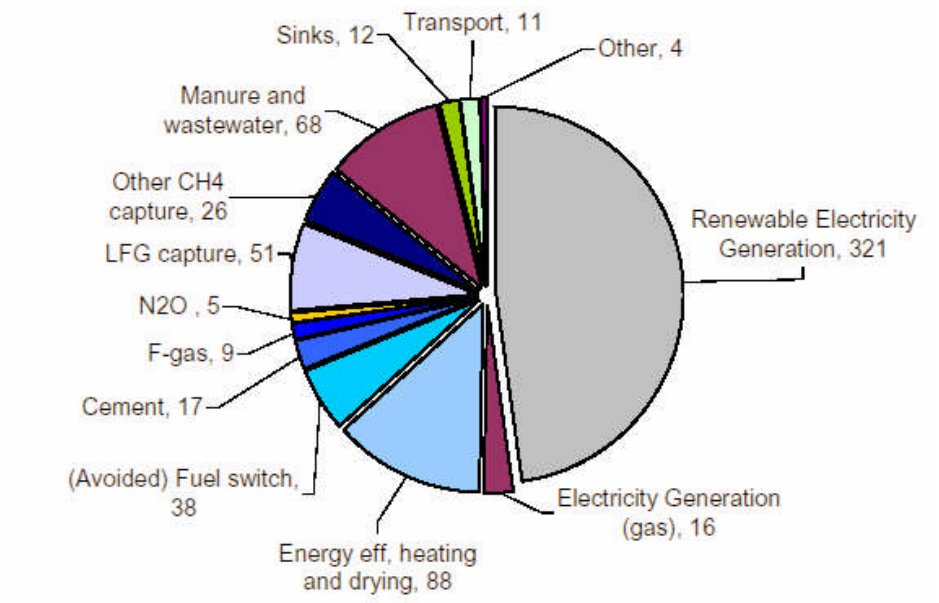


Figure 4: Number of projects (with PDD or approval by DNA) by type, November 2005.

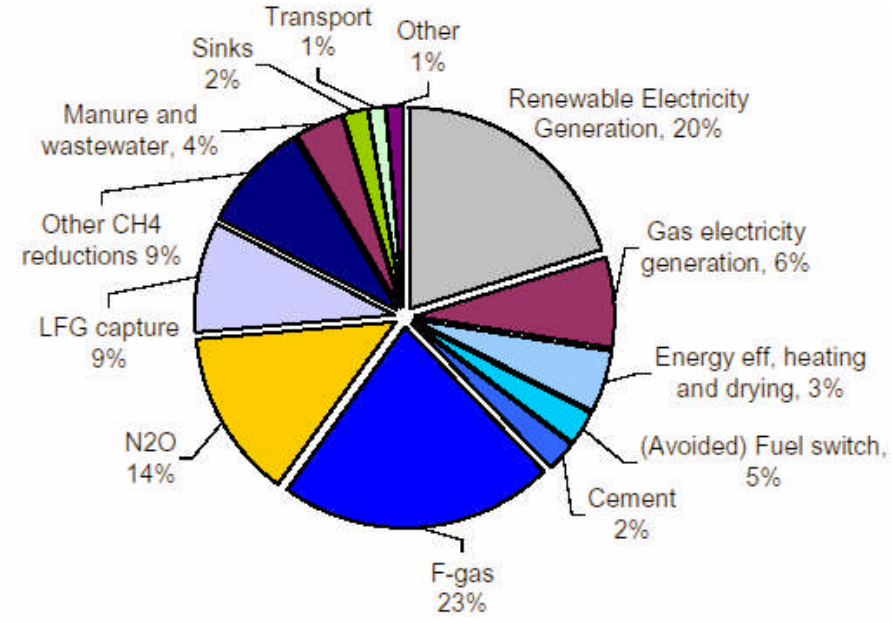


Figure 5: Percentage of annual credits (projects with PDD or approval by DNA) by project type, November 2005.

Figure 6 shows the distribution of projects for different size classes.

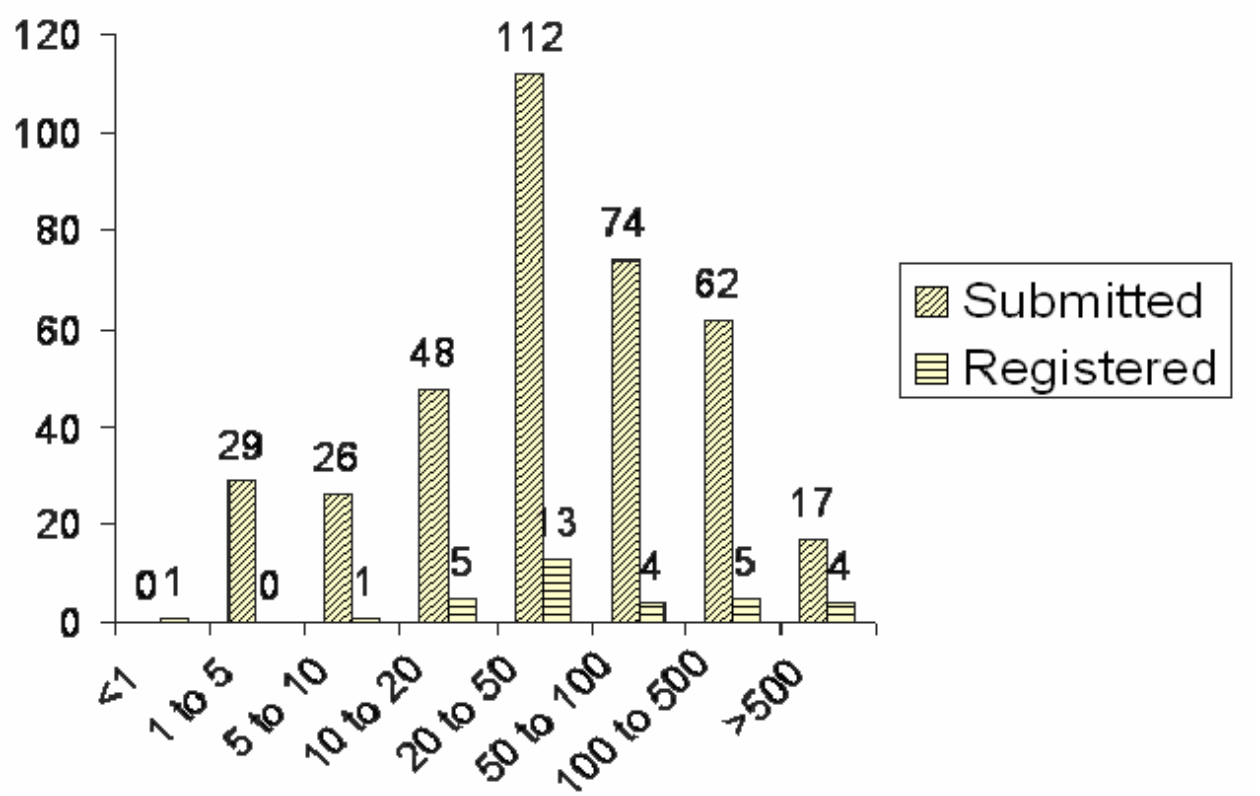


Figure 6: Size categories of submitted and registered CDM projects (average 1000 CERs per year until end of 2012). 3 November 2005. Source: "CDM: current status and possibilities for reform", Axel Michaelowa, HWWI Research.

It is visible that the distribution is more skewed to the right for the registered projects. This may be due to the fact that most of the small projects are so-called “unilateral” projects that have no Annex B participant before registration and thus have problems in mobilizing finance for CDM transaction costs.

In **Table 2,** countries are ranked according to expected annual emission reductions (CERs) to be obtained through registered CDM.

Table 2: Expected average annual CERs by host country by means of registered projects (10 April 2006)

Country	Average Annual Reductions (1 CER = 1 tCO_{2eq})
China	16.618.435
Republic of Korea	10.699.536
Brazil	10.462.474
India	7.612.445
Chile	1.748.853
Mexico	1.501.651
Viet Nam	677.000
Argentina	634.505
Nicaragua	280.703
Ecuador	258.261
Morocco	184.677
El Salvador	183.725
Honduras	177.636
Costa Rica	162.515
Guatemala	142.245
Armenia	135.000
Sri Lanka	104.130
Malaysia	94.491
Nepal	93.883
Israel	93.452
Bolivia	82.680
Bangladesh	80.000
Panama	60.343
Jamaica	52.540
Republic of Moldova	47.343
Colombia	45.538
Peru	45.308
South Africa	25.739
Fiji	24.928
Indonesia	3.500
Bhutan	524

- Methodological aspects

Additionality

Only *additional* emission reductions can be qualified as CERs. As stated in the MA paras 43 and 44: "A CDM project is additional if antropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity".

The current interpretation from the EB has produced working guidelines, including an optional Additionality Tool. The tool uses several, sequential tests (legal requirements, investment analysis or barrier analysis, common practice test and CDM impact test). This Additionality Tool is presented as optional by the EB and others can put forward new approaches, to be judged by the EB on their own merits. What is not currently optional is the general approach that focuses on the project additionality (or intent), i.e. "was it undertaken for CDM purposes?".

At the last COP/MOP in Montreal (november-december 2005) no decision was taken on additionality. However, it was stressed that the consolidated additionality test is not mandatory.

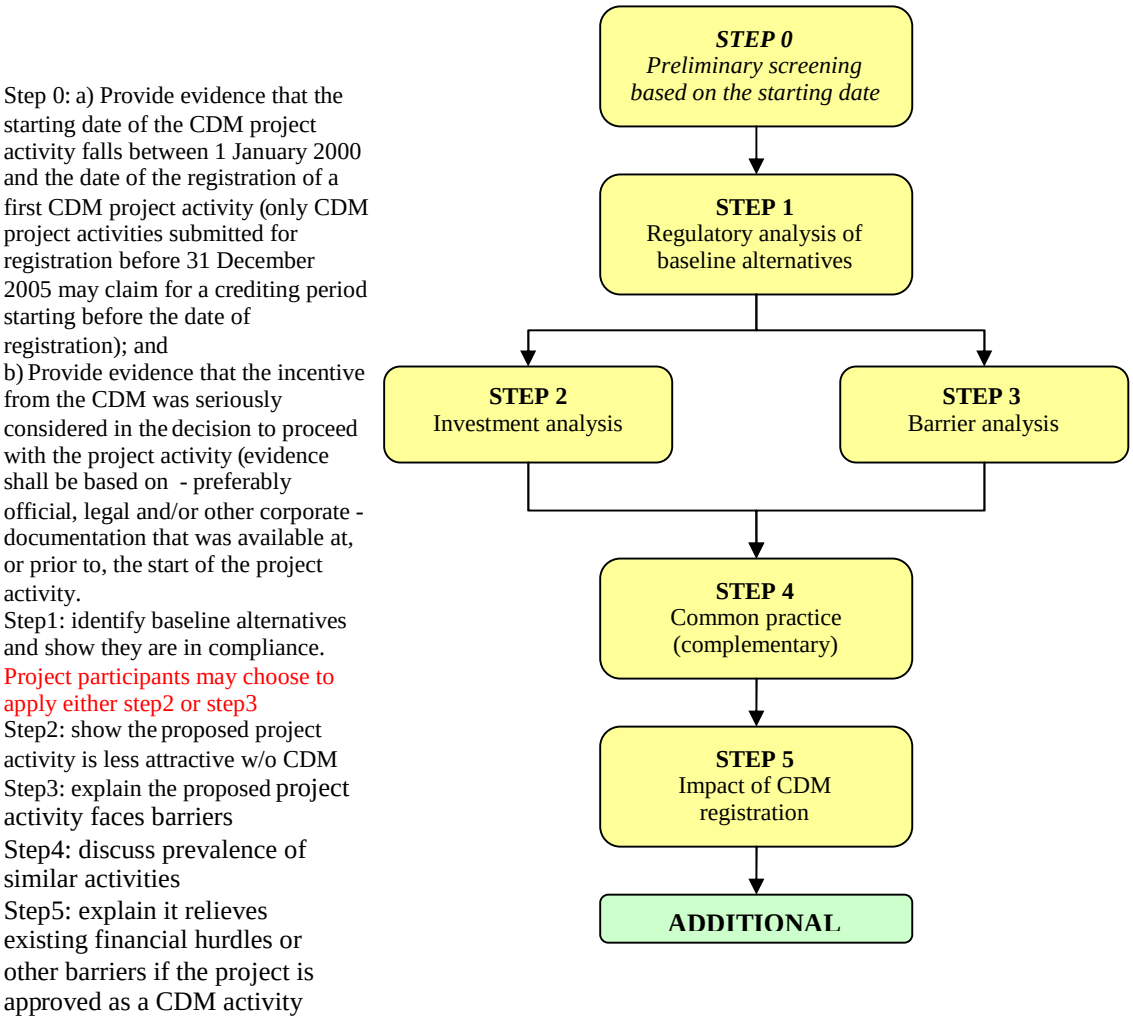


Figure 7: Additionality scheme proposed by EB

Bundling of projects

Bundle is defined as: "Bringing together of several small-scale CDM project activities[1], to form a single CDM project activity or portfolio without the loss of distinctive characteristics of each project activity. Project activities within a bundle can be arranged in one or more sub-bundles, with each project activities retaining it distinctive characteristics. Such characteristics include its: technology/measure; location; application of simplified baseline methodology. Project activities within a sub-bundle belong to the same type. The sum of the output capacity of project activities within a sub-bundle shall not exceed the maximum output capacity limit for its type.

Extract from ***GUIDELINES FOR COMPLETING THE SIMPLIFIED PROJECT DESIGN DOCUMENT (CDM-SSC-PDD), THE FORM FOR SUBMISSIONS ON METHODOLOGIES FOR SMALL-SCALE CDM PROJECT ACTIVITIES (F-CDM-SSC-Subm) AND THE FORM FOR SUBMISSION OF BUNDLED SMALL-SCALE CDM PROJECT ACTIVITIES (F-CDM-SSC-BUNDLE)*** **:**

General Characteristics

1. *Project activities wishing to be bundled shall indicate this when making the request for registration;*
2. *The composition of bundles shall not change over time (i.e. the submission of project activities to be used in a bundle shall be made at the same time). A project activity shall not be taken out of a bundle nor shall a project activity be added to the bundle after registration.*
3. *All project activities in the bundle shall have the same crediting period (i.e. the same length and same starting date of the crediting period).*
4. *Each small-scale CDM project in the bundle should comply with the simplified modalities and procedures for small-scale CDM project activities and use an approved simplified baseline and monitoring methodology included in Appendix B of the simplified modalities and procedures for small-scale CDM project activities.*
5. *Project participants shall at registration provide a written statement along with the submission of the bundle indicating:*
   - *That all project participants agreed that their individual project activities are part of the bundle;*
   - *One project participant who represents all project participants in order to communicate with the Board in accordance with approved Modalities and Procedures for Communication.*
6. *Bundled project activities shall be submitted in a single submission to the Board and pay only one fee proportional to the amount of expected average annual emission reductions of the total bundle;*
7. *If three Board members or a Party involved in a component project activity requests the review of the component project activity, the total bundle remains under review and the implications and recommendations on the review of project activity shall lead to a decision by the Board to register or not register the bundle.*

[1] The definitions of small-scale projects, set out in the Marrakech Accords, are as follows:

1. Renewable energy project activities with a maximum output capacity equivalent of up to 15 MW (installed or rated capacity[1]); type I category covers renewable energy projects including: Solar, wind, hybrid systems, biogas or biomass, water, geothermal and waste.

2. Energy efficiency improvement project activities which reduce energy consumption on the supply and/or demand side, by up to the equivalent of 15 GWh per year; type II covers supply side projects and end-use projects including residential, service, industry, transport, agricultural machineries and cross-cutting technologies which result in improvement in per unit power for the service provider or in reduction of energy consumption in watt hour in comparison with the approved baseline.

3. Other project activities that reduce anthropogenic emissions by sources and that directly emit less than 15 kilotonnes of CO2 equivalent per year. Type III covers agricultural projects, fuel switching, industrial processes and waste management. Possible examples in the agricultural sector include improved manure management, reduction of enteric fermentation, improved fertilizer usage or improved water management in rice cultivation.

Form

8. A form with information related to the bundle (F-CDM-BUNDLE) must be included in the submission;

9. The form should cover issues such as title of the bundle, general description, project participants, locations, types and categories, estimated amount of emission reduction, crediting period and monitoring plans;

Small scale limits

10. The sum of the size (capacity for type I, energy saving for type II and direct emissions of project activity for type III) of the technology or measure utilized in the bundle should not exceed the limits for small-scale CDM project activities as set in paragraph 6 (c) of the decision 17/CP.7

11. It should be demonstrated that the bundle will remain under the limit for the type every year during the crediting period. The total emission reduction estimated for the crediting period must be included in the draft CDM-PDD and further monitored;

12. If a bundle goes beyond the limits for the selected small-scale CDM project activities type, the emission reduction that can be claimed for this particular year will be capped at the maximum emission reduction level estimated for the bundle by the project participants in the "Bundle"form for that year during the crediting period.

Validation and verification

13. One DOE can validate this bundle;

14. One verification report is adequate, one issuance will be made at the same time for the same period, and a single serial number will be issued for all the project;

15. For projects submitting multiple CDM-SSC-PDDs, all CDM-SSC-PDDs shall be made publicly available for comments at validation stage at the same time. If, for corrective actions the DOE considers that major changes would be required in any of the project activities of the bundle, and that this would require the CDM-SSC-PDD to be made publicly available for comments another time, the whole bundle would need to be made publicly available for public comments.

