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Encouraging CDM energy projects to aid poverty alleviation

Final report of project R8037 under the DFID KAR programme

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The purpose of this study has been to facilitate the implementation of small-scale CDM projects that deliver direct benefits to alleviate poverty. We hope the results from the study will shape the modalities for these projects and ensure that sustainability benefits become an integral part of the design of small-scale projects. Our aim has also been to build capacity within the case study countries directly with our partners but also with the wider stakeholders and government representatives included in the workshops. In the process we hope we have moved the CDM process closer to reality and to achieving all of its expected benefits.

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Poverty alleviation and sustainable development has become a focal point in Tanzania endeavours to rid itself out of three main enemies which are poverty, ignorance, disease as well as other problems of underdevelopment. Therefore, a DFID funded project on encouraging CDM energy projects to aid poverty alleviation has just commenced on time while addressing the issues of Clean Development Mechanism (CDM) and climate change issues but at the same time catering for poverty alleviation and sustainable development in Tanzania.

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CONTENTS

All of the outputs designated at the start of the project have been achieved in this study. The outputs and report attachments are listed below

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2	Country reports on first and second workshops	2	
3	Country Contexts		Annex 4.3 to Attachment 4
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4&6&8&1	GHG Assessment of projects with UNFCCC recommendations	4	
5	Capacity Building & Institutional Structures	5	
7	Summary Report		

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Acronyms

AIJ	Activities Implemented Jointly
BAU	Business as Usual
BEA	Bureau of Environmental Analysis
CAN	Community Action Network
CAPA	Clean Development Mechanism for Poverty Alleviation Project
CDCF	Community Development Carbon Fund of the World Bank
CF-Assist	Carbon Fund Assist for capacity building for the CDM from the World Bank
CDM	Clean Development Mechanism (defined in Article 12 of the Kyoto Protocol)
CEEST	Centre for Energy Environment, Science and Technology
CER	Certified Emission Reductions (generated from CDM projects)
CFL	Compact Fluorescent Lights
CO_2	Carbon dioxide
COP	Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC)
COP-MOP	Meeting of Conference of the Parties to the United Nations Framework Convention on Climate Change serving as the Meeting of the Parties to the Kyoto Protocol
CP	Commitment Period
DFID	Department for International Development
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board for the CDM
EF	Emission Factor ($kgCO_2/kWh$)
ERU	Emission reductions units
EPA	Environmental Protection Agency
FDI	Foreign Direct Investment
GHG	Greenhouse gas
HH	Household
IB	Intermediate Body
ICS	Improved Cook Stoves
IET	International Emissions Trading
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation (outlined in Article 6 of the Kyoto Protocol)
KITE	Kumasi Institute for Technology and the Environment
KENGEN	Kenya Generation
KP	Kyoto Protocol
MCDA	Multi-Criteria Decision Analysis
MEND	Moving towards Emissions Neutral Development
MHP	Micro hydro power plants
MVP	Monitoring and Verification Protocol
M&V	Monitoring and Verification

NBSSI	National Bureau for Small Scale Industries
NGO	Non Governmental Organisation
NEMA	National Environment Management Authority
NPCC	
NCCC	National Climate change Committee in Tanzania
ODA	Official Development Assistance
PCF	World Bank Prototype Carbon Fund
PDD	Project Design Document
PHP	Pico Hydro power plant
SAM	Sustainability Assessment Model
SHS	Solar Home Systems
S-L	Sustainable Livelihoods
SSN	South- South- North project
SUSAC	Start-up Clean Development mechanism in ACP countries (Africa, Caribbean and Pacific)
TATEDO	Tanzania Traditional Energy Development Organization
TANESCO	Tanzania Electricity Supply Company
UNFCCC	United Nations' Framework Convention on Climate Change
UNEP	United Nations Environment Programme
VPO	Vice Presidents Office in Tanzania

Glossary

GWh	GigaWatt hour
kt	Kilotonne
kg	Kilogram
kW	Kilowatt
MWh	Megawatt Hour
M	Mega (10^6)
t	Tonne
US$	United States Dollars
y	Year

Executive Summary

This report is the final report of the study R8037 'Encouraging Clean Development Mechanism (CDM) energy projects to aid poverty alleviation' carried out under the Department for International Development (DFID) Knowledge and Research programme. The purpose of the study has been to contribute to the design of the CDM so that poverty-focussed energy projects are encouraged and to provide capacity building for host countries to implement these small-scale projects under the CDM.

I. The CDM and small-scale projects

The Clean Development Mechanism (CDM) is defined under the Kyoto Protocol to the UN Framework Convention on Climate Change (UNFCCC) as a 'flexibility mechanism' which allows a donor country to fund projects which reduce greenhouse gas (GHG) emissions and contribute to the sustainable development of a host country. In return, the donor country or investor receives 'credits', which contribute to their GHG emissions targets. In the CDM, the donor country will be an industrialised country or investor with emissions targets, whilst the host country will be a developing country (DC) without targets.

During the course of this study there have been many developments and changes with regard to the procedures and modalities for the CDM. The failed negotiations at COP 6 in 2000 and subsequent withdrawal of the USA from the Protocol culminated in the achievement of agreement among all remaining nations on the Marrakech Accords at COP 7 in 2001. This has been followed by the formation of the Executive Board (EB) for the CDM and the groups of experts on the CDM and small-scale projects. These developments have been summarised in ***Attachment 1*** to the final report along with activities on the CDM being carried out by a range of organisations both internationally and nationally. This study is placed within these activities and shows that it is timely and addresses host country needs.

II Study Approach

Our approach has been to analyse projects that are mainly already implemented and could be templates for CDM projects. Information has therefore been generated on actual benefits being delivered in practice. Data collection was carried out via site visits.

In this study we have focussed on small-scale energy projects over a range of sectors in three host countries in Africa, Tanzania, Ghana and Kenya. The range of projects studied were Biogas, SHS, Charcoal production, sustainable wood source, power factor capacitor improvement, Solar, MHP, Pico HP, cement production efficiency improvement, Improved Cook Stoves (ICS) and bagasse cogeneration for sugar production. Uncertainties in the data were explored in the analysis. The availability of data was a problem recognised in the workshops for action on capacity building. Country partners prepared country contexts (***Annex 4.3 to Attachment 4***) and these were used as background in producing the baseline scenarios for projects.

III Assessment of Sustainability Benefits from small-scale projects

The assessment of any sustainable benefits from projects has been left to the host countries so that there is very little in the Accords which ensures that these benefits are achieved. Yet we contend that without the delivery of the sustainability benefits the long-term GHG reductions will not be realised. Host governments do have a chance to ensure some local benefits at the Host Approval stage of the project, but in practice they do not necessarily have the resources, expertise or priority on these issues. This study is therefore intended to input to host governments, developers and professionals on Sustainability Assessment tools to enable them to conduct an assessment of small-scale projects and to suggest improvements to the projects, if required, before approval is granted.

Analysis Approach

Attachment 3 documents the work undertaken on the project sustainable benefits in detail. A multi criteria decision analysis (MCDA) approach was used to conduct the assessment. The starting point was the Sustainable Livelihood (S-L) approach as this addresses the community level of the project. Criteria were derived and the value tree for the assessment constructed. The final criteria set after discussion with the partners and stakeholder workshops is shown in Box A and defined in Attachment 3.

CRITERIA SET for ASSESSMENT ***BOX A***

food	**freed time**
forests	**health**
habitats	**education**
land use change	**skills**
air pollution	**energy**
GHG reduction	**infrastructure**
water supply	**dwelling.**
marginal groups	**resource depletion**
wider funds	**affordability**
local supply chain	**social networks**
security	**local manufactured equipment**
income generation	**jobs**

Results from Sustainability Assessment

The analysis produced the Sustainability Assessment Model (SAM) which can be applied to most community-based development projects. It was successfully tested on the case study projects with country partners in each country. Simplifications without the need to purchase software have also been proposed. The approach can be used not only for the CDM but also for any development project. A comparison with other studies showed that our approach

- Is properly grounded in theory and practice of decision analysis and does not use arbitrary scales
- assesses the project, the implementation actions and the existing baseline situation as a whole

- uses criteria which are based on the S-L approach and are tailored to the community projects
- does not judge projects only on total performance on criteria as this can be misleading
- examines the balance of the project on the major trade-offs
- allows the strengths and weaknesses to be explored for each option
- provides examples of additional actions which can be incorporated into the project design to mitigate weaknesses and improve the balance in the projects.(e.g. marketing training for ICS)
- allows comparison with the Status Quo and Benchmark projects so that the relative preference for a project can be assessed
- maximises the benefits from projects

A list of examples of additional actions for projects to improve performance on the criteria was compiled from the experience with the projects (Attachment 3). This provides a guide to thinking about appropriate measures as a basis for project improvements.

The results of the assessment of the projects in each country include the identification of the strengths and weaknesses of projects. The best performing project was identified as a benchmark project that could be used for comparison in assessments of new projects. In Tanzania it was the ICS programme, in Ghana the sustainable woodfuel project and in Kenya the Tungu MHP project. The model can be used in several ways.

1. To compare a project with other possible projects or against a benchmark. This allows a comparison of the project and its implementation context to see how good it is against a benchmark project or against the Status Quo. It also gives insights into how a project may be improved through additional actions. SAM also allows sensitivity analysis on the Policies, Institutions and Processes to test and improve robustness and generate new or improved projects. It allows characterisation of the benefits and gives an indication how they may be measured.
2. To audit the SD aspects using the criteria once the project is implemented.
3. To illustrate the crosscutting role of energy in the delivery of SD benefits.

Possible Outcomes from Analysis

- A project may perform well and is balanced so that there is no problem with approval.
- If a project performs well but is not balanced then the table of additional actions can point up some improvements that can be incorporated into the project design before it is approved. Unbalanced projects will not perform well in practice.
- If a project does not perform well whether it is balanced or not then project weaknesses can be identified and the table of additional actions may give ways in which the project may be strengthened so that it can be approved.
- The project is very poor and should not be approved.

IV GHG accounting modalities

There are many barriers to small-scale projects being implemented at all and to being implemented successfully. It is therefore important to simplify modalities as much as possible. The areas targeted in this study are carbon accounting modalities, comparisons with existing EB guidance and implications for bundling or aggregating small projects into programmes.

GHG reductions from projects in each country

Attachment 4 reports the detailed analyses involving the baseline scenarios constructed for the projects from the country contexts and including the uncertainties in the data. The analysis results are summarised in tables for each country. It was found that

- particularly in the case of the charcoal kilns, there is a wide variation in performance of the same type of kiln and we would suggest that further studies are required to obtain meaningful values for standardised approaches. A new methodology has been generated for the calculation of the reductions to take account of all the GHGs emitted in the process;
- monitoring before (e.g. kerosene use) and during the project (e.g. tree planting rates or biogas production) can reduce critical data uncertainties in the final result,
- most carbon reduction costs were positive and high but there are some cost saving projects (e.g. AHP cogeneration);
- variations in the grid mix for Kenya had little effect due to the high Hydro component;
- maximising the reductions is dependent on the load factor, the size of the project (though is only an indication) and what is substituted in the baseline. This in turn depends on the service being provided.

Comparison with current guidance under the EB for the CDM

A comparison of the emission reductions calculated using the EB simplified guidance and those calculated in this study provided the insights for baselines and for monitoring listed below.

Baseline methodologies

- What is substituted in the baseline can vary considerably for some project types. For example for Micro or Pico Hydro power and for Solar power the baseline can vary from kerosene to diesel generators and grid electricity. Current advice does not take account of this range of complexity and extended baseline options and specific advice for projects with mixed baselines are required
- The principle that where possible, there should be equivalence of service between the project and the baseline is implemented through the use of the project activity level for calculating the reductions. However in some cases in the energy efficiency category no specific direction is given and this needs to be added e.g. for equivalent tonnes of charcoal produced in project and baseline.
- Many of the projects do fit the available categories but new guidance on methodologies is needed for cement kilns, charcoal kilns, sustainable wood, and power capacitors projects.

- Though for some projects there were appropriate categories we found that for most of the projects some modification is required in the recommended guidance. An example is Tungu that has a mechanical component and a thermal component. In this case two categories are required. In addition the guidance for the mechanical energy produced an underestimate of the emissions while for the Uwemba MHP an overestimate was produced. For the Sony cogeneration and the AHP MHP where the baseline was grid electricity the guidance did not provide for such a baseline but could easily be expanded to cater for this.
- There is currently no appropriate guidance for ICS. There is also the problem of the size of the programme involving these small projects, as the whole ICS programme in Tanzania could not be counted as <15GWh reduction. Since it could not be considered as a large-scale project because of the nature of the household level of the equipment, this would seem an unreasonable restriction.
- The SHS project at Kpasa was able to be properly processed using the baseline guidance either on kerosene or using the solar power equation. On the other hand for the solar project at Utete, both the diesel and the solar equations overestimated the reductions.
- Some closer examination of the environmental integrity of the equations and emission factors suggested in the EB guidance in Annex B (UNFCCC 2002) is required especially with regard to emission factors for different sizes and load factors for diesel generators. If these emission factors are to be applied widely then we suggest that they should be modified, as they do not give conservative estimates.

Implications for Monitoring

For the Utete solar project, the AHP, Sony and Uwemba projects, the advice based on metering electricity consumption was appropriate. However for the other projects there were some problems. These are summarised below.

- The biogas project requires two main issues to be addressed. One is the kerosene use before and after the project needs to be sampled (which was not covered in current guidance on monitoring though mentioned in the baseline advice). The other is the biogas component of the fuel for the generator is crucial for the final reductions and their environmental integrity. Spot checks will be required on the biogas composition. This has to be explicitly included for this project type where there is a possibility of more than one fuel for the generator.
- The monitoring advice for the Kpasa SHS and Biogas project is based on metering electricity in the baseline and does not mention the kerosene use before and after the project. The existing guidance on monitoring is therefore insufficient if the standard equation is not applicable.
- In the projects where the baseline is kerosene use, we recommend that monitoring is minimised by taking a conservative value for the baseline kerosene use based on an initial country survey which could then be applied to all projects in the country.
- For the Tungu MHP project the guidance was also insufficient for the thermal parts of the baseline and new guidance along the lines suggested is required.

- No relevant guidance was available for the charcoal greencoal project, the sustainable wood project, the cement kilns project, the capacitors or the improved cook stoves project. For the ICS the lifetime of the stove before replacement and the number of stoves is required. Monitoring recommendations are given from the analysis in this study in Attachment 4.

Bundling

Aggregating small projects to minimise costs can be done in several ways. Possible options for bundling projects and options for monitoring the key variables were formulated with a view to simplification and cost minimisation without loss of integrity.

Options for bundling projects

The bundling of projects could be carried out under a variety of formats to minimise the costs of the baseline construction and monitoring.

- The simplest is to have a large programme of the same type of project e.g. ICS or SHS.
- Projects of different types but the same baseline conditions (the ICS and SHS are a special case of this as they do usually replace wood/charcoal or kerosene use respectively)
- Projects of the same type but with a limited number of different baseline conditions
- Projects which can complement each other in terms of GHG reductions to maximise sustainability benefits with a limited number of different baseline conditions.

Modalities for bundled projects

- The monitoring information can be derived from limited spot sampling and from general surveys within the country to keep down costs.
- These surveys to measure for example, wood and kerosene use, can then be applied to all subsequent projects to be bundled in that country.
- The reductions can be calculated using the standard baseline equations in the guidance modified through the baselines suggested from this analysis.
- The reductions should be calculated for one representative project for each baseline type and then multiplied by the numbers deployed and operational,
- The calculation of the reductions must take account of the operational lifetime of the project e.g. in the case of ICS three years or in the case of wood lots 5 years delay before harvesting so that the total reductions are not overestimated, maintaining equivalence of service where possible.

Capacity Building and Institutional Structures

The implementation costs of bundled projects are also determined by the institutional structures in the country and the capacity building requirements for these projects. These are discussed in ***Attachment 5*** to the main report. During the project, attention has been paid to capacity building in the host countries through interactions with country partners, and with the stakeholders attending the workshops held at the start and at the end of the project in each country. The workshops are reported in detail in ***Attachment 2***.

Capacity building is required in host countries despite the increasing number of initiatives because of the complexity of the task and the lack of in country resources. The barriers to the implementation of the CDM, and the actions to overcome them, have been collated from the discussions and common elements highlighted. Detailed specific barriers and the actions to overcome them for each country are given in Attachment 5 and are a mixture of actions common across the countries and new initiatives. The lists have been generated by people who are in the country and involved in the process. It forms a comprehensive guide to governments, donors and NGOs of what needs to be done and the immensity of the task. Finally a priority action list was agreed for Kenya and Ghana which forms a good basis for further action within countries.

It is clear that financing the capacity building actions is a priority if the CDM is to be implemented successfully on a reasonable scale. Host governments do not have the capacity or funding to do this entirely on their own. The CF-Assist programme is useful for this aspect.

Institutional Structures for small scale projects

How the small-scale projects can be bundled and processed at host country level is not clear given the project needs of capacity building during implementation and bundling administration while minimising transaction costs. Current and proposed institutional structures in the host countries were discussed and some proposals for simple transparent systems formulated along with clear statements of the needs of the host country and of the investor. These are documented in Attachment 5. A new approach is needed and the main issues concern investor complexity, simple structures and bundling administration.

1 Introduction

This report is the final summary report of the study R8037 ‘Encouraging Clean Development Mechanism (CDM) energy projects to aid poverty alleviation’ carried out under the Department for International Development (DFID) Knowledge and Research programme. The study has the twin aims of contributing to the design of the CDM so that poverty-focussed energy projects are encouraged and to provide capacity building for host countries to implement small-scale projects under the CDM.

1.1 The CDM and small-scale projects

The CDM is defined under the Kyoto Protocol to the UN Framework Convention on Climate Change (UNFCCC) as a 'flexibility mechanism' which allows a donor country to fund projects which reduce greenhouse gas (GHG) emissions in a host country. In return, the donor country or investor receives ‘credits’, which contribute to their GHG emissions targets. In the CDM, the donor country will be an industrialised country with emissions targets, whilst the host country will be a developing country (DC) without targets.

A key element of the CDM is that projects should assist the host country 'in achieving sustainable development' (Article 12.2). Further guidance for the CDM is given in the Kyoto Protocol (KP), i.e. that it 'should be integrated with national development programmes' and 'be appropriate to the specific conditions' of the host country (Article 3.4). Thus the essential feature of implementing the CDM will be to balance the aim of contributing to the sustainable development of the host countries with the need of the donor countries in achieving GHG emissions reduction.

Small-scale projects are targeted in this study for three main reasons.

- The CDM has the twin aims of Greenhouse Gas (GHG) Reduction and Sustainable Development benefit delivery as discussed above. These sustainable benefits, including poverty alleviation, can be more directly provided through small-scale projects especially community projects.
- Investment in CDM projects is expected to follow the pattern of Foreign Direct Investment (FDI) so that many developing countries, particularly the least developed countries, may lose out. Small-scale projects, given preferential treatment under the Marrakech Accords, are suited to developing countries and can be attractive to investors when the modalities are greatly simplified. Thus a more equitable distribution of CDM projects could be achieved.
- Small-scale projects can deliver long term reductions in greenhouse gases and though individually the reductions are small, programmes aggregated over a large number of projects can produce significant reductions.

