Appendix A[1] to the simplified modalities and procedures for small-scale CDM project activities

CLEAN DEVELOPMENT MECHANISM
SIMPLIFIED PROJECT DESIGN DOCUMENT
FOR SMALL SCALE PROJECT ACTIVITIES (SSC-PDD)
Version 01 (21 January, 2003)

Introductory Note

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

2. The SSC-PDD can be obtained electronically through the UNFCCC CDM web site (h0ttp://unfccc.int/cdm/ssc.htm), by e-mail (cdm-info@unfccc.int) or in print from the UNFCCC secretariat (Fax: +49-228-8151999).

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

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

5. In accordance with the CDM modalities and procedures, the working language of the Board is English. The completed SSC-PDD shall therefore be submitted to the Executive Board in English.

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

[1] This appendix has been developed in accordance with the simplified modalities and procedures for small-scale CDM project activities (contained in annex II to decision 21/CP.8, see document FCCC/CP/2002/7/Add.3) and it constitutes appendix A to that document. For the full text of the annex II to decision 21/CP.8 please see http://unfccc.int/cdm/ssc.htm).

7. A small-scale project activity with different components eligible to be proposed[2] as a small-scale CDM project activity may submit one SSC-PDD, provided that information regarding subsections A.4.2 (*Type and category(ies) and technology of project activity*), and A.4.3 (*brief statement on how anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity)* and sections B *(Baseline methodology)*, D *(Monitoring methodology and plan)* and E *(Calculation of GHG emission reductions by sources)* is provided separately for each of the components of the project activity.

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

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

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

CONTENTS

5. General description of project activity

A.1 Title of the project activity:

Rural Electrification by Decentralised Distribution Generation systems through mix of renewable technologies in Orissa, India.

A.2 Description of the project activity:

(Please include in the description

- *the purpose of the project activity*
- *the view of the project participants on the contribution of the project activity to sustainable development (max. one page).)*

Purpose of Activity:

In Orissa, nearly 87% of the population lives in the rural areas and is largely dependent on the agriculture for their livelihood. Out of 46 989 inhabited villages in the state, 35 190 villages have been electrified by the end of the 1999-2000, representing coverage of 74.89%. The state of Orissa in India has a net surplus of power. Yet, most tribal villages in Ganjjam, Gajapathi, Kendrapara and Jagatsinghpur districts in Orissa, have a severe shortage of electric power. It is unlikely that these villages will get a power grid supply due to the small and dispersed nature of their settlements as also as these villages are remote and in deep interiors and too far off to be connected through the grid, hence it is not possible for them to get electrified through grid power.

Under the earlier study on biomass assessment in some of the villages in these four districts carried out by TERI, the work was initiated to assess the pre-feasibility of electrification of the remote un-electrified villages through renewable sources like biomass, solar, micro-hydel etc. The village electrification program under this project/case study will be taken through bundling of the renewable energy technologies like Solar-Photovoltaics, Biomass and Micro-hydel. It will help in the reduction of the carbon emissions and at the same time, due to the decentralized nature of these technologies, this will help in conservation of local environment also.

About 149 un-electrified villages will need to be electrified in this project using decentralized distribution generation based on Solar Photovoltaics, Biomass and Micro-hydel. This project includes, installation of biomass gasifiers, micro-hydel plants and SPV systems for power generation applications in remote villages to replace the fossil fuels such as kerosene. Currently kerosene/diesel is being used to meet the lighting requirements. On an average, the monthly consumption of kerosene is about 3.3 litres /family for lighting. On considering 30 households in a village and with the same kerosene consumption, the amount of CO_2 emitted will be nearly 534 tons.

At present the villagers are using kerosene to meet their lighting needs only, which will be replaced by using the mix of the renewable energy technologies like Solar-Photovoltaics/ Biomass/ Mini-micro-hydel and Bio-diesel etc. In the absence of use of these RET's in these villages, the villagers could have opted for the diesel gensets to fulfill their irrigation needs as well, apart from using kerosene for lighting purpose.

Considering the different scenario of village electrification with provision of lighting through kerosene and irrigation of fields through diesel gensets. These diesel gensets

will be running in the morning to provide electricity for the irrigation purpose only, whereas the kerosene will be used as a fuel in the evening to meet the lighting loads of the villages. For irrigation purpose the genset runs for approx 4-6 hrs daily and for lighting purpose, the kerosene is used for 4 hrs, but the loads will be different for both the purposes. On considering a single genset of 10 kW capacity for one village, the amount of CO_2 emitted will be nearly 3874 tons /year for 149 villages. The diesel genset will run on 70% load for irrigation, and for the lighting purpose, the kerosene consumption will be approximately 3.3 litres/month/household in the village, which will emit about 534 tons/year of CO_2 for total 149 villages.

Such a project would deliver significant local and national development benefits. These un-electrified villages after getting electricity through these power generating sources, will be able to sustain themselves by linking themselves with several income generation activities. These income generation activities will certainly improve the livelihood and food security in the villages. The cleaner technology would lead to improvement in the local work environment, which will have long-term health benefits. Hence the project would contribute greatly to the sustainable development of the local communities.