The DOE validating the bundle shall consider the public comments for each of the CDM-SSCPDDs;

Letter of approval

16. The letter of approval by the host Party(ies) has to indicate that the Party is aware that the component project activity(ies) taking place in its territory is part of the bundle;

Issuance

17. If a bundle of project activities is submitted with a single or different CDM-SSC-PDDs it shall have only one identifier for purposes of issuance of CERs .

Use of a single PDD covering all activities

18. If all project activities in the bundle belong to the same type, same category and technology/measure, Project participants may submit a single CDM-SSC-PDD covering all activities in the bundle. If project participants use the same baseline for all the project activities in the bundle, it should be justified by considering the particular situation of each project activity in the bundle. As an example two project activities using the same technology to produce electricity but connected to different grids must use different baselines. A common monitoring plan can be utilized for the bundle with the submission of one monitoring report, under conditions to be specified. If different baselines are used, the proposed procedure for sampling must consider this situation, including the proportionate representative samples of

each baseline used. In this case (a single PDD is used) a single verification and certification report shall be submitted by the DOE;

19. In all other cases (if the bundle includes project activities with (a) the same type, same category and different technology/measure; (b) same type, different categories and technologies/measures and; and (c) different types), Project participants would have to make the submission of the bundle using a CDM-SSC-PDD for each of the component project activities contained in the bundle. Different monitoring plans will be required for project activities in the bundle and separate monitoring reports must be prepared. In these cases a single verification and certification report can be submitted for the bundle provided that it appraises each of the component project activities of the bundle separately and covers the same verification period.

In addition to the ability to bundle emission reduction activities under a program of activities (see below), **the COP/MOP1 CDM decision also allows large-scale project activities under the CDM to be bundled if they are validated and registered as one CDM project activity**. This is in line with the approach taken for small-scale project activities.

Resolutions taken at COP/MOP

- Programmatic CDM could represent a significant initiative in that it will allow project activities under a program of activities to be registered as CDM, provided that approved methodologies are used that define boundaries, avoid double-counting and account for leakage. While the Parties expressly rejected the push by some developing countries for a local, regional or national policy or standard to be registered as a CDM project, they have agreed that activities that are developed and implemented in response to that policy or standard[2] can be submitted as a single CDM project activity in the form of a program of activities This is expected to significantly reduce transaction costs and the time required for approvals;

- Prompt-start Projects. Prompt start projects are those that commenced their activities between January 1, 2000 and November 18, 2004. They could have potentially generated carbon credits during the four-year period.
Earlier, these projects had a December 31, 2005 deadline for UN registration to get full benefits because the Kyoto Protocol rules said that if registered after the said date, the projects would not be allowed to trade carbon credits generated prior to the date of registration. They could trade only those carbon credits that they accumulate after December 31, 2005.
A new decision was however taken at MOP 1 (first Meeting of Parties, Montreal November-December 2005)

1. **Extracts of Decision -/CMP.1 taken at MOP 1**
   Para 4. Decides that project activities that started in the period between 1 January 2000 and 18 November 2004 and have not yet requested registration but have either submitted a new methodology or have requested validation by a designated operational entity by 31 December 2005 can request retroactive credits if they are registered by the Executive Board by 31 December 2006 at the latest.

- Alternative methods for calculating emission reductions for small-scale project activities that propose the switch from non-renewable to renewable biomass (see http://cdm.unfccc.int/CDMNews/issues/issues/I_RX6NR37QOD2EQKNIM9BKE5D8NX8MKF/viewnewsitem.html)

[2] Recent guidance by the EB has clarified, however, that policies or standards that give comparative advantages to less emissions-intensive technologies need not be taken into account when developing the baseline scenario if the policy or regulation was introduced after 11 November 2001 (the agreement on the Marrakech Accords at COP7).

1.5 Status of methodologies

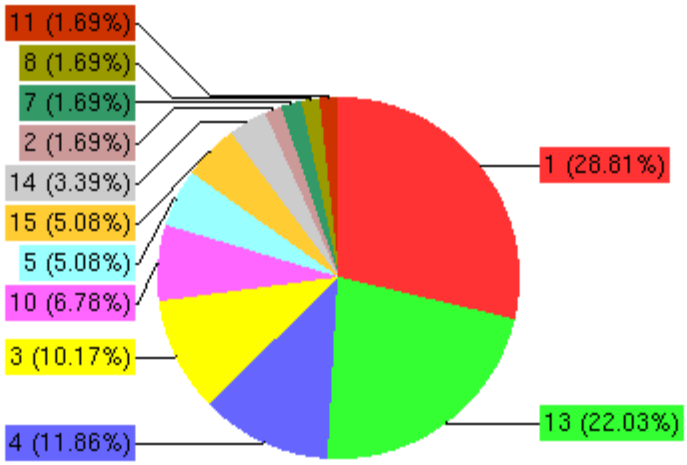


Figure 8 Approved Methodologies

Scope*	Number of Methodologies** (Large-scale (AM) , Small-scale (AMS) , Consolidated (ACM))
Energy industries (renewable - / non-renewable sources) (1)	17
Energy distribution (2)	1
Energy demand (3)	6
Manufacturing industries (4)	7
Chemical industries (5)	2
Transport (7)	1
Mining/mineral production (8)	1
Fugitive emissions from fuels (solid, oil and gas) (10)	4
Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride (11)	1
Waste handling and disposal (13)	13
Afforestation and reforestation (14)	2
Agriculture (15)	3
TOTAL	58

* Please note that only the scopes where at least one methodology is linked are listed
** A methodology can be linked to more than one scope

Scope*	Number of Methodologies** (Small-scale (AMS))
Energy industries (renewable - / non-renewable sources) (1)	6
Energy distribution (2)	1
Energy demand (3)	3
Manufacturing industries (4)	1
Transport (7)	1
Fugitive emissions from fuels (solid, oil and gas) (10)	1
Waste handling and disposal (13)	2
Afforestation and reforestation (14)	1
Agriculture (15)	1
TOTAL	17

Small-Scale Activities

A project which is eligible to be considered as a small scale CDM project activity can benefit from the simplified modalities and procedures, which were adopted by the Conference of the Parties at its eighth session (Simplified modalities and procedures for small-scale CDM project activities (Annex II to Decision 21/CP.8) (88 KB)).

In order to reduce transaction costs associated to preparing and implementing a CDM project activity, the simplified modalities and procedures provide for the following simplifications:

- A simplified project design document (most recent version of the CDM-SSC-PDD)
- Simplified methodologies for baseline determination and monitoring plans more >>
- Appendix C (7365 bytes) - Bundling of project activities at various stages in the SSC CDM project activity cycle(also note provision for avoidance of de-bundling of larger project activities)
- Simplified provisions for environmental impact analysis
- Lowered project registration fee (13 KB)
- Shorter review period for the registration of SSC CDM project activities
- The same DOE can validate **as well as** verify and certify emissions reductions for a specific SSC CDM project activity

Afforestation/Reforestation activities

Approved A/R Methodologies

This interface will provide access to approved methodologies for afforestation and reforestation CDM project activitiesand the **Tool for the demonstration and assessment of additionality for afforestation and reforestation CDM project activities (289 KB)** agreed by the CDM Executive Board (Annex 16, EB21).

Approved Large Scale Methodologies (1)

Meth. Number	Methodology Title (including baseline and monitoring methodologies)	Sectoral Scope	Approval History
AR-AM0001	Reforestation of degraded land (380 KB) The additionality of the project activity shall be demonstrated and assessed using the Tool for the demonstration and assessment of additionality for afforestation and reforestation CDM project activities (289 KB) Full view and history	14	ARNM0010

For **(non forestry) baseline and monitoring methodologies** approved by the Executive Board please see Approved methodologies.

For approved **simplified methodologies for small-scale afforestation and reforestation CDM project activities** , as agreed by COP/MOP1, please see the following document Simplified baseline and monitoring methodologies for selected small-scale afforestation and reforestation project activities under the CDM (171 KB).

1.6 Cost and financing of CDM Projects

Table 3 Transaction costs for CDM project

	CDM project cycle stages where costs are incurred	Average project (150.000 t CO2 per year)	Small-scale project (10.000 t CO2 per year)
Pre-operational phase Design	PIN/PDD Preparation	25.000-50.000 $	10.000-20.000 $
	Government approval	5.000-15.000 $	5.000-10.000 $
	Validation (to be paid to DOE)	10.000-30.000 $	8.000-15.000 $
	Registration* (to be paid to CDM EB)	20.000 $	- $
Operational phase	Implementation & Monitoring	3.000-6.000 $ per year	3.000-5.000 $ per year
	Reporting & Verification (to be paid to DOE)	5.000-10.000 $ (50% of validation) per verification	3.000-6.000 $ (50% of validation) per verification
	Certification/Issuance (to be paid to CDM EB)	0.1 $ / CER up to 15.000 CERs and 0.2 $ above --> 1.500+27.000=28.500 $ * 7 years = 199.500 $, 10 $ / t)	0.1 $ / CER up to 15.000 CERs and 0.2 $ above --> 1.000 $ * 7 years = 7.000 $, 10 $ / t)
	Adaptation levy	2% of CERs** --> 30.000 $, 10 $ / t	2% of CERs** --> 2.000 $, 10 $ / t
	Risk mitigation	1% - 3% of CER value --> 15-45.000, 10 $ / ton)	1% - 3% of CER value --> 1-3.000, 10 $ / ton)
TOTAL transaction costs		340.000-480.000 $	70.000-125.000 $
TOTAL CER revenues		1.500.000 $ * 7 years = 10.5 M $	100.000 $ * 7 years = 0.7 M $
Cost % on CER revenues (CER = 10$ / t CO_2)		**3.2-4.6 %**	**10-18 %**

* The registration fee paid will be deducted from the share of proceeds for administration due at issuance of CERs.
** Exemption for least developed countries

Initial Administration Fee ("Registration Fee") at the Registration Stage of the CDM Project Activity is given below:-

Table 4 Registration Fee

Average tonnes of CO2 equivalent reductions per year over the crediting period (estimated/approved)	**US$ (*)**	***Revisions***
<= 15,000	5,000 → 0	No registration fee has to be paid for CDM project activities with average annual emission over the crediting period below 15,000 t CO2 equivalent.
> 15,000 and <= 50,000	10,000	
> 50,000 and <= 100,000	15,000	
> 100,000 and <= 200,000	20,000	
> 200,000	30,000	

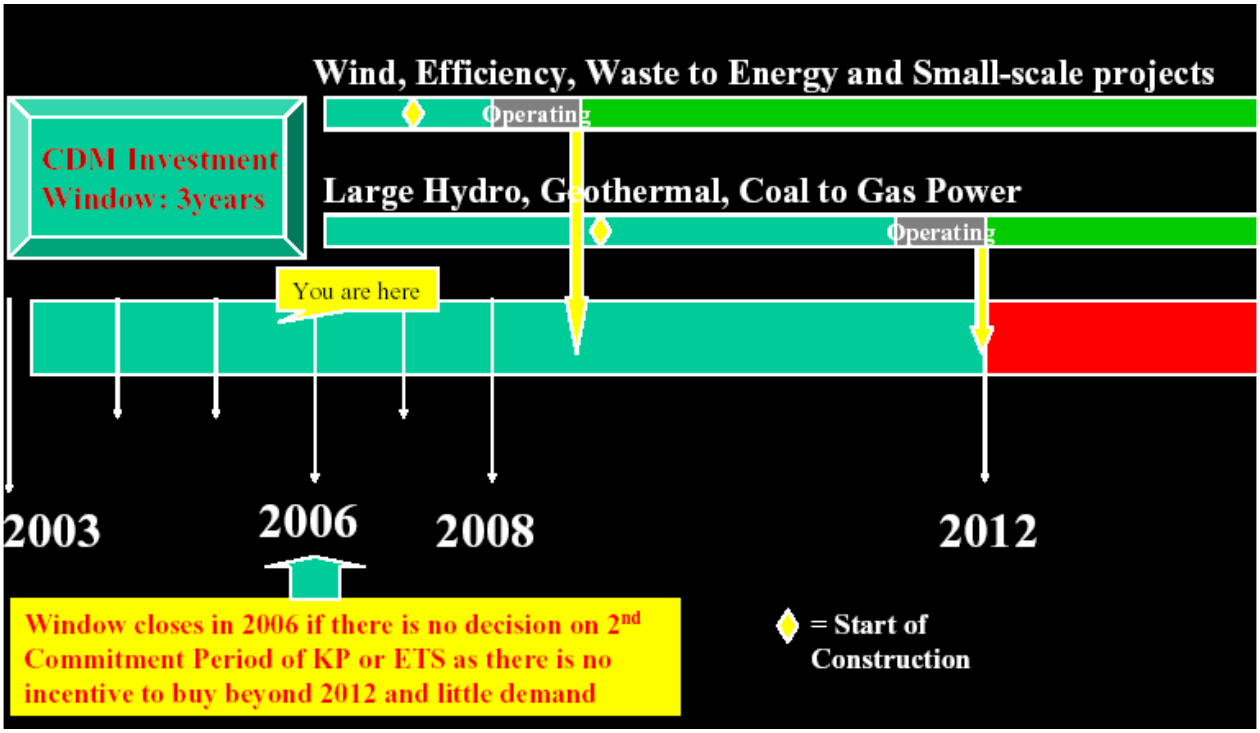


Figure 9. Challenge of the Closing Window to Deliver Projects for First Commitment Period (CO2/CH4 Segment of CDM Market). Source: World Bank.

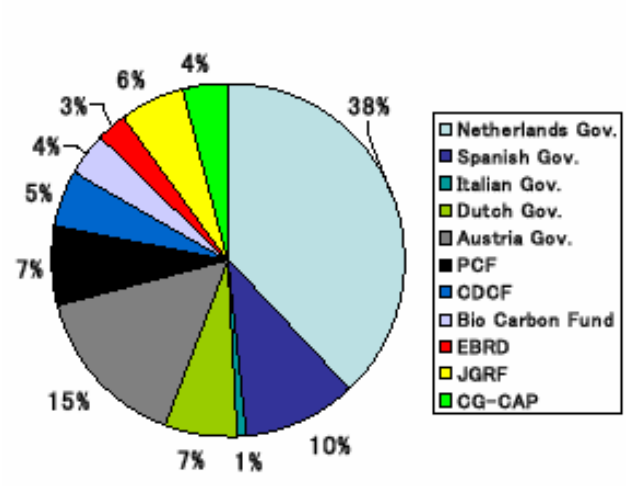


Figure 10: Share of mayor credits buyers

1.7 SELECTION OF CASES TO STUDY

CDM Matrix for ECO-PRO Project, 02-01-2006
(CDM projects being processed under United Nations approval procedure)

Table 10 Type of Projects being registered for CDM.

Country / Type	India	Nepal	Bangladesh	Laos	Vietnam	Thailand	Cambodia	Sri Lanka
1. small-medium grid-connected biomass power generation (scale 5-15 MWe)	48-53 (6 registered)	-	-	-	-	3	-	?
2. biomass-based electricity /thermal energy generation by the user (scale 2-10 MWt)	15-20 (4 registered)	-	-	-	-	-	1	?
3. tree planting / reforestation/ afforestation	1	-	-	-	-	-	-	
4. (biogas based energy generation)	2* (1 registered) + 1**	2* (registered)	-	-	1**	7**	-	
5. (biodiesel)	1			-				
*6. (hydro)****	---	---	---	---	---	---	---	3

* animal waste
** waste water (in some cases deriving by starch processing)
*** only for Sri Lanka to highlight country-specific issues

Complete analysis of methodologies, approval process steps, critical aspects, success/failure factors for:

- **Type 1: India (1 case)**
- **Type 2: India (1 cases)**
- **Type 3: India (1 case)**

Simplified analysis of methodologies and of critical aspects for:

- **Type 6: Sri Lanka (1 case to highlight only relevant country-specific issues)**

Table 11: List of Selected Projects

Name	Host Country	Type	Applied Methodology
DSL Biomass based Power Project at Pagara (registered)	India	1	AMS-I.D. (initially AMS-I.A.)
Chitra Bio Energy 7.5 MW Renewable Energy Grid Connected Biomass Power Project	India	1	AMS-I.D.
Surat Thani Biomass Power Generation Project in Thailand	Thailand	1	AMS-I.D. AMS-III.E.
9 biomass gasifier based power plants totalling 2.25 MW	India	2	AMS-I.A.
3.5 MW Rice Husk based Cogeneration Project at Nahar Spinning Mills Ltd. (registered)	India	2	AMS-I.C.
Angkor Bio Cogen Rice Husk Power Project	Cambodia	2	AMS-I.A. AMS-III.E.
Reforestation of severely degraded landmass in Khammam District of Andhra Pradesh, India under ITC Social Forestry Project	India	3	AR-AM0001
Anaerobic wastewater treatment and energy recovery project at rubber producing company in Vietnam	Viet Nam	4	AMS-I.A. AMS-III.D.
Biogas Sector Partnership Nepal (BSP-Nepal) Activity-1 (registered)	Nepal	4	AMS-I.C.
'30 TPD Biodiesel Project at Samasthan Narayanpur village, Choutuppal Mandal, Nalgonda District, Andhra Pradesh'	India	5	NM0069 (not approved), then NM0108 (methodology in progress)

1.8 ANALYSIS OF CDM CASES

Typology 1 – small-medium scale grid-connected biomass power generation

General description of selected project

Table 12: Description of Project at Pagara (India)