1.2 Structure of the summary report

During the course of this study there have been many developments and changes with regard to the procedures and modalities for the CDM. The failed negotiations at COP 6 in 2000 and subsequent withdrawal of the USA culminated in the achievement of agreement among all remaining nations on the Marrakech Accords at COP 7 in 2001. This has been followed by the formation of the Executive Board (EB) for the CDM and the groups of experts on the CDM and small-scale projects. These developments have been summarised in Attachment 1 along with activities on the CDM being carried out by a range of organisations both internationally and nationally. Input for the latter was obtained from a meeting held with UK organisations known to be involved in the CDM to exchange information on current involvement in CDM projects.

This study is placed within these activities and shows that it is timely and addresses host country needs.

In section 2 we discuss the projects and data used in this study. We have focussed on small-scale energy projects over a range of sectors in three host countries in Africa, Tanzania, Ghana and Kenya. These are projects that in the main have already been implemented and could act as CDM templates. Data collection on actual benefits delivered has been carried out. The range of projects studied were Biogas, SHS, Charcoal production, sustainable wood source, power factor capacitor improvement, Solar, MHP, Pico Hydro Power (PHP), cement production efficiency improvement, Improved Cook Stoves (ICS) and bagasse cogeneration for sugar production. Country contexts to act as background information for the baseline scenarios were prepared for each country and are reported in Annex 4.3 to Attachment 4 to this main summary report.

The project analysis has two main strands; the sustainability benefit assessment and the GHG reduction accounting.

Section 3 of the report deals with the analysis of the sustainability benefits associated with the project. Multi criteria decision analysis (MCDA) has been used for the assessment of the sustainability benefits delivered by the projects. The criteria for the analysis were based on the sustainable livelihood's framework which was discussed and developed into a value tree. This sustainability assessment model (SAM) approach, which is an MCDA model, can be applied to most community-based projects and has been tested successfully on the case study projects with country partners in each country. Simplifications without the need to purchase software have also been proposed. The approach can be used not only for the CDM but also for any development project. The detailed analyses are given in Attachment 3 to this main summary report.

The modalities for the estimation of the greenhouse gas reductions (GHGs) are treated in Section 4 of this report. The study has addressed issues of simplification of procedures for the estimation of GHGs for these small projects to input to the simplified modalities being developed by the EB. The uncertainties in the calculations were used to identify the variables which were key to the estimation. A comparison with existing guidance has revealed several areas where this project can input to improve current advice on project boundaries, baselines, and monitoring and verification. Additionality was explored in the baseline scenarios and new baseline recommendations were generated for the charcoal project. The insights gained in the analysis have also allowed us to propose a range of possible models for bundling or aggregating projects. Attachment 4 provides the details of the analyses conducted.

Section 5 discusses the capacity building aspects of this study. During the project, attention has been paid to capacity building in the host countries through interactions with country partners, and also through the stakeholders attending the initial and final workshops held in each country. The workshop reports are collated in Attachment 2. Priorities in capacity building for the implementation of the CDM have been identified and some initial proposals on institutional structures for small-scale projects and their bundling administration produced. Action lists were generated on country priorities for CDM implementation and it is clear that capacity building for the CDM is an ongoing demanding activity due to the complexity of the CDM. Attachment 5 provides a detailed report of these results.

2 Projects and data

The projects studied in the partner countries Tanzania, Ghana and Kenya are listed in Table 2-1.

Table 2-1: List of projects studied across the partner countries

Kenya	Tanzania	Ghana
MHP, Tungu Kaburi	MHP Uwemba	
Thima Pico hydro		
Sony sugar co Diesel to bagasse cogen	*Sugar cogen grid to bagasse Mtibwa*	Biomass Plantation for sustainable wood source Nabari
Bamburi cement energy efficient kilns	*Kitulanga Charcoal Kilns*	*Charcoal Production, Ashanti Region More efficient kilns*
TEA industry MHP projects		Energy Efficiency in Small-scale Industries – Capacitor Installations
	Solar Power for hospital research laboratory Utete	*SHS at Kpasa*
	ICS IREDECT programme	Biogas project at Appolonia

The projects marked in italics are where we have across country comparisons on GHG reductions.

The details of the projects and the data collection are discussed in Attachments 3 and 4 for the sustainability benefit assessment and for the GHG accounting. A short summary of the projects is given here for background information. Data availability was a problem in this study and was a key determinant in the final selection of projects from the initial lists.

2.1 Tanzania

2.1.1 Uwemba MHP Project

The Microhydro power (MHP) project (843kW) was constructed in 1984 and has operated from 1991 in Njombe district in Uwemba village. It replaces a diesel generator for Njombe town and Uwemba village and provides electricity for domestic use and small industries including a tea factory, mills and domestic water pumping. It is owned by Tanesco and not the community. There is an increase in number of local and town households served. It is affordable by middle income domestic users at national rates though some local house structures are not suitable for wiring. There was an infrastructure road improvement associated with the project.

2.1.2 Improved Cookstoves Project (ICS)

The programme was launched in 1999 as part of the integrated renewable energy development and environment conservation (IREDEC) programme in Dar es Salaam, Mwanza, Shinyanga, coast region and Kilimanjaro. The project provides for production and dissemination of improved cookstoves with lower wood fuel requirement at household level in urban and rural areas. It replaces traditional 3 stone stoves and inefficient charcoal stoves in urban areas. Overall it is equivalent to 144MW with 120,000 stoves. It has created small stove manufacturers, produced new designs and markets. The project has involved community participation and training with empowerment of women, increased income with employment, savings in time and in charcoal purchase, and natural resource conservation. The project has demonstrated a need for micro credit.

2.1.1 Utete Solar Hospital Research Project

This consists of the provisions of 12, 75Wp Solar panels for a malaria research unit at Utete district hospital in Rufiji coastal region. It was installed in 1999 and replaced the use of the diesel generator still used in rest of hospital. It provides a lighting service, increased 24hr service for computers, communication, refrigeration and an expanded health service to neighbouring communities.

2.1.2 Mtwibwa Sugar Cogeneration

At Mtibwa (2.5MW) and TPC sugar factories (6MW for 22GWh/y), the new plant uses bagasse. It replaces grid electricity for factory needs.

2.1.3 Kitulango forest efficient charcoal kilns

This project involves replacement of a traditional earth mound inefficient kiln to reduce wood demand. The new half orange kiln is more efficient (1/3 more) and has been built on the Kitulangalo forest reserve.

2.2 Kenya

The following projects were proposed for study from Kenya and are listed in the table above.

2.2.1 Tungu Micro Hydro Power

This project is an 18 kW mechanical turbine producing 14 kWe, targeting 300 HH direct beneficiaries and about 4000 individuals indirectly at Chuka, Meru District. It was started in 1999 and is still ongoing. The community who designed it from the start owns it. In Kenya current legislation prevents the local distribution of electricity although power can be generated and so the main purpose is to power a new enterprise centre with a hairdresser, welding shop, battery charging facility, tobacco curing and grain milling. It replaces services from a diesel generator for milling and wood and charcoal for tobacco curing. The number of households who have membership in the scheme is 300 but it is available to all. It impacts on education opportunities and the provision of other businesses as well as providing pumped water from the river with filtering.

2.2.2 Sony sugar cogeneration with bagasse

This project is located in Awendo – Sare, South Nyanza and is owned by the Sony Company but it was carried out with community participation. It is proposed that a 15 MW cogeneration plant is built (2003-7) replacing grid electricity for lighting using biomass (bagasse). It has associated benefits of natural resource conservation through tree planting, more roads being built and more opportunities for education through micro credit loans. Though this was not an operational project it will take place within an existing sugar factory structure where these measures are already in place.

2.2.3 Kathamba and Thima pico Hydro power project

These are 2 Pico hydro power schemes rated at 1.2 kW and 2.2 kW respectively supplying 226 HH with power using a micro grid near Kerogoya town in Kirinyaga district. It is a relatively new project implemented from 2000 to 2001. It provides electricity for lighting replacing kerosene lamps and is community owned. They operate on the basis of availability for a membership fee but in practice soft credit facilities mean that there is participation of all. It allows an opportunity for evening study and small enterprises can operate through the evening.

2.2.4 Finlays tea MHP

This is a 1.4MW Mini Hydro serving the 7 Factories in Kericho District built in 1999 - 2002. It produces emissions reduction due to replacement of grid and diesel electricity for machinery in the tea factories. This project has not been realised and there are no sustainability benefit data available.

2.2.5 Bamburi Cement Works

This project is an energy efficiency project for cement production where a more efficient horizontal dry kiln replaces 4 vertical wet kilns at Mombasa and the Athi River. The project was carried out in 1998 - 2001. This project was not assessed on the community project assessment procedure, as it is a purely industrial project. It will have more strategic benefits that are discussed separately.

2.3 Ghana

The projects studied in Ghana have been listed in the Table above and are described in turn below.

2.3.1 Appolonia Rural Energy and Environment Biogas project

This project is located in the village of Appolonia, Tema District. It was commissioned in 1992 a part of an initiative from the Ministry of Energy. It was designed to take cow dung and human waste which passes into digesters of capacity $50m^{3}$. The gas is stored in two gasholders of capacity $13m^3$each and is burned in two generators of capacity 8kW each to generate electrical power of 5kW and 7.5kW respectively. The main output from the project is electricity that replaces Kerosene and candles for lighting. The gas was also supposed to be used for cooking but with the human waste factor and to some extent even with the cow dung cooking was not considered to be hygienic with this source so that it is only used in the wet season when wood is not available. When the biogas is not available then diesel can be used in the generators. It is owned by community and serves 21 households and 15 streetlights. There are increased commercial activities under the streetlights and the biogas plant produces organic fertiliser for increased food production.

2.3.2 MME/Spanish off-grid Solar PV Rural Electrification

This project is in the village of Kpasa in the Nkwanta district and was implemeted in 1998 to 2001. It consists of 5.5 kwh/m^2/day Solar PV panels supplying a lighting service to 400 HH replacing kerosene lamps. It is owned by individuals in the community
The project involved training personnel and provides improvements in health, opportunity for education, and infrastructure.

2.3.3 Greencoal improved charcoal kilns project

This project was commissioned in 2001 in the Manso-Amenfie, Western Region. It involves the construction of an efficient kiln for the production of 720tons of charcoal per year. It replaces inefficient earth mounds. The project uses waste wood from the sawmill and is owned by the sawmill. The wood would have been allowed to rot or burned in heaps. The charcoal produced is not the same quality as local earthmound charcoal and is faster burning though one producer does source from the sawmill waste wood. Most of the charcoal is destined for transport to the Netherlands. The kiln has required 7 trained personnel and reduces air pollution, reduces impacts of waste wood and reduces water pollution that occurs when rain falls on the tarry ash left from earth mound kilns. It has no real effect on community.

2.3.4 Traditional Energy Unit Project

This is a sustainable forest management project which is community owned. The project is situated in Nabari in the Northern Region and it is proposed that eventually there will be a 60 ha sustainably managed woodlot. It started in 2000 and is currently ongoing and replaces an unsustainable wood supply

The wood is available to the local community at no cost for domestic purposes but they pay fee for wood for commercial purposes. The project is situated near the village so that the time for gathering wood is drastically reduced. This provides benefits in terms of time for education, other businesses, and reduces drudgery. As part of the project a community centre has been built.

2.3.5 Energy Efficient capacitors

This is part of the AREED project. We have examined the installation of energy efficient capacitors at 16 industrial sites for power factor correction. The project started in 2001 and is still ongoing. It is designed to reduce power losses at industrial sites. As it is a purely industrial project it has not been included in the sustainability benefits assessment.

3 Sustainability Benefit Assessment for small-scale projects

This part of the study has been described in detail in Attachment 3 to the report. Multi Criteria Decision Analysis (MCDA) was used to assess the projects in the case study countries. The starting point for generating the values associated with the appraisal was the Sustainable Livelihoods (S-L) approach. Detailed discussions on S-L led to the formulation of the value tree illustrated in Figure 3-1.

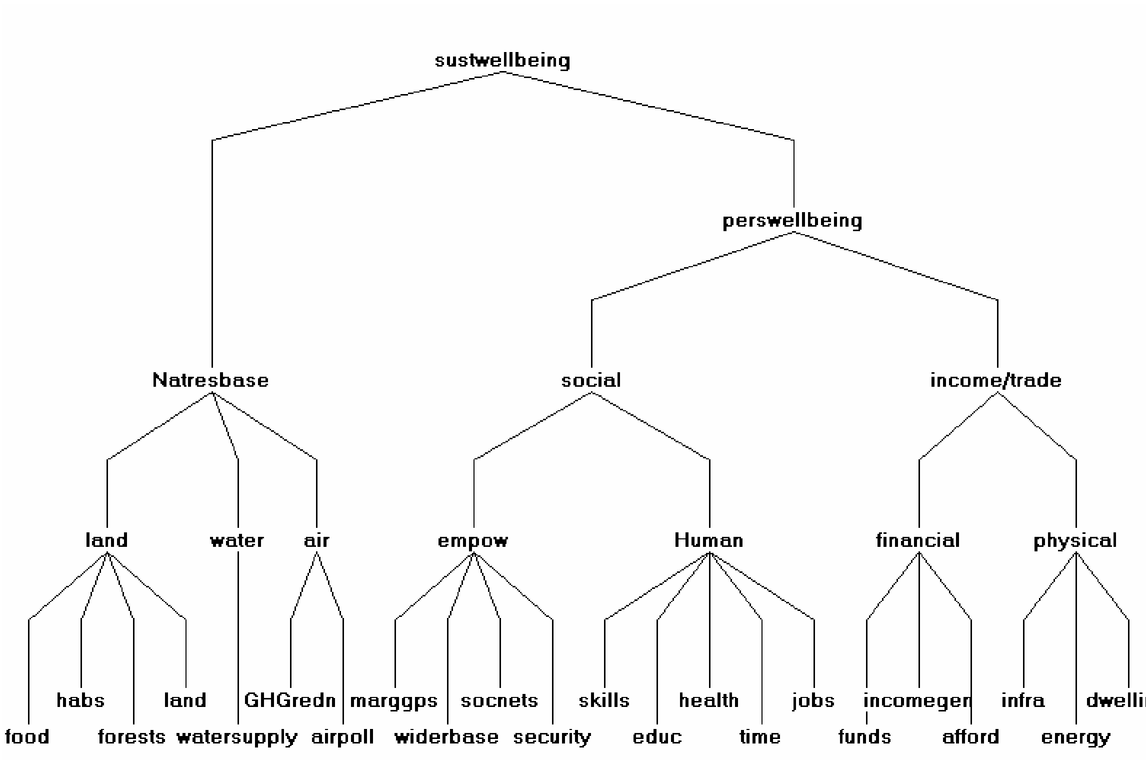


Figure 3-1: Value tree for Sustainability Benefit Assessment

The criteria for the assessment are those shown as 'twigs' at the end of the tree. The criteria are defined and listed in Attachment 3 and summarised in Box A.

CRITERIA SET for ASSESSMENT	***BOX A***
food	**freed time**
forests	**health**
habitats	**education**
land use change	**skills**
air pollution	**energy**
GHG reduction	**infrastructure**
water supply	**dwelling**.
marginal groups	**resource depletion**
wider funds	**affordability**
local supply chain	**social networks**
security	**local manufactured equipment**
income generation	**jobs**

It can be seen that the major trade-offs in an assessment are the natural resource base with personal well being. Both these trade-offs are explained by the criteria that make up that branch of the tree. In the analysis the projects have been assessed using these criteria by the country partners and also with Dr Wilkinson. The projects assessed using this approach, which we have called the Sustainability Assessment Model (SAM), are a subset of those listed in Table 1-1 as the industrial projects were not suitable for this type of assessment.

Typically in an MCDA, the overall performance of different options would be compared and the option with the highest expected value (Total weighted sum of scores on relative preference scales over all the criteria) would be chosen for further investigation. These overall performance results are given in the audit trail for the analyses. The results are relative and are dependent on the specific project circumstances in terms of how the project was implemented and what the baseline situation was. It is *not* an assessment of project types or that one project type is better than another. What we are showing is that all projects can deliver a range of benefits provided they are implemented with the necessary capacity building and technology transfer requirements in place.

In Attachment 3, we discuss the results from each country project appraisal exercise in terms of

- the overall performance of the project on the criteria relative to Status Quo
- the balance between the major tradeoffs
- the exploration of the criteria set
- the strengths and weaknesses of the projects
- the additional actions which can improve project options

Examples of this analysis are given here.

3.1 Overall Performance of projects in partner countries

An example of the relative performance of the community-based projects studied in the partner countries relative to the Status Quo is shown in Figure 3-2 for Kenya. The projects are numbered 1 to 4.

Option 1: Status Quo
Option 2: Tungu MHP
Option 3: Kathamba Pico hydro
Option 4: Sony sugar cogeneration

The diagram shows the performance of the options over a range of possible weights for one of the major trade-offs; maximising the sustainability of the natural resource base. The ***y-axis*** is the performance of the option on the objective of maximising the sustainability of the natural resource base. The scale relates to the weighted sum of the scores of the projects on all the relevant criteria for that objective. ***The x-axis*** is the total weight on that trade-off (made up of the lower level weights). The vertical red line indicates the current weight on the objective. The graph shows that the current weight could be increased or decreased (keeping the ratios of the other weights the same) without affecting the order of preference for the options. Option 2 is robust on this criterion.

3.1.1 General Conclusions

- The performance of the projects was related to some extent to the amount of benefit produced so that larger projects or programmes of small projects were relatively more preferred.

