



# **United Nations Environment Programme**

## **MID-TERM EVALUATION OF UNEP/GEF PROJECT GF/4040-05-10 (4837) "GENERATION AND DELIVERY OF RENEWABLE ENERGY BASED MODERN ENERGY SERVICES IN CUBA: THE CASE OF ISLA DE LA JUVENTUD"**

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## LIST OF ACRONYMS

AENTA	Agency of Nuclear Energy and Advanced Technologies	Agencia de Energia Nuclear y Tecnologias de Avanzada
ALASTOR	Company dealing with installation and operation of boilers	
BMs	Business Models	
BSP	Bali Strategic Plan	
BOT	Build Operate Transfer	
CF		Compania Fiduciaria
CICMA		Centro de Investigaciones de Mecanizacion Agricultura
CITMA	Ministry of Science, Technology and Environment	Ministerio de Ciencia, Tecnología y Medio Ambiente
CMIJ		Centro Meteorologico Isla de la Juventud
DGEF	Division of GEF Coordination	
EA	Executing Agency	
EOU	Guidelines... Evaluation Office...	
EO	Evaluation Office	
EFI	local forestry company	Empresa Forestal Integral de la Isla de la Juventud
ER	Evaluation Report	
FRR		
GEAM	national forestry organization	Grupo Empresarial de Agricultura de Montana
GEB	Global Environmental Benefits	
GEPROP	Centre for Management of Priority Programmes and Projects	Ecosol Solar and the Institute for Meteorology Cuba
GIS	Geographical Information System	
IA	Implementing Agency	
IIF		Instituto de Investigaciones Forestales
IJ		Isla de la Juventud
INEL	National electricity institute	Instituto Nacional de Electricidad
MEP	Ministry of Economy and Planning	
M&E	Monitoring and Evaluation	
MINAG		Ministerio de la Agricultura
MINAL	Ministry of food industry	Ministerio de la Industria Alimenticia
MINBAS	Ministry of Basic Technology	Ministerio de Industria Básica
MINCEX	Ministry of International Cooperation	
MINVEC	this is now MINCEX	Ministerio de Inversiones Extranjeras y Colaboración
MTE	Mid-term Evaluation	
MTR	Mid-term review	
MTS	Medium Term Strategy	
NES	National Electric System	
OBE	Local Electricity Utility	Organización Básica de la Isla de la Juventud
PDF/B		
PFC	Power finance corporation	
PIR	Project Implementation Review	
POW	Programme of Work	

PSC	Project Steering Committee	
RC	Institution dealing with mechanical engineering	
ROtI	Review of Outcomes to Impacts	
RRMF	Risk and Replication Management Fund	
RT	Reference Terms	
SIME	Ministry of Mechanical Industry	Ministerio de la Sideromecánica
SLM		
SWERA	Project of UNEP/GEF	
TE	Terminal Evaluation	
TOC	Theory of Change	
TT	Technology Transfer	
UNICAR	Institution in Havana dealing with meat	
UNILAC	Institution in Havana dealing with milk	
UNE	National Electricity Utility	Unión Nacional Eléctrica
UNEP	United Nations Environment Programme	
UNIDO	United Nations Industrial Development Organization	

## EXECUTIVE SUMMARY

From the viewpoint of its design, the general purpose and objectives of the project are adequate, taking into consideration the general energy outlook of Cuba and of Isla de la Juventud in particular. There are plenty of renewable energy resources, especially biomass, and the electricity generation and industrial activities heavily depends on imported liquid fuels, but up to now no systematic efforts had been directed towards the use of renewable domestic resources. The realization of the project objectives will clearly pave the way for a wider use of renewable energy resources in other parts of the country.

The selection of final beneficiaries of the demonstration activities has been made taking into consideration their relevance and the real necessities of the community of Isla de la Juventud, as well as their potential replicability; dairy and meat industries cover basic necessities, marabu is a real problem, replacement of liquid fuels for generation of electricity is an urgent issue, etc.

In general, the project activities are being seen by the final beneficiaries as a potential source of income (up to now the biomass obtained from forest cleaning was considered as waste), of reduction of fossil fuel consumption and creation of jobs. Due to the structure of the Cuban state, institutions are strongly interrelated to enterprises and companies, and hence the institutions are very closely following the impacts of the activities being carried out by the project. A general atmosphere of support to renewable activities is being created, both at national and local level, and a high degree of interest on all the technologies contemplated in the project has been created in national and local authorities and other involved stakeholders, and this is a basic requisite for future activities. There are clear perspectives for future replication, and this would not be possible without the dissemination and demonstration efforts contemplated in this project.

From the side of the practical realization of the project outputs, the project has experienced considerable delays, due to several causes. Some of these causes can be considered as “force majeure”; the hurricanes which reached Isla de la Juventud in September 2008 caused very serious damage to the island infrastructures, and a vast reconstruction effort was necessary. The economic crisis also had a negative impact. The Cuban government had to devote large amounts of money to reconstruction purposes, and asked for a reduction in the project objectives. Beside this, it was not possible to fulfil the expectations contained in the Project Document about raising significant private investments in the field of development of renewable energy sources in Cuba. Given the circumstances, the project Steering Committee agreed, and a new set of objectives was defined. Moreover, revised milestones for project execution were defined (a set in May 2009 and another one in January 2010, for March, June and until December 2010). Given the project situation at that time, the milestones were reasonably well established, adequate to the situation and reachable.