OREDA (Orissa Renewable Energy Development Agency) functions as the state nodal agency for the promotion of the various renewable systems. OREDA is undertaking the rural electrification of difficult and remote villages in the state through renewable sources like biomass, solar, micro hydel etc. so it will actively participate in the implementation of these RET's for power generation in these villages.

Such a project activity cannot be done for different renewable energy technologies separately, as the CER will be very small. So the bundling of the different RET's is done to make such small project activities together and make it a big one. The bundling of different technologies can be done either in the same region/place or in a different region/place also.

A.3 Project participants:

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

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

Parties to the Project:
OREDA (Orissa Renewable Energy Development Agency) and Gram Vikas are the parties involved in the project activities.

Contact Party:

TERI (The Energy and Resources Institute), New Delhi.

A.4 Technical description of the project activity:

A.4.1 Location of the project activity:

A.4.1 Location of the project activity:

A.4.1.1 Host country Party (ies): India

A.4.1.2 Region/State/Province etc.:
The project area would cover one state in South-Eastern India namely Orissa.

A.4.1.3 City/Town/Community etc:
The different un-electrified villages are proposed for such activities in the Ganjjam, Gajapathi, Kendrapara and Jagatsinghpur districts in the State of Orissa.

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

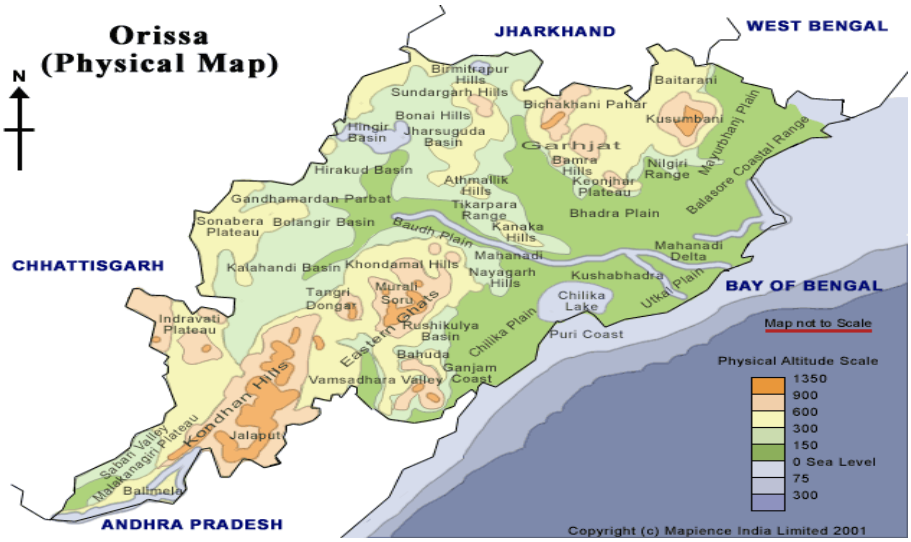
The different communities for the proposed project activities are in the four districts in the State of Orissa. The rationale behind selecting these locations are, (i) these communities or villages are yet to be electrified through renewables, as they are too far-off to be connected through grid. Most of the villagers are below the poverty line, hence the demand for such intervention exists to improve the livelihood of these villagers through promoting income generation activites. These can be done, as the power plant and the energy plantation (if considered) can open the new avenues of income generation and employment generation for local people also, as the opportunity to use the power generated will be provided to farmers for irrigation purpose to increase their income, this will help in overall development of the village.

Further, amongst these locations (4 districts), Ganjjam District is chosen for immediate action, since the project developer has infrastructural facilities located in this district itself and some level of dissemination has already taken place here.

All the 8 study villages, which are surveyed earlier for electrification through biomass gasifiers etc. by TERI are located in hilly and forested area and the other 10 villages of Jagatsinghpur and Kendrapara districts of Orissa state were surveyed by TERI for electrification through SPVs .

OREDA (Orissa Renewable Energy Development Agency) as one of the project participant will be associated in providing different RET's like solar energy sources, mini-hydel projects, etc. to villages located in the odd geographical locations, which are difficult to be connected with the conventional electricity grid.

Whereas Gram Vikas will be associated in providing biomass based systems for the electrification of the villages.



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

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

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

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

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

Type I-Renewable Energy Projects

I A. Electricity generation by the user.

1. Biomass Gasifiers:

Biomass Gasifier is a device that converts solid biomass into gaseous fuel, known as producer gas, by burning biomass under controlled conditions. Sized biomass is burnt in a reactor where the fuel undergoes pyrolysis, oxidation under very high temperature of over 1000 degrees. Celsius and reduction through a charcoal bed that is created during the process itself. The process of converting solid biomass to gaseous fuels as explained above, is called gasification.

There are three main types of gasification, namely down draft, updraft and cross draft. In case of down draft gasifiers, the flow of gases and solids occurs through a descending packed bed. The gases produced here contain least tar and particulate matter and are fairly simple, reliable and proven for certain fuels. In case of updraft gasifiers, the gases and solids have counter-current flow and the product gas contains a high level of tar and organic condensable. In the cross draft gasifier, solid fuel moves down and the airflow moves horizontally. This has an advantageous characteristic of being useful in traction applications. But the product gas is however high in tars and requires cleaning.