Project Features	DSL Biomass based Power Project at Pagara (registered)
Location	Guna, Madhya Pradesh, India
Fuel type	Husk dust, soya, bagasse, gram, etc. Crop residues are collected from farmers and brought to the project, thus generating additional revenues on account of supply of these residues (25.200 t/y)
Technology	14 TPH atmospheric fluidized bed combustion (AFBC); steam 64 kg/cm^2 and 485°C at outlet 3 MW multistage, impulse and condensing-type steam turbine – inlet 63 kg/cm^2 and 485°C Auxiliary facilities: fuel handling, ash handling, water pre-treatment, cooling tower, compressed air, control and instrumentation, fire fighting Three-days storage capacity for biomass
Output	217.800 MWh, 174.240 tCO_2 avoided - 10 years (7260 h/y)
Baseline	0.8 kg CO_2 / kWh *For a system where all generators use exclusively fuel oil and/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 I.D.1.*
Barriers	Investment barrier → high initial investment, raising biomass prices and raising biomass demand, human and financial resources to ensure fuel supply Prevailing practice barrier → first biomass power plant in the region
Duration	Expected operational lifetime: 25 years Crediting period: fixed – 10 years
Monitoring	Metering of - generated electricity (gross and auxiliary), - biomass input and coal input (when used) at purchase and usage, quantity and quality (Cal. Value and C content) Frequency, reliability, registration and reporting Recorded data to be kept for CP+2 years in e-archives
GHG sources	Direct on-site: null, due to cyclic absorption by biomass Direct off-site: a small amount for transportation of biomass; it should be balanced by emissions for transportation of diesel, which have been neglected for conservative reasons – 352 t CO_2 / y (neglected too!) Indirect on-site: emissions for the construction of biomass plant – negligible
Environmental impacts	NO EIA (Environmental Impact Assessment) required Bottom ash collected by means of water impounded hopper Fly ash collected economizer, air pre-heater, dust hopper
Stakeholders involvment	- Madhya Pradesh Pollution Control Board - Madhya Pradesh Urja Vikas Nigam Limited - Village Panchaayat - Biomass suppliers (farmers, etc.) - Consultants - Equipment suppliers

Table 13: Emission Specifications

Emission factors for diesel generator systems (in kg CO2equ/kWh*) for three different levels of load factor**			
Cases:	Mini-grid with 24 hour service	i) Mini-grid with temporary service (4-6 hr/day) ii)Productive applications iii) Water pumps	Mini-grid with storage
Load factors [%]	25%	50%	100%
<15 kW	2.4	1.4	1.2
>=15 <35 kW	1.9	1.3	1.1
>=35 <135 kW	1.3	1.0	1.0
>=135<200 kW	0.9	0.8	0.8
> 200 kW***	0.8	0.8	0.8

*) A conversion factor of 3.2 kg CO_2 per kg of diesel has been used (following revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories) **) Figures are derived from fuel curves in the online manual of RETScreen lnternational's PV 2000 model, downloadable from http://retscreen.net/
***) default values

Preparation process and issues arising for validation

- Host Party approval and authorisation

Government Approval is expressed in rather concise terms: "*the project contributes to Sustainable Development in India*"

Further conditions are set on:

- acquisition of CERs cannot be done using ODA[3] funds; information on the buyer has to be provided to National CDM Authority
- authorisations required from competent authorities
- satisfaction of CDM EB and of Indian National CDM Authority

- Process of development of PDD and production of final PDD to be commented for Validation (Analysis of Validation Report)

The Validation Report (also based on a Validation and Verification Manual agreed by DOEs; www.vvmanual.info) is examined and the most relevant parts are hereafter quoted.

"In particular, the project's baseline, the monitoring plan (MP), and the project's compliance with relevant UNFCCC and host country criteria are validated in order to confirm that the project design as documented is sound and reasonable and meets the stated requirements and identified criteria".

PROJECT DESIGN

"The objective of the project is to reduce GHG emissions by installing a power plant with fuel supply by renewable sources.

The project itself does qualify as a Small Scale Project as it fulfils the requirements defined in paragraph 6 (c) of decision 17/CP.7 on the modalities and procedures for the CDM by being a project in the category i) "renewable energy project activities with a maximum output capacity equivalent to up to 15 megawatts". The project activity itself is not a debundled component of a larger project activity according to the rules for "determining the occurrence of debundling" as they are outlined in Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities. Currently there is no other small scale project activity already registered or in the process of applying for registration - done by the same project participant within one kilometre distance".

[3] Official Development Assistance

"Moreover its is assured that as the start of the crediting period is before the registration of the project that the project activities starting date falls in the period between 1 January 2000 and the registration of the first clean development mechanism project. During the validation process the audit team obtained the information and evidenced that the start of project activities has been before the registration date of the first clean development mechanism project".

Some Corrective Action Requests (CARs) and Clarification Requests (CRs) are raised by DOE and discussed between Client and DOE:

Clarification Request No. 1:
In the financial data of the project the means of finance list "foreign currency loans" as contributing to the project finance. Please specify the origin of these loans.
Response:
Under the Technology Up gradation Fund Scheme (TUFS) of the Ministry of Textile, Govt. of India, the project activity is eligible for 5 % reimbursement on the interest charged by financial institution. Interest reimbursement is available on 'rupee loan'. The project activity involves only rupee loan from State Bank of India (SBI) and does not involve any foreign currency loan. The project financing structure is as follows: Equity/ Internal accruals- 20 % / Debt: 80 % (from SBI).

Clarification Request No. 3:
The operational lifetime of 25 years should be justified.
Response:
A document from the boiler manufacturer /17/ has been submitted which confirms the indicated lifetime.

BASELINE and ADDITIONALITY
"The project does not confirm with the project category I.A. "Electricity generation by the user" as ASM I.A asks only for electricity supply to households or small amounts of electricity – produced by multiple installations (as indicated in the baseline and monitoring methodology) - and not for a single mini grid connected installation as foreseen in the project.
The PDD describes that the project is not a likely baseline scenario according to various barriers faced by the project. The investment barrier described is not supported by respective documentation and the price increase in the used fuel did take place after the financial closure of the project and can hence not be considered to be a driving force in decision making. But according to the PDD the project is the first of its kind in the state and hence a barrier due to prevailing practice can be presumed. But corresponding evidence should be submitted. During the validation process the audit team moreover obtained the information and evidenced that the start of project activities has been before the registration date of the first clean development mechanism project. The way considering CDM revenues in the project planning stage could not be evidenced during the visit on site and additional documentation has been requested".

Corrective Action Request No 1:
The project proponent should make use of an appropriate methodology for the respective project type.
Response:
The correct methodology has been applied.

Clarification Request No. 2:
Clarification in form of additional information should be submitted in order to give evidence that the project is the first of its kind in the state.

Response:
The project proponent has submitted a letter from MP Energy Development Corporation dated July 18, 2003 declaring that this unit is the first and biggest unit using biomass in any textile mills in the state. The role and relevance of the MP Energy Development Corporation has been explained.

Clarification Request No. 4:
The way considering CDM revenues in the project planning stage could not be evidenced during the visit on site. To be clarified.

Response:
The project proponent has submitted a copy of a resolution passed in the meeting of the Board of Directors of Deepak Spinners Limited, held August 21, 2003, which gives evidence that the CDM has been a significant parameter during the time the decision to proceed with the project has been made. The document is a copy but the project proponent made also the original document available. In addition the project proponent agreed that the document can be made publicly available as an annex to the validation report.

MONITORING PLAN

"The selected monitoring methodology is in line with the monitoring methodologies provided for the relevant project category as the Simplified Modalities and Procedures for Small-Scale CDM project activities ask for the metering of the electricity generated by the renewable technology.
This statement is independent from the choice of the methodology (ASM I.A versus ASM I.D). In addition the project developer aims at monitoring of the biomass, the fossil fuel input and the energy content of the both fuel types. This is only due to emergence cases as in the regular operation it is not envisaged to use fossil fuel for the plant. No emergency situation with unintended emission has to be expected.
The application of the monitoring methodology is transparent.
No indicators have been defined regarding project emissions and leakage emissions to be monitored according to the monitoring plan as there are no emissions to be expected in the regular operation of the plant.
The responsibility of the project management is clearly described. During the visit on site, the validator was able to observe the practical implementation on site. There are two vice presidents who are involved in the operation of the plant: Vice President Commercial and Vice President Technical who have shared responsible for running this project.
No initial extensive training is required as the projects technology is well established.
There are no procedures defined for internal audits. But as the project performance can be easily obtained from the amount of electricity produced, the compliance can be checked regularly without further audits".

Clarification Request No. 5:
Provisions regarding archiving of data should be submitted to the audit team.
Response:
Section 3.2 of the revised document; “Registration, monitoring, measurement, archiving & reporting of data” includes the respective information.

Clarification Request No. 6:
The procedure covering the authority / responsibility of monitoring records, retention period for records, calibration of monitoring equipments and corrective actions is not defined.
Response:
A document named “Registration, Monitoring, Measurement and Reporting Procedures for Deepak Spinners Limited” has been submitted which contains basic instructions regarding the assigned parameters.

Clarification Request No. 7:
Respective procedures covering internal audits, performance reviews and corrective actions should be defined and submitted to the audit team.

Response:
A document named “GHG Performance Procedures for Deepak Spinners Limited” has been submitted which contains basic instructions regarding the assigned parameters.

Clarification Request No. 8:
It should be explained how it is ensured that power produced by the still equipped DG sets is not measured as produced by the biomass plant.
Response:
The metering of the energy produced by biomass plant and energy produced by DG sets is done separately. This can be checked during verification. During the initial verification the same should be verified as this is the objective of the initial verification.

CALCULATION of GHG EMISSIONS

"The PDD does clearly define the project's spatial boundaries. The project involves the implementation of a bioma ss based power generation plant including the storage area of the biomass which is an integral part of project. The PDD does also correctly define the project's system boundaries. Thus, all components and facilities used to mitigate GHG's are covered.

Information regarding the capacity of the installation is supported by corresponding documentation.

No project scenario emissions are to be expected in the regular operation of the plant. Leakage calculations are according to the Simplified Modalities and Procedures for Small-Scale CDM project activities requested in case the renewable energy technology is equipment transferred from another activity. This is not the case in the assessed project. Hence no leakage emissions are calculated.

Concluding it can be stated that all aspects related to direct and indirect baseline emissions are captured in the project design.

The calculation s of the baseline emission are documented in a complete and transparent manner. Hereby, conservative figures have been used"

ENVIRONMENTAL IMPACTS

"An analysis of the environmental impacts of the project activity is not required according to Indian legislation. The project does comply with environmental legislation. The Project meets all requirements of the consents given by the State Pollution Control Board.

Environmental effects are addressed in the PDD. It is not expected that the project will cause negative environmental effects".

COMMENTS by LOCAL STAKEHOLDERS

"Stakeholders have been directly asked to comment on the project. No stakeholder process is required according to national legislation.

There is written sanction of the project by the State Pollution Control Board and the Local Gram Panchayat. All comments received so far are neutral or positive"

COMMENTS by PARTIES, STAKEHOLDERS and NGOs

"TÜV SÜD published the project documents on its website on May 28, 2005 and invited comments within 30 days, until June 26, 2005 by Parties, stakeholders and non-governmental organisations. One comment was received.

The comment has been submitted on June 26, 2005 by Mr. Sripur. Mr. Sripur is not an accredited observer organisation to the United Nations Framework Convention on Climate Change Conference of the Parties. The comment has subsequently not been considered".

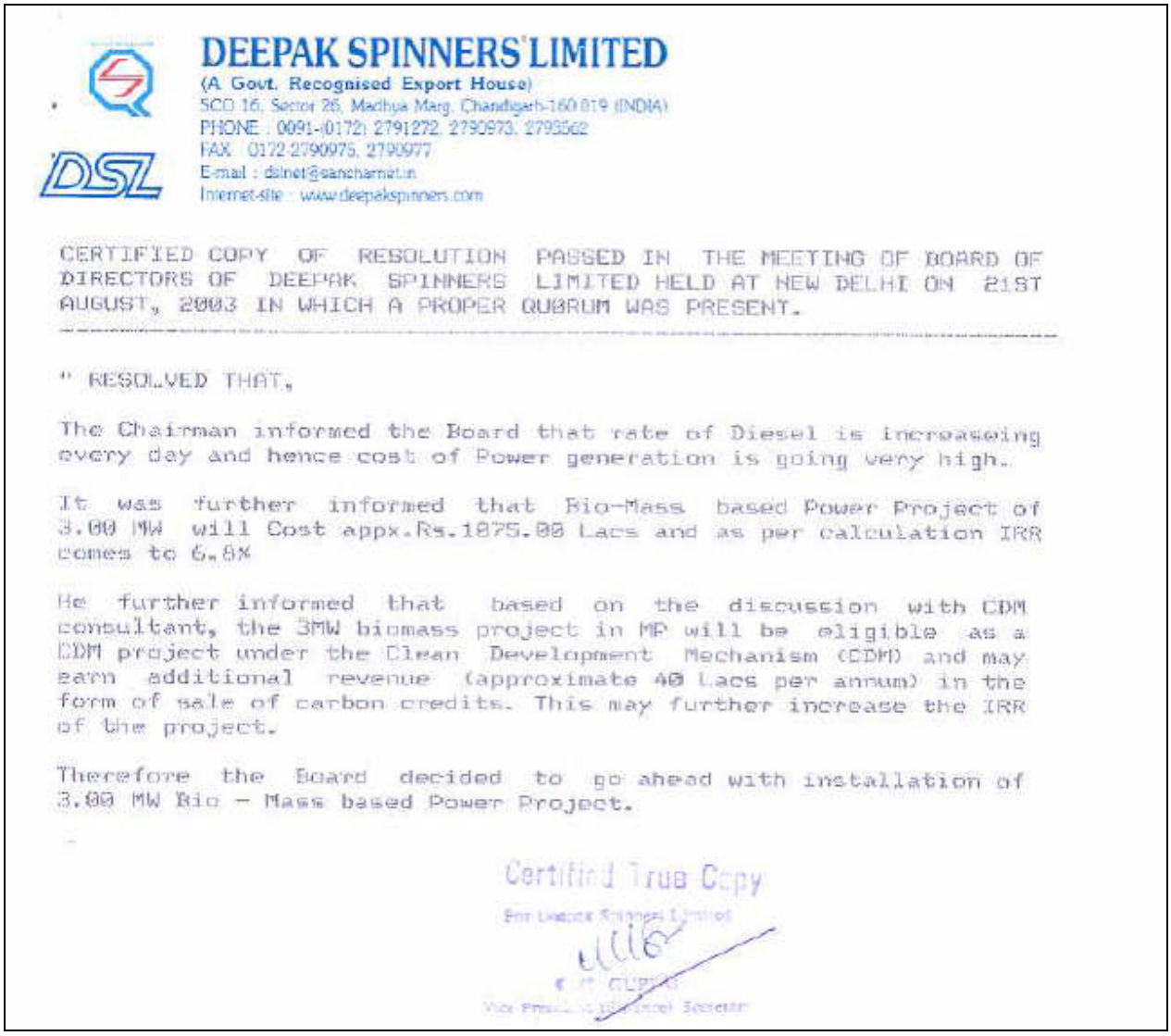
Registration of projects - process and documentation requested

Request for registration
Request for review

Table 14: Documentation Required for Pagara Project

Reference No.	Document or Type of Information
1	On-site interview at the offices and at the plant of Deepak Spinners Limited (DSL) in Chandigarh and at plant in Pagara Guna, Madhya Pradesh, conducted on March 7-8, 2005 by auditing team of TÜV SÜD **Validation team on-site:** Sunil Kathuria TÜV Süddeutschland India **Interviewed persons:** — INTERVIEW TOPICS Mr. S.N.Aggarwal Deepak Spinners Limited Vice president Commercial — Project design, Technical equipment Mr.V.K.Sharma Deepak Spinners Limited Vice president Technical — Sustainable development issues, Baseline determination Mr.O.N.Singh Deepak Spinners Limited Vice president Personal — Additionality, Crediting period Mr. H.S Rathore Deepak Spinners Limited Vice president Purchase — Monitoring plan, Management system, Environmental impacts, Stakeholder process, Approval by the host country
2	Draft Project Design Document, submitted February 2005
3	UNFCCC homepage http://www.unfccc.int
4	Copies of purchase orders of boiler, turbine-alternator set, RO-filteration, dated May 6 and August 26, 2003, submitted March 2005
5	Boiler Certificate Form V, dated April 16, 2004, submitted March 2005
6	Consent to establish a 3MW Captive Power Plant based on biofuel from the M.P State Pollution Control Board, dated September 3, 2004, submitted March 2005
7	Permission from Chief Engineer (Electrical Safety) & Chief Electrical Inspector to run 3MW Project, dated June 25, 2004, submitted March 2005
8	Letter of consent issued by Mr. Nihal Singh Raghuvanshi - Chief Marketing Society Pagara & signed by five elders of the village, submitted March 2005
9	No Object Certificate issued by Pagara Gram Panchyat, submitted March 2005
10	Chief Engineer (Electrical Safety) & Chief Electrical Inspector Madhya Pradesh State Govt., dated October 23, 2003
11	Summary for biomass supply in the period July 04 –Feb 05, submitted March 2005
12	Project fianancial data, issued by Deepak Spinners Limited, submitted March 2005 (confidential)
13	Letter of Approval, issued by the Government of India, Ministry of Environment and Forest, dated February 7, 2005, submitted February 2005
14	Default Monitoring Report (excel format), submitted February 2005
15	Approved baseline and monitoring methodologies for Small Scale CDM Project Activities, UNFCCC, 2005
16	Final Project Design Document, submitted May 2005
17	Letter issued by Thermax Limited on boiler lifetime, submitted May 2005
18	Certified Copy of Resolution passed in the meeting of the Board of Directors of Deepak Spinners Limited, held August 21, 2003, submitted May 2005.
19	GHG Performance Procedures for Deepak Spinners Limited, submitted May 2005
20	Registration, Monitoring, Measurement and Reporting Procedures for Deepak Spinners Limited, submitted May 2005
21	Comment to the project submitted during the Public Stakeholder Process period, issued by Mr. Sripur, dated June 26, 2005
22	Validation and Verification Manual, IETA/PCF http://www.vvmanual.info
23	Revised document “Registration, Monitoring, Measurement, Archiving & Reporting of Data” for Deepak Spinners Limited, submitted July 2005
24	Letter from MP Energy Development Corporation, dated July 18, 2003, submitted July 2005
25	Revised Final Project Design Document, submitted August 2005

LETTER OF BOARD OF DIRECTORS



DEEPAK SPINNERS LIMITED
(A Govt. Recognised Export House)
SCO 16, Sector 26, Madhya Marg, Chandigarh-160 019 (INDIA)
PHONE : 0091-(0172) 2791272, 2790973, 2793562
FAX : 0172-2790975, 2790977
E-mail : dslnet@sancharnet.in
Internet-site : www.deepakspinners.com

CERTIFIED COPY OF RESOLUTION PASSED IN THE MEETING OF BOARD OF DIRECTORS OF DEEPAK SPINNERS LIMITED HELD AT NEW DELHI ON 21ST AUGUST, 2003 IN WHICH A PROPER QUORUM WAS PRESENT.