The first set of milestones (for January 2010) were mostly met, but since then the project has experienced new delays, and the present situation is clearly unsatisfactory; the

June 2010 milestones have not been reached, and it is uncertain that those corresponding to December 2010 can be fulfilled, although it is not impossible, provided that adequate measures are adopted: a better coordination and a more frequent dialog between UNIDO and the Cuban counterparts and elimination of blockages in several activities (as indicated in the main text of this report, especially in Sub-Chapters 2.1 and 2.6). At present it seems difficult, but not impossible, to complete all the project activities according to the project schedule; nevertheless, a 6-months extension of the project could be necessary.

The high number of Ministries and organizations involved has been a serious barrier for the implementation of the project, and has caused considerably delays in project implementation. Unfortunately the situation has not changed since the project objectives were reduced; it cannot be said that local decision processes have been effective. It is a matter of concern that this will also create problems for implementation of future projects and activities. Therefore, immediate actions for improvement of the co-ordination and communication channels among the different stakeholders are necessary and strongly recommended (including those between the project management in Cuba and UNIDO).

The Cuban authorities have decided not to give financial support to new investments for the development of renewable energy sources in Cuba; this has been left to be implemented through foreign investment. No Renewable Energy Policy has been enacted, although a draft is under preparation, but nevertheless the Cuban authorities have repeatedly declared their support to renewable energy.

The initial project budget contemplated large private investments which have not materialized. Since no Cuban public funds will be available, it is clear that from the viewpoint of sustainability the creation of the Risk and Replication Management Fund (RRMF), devoted to facilitate funding of future renewable energy projects, plays a major role. Potential for replication of project activities is high, not only in Isla de la Juventud, but also in the main island. Since the Cuban Government has decided to adopt the approach mentioned in the previous paragraph, clearly the Fund, if properly designed and managed, will act as an embryo for future activities. This project activity should be considered of the utmost importance.

The financial mechanism to be established by Compañía Fiduciaria has not yet been completed; only basic guidelines and indications of relevant information to be submitted by companies interested in future renewable energy developments have been drafted, but concrete loan conditions for the four business units contemplated in the project have not been defined, nor drafted. The reason given for this is that the contract between UNIDO and Compañía Fiduciaria has not yet been modified to take into consideration the changes in the project objectives approved by the Steering Committee, and therefore Compañía Fiduciaria does not have access to the corresponding new funds to be granted. But the preparation of the loan agreements could have been carried out entirely until the loan contracts are ready for signature, and at the same time the addendum or modification to the contract could have been negotiated with UNIDO. No draft addendum has been submitted to UNIDO. This situation should be unblocked immediately; this is especially important for GEAM, in charge of biomass supply for other Business Models (Investments).

The Compañía Fiduciaria seems to have clear ideas about how to build the loan mechanism to guarantee that loans from future projects are returned on a revolving basis



and about the guarantees to be required, but no draft has been prepared. It is to be discussed whether loans for projects not included under this one should be charged a low rate of interest. Another issue to be discussed is whether UNEP-UNIDO should remain in the Technical Committee after the end of the project; since the only possible sources of funds are foreign investments, the permanence seems reasonable.

Acquisition of some equipment which is necessary for the realization of several project activities is to be carried out by UNIDO; the process should be carried out in close and frequent communication between UNIDO and the Cuban counterpart in order to accelerate the process and to avoid misunderstandings; it has been detected that the Cuban counterparts are not familiar with UNIDO bidding procedures. This is the case of the almost finished Cocodrilo plant, which has not been guaranteed the necessary supply of biomass, allegedly due to the fact that the necessary equipment to collect the biomass has not yet been purchased.

As for the direct beneficiaries, all of them had been adequately informed about the nature and purposes of the project and shown a clear interest in the success of its activities. It was noted, however, that the technical implications (possibility of load variations, start-up times, etc.) of use of biomass gas for steam generation had not been adequately explained to the corresponding stakeholders (meat and dairy factories), which are currently using oil-fuelled boilers for steam generation. The experience in the field of use of renewable energy sources was very limited in Cuba before this project started; in the field of biomass gasification, external expertise/support seems necessary.

There have been four different National Project Directors during the project lifetime up to now; these changes have resulted in delays and have affected the due coordination among the different activities and bodies involved. It is highly desirable that no more changes in relevant positions take place until the end of the project. The Evaluation Team suggests that some personnel should be hired to give direct support to the Project Director.

A set of both general and technically-oriented concrete recommendations for the pending project activities has been included in Chapter 5 of the main text.

# 1. INTRODUCTION AND BACKGROUND

## 1.1. Project overview

### 1.1.1. Project objectives

The main objective of the project is to reduce greenhouse gas emissions in the Republic of Cuba by promoting environmentally sound renewable energy technologies for power generation, as well as for providing modern energy services on a commercial basis at the Isla de la Juventud.

More concrete objectives of the project are:

- To remove key barriers to development of renewable energy technologies for power generation and process heat on commercial basis at the Isla de la Juventud.
- To reduce the island vulnerability and environmental stress.
- To promote business models for sustainable harnessing of renewable energy resources in Cuba.

### 1.1.2. Status of activities

The project started in 2005 and has faced considerable delays due, among other causes, to the effects of the hurricanes which reached Isla de la Juventud in September 2008, which had a serious impact on the island infrastructures and forced the introduction of changes in the priorities of the Government of Cuba. The present economy crisis has also had a negative influence on both the situation of the Cuban economy and the project development.

In view of this situation, the Steering Committee meeting of May 2009 decided to reduce significantly the level of some project objectives and to proceed with a comprehensive Project Revision to be approved during the next meeting of the Committee.

Consequently, the Steering Committee meeting of January 2010 established updated objectives, budget and milestones for the project. Three sets of milestones were prepared for March, June and December 2010. Given the project situation at that time, the milestones can be considered realistic and reachable.