The gasification technology makes use of biomass which is environmentally benign, and the gasification occurs inside a reactor. The pollutants that come out are far less when compared to other comparable fuel-device combination like furnaces (bhatti's). Also the gasifier works under very low pressure (of about 10 to 15 cm manometric pressure), the refuge from gasification plant is also minimal and less hazardous since the biomass contains only 2 to 5 % ash.

The gasifiers currently being installed and used for different applications can use biomass which has bulk density higher than 250 kg/m^3. Also it requires sizing not to exceed 4 inches or 6 inches depending on the size of the reactor. Thus it can make use of waste fuelwood cut into proper size and the agriculture residue in the form of briquettes.

At most of the locations where the installation of gasifier based systems are proposed, have abundant fuel wood through forests or other waste lands. These are the likely supply sources for fuel for gasifier installations. The proposed capacities of the units to be installed are 10-20 kWe, based on the size of the village and the provision of other income generation activities in that area.

In other places where there are not plenty of fuelwood available from nearby places, the provision for Energy plantation is made for the regular and sustainable supply of biomass to the power generating plants. These energy plantations will be done on nearly 5-10 hectares of wastelands available in and around villages, so that a regular supply of biomass can be made to the plant for electricity generation.

These villages are located on the fringes of the forests or wastelands and the villagers do collect their fuelwood for cooking purpose etc. from these places only. So, as a routine through proper mechanism, the supply of biomass from these

forests/wastelands or energy plantation etc on 30kg/month basis by villagers to the power plant will make the system sustainable.

2. Solar photovoltaic technology (SPV):

It is primarily a semiconductor-based technology used to convert solar radiation into direct electricity. A basic PV system comprises PV modules and the BOS (balance of systems). Balance of systems includes support structure, wiring, storage, power electronics, etc.

When solar radiation strikes the PV module, DC (direct current) electricity is generated. During generation, power can be used in any DC load directly, but generation is possible only while the sun shines. So, some storage device is needed to run the system at night or in periods of low sunshine. Electricity generated can be stored in an electrochemical storage battery or can be fed to the grid. The battery or the grid provides back-up power to the load when the PV system is not functioning. Since many common appliances require AC (alternating current) power, the DC power available from the module directly or through the battery needs to be converted into AC. Thus an inverter is used to convert DC (direct current) to AC (alternating current) to operate AC-powered loads. The charge controller controls the battery charging and discharging.

PV systems have successfully been used in different small and large applications. PV is a modular technology. Any amount of power, starting from milliwatt to megawatt can be generated. PV systems can be added to existing PV power plants if the demand increases. These systems have no moving parts, consume no conventional fuels and do not pollute.

3. Micro-Hydel:

The technology used in these hydro projects is to generate electricity from hydro potential through run-of-the-river schemes where no dam is built. The scheme envisages minimum civil works with no adverse environmental effect. The natural water is directed to a Forbay tank through a weir and Channel arrangement. The water from the forbay is fed to a turbine by penstock pipe. The turbine is coupled to a generator, which produces electricity and then is fed to the grid. The whole operation is maintained by sophisticated control system.

The technology for the power generation through biomass gasifiers is developed by TERI and apart from this, TERI has got involved in the technical collaboration with **DTU** (Technical University of Denmark) for the betterment of the system performance even in the rural areas and with the **KOEL** (Kirloskar Oil Engines Ltd.) for supplying the engines which can run on producer gas.

TERI has transferred its biomass gasification technology to six licensee manufacturers all over India, through which the dissemination of the biomass gasifier takes place.

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

(Please state briefly how anthropogenic GHG (greenhouse gas) emission reductions are to be achieved (detail to be provided in section B.) and provide the estimate of total anticipated reductions in tonnes of CO_2 equivalent as determined in section E. below.)

Reduction of Emissions:

A total of 149 villages are considered in this project activity. Assuming single diesel genset of 10 kW capacity per village for irrigation purpose and kerosene for their lighting purpose, the total carbon emissions will be nearly 4408 tonnes/year. So, replacing this diesel and kerosene (used in the absence of CDM project for the lighting and irrigation purpose) with the mix of RETs will reduce the *anthropogenic GHG(greenhouse gas)* emissions.

A.4.4 Public funding of the project activity:

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

All the public funding schemes would be available if MNES subsidy scheme would have been opted with some big percentages of subsidies and rest of the amount to be contributed by community. But, if the other pattern would have been opted (40% grant with remaining 60% as loan from REC with 3% interest rate), then no CFA would be provided and the repayment of this 60% loan amount for all RET's would become difficult. So, the CDM project becomes applicable to this kind of pattern for the repayment of the loan amount.

The subsidy is on hardware components only, whereas for the rest of the major components, the cost has to be borne by the implementation agency.