- All projects were preferred compared to the Status Quo

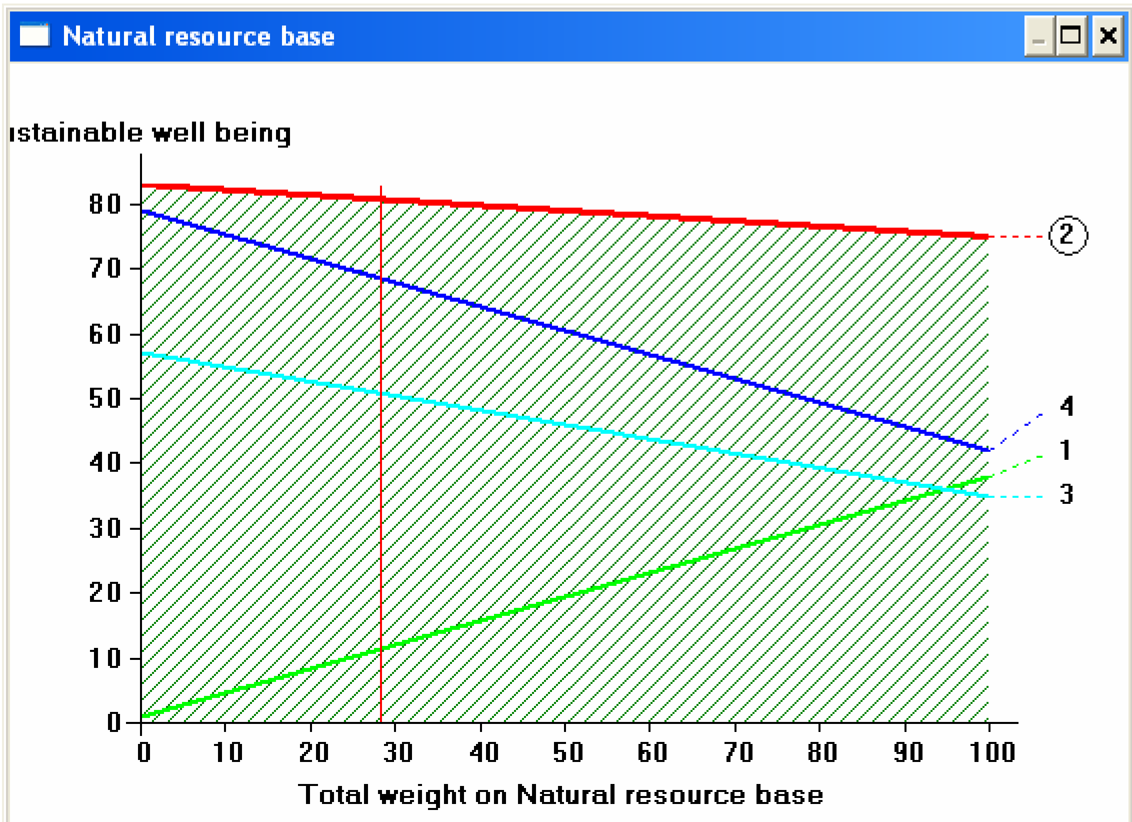


Figure 3-2: Performance of project options in Kenya

3.2 Balance in the project options

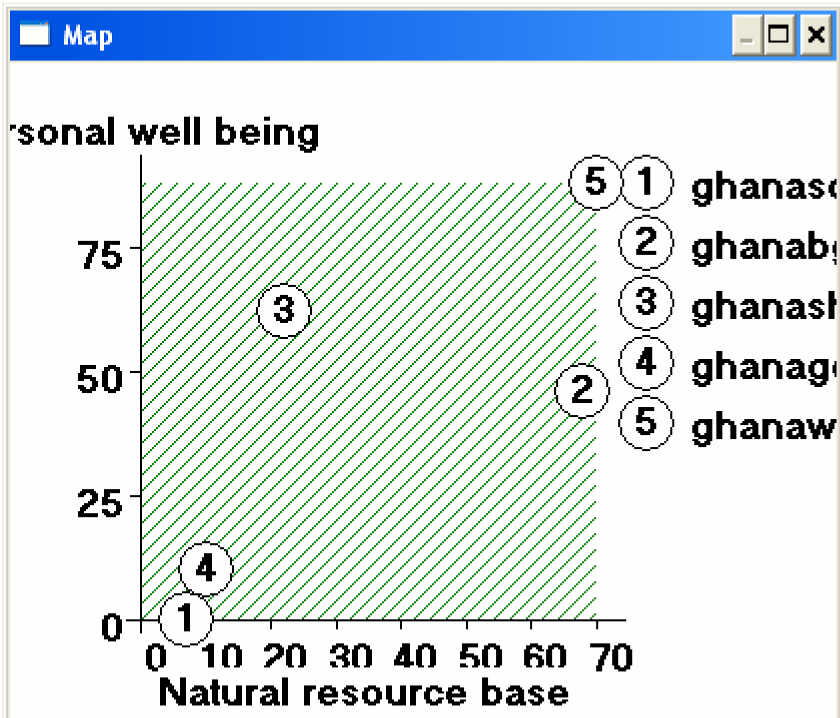
It is important that an option is well balanced on the major criteria otherwise there will be a serious weakness in the option which will eventually cause problems either during implementation or during operation possibly leading to failure. This is commonly the case with decisions and is the reason why we consider this aspect of the options rather than finishing the analysis with the choice indicated by the overall performance or Expected Value. The results are illustrated in Figure 3-3. The y-axis is the performance of the options on maximising personal well being sustainability benefits while the x-axis is the performance on maximising the sustainability benefits for the natural resource base. The project options are numbered in circles 1 to 5. These are as follows.

1. Status Quo
2. Biogas
3. Solar Homes Systems (SHS)
4. Greencoal
5. Sustainable wood

3.2.1 Conclusion

This analysis indicates that projects 1, 4 and 5 are balanced though obviously the options performing well on both objectives are preferred and are at the top right hand corner of the graph. Project 5, the sustainable wood project is therefore most preferred here. In fact this option had the highest expected value as well. However some projects appear to perform well overall but can be flawed if attention is not paid to this relative balance between the major trade-offs in the decision. Project 3 the SHS project performs well on personal well being but not on natural resource base while the strength of the biogas project is in the benefits to the natural resource base but it is not performing so well on the personal well being.

Figure 3-3: Balance in the options from Ghana



3.3 Criteria Set

In this approach the criteria set was derived from the S-L approach. In a normal decision conference the criteria would be elicited from the relevant stakeholders to the decision. As this is not a typical decision context and we also felt it was important to ground the assessment in a widely recognised and applied framework we used the S-L framework as a starting point as discussed earlier. It was therefore important in the analysis to check how comfortable the country stakeholders were with the criteria set used and if the criteria were in fact meaningful. This was carried out during the assessment of the country projects with the project partners.

3.3.1 Conclusions on criteria set

The main points from the analysis process can be summarised as follows:

- The criteria set seemed to be meaningful to the participants and they were able to assess the projects on these criteria.
- The original set of criteria seemed to be appropriate for the range of projects covered in this study. The number of criteria which contributed 90% of the weight in the decision encompassed most of the criteria set showing that most of the criteria listed above are indeed relevant and important in an assessment of this type.

- A new criterion, wider funds should replace the wider Base and Funds criteria

3.4 Improving Options

A comparison of the projects within the countries allowed an exploration of the advantages and disadvantages of the projects in their current context. This can be used to identify the actions that can deliver these improvements. An example from the current analysis is given below.

The sustainable wood project is compared to the biogas plant for Ghana and the results summarised in the following Table 3-1. The order of the criteria in the table is the largest advantage of the sustainable wood project is first and as we go down the table the size of the advantage over the biogas project decreases until there is a switch and then the criteria on which the biogas project perform better than the sustainable wood project are shown (Dwelling, security, land use and air pollution). In some cases the nature of the project and or the baseline situation is responsible for the better performance while in other criteria additional actions have been incorporated into the project which has improved its performance on the criterion. The MCDA approach allows this kind of analysis to be easily carried out. By pinpointing problems, redesign of projects to improve or give them balance can be undertaken.

Table 3-1: Comparison between sustainable wood project and biogas project in Ghana

	Advantages of sustainable wood project over Biogas project	Areas for improvement and key actions for Sustainable wood project	Areas for improvement and example Key Actions to improve the biogas project
Intermediate objectives			
Empowerment	Marginal Groups. Empowerment of women through new women's associations while biogas no empowerment except when use gas for cooking in dry season		Empowerment through the formation of women's groups
Land	Forests: Project provides a sustainable wood source close at hand while biogas has some effect from fertiliser		Depends on Project type Additional actions : sustainably managed wood source
Human	Skills: 11 trained and whole community plants trees while biogas minimal training for 3 and ministry has to fix		Training programme appropriate to project type properly carried out to make sure can be sustainable
Human	Time freed from collecting wood (1-5Km before). The biogas has seasonal time saving when wood too wet and use biogas		Project type, and services provided can address areas where time is spent in drudgery. e.g. provision of a mill
Financial	Funds: additional funds from world bank already and cooperatives can leverage funds while biogas project has not produced further funds		Future activities in the hands of the local community but if participation and management has been carried out well they should be in a position to do this.
Physical	Energy: Energy for cooking for wood project while Biogas has lighting and limited access to electricity for TV etc		Depends on resources available, Project type, and service provided as well as initial participatory planning

	Advantages of sustainable wood project over Biogas project	**Areas for improvement and key actions for Sustainable wood project**	**Areas for improvement and example Key Actions to improve the biogas project**
Financial	Income generation: Sustainable wood project has co-operatives which are businesses that increase income for women, harvesting income, beer brewing, cassava roasting. The biogas project provides savings in kerosene, vegetables for sale, drinking bars, shops		Initial planning backed by training programme. Does depend on project. Small enterprises can be encouraged
Financial	Sustainable wood is affordable for many. They do not pay for domestic fuel, only use fallen wood. If cut then costs 150cedis/kg biogas: savings 20% or 10% of income, those less than 150,000 cedis a month cannot afford service -about 50%?		Good organisation and planning for training etc in the implementation of project needed Have to pay attention to overall costs and replacement in future. Design to include most people
Land	Effect on habitats for sustainable wood is high with 7ha of new conserved area of forest Biogas has fertiliser improving soil and sustaining wildlife populations		May be an effect of the project type. Can take measures to conserve habitats or minimise effects depending on project circumstances
Empowerment	Social networks: In sustainable wood project there are cooperatives, women's associations and a community centre. For biogas lighting provides an increase in social gatherings		Implementation through participation and community involvement from the start and the service provided by the project. The provision of an additional facility such as the community centre is very important

	Advantages of sustainable wood project over Biogas project	**Areas for improvement and key actions for Sustainable wood project**	**Areas for improvement and example Key Actions to improve the biogas project**
Human	Jobs: 11 jobs with sustainable wood and 3 for biogas with indirect jobs in both cases.		Depends on size and type of project as well as good planning. A training programmes for jobs is required
Water	Water supply: forests encourage more rain so quantity increased for the sustainable wood project. For biogas the toilets, reduced chemical fertiliser and the dung collected all improve water quality		Project type or Good design of project to deliver relevant services Participatory discussions from an early stage. Measures to minimise adverse effects
Empowerment	Wider base : sustainable wood part of larger project and so effect is greater than for biogas which is also a showcase project		Projects have been used as a showcase and had a major effect
Human	Education: opportunity for education as not collecting wood Biogas provides light, watch programmes, radios, opportunity to study, adult education for a while.		Project type, providing opportunity or lighting service
Land	Food about same for both projects: sustainable wood and growing crops between trees. Existing farms moved but no effect, as planting farms and also trees at beginning then moved. However overall increase in food is temporary. Also were given Soya beans. Was a depleted vegetation area. Now some species medicinal. Biogas: set up vegetable farm next to project		Good design of project to deliver relevant services. Participatory discussions from an early stage Additional actions eg given seeds

	to use fertiliser (near Accra so income from market).. 20% seems to real		
	Advantages of sustainable wood project over Biogas project	**Areas for improvement and key actions for Sustainable wood project**	**Areas for improvement and example Key Actions to improve the biogas project**
Human	Health improvement about same for both projects Biogas gives a reduction in kerosene fumes, better waste management, organic vegetables, latrines while sustainable wood gives medicinal plants, less backache and less tired		Project type dependent and gave a range of benefits depending on circumstances of project. For example, biogas lowers risk of burns for kerosene.
Physical		Dwelling; improved wiring with biogas and no effect from sustainable wood	Project type, service provided and affordability as well as additional measures. Wiring , improved construction of dwellings
Empowerment		Security low crime anyway but streetlights for biogas project	Depends on project type eg lighting and additional actions
Land		Land use is small for biogas but large for sustainable wood as farmers had to be moved	Depends on Project type and baseline condition
Air		Air pollution reduction with less kerosene and possibly less methane for biogas while sustainable wood project emissions may be increased	Depends on Project type, baseline replacement.

3.5 *The Sustainability Assessment Model (SAM) for Small-scale CDM and development projects*

The results discussed briefly above show that the assessment approach we have developed in this study is feasible and workable for small-scale community projects. No other approach addresses these projects in this comprehensive yet practical way. Often macro indicators are used in other approaches.

The **SAM method** or **a Simplified SAM Procedure** is designed to be used in a host country context to enable a decision to be taken on the host country approval of a CDM project. The SAM model or the simplified procedure can be used in the following ways.

1. To compare a project with other possible projects or against a benchmark. This allows a comparison of the project and its implementation context to see how good it is for example against the benchmark project or against the Status Quo.
    - It also gives insights into how a project may be improved through additional actions.
    - SAM allows sensitivity analysis using the MCDA model on the Policies, Institutions and Processes to test and improve robustness and generate new or improved projects.
    - It allows characterisation of the benefits and gives an indication how they may be measured.
2. To audit the SD aspects using the criteria once the project is implemented.
3. To illustrate the crosscutting role of energy in the delivery of SD benefits.

In order to perform the assessments some of the practical aspects of using an MCDA model have to be considered.

3.6 *Methodology for application of SAM*

The decision to approve a particular project or set of projects is composed of the traditional decision steps. We discuss each of these steps in turn to highlight the issues to be considered.

3.6.1 Formulation of the Options

The model allows projects and their context to be compared. However it is clear from the analysis that project performance on the criteria depends on ***how*** the projects have been carried out and the particular baseline situations for the projects. A simple comparison on project type alone is therefore not meaningful.

From this study we have shown that the delivery of the benefits depends on

- ***The project type and service provided;***
- ***The additional implementation actions (How);***
- ***The baseline situation.***

- ***The size of the programme of small projects or the size of the independent small project is an important aspect for the assessment with the larger projects or programmes considered to be delivering more benefits.***

We therefore propose that the option set is defined in these terms so that the range of information for the assessment is available.

3.6.2 The criteria set for assessment

In a normal decision, the criteria are elicited for each decision context. In this case however for general applicability a criteria set has been generated through discussion based on the S-L approach. This criterion set has been tested for projects in three countries in this study and has been judged to be robust. Additional criteria from discussions have been added. The criteria set is summarised in Box A above.

3.6.3 Structure of the option set

What is meant here is that the option set can be composed in a way that will answer the decision problem. In this analysis we have compared the projects to the Status Quo in the countries which allows us to see how much better, or worse, the projects are compared to existing conditions.

In this project approval problem we suggest that the projects be compared to a Status Quo option and/or to a Benchmark project in terms of its delivery of sustainability benefits. A decision can then be taken with respect to the performance of the project to be judged relative to known existing projects or the situation with no intervention.

3.6.4 Benchmarks for use in the option set

For a host government trying to take a decision on the acceptability of a project on its potential to deliver sustainability benefits, projects could be regarded as acceptable if they can be assessed to be better than the Status Quo and be comparable to known 'good' benchmark projects. Proposed projects may also be improved by adding actions that have been taken to maximise the delivery of possible sustainability benefits in line with country priorities. However this approval does also depend on checking that the implementation actions are in fact actually carried out.

In Ghana the sustainable wood project stands out as a good project while the biogas project or SHS never fully realised their potential. Thus in Ghana we can recommend the sustainable wood project as a good standard for comparison to vet other projects. Of course a project does not need to be as good as the benchmark to be approved but the point is to be able to judge the relative performance of the project. It can also be better than the benchmark project chosen.

The system also allows for recommendations to be made on improving projects. The charcoal kilns project is a good example of this where the company focussed on its own needs and paid little attention to local needs or concerns. This is shown in Table 3-2.

Ghana

Table 3-2: Overall performance of the options in Ghana for host approval

Project	Sustainability for community	Balance
Sustainable Wood	high	Well balanced
Biogas Appolonia	Medium	Not Balanced More personal wellbeing actions required
SHS Kpasa	Medium to low	Not balanced More natural resource base actions required
Charcoal Kiln commercial	Low for community	Balanced, not many benefits for community

Kenya

In Kenya the Tungu MHP project and the sugar cogeneration project are very good projects while the Kathamba/Thima pico plant is assessed at a relatively lower performance because of its size though it is also a good project. The sugar cogeneration plant particularly addresses many of the social needs well above normal project requirements. The Tungu MHP project could be used as a benchmark for comparison with new projects. In common with Ghana all the projects are good projects compared to Status Quo but again they can be improved (Table 4-2).

Table 3-3: Overall performance of the options in Kenya for host approval

Project	Sustainability	Balance
Tungu MHP	high	Well balanced
Sugar Cogeneration	medium	A few more natural resource base actions required
PHP	Medium to low	More natural resource base actions but less than for cogeneration, size dependent

Tanzania

Table 3-4: Performance of options for Tanzania for host approval

Project	Sustainability	Balance
ICS	high	Well balanced
MHP	medium	A few more personal wellbeing actions required
Solar	Medium to low	A few more personal wellbeing actions required

In Tanzania the ICS project could be taken as a benchmark. The MHP seemed to perform well with again size differentiating between the options as well as the extent to which they are oriented to community needs. In this respect the solar hospital project performed less well.

3.6.5 Assessment of the performance of the options

Having defined the project options and structured the option set, the options can be evaluated on the criteria set given as described earlier. The weights on the criteria can be determined by the 'swing' weighting method and then the weighted sum of the scores over all the criteria are produced for each option in the model. This could also be carried out using a spreadsheet in a simplified procedure. From the results the performance of the options on the major trade-offs of 'Natural resource Base' and 'Personal wellbeing' can be determined to examine the balance in the options which is so vital for the avoidance of problems in the future.

It may be the case that the results show that some projects are not well balanced or are performing poorly overall. At this stage, we can explore the possibility of improving the options. For a host government it would be feasible for them to discuss improvements to be incorporated into the existing proposal to maximise benefits for the host provided they do not entail excessive cost for the developer.

3.6.6 Improving project options with additional implementation actions

We showed in our analysis that options could be analysed in the model to display their weaknesses and their strengths so that actions could be targeted to improve the options to provide balanced good performing projects.

The additional implementation actions are the key additional actions that deliver many benefits that would not otherwise occur. They are delivered through good design and attention to local needs through participatory approaches. The complexity of the problem can be seen from the fact that the performance of a project on the criteria depends on what is going to be done, how it affects the existing situation and how it is carried out, if sustainability benefits are to be realised.

Particularly the social and human criteria are more dependent on additional actions being carried out under the project than on the project type or baseline activities. This forms the basis of simplified recommendations for the use of this work.

Small-scale CDM projects to alleviate poverty at the rural community level must therefore be carried out with all the criteria in mind and with funding and people able to implement the project with the key additional actions.

In Table 3-5 examples of additional actions which can be designed into a project are collated. They are not an exhaustive list and many other appropriate actions may be undertaken.

Table 3-5: Examples of Additional Actions to improve options

Criterion	Generic dependence	Examples of Specific Implementation actions
Natural		
Food	-Project type dependent e.g. irrigation from MHP -Baseline activity	-Start new ventures e.g. vegetable farm near market -Give seeds -Replacement activities e.g. cattle grazing
forests	-Project type dependent e.g. ICS sustainable wood fertiliser from biogas -Baseline activity: e.g. tobacco curing with wood	-Active forest planting against erosion -Sustainable tree planting for community additional to project needs -Use of fertiliser
habitats	-Project type dependent e.g. sustainable wood -Baseline activity	-Planting programmes -Conservation measures
land use change	-Project type -Baseline activity	-Transition arrangements
air pollution	-Project type -Baseline activity	-Windows can be fitted -Chimneys can be fitted
GHG reduction	-Project type -Baseline activity	-Size and load factor
water supply	-Project type -Baseline activity	-Pumped water -Filtered water - Irrigation - Water treatment to minimise contamination coupled with treated drinking water to local community
Social and human	Some projects are not at community level	
marginal groups	Depends on how it is implemented	-Training programmes for women e.g. manufacturing, marketing, management -Community project management committee -Women allowed to make decisions in workshops -Women in co-operatives -Formation of women's' associations

wider base	Depends on how it is implemented	-Degree of donor involvement -Policy influence -Company level network -Projects as showcase
social networks	-Project type and baseline activity -provision of lighting service	-women's groups -community management -social hall -community centre provision -co-operatives
security	-Project type -Baseline activity	-streetlights
jobs	-Project type -Baseline activity	-Training to enable jobs to be filled -more jobs with larger size of project
freed time	-Project type and baseline	-focus efforts of project on drudgery activities e.g. replace milling, collecting wood, carrying water, sending messages
health	-Project type -Baseline activity E.g. biogas has better waste management	-refrigeration -clinic lighting -medicinal plants
education	-Project type -Baseline activity	-opportunity for more study with lighting service -TV programmes
skills	-Project type and service e.g. electricity supply encourages skilled work	-Training programmes e.g. agro practices, planting trees
Financial and physical		
income generation	-Project type -Baseline activity	-Training programmes
energy	-Project type and service -Baseline activity	-Participation in planning to make full use of opportunity -training in maintenance -technology transfer for spares and skills required -manufacturing base in country where possible
affordability	-Project type -Baseline activity	-Good management of project -Good training in financial skills -Provision of micro credit to reach the poor

infrastructure	-Project type -Baseline activity	-new road and dam with MHP -streetlights ,toilets, with biogas -water supply, charging for mobile phones, enterprise centre with MHP -new roads with cogeneration -community centre for sustainable wood project
dwelling	-Project type and service -Baseline activity	-wiring for MHP and biogas -improved housing stock with cogeneration
Other possible criteria		
Resource depletion	- Project type and service - Baseline Activity level	-Waste minimisation -recycling initiatives -alternative processes -increased efficiency
Supply chains	-Project type	- training programmes for skills - funding for new and clean sources
Local equipment	-Project type -Baseline activity	-training programmes to build skills for entrepreneurs -funding for start-ups -market analysis

3.6.7 Practical aspects of the use of SAM for small-scale community projects

The SAM approach can be used at two levels. The first is the use of the SAM HIVIEW MCDA model and the second is as the simplified SAM procedure.