" RESOLVED THAT,

The Chairman informed the Board that rate of Diesel is increasing every day and hence cost of Power generation is going very high.

It was further informed that Bio-Mass based Power Project of 3.00 MW will Cost appx.Rs.1875.00 Lacs and as per calculation IRR comes to 6.6%

He further informed that based on the discussion with CDM consultant, the 3MW biomass project in MP will be eligible as a CDM project under the Clean Development Mechanism (CDM) and may earn additional revenue (approximate 40 Lacs per annum) in the form of sale of carbon credits. This may further increase the IRR of the project.

Therefore the Board decided to go ahead with installation of 3.00 MW Bio - Mass based Power Project.

Certified True Copy

For Deepak Spinners Limited

- Registration form (F-CDM-Reg-Form)

Communication with CDM Executive Board for registration, allocation and issuance of CERs.

Typology 2 – Biomass-based electricity /thermal energy generation by the user

General description of selected project

Table 15: Description of Projects in Karnataka and Tamil Nadu, India.

Project Features	**9 biomass gasifier based power plants totalling 2.25 MW**
Location	Cities of Combatore, Kushal Nagas, Bangalore, Kumpta, Hubli and Chennai; States of Karnataka and Tamil Nadu, India
Fuel type	Coconuts shell, casuarina, eucalyptus, jungle wood, cashew shell, juliflora, forest waste
Technology	"IISc DASAG" open-top down-draft biomass gasifiers 50-1000 kWe; 1.4 kg of wood per kWh. Generated producer gas: 18% H2, 20% CO, 2% CH4, 12% CO2, 3% H2O, rest N2 Fed into internal combustion engine (dual-fuel IC engine) *More detailed technical specifications missing* *Auxiliary facilities missing*
Output	126.060 MWh, 123.390 tCO_2 avoided - 10 years (264 d * 19 h/d for 1250 kW or * 24 h/ d for 1000 kW)
Baseline	**0.99 kg CO_2 / kWh – grid electricity replaced** **(AMS-I.A. : Electricity generation by the user)** *7. For all other systems, the baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO2equ/kWh) calculated in a transparent and conservative manner as:* *(a) The average of the "approximate operating margin" and the "build margin", where:* *(i) The "approximate operating margin" is the weighted average emissions (in kg CO2equ/kWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;* *(ii) The "build margin" is the weighted average emissions (in kg CO2equ/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent4 20%5 of existing plants or the 5 most recent plants.";* *OR,* *(b) The weighted average emissions (in kg CO2equ/kWh) of the current generation mix.* **0,9 kg CO_2 / kWh – captive diesel electricity replaced** **(AMS-I.A. : Electricity generation by the user)** *7. The emissions baseline is the energy baseline calculated in accordance with paragraph 4 above* *times the CO2 emission coefficient for the fuel displaced. IPCC default values for emission coefficients may be used. A default value 0.9 kg CO2equ/kWh, which is derived from diesel generation units, may be used. A small-scale project proponent may, with adequate justification use a higher emissions factor from Table I.D.1*
Barriers	Prevailing practice barrier → least cost approach is directing investors at hydro or (fossil) thermal; problems to persuade public/private/IPP to install biomass gasifiers due to high initial costs and difficulties in organising biomass supply; need of a close cooperation between promoter and technology supplier.
Duration	Expected operational lifetime: 15 years Crediting period: fixed – 10 years
Monitoring	**(AMS-I.A. : Electricity generation by the user)** *9. Monitoring shall consist of:* *(a) An annual check of all systems or a sample thereof to ensure that they are still operating (other evidence of continuing operation, such as on-going rental/lease payments could be a substitute).* *OR* *(b) Metering the electricity generated by all systems of a sample thereof.*

Project Features	**9 biomass gasifier based power plants totalling 2.25 MW**
GHG sources	Direct on-site: null, due to cyclic absorption by biomass Direct off-site: a small amount for transportation of biomass - neglected Indirect on-site: not considered
Environmental impacts	"NO Environmental Impact Assessment is required "
Stakeholders involvment	- Promoters - Neighbours - Local government officers

Preparation process and issues arising for validation

- Comments received

1) Axel Michaelowa, Hamburg Institute of International Economics (HWWA) - 2004-07-28

Weak arguments for additionality

In B.3 (Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity, Editor's Note) *the project proponents clearly state that the projects are commercially viable due to government subsidies. The argument that the equity would not be forthcoming is not substantiated, especially as the promoters state that "plants are managing to reach commissioning stage without CDM advance money" (p. 17).*

The purported "investment barrier" does not exist. Commercial electricity users (projects 4-6) are charged rates of about 6 Rs/kWh by the SEBs (State Electricity Boards, Editor's Note). *Thus for them generating power at 3 Rs/kWh is clearly attractive.*

There is already a large number of biomass gasifiers installed in India. However, the technology barrier can be relevant given the unreliability of biomass gasification.

The "prevailing practice barrier" would only be true if the power was sold to SEBs. This is not the case here. The institutional barriers cited are commonly overcome by the operators of biomass power plants in several states of India.

The project developers should carefully redo the barrier assessment.

Choice of wrong small-scale project category

If the small scale project category I A is used, it has to be made sure that no power is sold to the grid. At least for projects 1 and 2 this is not clear ("mainly" for own use, p. 6). The use of diesel as a baseline is unrealistic for grid-connected users in large Indian cities such as Bangalore (projects 2, 6, 8), Coimbatore (project 1), Thajavur (project 9) and Tiruchirapalli (project 7). These users will have diesel as a back-up but not use it as long as grid electricity is available. The project should thus be registered under category I D (renewable electricity generation for a grid) and calculate the baseline accordingly. The emissions factor cited in B.2 as Indian grid average is not referenced; it is clearly overestimated. For the Western and Southern grid, it is lower than 900 g CO2/kWh.

No coverage of leakage

Projects using biomass fuel have to calculate leakage even under the small scale CDM rules (para 8 of "General guidance": 8. Biomass projects: In the case of project activities using biomass, leakage shall be considered."). Leakage due to diversion of fuel from other uses is likely here. Wood from forests (projects 3 and 5), eucalyptus (project 8) and prosopis juliflora (projects 6 and 9) are normally used as fuel and raw

material in the Indian context. Unless dedicated fuel plantations are established for these projects, a conservative calculation should assume a leakage of 100%.

2) N Y Dinesh Babu, TERI - 2004-07-28

Reference Comment

A.2 This section may include a brief write-up on the performance update details of the plant built in Varlakonda as referred and similar plants currently operating in India. A brief write-up on the skills available or proposed to be developed for all these 9 projects as regards operational and maintenance of these plants is required as the college professionals, municipality, village community etc., may not possess such skills.

A.2 Please replace 'capacities' with capacity in the third line of the second paragraph of this section

A.2 & B.3 The extent of Government of India Subsidy and any state subsidy is not provided in this section but provided in Section B.3. As gasification programme has always been highly subsidised by the Government, an argument on the extent of CDM revenues facilitating the project implementation is essential

A.2 A clarification of who is the supplier (of CERs) is essential as a host of firms and experts have been involved in developing, manufacturing, licensing, implementing the subject technology. The bundling aspect also needs to be mentioned here as the supplier will be responsible for arranging for verifying and certifying the CERs from all these 9 plants.

Table on Promoter and Location Sl No.1,2 & 9 projects are implemented in Colleges. Hence it is not clear how a college can sell power to additional customers and who they will be. Colleges normally have Diesel Generator Sets as a back up to grid power. Information regarding the extent of use of DG sets is required to see the degree of dependence for power.
Sl No 3 project is clearly mentioned for water pumping for a local municipality and hence sale of power to additional customers needs to be clarified.

Sl No 4 project is a very small unit of 50 kW and hence question of selling power to additional customers does not arise given the exorbitant cost of T&D lines.

Sl No 5 project is for a dairy and hence sale of power to additional customers needs to be clarified.

Sl No 6 project is for irrigation purposes and hence sale of power to additional customers needs to be clarified.

Sl No 7 project is reported to implemented as a demonstration project to understand the performance of such projects and assess the potential for replication. Hence the major objectives of GHG reductions and achieving sustainable development is sidelined. At least this project does not seem to be additional.

Sl No 8 project is in a University located in an Urban area. The survey of biomass availability has not been done as admitted in the PDD itself (Ref. Table on Biomass sources). Under these circumstances, availability of sustainable biomass remains un-clarified. Adequacy of use of biomass available within the campus and University's opinion/consent/comments on the same are not provided. Again sale of power to additional customers needs to be clarified.

Reference Comment

A.2 As regards biomass requirement, estimating 250 acres for 100 kW (hence assumed 125 acres for 50 kW) project is not feasible for colleges and small firms. Sourcing biomass for projects located in urban area will be extremely difficult and economically unviable. Hence a clear picture of finite biomass sources, cost and availability for each of the project is essential to clear these doubts/uncertainties. It has been mentioned that Eucalyptus is available for most of these projects whereas only 3 out of 9 projects use the same. The

statements as regards biomass for these 9 projects are contradicting with each other.

The details of economics is not attached with the draft PDD. Since it is not made available (for some reasons) the statement requesting to refer such document should be deleted from PDD

A.4.1.2 Since the project is implemented in only two states, these two states need to be mentioned

A.4.1.3 City and Districts in these two states where the projects are being implemented need to be mentioned

A.4.2 , A4.3 & D The PDD should clearly state whether all the projects will be using 100 % gas engine or not. This clarity is required as the Monitoring table shows a column for diesel consumption but the table in section A4.3 shows project emissions is "zero".

A.4.3 This sections argues that in the absence of this project the project participants would have used diesel for power generation. But previously in section A.2 it is mentioned that the participants are not having grid power of poor quality. Consistency is expected in this argument.

B.1 The use of formula EB is not adequately explained with reference to the one 200 kW plant to be installed in PMC college, Thanjavur, Tamil Nadu. Use of diesel emission factor is not acceptable for all projects without a clear picture of the current situation of fuel source for power

B.2 The emission factor for the country as around 0.99 tCO2/kWh is not adequately supported by any reference/details. In case of a regional approach, the baseline for the grid power will be lower than this figure and that of diesel too. There is lack of consistency in this assumption and argument.

B.3 No details of economics attached for reference

The reference for providing the figure of levelised tariff for the power produced from the most recent thermal plants built in India as Rs 1.85/kWh is not provided. The statement as regards that except 18,000 villages other villages have access to power is incorrect. As per Ministry of Power, a total of 70,000 villages are un-electrified out of which 18,000 are remote villages for which electrification by means of renewables is planned by MNES (Ministry of Non-Conventional Energy Sources). Balance 52,000 villages will be electrified by grid extension. Again the statement that the Indian consumers are paying the lowest tariff is not correct. Such arguments should be supported by some reference and actual consumer tariff slabs across different consumers. Argument could be on subsidised power for agriculture, theft, T&D loss leading State utilities to incur loss to the tune of Rs 1.1/kWh.

<u>Reference Comment</u>

B.3 (a) While in B.2 it is argued that the diesel baseline is more conservative than that of the grid, it is argued here that the coal fired plants would have been built if such gasifier based power projects are not built. Again consistency in the arguments is missing. Further on reality implementing such small power gasifiers will not necessarily lead to avoiding implementation of fossil fuel based thermal power plants.

B.3 (c) All these 9 biomass gasifiers projects need not obtain any license and approval from Central or State Electricity Regulatory Commissions. They can be considered under delicensed industrial activity. Hence there is no barrier in obtaining such approvals for implementing at least these 9 biomass gasifier power projects.

B.3 (d) The details of the modern technologies proposed to be used in 2 of the present project activities are not provided.

B.3 conclusion The argument "that the project implementation is only dependent on 10% of the project cost to come from CER revenues" is not strong enough.

B.3 Specific barriers in the case of BHEL plant This project is reported to implemented as a demonstration

project to understand the performance of such projects and assess the potential for replication on a commercial scale. Hence the major objectives of GHG reductions and achieving sustainable development is sidelined. BHEL being a public sector can on its own carry out this activity if it sees the commercial potential of such projects for rural electrification as desired by the Government of India. At least this project does not seem to be additional.

B.4 The use of natural gas engine is mentioned here only and not elsewhere. This should be specified wherever the system/project description is initially mentioned (i.e section A.2) Hence the monitoring table should have no column for diesel consumption. The statement that none of the equipment using the power from the 9 biomass gasifier power plants will be using any power from any other source" is not acceptable as the details of such equipments are not given. Further such equipments if essential for daily operation, may require alternate power source in case of any unexpected gasifier shut down. This needs further elaboration. In absence of such equipments, the definition of project boundary is incomplete. A justification of a common project boundary for all the projects can be accepted only after the clarification on the type of equipments, how far they are and their dependence only on the gasifier power. Definition of project boundary for bundled projects are new to the CDM community. Some clarity is require in general while defining project boundary for such bundled projects. Leakage not discussed.

D The column for DG sets needs to be removed. Alternative power supply for equipments powered by gasifier power during break down needs to be explained in Section B as this table envisages down time due to break down.

<u>Reference Comment</u>

D.2 Justification not adequate. Needs elaboration or reference to such elaboration if made elsewhere in the PDD.

D.3 Rows/Columns for diesel need to be deleted in case of 100 % gas engine. Rows/Columns for diesel consumption for maintenance need to be clarified in case of 100 % gas engine. Rows/Columns for unit supply by grid means that there will be grid power consumed by the 9 firms in the absence of gasifier power. Needs clarification

Biomass Sustainability section I feel that claiming Emission reductions from growth of energy plantation and also by using it gasifiers are not allowed. This leads to double counting. This aspect needs clarification.

Typology 3 – Tree planting / reforestation/ afforestation

Introduction

COMPLIANCE

The forest area in the given A/R CDM project activity complies with the definition of reforestation which says that ,"Reforestation" is the direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land. For the first commitment period, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989.

The definition for "forest" selected by the host Party, specifies:

- A single minimum tree crown cover value is 30 per cent

- A single minimum land area value is 0.05 hectare; and

- A single minimum tree height value is 5 metres.

Such a forest did not exist in the plots where project activity is undertaken. Evidence based on satellite imageries and land records would be provided to the validator for examination. Also see figures provided in Section B.3.

Key sections of the Project Design Document (PDD)

B.2. Description of how the methodology is applied to the proposed A/R CDM project activity:

The baseline methodology used by the proposed A/R CDM project activity outlines the methodology in a step-wise way that is followed as described below:

1. Assessment of the historical and existing land use/cover changes

The area which are covered under the social forestry are seriously degraded barren lands of low productivity with few trees. The crown cover of these sites are still below the national threshold of defining the forest i.e.,

• A single minimum tree crown cover value of 30 per cent

• A single minimum land area value of 0.05 hectare; and

• A single minimum tree height value of 5 metres.

Historically, there has not been noticeable land use and land cover changes in the project areas as evidenced by the satellite imageries as also by the statistics of the district providing land use.