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

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

This project activity is independent of other big projects and hence is not a debundled component of a larger project activity, and also comes under the small-scale CDM project as the anthropogenic emissions of sources that directly emit less than 15 kt (kilotonnes) of carbon dioxide equivalent annually.

B Baseline methodology

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

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

Rural Electrification by Decentralised Distribution Generation systems through mix of renewable technologies in Orissa
Type I-Renewable Energy Projects

I A. Electricity generation by the user.

B.2 Project category applicable to the project activity:

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

Baseline technology: Kerosene for lighting and Diesel for irrigation.

The simplified baseline used in this project is the fuel consumption of the kerosene and diesel that would be used instead of the proposed RET's, times the IPCC emissions coefficient of these fossil fuels.

Based on the data's and TERI measurements, the following conversion ratios are used to relate current fossil fuel consumption to equivalent CO_2 saved.

Kerosene: 2.45 kg CO_2/litre of kerosene
Diesel: 1.3 kg CO_2 /kWh (at 70% load factor)

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

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

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

Justification: Without the proposed project, users would have used diesel for their irrigation purposes and would have continued using kerosene to meet their lighting loads.

The following identified barriers based on (i) a primary survey of approximately households spread over 18 villages, (ii) village level participatory meetings, and (iii) state and central level stakeholders' meetings for sustainable rural electrification based on RETs, for power generation would be removed by the project:

1. BARRIERS RELATED TO THE TECHNOLOGY AND THE CONCEPT

- Limited experience with minigrids, yet limited dissemination of this experience, resulting in a lack of confidence among potential users
- No prior exposure to electricity usage, safety and precautions, conservation and management – a bottleneck to effective utilization of the minigrids
- Lack of an effective mechanism or device to monitor the use of electricity
- Lack of performance monitoring data and documentation

2. **BARRIERS RELATED TO INSTITUTIONAL CAPACITIES AND LINKAGES**

- No institutional linkages for inducing income generation with provision of electricity services
- Current support for RET-based initiatives for rural electrification does not provide linkages with other developmental programmes of the state
- Appropriate institutional linkages between the agencies identified to implement RET-based rural electrification, and that for grid-based electrification under the reforms scenario is not yet looked at
- An effective revenue collection model is not yet in place
- Involvement of local entrepreneurs, NGOs and the user community has been nil in rural electrification planning and implementation.

3. BARRIERS RELATED TO FINANCING

- The current funding policy for RET-based initiatives supports only the capital cost of the plant. Replacement of the battery, O&M, particularly of the distribution network etc are not included
- Finance for users to invest in taking electricity connections, utilizing its benefits, and initiating income generation activities, is not available.

4. **BARRIERS DUE TO UNAVAILABILITY OF NET-WORKING**:
Multiple agencies are required for the dissemination of gasifiers for example, manufacturing, marketing, installation, supply of sized biomass, service back up, annual maintenance contracts, spare parts outlet, etc. So, a proper net-working between these is required for the proper and smooth functioning of the whole system.

The provision of financial and fiscal incentives for the **hardware** (for power generating projects) can be approached through different routes. It can be achieved through:

- Big percentages as the subsidies through MNES with remaining amount to be contributed from community, and
- 40% grant with remaining 60 % as loan from REC with 3% interest rate.

Above all, this subsidy is on hardware components only, whereas for the rest of the major components, the cost has to be borne by the implementation agency.

All the above mentioned public funding schemes would be available if MNES subsidy scheme would have been opted with some big percentages of subsidies and the rest of the amount to be contributed by community. But, if the other pattern would have been opted (40 % grant with remaining 60 % as loan from REC with 3% interest rate), then no CFA would be provided and the repayment of this 60% loan amount for all RET's would become difficult, So, the CDM project becomes applicable to this kind of pattern for the repayment of the loan amount.

All these incentives are for the hardware part only, whereas the money for the Operation & Maintenance part for these power generating projects and for providing after sales services, is a big amount which is needed, for which the CDM funding can play a big and major role.

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

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

The project boundary for this project consists of the 149 un-electrified villages in the four districts of the Orissa state using the Renewable energy technology based systems.

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:

Proposed baseline methodology for the proposed project is explained below:

The baseline for the project will be the emissions that would have been produced by the fossil fuel alternative in each location. The following conversion ratios are used to assess current fossil fuel consumption to equivalent CO_2 saving.

Kerosene: 2.45 kg CO_2/litre of kerosene
Diesel: 1.3 kg CO_2 /kWh (at 70% load factor)

Kerosene for lighting and Diesel is used for irrigation for 149 villages in 4 districts.

Tables are provided in E2, which contains the details of households/villages baseline for surveyed set of households/villages. Based on the daily figures, the total fossil fuel consumption is calculated. This number will be used for calculating the emissions using the emission coefficient for that particular fuel as follows:

For Kerosene:
Annual energy baseline (tonnes fuel/year) = Daily fuel consumption (kg/day) of fossil fuel alternative * number of days of operation of the unit (days)/1000

Annual emissions baseline (tonnes CO_2/year) = Annual energy baseline (tonnes fuel/year) * emission coefficient of the fossil fuel used in that unit (kg of CO_2/kg of fuel)

For Diesel:
Annual energy baseline (tones fuel/year) = No. of villages * number of hours of operation of the unit (hours) * power generated per hour

Annual emissions baseline (tones CO_2/year) = Annual energy baseline (tones fuel/year) * emission coefficient of the fossil fuel used in that unit (kg of CO_2/kWh)

For 149 villages,

For lighting

Assuming 30 households per village and extrapolating it for 131 villages with average kerosene consumption per household per day as 0.15 litres.