3.6.7.1 The SAM evaluation decision model

The MCDA approach (DETR 2001) has been discussed at length in Attachment 3. It involves the use of the model HIVIEW and this should be used only after some training in decision analysis techniques and elicitation has been carried out so that a competent facilitator is able to guide the assessment. Such training is also available from the London School of Economics. The exercise carried out in this study showed that developing country partners appreciated the use of the MCDA approach and its potential to be applied to a range of development projects and problems, not just CDM.

In view of the relative complexity of using an MCDA model for the assessment it was considered useful to transform some of the elements of the model into a simplified set of instructions to lead people through an assessment. This is elaborated in the next section.

3.6.8 Simplified Procedure for Approval of small-scale community CDM (or development) projects in terms of Sustainability Benefits.

For the CDM, the overall approval of projects must take account of their financial additionality with respect to ODA and host government approval with respect to the delivery of sustainability benefits for the host country.

In order for the host government to carry out this latter task we have proposed either the use of the SAM model or a simplified procedure. This simplified approach is based on the criteria set that has been identified and discussed in the previous sections. Though the weights on the criteria were fairly evenly distributed in the three study countries the same results cannot be obtained by simple equal weighting. The weighting depends on the set of project options being evaluated and has to be justified in the procedure.

The approach has three main parts.

1. An introduction to the procedure.
2. A checklist with
    - A set of criteria and definitions
    - Instructions on how to score the projects on the criteria and how to weight the criteria
    - List of examples of key implementation actions for each criterion which could be added in to the design of the project to deliver the priority sustainability benefits if required (Table 3-5 above).

3. Data for comparison of project with Benchmark project

Ideally benchmark projects would be identified for a range of project types but this is unlikely to be available. What we have instead are some 'good' projects and lists of examples of key actions which could be included in the project design to improve the project and help to ensure the delivery of a balanced set of benefits.

3.6.9 Summary

The value tree for the assessment was derived through discussion about the Sustainable Livelihood approach as this addresses the community level of the project. Other approaches tend to use macro criteria at a national level or even the millennium goals as a starting point which are not necessarily appropriate to these small projects. A comparison with other studies showed that our approach is

- properly grounded in theory and practice of decision analysis
- does not use arbitrary scales
- assesses the project, the implementation actions and the existing baseline situation as a whole
- uses criteria which are based on the S-L approach and are tailored to the community projects
- does not judge projects only on total performance on criteria as this can be misleading
- examines the balance of the project on the major trade-offs

- allows the strengths and weaknesses to be explored for each option
- provides examples of actions which can be incorporated into the project design to mitigate weaknesses and improve balance in the projects.
- allows comparison with the Status Quo and Benchmark projects so that the relative preference for the option can be assessed

4 Analytical results for GHG accounting

The projects that have been analysed have been listed and described in section 2. In this section we discuss the results for the estimation of the GHG emission reductions from the projects in the three study countries.

The details of the analyses performed are described in Attachment 4 and are not discussed further here. The range of aspects covered for each project includes

- Baseline scenarios for each project,
- Project boundaries
- Uncertainties explored,
- Assumptions,
- Calculations,
- Detailed country contexts. The country contexts formed the background for the scenarios generated for exploration of the baseline conditions and are given as Attachment 2 to this report.

In the following sections we present the summarised results for each country and comparisons across project types and countries. A comparison is then made with the current guidance on small-scale projects and recommendations are made for the baseline methodology, the monitoring and the calculation of reductions. In conclusion the implications for bundling small-scale projects are explored and options generated.

4.1 Country results

Each project was analysed separately with scenario baselines constructed in line with the project situation. The results from these analyses are collated here within the countries and also across countries for suitable projects. *In each case we have left out the results from the continued additionality of the project and compare the results only on the other data uncertainties explored in the baselines.* Additionality uncertainty is discussed in a separate section below. Further explanation and details of the scenarios are in Attachment 4. The data for the reductions is expressed over the 21year crediting lifetime as total reductions. Where there is the possibility of equivalence of service then the unit reductions in terms of tCO_2/MWh is given. In attachment 4 we have discussed the situation where there is no possibility of equivalence of service between the project and the baseline and in that case we advocate a different approach where the data warrants it which is kg CO_2/capita/y for the unit emissions reduction measure. In the costs section where there are incremental cost savings which are negative then the unit incremental costs are not meaningful and are not included. In some cases data was not available. Full details are given in Attachment 4.

4.1.1 Ghana

	Total Emissions Reduction	Unit Emissions Reduction		Incremental Costs	Unit Incremental Costs
	$ktCO_2$	$kgCO_2$/ capita/ y	tCO_2/ MWh	M US$	US$/$tCO_2$
Appolonia Biogas	0.15±20% (for 9-12lkerosene/mth) 0.01-0.18 (for 20-80%compared to 80/20% biogas)	32-21 2-32		0.0002-0.004 0.011-0.0002	1-35 1-1200
Sustainable wood Nabari	1.85±24% with range of tree planting rates		1.5-1.71	-	-
Kpasa Solar homes	2.65±28% (7-12lkerosene/mth)	23-42		0.02 subsidised 0.48 un-subsidised	12 140
Greencoal project	Unsustainable wood, High and low inefficient kiln scenarios 32.5±54% Reduction due to neutral wood source mainly & efficient kiln. Transport emissions to Holland 0.8 to 2.9kt			0.92	106

Table 4-1 Summary table for Ghana projects

4.1.1.1 Discussion and recommendations

- The data uncertainties investigated in the projects contributed about 30% to the uncertainty of the emission reductions but can in the main be reduced by monitoring/surveys before the project (kerosene use) or monitoring during the project (tree planting rates or biogas production).

- However some uncertainties will need more work to resolve. Particularly in the case of the charcoal kilns, there is a wide variation in performance of the same type of kiln and we would suggest that further studies are required to obtain meaningful values for standardised approaches.

- The reductions were highest in the case of the greencoal project with unsustainable wood in charcoal kilns. This was due to the large size of the project. Though the Nabari sustainable wood fuel project relates to a cooking service, where much more energy is consumed compared to the lighting service, this reduction was not significantly higher than the Kpasa solar homes project. This is probably due to the large number of homes affected by the project in Kpasa. This is in agreement with previous studies (Begg et al 1998).

- Most carbon reduction costs were positive and high except for Kpasa where there was a subsidy that would make the project attractive for an investor.

4.1.2 Tanzania

Project	**Total Emissions Reduction**	**Unit Emissions Reduction**		**Incremental Costs**	**Unit Incremental Costs**
	$ktCO_2$	**$kgCO_2$/ capita/y**	**tCO_2/ MWh**	**M US$**	**US$/$tCO_2$**
Uwemba MHP project 893kW	41.5±18% variation due to project output uncertainty		0.77	0.6-3.1	13-102
ICS	6450±7% variation due to uncertainty in numbers of wood/charcoal stoves	365	2.5	-37 to -86	-15 to -6
Utete solar panels	33.5±13% due to project output variation on insolation		0.89-1.16	-142to +1119	-4 to 38

Table 4-2: Summary table for Tanzanian projects

4.1.2.1 Discussion

- For Uwemba and Utete, the project output proved to be inconsistent with other project data and was explored in the analysis. This project output uncertainty contributed between 13 and 18% variation. These variations are lower than those found for Ghana projects and would be removed by monitoring of the project output in both cases.

- The projects in Tanzania tend to be larger than in Ghana with the highest reductions coming from the ICS programme through the sheer size of the programme and the fact that it addresses cooking as a service which requires higher energy inputs.

- The incremental costs of the projects (project minus baseline costs) vary considerably with project performance and are cost saving in the ICS project, and in Utete for the higher project output case.

4.1.3 Kenya

The results for the Kenya projects are set out in the summary table below.

Project	**Total Emissions Reduction**	**Unit Emissions Reduction**		**Incremental Costs**	**Unit Incremental Costs**
	$ktCO_2$	**$kgCO_2$/ capita/y**	**tCO_2/ MWh**	**M US$**	**US$/$tCO_2$**
Tungu MHP	0.46±28% variation in diesel and wood use		1.37-2.32		
Sony sugar cogeneration with bagasse	119±7%		0.35-0.4	0.3	2-3
AHP tea MHP 1.4MW	14.5±3% variation due to grid mix minimised by 30% standby diesel		0.15	-3.4	
Kathamba pico hydro	0.93±18% variation from kerosene use		8.16-11.66	-0.08 to –0.12	

Table 4-3: Summary table for projects in Kenya

4.1.3.1 Discussion

- Much of the uncertainty in the calculations of emission reductions is arising from the baseline situation. Surveys for kerosene use before the project will be needed. Variations in the grid mix for Kenya had little effect due to the high Hydro component.

- The Tungu project though ostensibly larger than the Pico hydro at Kathamba has less emissions reductions, as the load factor is very low. Thus there is unused potential for further reductions in this project. In addition the consumption of diesel in a relatively efficient generator and woodburning compared to inefficient kerosene consumption also contributes to the higher reductions at the pico sites.

- The AHP project is cost saving while the Sony cogeneration plant incremental costs are low and could mean that this project is viable too.

4.1.4 Comparison on project size

A summary of the projects listed in order of size of plant giving both the baseline condition and the final reductions is presented in Table 4-4.

Table 4-4: Summary in order of size over all countries

Country	**Project**	**Baseline**	**Size**	**Reduction over 20y in ktCO$_2$**
Tanzania	ICS	Trad stoves	144MW	6450
Kenya	Cogeneration	Grid electricity	15MW	119
Kenya	MHP	Grid and diesel	1.4MW	52.2
Tanzania	MHP	Diesel generator	843kW	41
Ghana	Traditional wood	Unsustainable wood	38kW	1.85
Ghana	SHS	Kerosene	21kW	2.7
Kenya	MHP	Diesel and firewood	18kW	0.46
Ghana	Biogas	Kerosene	12.5kW	0.15
Kenya	Pico hydro	Kerosene	3.4 kW	0.93
Tanzania	solar	Diesel	0.9kW	0.033
Ghana	Efficient charcoal kiln	Inefficient kiln	720t/y charcoal	32.5
Kenya	Cement	Inefficient kilns		
Ghana	Capacitors	Inefficient power factor		

It can be clearly seen from the table that there is no direct correlation with project size and reductions and that other factors such as load factor play a major part in the quantity of reductions achieved by a project. Nevertheless, the larger the programme of small-scale projects or the larger the individual project then the greater the expected emission reductions would be.

Other key factors for reductions are the baseline fuel use and the type of service provided. These are investigated more closely in the following section.

4.1.5 Comparison across projects and countries

In this study only MHP projects can be easily compared across the countries. In the case of solar projects the nature of the projects is quite different with one being a large panel set in a hospital while the other concerned individual solar homes. Results from a previous study are therefore included for comparison (Begg et al 1998). The improved cook stoves are also compared with the results from the previous study, as there is no available cross-country comparison in the current study.

Table 4-5: Summary of across country comparison of projects

Country	Project	Baseline	Total Reduction $ktCO_2$	tCO_2/MWh
SOLAR				
Tanzania	Utete hospital solar 0.9kWp	Diesel generator	0.033	1.1
Ghana	Kpasa shs (410HH) 21kWp	kerosene	2.65	
Zimbabwe (1998 study)	SHS (9800HH) 0.4MWp	kerosene	45	
Kenya (1998 study)	SHS (20000HH) 0.28MWp	kerosene	13 over10y panel life	
HYDRO				
Tanzania	Uwemba mhp (843kW)	diesel	41	0.77
Kenya	Tungu MHP (18kW)	Diesel and firewood	0.46	1.87
	Kathamba pico (3.4kW)	kerosene	0.93	
	AHP tea MHP (1.4MW)	Grid and diesel	52	0.15
Sri Lanka (1998 study)	MHP 27kW	kerosene	0.9	
Sri Lanka (1998 study)	MHP 1.7kW	kerosene	0.13	
ICS				
Tanzania	120000stoves wood and charcoal 144MW	Inefficient stoves	6450	
Kenya (1998 study)	Wood, 1500MW	Inefficient stoves	41300 (15y)	1.4
Sri Lanka (1998 study)	450000 stoves 240MW	Inefficient stoves	3280 (15y)	0.84

4.1.5.1 Solar PV

The results across the countries studied including those from the previous study are consistent with the size of the project for the case of the solar homes with the baseline being kerosene use as would be expected. We have only one solar project where the baseline is diesel and in that case it is not consistent and has a lower emission reduction than the kerosene case. It is logical that the diesel generator is more efficient than kerosene lamps hence the lower reductions. It sends a signal that the baseline component is crucial in selecting a standardised baseline approach.

4.1.5.2 MHP

Unlike the SHS with kerosene baseline, the MHP project reductions are not linearly correlated to the size of the project. For the kerosene baseline projects, the variation in reductions does not follow the project generator size. These differences between Kathamba and the two Sri Lankan projects can be explained by variations in load factor between the projects and variations in kerosene consumption across the projects.

Where the projects have a diesel generator baseline or mixed diesel baseline then the size of the project again does not correlate with reductions. It may be expected that the reductions would depend on the load factor. However the reality is more complex with diesel being on standby for the AHP project with a load factor of 30% and grid being the main baseline emission source. For the Uwemba MHP which is theoretically about half the size, the baseline is a diesel generator with 22% load factor. The AHP project delivers only slightly more reductions than the Uwemba project because it has a mixed baseline with the grid emission factor for Kenya being quite low with a high proportion of Hydro. The Tungu baseline is a mixture of wood and diesel giving an uncertainty of 28% in the estimation of reductions. As discussed earlier, the reductions for Tungu are lower than might be expected because of the efficiency of the diesel generator in the baseline and the wood compared to kerosene lamps. Thus the projects studied, despite having the same technology, have very different baseline situations that will need to be taken into account in any standardisation process.

4.1.5.3 ICS

Again the reductions are not linearly correlated to the size of the project though the trend is clearly that larger projects have deeper reductions.

In all cases wood use was lowered by the project so that the baselines here are the same. We would suggest that the differences arise because of the difference in the type of wood and the amount of wood used in the baseline.

Again the standardisation of the baseline must take this into account.

4.1.6 Conclusions for standardisation and bundling

- The size of the project can only indicate a general trend for increased reductions with increased size of the project.
- The reductions are also dependent on what is substituted in the baseline. This in turn depends on the service being provided.
- What is substituted in the baseline can vary considerably for some project types. For example for Micro or Pico Hydro power and for Solar power the baseline can vary

from kerosene to diesel generators and grid electricity. For ICS the baseline tends to be consistent as inefficient wood stoves.

- It will be important in a standardised procedure to take account of these factors and provide differentiated baselines according to what is substituted.
- Current advice does not take account of this range of complexity.
- This has implications for bundling projects where care will need to be taken that in a mixed set of baseline conditions representatives of each baseline condition are taken for monitoring and verification.

4.2 Additionality uncertainty

In the baseline scenarios described above, the effect of some variations in crediting lifetime has been explored on the basis that for some projects there is a likelihood that they would have been done anyway at some point within a 21 year crediting lifetime. However the effect of the risk of a project becoming non additional within a given crediting period can be explored. From work carried out under the EU Probase project (Begg et al 2003), it has been shown that the effect on emission reductions associated with the risk of non-additionality of a project can be expressed as an uncertainty. Thus a correction factor for the risk of non-additionality can be suggested and used as a weighting factor for a baseline.

In the case of the EU study, a 25% weighting factor on a standardised baseline (ie 75% credited) was suggested as an average factor over a range of possible years (1-5y) of non additionality for large projects for a 10 year fixed lifetime. In this study we have considered only the 21 year crediting lifetime. This crediting lifetime has revisions every 7 years so that the non additionality risk is much lower. This is due to the fact that in the first 3-5 years predictions can be reasonably accurate and the main risk is only in years 6 and 7. Two years of reductions may therefore be erroneously credited with up to a maximum 30% relative uncertainty in the 7 year periods. This could equate to an average factor of about 10% applied to large projects but is not a large loss in integrity in absolute terms.

In the case of small-scale projects, such a correction would be small and could be another disincentive to carry out these projects. We would therefore suggest that a correction factor should not be used as the risk of non-additionality is generally low in developing country circumstances.

4.3 Comparison with EB recommended standard baseline methods

A comparison of the study results can be made with existing guidance on baselines, boundaries, monitoring and calculation of reductions for small-scale projects under the Executive Board for the CDM. Attachment 1 describes the current guidance in more detail but the main project categories are summarised here in Table 4.6 as we use these in the discussion of the results that follows.

Table 4-6: Project categories for small scale CDM projects

Project type	***Project Category***
Type (i) Renewable energy projects	*A. Electricity generation by User/Household* *B. Mechanical energy for the User/Enterprise* *C. Thermal energy for the User* *D. Electricity generation for a system*
Type (ii) Energy efficiency improvement projects	*E. E Supply-side energy efficiency improvements-Transmission and distribution* *F. F Supply side energy efficiency improvement – generation* *G. Demand side energy efficiency programmes for specific technologies* *H. Energy efficiency and Fuel Switching measures for industrial activities* *I. Energy efficiency and Fuel Switching measures for buildings*
Type (iii) Other project activities	*J. Agriculture* *K. Switching fossil fuels* *L. Emission reductions in the transport sector* *M. Methane recovery*
Types(i) to (iii)	*N. Other small scale projects (new or revised)*

In the following section we take the baselines for the projects according to the categories outlined in the EB guidance for Type (i) and then Types (ii) and (iii) as described in Table 4-6, followed by a comparison of the monitoring guidance with the analytical results for each project.

4.3.1 Comparison of Guidance for Renewable energy projects (Type (i)) for category A projects (Electricity generation by the user/household) with Analysis Results

This category is defined as 'renewable technologies that supply an individual household or user with a small amount of electricity. The generation capacity should be less than 15MW or less than 15GWh'.

The projects which come under this category are
Kpasa Ghana
Appolonia Ghana
Utete solar project, Tanzania
AHP MHP
Sony cogeneration

Uwemba MHP
Tungu MHP

We have taken each project in turn and compared our results with the recommended standardised approach. The results are summarised in Table 4-7.