Table 16: Land Use Pattern of Khammam District, Andhra Pradesh

Sl. No.	Category	1999-2000	2000-2001	2001-2002	2003-2004	2004-2005
1.	Total geographical area	15,80,935	15,80,935	15,80,935	15,80,935	15,80,935
2.	Forests	7,43,793	7,43,793	7,43,793	7,43,793	7,43,793
3.	**Land put to non-agricultural use**	**123527**	**124967**	**124967**	**124988**	**124988**
4. Fallow	**land**	**22567**	**21850**	**28662**	**29506**	**31030**
5. Net	sown area	447313	446613	406788	421606	437942

2. Assessment of the national and/or sectoral policies

In resolution N0. 13/52/F, dated the 12th May 1952 the Government of India in the earstwhile Ministry of Food and Agriculture, enunciated Forest Policy to be followed in the management of State forest in the country. This policy has been revised and renewed over the years to evolve new strategy for forest conservation which includes preservation, maintenance, sustainable utilization, restoration, and enhancement of the natural environment. In the year 1998 a new National Forest Policy has been formulated with the following objectives:

• Increasing substantially the forest/tree cover in the country through massive afforestation and social forestry programmes, especially on all denuded, degraded and unproductive lands.
• Meeting the requirements of fuel-wood, fodder, minor forest produce and small timber of the rural and tribal populations.
• Increasing the productivity of forests to meet essential national needs.
• Encouraging efficient utilisation of forest produce and maximising substitution of wood.
• Creating a massive people's movement with the involvement of women, for achieving these objectives and to minimise pressure on existing forests.
To meet the above mentioned objectives a detailed strategy for Afforestation, Social Forestry & Farm Forestry also is undertaken with the following action based programme
• A massive need-based and time bound programme of afforestation and tree planting, with particular emphasis on fuelwood and fodder development, on all degraded and denuded lands in the country, whether forest or non-forest land, is a national imperative.
• Village and community lands, including those on foreshores and environs of tanks, not required for other productive uses, should be taken up for the development of tree crops and fodder
resources. Technical assistance and other inputs necessary for initiating such programmes should be provided by the Government. The revenues generated through such programmes should belong to the panchayats where the lands are vested in them; in all other cases, such revenues should be shared with the local communities in order to provide an incentive to them. The vesting, in individuals, particularly from the weaker sections (such as landless labour, small and marginal farmers, scheduled castes, tribals, women) of certain ownership rights over trees, could be considered, subject to appropriate regulations; beneficiaries would be entitled to usufruct and would in turn be responsible for their security and maintenance.
The spread of such measures is not extensive and have not reached the land owners of the present project activity.

3. Assessment of alternative land use

Use of land for agriculture	This alternative faces following prohibitive barriers • Land owners are tribals and they do not have farming back ground. • Irrigation infrastructure is not available and rainfall is poor • The economic conditions of farmers would not favour investment in ground water utilization.
Leaving the land without any land use change causing further degradation	This is the most probable baseline scenario considering the economic conditions and experience of the land owners, land topography and the soil conditions, climatic conditions and water infrastructure. Natural regeneration also cannot occur with in the crediting period considering the climatic, soil, hydrology, and ecological conditions.

Considering economic condition of the tribal poor and the land topography the only realistic option is to leave the land without any land use change causing further degradation

4. Stratification of the A/R CDM project area

The stratification of the site is undertaken by conducting field visits and assessing the vegetation analysis such as strata with growing trees and strata without growing trees and also by using land use/cover maps, soil maps, etc. Local tribals are interviewed to understand the land use land cover history and to assess the impact of the human intervention on the project site. Accordingly the following two strata are taken into consideration for baseline study

-Strata without growing trees
-Strata with growing trees

5. Determination of baseline scenario for each stratum

The baseline scenario is determined by considering the following facts:

It was evident form the land use map study that the land under reforestation is not forested since 1989 and in 2000 too the vegetation is very sparse, hence there is no seed source available in the project land for any natural regeneration to take place. Further it is evident from the field survey that the land is degraded beyond its natural regeneration capacity.

For strata without growing trees, this methodology conservatively assumes that the carbon stock in aboveground and below-ground biomass would in the absence of the project activity remain constant, i.e., the baseline net GHG removals by sinks are zero. For strata with a few growing trees, the baseline net GHG removals by sinks are estimated based on methods in GPG-LULUCF1. Only the carbon stock changes in above-ground and below-ground biomass (in living trees) are estimated. The omission of the other pools (soil organic matter, dead wood and litter) is considered to be conservative because it can be justified that these other pools would decrease more or increase less in the absence of the proposed A/R CDM project activity, relative to the project scenario.

6. Determination of baseline carbon stock changes

The net GHG removal of the baseline scenario is calculated by following step:

-Determination of the sum of carbon stock changes for each stratum

-The sum of the baseline net GHG removals by sinks across all strata.

For those strata without growing trees, the sum of carbon stock changes in above-ground and below-ground biomass is set as zero.

For those strata with growing trees, the sum of carbon stock changes in above-ground and below-ground biomass is determined based on the projection of their number and growth, based on growth models (yield tables), allometric equations, and local or national or IPCC default parameters. The brief description is given as below:

This dominant carbon pool of the above ground biomass is estimated by the most commonly used plot method. Sampling involved enumeration of all trees on individual farms i.e., whole farms. Sampling strategy for farm forestry involved randomly selecting 10 farmers who were open to farm forestry activity with Eucalyptus clones, out of which 5 were small farmers (<2 ha) and 5 were large (>2 ha). A total of 40 farmers were interviewed for the cost and benefit of the present crop, area available for social forestry. A total of 235 acre of degraded land owned by them was sampled. All trees >1.5 m in height or >5 cm DBH (Diameter at Breast Height) were enumerated. In each tree plot, smaller plots (10m X 10m) were demarcated to enumerate shrubs and regenerating seedlings and record the species name, height and DBH (130 cm above ground) of each tree or sapling or shrub was recorded. The field data was compiled and basal area estimated using DBH and height data. Species-specific or generic volume equations from FSI reports (1996) were used to convert DBH and height into volume (m^3/ha). The biomass estimate was obtained by using the density values of dry wood and the carbon value by using 0.45 of biomass as carbon content. Hence the above ground biomass is 0.02 +-0.05 t/ha (dry Wt.)

The below ground biomass is calculated by using a default conversion factor of 0.26 of aboveground biomass given by IPCC, 2003.

The baseline is determined ex-ante and remains fixed during the subsequent crediting period. Thus the baseline is not monitored.

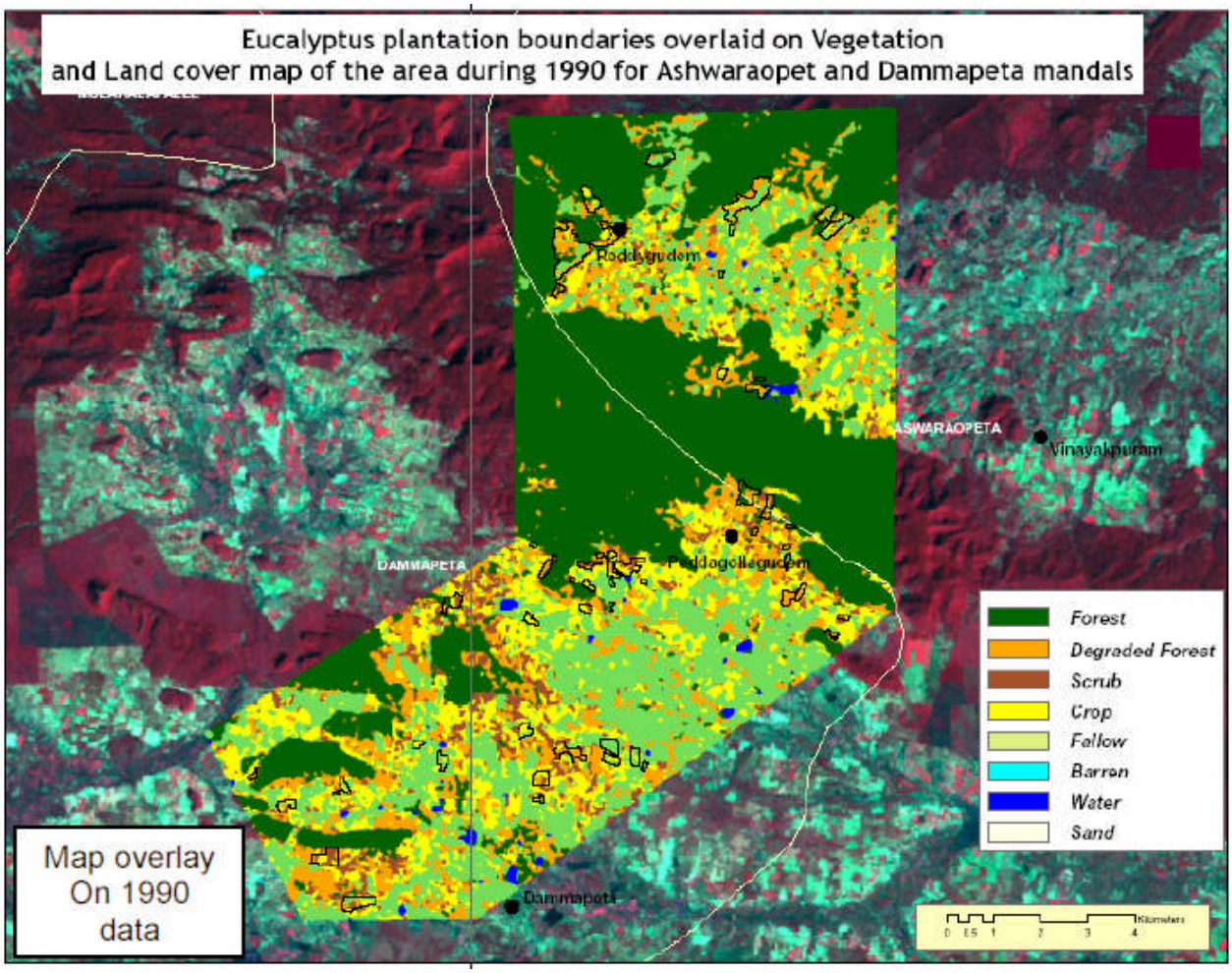
B.3. Description of how the actual net GHG removals by sinks are increased above those that would have occurred in the absence of the registered A/R CDM project activity

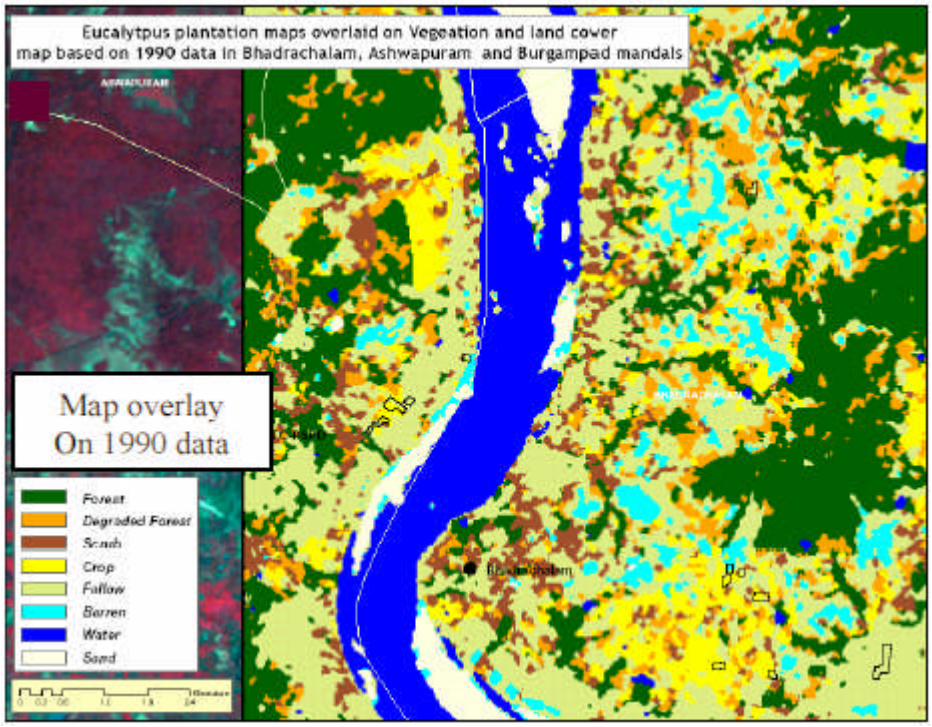
>> **Additionality test** The steps as outlined in the additionality tool are followed to demonstrate that the proposed A/R CDM project activity is additional and not the baseline scenario. In this the barrier arguments (steps 3) is used in preference to step 2., investment analysis.

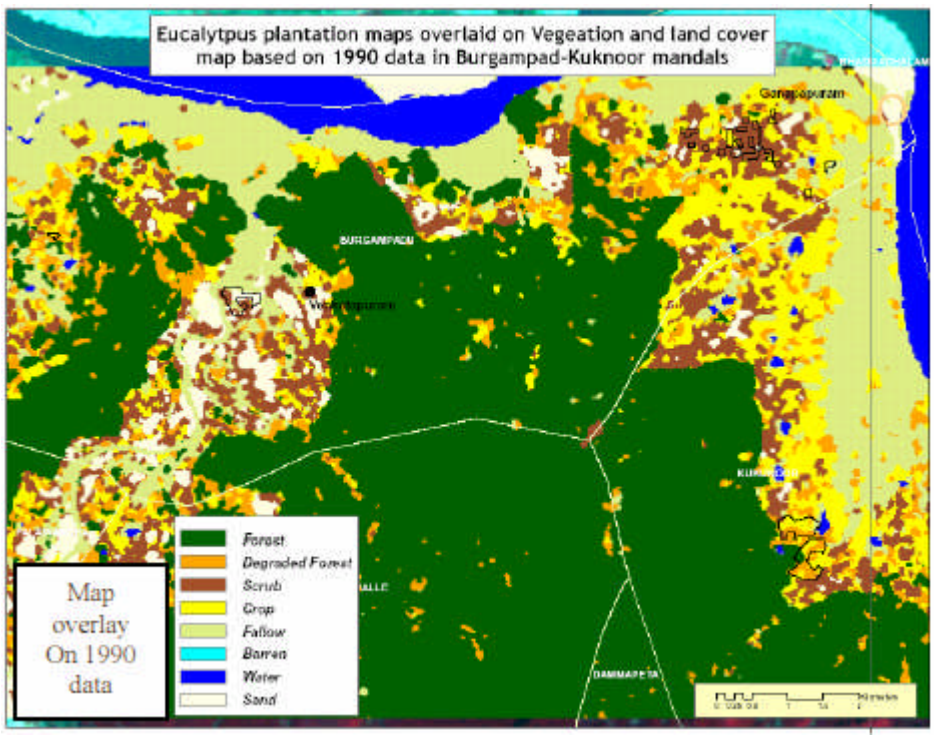
Step 0. Preliminary screening based on the starting date of the A/R project activity The A/R CDM project activity started after January 2000, and the project is in operation at present. ITC had gained awareness regarding the clean development mechanism in 1999-2000 through various seminars and conferences and published literature. The ITC's management had taken a decision to go ahead with the project, after duly considering CDM benefits under the Kyoto Protocol. The possibility of CDM benefits was communicated to the beneficiaries, before the decision to proceed ahead with this project activity. There is documentary evidence to such decision that could be verified by the validator.

Step 0a. Preliminary screening based on the specific features of A/R activity This is demonstrated as given below :

Land eligibility As described in section B.2, the land that was planted in this A/R CDM project activity was degraded and comprised of less productive barren lands with few shrubs. The forest area in the given A/R CDM project activity complies with the definition of reforestation which says that,"Reforestation" is the direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land. For the first commitment period, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989. The definition for "forest" selected by the host Party, specifies: - A single minimum tree crown cover value is 30 per cent - A single minimum land area value is 0.05 hectare; and - A single minimum tree height value is 5 metres. Therefore the lands of the A/R CDM project activity comply with the definition for afforestation or reforestation defined by decision 11/CP.7. The land eligibility is demonstrated by the land use and land cover maps respectively in 1989 and 1999 (fig B-1 to B.3-4 below. The lands under plantations in the A/R CDM project activity are marked with lines in these figures




Eucalytpus plantation maps overlaid on Vegeation and land cover
map based on 1990 data in Bhadrachalam, Ashwapuram and Burgampad mandals
Map overlay
On 1990 data
Forest
Degraded Forest
Scrub
Crop
Fallow
Barren
Water
Sand


Eucalytpus plantation maps overlaid on Vegeation and land cover
map based on 1990 data in Burgampad-Kuknoor mandals
Map
overlay
On 1990
data
Forest
Degraded Forest
Scrub
Crop
Fallow
Barren
Water
Sand

STEP 1: Identification of alternatives to the project activity consistent with current laws and regulations

Alternatives	Permitted by Local Regulations	Other Reasons
(a) The proposed project activity not undertaken as A/R CDM project activity	Yes	• This alternative faces investment barriers • Alternative also faces prohibitive barriers as the land is degraded, scarce water availability, infra-structure, lack of plantation expertise among the tribal / poor farmers and investment barrier.
b) Use of land for agriculture	Yes	This alternative faces following prohibitive barriers • Land owners are tribals and they do not have farming back ground. • Land is rocky and requires extensive tilling • Irrigation infrastructure is not available and rainfall is poor • The economic conditions of farmers would not favour investment in ground water utilization.
c) leaving the land without any land use change causing further degradation	Yes	This is the most probable baseline scenario considering the economic conditions and experience of the land owners, land topography and the soil conditions, climatic conditions and water infrastructure. Natural regeneration also cannot occur within the crediting period considering the climatic, soil, hydrology, and ecological conditions.

From the analysis above project activity is not the only feasible credible alternative scenario permitted by applicable regulations to the project participants, hence project activity is not the baseline scenario.

Sub-step 1b. Enforcement of applicable laws and regulations

As above in step 1a. the laws and regulations as regards to land use/land use change are largely and effectively administered in the region.

Sub-step 1c. Selection of the baseline scenario*:*

As brought forth in the above given discussion leaving the land without any land use change causing further degradation, is the most probable baseline scenario considering the economic conditions and experience of the land owners, land topography and the soil conditions, climatic conditions and water infrastructure and hence is the selected baseline scenario.

STEP 2: Investment analysis

In this CDM project activity step 2 is not considered for demonstrating additionality.