Therefore, for 131 villages, the daily kerosene consumption is 590 litres.

And for 131 villages, the annual kerosene consumption is 215 167 litres

Therefore, for 149 villages,

Total consumption of Kerosene/year	=	244 732 litres/yr
Total CO_2 reduction/year	=	244 732*2.45
	=	600 tons CO_2/yr
Total CO_2 saved	**=**	**600 tons/yr**

And for irrigation:

A single diesel genset of 10 kW capacity is used per village which runs for about 2000 hours /year depending upon the season and ripening of the crops.

Now For 149 villages, CO_2 released will be

10 * 1.3 * 2000 *149 = **3874 tons/year** .

Therefore total CO_2 released/saved will be 600+3874 = **4474 tons/yr**

Hence the project is estimated to displace approximately 4474 tons of CO_2 per year. The total emissions would amount to 44740 tonne of CO_2 over the next 10 years in the absence of the CDM project.

B.5.2 Date of completing the final draft of this baseline section:

July 2004. The baseline need not be reviewed for any purpose till the crediting period of 10 years. The need for updating the baseline will arise when a new project is proposed in the same location later.

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

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

TERI,
Darbari Seth Block,
India Habitat Center, Lodhi Road,
New Delhi – 110003. India
Tel. 91-11-24682111 or 24682100
Fax. 91-11-24682144 or 24682145

C Duration of the project activity and crediting period

C.1 Duration of the project activity:

C.1.1 Starting date of the project activity:
(For a definition of the term "starting date", please refer to the UNFCCC CDM web site).
January 2005 (assumed).

C.1.2 Expected operational lifetime of the project activity: *(in years and months, e.g. two years and four months would be shown as: 2y-4m.):* *10y-0m*

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

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

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

C.2.1.1 Starting date of the first crediting period *(DD/MM/YYYY)*: *N/A*

C.2.1.2 Length of the first crediting period *(in years and months, e.g. two years and four months would be shown as: 2y-4m.)*: N/A

C.2.2 Fixed crediting period:

10y-0m

C.2.2.1 Starting date *(DD/MM/YYYY)*:
01/01/2005(assumed)

C.2.2.2 Length (max 10 years): *(in years and months, e.g. two years and four months would be shown as: 2y-4m.):*
10y-0m
Justification: The length of the crediting period can not be less than 10 years due to the following reasons,

- The life of the system is nearly 10 years
- The future demand is not going to change as such but still provision is made after taking this future demand into consideration.

D. Monitoring methodology and plan

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

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

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

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

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

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

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

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

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

(If a national or international monitoring standard has to be applied to monitor certain aspects of the project activity, please identify this standard and provide a reference to the source where a detailed description of the standard can be found.)

Type I-Renewable Energy Projects
I A. Electricity generation by the user.

The monitoring methodology involves metering of the electricity generated and supplied to the mini-grid by the renewable technology. And the separate metering will be done for all the industrial applications for income generation at rural areas, which will be deducted from the total meter reading. The remaining units used will be for the lighting and irrigation loads only.

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

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

The after installation monitoring will be done in this project activity for all the RETs to be used in it.

For after installations, as the number of villages where the power generating plants will be set-up through biomass, solar devices and hydro power will be 23 (biomass-8, solar-10 and 5 hydro projects) and the energy meters will be provided in all installations, therefore the 100% monitoring of these villages will be made on yearly basis.

The proposed methodology thus provides measured data on the amount of electricity generated. With this information, a reliable estimate of the amount of emission reduction can be made.

The monitoring methodology is based on following two datas

- The measurement of fossil fuels consumed by the villages as baseline for calculation of CER's, by taking only 10-20% of the total villages on maximum coverage area basis. This will validate the baseline, otherwise the baseline validation is to be done by the actual measurement of the fossil fuel consumption in all 149 villages.
- Total generated amount of electricity from the mix of renewables energy technologies used (biomass, solar photo voltaic, micro-hydel).
- Generated amount of electricity from the mix of renewables energy technologies used (biomass, solar photo voltaic, micro-hydel) for the rural industries (for income-generation applications)

D.3 Data to be monitored:

(The table below specifies the minimum information to be provided for monitored data. Please complete the table for the monitoring methodology chosen for the proposed project activity from the simplified monitoring methodologies for the applicable small-scale CDM project activity category contained in appendix B of the simplified M&P for small-scale CDM project activities.
Please note that for some project categories it may be necessary to monitor the implementation of the project activity and/or activity levels for the calculation of emission reductions achieved.
Please add rows or columns to the table below, as needed)