The new milestones are summarized in the table below, which includes a column in which the status of the different activities at the time of the mid-term evaluation (mid-June 2010) is indicated. In general, the March milestones have been fulfilled only in a few cases, whereas most of those corresponding to June have not been reached. Nevertheless, if the necessary steps are taken, a large part of the December milestones are still achievable.

For the Demo activities, it can be said that in several cases, the necessary equipments have been defined, and the corresponding documentation has been submitted to UNIDO, but the purchase of equipment has not yet been carried out. It seems necessary to improve the channels of communication between UNIDO and the Cuban counterparts in order to

adequate the purchase requirements to the UNIDO procedures and to accelerate the entire process.

In some other cases, agreements and supply contracts have not been signed due to the necessity to have the corresponding investments and activities included in the National Economy Planning for the next year before contracts and agreements can be signed. The corresponding requirements for inclusion have been filed in all cases, and a final response cannot be expected before by December 2010, due to the requirements of the existing procedures in Cuba.

Except in a few cases, the milestones corresponding to March and June 2010 have not been reached, and the fulfilment of the compromises for December 2010 seems in general difficult.

More details about the status of the different activities are given in Sub-Chapter 2.6 below.

### Project milestones and status

Subproject	Milestone March 2010	Milestone June 2010	Status as of 14 June 2010	Milestone Dec 2010	Responsible / Remarks
<b>Demo</b>					
1 - Cocodrilo 50 kW Biomass Gasifier	System installed, test run & calibration	System operational & biomass supply secured	<b>System installed and commissioned. Civil works almost completed. Supply of biomass not secured; Flora and Fauna lacks the necessary equipment (tractor, etc.), hence biomass supply contract not signed. Relevant parts of this supply equipment to be acquired abroad, through UNIDO.</b>	First performance data evaluated	UNIDO: secure immediate technical assistance from India (Febr 2010); UNE for construction, assembly, commissioning & operation; Flora y Fauna for biomass supply; CubaEnergía for overall project supervision.
2 - Radar Punta del Este - Hybrid		Engineering Design complete	<b>Not designed. Gasifier technology not transferred (see 5 below).</b>  <b><u>NB: this demonstration activity has been recently dropped</u></b>	Procurement for complete system ready	Project depends on TT Agreement Biomass Gasification (see 5); CMIJ Centro Meteorológico for request, investment, installation, operation. CubaEnergia for project

					supervision & validation
3 - Marabu Cutter - Biomass Processing	Specifications formulated	Latest arrival of all components for assembly & field testing	<b>Specifications for tractor submitted to UNIDO in December 2009. The tractor model has to be selected before the rest of the components can be defined. No response from UNIDO, nor any follow-up of the submission to UNIDO from the Cuban side.</b>	Cutter, locally assembled/manufactured & operational	UNIDO procurement & supply of components; CICMA for manufacturing; CubaEnergia for supervision validation & reporting
4 - Small Wind turbines: Local Manufacturing	UNE/CubaEnergia to identify equipment. UNIDO supply of imported components	Latest arrival of all components for assembly & field testing	<b>Components not received. INEL-UNE has identified the necessary equipment for two types of wind turbines, but UNIDO has not carried out the acquisition process.</b>	Prototype operational	UNIDO to facilitate Tech. Trans and timely procurement & supply; UNE & INEL for engineering design, manufacturing & testing; CubaEnergia for project supervision & evaluation
5 - Biomass Gasification Compact Plants – Local Manufacturing	UNIDO to facilitate processing TT Agreement not later than March	Agreements signed	<b>Process of transference of technology not initiated (only preliminary conversations). Agreements not signed.</b>	Design for local manufacturing finished	Depends on agreement re. Technology Transfer from India. UNE Engineering Design & Manufacturing
<b>Investments</b>					
1 - Biomass Boiler Meat Processing Plant Gerona	Submission Investment proposal to MEP	Engineering design complete; Financial Agreement ready; Supply Contract Boiler agreed & signed.	<b>Investment proposal submitted to MEP. Supply Contract Boiler not yet agreed. Financial agreement not prepared. Biomass supply not secured</b>	Start Civil Works	MINAL (Min for Food industry) for investment (incl. request to MEP), procurement. RRMF by Comp Fiduciaria; CubaEnergia for project supervision and

					validation.
2 - Biomass Boiler Dairy Industry Gerona	Submission Investment proposal to MEP	Engineering design complete; Supply Contract Boiler agreed & signed	<b>Investment proposal submitted to MEP. Supply Contract Boiler not yet agreed. Financial agreement not prepared. Biomass supply not secured</b>	Start of Civil Works	MINAL (Min for Food industry) for investment (incl. request to MEP), procurement. RRMF by Comp Fiduc; CubaEnergia for project supervision and validation
3 - Biomass Gasifier Melvis 2 x 250 kW	Submission of investment docs to MEP by UNE. Loan Agreement with Comp.Fid. Preferably Supply Contract to include Technology Transfer for demo -5?	Start of detailed Engineering design; Supply contracts agreed; execution schedule ready	<b>Offers received from providers in 2006, not updated. Basic engineering concluded, detailed engineering to be started once the technology has been selected. Supply contracts not signed, execution schedule not ready. Investment proposal submitted (for 2010 and 2011). No loan agreement with Comp. Fid.</b>	Civil works in progress	UNE for all activities from request, investment to operation. CubaEnergia for project supervision and validation
4 - Biomass Processing - Empresa Forestal	Specifications ready & Tender initiated	Technical Equipment Supply contracts agreed	<b>Tender process initiated for field equipment (tractors, etc.), but not for industrial equipment). Financial agreement with Compañia Fiduciaria not finished (necessary to buy equipment).</b>	Plantations started	GEAM/MINAC for entire project. CubaEnergia for project supervision and validation. <b>Urgent issue: nursery process must start in November, and three months are necessary for manufacturing, supply and installation of nursery equipment.</b>
<b>Others</b>					
1 - Compania	Terms &	All loan	<b>Terms and</b>		Comp. Fiduc.