STEP 3: Barrier analysis

Sub-step 3a: Identify barriers that would prevent the implementation of the type of the A/R CDM project activity:

a) Investment barriers

• Many tribals still live below the national poverty level and practice at times marginal agriculture in disperse locations and firewood and forest produce collection constitute major form of livelihood.

• The economic condition of the tribals who own this land do not allow them to afford the high establishment investment in the early stage of plantation process, because all incomes from timber, and CERs, was envisaged to occur four years after the start of the proposed A/R CDM project activity.

• The chances to get commercial loans from banks for the purpose of reforestation activities were very low (loans for agricultural activities are much easier to obtain) because of the high market risk and economical unattractiveness in the context of degraded land. Only with the present A/R CDM project activity, the tribals have been involved in the process of plantation for reforestation on the degraded land, and ITC has agreed to commit funding for this project.

b) Technological barriers: The tribals in the region where the A/R CDM project activity is being carried out, do not have access to quality seed sources and lack skills for producing high quality seedlings. They also lack expertise for successful tree planting, as well as for preventing planted trees from being subject to fire, pest and disease attack. They are far poorly educated to have access to information and knowledge that will help them achieve any benefit from the land that they own.

c) Institutional barriers: Individual tribals that own these lands are too weak to successfully manipulate the chain from investment, production to market especially for the timber and non-wood forest products which will take a much longer period than food production firewood/forest produce collection. In addition, the lack of organizational instruments also prevents them from overcoming technological barriers mentioned above.

d) Market risks: The availability of an income stream can be guaranteed by means of a fixed commodity price. However, there is high market risks for timber for which the produce will take at least 5 years. The risks of timber market prices, especially in such remote degraded lands with low productivity and high transportation costs, are perceived to be high by the project participants, whereas through the present A/R CDM projects activity the market risks have been phased out by ITC contribution. This provides the certainty of future incomes (subject only to risk of failure of the reforestation per se). Although the market risks do exist for all other afforestation / reforestation projects, the higher productivity tends to reduce the risks. In addition, the project participants see the proposed A/R CDM project activity as a "testing ground" for carbon finance, which further increases their interest to go ahead with the proposed A/R CDM project activity.

Sub-step 3b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity).

Alternatives	Investment barriers	Technological barriers	Institutional barriers	Market risks
• **The proposed project activity not undertaken as A/R CDM project activity**	This barrier makes the alternative completely unviable	The implementation of this alternative is not possible with the barrier stated	The implementation of this alternative is not possible with the barrier stated	The implementation of this alternative is not possible with the barrier stated
• **Use of land for agriculture**	The stated alternative also faces the investment barrier to a lesser extent.	It also faces this barrier to a lesser extent.	It does not face this barrier	It does not face this barrier
• **Leaving the land without any land use change causing further degradation**	This alternative does not face the stated barrier	This alternative has no technological barrier.	There is no institutional barrier involved while leaving the land to degrade.	There is no market risk involved while leaving the land to degrade

The alternative leaving the land without any change in land use (continued status as wasteland) does, of course, not face the above-mentioned barriers.

STEP 4: Impact of CDM registration - The approval and registration of the proposed A/R CDM project activity will alleviate economic and financial hurdles, as well as the other identified barriers, and thus enable the proposed A/R CDM project activity to be undertaken and generate the revenue which will benefit the tribals and encourage them to continue their efforts in developing plantation projects and also help organizations like ITC in initiating forestry project there by contributing to the economy and the ecology of the region.

With step 4 being satisfied, the proposed A/R CDM project activity is not the baseline scenario, and is thus additional.

C.3. Monitoring of the baseline net GHG removals by sinks and the actual net GHG removals by sinks:

1. Monitoring of the baseline net GHG removals by sinks The proposed A/R CDM project activity aims to restore forests on degraded lands, the baseline scenario of which is established using proposed new baseline methodology, i.e., "Reforestation of Degraded Land" (section B). The carbon stock changes in the baseline scenario are set to zero for lands without growing trees and the projected carbon stock changes in above- and below-ground biomass of existing trees for lands with growing trees. In addition, the participants use 30 years fixed period as the crediting period and renewal is not needed. Therefore the baseline net GHG removals by sinks need not to be monitored.

2. Monitoring the boundary of the proposed A/R CDM project activity

• Field survey on the actual boundary that actual reforestation activity has occurred, site by site.

• Measuring geographical positions (latitude and longitude of each corner of polygon sites) using GPS

• Check whether or not the actual boundary is consistent with the description in section A.

• If the actual boundary falls outside of the designed boundary in section A, additional information for the part of lands that are beyond the designed boundary in section A will be provided; the eligibility of these lands as a part of the A/R CDM project activity will be justified; and the projected baseline scenario will be demonstrated to be applicable to these lands. Otherwise, these lands will not be accounted as a part of the proposed A/R CDM project activity. Such changes in boundary will be informed to DOE and subject to validation during the project.

• Input the measured geographical positions on GIS system and calculate the eligible area of each stratum and sub-stratum.

• The project boundary will be monitored periodically through the crediting period. If the boundary is changed during the crediting period, for instance, deforestation occurs on the project area, the specific location and area of the deforested land will be identified, the boundary will be modified and reported to DOE for subsequent verifications, the deforested area will be excluded from the project, and the CERs resulting from that will subsequently be retired. Similarly, if the planting on certain lands within the project boundary fails, and other land uses take the place, these lands will be documented.

3. Monitoring of the forest establishment To ensure the planting quality and confirm the practice described in section A is well-implemented, following monitoring activity will be conducted in the first three years after planting:

• Confirm site and soil preparations are implemented based on practice documented in section A.

• Survival checking

• Weeding checking: check and confirm that the weeding practice is well-implemented.

• Survey and check the area of planted species and planting year for each stratum and sub-stratum.

Monitoring of the forest management

• Harvesting: harvested location, area, tree species.

• Fertilization: tree species, location, amount and type of fertilizer applied, etc.

• Checking and confirming that the harvested lands are re-planted or re-sowed immediately after harvesting if direct planting is used. Checking and ensuring that good conditions exist for natural regeneration if harvested lands are allowed to re-sprout naturally.

Table 17: General description of selected project in Andhra Pradesh, India.

Project Features	Reforestation of severely degraded landmass in Khammam District of Andhra Pradesh, India under ITC Social Forestry Project.
Location	Khammam District, Andhra Pradesh, India
Plantations	Eucalyptus tereticornis Smith and Eucalyptus camaldulensis Dhen. Multi species plantations along with inter crops are promoted on private wastelands by providing long-term loans to resourceful households.
Technology	To achieve improvements in productivity and profitability of plantations, the company has developed genetically improved planting stock and improved package of practices. Major gains in productivity of eucalyptus plantations have been achieved ranging from 24 to 58 m3/ha/yr. Apart from increases in productivity by 4 to 6 times, the rotation period is reduced to 4 to 5 years instead of the conventional 7 to 8 years. **Genetic Source** *Eucalyptus tereticornis* Smith and *Eucalyptus camaldulensis* Dhen are the main species for clonal propagation. The seeds of these species were imported from CSIRO, Australia, provenance trails were raised and plus trees were selected, multiplied vegetative and field-tested. The short-listed promising clones with high productivity and resistant to disease were multiplied and planted in the project area. **Nursery Technique (Clonal Technology)** The "Bhadrachalam" clones of eucalyptus are produced following macro-propagation (mist propagation) technique. The method described by Hartmann and Kester in Plant propagation and New Forests by Aracruz, Brazil is followed. Apart from the above the procedures described in the USDA manuals and several Indian editions of nursery and plantation management are followed. **Quality Control during the Entire Process** The quality parameters of clonal plant production are enlisted which are similar to Aracruz method. **Soil and Site Preparation** The profile, pH and electric conductivity of soils are studied before deciding to raise clonal plantations. Areas with shallow soils less than 1 mµ in depth or those with strong calcareous or lateritic pans are avoided. Likewise, areas with high alkalinity or salinity are also avoided. Generally the soil pH less than 8.5 and electric conductivity less than 2 millimhos/cm was preferred. The land is prepared for planting by removing rootstocks, bushes etc. and ploughed with mould board plough. Planting sites is well prepared by deep ploughing in either direction followed by harrowing. **Planting Technique** Alignment is done with 3 x 2 m spacing. Pits of 30 x 30 x 30 cm are dug and clonal plants (ramets) are planted by the beneficiaries in July –August months (South-East monsoon). Mortality if any is replaced within a month's time. Fertilizer - Single Super Phosphate was provided in the first year only at the time of planting. This practice was followed for two years i.e. for 2001-02 and 2002-03 plantations. Later, it was discontinued. For termite and root grub control 2 g of phorate granules was applied in the pit during planting. **Plantation Maintenance and Management** In the second year of the plantation, the fields were ploughed to arrest the weed growth. All the plantations were rainfed and no plantation is irrigated. The beneficiaries are advised to protect the plantations especially in the initial months from cattle damage. NGOs supervisors (village organizers) periodically visit the plantations and carryout extension services advising the farmers on maintenance of plantations. The organizers enumerate the plantations every year during the months of January and February. A third party does a sample check to verify the authenticity of this enumeration. **Harvesting** The plantation maturity for Eucalyptus pulpwood is at 4 years. The plantations are felled, debarked and loaded on to the truck manually. The beneficiaries do these operations and by this get some income during the lean agriculture season. This wood thus felled, is

Project Features

Reforestation of severely degraded landmass in Khammam District of Andhra Pradesh, India under ITC Social Forestry Project.

transported to the pulp mills by tractors or trucks. The wood proceeds are given to the Sangha, without deducting any ITC spent money. This money gets converted into village development fund and further distributed amongst the land owners and utilized by the community for their development.

Avoided emissions

Carbon Pools Selected	**Selected (Yes/No)**	**Justification / Explanation**
Above ground	**Yes**	Major carbon pool in this project activity
Below ground	**Yes**	Major carbon pool in this project activity
Dead wood	**No**	Conservative approach under applicability condition
Litter	**No**	Conservative approach under applicability condition
Soil organic carbon	**No**	Conservative approach under applicability condition

Year	**Annual estimation of net anthropogenic GHG removals by sinks in tonnes of CO2 e**
2001	-2495
2002	-1523
2003	7450
2004	28300
2005	35729
2006	55953
2007	57822
2008	61417
2009	51604
2010	55980
2011	57880
2012	61381
2013	51703
2014	55834
2015	57907
2016	61438
2017	51666
2018	55932
2019	57760
2020	61465
2021	51724
2022	55896
2023	57859
2024	61319
2025	51751
2026	55953
2027	57822
2028	61417
2029	51604
2030	55980

Project Features	**Reforestation of severely degraded landmass in Khammam District of Andhra Pradesh, India under ITC Social Forestry Project.**

Total estimated net anthropogenic GHG removals by sinks (tonnes of CO2 e)	**1484530**
Total number of crediting years	**30**
Annual average over the crediting period of estimated net anthropogenic GHG removals by sinks (tonnes of CO_2e)	**49484**

Baseline

The approved baseline methodology **AR-AM0001/Version 01,** Sectoral Scope: 14 has been used to determine the baseline emissions and emission reduction due to the A/R CDM project activity. The title of this baseline methodology is "**Reforestation of degraded land".**

Selected baseline approach from paragraph 22 of the CDM A/R modalities and procedures is "Existing or historical, as applicable, changes in carbon stocks in the carbon pools within the project boundary."

The methodology **AR-AM0001/Version 01,** is applicable to project activities with the following conditions:

• The project activity does not lead to a shift of pre-project activities outside the project boundary, i.e. the land under the proposed A/R CDM project activity can continue to provide at least the same amount of goods and services as in the absence of the project activity;

• Lands to be reforested are severely degraded with the vegetation indicators (tree crown cover and height) below thresholds for defining forests, as communicated by the DNA consistent with decision 11/CP.7 and 19/CP.9, and the lands are still degrading;

• Environmental conditions and human-caused degradation do not permit the encroachment of natural forest vegetation;

• Lands will be reforested by direct planting and/or seeding;

• Site preparation does not cause significant longer term net emissions from soil carbon;

• Plantation may be harvested with either short or long rotation and will be regenerated either by direct planting or natural sprouting;

• Carbon stocks in soil organic matter, litter and deadwood can be expected to decrease more due to soil erosion and human intervention or increase less in the absence of the project activity, relative to the project scenario;

• Grazing will not occur within the project boundary in the project case;

• The application of the procedure for determining the baseline scenario in section II.4 leads to the conclusion that the baseline approach 22(a) (existing or historical changes in carbon stocks in the carbon pools with the project boundary) is the most appropriate choice for determination of the baseline scenario and that the land would remain degraded in the absence of the project activity.

In case of the A/R CDM project activity under consideration:

• The project activity does not lead to a shift of pre- project activity out-side the project boundary as the land that is reforested was degraded and left barren without any activity in the project boundary.

• Lands that was reforested by ITC , Bhadrachalam was severely degraded with the vegetation indicators (tree crown cover and height) below thresholds for defining forests, as communicated by the DNA consistent with decision 11/CP.7 and 19/CP.9, as mentioned in A.4.5 and the lands would still degrade without the project activity.

• The land use patterns before the CDM project activity indicate that the land was degraded beyond its natural regeneration capacity.

• The land under this A/R CDM project activity is reforested by direct planting of Bhadrachalam clones of Eucalyptus and Subabul Species.

• Since the A/R CDM project activity involves site preparation for plantation of the Eucalyptus and Subabul species in the reforested land once in 12 years time ,it does not cause significant longer term net emissions from soil carbon;

• In the project activity the trees that are planted are woody perennial species, and are harvested for pulp utilization, harvesting is carried out on long rotation

Project Features	**Reforestation of severely degraded landmass in Khammam District of Andhra Pradesh, India under ITC Social Forestry Project.**
	(4-5 years) and will be regenerated by planting as well as natural sprouting. • As the land with in the project boundary was barren for last several years before the reforestation activity was carried out, carbon stocks in soil organic matter, litter and deadwood can be expected to decrease more due to soil erosion and human intervention or increase less in the absence of the project activity, relative to the project scenario. • Grazing will not occur within the project boundary in the project case. • The application of the procedure for determining the baseline scenario in section II.4 leads to the conclusion that the baseline approach 22(a) (existing or historical changes in carbon stocks in the carbon pools with the project boundary) is the most appropriate choice for determination of the baseline scenario and that the land would remain degraded in the absence of the project activity
Barriers	Investment barrier → high initial investment, raising biomass prices and raising biomass demand, human and financial resources to ensure fuel supply Prevailing practice barrier → first biomass power plant in the region
Non-permanence	In accordance with the paragraph 38 and section K of CDM A/R modalities and procedures, the selected approach to address non-permanence is to opt for lCERs. *38. The project participants shall select one of the following approaches to addressing nonpermanence of an afforestation or reforestation project activity under the CDM:* *(a) Issuance of tCERs for the net anthropogenic greenhouse gas removals by sinks achieved* *by the project activity since the project start date in accordance with paragraphs 41–44 below; or* *(b) Issuance of lCERs for the net anthropogenic greenhouse gas removals by sinks achieved* *by the project activity during each verification period, in accordance with paragraphs 45–50 below.* *39. The approach chosen to address non-permanence shall remain fixed for the crediting period including any renewals.*
Duration	Operational lifetime: 50 years Crediting period: fixed – 30 years, starting 01/01/2001

Project Features	**Reforestation of severely degraded landmass in Khammam District of Andhra Pradesh, India under ITC Social Forestry Project.**
Monitoring	The approved monitoring methodology AR-AM0001 / Version 01, Sectoral Scope: 14 has been used. The title of this monitoring methodology is "Reforestation of degraded land". The proposed new monitoring methodology includes methods for measuring, monitoring and estimating following elements relevant to precisely estimate the net anthropogenic GHG removals by sinks for a proposed A/R project activity on degraded and degrading abandoned land: • Overall performance of the proposed A/R CDM project activity, including the project boundary, forest establishment and forest management activities; • Checking whether baseline scenario set in the baseline methodology is valid or not, which will be relevant for the next crediting period; • Actual net GHG removals by sinks including changes in carbon stock in above- and below-ground biomass, increase in GHG emissions within the project boundary due to nitrogen fertilization. • Leakage due to vehicle use for transportation staff, labours, seedlings, timber and non forest products, as a result of the implementation of the proposed A/R CDM project activity; • Guidance for the implementation of a Quality Assurance/Quality Control plan, including field measurements, data collection verification, data entry and archiving, as an integral part of the monitoring plan of the proposed A/R CDM project activity to ensure the integrity of data collected and improve the monitoring efficiency. The baseline net GHG removals by sinks do not need to be measured and monitored over times because, as per the conditions for the methodology, the lands to be reforested are degraded and are still degrading without possibility of natural encroachment of trees. Such removals are set to zero for lands without growing trees and projected carbon stock changes in above- and below-ground biomass of existing trees for lands with a few growing trees. To be conservative and make the monitoring cost-effective, only carbon stock changes in above- and below-ground biomass are proposed to be measured and monitored because others pools are unlikely to decrease or decrease more than the baseline. The proposed monitoring methodology stratifies the project area based on local climate, existing vegetation, site class and tree species to be planted under the aid of land use/cover maps, satellite image, soil map, GPS and field survey. The proposed methodology uses permanent sample plots to monitor carbon stock changes in above- and below-ground biomass pools.
GHG sources for the project	

Sources	**Gas**	**Included/ Excluded**	**Justification /Explanation**
Fertilizers	N2O	Included	The A/R CDM project activity will result in increase in emissions of nitrous oxide due to nitrogen fertilization practices in eucalyptus plantation
	CO2	Excluded	Emission is of an insignificant quantity
Transportation	N2O	Excluded	Emission is of an insignificant quantity
	CO2	Included	The vehicular movement for the transportation of timber and the seedlings with in the project boundary will cause the emissions

Environmental impacts	NO EIA (Environmental Impact Assessment) required Bottom ash collected by means of water impounded hopper Fly ash collected economizer, air pre-heater, dust hopper

Project Features	Reforestation of severely degraded landmass in Khammam District of Andhra Pradesh, India under ITC Social Forestry Project.
Stakeholders involvment	- Madhya Pradesh Pollution Control Board - Madhya Pradesh Urja Vikas Nigam Limited - Village Panchaayat - Biomass suppliers (farmers, etc.) - Consultants - Equipment suppliers

Preparation process and issues arising for validation

Methodology approved:

Modalities and procedures for afforestation and reforestation project activities under the clean development mechanism

1. Provisions governing tCERs

41. A Party included in Annex I may use tCERs towards meeting its commitment for the commitment period for which they were issued. tCERs may not be carried over to a subsequent commitment period.