ID No	Data Type	Data Variable	Data Unit	Measured(m),Calculated© or estimated(e)	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (electronic / paper)	For how long is archived data to be kept?	Comment
A (After installation)	Quantitative	Total Electricity Generated by biomass	kWh	m	Yearly	100%	Electronic and paper	Crediting period	Summing up of total electrical units generated
		Total Electricity Generated by solar	kWh	m	Yearly	100%	Electronic and paper	Crediting period	Summing up of total electrical units generated
		Total Electricity Generated by micro-hydel	kWh	m	Yearly	100%	Electronic and paper	Crediting period	Summing up of total electrical units generated
B (For industrial applications linked with income-generation)	Quantitative	Electricity generated by biomass	kWh	m	Yearly	100%	Electronic and paper	Crediting period	Summing up of total electrical units generated
		Total Electricity Generated by solar	kWh	m	Yearly	100%	Electronic and paper	Crediting period	Summing up of total electrical units generated
		Total Electricity Generated by micro-hydel	kWh	m	Yearly	100%	Electronic and paper	Crediting period	Summing up of total electrical units generated

D.4 Name of person/entity determining the monitoring methodology:
(Please provide contact information and indicate if the person/entity is also a project participant listed in annex 1 of this document.)

TERI
Darbari Seth Block,
India Habitat Center, Lodhi Road,
New Delhi – 110003. India
Tel. 91-11-24682111 or 24682100
Fax. 91-11-24682144 or 24682145

E. Calculation of GHG emission reductions by sources

E.1 Formulae used:

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

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

E.1.1 Selected formulae as provided in appendix B:

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

For Kerosene:
Annual energy baseline (tonnes fuel/year) = Daily fuel consumption (kg/day) of fossil fuel alternative * number of days of operation of the unit (days) / 1000

Annual emissions baseline (tonnes CO_2/year) = Annual energy baseline (tonnes fuel/year) * emission coefficient of the fossil fuel used in that unit (kg of CO_2/kg of fuel)

For Diesel:
Annual energy baseline (tones fuel/year) = No. of villages * number of hours of operation of the unit (hours) * power generated per hour

Annual emissions baseline (tones CO_2/year) = Annual energy baseline (tones fuel/year) * emission coefficient of the fossil fuel used in that unit (kg of CO_2/kWh)

The following emission coefficients have been used;

Kerosene : 2.45 kg CO_2/litre of kerosene
Diesel : 1.3 kg CO_2/kWh (at 70% load)

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

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary: *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

For Kerosene:
Annual energy baseline (tonnes fuel/year) = Daily fuel consumption (kg/day) of fossil fuel alternative * number of days of operation of the unit (days) / 1000

Annual emissions baseline (tonnes CO_2/year) = Annual energy baseline (tonnes fuel/year) * emission coefficient of the fossil fuel used in that unit (kg of CO_2/kg of fuel)

For Diesel:
Annual energy baseline (tonnes fuel/year) = No. of villages * number of hours of operation of the unit (hours) * power generated per hour

Annual emissions baseline (tonnes CO_2/year) = Annual energy baseline (tones fuel/year) * emission coefficient of the fossil fuel used in that unit (kg of CO_2/kWh)

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

It is assumed that there is no leakage from the project activity.
E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the project activity emissions:

DBC implemented scenario project activity emissions = CE' X 44/12

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHG's in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities: *(for each gas, source, formulae/algorithm, emissions in units of CO_2 equivalent)*

This section provides information on carbon dioxide emission reduction potential in tones per year. It is calculated and cumulated every year for the 10 year crediting project period. A total of 4408 tonnes per year of CO_2 emission reduction will be achieved once all gasifiers, solar photovoltaic and micro hydro systems have been installed.

For 149 villages,

For lighting

Assuming 30 households per village and extrapolating it for 131 villages with average kerosene consumption per household per day as 0.15 litres.

Therefore, for 131 villages, the daily kerosene consumption is 590 litres.

And for 131 villages, the annual kerosene consumption is 215 167 litres

Therefore, for 149 villages,

Total consumption of Kerosene/year = 244 732 litres/yr

Total CO_2 reduction/year = 244732*2.45

= 600 tons CO_2/yr

Total CO_2 saved = 600 tons/yr

And for irrigation:

A single diesel genset of 10 kW capacity is used per village which runs for about 2000 hrs /year depending upon the season and ripening of the crops.

Now For 149 villages, CO_2 released will be

10 * 1.3 * 2000 *149 = **3 874 tons/year** .

Therefore total CO_2 released/saved will be 600+3874 = **4474 tonnes/yr**

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

Table: Household-wise yearly consumption of kerosene:

Sr.No	Village	Lighting Kerosene-litres/yr	No. of Households
1	Koikoute	1440	30
2	Betajhar	1080	30
3	Mitrpur	972	27
4	Sarokata	1306	34
5	Rampalli	1680	35
6	Sankaranjai	672	20
7	Ramadiha	2400	50
8	Chiriyagarda	1044	29
9	**Total**	**10 594 litres kerosene/yr**	**255 households in 8 villages**

Note: These datas are for the 8 villages surveyed earlier for the state of Orissa for the replacement of kerosene with biomass gasifier based power generating systems for lighting purpose.