Fiduciaria	Conditions adapted for project financing for all IJ investment projects.	procedures complete	<b>conditions not defined. Loan procedures unfinished in the case of GEAM and not initiated for the meat and dairy industries.</b>		
2 - 4 Meteo Towers		Installation of remaining 3 towers completed & operational (incl. software)	<b>Towers not installed; data compilation from Tower 1 not initiated due to lack of some parts of the necessary communication software.</b>	First analysis ready	CMIJ – Meteo Center Isla de la Juventud; CubaEnergia for project supervision and validation.
3 - Forestry Management Support	Supply Contract (UNIDO) for nursery & equipment	Equipment Supply	<b>ToR were translated into English and submitted to UNIDO in December 2009. Tender process not finished (and hence supply contracts not agreed).</b>	Nursery in operation	GEAM & UNIDO for supply. CubaEnergia for project supervision and validation. <b>Urgent issue: nursery process must start in November, and three months are necessary for manufacturing, supply and installation of nursery equipment.</b>
4 - Equipment for sustainable biomass supply to Cocodrilo	Commercial Contracts agreed and signed	In operation	<b>Equipment not available (see Demo 1 above). Biomass supply contracts not signed.</b>		UNIDO/Flora y Fauna; CubaEnergia for project supervision & validation.

*CMIJ – Centro Meteorológico Isla de la Juventud*

*MINAL – Ministerio de la Industria Alimenticia*

*CICMA – Centro de Investigaciones de Mecanización*

*Agricultura*

*GEAM – Grupo Empresarial de Agricultura de Montaña*

*UNE – Unión Eléctrica*

*INEL – Empresa Ingeniería de UNE*

### 1.1.3. Methodology applied

The Mid – Term Evaluation took place between from 8<sup>th</sup> to 24<sup>th</sup> June 2010 in Havana and Isla de la Juventud (from 11<sup>th</sup> to 14<sup>th</sup> June) and was carried out by the authors of the present report (see front page). A list of persons contacted during the evaluation is included in Annex 2.

As specified in the Terms of Reference of the Evaluation, the applied methodology to perform the project evaluation has consisted of:

- Detailed analysis of the project documentation, supplied by UNEP - UNIDO before the field trip to Cuba.
- Phone conference with UNE – UNIDO officials to clarify details.
- Upon arrival to Havana, a first set of interviews with the Project Director and representatives of some relevant stakeholders.
- A three days trip to Isla de la Juventud, including visits to the sites corresponding to the different project activities and meetings with all the relevant local stakeholders and local authorities.
- A second set of interviews with the rest of relevant stakeholders (including UNIDO), as well with national authorities in Havana.
- Revision of project documentation facilitated by the Cuban counterparts.
- Final discussions with the Project Director and other relevant actors.
- Preparation of the Draft Report, after the end of the stay in Havana.

The present Final Mid – Term Evaluation Report has been prepared after reception of comments from stakeholders (summarized in Annex 6), as stipulated in the ToR.

## 1.2.Scope, objective and methods

The main purpose of the Mid –Term Evaluation is to give an assessment of the operational aspects of the project, such as project management and the level of implementation of the different activities, as well as the extent to which the objectives can be fulfilled or are being fulfilled. The Evaluation Team has tried to give a clear overview of all the relevant pending issues in each activity, of the necessary measures to be eventually taken to unblock them and to allow their completion according to the corresponding schedule. Special importance has been give to explore the possibilities of replication and to evaluate the comments received from local authorities and stakeholders about their expectancies and degree of satisfaction with the general objectives of the project and its general approach.

The evaluation has been focused on the following issues:

- To assess the relevance of the project initial design against the real situation and conditions faced during the project execution.
- To assess the adequacy of the execution against the project general objectives.

- To analyze the relevance of outcomes and impacts to date, and the likelihood of achieving the future impacts defined in the Project Document.
- Expressed in more concrete terms, the main purpose of the evaluation is to give an overview of the general situation of the project after the modifications approved by the Steering Committee in 2009, to check the degree of accomplishment of the milestones defined in the January 2010 Steering Committee meeting, the perspectives of the different tasks being terminated according to the current time schedule of the project, and the corrective actions needed to obtain maximum impact from the project activities.

The main issues addressed during the evaluation include:

- The general design and strategy of the project and the general arrangements made for its realization (selection of stakeholders, organizing issues, etc.).
- The management and implementation arrangements, and performance since the project start-up.
- The sustainability and potential replication of the project. Special importance has been given to the comments and opinions received from the direct beneficiaries and from the local authorities about the general purposes of the project and about the expectations arisen.

The applied methodology for evaluation, whose practical steps have been summarized in Sub – Chapter 1.1.3 above, has consisted of the evaluation and rating of a set of issues, as defined in the evaluation ToR (Annex 1):

- Attainment of objectives and planned results
- Sustainability
- Catalytic role and replication
- Stakeholder participation and public awareness
- Country ownership/driven-ness
- Achievement of outputs and activities
- Preparation and readiness
- Assessment of monitoring and evaluation systems
- Implementation approach
- Financial planning
- UNEP supervision and backstopping
- Complementarity with UNEP medium term strategy and work programme

All the above issues are analyzed, evaluated and rated in the different sub – chapters of Chapter 2 below.