42. Each tCER shall expire at the end of the commitment period subsequent to the commitment period for which it was issued. The expiry date shall be included as an additional element in its serial number. An expired tCER may not be further transferred.

43. Each national registry shall include a tCER replacement account for each commitment period in order to cancel AAUs, CERs, ERUs, RMUs and/or tCERs for the purposes of replacing tCERs prior to expiry.

44. A tCER that has been transferred to the retirement account or the tCER replacement account of a Party included in Annex I shall be replaced before its expiry date. To this end, for each such tCER, the concerned Party shall transfer one AAU, CER, ERU, RMU or tCER to the tCER replacement account of the current commitment period.

2. Provisions governing lCERs

45. A Party included in Annex I may use lCERs towards meeting its commitment for the commitment period for which they were issued. lCERs may not be carried over to a subsequent commitment period.

46. Each lCER shall expire at the end of the crediting period or, where a renewable crediting period is chosen in accordance with paragraph 23 (a) above, at the end of the last crediting period of the project activity. The expiry date shall be included as an additional element in its serial number. An expired lCER may not be further transferred.

47. Each national registry shall include an lCER replacement account for each commitment period in order to cancel AAUs, CERs, lCERs, ERUs and/or RMUs in accordance with paragraphs 48–50 below for the purposes of:

(a) Replacing lCERs prior to their expiry date;

(b) Replacing lCERs where the certification report of the DOE indicates a reversal of net anthropogenic greenhouse gas removals by sinks since the previous certification;

(c) Replacing lCERs where the certification report has not been provided in accordance with paragraph 33 above.

48. An lCER that has been transferred to the retirement account of a Party included in Annex I shall be replaced before its expiry date. To this end, for each such lCER, the concerned Party shall transfer one AAU, CER, ERU or RMU to the lCER replacement account for the current commitment period.

49. Where the certification report of the DOE indicates a reversal of net anthropogenic greenhouse gas removals by sinks since the previous certification, an equivalent quantity of lCERs shall be replaced.

To this end, the Executive Board shall:

(a) Request the transaction log administrator to identify the quantity of lCERs issued for the project activity held in each registry not yet replaced or transferred to the lCER replacement account, distinguishing those held in retirement accounts for the current and previous commitment periods and in holding accounts;

(b) Immediately notify the transaction log that, in accordance with these modalities, the lCERs identified in paragraph 49 (a) above as being in holding accounts are ineligible for transfer to holding or retirement accounts. When a Party has completed replacement of the required lCERs in accordance with paragraph 49 (d) below, the lCERs in the holding accounts of that Party are again eligible for transfer.

(c) Calculate the proportion of lCERs from the project activity to be replaced by dividing the amount specified in the request for replacement by the amount identified in paragraph 49 (a) above;

(d) Notify each Party concerned of the requirement to replace a quantity of lCERs equal to the proportion, as calculated in paragraph 49 (c) above, of the lCERs identified in paragraph 49 (a) above of that Party. To replace an lCER a Party shall transfer one AAU, CER, ERU, RMU or lCER from the same project activity to the lCER replacement account for the current commitment period within 30 days.

If the requirement to replace involves a fraction of a unit that fraction of a unit shall be replaced by one AAU, CER, ERU, RMU or lCER from the same project activity.

50. Where the certification report has not been provided in accordance with paragraph 33 above, the lCERs issued for the project activity shall be replaced. To this end, the Executive Board shall:

(a) Request the transaction log administrator to identify the quantity of lCERs issued for the project activity held in each registry not yet replaced or transferred to the lCER replacement account, distinguishing those held in retirement accounts for the current and previous commitment periods and in holding accounts;

(b) Immediately notify the transaction log that, in accordance with these modalities, the lCERs identified in paragraph 50 (a) above as being in holding accounts are ineligible for transfer to holding or retirement accounts;

(c) Notify the Parties concerned of the requirement to replace the lCERs identified in paragraph 50 (a) above. To replace an lCER a Party shall transfer one AAU, CER, ERU, RMU or lCER from the same project activity to the lCER replacement account for the current commitment period within 30 days.

Typology 4 – Small hydro Projects

Sri Lanka: Hapugastenne and Hulu Ganga Small Hydropower Projects (44.842 t CO_2 per annum)

BASELINE

Power generation capacity expansion is an urgent issue in Sri Lanka. Energy demand in the country has been growing at an average rate of about 7-8% per annum in the past 20 years, a trend that is expected to accelerate over the next decade. According to the CEB, further exploitation of large hydro resources is becoming increasingly difficult owing to social and/or environmental impacts associated with large-scale developments. In addition, the extensive reliance on hydropower makes the power system of this island nation overly vulnerable to drought. Severe drought led to power cuts in 2001 and the CEB has expressed its concern that cuts could occur again in the absence of capacity expansion.

The CEB is the government-owned monopoly power utility that prepares and manages the implementation of the country's power generation expansion plan. To meet the rapid growth in energy demand, the CEB expansion plan forecasts the addition of 2,690 MW in installed capacity between 2002 and 2016. The generation expansion plan takes into consideration contributions from existing and committed power facilities, and identifies additional capacity needs to meet future energy demand at the least possible generation cost. While the existing generating system is predominantly based on hydro power (60% of installed capacity), the base case expansion plan focuses on growth in thermal power.

Specifically, it includes only 220 MW of hydro power additions (in 2004 and 2008) and 2,470 MW of thermal power additions. Annex 3. summarizes the data, methods and results of the CEB expansion plan.

The potential for small scale hydropower to access the marketplace in Sri Lanka is restricted by the fact that CEB controls access to and the terms for power production. The CEB is the major owner and operator of most power plants in Sri Lanka and is responsible for issuance of power production licenses.

All power generation licenses specify that output must be sold to the CEB. Over the past five-seven years, the CEB has increasingly turned towards commissioning power plants on build, operate, own and transfer (BOOT) contracts with private operators. Note that all BOOT contracts have been for the construction of thermal power plant facilities. The CEB nevertheless maintains control of the process of identifying and licensing these new facilities. Similarly, all small-scale projects must have the preapproval of the CEB and developers must accept the CEB's energy purchase price that changes annually - not based on verifiable, objective criteria, but rather changes in accordance with the CEB internal calculations.

This discussion serves to highlight the dominating role of the CEB in setting the specific market and policy conditions for sector expansion. Given the tremendous growth in electricity demand, the CEB has instituted a number of policies and practices that strongly favor investments in thermal generation combined with only two new investments in large-scale, publicly-managed hydropower facilities.

As the rest of this section demonstrates, the four small-scale hydropower projects in this PDD are considered additional to the Sri Lanka energy sector emissions baseline based on an analysis of selected barriers listed in Attachment A to Appendix B, the simplified project design document for small-scale CDM project activities (SSC-PDD). Specifically, we demonstrate that the projects face significant barriers related to (i) heightened investment risk (common to all small-scale renewable investments in Sri Lanka), (ii) low market penetration of run-of-river small hydropower technology, and (iii) non-transparent procedures in the calculation of tariff schedules for small hydropower operators.

(i) investment risk barrier

*Energy generation investment opportunity in Sri Lanka is relatively limited. In that limited market, small hydropower investments are subject to much higher risks than investments in thermal power projects. The difference in levels of risk are in large part linked to the power purchase terms set by the CEB. In the case of thermal power plants the **CEB pays a capacity charge** sufficient to cover all up-front capital costs including an agreed rate of return on the investment. In addition, separate payments are made for energy on a pass through basis. Thus, private thermal power plant operators and investors are guaranteed a no risk rate of return on their investment provided the technical aspects of the plant are sound.*

In contrast, investors and operators of small hydropower facilities (and other small renewables) do not receive a capacity charge. Instead, small hydropower developers are paid based strictly on the CEB's short-run avoided costs. These avoided costs can fluctuate considerably from year to year and small hydro developers can and have in the past suffered losses in individual years. Unlike thermal power plant operators, small hydropower investors cannot claim a payment to compensate for drought-induced generation shortfalls. These arrangements act as a disincentive to investments in small-scale hydropower and argue for the additionality of the EPL investments at Hapugastenne and Hulu Ganga.

(ii) Low market penetration/uncommon practice barrier

Previous studies conclude that the country has limited potential for small-scale hydropower (100-200 MW). A World Bank project document notes that installed small hydropower was 30 MW at the end of 2001, which is equal to less than 2% of total capacity in the country. Looking at the impact of the four projects in this PDD, it is clear that they make very marginal contributions to the current and future generation mix. For example, the four projects in this PDD will generate a combined 56.6 GWh/year, which corresponds to only 0.82% of the national annual electricity generation of 6,843 GWh in 2000, and a mere 0.39% of the total capacity of 14,278 GWh forecast in 2012. With an aggressive schedule for future expansion of thermal power capacity, small scale hydropower will continue to be a marginal technology in Sri Lanka with low market penetration, unless CDM revenues enable small hydro developers to take on the higher risks associated with investing in small run of river hydro plants.

(iii) barriers related to uncertainties in power purchase agreement conditions

Small-scale hydropower investors like EPL also face uncertainties and risks related to power purchase terms of the CEB, a monopoly utility. Each year the CEB sets a power purchase agreement price level for the wet and dry seasons. That figure is based on a 3-year running average of avoided costs. However, ***the CEB does not transparently demonstrate to small power producers the methodology for calculating these rolling averages****. As a result, private investors have considerable difficulty predicting the direction of price changes and the degree of fluctuation from one year to the next. For example, the CEB recently announced the 2004 prices for small hydro independent power producers. Despite one of the worst droughts in decades and a steep rise in oil prices, the CEB reduced the tariff 28% below its 2003 level. The only recourse is for producers to enter into arbitration over rate calculations. However, EPL has learned from experience that arbitration can easily continue, with no resolution, for several years.*

This analysis of three different barriers suggests that small hydropower investments like the ones at Hapugastenne and Hulu Ganga are additional to a national baseline which is clearly oriented to favor large-scale thermal investments combined with a limited number of large-scale, publicly managed hydropower investments.

Faced with the multiple investment barriers described here, EPL began in early 2000 to evaluate the possibility of improving project rates of return and reducing its financial risks through registration of its projects under the CDM.

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:*

The CEB, as a monopoly entity that controls the country's power grid, prepares annual demand and supply forecasts, manages most power generation facilities in Sri Lanka (except for thermal power plants introduced in the past eight years), sets the terms of small power purchase agreements and leads development of grid expansion plans.

The expansion plan (updated every two years) is designed to respond to two key concerns. First, electricity demand in Sri Lanka is growing at an average annual rate of 7-8%, which will require major investments in new generation facilities over the next decade. Second, further exploitation of large scale hydro resources (which have historically provided a large percentage of total power) is becoming increasingly difficult owing to social and/or environmental impacts associated with such developments. The CEB's 2002-2016 national expansion plan, therefore turns to thermal power plants as the primary solution to meeting the country's growing energy needs. Specifically, the CEB forecasts thermal power generation capacity to increase from

its 2002 level of 751 MW to a target level of 2,754 MW in 2016. This forecast reflects a steady trend of increasing reliance on thermal power sources since the late 1990s. For example, between 1997 and 2003, the country added 724 MW of thermal power generation capacity. On the other hand, facilities less than 15 MW in size, which includes the small hydropower plants described in this PDD, are ***not*** *incorporated into the national expansion plan. So, all small hydropower and other renewables are not part of the default power generation baseline.*

Baseline uncertainties and alternative scenarios. Based on the facts regarding how CEB prepares and guides both the dispatch of current energy supply as well as the options for future energy investments, the most likely baseline scenario in Sri Lanka is the one that conforms to the CEB's current generation mix plus the base case expansion plan. The major uncertainties related to this scenario are (i) emergency conditions that lead to generation short-falls and power outages; and (ii) delays in building new power generation facilities. Either of these scenarios is likely to increase average emissions levels because (a) older, higher emissions thermal power plants will have to be used longer and for more operating hours per year, and (b) emergency diesel generators will be required to overcome generation shortfalls. A third possible scenario is a substantial increase in small-scale renewable energy or a greater investment in large-scale hydropower. However, as the earlier discussion emphasized, small-scale hydropower and wind power have very limited potential (100-200 MW for small-scale hydropower) compared to the total expected growth in generation over the next 15 years. Similarly, the country has nearly exhausted its options for large-scale hydropower because of environmental and social concerns.

The latest version of the small-scale CDM project guidelines issued on January 24, 2003, offers two options for calculating baseline emissions of category I.D. projects. The baseline for the Hapugastenne and Hulu Ganga projects is based on the second option identified in Appendix B of the simplified modalities and procedures for small-scale CDM. According to this option the baseline is defined as the kWh produced by the small hydropower plants multiplied by an emission coefficient (measured in KgCO2/kWh) calculated in a transparent and conservative manner as follows:

The average of the "approximate operating margin" and the "build margin: where:

(i) The "approximate operating margin" is the weighted average emissions (in kg CO2equ/kWh) of all generating sources serving the system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation;

(ii) The "build margin" is the weighted average emissions (in kg CO2equ/kWh) of recent capacity additions to the system, which capacity additions are defined as the greater (in MWh) of most recent 20% of existing plants or the 5 most recent plants.

The operating margin and build margin are derived from information available in the CEB 2002-2016 expansion plan. The plants that are included in the operating margin are those known to be on-line as of August 2003, when this PDD was first prepared. The calculations that quantify the baseline and expected emissions offsets are shown in Section E. In looking at the expansion plan, the CEB's intent is clearly to build up coal power. However, experience over the past five years shows that the CEB expansion plan rarely adheres to schedule – delays in commissioning new plants can continue for many years. Thus, to be conservative, the PDD calculates the baseline emissions based uniquely on the power plants already operational as of August 2003.

The remainder of this section is dedicated to an overview of the CEB expansion plan in order to clearly show the specific power plants that are part of the baseline. The expansion plan study results in the following base case demand forecast, which includes existing plants serving the grid. Note that only grid-connected facilities are included in this table. The two, small non-grid facilities do not impact on the baseline issue.

Table5: Ceylon Electricity Board base case supply forecast

Plant Name	*Capacity (MW)*	*Annual Average Energy (GWh)*
Existing and Committed Hydro Power Plants		
EXISTING		
Laxapana Complex	*335*	*1432*
Mahaweli Complex	*660*	*2100*
Samanalawewa	*120*	*361*
Inginiyagala	*11*	--
Uda Walawe	*6*	--
Nilambe	*3*	--
Private hydro power	*12.25*	--
COMMITTED		
Kukule (End 2003)	*70*	*303*
Upper Kotmale (2008)	*150*	*530*
TOTAL HYDRO POWER	***1367.3***	***4726***
Existing, Committed and Additional Thermal Power Plants		
EXISTING		
Kelanitissa station		
Old gas turbines	*96*	*600*
New gas turbines	*115*	*813*
Steam (fuel oil)	*40*	*250*
Combined cycle plant (early 2003)	*165*	*1253*
Sapugaskanda Station		
Diesel	*72*	*488*
Diesel extension	*72*	*444*
Independent Power Producers		
Lakdhanavi	*22.5*	*156*
Asia Power Ltd	*51*	*330*
Colombo Power (Pvt) Ltd	*64*	*420*
Diesel Plant Matara (2002)	*24.8*	*136*
COMMITTED		
Pielstick (Jan 2003)	*22*	*149*
*Independent Power Producers**		
Kelanitissa AES CCY (2003)	*163*	*1314*
Diesel Plant Horana (2003)	*24.8*	*136*
TOTAL THERMAL POWER	***932.1***	***6489.0***
EXPANSION PLAN ADDITIONS (in sequence)		
Kerawalapitiya combined cycle (2006)	*300*	
Gas turbine (2007)	*105*	
Coal Steam West Coast I (2008)	*300*	
Coal Steam West Coast II (2010)	*300*	
Coal Steam West Coast III (2012)	*300*	
Coal Steam Trincomalee I (2013)	*300*	
Coal Steam Trincomalee II (2015)	*300*	
Gas Turbines (2016)	*175*	

** IPP facilities were commissioned as build, operate and own contracts with CEB.*

The table above presents the CEB's supply response to the base demand forecast. The CEB's sensitivity analysis of key parameters (overall demand, impact of demand side management measures, changes in

discount rate, and a change in oil price) shows that the timing of power plant additions may shift slightly (1-3 years) but the overall trend is still one of aggressive capacity expansion.