Table: Household-wise yearly consumption of kerosene

Sr No.	Village	Lighting Kerosene-litres/yr	No. of Households
1	Suakana	2451	46
2	Tarasahi	20396	440
3	Ahirajpur	3212	88
4	Anantakeshari	2631	68
5	Banipal	4646.5	95
6	Dolasahi	7427.4	119
7	Giriapahi	5708.6	92
8	Garata	5874	149
9	Keruapal	7370.5	159
10	Prabhati	4204.8	80
	Total	**63922 litres kerosene/yr**	**1336 Households in 10 villages**

Note: These data's are for 10 villages surveyed earlier for the state of Orissa for the replacement of kerosene with SPV's for lighting purpose.

The district wise details of the un-electrified villages near river side in the mentioned 4 districts are as given below (as per survey results)

Ganjjam District - 123 villages
Gajapati District - 8 villages
Kendrapara - N/A
Jagatsinghpur - N/A

List of Micro-Hydel Project potential(up to 100 kW capacity):

Sl. No.	District	Category of project	Capacity in kW	Name of river or canal	Head in metres	Discharge in Cumecs
1	Ganjam	ROR	1x75	Ghodahada	18.3	0.78
2	Ganjam	Canal drop	2x50	Dhanei canal	6.98	3.42
3	Ganjam	Canal drop	2x50	Ghodahada main canal	5.39	2.90
4	Jagatsinghpur	Canal Fall	2x100	Taladanda canal	-	-
5	Kendrapara	Canal Drop	2x50	Pattamundai canal	2.2	5

F. Environmental impacts

F.1 If required by the host Party, documentation on the analysis of the environmental impacts of the project activity: *(if applicable, please provide a short summary and attach documentation)*

One of the concerns with usage of biomass is its sustainable supply. Details of location-wise estimation carried are being provided in this section. The analysis very clearly indicates that the consumption of biomass is only marginal of the supply. Also there exists scope to further focus on its production, which by itself would be another profitable venture in future. The analysis made for location specific availability of biomass is given in detail in the following section.

F.1 Documentation on the analysis of the environmental impacts of the project activity: Sustainability of biomass supply

Location-wise estimation of Biomass
The estimation of biomass in 8 villages in the district Ganjam of Orissa state was carried out. Biomass available from following source was considered namely, (i) biomass growing potential from barren lands.

Estimation of fuel wood from barren land
Biomass potential from energy plantations: Energy plantations on barren/waste lands are one important source of biomass. This will serve the dual purpose of providing an energy store house and also help in sequestering carbon and benefit the environment. This cannot be treated as an immediate solution to the immediate requirements, but definitely it is an important element in the long run and to provide resources on a sustainable basis. Keeping this aspect in view, some assessment has been done specific to the project locations.

Sustainable biomass availability in the study villages (tons/year)

Village	Tree biomass	Shrub biomass	Total biomass	Consum-ption	Surplus biomass
Koikoute	78.63	144.04	222.66	78.84	143.82
Betajhar	85.85	211.02	296.88	76.65	220.23
Mitrapur	140.22	360.64	500.86	78.84	422.02
Sarokata	115.68	294.33	410.01	86.87	323.14
Rampalli	29.10	61.55	90.65	89.42	1.22
Sankaranjai	156.33	391.67	548.00	58.4	489.60
Ramadiha	8.13	16.42	24.55	109.5	-84.94
Chiriyagarda	58.75	152.57	211.32	63.51	147.81

While one accounts for biomass growing potential at normally agreed norms of (in the districts of the surveyed locations) is around 1700 tonnes/year which can be extrapolated for 149 villages and comes to nearly around 31 660 tonnes/year. Thus

when one accounts for all the available sources, the requirement would be miniscule. However, the market forces balance the demand and supply. There are instances in a few parts of the country, that increased prices of biomass have resulted in farmers growing some fast growing tree species, which they sell as fuel in the open market.

Whereas in the villages like Ramadiha, where the surplus biomass is in negative amount, the feasibility and sustainability of the biomass based power plants will be achieved through energy plantation. So, for the places where there are not plenty of fuelwood available from nearby places, the provision for energy plantation is made for the regular and sustainable supply of biomass to the power generating plants. These energy plantations will be done on nearly 5-10 hectares of wastelands available in and around villages, so that a regular supply of biomass can be made to the plant for electricity generation.