Table 4-7: Comparison of EB baseline recommendations for Type (i) Projects with Analysis Results

Project	**Baseline conditions**	**UNFCCC recommendations for Baseline**	**Calculated reductions for UNFCCC baseline ktCO2**	**Calculated total reductions from analysis ktCO2**	**Comment**
Appolonia Biogas	Kerosene for lighting 9-12l/mth/ HH (Household)	Where the electric output is metered the baseline is the kWh produced times the emission coefficient for diesel power based on a 50% load factor No mention of CH4 reduction	0.09kt metering electricity output in this case does not guarantee that the biogas is the fuel burned		The standardised equation takes no account of the uncertainty in the biogas proportion and could overestimate if this is not monitored and the residual diesel use accounted for. Otherwise there is little difference in result.
		Where the electric output is not metered and liquid fuels are displaced the baseline is the fuel consumption of technology in use or would have been used times the emission coefficient for the fuel displaced.	As for analysis	0.15±33% (kerosene data uncertainty) 0.09±89% (biogas% uncertainty)	No difference in approach for baseline Project emissions must include all sources so residual kerosene and diesel use should be covered
Kpasa SHS	Kerosene for lighting 7-12l/mth/HH	Where the electric output is not metered and displaces liquid fuels the baseline is the fuel consumption of technology in use or would have	As for analysis	2.65±28% (kerosene data uncertainty)	No difference in approach

		been used times the emission coefficient for the fuel displaced Alternative from Table B1 for SHS is 75kg/y+4*Wp for 410 HH over 21y	 2.37 ktCO_2		 Result from SHS equation is in range calculated from kerosene use
Utete Solar 12*75Wp	Diesel generator for hospital	Electrical output is metered at 2.15MWh/y The baseline is the kWh produced times the emission coefficient for diesel power based on a 50% load factor from Table B4 using the SHS equation from Table B1 as above	0.059kt CO2 0.077kt CO2	0.033	Tendency to overestimate with this Table B4 EF[1] used compared to other standard values used in this analysis but is more related to characteristics of diesel generators according to the references used. Again an overestimate using B1 equation
AHP MHP for tea production This Project could come under this	Grid electricity and 30% diesel standby 98286MWh	Under A (electricity generation) or B (mechanical energy for the user) the project baseline is as follows Where the electric output is metered the baseline is the kWh produced times the emission coefficient for diesel power based	78.6kt CO2 The electricity produced is metered but the baseline is	52.2±3%	Uncertainty on which category this project belongs to as is mixture if grid and diesel generator. None are completely appropriate The only category which

[1] The simplified guidance from the EB (Annex B to UNFCCC (2002) FCCC/CP/2002/7/Add.3 Simplified modalities and procedures for small scale projects) contains recommended methodologies under the project types listed in Table 4-6. Under type IA a list of equations is given in Table B1 which apply to SHS and hydropower among others based on an ECN study. Under type ID Table B4 contains a list of emission factors for diesel generators for three load factors for a range of generator sizes.

category Type (i) A (electricity generation) or B (mechanical energy) or C Thermal energy for the user Or Type D electricity generation for a system)		on a 50% load factor It assumes a diesel only baseline and 4-6 hrs/day service and no grid Under Type (i) C Baseline is not relevant as it specifies fuel consumption or firewood though it does discuss replacing a fossil fuel system. Under type (i) D the baseline is the weighted average of the current generating mix or The operating and build margin baseline Using the MHP equation from Table B1	not diesel as assumed Not relevant Similar to the analysis 56ktCO_2		discusses grid electricity is Type (i) D for projects supplying into the grid UNFCCC categories available need to be widened MHP equation gives similar results
Sony cogener-ation with Bagasse 1.4MW	Replace-ment of a grid lighting service and grid for factory??	This is similar to the problem for the AHP plant above. The electricity generated by the plant is used to replace a grid lighting service and the factory grid use Under type (i) A (electricity generation) or type (i) B (mechanical energy for the user) the project baseline is as follows	253kt CO_2 The output EF used is 0.8	119kt CO_2 The output EF used for the Kenyan electricity system is 0.41kgCO_2/kWh	This type of project is best covered by the type (i) D baseline in the guidance and some modification is required.

		-Where the electric output is metered the baseline is the kWh produced times the emission coefficient for diesel power based on a 25% load factor (Table B4) It assumes a diesel only baseline Under Type (i) C This baseline is not relevant as it specifies fuel consumption or firewood though it does discuss replacing a fossil fuel system. Under type (i) D the baseline is the weighted average of the current generating mix or The operating and build margin baseline Output Emission factors times the output of the plant	This is similar to our analysis though the category is not appropriate Analysis result as for study		
Uwemba MHP Tanzania	Diesel generator Load factor 22% For lighting	Generation for a system Baseline for Type (i)D Annual kWh*EF for modern diesel of relevant capacity operating at optimal load discuss with Rona in Table B4	EF is 0.8 50.5kt	Calc 34-49ktCO2 Depending on project output	In this case the reductions are calculated on almost the same basis and the results differ only in the slightly higher EF recommended in Table B4 of UNFCCC Annex B on simplified monitoring and baseline methodologies.

Tungu MHP Kenya 18kW	Diesel generator for grain milling and firewood for tobacco curing	Diesel for grain milling Electricity generation for mechanical energy Type (i) B Where baseline would have been diesel generation then baseline is the mechanical energy produced (MJ) times 3.6 to convert to kWh times the emissions factors based on Table B4 for 50% load factor and the relevant capacity in this case 1.3 Firewood for curing Type (i) C thermal energy for the user Firewood consumption times emission coefficient for firewood	Measured total output is 12MWh Assumed 75% milling as for baseline 1 (9MWh), EF 1.3 0.23ktCO2 This is as for analysis	For baseline 1 75% milling the total reductions due to milling were calculated as 0.16ktCO2	The main problem is that there is no explicit guidance where there is a mixed baseline such as this. Information may not be available for the relative proportions of the activities and an approach to this is also needed. The method uses a high emissions factor for the generator due to the small size of the generator so that standard values as used in this analysis may underestimate the reductions

4.3.2 Comparison of Guidance for Energy efficiency improvement (Type (ii)) and other project activities (Type (iii)) with Analysis

The projects that are considered under this part of the existing guidance are
Greencoal Ghana
Sustainable woodfuel Nabari, Ghana
Cement efficient kilns, Kenya
Improved Cook stoves in Tanzania

The results of the comparison are summarised for each of the projects in the following table.

Table 4-8: Comparison of EB small-scale projects baseline recommendations and Analysis for other project types.

Project	Baseline conditions	UNFCCC recommendations for Baseline	Calculated reductions for UNFCCC baseline ktCO2	Calculated total reductions from analysis ktCO2	Comment
Greencoal Ghana	Inefficient kilns And sustain-able wood source	Type (ii) (H) demand side energy efficiency and fuel switching for industrial projects. The UNFCC baseline is specified by the energy use of the retrofit measures or what would have been built The emissions are calculated by the product of each energy form in the emissions baseline times the emission coefficient. Type (ii) (G) is an alternative but does not take account of the change in sustainable wood source	In this case the fuel is wood but the emissions from the kilns are a complex mixture of pollutants and variable in output so that the data on efficient and inefficient kilns is essential for the comparison. In principle the analysis carried out followed this but required much more data which should be included in the	Depending on sustainable or unsustainable wood source in the baseline the reductions are 4±125% Or 32.5±54%	New guidance is required for this type of project. An indication is given in this analysis. The wood source has to be in the project boundaries

			guidance		
Woodfuel Ghana	Sustain-able wood source	There is no suitable category for this project type . The current Types (ii) (H) or (I) are specified for industrial facilities or buildings while the switching fossil fuels does not apply (Type (iii) (K)		The analysis was based on the substitution of unsustainably sourced wood with sustainably sourced wood 1.85±24% due to uncertainty in rate of tree planting. This would have to be monitored	A new category is required for this project type. The calculation is based on the amount of fuel used (which would have to be monitored by surveys) and the emission factor for wood.
Cement Kenya	Improved efficiency kilns	This project could be described under Type (ii) (H) energy efficiency and fuel switching for industrial technologies The baseline is based only on the electricity use of existing equipment if a retrofit as is the case here corrected for transmission and distribution losses for the grid. The emissions factor is that specified under type (i) D. operating and build margin method or the weighted average of the current generation mix			A specific category for small cement works could be added which can allow for process emission reductions if required. Some guidance on equivalence of service is also required.

		or dispatch data. For cement in addition to energy savings from efficiency improvements some projects may reduce the process emissions from the clinker production			
ICS Tanzania	Improved efficiency cook stoves	This project is a programme of small energy efficient stoves and comes under Type (ii) (G) This is the only type to take account of programmes of small projects. This type discusses only energy displaced as fossil fuel or as electricity while in this project it is wood There is no provision for equivalence of service. It is assumed that the same service is provided more efficiently.	In principle the method should follow the advice on fossil fuel which is the fuel use multiplied by the emission coefficient for the fuel for the baseline emissions and compared to the fuel use for the project.	The method used in this study follows this principle for wood. The analysis result was 6450ktCO_2±7 % with uncertainty in wood or charcoal stove relative numbers It should be noted that the lifetime of the stove is usually 3 years so that the calculation of the reductions has to calculated for each stove	ICS is not mentioned or catered for in this guidance but it would require little modification of the existing guidance to include wood as a fuel. The number of stoves and lifespan are required data However the restriction of 15GWh could be problematic as it is difficult to be precise about the number of hours for which the stoves operate. In this case the full 180000 of the programme could not be counted. It would have to be in the region of 90000 assuming stoves are used for 4 hours a day 365 days a year. This restriction seems unnecessary as the project cannot be considered as a

				for 3 years or the lifespan of the stove only and summed over the number of stoves rolled out in the programme.	large project due to the small-scale nature of the individual stoves.

4.3.3 Comparison of Guidance for calculation of reductions and for monitoring with Analysis Results

A comparison is made in the following section between the guidance from the EB on monitoring for the specified project type and the actual requirements for the project derived from detailed analysis of uncertainties. The results are summarised in the following Table 4-9.

In the table, we list the implied monitoring requirements from our study and compare them to the monitoring guidance provided by the EB. For the Utete solar project, the AHP, Sony and Uwemba projects, the advice based on metering electricity consumption was appropriate. However for the other projects there were some problems.

Table 4-9: Comparison of UNFCCC recommendations for calculation of reductions and for monitoring

Project	Baseline conditions	UNFCCC recommend-ations for monitoring and calculation of reductions	Uncertainty Analysis Recommendations	Comment
Appolonia Biogas	Kerosene for lighting 9-12l/mth	Metering the electricity system or sample where the baseline is based on the electricity produced. Reductions are subtraction of project from the baseline for the project output so assumes equivalence of service	Kerosene consumption surveys before and *after the project on random sample basis.* Checks to see that biogas/diesel ratio maintained are needed. *This could not be done purely on the metered electricity output* Reductions cannot be based on equivalence of service between project and the baseline for lighting with kerosene. Simple subtraction is OK but projects cannot be compared easily.	The UNFCCC monitoring approach cannot be used for this project as the baseline has no electricity produced. It needs to be expanded to include fuel use before and after the project. It neglects the problem with the biogas/diesel mixture with the need to ensure that the biogas input is maintained Monitoring of the biogas component would be required in addition.
Kpasa SHS Ghana	Kerosene use (7-12l/HH/mth)	Annual check that all systems or sample needed to ensure still operating where baseline is from Table B1. Reductions are simple subtraction of project from	Kerosene consumption surveys before and *after the project on random sample basis* Reductions cannot be based on equivalence of service	The UNFCCC monitoring approach checks that SHS systems are still working when using standard equation If kerosene based there is no guidance on monitoring

		the baseline	between project and the baseline for lighting with kerosene. Simple subtraction is OK but projects cannot be compared easily	before and after project.
Utete Solar Power	Diesel generator for hospital	Metering the electricity system or sample where the baseline is based on the electricity produced. This is equivalence of service	As for UNFCCC	This is the correct monitoring advice for this project
AHP MHP in Kenya	Grid electricity and 30% diesel standby	Metering the electricity system or sample where the baseline is based on the electricity produced. This is equivalence of service	For Kenya there is no large effect of projected changes in the electricity supply system so that the result is not sensitive to future projections of the grid emission factor in Kenya. The 30% diesel standby also buffers the sensitivity of the reduction to these changes.	The monitoring advice from Type A /B C is relevant
Sony Cogenerati on with Bagasse	Grid electricity	Metering the electricity system or sample where the baseline is based on the electricity produced. This is equivalence of service	As for AHP plant above. There is no diesel standby but Kenya emission factors for grid only vary by 7%	The monitoring advice from Type A /B C is relevant
Uwemba	Diesel generator for lighting service	Metering the electricity produced by the renewable technology. This is equivalence of		This monitoring advice is relevant

		service		
Tungu MHP	Diesel for milling and firewood for tobacco curing	Metering system output by all or sample of systems Metering the thermal energy or sample thereof for tobacco curing		The first part on milling is relevant to the project the amount of wood use before and after the project is needed for the thermal energy part and the amount of tobacco cured. New additional advice is required here
Greencoal project Ghana	Improved efficient kilns and sustainable wood source	For retrofit the recommendations are for documenting the specifications of the equipment replaced, metering the energy use of the equipment installed and calculating the energy savings. In this case this would not be quite correct as there are two aspects. One is the shift to sustainable wood and the other is the change in pollutant emission concentrations with the new technology	We would suggest that experimental data on the emissions from typical kilns is generated to give more data for use in the baseline and new technologies must have their emissions characteristics specified. In addition the amount of wood use needs to be closely monitored for this project and its source if it is to be considered sustainable.	The UNFCCC advice does not apply to this project. New advice as suggested is required with some guidance on equivalence of service in terms of tonnage of charcoal.
Nabari woodfuel	Sustainable wood source	No available project type	In this case the amount of wood used in the project	New advice as described

project			would need to be established by surveys Checks to ensure sustainable practices are maintained	
Cement Kenya	Improved efficiency of kilns	. For retrofit the recommendations are for documenting the specifications of the equipment replaced, metering the energy use of the equipment installed and calculating the energy savings. Clinker data is also required	In this case the energy bills for the company should be available before and after the project. clinker data is also required if there are process reductions	Again there is no direction on equivalence of service between the project and the baseline eg in terms of tonnage of cement A standardised methodology has been also been developed by Sathaye et al (2001) for these projects and this could be tested for incorporation
ICS Tanzania	Improved Cook stoves	There is no existing category and wood as a fuel is not mentioned in Type (ii) (G)	Wood use for cooking before and after project	Surveys of the wood use before and after the project on a spot sampling basis are required. The number of stoves sold and the lifetime of the stoves

4.4 Implications for Standardised approaches to baselines for small-scale projects

This study has examined a range of project types in different countries, which has shown that project type does not give a simple guide to the relevant baseline for a project. There can be many different baseline circumstances for a given project type and some widening of the existing guidance is recommended to increase flexibility of application.
Though the detailed comparison with the existing guidance from the UNFCCC Executive Board has been outlined in the Tables above some general summary points can also be made.

- What is substituted in the baseline can vary considerably for some project types. For example for Micro or Pico Hydro power and for Solar power the baseline can vary from kerosene to diesel generators and grid electricity. Current advice does not take account of this range of complexity and extended baseline options and specific advice for projects with mixed baselines is required.
- The principle that where possible, there should be equivalence of service between the project and the baseline is implemented through the use of the project activity level for calculating the reductions. However in some cases in the energy efficiency category no specific direction is given and this needs to be added eg for equivalent tonnes of charcoal produced in project and baseline.
- Many of the projects do fit the available categories but new guidance on methodologies is needed for cement kilns, charcoal kilns, sustainable wood projects.
- Though for some projects there were appropriate categories we found that for most of the projects some modification is required in the recommended guidance. An example is Tungu that has a mechanical component and a thermal component. In this case two categories are required. In addition the guidance for the mechanical energy produced an underestimate of the emissions while for the Uwemba MHP an overestimate was produced. For the Sony cogeneration and the AHP MHP where the baseline was grid electricity the guidance did not provide for such a baseline but could easily be expanded to cater for this.
- There is currently no appropriate guidance for ICS and a modification of Type (ii) (G) is required to include firewood. There is also the problem of the size of the programme involving these small projects, as the whole ICS programme in Tanzania could not be counted as <15GWh reduction. Since it could not be considered as a large-scale project because of the nature of the household level of the equipment, this would seem an unreasonable restriction.
- The SHS project at Kpasa was able to be properly processed using the baseline guidance either on kerosene or using the solar power equation. On the other hand for the solar project at Utete, both the diesel and the solar equations overestimated the reductions.
- Some closer examination of the environmental integrity of the equations and emission factors, suggested in the EB guidance Annex B, is required especially with regard to emission factors for different sizes and load factors for diesel

generators. If these emission factors are to be applied widely then we suggest that they should be modified, as they do not give conservative estimates.

4.5 Implications for Monitoring

- The biogas project requires two main issues to be addressed. One is the kerosene use before and after the project needs to be sampled (which was not covered in current guidance on monitoring though mentioned in the baseline advice). The other is the biogas component of the fuel for the generator is crucial for the final reductions and their environmental integrity. Spot checks will be required on the biogas composition. This has to be explicitly included for this project type where there is a possibility of more than one fuel for the generator.
- The monitoring advice for the Kpasa SHS and Biogas project is based on metering electricity in the baseline and does not mention the kerosene use before and after the project. The existing guidance on monitoring is therefore insufficient if the standard equation is not applicable.
- In the projects where the baseline is kerosene use, we recommend that monitoring is minimised by taking a conservative value for the baseline kerosene use based on an initial country survey which could then be applied to all projects in the country.
- For the Tungu MHP project the guidance was also insufficient for the thermal parts of the baseline and new guidance along the lines suggested is required.
- No relevant guidance was available for the charcoal greencoal project, the sustainable wood project, the cement kilns project, the capacitors or the Improved cook stoves project. For the ICS the lifetime of the stove before replacement and the number of stoves is required. Monitoring recommendations are given from the analysis in this study in the table.
- The uncertainty analysis has helped to pinpoint key variables which need to be measured to maintain integrity.

4.6 Bundling

For small-scale projects, the transaction costs incurred for the projects presents a significant barrier to the implementation of these small-scale projects under the CDM. These costs are associated with the ease by which the baselines and monitoring plan can be generated, validated, monitored and verified by an operational entity. They are recognised to be very high compared to the project costs and the expected revenue from the sale of CERs. (Michaelova and Stronzic 2002, KITE 2003). The different aspects of transaction costs are discussed in Attachment 4 under Bundling.

In the following sections we discuss the issue of size of project in relation to the projects in this study and the issue of common elements for baseline standardisation. Institutional arrangements are dealt with in Attachment 5.

4.6.1 Suitability of current projects in terms of size

Michaelova and Stronzic (2002) categorised projects according to size in terms of total reductions and correlated this with expected costs and cost of reductions per tonne carbon dioxide. Their categories were

- Large (wind solar thermal) giving reductions of 20000-200000tCO_2/y

- Small (boiler conversions, DSM, small hydro) giving reductions between 2000-20000tCO_2/y
- Mini (energy efficiency in housing , SME, mini hydro) 200-2000tCO_2/y
- Micro (PV) <200 tCO_2/y

They suggested from this rough guide that projects of 20000t CO_2/y were needed before the cost of the reductions would make the project attractive to investors.

Taking the table of projects listed by size we can label the projects using the colour scheme indicated.