As per the instructions for small-scale projects, the power plants considered for the baseline include only those grid-connected power facilities in operation as of the date of preparation of the PDD (August 2003). Table 3 lists the thirteen (13) power plants included for purposes of estimating the approximate operating margin of the baseline. It is important to note that both of the combined cycle plants listed in the table (JBIC and AES) are only operating the open cycle at this time and that emissions factors at the two plants are therefore higher than they would be with both cycles in operation.

Table 6: Power plants included in the Sri Lanka approximate operating margin

		Capacity (MW)	***Date(s) commissioned***
	CEB-operated facilities		
1	*Kelanitissa gas turbines (old)*	*96*	*1980-82*
2	*Kelanitissa gas turbines (new)*	*115*	*1997*
3	*Kelanitissa steam power units*	*40*	*1962-63*
4	*Sapugaskanda diesel plant*	*72*	*1984*
5	*Sapugaskanda diesel extension*	*72*	*1997-99*
6	*Pielstick diesel plant*	*22*	*2003*
7	*Combined cycle plant 1 (JBIC-financed)*	*165*	*2002-2003*
	Independent Power Producers (BOOT contracts)		
8	*Lakdhanavi diesel engine*	*22.5*	*1997*
9	*Asia Power Ltd diesel engine*	*51*	*1998*
10	*Colombo Power Ltd diesel engines*	*64*	*2000*
11	*Matara diesel plant*	*24.8*	*2002*
12	*Combined cycle plant 1 (JBIC-financed)*	*165*	*2002*
13	*Horana diesel plant*	*24.8*	*2003*
14	*Combined cycle plant 2 (AES with an ADB loan guarantee)*	*163*	*2002*

The baseline build margin is based on the list of all grid-connected power plants currently in operation. Table 4 summarizes that list, presented in order of the year the facility entered into operation.

Table 7: Power plants considered for preparation of the build margin

	Facility	***Fuel***	***Commission date***	***Capacity (MW)***
1	*Old Laxapana*	*Hydropower*	*1950 & 58*	*50*
2	*Kelanitissa steam power units*	*Fuel oil*	*1962-63*	*40*
3	*Inginiyagala*	*Hydropower*	*1963*	*11*
4	*Wimalasurandra*	*Hydropower*	*1965*	*50*
5	*Polpitiya*	*Hydropower*	*1969*	*75*
6	*Uda Walawe*	*Hydropower*	*1969*	*6*
7	*New Laxapana*	*Hydropower*	*1974*	*100*
8	*Ukuwela*	*Hydropower*	*1976*	*38*
9	*Kelanitissa old gas turbines*	*Auto diesel*	*1980 & 82*	*96*
10	*Bowatenna*	*Hydropower*	*1981*	*40*
11	*Canyon hydro*	*Hydropower*	*1983 & 88*	*60*
12	*Sapugaskanda old diesel*	*Residual fuel oil*	*1984*	*72*
13	*Victoria*	*Hydropower*	*1985*	*210*
14	*Kotmale*	*Hydropower*	*1985*	*201*
15	*Randenigala*	*Hydropower*	*1986*	*122*
16	*Nilambe*	*Hydropower*	*1988*	*3*
17	*Rantambe*	*Hydropower*	*1990*	*49*
18	*Samanalawewa*	*Hydropower*	*1992*	*120*
19	*Kelanitissa new gas turbines*	*Auto diesel*	*1997*	*115*
20	*Sapugaskanda new diesel ext. (4 units)*	*Residual fuel oil*	*1997*	*36*
21	*Lakdhanavi diesel engine*	*Auto diesel*	*1997*	*22.5*
22	*Asia Power Ltd diesel engine*	*Auto diesel*	*1998*	*51*
	Facility	***Fuel***	***Commission date***	***Capacity (MW)***
23	*Sapugaskanda new diesel ext. (4 units)*	*Residual fuel oil*	*1999*	*36*
24	*Colombo Power Ltd diesel engines*	*Auto diesel*	*2000*	*64*
25	*Matara diesel plant*	*Auto diesel*	*2002*	*24.8*
26	*Pielstick diesel plant*	*Fuel oil*	*2003*	*22*
27	*Combined cycle plant 1 (JBIC-financed)*	*Fuel oil*	*2002*	*165*
28	*Horana diesel plant*	*Auto diesel*	*2003*	*24.8*
29	*Combined cycle plant 2 (ADB guarantee)*	*Fuel oil*	*2002*	*163*

The build margin is defined as the greater of the most recent 20% or the 5 most recent plants.
In this case, the most recent 20% is applicable, and hence the build margin is therefore the last six plants added to the grid: Colombo, Matara, Pielstick, Horana, and two combined cycle power plants (shown in grey in Table 4).

Section E applies this baseline list of power plants to calculate the expected GHG emissions reductions associated with the four small hydropower projects.

Step 1: Calculate the relative power contribution of each thermal power plant on the grid

Power plants		**Date commissioned**	**Fuel source**	**Hours / year**	**Maintenance (days/yr)** [a]	**Forced outage rate (%)** [a]	**Operating hours**	**Capacity (MW)** [a]	**Annual Max. Energy (10^9 kWh/yr)**	**Contribution to total energy supply (% of kWh)**
Variable				A	B	C	D	E	F = (D * E *1000)/10^9	G = F / (SUM: total thermal power available)
Facilities as of August 2003										
CEB-operated Kelanitissa Power Station										
1	Gas turbines (old)	1980-82	Auto diesel	8760	40	20	6240	96	0.60	9.1%
2	Gas turbines (new)	1997	Auto diesel	8760	45	8	7066	115	0.81	12.4%
3	Kelanitissa steam power units	1962-63	Fuel oil	8760	40	20	6240	40	0.25	3.8%
CEB-operated Sapugaskanda Power Station										
4	Diesel plant	1984	Residual oil	8760	44	12	6780	72	0.49	7.4%
5	Diesel extension	1997-99	Residual oil	8760	44	20	6163	72	0.44	6.8%
6	Pielstick	2003	Fuel oil	8760	44	12	6780	22	0.15	2.3%
Independent Power Producers (BOOT contracts)										
7	Lakdhanavi diesel engine	1997	Auto diesel	8760	30	8	7397	22.5	0.17	2.5%
8	Asia Power Ltd diesel engine	1998	Auto diesel	8760	30	8	7397	51	0.38	5.8%
9	Colombo Power Ltd diesel engines	2000	Auto diesel	8760	30	8	7397	64	0.47	7.2%
10	Matara diesel plant	2002	Auto diesel	8760	30	8	7397	24.8	0.18	2.8%
11	Combined cycle plant 1 (JBIC-financed)	2002-03	Naptha	8760	32	5	7592	165	1.22	18.6%
12	Horana diesel plant	2003	Auto diesel	8760	30	8	7397	24.8	0.18	2.8%
13	Combined cycle plant 2 (ADB guarantee)	2002	Fuel oil	8760	30	8	7397	163	1.21	18.4%
Capacity sub-total end 2003								932.1	6.59	100%

Step 2: Calculate the emissions factor for each thermal power plant.

Power plants		Plant Conversion efficiency (%) [a] I	Heat rate (MJ/MWh) J = (1/I)*3.6*10^3	Carbon Content (unadjusted) (tC/TJ) [c] K	Combustion Efficiency Factor [b] L	Carbon Content (adjusted) (tC/TJ) [c] M = K * L	Emissions factor (kgC/MWh) N = J * M *10^3/10^6	Emissions factor (kg CO2/kWh) O = (N *44/12) /10^3
Facilities as of August 2003								
CEB-operated Kelanitissa Power Station								
1	Gas turbines (old)	0.27	13155	20.2	0.99	20.0	263.1	0.9646
2	Gas turbines (new)	0.21	17419	20.2	0.99	20.0	348.4	1.2773
3	Kelanitissa steam power units	0.22	16024	20.2	0.99	20.0	320.4	1.1750
CEB-operated Sapugaskanda Power Station								
4	Diesel plant	0.41	8733	21.1	0.99	20.9	183.3	0.6720
5	Diesel extension	0.43	8314	21.1	0.99	20.9	173.7	0.6368
6	Pielstick	0.40	8955	20.2	0.99	20.0	179.1	0.6567
Independent Power Producers (BOOT contracts)								
7	Lakdhanavi diesel engine	0.40	9000	20.2	0.99	20.0	180.0	0.6599
8	Asia Power Ltd diesel engine	0.40	9000	20.2	0.99	20.0	180.0	0.6599
9	Colombo Power Ltd diesel engines	0.40	9000	20.2	0.99	20.0	180.0	0.6599
10	Matara diesel plant	0.40	9000	20.2	0.99	20.0	180.0	0.6599
11	Combined cycle plant 1 (JBIC-financed)	0.30	12000	20.2	0.99	20.0	240.0	0.8799
12	Horana diesel plant	0.40	9000	20.2	0.99	20.0	180.0	0.6599
13	Combined cycle plant 2 (ADB guarantee)	0.29	12414	20.2	0.99	20.0	248.3	0.9103

Step 3: Calculate the approximate operating margin of non-renewable plants connected to the grid

Power plants		**Weighted average emissions (kgCO2/kWh)** P = O * G	**Approximate operating margin emissions (kgCO2/kWh)** Q
Facilities as of August 2003			
CEB-operated Kelanitissa Power Station			
1	Gas turbines (old)	0.0882	
2	Gas turbines (new)	0.1584	
3	Kelanitissa steam power units	0.0448	
CEB-operated Sapugaskanda Power Station			
4	Diesel plant	0.0501	
5	Diesel extension	0.0431	
6	Pielstick	0.0149	
Independent Power Producers (BOOT contracts)			
7	Lakdhanavi diesel engine	0.0168	
8	Asia Power Ltd diesel engine	0.0397	
9	Colombo Power Ltd diesel engines	0.0477	
10	Matara diesel plant	0.0185	
11	Combined cycle plant 1 (JBIC-financed)	0.1639	
Commissioned			
12	Horana diesel plant	0.0185	
13	Combined cycle plant 2 (ADB guarantee)	0.1675	
Approximate operating margin			**0.8719**

Step 4: Calculate the build margin

Power plant		Date(s) commissioned	Annual Max. Energy (10^9 kWh/yr)	Contribution to total energy supply (% of kWh)	Emissions factor (kg CO2/kWh)	Weighted average emissions (kgCO2/kWh)
1	old laxapana	1950				
2	Kelanitissa steam power units	1962				
3	inginiyagala	1963				
4	wimalasurandra hydro	1965				
5	polpitiya	1969				
6	uda walawe	1969				
7	new laxapana	1974				
8	ukuwela	1976				
9	Kelanitissa old gas turbines	1980				
10	Bowatenna	1981				
11	Canyon hydro	1983				
12	Sapugaskanda old diesel	1984				
13	victoria	1985				
14	kotmale	1985				
15	randenigala	1986				
16	nilambe	1988				
17	Rantambe	1990				
18	Samanalawewa	1992				
19	Kelanitissa new gas turbines	1997				
20	Sapugaskanda new diesel ext. (4 units)	1997				
21	Lakdhanavi diesel engine	1997				
22	Asia Power Ltd diesel engine	1998				
23	Sapugaskanda new diesel ext. (4 units)	1999				
24	Colombo Power Ltd diesel engines	2000	0.47	0.14 %	0.66	0.0910
25	Matara diesel plant	2002	0.18	0.05 %	0.66	0.0348
26	Pielstick	2003	0.15	0.04 %	0.66	0.0289
27	Combined cycle plant 1 (JBIC-financed)	2002	1.22	0.36 %	0.88	0.3148
28	Horana diesel plant	2003	0.18	0.05 %	0.66	0.0348
29	Combined cycle plant 2 (ADB guarantee)	2002	1.21	0.35 %	0.91	0.3230
	Capacity sub-total end 2003		3.41	100%		
	Approximate build margin					**0.8273**

***Step 5**: Calculate the average emissions of the operating margin and the build margin:*

Operating margin emissions	*0.8719*
Build margin emissions	*0.8273*
Average emissions (kgCO2/kWh)	***0.8496***

Table footnotes:

[a] Figures are based on data in the CEB's expansion plan and the annual statistical digest for the years 1999 and 2002. Figures for independent operators are based on similar CEB-managed facilities.

[b] Variables from World Bank GHG Handbook

[c] Carbon content values taken from WB GHG Handbook except for fuel oil values taken from CEB own estimates. Both sources report their figures as derived from IPCC 1996 guidelines.

Baseline emissions uncertainties. Section B.5 presented the possible alternative scenarios to the emissions estimates calculated here. The primary sources of emissions uncertainties stem from slower than expected power plant expansion and energy shortfalls related to drought or powerplant failure. Both scenarios will result in higher, not lower emissions as older power plants remain on-line longer and the gap from any generation short-fall will be filled by emergency generators. Given these alternatives, the baseline emissions calculated above are conservative estimates.

Deduction of construction-related emissions. Section E.1.2 provides formulae for calculating the project-related emissions. The following tables illustrates the actual emissions resulting from each of the four projects in this PDD. These emissions occur only once during the construction phase of the project. The total project-related emissions from the sum of all four project sites is 298,690 kg CO2e, or 298.7 tCO2e.

Summary of CEB expansion plan

Table 8: Capital Cost Details of Expansion Candidates Considered

Plant	*Capacity (MW)*	*Pure Const. Cost (US$/kW)*		*Total cost (US$/kW)*	*Const Period (yrs)*	*IDC* at 10% of pure costs*	*Const cost incl. IDC (US$/kW)*		*Economic life (yrs)*
		Local	*Foreign*				*Local*	*Foreign*	
HYDRO POWER PROJECT CANDIDATES									
Gin Ganga	*49*	*389.2*	*2095.2*	*2484.4*	*4*	*18.53*	*461.3*	*2483.5*	*50*
Broadlands	*40*	*523.9*	*2219.7*	*2743.6*	*4*	*18.53*	*621.0*	*2631.0*	*50*
Uma Oya	*150*	*395.2*	*2001.0*	*2396.1*	*5*	*23.78*	*489.1*	*2476.7*	*50*
Moragolla	*27*	*408.2*	*3123.2*	*3532.4*	*4*	*18.53*	*483.9*	*3701.9*	*50*
THERMAL POWER PROJECT CANDIDATES									
Coal Trincomalee	*300*	*147.2*	*844.2*	*991.4*	*4*	*18.53*	*174.5*	*1000.7*	*30*
Coal West Coast	*300*	*237.2*	*770.7*	*1007.9*	*4*	*18.53*	*281.2*	*913.5*	*30*
Gas Turbine	*35*	*62.0*	*488.5*	*550.6*	*1.5*	*6.51*	*66.1*	*520.3*	*20*
Gas Turbine	*105*	*42.2*	*332.2*	*374.4*	*1.5*	*6.51*	*44.9*	*353.8*	*20*
Combined Cycle (Kera)	*150*	*155.7*	*680.5*	*836.3*	*3*	*13.54*	*175.6*	*767.4*	*30*
Combined cycle	*300*	*113.9*	*474.8*	*588.6*	*3*	*13.54*	*129.3*	*539.0*	*30*
Diesel-Fuel oil	*10*	*110.0*	*1238.4*	*1348.4*	*2*	*8.79*	*119.6*	*1347.3*	*25*
Diesel-Residual oil	*10*	*110.0*	*1238.4*	*1348.4*	*2*	*8.79*	*119.6*	*1347.3*	*25*
Steam – Fuel oil	*150*	*177.4*	*825.9*	*1003.2*	*4*	*18.53*	*210.2*	*978.9*	*30*
Steam – Fuel oil	*300*	*150.0*	*698.1*	*848.0*	*4*	*18.53*	*177.7*	*827.4*	*30*

** IDC = Interest During Construction.*

Table 9: Specific Cost of Generation of Candidate Plants used in the 2002-2016 Expansion Plan

PROJECT/PLANT	*CAPACITY (MW)*	*SPECIFIC COST (Jan 2001 border prices)*	
		USCts/kWh	*Rs/kWh*
HYDRO			
Gin Ganga	*49*	*6.86*	*5.49*
Broadlands	*40*	*9.05*	*7.24*
Uma Oya	*150*	*10.04*	*8.03*
Moragolla	*27*	*10.27*	*8.22*
THERMAL			
Coal Trincomalee (80% PF)	*300*	*3.99*	*3.19*
Coal West Coast (80% PF)	*300*	*4.13*	*3.31*
Combined Cycle (60% PF)	*300*	*5.70*	*4.56*
Combined cycle Kera (60% PF)	*150*	*5.80*	*4.62*
Diesel-Fuel Oil (80% PF)	*10*	*6.35*	*5.08*
Diesel-Residual Oil (80% PF)	*10*	*5.82*	*4.66*
Steam-Fuel Oil (80% PF)	*150*	*6.19*	*4.95*
Steam – Fuel Oil (80% PF)	*300*	*5.45*	*4.36*
Gas Turbine (30% PF)	*35*	*9.91*	*7.93*
Gas Turbine (30% PF)	*105*	*8.47*	*6.78*

List of documents

Annex 1: Report on Comments by Parties, Stakeholders and NGOs
Annex 2: Comprehensive list of documents attached
Annex 2: List of persons interviewed
Annex 4: Validation Protocol (UK.AU4.CDM.VAL0023 Annex 4)
Annex 5: Overview of findings (UK.Findings.CDM.VAL0023 Annex 5)
Annex 6: Answers from local assessor
Annex 7: Validation Report (UK.AR6.SSC.CDM.VAL0023 Annex 7)
Annex 8: Modalities of communication
Approval Letter Hapu I & II Hulu I & II
Declaration of Approval Hapugastenne Hulu Ganga 19 May 2005
Letter of Authorisation Hapugastenne & Hulu Ganga 19 May 2005