## **2. PROJECT PERFORMANCE AND IMPACT**

In general terms, the general purpose an initial design of the project are adequate, taking into consideration the general energy outlook of Cuba and of Isla de la Juventud in particular. There are plenty of renewable energy resources, especially biomass, and the electricity generation heavily depends on imported liquid fuels, but up to now no systematic



efforts had been directed towards the use of renewable domestic resources. The realization of the project objectives (especially the introduction and demonstration of technologies for use of biomass in the fields of thermal energy and electric power which were not in use in Cuba) will clearly pave the way for a wider use of renewable energy resources in other parts of the country. Also very important are the activities devoted to guarantee a continuous and reliable supply of biomass in the future.

On the one hand, there is, at present, a high degree of interest on all the technologies contemplated in the project has been created in national and local authorities and other involved stakeholders, and this is a basic requisite for future activities. There are clear perspectives of future replication, and this would have been not possible without the dissemination and demonstration efforts contemplated in this project.

On the other, the high number of Ministries and organizations involved has been a serious barrier for the implementation of the project, and has caused considerably delays in project implementation. Unfortunately the situation has not improved since the project objectives were reduced. It is a matter of concern that this will also create problems for implementation of future projects and activities. Moreover, the organization of the Cuban Government has varied during the development of the project; some Ministries have been merged, and some other organizations have been restructured. All these changes seem to show a tendency towards simplification and rationalization, and it can be expected that in the future the situation will register a light improvement.

## **2.1. Attainment of objectives and planned results**

According to the last available Progress Report (July - December 2009), only Output 2 (Local and national capacity built to utilize the commercial potential of renewable energy technologies) is already completed. Some activities of Output 3 (Setting up of innovative financial mechanisms and structures to encourage private/public sector investments in renewable energy projects), and of Output 5 (Establishment of project management and coordination structures) have also been concluded. Clearly the hurricanes of September 2008 have had a very negative impact on the attainment of objectives and planned results.

A detailed assessment of the situation of the activities being presently carried out is given in Sub-Chapter 2.6 below.

### **2.1.1. Effectiveness**

The global objective of the project (reduction of energy-related CO<sub>2</sub> through removal of barriers and promotion of environmentally sound renewable energy technologies for power generation and process heat) will be reached, probably with some delay in certain project outputs. Up to now only a small reduction of CO<sub>2</sub> emissions has been reached (through Los Canarreos wind farm, about 2950 metric tons CO<sub>2</sub> until mid-June 2010), but certainly many barriers have been removed and several environmentally sound technologies are being promoted.

The GEF Review of Outcomes to Impacts (ROtI) method has been designed to be used mainly for Final Evaluations. The project object of the present Mid-Term Evaluation is of course not finished, and therefore not sufficient data for rating of outcomes and

intermediate states are available; the ratings given have been based on hypothesis which seem reasonable and realistic at the time of this evaluation.

In order to give a clearer perspective, effectiveness of project outcomes are firstly rated separately, and then a global rating for project effectiveness is given.

The present perspectives for the project outcomes can be summarized as follows:

- *Strengthened enabling policy environment for the promotion of renewable energy technologies in Cuba and the region.* In certain aspects the situation is favourable for the realization of this outcome: the attitude of both local and national authorities towards renewable energy source has improved since the project start and an instrument to finance future energy project has been created (RRMF), and the general tendency of the Cuban authorities is to move towards a progressive decentralization; it has recently been approved that projects whose budget is lower than 5 MCUC can be directly authorized by the corresponding Ministry (which is also in charge of getting the necessary financing), instead of Ministry of Economy and Planning (MEP). However the Cuban authorities are at present not giving any financial support to renewable energy other than long term loans, and no renewable policy as such has been created. The national authorities contemplate some scenarios but no systematic policy has been adopted, and the development of renewable energy sources is to be financed through foreign investments.

A draft renewable energy policy (the so-called Marco Regulatorio) is under preparation and has been submitted to the Council of Ministers, but the Evaluation Team was not given access to the draft.

The realization of this outcome should be analyzed again at a later stage of development of this project.

**Rating: BC (Moderately Likely)**

- *Established national capacities to utilize the commercial potential of renewable energy technologies.* The Evaluation Team observed a clear interest from the side of the Cuban authorities in having participation of the Cuban industry in the manufacturing of biomass gasifiers and other devices for use of renewable energy sources, but the necessary transfer of technology agreement has not yet been defined, nor signed. It is extremely important that the activities related to installation of biomass gas-fired boilers and of power gasifiers are successful if this outcome is to appear. The rating below is an estimation of possibilities of occurrence.

**Rating: BB (Likely)**

- *Development of an IPP sector.* Since the Cuban economic system is centralized, this outcome must be understood as the development of a group of producers other than the present vertically integrated electric utility Unión Eléctrica (UNE). The question of introduction of private property is currently being debated, but it seems highly improbable that it is extended to relatively

large enterprises such as independent power producers. The Foreign Investments Act contemplated the possibility of implementation of joint ventures, to create independent power producers. There are already some companies supplying electricity to UNE, most of them using bagasse from sugar cane as fuel (these cogeneration installations were designed with the basic purpose of elimination of bagasse, not of efficient production of electricity and heat, hence the bagasse is burned very inefficiently).

**Rating: BC (Moderately Likely)**

- *Recognized options innovative financial mechanisms to encourage private sector investments in renewable energy projects in Cuba.* Since private sector does not exist in Cuba, this outcome must be understood in terms of encouragement of foreign investments in renewable energy projects in Cuba. This outcome coincide with the intentions of the Cuban government, and seems reachable. The role and performance of RRMF are essential as one of the possible mechanisms to support the future development of more renewable energy projects in Cuba.

**Rating: BC (Moderately Likely)**

- *To remove the key barriers that constrain widespread use of renewable energy technologies (biomass and wind) through business models on Isla de la Juventud and rest of the country.* Creation of business models is still far from complete, but seems reachable. Successful implementation of the business models contemplated in the project is essential for future developments. The replication potential of these first Business Models being currently prepared is large, both in Isla de la Juventud and in the main island.