Table 4-10: List of projects and sizes

Country	Project	Baseline	Size	Reduction over 20y in $ktCO_2$
Tanzania	ICS Programme	Trad stoves	144MW 30-60GWh/y reduction project would need to be halved in size to meet 15GWh restriction	6450
Kenya	Cogen	Grid electricity	15MW	119
Kenya	MHP	Grid and diesel	1.4MW	52.2
Tanzania	MHP	Diesel generator	843kW	41
Ghana	Trad wood	Unsustainable wood	38kW	1.85
Ghana	SHS	Kerosene	21kW	2.7
Kenya	MHP	Diesel and firewood	18kW	0.45
Ghana	Biogas	Kerosene	12.5kW	0.15
Kenya	Pico	Kerosene	3.4 kW	0.93
Tanzania	solar	Diesel	0.9kW	0.033
Ghana	Eff charcoal kiln	Inefficient kiln	5GWh/y	32.5
Kenya	Cement	Inefficient kilns		
Ghana	Capacitors	Inefficient power factor		

It can be seen that the ICS project in Tanzania is already a bundled project. It is the only one likely to have transaction costs spread over the projects sufficiently to make the project viable in terms of transaction costs for the CDM. In fact it may be over the limit for small projects which as pointed out earlier would be counterproductive. The advice on debundling from the EB would mean that only part of the project could be eligible for CERs.

The Ghana SHS is also bundled in a sense, but like all the other projects is too small, and would have to be bundled further in some way.

4.6.2 Implications for Bundling from the Analysis

The results from our analysis have an impact on how projects can be bundled to effectively maximise the time savings associated with the simplified procedures for fast tracking projects. From the discussion above a target of at least 20000tCO_2/y for the reductions from a set of projects has been identified (Green et al 2003) so that the number of projects included in the bundled project should be able to be identified.

This should also ensure that the CERs represent a significant percentage of the net revenue. In the following sections we explore the possible bundling options with respect to the projects in the study firstly from the baseline point of view and then from the monitoring aspects.

4.6.3 Bundling options and Baseline standardisation from the analysis

In the set of projects examined in this study, it is clear that similar project types do not necessarily have similar baselines. For example for the MHP projects the range of mixed baselines was high and ranged from kerosene to grid electricity. This does not apply to ICS or to SHS projects where wood fuel or kerosene is usually replaced.

Simplified baseline modalities can be applied where the baseline situation is similar or there are only a small number of standardised baselines needed to describe the bulk of the projects. Thus the focus has to be on what is being replaced in the baseline as well as what service the project is providing. For the MHP projects in Kenya, the service provided and baseline are listed in the table below.

Table 4-11: MHP projects in Kenya with varying baselines

Project	Service	Baseline	Comment
Tungu	Electricity for local enterprise centre Heat for Tobacco curing	Diesel generator Wood fuel	Mixed baselines
Kathamba Pico Hydro	lighting	kerosene	Simple baseline
AHP tea MHP	electricity for factory and lighting	Grid electricity	Simple baseline

From Table 4-11 it can be seen that in the same country we can have a whole range of different baseline conditions for the same project type. However simplified baselines can be applied for these types of projects, and even with this diversity, bundling over a larger sample would be possible provided the baseline situation is known for each and that they fall into limited categories such as those in the table above.

Similarly if a series of projects are of different types the diversity of the baseline situation is all that matters in terms of minimising the complexity. Table 4-12 illustrates this for different projects.

Table 4-12: Mixed type projects with similar baselines

Project	Service	Baseline	Comment
Pico Hydro eg Kathamba	lighting	kerosene	Simple baseline
Biogas project such as that in Appolonia Ghana	lighting	kerosene	Simple baseline
SHS projects such as Kpasa in Ghana	lighting	kerosene	Simple baseline

It is interesting to consider how projects may be bundled to maximise the benefits for GHG reductions and for sustainability. With this in mind, one could envisage projects complementing each other to maximise the range of sustainability benefits as in Table 4-13.

Table 4-13: Projects with complementary benefits

Project	Service	Baseline	Comment
SHS	lighting	kerosene	Simple Baseline
MHP	Electricity for enterprises	diesel	Simple Baseline
ICS project	Cooking	wood	Simple Baseline
Sustainable wood project	Carbon neutral source for cooking	Unsustainable wood	Simple Baseline

Green et al (2003) also propose some options for bundling where

- there could be a range of project types/sectors bundled together
- over a range of countries
- a bundling organisation is set up and funded by commercial enterprises

However from their conclusions too much diversity in the first two factors would tend to increase the risk of failure due to lack of control with no clear standardisation of the baselines.

From this analysis we would agree that a range of countries would be too difficult in practice but the kind of synergies discussed above would be possible combinations for bundling and using standardised baselines. Our proposals for bundling options are listed below.

- ➢ same project type with limited number of standardised baselines
- ➢ different project types providing a similar service and with similar baseline conditions
- ➢ different project types which are complementary to the needs of the target community or company but with a limited number of standardised baselines

4.6.4 Bundling options and Monitoring requirements

The other key factor for minimising costs in the project cycle is in the monitoring requirements that affect the costs of monitoring and verification. From this analysis we suggest that the bundling options described above do have feasible monitoring implications. Taking each in turn we examine the requirements.

Table 4-14: MHP same project type /different baselines

Project	Service	Baseline	Monitoring
MHP project such as Tungu	Electricity for local enterprise centre Heat for Tobacco curing	Diesel generator in neighbouring village Wood fuel	Metering for plant Surveys of wood fuel use before and after project Survey of deployment numbers
Pico Hydro e.g. Kathamba	lighting	kerosene	IF Equation from Table B1 (UNFCCC) then only surveys to see deployment and operational. (Standardised equation is not reliable) or deployment numbers and kerosene surveys before and after project
MHP such as AHP tea	electricity for factory& lighting	Grid electricity	Metering for plant Surveys or records of deployment numbers

For projects with similar baseline conditions

Table 4-15: Mixed type projects with similar baselines

Project	Service	Baseline	Monitoring
Pico Hydro eg Kathamba	lighting	kerosene	IF Equation from Table B1 (UNFCCC) then only surveys to see deployment and operational. (Standardised equation is not reliable) or kerosene surveys before and after project and deployment numbers
Biogas project such as that in Appolonia Ghana	lighting	kerosene	Biogas use spot checks Deployed numbers Kerosene use surveys or use of standard equation
SHS projects such as Kpasa in Ghana	lighting	kerosene	Deployed numbers Spot check are operational Kerosene use surveys or use standard equation

For projects where there are synergistic benefits both for the GHG reductions and for the sustainability benefits then the monitoring can be standardised on a few variables as follows

Table 4-16: Projects with complementary services

Project	Service	Baseline	Monitoring
Community projects			
SHS	lighting	kerosene	Use weighted equation or kerosene use surveys before and after Deployment numbers Spot checks are operational
MHP	Electricity for enterprises	diesel	Electricity metering Deployed numbers
ICS project	Cooking	wood	Deployed numbers. Lifespan, Spot checks to ensure are operational. Surveys for wood use before and after
Sustainable wood project	Carbon neutral source for cooking	Unsustainable wood	Hectares planted Sustainable practices maintained Survey of wood use This can applied across country for all projects

4.6.5 Recommendations

- The bundling of projects could be carried out under a variety of formats to minimise the costs of the baseline construction.
  - The simplest is to have a large programme of the same type of project eg ICS or SHS with the same baseline. Other formats include
  - Projects of different types but the same baseline conditions (the ICS and SHS are a special case of this as they do usually replace wood/charcoal or kerosene use respectively)
  - Projects of the same type but with a limited number of different baseline conditions
  - Projects which can complement each other in terms of GHG reductions and sustainability benefits with limited number of different baseline conditions.
- The monitoring information can be derived from limited spot sampling on representative projects to keep down costs and from general surveys within the country.
- These surveys to measure for example, wood and kerosene use, can then be applied to all subsequent projects to be bundled in that country.
- The reductions can be calculated either using the standard baseline equations in UNFCCC Tables B1 and B4 with some checks to prevent overestimates or through the baselines suggested from the analysis.

- The reductions should be calculated for one representative project for each baseline type and then multiplied by the numbers deployed and operational, maintaining equivalence of service where possible and taking account of the lifetime of the technology (e.g. ICS 3 years).

Bundling of projects also requires consideration of the institutional structures in the country and the capacity building requirements for these projects. These are discussed in Attachment 5 to the main report and in the following sections.

5 Capacity Building and Institutional Structures for small-scale CDM projects

Capacity building has taken place throughout the project on the issues discussed above with country partners and with targeted stakeholders in each country. A meeting of all the partners was held near the start of the project. The first workshops with the targeted stakeholders were successfully held to raise awareness of the project and the CDM and enable stakeholders to become engaged with the study. On the extra country visits contacts were made with government officials to raise awareness and discuss priorities as well as capacity build with country partners. At the final workshops the results of the project were communicated to a range of stakeholders who were then engaged in discussion groups. Under these groups, barriers to the small-scale projects in the partner countries were elicited along with actions to overcome the barriers. In addition the problem of special institutional arrangements for small-scale projects was considered and some initial possible structures suggested. These results have been summarised and structured over the three countries to provide insights into where actions need to be targeted and how much still needs to be elaborated if small-scale projects are to be successfully implemented.

Most of the following data comes from the final workshops held in each country. Attachment 5 describes the capacity building and institutional structures discussion in more detail. Further information can be found in the country reports of the final workshops.

5.1 Actions to overcome barriers for small-scale CDM projects from country workshops

In the workshops, one of the discussion sessions addressed the question ***'What can be done and by whom so that small-scale energy projects can be implemented under the CDM to achieve GHG reductions and sustainability benefits in terms of short term and long term measures'.***

The groups in each country workshop first of all discussed the barriers to CDM projects and then ways in which they could be overcome. The barriers discussed in the different groups are amalgamated here for each country for ease of comparison along with the actions to overcome the barriers that were suggested. In each country the findings of the groups had several elements in common and in this amalgamation we have tried to ensure that no perspectives have been lost. The results are illustrated in Table 5-1.

5.1.1 Conclusions

It can be seen that the perceptions of barriers across the countries have many elements in common. Common barriers were grouped under the following headings.

- Lack of awareness and CDM knowledge
- Financial barriers
- Technology barriers
- Institutional Barriers
- Poverty social and cultural barriers
- Lack of existing baseline data

- Infrastructure limitations for communications

Other barriers included Network of competence barrier and Specific CDM competence barrier. These are important subsets of the technical barriers and are dealt with separately in the table.

This list has been generated by people who are in the country and involved in the process. It forms a comprehensive guide to governments, donors and NGOs of what needs to be done and the immensity of the task. Actions can be targeted using this list as a starting point.

It is clear that financing the capacity building actions is a priority if the CDM is to be implemented successfully on a reasonable scale. Host governments do not have the capacity or funding to do this entirely on their own. It will be imperative as well that host countries do ratify the Kyoto Protocol. The World Bank initiative the CF-Assist programme is well targeted in this respect.

5.2 Common developments and needs in the case study countries

A number of similar developments in Kenya, Tanzania and Ghana, can be identified as well as similar gaps in development so far. Progress and gaps are summarised below for a number of topics.

5.2.1.1 National structures and policies

Progress: The Kyoto Protocol has been ratified by Tanzania and Ghana but not by Kenya. Some national structures for the CDM are in place. Future strategies on energy, development and sustainable development have been formulated or are in the making.
Lacking: Institutional Structures are not in place (e.g. only a handful of experts who are overburdened) and policies are incomplete (e.g. priority sectors/projects), in particular with regards to the technicalities of the CDM. A legal framework is often lacking.

5.2.1.2 Capacity building

Progress: Significant capacity building efforts have taken place at the central government level and in the (formal) industry and energy sectors.
Lacking: Awareness had been raised mainly at high levels with no linkages to the grass roots. Other stakeholders have not been sufficiently reached, including local government, the legal sector, NGOs, receptor groups (local community), but also investor groups, project developers, the financial sector. Different stakeholder groups have different information requirements and need to be targeted differently.

There is insufficient capacity and resources to implement the CDM especially for auditing and trading know-how, baselines know-how for projects, monitoring and the other issues required in the Project design document. Sustainability assessment tools are lacking for assessment of sustainable development contribution of projects (see Attachment 3).

5.2.1.3 Financing

Progress: A number of organisations for financing activities are commonly active across the countries. For the CDM, these include UNIDO, UNDP, PCF, DFID,

NORAID, the Dutch government. Complementary to the CDM, there is financing for renewables through the World Bank, GEF, Spain, IFC, DANIDA, DFID, GTZ, CIDA, SIDA, USAID, EU.
Lacking: There is an urgent need to increase the sources of financing. The private sector (especially domestic) is not sufficiently involved. Investor groups, potential project developers and the financial sector are insufficiently aware of the opportunities that the CDM can bring to them. The World Bank CDCF will help in this but here are signs that local institutions are beginning to take notice e.g. South African Development Bank.

5.2.1.4 Sectors

Common needs were identified in all sectors but SMEs, transport and the agricultural sector should be targeted more for the CDM
Progress: A number of large-scale initiatives have been put forward, including market reform/liberalisation.
Lacking: More small-scale projects needed in these sectors, as these are expected to provide more direct SD benefits.

5.2.1.5 Data

Progress: All countries have done or are doing their GHG inventories.
Lacking: Sufficient and good quality data are still a problem.

Table 5-1 Barriers to the CDM and Small-scale Projects with Actions to Overcome the Barriers for each study country

Barrier	Tanzania	Kenya	Ghana
➢ ***Awareness and knowledge barriers*** ➢ **Lack of Knowledge of CDM for Small-scale for Decision makers, Financial sector and general public** ➢ **Complexity of CDM** ➢ **Lack of political will and Attitude of government officials because not knowledgeable on the subject.**	➢ Awareness to government officials and policy makers eg Introduce policy maker to different ways of obtaining information on CDM e.g. Website ➢ Set pilot Projects as models, demonstrations by government ➢ Training & workshop (formal) eg by UN organisations and donors, short courses eg by NGOs ➢ Newsletters, ➢ Use media newspapers/pamphlets etc ➢ TV, Pamphlets ➢ Undertake training and conduct awareness raising, This can be done by Expert on CDM, Universities, Media, Politicians, NGO's –CEEST, CBOS, Teachers	➢ Use ICT to create information exchange nationally and internationally ➢ Develop appropriate media content and deliver to the public through national and local media in various languages. By focal point offices and NGOs. ➢ Awareness creation for politicians, financiers and communities. ➢ Advocacy for CDM stakeholders. ➢ Popularise CDM ➢ Develop criteria for mass education ➢ Communication at all levels i.e. technical policy makers, implementers and beneficiaries i.e. trickle down information system ➢ Decentralise information	➢ Vigorous Advocacy: since the CDM is linked to all the sectors including health, energy and the Poverty Reduction Strategy, efforts must be made to explain these issues to the people at all levels of the decision – making process.

	➢ Awareness raising campaigns for local investors/financial institutions ➢ Knowledge of criteria for eligibility of funding ➢ Education – Curriculum changes (Ministry of education & universities)- long term ➢ E-training sponsored by government , universities, donors	access points like media print and electronic ➢ Keep abreast on information on CDM and Climate change	
Financial Barriers ➢ **Financial capacity to implement projects** ➢ **Higher cost of small-scale project for poor** ➢ **Higher imports duties and tax rates** ➢ **Difficult to borrow** ➢ **High cost of finance** ➢ **High risk factor** ➢ **Concentrate only on commercial aspects** ➢ **Resources to carry out capacity building** ➢ **Lack of resources (especially NGOs)**	➢ National budget should be allocated to this project ➢ Use of private sector to invest in this sector ➢ Assistance as provided for in the Kyoto protocol To be done by Government, Private sector, Financial institutions, Kyoto Protocol ➢ Creation of financing schemes ➢ revolving funds ➢ loans and guarantee ➢ subsidies ➢ tax holidays ➢ Trust funds for CDM (Long term) ➢ Set up financing facility for loans or grants	➢ Provision of credit-banks, government and development partners ➢ Private sector to finance as tax incentives ➢ Provide innovative financial products ➢ Develop favourable legal and fiscal environment ➢ Create awareness with bank for viability of small-scale energy projects ➢ Long term profitability/return/benefits ➢ Off shore Guarantors to reduce risks ➢ Create community awareness with banks	➢ Funding: internally generated funds (e.g. energy fund generated from fees on petroleum products and electricity); grants (e.g. from CDM support and Global Environment Facility); loans and community levies for the CDM (i.e. paying for the benefits they will receive). ➢ Reduce costs through early project identification and also bundling of projects together

	➢ Incentives in fiscal policies e.g. tax reduction , Reduce / remove import duties ➢ Regulatory frameworks clear for investors ➢ Higher funding priority to CDM projects ➢ Locally designed, cost effective equipment etc	➢ Tax benefits ➢ Establish energy service companies (ESCO) ➢ IFC should fund these projects ➢ Operate CDM projects as a business venture ➢ Provide resources to both private sector and government, not just an NGO affair ➢ Private organisations to finance as part of social responsibility ➢ Establishment of trust fund managed by government and private sector and stakeholders ➢ All stakeholders to provide finances i.e., government private sector and development partners	
Technical Barriers ➢ **Lack of capacity for local technology** ➢ **Information on reductions (technical capacity and information)**	➢ Integrate CDM Projects in our company strategic plans as priority Projects ➢ Assessment technology training needs and provide the same ➢ Encourage local innovation ➢ Encourage local initiatives & improve their skills ➢ Training in special skills	➢ Make facilities more available ➢ Transfer of technology to local enterprises to ensure sufficiency ➢ Training, encourage suppliers, users training by institutions ➢ Develop manuals for different technologies ➢ Warranties for maintenance ➢ Standards need to be	➢ Identify small-scale CDM projects that can give sustainable benefits ➢ Identify what direct and relevant benefits Ghana is seeking to achieve from the projects. ➢ Ensuring that validation is done by local (African) organisations and not foreign

➢ **Lack of appropriate technology** ➢ **Lack of capacity for project development**	➢ Encourage technology transfer ➢ Training to build capacity on developing local technology by Tatedo and ministry of energy and mineral. ➢ Conduct a targeted training programmes on CDM relevant technologies ➢ Establishment of information and data centre for small-scale CDM projects. ➢ Sharing of available local technology to be emphasised and encourage local manufacture ➢ Train more trainers ➢ Full utilisation of the available technology ➢ Curriculum development to include CDM in schools, technical institution and institutions of higher learning Vocational courses from technical colleges ➢ Solicit funding for capacity building on local technologies ➢ Co-operation between donor and scientific community to be encouraged ➢ Participatory training	developed so that good technology is adopted ➢ Accessibility to data, sharing and acknowledge best practice, transparency, give credit where due, acknowledge ➢ Need to explain what the small-scale energy projects entail (from biomass, wind, solar, hydro etc.) ➢ Advocacy at rural level	organisations ➢ Build capacities for the establishment of operational entities in Africa ➢