Balance sheet of availability/generation and estimated biomass consumption

An assessment has been made to understand whether sufficient biomass is available to meet the requirement of the gasifiers for power generation applications and if its usage accounts to larger portion of the availability.
Biomass comes mainly from biomass growing potential barren lands which seems to be the simplest option as well to be procured rather than from any other sources. An estimate indicates that the total biomass production in these forests and barren lands of Orissa is nearly

Area under different types of land use (hectares)

Village	Forest land	Cultivable land	Cultivable waste land	Area not available for cultivation
Koikoute	167.14	31.97	8.90	0
Betajhar	28.73	11.74	2.43	161.06
Mitrapur	1.12	10.93	0	312.82
Sarokata	10.12	28.73	2.02	246.86
Rampalli	38.45	130.71	7.28	19.43
Sankaranjai	31.16	2.43	6.03	312.82
Ramadiha	12.95	9.31	1.21	4.05
Chiriyagarda	-	1.21	131.12	0.41

G. Stakeholders comments

G.1 Brief description of the process by which comments by local stakeholders have been invited and compiled:

G.2 Summary of the comments received:

G.3 Report on how due account was taken of any comments received:

The local stakeholders here in these projects are the local villagers. These projects will not only initiate some different income-generation activities around it but will also generate employment to the local people. As these projects are renewable based so the hazards related to the processes are almost nil and hence it eliminates the health hazards to the greater extent, when compared to the other conventional ways of using kerosene and diesel for lighting and irrigation purposes, and creates a better environment to work in and to live in.

The electricity provided through these projects will certainly improve the living standards of these villagers and will help them to become aware themselves about the new things happening around them.

Once these projects starts generating electricity for the villagers then the consumption of the kerosene and diesel for their lighting and irrigation purposes will reduce drastically in each of the villages and so the profit makings of the traders of these fossil fuels will also reduce to almost nil for above mentioned purposes. Hence, these traders may create some resistance in any of the means to the functioning of these projects.

Annex 1

Annex 1: Project Participants

Project Proponent	Gram Vikas
Contact person	Mr Joe Madiath
Contact details	Mohuda, Berhampur, Distt. Ganjam, Orissa
E-mail contact	info@gramvikas.org
Contact numbers	0680-2261863 till 2261874
Company logo	
Owner of the company	Mr. Joe Madiath
Project Proponent	OREDA (Orissa Renewable Energy Development Agency)
Contact person	Mr A.K.Choudhary
Contact details	UNDP Desi development project , Komna, OREDA, S-3/59, Mancheswar Industrial estate Bhubhaneswar-751010.
E-mail contact	
Contact numbers	580660,580698
Company logo	
Owner of the company	Director, OREDA

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Financial and fiscal incentives (for power generating projects) at a glance for FY 2002-03

Technology/application	Capital subsidy	Interest subsidy	Accelerated depreciation
Small/mini hydro			
Private sector	Nil	2-7.5%	Nil
SHP projects (in government sector) up to 15 MW	Equipment cost + 50% of civil cost/90% of project cost[3]	Nil	Nil
Water mills (up to 5 kW) with electrical and/or mechanical output facilities	Up to 75% of actual cost[4]	Nil	Nil
Biomass gasification			
Biomass gasification for electrical applications e.g. captive power (with surplus power to grid) and pumping	Rs.1.50 lakh/100 kW (Rs.15 lakh/MW)[5] *(conversion of DG sets & Rural electrification – not included)*	Nil	Nil
100% producer gas engines up to 250 kW	Rs.1.5 crore/MW[1]	Nil	Nil
100% producer gas engines in MW-scale	Rs.1 crore/MW	Nil	Nil
Commercial atmospheric gasification including captive power	Nil	2%[2]	Nil
Advanced biomass gasification	Rs.1 crore/MW	Nil	Nil
Solar Photovoltaic			
SPV grid connected power	2/3 of project cost, up to a maximum of Rs.2 crore/100 kW	Nil	Yes
Solar home systems	50% of cost (90% for N-E region)	Nil	Nil
Solar water pumping systems	Rs.110 per watt of SPV array used	Nil	Nil

[3] Rs 30 000 /MW to Rs. 4.5 crores/ MW

[4] Up to maximum of Rs 30 000 to Rs 60 000

[5] 20% higher for N-E states

Gaps and Challenges:

- The names of the 131 villages in the case study and the data's regarding those villages are not known.
- The number of households per village are not known and has been assumed in the case study as 30 households per village based on the data's available for the 18 villages to be electrified through biomass and solar devices.

Costing for each of the technologies:

A) Mini Hydro Power plants:

Cost for total project will be **Rs 1 80 000 /kW**

30% of total cost is for = Civil works

35% of total cost is for = Electrical works

35% of total cost is for = Hardware (Electromechanical equipments)

Operation & Maintenance of plant, Running cost, AMC for the plant etc are excluded.

B) Biomass Gasifier Power plants:

Cost of total project will be **Rs 1 00 000/kW**

15% of total cost is for = Civil works

15% of total cost is for = Electrical works

40% of total cost is for = Hardware (Electromechanical equipments)

30% of total cost is for = AMC and O&M charges for plant for 1 year

Running cost for the plant are excluded.

C) Solar devices based power plants:

Cost of total project will be **Rs 7 80 000/kW**

45% of total cost is for = Hardware

30% of total cost is for = Electrical works

10% of total cost is for = Civil works

15% of total cost is for = AMC charges for plant for 10 years

All these incentives are for the hardware part only, whereas the money for Operation & Maintenance part for these power generating projects and for providing after sales services along with the monitoring part, is a big amount which is needed, for which the CDM funding can play a big and major role.