**Rating: AC (Moderately Likely)**

- *To develop a replication and information strategy to promote renewable energy technologies in the region.* The existence of this outcome can be already partially detected; the dissemination activities carried out by the project have created interest in further development of use of renewable energy sources, being the possibility of reduction in consumption of liquid fuels a strong motivation for this interest. Particular interest for replication has been detected in the field of food industry.

**Rating: AC+ (Likely)**

It cannot be said that local decision process have been effective. Certainly much effort and time would have been saved with more agile procedures but, given the existing procedures, communications between the different stakeholders involved have been too slow, and co-ordination needs to be improved (including that between the project management and UNIDO).

The Cuban approach to regulate foreign private investments is defined in Law 77/1995. The law contemplates the creation of mixed enterprises (joint ventures, partially owned by a Cuban entity), foreign enterprises (fully owned by foreign persons or entities)

and the so-called International Economical Association Contracts (EAC), which do not contemplate the creation of any enterprise; they are contracts between Cuban and foreign bodies whose objective is to carry out a certain activity. It is worth noting that the creation of foreign enterprises, as described above, requires authorization from the Council of Ministers, and this is also the case when the objective of the enterprise or contract is the exploitation of natural resources. Apart from this, the law does not contain any specific mention to activities in the field of use of renewable energy sources.

Many mixed enterprises have been created in the past years in different sectors mainly in the tourism sector (in the form of EAC), so the system has to be considered effective, at least to some extent. Moreover, the Council of Ministers has explicitly expressed its support to use of renewable energy technologies and its willingness to leave open the exploitation of the country renewable energy resources to foreign investment. This is a favourable attitude, but at the same time it implies that no financial support is to be supplied by the Cuban state to renewable technologies (except in the form of soft loans).

The financial mechanism to be established by Compañía Fiduciaria has not yet been completed; only basic guidelines and indications of relevant information to be submitted by Cuban companies responsible for the four Business Units contemplated in the project have been drafted, but loan conditions have not been defined nor drafted. The reason given for this is that the contract between UNIDO and Compañía Fiduciaria has not yet been modified to take into consideration the changes in the project objectives approved by the Steering Committee, and therefore Compañía Fiduciaria does not still has access to the corresponding new funds to be granted. But the preparation of the loan agreements could have been carried out entirely until the loan contracts are ready for signature, and at the same time the addendum or modification to the contract could have been negotiated with UNIDO. No draft addendum has been submitted to UNIDO. In general, it has been observed that companies do nothing when no contracts are signed, and this is a major cause of delay.

Moreover, it is still unclear whether it will be possible to have at least a part of the project funds still to be supplied located in an account of a foreign bank; this would make easier and less time-consuming the acquisition of equipments manufactured abroad. A request for authorization to do so should be filed.

As for the willingness and capacity of the Cuban government in relation to the financial commitments for co-funding and investments contemplated in the original project document, clearly the impact of the hurricanes of 2008 has a put a severe blow to it, which is understandable given the large destruction caused and the necessity from the side of the Government to supply funds for reconstruction. One relevant change of the initial design of the project, approved by the Steering Committee, was to increase the RRMF in US\$ 1M, considering the build-up of the Los Canarreos wind farm as a financial contribution from the Cuban side. The Cuban officials contacted by the Evaluation Team have shown their willingness to materialize the pending Cuban contribution to the project.

As indicated elsewhere in this report, the causes of the delays experienced by the project are the effects of the hurricanes in 2008 and the slowness and degree of complication of the procedures applied to a project in which many Ministries and bodies are involved. The Evaluation Team considers that the Steering Committee show a comprehensive and realistic attitude when it defined new objectives (May 2009) and

milestones (January 2010) for the project. At the time of their definition, the milestones and objectives were both realistic and attainable, but the project has later experienced new delays, most of the June 2010 milestones have not been reached, and many of those corresponding to December 2010 will not be reached either (see Sub-Chapter 2.6 for more details).

### **Overall Rating for Effectiveness: Moderately Satisfactory**

#### **2.1.2. Relevance**

The outcomes defined in the Project Document can be in general considered consistent with focal areas and operational program strategies and are adequately considering the basic requirements for a stable development of use of renewable energy sources in Cuba. As indicated above, the key factor of the interest shown by several of the Cuban stakeholders is the reduction in use of liquid fuels, more than directly the reduction of emissions of pollutants and of greenhouse gases, but nevertheless the project outcomes, if successful, will make a significant contribution to the GEF general purposes and objectives. And the Cuban authorities have made clear to the Evaluation Team their commitment to environmental issues and reduction of emissions of greenhouse gases.

#### **Rating: Satisfactory**

#### **2.1.3. Efficiency**

The cost effectiveness of the project have been negatively influenced by the important delays it has faced, due to the catastrophic impacts of the hurricanes which reached Cuba in September 2008, to the economic crisis, and to the slowness of the necessary decision procedures (due to the large number of involved Ministries and institutions and to the general bureaucracy in Cuba). But at the time of its design the cost-effectiveness of the project was adequate; it is difficult to establish whether its design was the least cost option or not due to lack of references, but the approach adopted and the funds provided seem adequate.

The Cuban counterpart has moved towards in-kind co-financing instead of direct funding, but this has to be considered a reasonable approach given the situation of the Cuban economy and the impact of the hurricanes (it was very costly to re-construct the Isla de la Juventud infrastructures).

The project design was adequately build on past initiatives whenever possible (SWERA, CREDP) and it is doing adequate use of available technical information and expertise (relevant external researchers and manufacturers have been contacted for assessment and possible transfer of technology). The technological risks of the project activities have been maintained at a level as low as possible.