	➢ Pilot/Demonstration projects ➢ Encourage information flow from grassroots ➢ Train extension personnel e.g., technician, vocational assistant, ➢ create volunteer schemes/ national service ➢ NGOs in communities to address technical energy/fuel issues		
Institutional Barriers ➢ **Lack of institutional capacity** ➢ **Lack of simple procedures and policies to implement projects** ➢ **Lack of clear policy for CDM in the country (Kenya) to determine and regulate modalities**	➢ Policy and laws (Regulatory frameworks) – Enforcement and compliance - Ministries short and long term ➢ Policy focus on relevant interventions (lead agency, line ministries) - long term ➢ Create an enabling environment (laws/regulations Institution set up) for the CDM Projects to be successfully implemented	➢ Sensitise governments and stakeholders in needs and benefits of CDM ➢ Sensitisation of the political and legal institutions (Cabinet, Parliament) with regard to the CDM ➢ Development of climate friendly policies specifying clear roles of stakeholders including NGOs/Government/target groups ➢ Accreditation body is required in the country ➢ Lobby Government to ratify	➢ The establishment of a CDM Commission ➢ Education: policies on energy, environment, trade and investment can be studied and used to promote CDM projects; ➢ Relevant institutions should facilitate the understanding and implementation of CDM; ➢ Policy intervention/ incorporation into policies ➢ Streamline the work of relevant institutions to avoid duplication of efforts

➢ **No legal framework for CDM projects in the country. No body established by parliament but the National Environmental Management Authority (NEMA) is the Focal point (Kenya).** ➢ **Energy policy is limiting (Kenya)**		the Kyoto protocol ➢ Establish accreditation bodies e.g. Kenya Bureau of Standards (KEBS), NEMA, KIRDI, National Council of Science and Technology ➢ Establish an effective legal institution dealing with CDM through an act of parliament ➢ Mainstreaming CDM into the NARC agenda. Make it a cross cutting issue like AIDS	
Poverty and Cultural Barriers ➢ **High resistance to change, people may resist CDM** ➢ **People in rural areas need to be convinced of the project so that they are committed to the projects** ➢ **Lack of socio-economic set up and poverty**	➢ Involvement of local people – participatory at grassroots level (NGO, CBOs, Local government)- ➢ Local involvement from project inception to implementation ➢ Networking through government and NGOs -Long Term	➢ Community participation throughout project cycle ➢ Need to advocate for support and prepare people prior to project implementation ➢ Affirmative actions and empowerment of marginalized groups e.g. women, Pastoralist etc by NGOs and Government ➢ Involve target groups in CDM projects to overcome social and cultural barriers)	➢ Participatory projects: to involve all the relevant stakeholders especially at the community level. ➢ Projects are usually implemented at the community level and therefore creating awareness at the community level will help foster understanding;

➢ **Limited community involvement** ➢ **Low awareness of the benefits to the community**			
Infrastructure capacity ➢ **Infrastructure limitations for communications**	➢ Government to invest in infrastructure	➢ Improve local infrastructure which includes all the stakeholders including government	
Network of competence barrier ➢ **Need to bring skilled people together** ➢ **Lack of a critical mass of people/organisations for project design and implementation** ➢ **Limited people to do PDD** ➢ **Limited institutions so cannot follow on – provide continuity**		➢ Strengthen institutional partnerships for training, capacity building, information exchange (NGOs, Universities etc.) ➢ Exchange programmes with international institutions ➢ Network all stakeholders of CDM projects ➢ Organizing collaborations with successful CDM practitioners in and outside Kenya ➢ Need for skills in project management	
	➢ Training on how to implement	➢ University of Surrey to link	

Specific CDM project skills competence barrier ➢ **Lack of high level Expertise**	small-scale energy projects under CDM ➢ Project management courses in university and institutions to be introduced so that we can have enough experts in this area (Government to act) ➢ Create clean technology courses at degree level	with local institutions (CDM institution e.g. the universities) for capacity building ➢ Train in CDM project development ➢ Providing skills definition for CDM practitioners ➢ Establish a centre for CDM training ➢ This project should come up with a follow-up capacity development project to assist the locals participate in CDM projects as equal partners ➢ Training in development of baselines	
Data availability barrier ➢ **Lack of existing baseline data** ➢ **Lack of database on baselines** ➢ **Non availability of funding especially for data collection/compilation of database**	➢ Initiate centres at village level to collect data ➢ More researches are needed to provide enough data so that we can know where to locate which project ➢ Develop methodologies and methods of collecting data and involve schools, colleges and universities ➢ Use of students to collect emission data as part of their thesis (whatever practical)	➢ Information may not be easily available. ➢ Energy data does not need to be seen as confidential. ➢ Enthusiasm is low among SMEs in Kenya ➢ Level of enthusiasm is same in Annex 1 and non-Annex one countries ➢ Energy conservation is to be used as a benchmark as uncertainty is low, ➢ Majority of SMEs in Annex 1	➢ Develop database of available resources (e.g. an energy/climate change database). In the absence of baseline data assumptions would have to be relied on.

		have expressed interest. ➢ Corporate interest in environment seemed low ➢ Need to have impact on bottom line of the firm	

5.3 Institutional Structures for small-scale CDM projects

Institutional barriers were identified as one of the major barriers to the implementation of CDM projects. Particularly for small-scale projects there is a concern that existing approaches would not facilitate these projects.

For small-scale projects whose viability can be fragile there is a danger that host country procedures will be used which have been designed with traditional large Foreign Direct Investment (FDI) projects in mind. With small projects there is a risk that delays due to complex or long-winded procedures and lack of structures could mean that the project is lost. If investors perceive that not only are there risks associated with the viability of the project and the stability and legal structures in the country but also that the CDM streamlined systems are not available then this may be sufficient to discourage investors from this route.

In the workshops the current institutional arrangements in the project cycle were explored first before considering what might be done for small-scale projects in the host country. These are documented in Attachment 5.

The question addressed by the discussion groups was as follows.

- **How can the interfaces for small-scale projects be improved?**
    - **Financing**
    - **Capacity Building and participatory implementation**
    - **Bundling administration**
- **What are the Investor needs, and host country needs?**
- **What structures could be put in place to deliver these objectives?**

5.3.1 Investor Needs

In the discussions in the country workshops we identified first of all what the investor wants when developing a small-scale CDM project and what the country host needs from the process. Table 5-2 summarises the outcomes from the discussions across all the countries for comparison.

Table 5-2: Investor Needs

Investor needs	**Tanzania**	**Kenya**	**Ghana**
Financial	Minimised risk in the investment (viability, feasible carbon stock) Viable project with low risk Collateral (loan) history	High quality offsets	Low risk
Country investment risks	Good investment climate (tax breaks) and Capacity / ability to implement in country	Low costs	Economic and political stability
Institutional process	Simple – transparent – efficient	Simple transparent process	Simple systems
Ease of implementation	Infrastructure communication		
Data availability and expertise	Facts / information (information point		Competence in ministries
Technological options	Low cost technology		
Corruption risk			Low corruption risk through transparency

Thus there is general agreement that a low risk investment environment and simple systems with competent institutions are required.

5.3.2 Host Country Aspirations

There was also general agreement on what the host country wants to achieve from small-scale CDM projects as shown in Table 5-3.

Table 5-3: Host country aspirations

Host needs	Tanzania	Kenya	Ghana
Sustainability benefits	Sustainability benefits	Meeting S-D goals Poverty alleviation	Ensure sustainable benefit delivery
Economic progress	Employment – use locally available resources / raw materials and locally available labour skills Attract investors	Equity	
Contribution to host country goals	Funds	Development plan priorities	Align with host country goals
Community involvement	Impact to community and services to project developer	Local ownership	
Expertise development	Institutional support (NGO)	Local technology capacity building	Competence for negotiation
Technology transfer		Technology transfer	Technology transfer

5.3.3 Tanzania Barriers

In Tanzania the discussions focussed on the barriers specific to small-scale projects. Inevitably these overlap with the barriers identified in earlier discussions on capacity building. However they are more focussed and lead to some specific action recommendations. The following summarises the results from the discussion groups.

- Inadequate capacity to implement and process small-scale CDM projects from design, implementation, monitoring and verification
- Policies not favourable for small-scale project due to threshold level
- Taxation
- Infrastructure (i.e., reaching projects in rural areas)
- Acceptance by community
- Access to funds
- Bureaucracy
- Low institutional capacity of DNA – no full time CDM official

- No effective technical CDM committee or expert committee
- Complex land laws
- Lack of technology / technical capacity
- Lack of funds for DNA office
- Lack of clear policies / regulations

5.3.3.1 Actions to overcome barriers in Tanzania

- *Minimising the risk of investors*
    - clear government policy on investment and stable government
    - Locals carryout basic studies to determine project viability
    - Investors need information / assurance of future market of her/his project
    - Legislation and good governance in place
    - Good information and future market for product
    - Local needs maximum involvement of the local community for the sustainability of the project
    - Designate full time CDM staff (Responsible VPO)
    - Government appoint a Technical CDM committee
    - Strengthen DNA capacity to enhance initiation of CDM

- *Put in place good investment climate*
    - Incentive package required
    - Needs appropriate policies that encourages investment such as tax relief
    - Develop CDM investment policy
    - Train local host on contracts / business partnership. This will help them understand terms and agreements during contract signing
    - Management codes of conduct
    - Institutionalise CDM concept in the existing legal instruments
    - DOE as a UNFCCC focal point should be prepared to handle CDM related issues
    - TIC and DOE should disseminate the knowledge on CDM. Other institutions also should assist (COSTECH, CEEST)

- *Information point*
    - Create information centre e.g., website, email etc
    - Create capacity within Tanzania Investment Centre (TIC)
    - Establish database and information centres

- *Low cost technology*
    - Use locally available raw materials
    - Provide tax exemption to imported small-scale CDM energy project equipment
    - Environmentally friendly project

- *Infrastructure and communication*

- Investor needs to know the status of the infrastructure such as reliable roads, communications etc
    - Low cost and reliable communication system
    - Government to improve infrastructure using road fund

- *Simple , transparent and efficient system*
    - Avoid corruption
    - Minimise bureaucracy

- Sustainability benefits
    - The project should provide employment opportunities for the people / local community
    - Train NGOs to implement projects
    - Develop sustainability indicators

5.3.4 Existing Country Institutional Structures

The discussions in Kenya and Ghana were focussed on the issue of the actual institutions and procedures that would be involved in the process. The starting point was the existing available structures for the CDM in the host countries.

Table 5-4 gives a picture of what is happening in each country and a comparison across the countries

Table 5-4: Existing country CDM Structures

Structure or Situation in country	**Tanzania**	**Kenya**	**Ghana**
Ratification	Ratified	Not ratified	Ratified
Designated National Authority	Division of Environment	Possibly NEMA	Ministry of Environment and Science See diagrams
National office for project developers	No national office for project developer focus	No national office for project developer focus	See diagrams
Committee for project appraisal	none	none	National Climate Change Committee
Any existing structure	FDI Tanzanian Investment Centre (TIC)	FDI	See diagrams

5.3.4.1 Summary

It was interesting to note that each country was at a different stage in its development of structures to deal with the CDM. Kenya has not ratified and seemed to be the furthest behind of the three countries in progressing the CDM. This was in direct contrast to the awareness of industry and NGOs who were keen to progress matters and who were knowledgeable and informed on the issues.

Tanzania has ratified and seems to have some structures in place but have not developed these sufficiently yet to handle the CDM. There was a lot of interest and knowledge on the CDM but little government support at this stage. Ghana on the other hand at the governmental level has ratified and progressed the furthest with existing and proposed structures. These are available in Attachment 5.

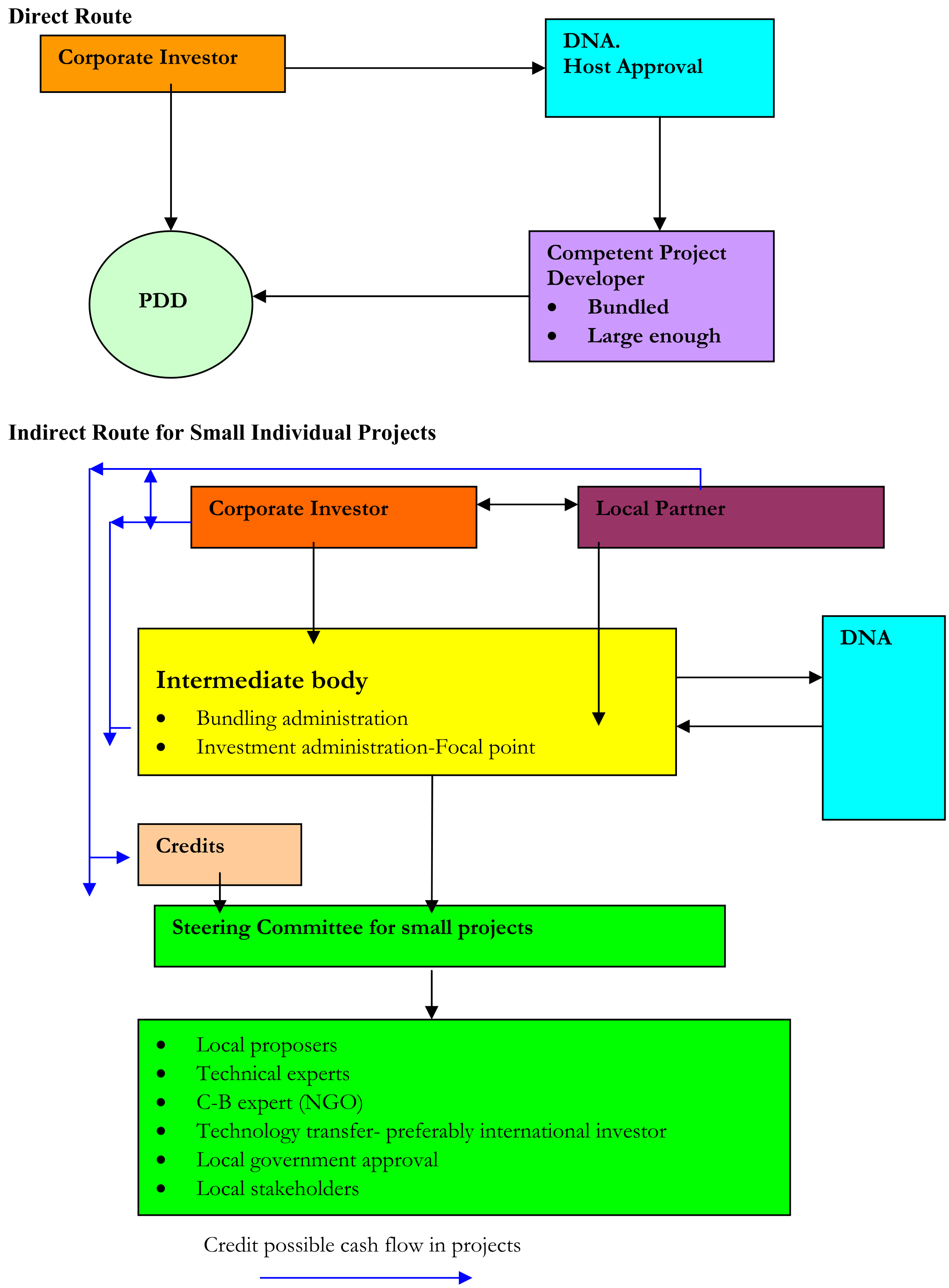
5.3.5 Proposals for Institutional Structures for small-scale projects from the discussion groups

The workshops in Kenya and Ghana focussed on what the procedures and institutional structures would be for an investor with a project that needed to be bundled who wanted to minimise their risk and time and so was looking for a streamlined system to progress the approval of the project.

5.3.5.1 Kenya

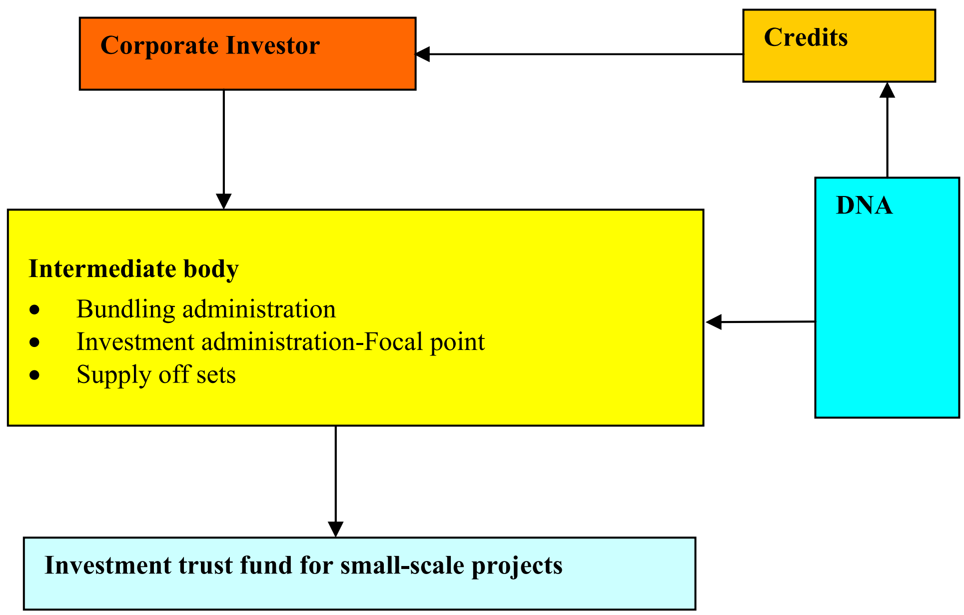
Two sets of proposals were generated with many common elements. In the first, three different routes were proposed depending on the circumstances of the project. These were the direct route, the indirect route for small individual projects and a one stop shop. The direct route would apply for a competent project developer with a large bundled project with a corporate investor coming into the DNA as a focal point. The investor is competent to bundle and implement the project with the necessary capacity building.

Figure 5-1: Different routes for Investors in Kenya



In the indirect route, small individual projects are processed and bundled by an intermediate body that has the role of bundling administration and can act as a focal point for financing projects and finding local partners. The intermediate body (IB) also handles the project approval by the DNA. The credits can be used as a possible cash flow for the project. The investor can get involved with a local partner directly or through the IB but not with the project in detail. This is handled by a steering group of relevant stakeholders.

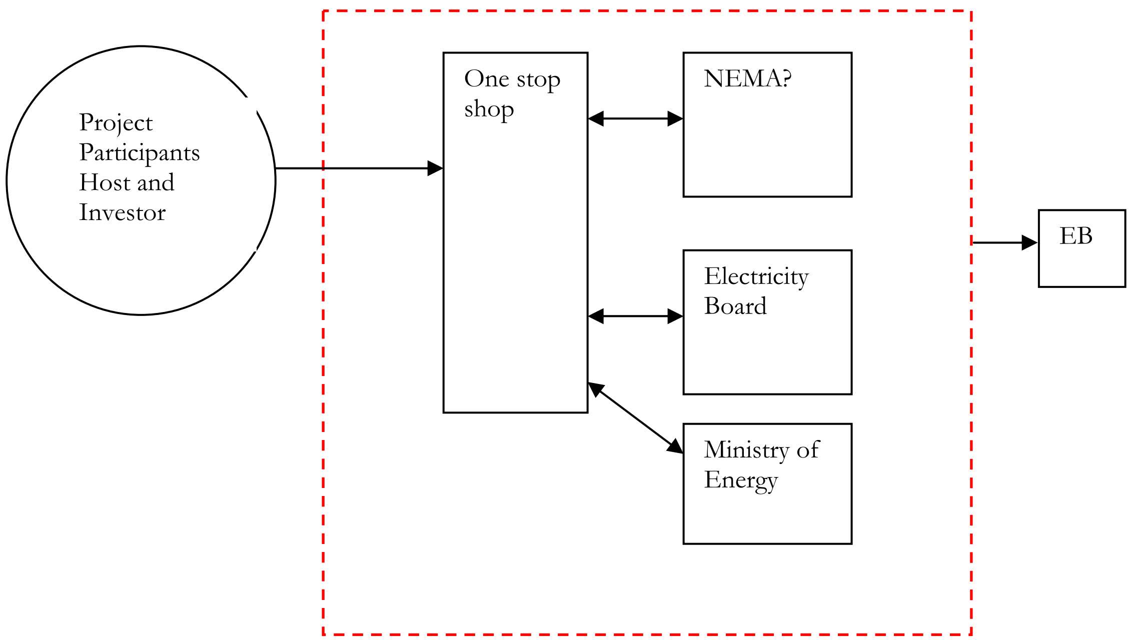
Figure 5-2: One Stop Shop Version one.



In this one stop shop, the investor is not interested in implementing the project themselves but can access the CERs through investment via the intermediate body. Small-scale projects are financed through a trust fund set up with investor money not linked to a specific project but with guaranteed credits.

Another group proposed an alternative version of a one-stop shop as described in the diagram below.

Figure 5-3: One stop shop version 2



One Stop Shop

One suggestion was for NEMA to be the one stop shop, which would play a key role in the CDM process, and its composition should be flexible so that expertise matches the projects. The key roles of the one stop shop would be as follows.

- Co-ordinate and link up groups
- Perform the role of bundling
- Link up project proposers with government institutions depending on the proposal
- Act as a resource centre where information on CDM is stored. Proposers can get information there.

Some suggested institutions

- Climate Network Africa (CNA)
- African Centre for Technological Studies (ACTS)
- Intermediate Technology Development Group - Eastern Africa (ITDG-EA)

It was noted that if there were so many players in the approval institution, it was likely to discourage potential investors and thus the rational for the one stop shop.

5.3.5.2 Ghana

In Ghana, the detailed interfaces were discussed and suggestions were made. However it was clear in discussions that the roles of existing ministries had all to be taken into account. A more streamlined approach may be required. The proposed interfaces are illustrated below.

Figure 5-4: Investor Interfaces

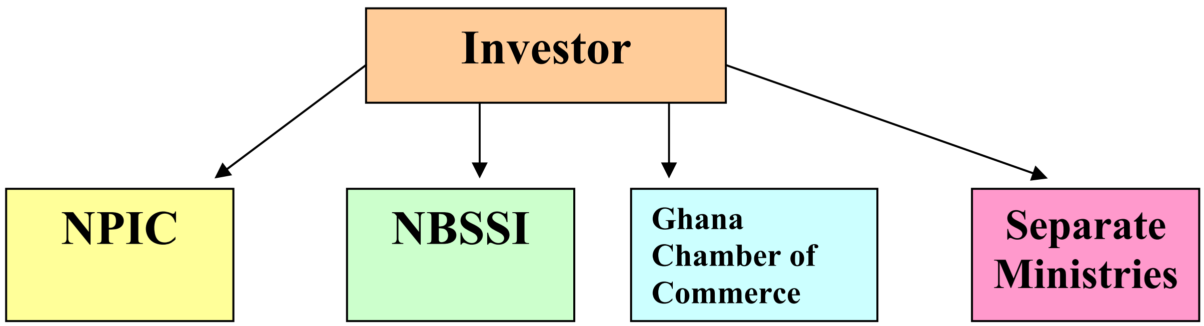
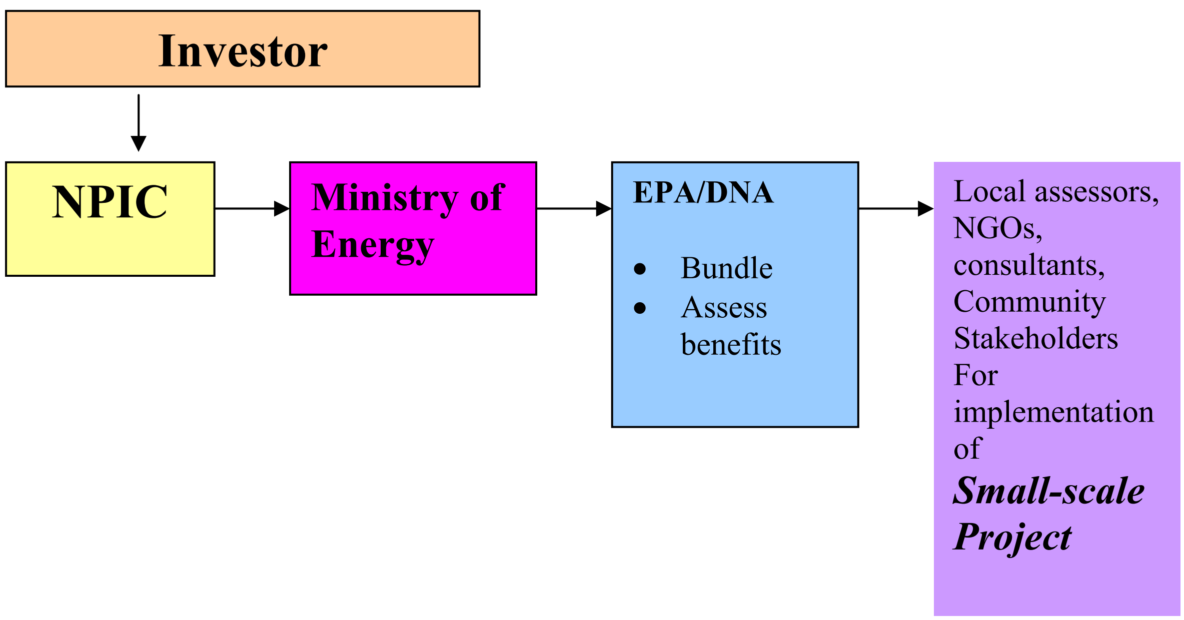


Figure 5-5 Administration of projects



5.4 *Considerations for a simplified institutional procedure for small-scale projects*

How a simple streamlined procedure for approval of small-scale projects would be carried out in practice in host countries is not clear. Some of the main aspects to be taken into account are summarised as follows.

Investor complexity:

- Some investors will be competent to carry out small-scale projects and will be able to bundle and administer the project as well as carry out the required capacity building.
- Some investors without development experience should not implement projects without an appropriate partnership with an NGO or other organisation. Assistance with bundling administration may be required. For small projects not already part of a programme this provides an opportunity for an intermediate body to bring projects together to be bundled to save transaction costs. We have discussed possible ways in which projects could be bundled in detail in Attachment 4 to the report.
- Some investors only want to be supplied with CERs in return for their investment. This is the model used in Costa Rica for the carbon sink projects involving thousands of small farmers. In that case the government takes the risk and guarantees the offsets to the investor. They then administer the bundled project through the small farmers. This is one one-stop shop model.

Simple systems

- Some sort of template would be useful for host countries to enable them to offer a simple procedure to investors. The system devised has to take account of the following.
    - Assessment of the sustainability benefits from the projects. Additional actions may need to be prescribed to make the project suitable as described in Attachment 3 to the report.
    - Check that there is equity in the project partnership and competent people are to implement
    - CERs applications to EB where bundled project is administered internally and donor investor is external to the project.
    - Interface for dealing with project implementation organisations for bundled projects without competent investors
    - Registry for reductions and CERs is available for tracking.
    - Possible partnerships are available for investors through a project office central contact point
    - Financial mechanisms through local banks are available for funding especially for unilateral projects.
    - Information on country resources, legal systems etc and advice is available.
    - Investors should not have to pass from Ministry to ministry and all should be in house if possible.
    - Transparent procedures open to inspection to avoid corruption.

Bundling Administration

- This was not dealt with in detail but the main model discussed was bundling within the CDM government office. In fact this could be a flexible arrangement with some projects being bundled by the developers before the submission for approval while others may need to be collected together by the projects office and bundled at that stage. Green et al (2003) suggest a commercial entity for bundling.

5.5 *Country Action Plans*

From the discussions, participants in Kenya and Ghana were asked to choose one action which they thought was the most important to go forward to an Action plan. In this way an action plan for these two countries was assembled and is presented below.

5.5.1 Kenya Action Plan

- Sensitise government and financial institutions to CDM and to ratify the Kyoto Protocol and set up national office speaking with one voice
- University of Surrey and local university institutions to develop framework for capacity building on the CDM
- Resource mobilisation for projects
- Effective coordinating body. For example ITDG could coordinate with other institutions and organisations to keep track of what is happening in Kenya on the CDM
- Sustainability assessment should be extended to forests.
- Replicate successful projects
- Every one to visit the relevant websites including BEA website to find out more about the ongoing activities.

  http://www.surrey.ac.uk/CES
  http://www.surrey.ac.uk/eng/ces/research/ji/index.htm
  http://www.itdg.org
  www.BEAINTERNATIONAL.ORG
  http://unfccc.int and www.unfccc.org
  http://prototypecarbonfund.org
  http://www.undp.org/seed/eap/html/climate.htm
  http://www.ifc.org

- Build a programme to fit projects into CDM process
- Consider getting SME’s involved in the process
- More training on assessment of sustainability using the Sustainable Livelihoods approach and the MCA
- Building on the projects studied, need to see how to get this initiative on board at government level.
- More inclusion of the community in the process so that they get some equity from this.
- Need to develop a complementary project approach and fit current development priorities instead of trying to discredit KENGEN and the micros.

- Emphasise positive aspects of the CDM
- CDM approval process must be better than existing system- develop the process and the criteria. Approval process is bureaucratic. Panpaper has been trying to get a Micro Hydro - a 20 MW plant on river Yala but approval never came through
- Data collection and archiving is important
- Develop a way froward for the cement and sugar industries in the CDM
- NEMA to look at how CDM fits into its activities
- Follow up exchanges for information
- Develop a process for project identification
- Capacity building for local people
- Directory of CDM who's who
- Programme on CDM for the transport sector eg standards, MOT, testing authorities
- Need policy shift to focus on energy supply, i.e. generate more with local resources than the use of independent power producers (IPPs) using thermal power.

5.5.2 Ghana Action Plan

- Creation of a Central National Authority should help crystallize all ideas into a cohesive whole.
- Training of trainers in CDM is very necessary.
- Capacity building should not be limited to the short term but should be extended to educational institutions in the long term
- Advocacy needs to be strengthened
- Setup a CDM specific foundation
- Get professionals on board to serve as motivational factor for the group
- We should know where we are coming from and where we want to go with CDM
- Annex 1 countries should do more than they are doing now
- Increase awareness among policy makers
- Increase general awareness and encourage more advocates of CDM
- Explore funding possibilities
- Continuous/vigorous sensitisation and education of policy makers
- More NGOs need to play advocacy/sensitising roles to add to what KITE is doing. (E.g. Energy Commission's role in getting taxes on CFLs removed)
- Strengthen institutional capacity building
- Need to build expertise to write CDM proposals
- Use existing projects to learn more about the CDM
- Technical advancement, national institutes for CDM
- Move out of theorising and develop real models and projects
- Develop Public/Private Partnerships
- Capacity building at all levels – policy makers, students, communities, and include the issues in the school curriculum
- The Public Utilities Regulatory Commission and the Energy Commission to develop proposals among others to provide green and efficient energy (e.g. as in the case of the cogeneration project that KITE is looking at)
- Motivate the public sector to work with CDM
- Create awareness about the CDM within the private sector

- Development and publicising of technical specifications to generate interest of private investors
- Comprehensive Database on CDM issues
- Educate financial institutions to know what is going on in CDM. There is currently no awareness within the Ministry of Finance
- Establishment of CDM Office
- Issues of projects development, and capacity building
- Make CDM an attractive project to sell

6 Implications of the results for achieving the objectives

The objective of the study was to contribute to the design of the CDM so that poverty focussed energy projects are encouraged and provide capacity building to implement small-scale projects under the CDM. The study has focussed on three main areas

- assessment of sustainability benefits from small scale projects,
- contribution to simplified modalities and bundling for small scale projects
- capacity building and institutional aspects in DC host countries

6.1 The Sustainability Benefit Assessment for small-scale CDM community projects

In the preceding sections we have briefly described an approval procedure for small-scale projects to be used by host countries. This procedure can use an MCDA model (the SAM model) or a simplified approach.

A comparison with MEND, SUSDAC and S-S-N shows that our approach is

- properly grounded in theory and practice of decision analysis
- does not use arbitrary scales
- uses criteria which are based on the S-L approach and are tailored to the community projects
- does not judge projects only on total performance on criteria as this can be misleading
- examines the balance of the project on the major trade-offs
- allows the strengths and weaknesses to be explore for each option
- provides examples of actions which can be incorporated into the project design to mitigate weaknesses and improve balance in the projects.
- allows comparison with the Status Quo and Benchmark projects so that the relative preference for the option can be assessed
- assesses the project, the implementation actions and the existing baseline situation as a whole

The approach has been applied by a team member who is a practitioner in the field of decision analysis models and stakeholder involvement in the assessments has been obtained from in country partners. Thus the SAM model has been tested in the host countries on real projects where we have gathered field data and the approach has been found to be practical and useful.

Our approach therefore provides help to host governments so that they can assess CDM projects against the Status Quo and 'benchmark' projects, and suggest and negotiate improvements so that the projects will deliver the benefits needed. We are clear that the performance of projects should be assessed on all of the following aspects which must be in the definition of the project.

- Project type
- The baseline activity

- The additional implementation actions

We have therefore achieved the objective set out above in the sense of
a) contributing to the CDM process at the approval stage and
b) capacity building in host countries in providing the tools and awareness of how this can be done. It was clear from the reception to the model at the final workshops that it was appreciated that it would be useful for assessment of any development or CDM project.

Further detail can be found in Attachment 3.

6.2 GHG emission reductions accounting

We have previously discussed the reasons for focussing on small scale projects to deliver direct sustainability benefits. The barriers to these projects for the CDM are high and procedures to simplify the process to reduce transaction costs are critical to their viability. The modalities for the small scale projects are currently being formulated under the Executive Board for the CDM. The results from this project will allow us to contribute to this process.

We have produced the following recommendations to the simplified baseline and monitoring modalities.

- the complexity of the baseline of even small-scale projects eg substitution of diesel and wood must be able to be handled,
- an approach for charcoal kilns is recommended,
- the need for an expanded set of electricity baselines to account for baselines other than diesel,
- consideration of a more conservative set of emission factors for diesel,
- the need to expand the categories to deal with a wider range of project circumstances especially mixed baselines,
- simplified approaches for the projects studied so that they may be bundled has been produced.
- an improved set of project boundaries has been produced
- expanded guidance on bundled projects is recommended. At the moment it is very limiting.
- recommendations on practical key parameters for monitoring based on the uncertainty analysis to augment the current recommendations
- exploration of additionality risk on reductions

On bundling we have been able to construct a series of possible options for bundling projects on the basis of

- project type
- baseline commonality
- limited range of baselines with complementary sustainable benefit delivery

Further improvement in the guidance is needed on this issue.

The objective of contributing to the design of the CDM to enable small-scale projects to be undertaken to relieve poverty has been achieved through this work. The simplified modalities generated and the improvements in current guidance suggested would lower transaction costs for a larger number of real small-scale projects. These types of projects have been shown to contribute to sustainable development and alleviate poverty directly. Further detail is available in Attachment 4.

6.3 Capacity building and Institutional structures

Capacity Building in this project has been achieved through a number of mechanisms.

6.3.1 Capacity Building during the project

Host country partner involvement in the project has allowed the transfer of MCDA awareness and has generated an interest in this approach for project assessment for sustainability benefits in country partners and workshop participants not limited to the CDM.

Capacity building with partners in host countries and with participants in the workshops has also been achieved through extra country visits to raise awareness combined with practical involvement in the data collection and discussions on GHG analysis. Spreadsheets for the analysis have been made available to all countries to act as templates.

The wider participation at the workshops has raised awareness on the CDM and available tools and know how for PDD preparation. It has also generated a demand for further work as described in priority tasks in capacity building in each country.

6.3.2 Capacity Building Requirements highlighted by the project

The requirements for capacity building and institutional structures for small-scale projects generated by the workshops have provided a way forward for the CDM in the host countries. The discussions generated a list of actions which could be used as a starting point for progressing the CDM implementation in host countries (Attachment 5).

The different structures and considerations needed for implementation of small-scale projects produced a range of solutions and revealed the complexity of the problem. Some key considerations were identified from this exercise which need to be followed up if transaction costs are to be minimised.

6.3.3 CDM context

A summary of CDM activities and the current developments under the UNFCCC has been produced in Attachment 1 which has shown that this project fits in very well with the other initiatives being undertaken in this area and is timely and well targeted.

7 Priority Tasks for Follow up

Dissemination in host countries has already begun with the final workshops held in February/March 2003 and dissemination of the workshop reports. From the lists generated in the workshops on priority actions, one theme was the need for more training on the CDM. This includes the project design document and the processes involved in CDM project implementation. Specific further tasks related to the key study areas are suggested below but first the general actions which will be undertaken within this project for dissemination are listed.

- The results of all aspects of the project will be made available as pdf file on the web when approved.
- Country partners will be asked to circulate the final report pdf files to workshop participants.
- The results will be published in a report that will be sent out to selected interested parties.
- Publication of sustainability approach in refereed journal
- Publication of modalities and bundling approach in refereed journal

7.1 Sustainability Benefit Assessment for Small-scale and Development Projects.

Workshop participants are interested in the MCDA/S-L approach and project partners are also keen to apply the assessment method to other development situations as well as the CDM. They have requested more training using MCDA.

7.1.1 Recommended further priority Tasks for Sustainability Benefit Assessment

- Further training for MCA/SAM and simplified procedure for in-country partners and host governments (requested at workshops)
- Application to real projects working with host governments if possible.
- Development of similar model for industrial projects
- Dissemination at side meeting at COP 9 to policymakers and host government representatives (this was a specific request from country partners)
- Dissemination to UNEP
- Wide dissemination in host countries of final report

7.2 CDM Modalities for the PDD

The priorities here relate to the Project Design document and to bundling. Again, at the workshop, there were specific calls for training in this area and in general in educational establishments.

- Dissemination of simplified PDD modalities and recommendations to the EB for the CDM for inclusion in current simplified guidance through UK government and direct submission to the UNFCCC secretariat
- Dissemination at side meeting at COP 9 to policymakers and host government representatives (specific call from country partners, funding required)
- Development of options for bundling and assessment of Bundled projects for GHG reductions, sustainability benefits and practicality.
- Training on the PDD for host country CDM project developers, government representatives, banks, and possible host country operational entities.
- Delivery of courses on the CDM in universities and other appropriate institutes
- Dissemination in host countries of final report

Particularly bundling of small-scale projects and how bundled projects can be administered has not been fully elaborated and could well provide a serious barrier to small-scale CDM. Priority Tasks are therefore concerned with dissemination of the findings from the study and the need to develop some aspects further to ensure that the sustainability assessment SAM has an impact and bundling is developed further to make small-scale projects viable. Dissemination at COP9, to UNEP and to UNIDO would contribute to this process.

7.3 Capacity Building and Institutional Aspects

The workshops in Kenya and Ghana were asked to produce key actions from the discussions. These have been listed in the results section above and are documented in Attachment 5.

These actions form the basis for recommended priority tasks in the countries. In general it is clear that further work is required in

- Awareness raising and training in the CDM
- Provision of resources for host country capacity building for the range of actions identified at the workshops including internal institutional structures and training similar to the world bank CF-Assist initiative
- Development of institutional streamlined structures and procedures for approval of bundled projects with active assistance to make it work.