#### **Rating: Moderately Satisfactory**

**Overall rating for Attainment of Objectives and Planned Results: Moderately Likely**

## **2.2.Sustainability**

A relevant characteristic of the Project is that it is not only devoted to develop a number of activities with different types or renewable sources to serve as good examples and precedents for other future projects and activities; the general principle on which the project is based is to create a mechanism to carry out in a sustainable manner the development of renewable energy sources in Cuba. Clearly, the concept of sustainability was a first matter of concern at the time of the project design, and in fact this is clearly reflected in the Project Document.

At the time of the present Mid-Term Evaluation, the Cocodrilo gasifier is the only installation contemplated under the project for use of renewable energy uses that has been commissioned; the following comments are consequently referred to the future outlook that can reasonably be estimated at present.

#### 2.2.1. Financial resources

From the viewpoint of sustainability, the creation of a fund (Risk and Replication Management Fund (RRMF) devoted to facilitate funding a future renewable energy projects plays a major role. Since the Cuban Government has decided to leave the development of the renewable country resources to be implemented through foreign investment, clearly the Fund, if properly designed and managed, will act as an embryo for future activities.

There is a risk the future development of the Fund can face, and this is based on the foreseeable future monetary situation of the country. At present, a relevant characteristic of the Cuban economy is that it is based in the use of two currencies: the Peso (also called Moneda Nacional) and the Peso Convertible (CUC). Moneda Nacional is used for local transactions and cannot be directly converted into any foreign currency. The Peso Convertible can be converted into any foreign currency, but the exchange rates are fixed by the corresponding Cuban authorities, and in fact do not always reflect real market values. The reasons for adoption of this complex system are varied, and one of them is the situation of embargo which the Cuban economy is experiencing.

A complete and detailed description of the Cuban economic and monetary system is beyond the scope of this report, but an increasing consciousness seems to exist in Cuba about the fact that this monetary system is unsustainable in the long term. Its disappearance would imply the creation of a single Cuban currency, but the criteria to be applied to exchange CUCs into the new currency is uncertain. The CUC exchange rate seems to have been maintained artificially high, and the move towards a more realistic exchange rate could have negative consequences for the project funds at that time. Given that the RRMF administered by Compañía Fiduciaria is composed of CUCs, this represents a risk which at present is very difficult to quantify and whose date is uncertain. Location of the funds (or a part of them) in a bank outside Cuba would be an advantage both from this viewpoint and from that of simplification of payment procedures for items and equipment which have, necessarily, to be acquired abroad.

Nevertheless, the very existence of the RRMF is an important step towards sustainability of activities in the fields of renewable energy sources. Apart from the role played by the funds directly supplied by the Project, it guarantees the continuous existence of funds for funding of future projects and it constitutes a nucleus for future financing from other possible external donors.

**Rating: Moderately Likely (ML)**

2.2.2. Socio-political

No risks of a socio-political nature have been detected during the evaluation process. Consciousness about the convenience of use of renewable energy resources is high and growing among the stakeholders, authorities and general public and the high prices of fossil fuels being replaced by renewable sources are an important pressure towards increasing future impacts of this type of projects.

**Rating: Highly Likely (HL)**

2.2.3. Institutional framework and governance

The general energy policy of the Cuban authorities is directed towards reduction of oil imports and use of domestic energy resources. There are no reasons to presume that this attitude is going to be modified (in fact, it can be found everywhere around the world). Beside this, local authorities, bodies and enterprises are supposed not to exceed limits of consumption of oil products previously fixed by the national authorities, and every help to maintain consumption below these allotments is welcome.

The necessary know-how is at present not in place; Cuba has the required technical resources to manufacture biomass gasifiers and other types of components for installations that use renewable energy sources, but a transfer of technology is necessary to take advantage of these capabilities. In this sense, the signature of agreements for transfer of technologies with the foreign institutions already contacted during the development of the project is very important.

**Rating: Likely (L)**

2.2.4. Environmental

From the viewpoint of protection of the environment, no risks are derived from the project activities. The use of wind resources is not harmful, consumption of biomass is contemplated under a scientific approach (biomass cultivated exclusively for its use as an energy resource, use of forest waste proceeding from cleaning, etc.). In fact, cleaning of forests was already being carried out, but now an economic profit is to be obtained from the residues. This is considered a very relevant issue by both Flora y Fauna and GEAM (in charge of biomass supply to Cocodrilo and all the other plants, respectively). The only possible risk is that a delay in the implementation of the scientific approach mentioned above results in an excessive use of forest wood other than residues during the first 6-7 years after the project end (due to the unavailability of the nursery).

**Rating: Likely**

**Overall Rating for Sustainability: Moderately Likely (ML)**

## **2.3. Catalytic role and replication**

The project basic objectives and activities, as defined in the Project Document, clearly show that a key criteria for its definition was to create a catalyst for future activities; in fact

the idea behind the creation of a Risk and Replication Management Fund is to develop a mechanism to support the development of future projects, since one of the most important barriers to implementation of projects based on renewable energy sources is the difficulty of finding adequate funding. The project contains activities of the foundational type (establishment of a policy and regulatory framework enabling development of renewable energy technologies), as well as demonstration activities (biomass gasifiers for use in power plants and in industrial installations, wind generators, etc) and investment activities (implementation of business models). This chain of activities seems to be well designed to create a basic infrastructure to allow for replication and sustainable activities in the field of renewable energy.

#### 2.3.1. Incentives

Up to now, cleansing of forests was an activity that was carried out in Isla de la Juventud only because it is necessary to guarantee an adequate development of forests, to prevent fires, etc., and the biomass obtained was treated as a residue. The project is creating the possibility to see this activity from a completely new viewpoint: now this “residue” has a commercial value, defined by the value of the fossil fuel savings that are obtained through use of biomass for generation of electricity and heat. Beside this, the new land area to be reforested for generation of more biomass results in creation of jobs and an increased consciousness about the importance of forest related activities.

The incentives created by other project activities are also important: marabu has invaded a large surface of land (not only in Isla de la Juventud, but also in the main island), and it is seen as a serious problem; the design of an effective marabu-cutting machine will create an incentive for use of biomass and will also contribute to the creation of new jobs.

Reduction in the use of fossil fuels is a strong incentive towards use of renewable energy sources. Oil imports are a heavy burden on the Cuban economy, and every mechanism to reduce it is welcome by stakeholders, mainly by those responsible for industrial activities.

In summary, the project activities are acting as a strong incentive towards new and positive attitudes from stakeholders about use of renewable energy sources.

#### 2.3.2. Institutional change

As indicated in the previous paragraphs, the project activities are being seen as a source of income, of reduction of fossil fuel consumption and of creation of jobs. Due to the structure of the Cuban state, institutions are strongly interrelated to enterprises and companies, and hence the institutions are very closely following the impacts of the activities being carried out by the project. A general atmosphere of support to renewable activities is being created, both at national and local level.

#### 2.3.3. Policy change

As indicated elsewhere in this report, no renewable energy policy as such exists in Cuba; only references are given in some pieces of law (a draft renewable energy policy is under preparation). Moreover, the Cuban authorities do not contemplate financial support for renewable beyond the scope of this project (only the possibility to obtain soft loans is available); development of renewable energy sources will have to be financed from foreign



sources. It is expected that Activity 1 (not yet initiated) will have a positive impact on this field.

#### 2.3.4. Catalytic financing

As indicated above, the Cuban government does not contemplate financial support for activities in the field of renewable energy, and given the present situation of economy crisis, this attitude will probably not change in the near future.

Nevertheless the creation of the Risk and Replication Management Fund is a very important step for the future, since it is a very appropriate tool to channel future development activities involving renewable energy. The Fund can receive funds from donors other than this project, and future donors will be happy to have at their disposal a proven mechanism to select and finance new activities. It can be reasonably expected that RRMF will play a relevant role in the future development of activities in Cuba in the field of renewable energy.

#### 2.3.5. Project champions

CubaEnergia, the Cuban counterpart of the project, has strongly championed the project activities, as well as UNE, the electric utility, and the Isla de la Juventud local authorities.

#### 2.3.6. Replication

Speaking in general terms, the project is clearly suitable for replication. Distinction has nevertheless to be made between the replicability of the project as a whole and of its different activities.

As a whole, it could be replicated in other areas, especially in those with geographical and environmental characteristics similar to those of Cuba (large biomass resources, scarce development of activities in the field of renewable, absence of structures for funding of renewable energy projects, etc.). Of course the entire project cannot be replicated in Cuba (it would be useless to have two sets of guidelines for development of renewable, two RRMFs, etc.).

The creation of a RRMF can be very useful in other parts of the world (financing has proved to be a strong barrier for development of renewable energy projects practically everywhere). It is worth noting that the Cuban system makes specially difficult to arrange for investments from foreign country, so the creation of a RRMF should in principle be easier elsewhere.

The demonstration and creation of business activities can be replicated inside Cuba, and in fact the Evaluation Team was informed of several plans to do so (to generate electricity from residues in sawmills, to electrify isolated areas through forest biomass and/or wind energy, to develop plants of the “La Melvis” type in other parts of the main island, etc.). However, replication will only happen if the RRMF is successfully implemented.

**Rating for Catalytic Role and Replication: Moderately Satisfactory (MS)**

## **2.4. Stakeholder participation and public awareness**

The local authorities in Isla de la Juventud have been adequately informed about the nature and advantages of the project activities and have indicated their strong commitment to the project objectives to the Evaluation Team. Two meetings were held, at the beginning and at the end of the field trip to the island, and a clear interest in all the project activities was shown.

It is worth noting that the current procedures for authorization of projects and installations not only involve the local authorities, but also Ministries and other organizations based in Havana, hence the delays in authorization procedures are not the direct responsibility of the local authorities.

As for the direct beneficiaries, all of them had been adequately informed about the nature and purposes of the project and shown a clear interest in the success of its activities. It was noted, however, that the implications of use of biomass gas for steam generation had not been adequately explained to the corresponding stakeholders (meat and dairy factories), which are currently using oil-fuelled boilers for steam generation.

Taking into consideration the destructive effects of the two hurricanes which reached the island in 2008 and the consequent delays experienced by the project activities, it can be said that public awareness is satisfactory and that the effectiveness of collaboration and interaction between the project partners can be considered adequate.

**Rating: Satisfactory (S)**

## **2.5. Country ownership/driven-ness**

Since the early 1990s, Cuba has experienced a serious economic crisis, including shortage of energy supplies, due to the collapse of commercial relations with the former COMECON, worsened by the reinforcement of the trade embargo the country is facing. The Cuban Government initiated in 2005 the so-called “Revolución Energética” (Energy Revolution), which contemplated different measures to reduce the country dependency on imported fuels (including use of domestic resources and renewable), and to encourage efficient use of energy.

The most relevant piece of law in relation to the activities included in the project is the National Program for Development of Local Energy Sources, which, among other things, considers development of renewable energy sources. Beside this, the Evaluation Team was informed that a Renewable Energy Policy is under preparation, but it was not allowed access to the draft. Nevertheless the Cuban Government has made repeated declarations in favour of use of domestic energy resources, in particular renewable, and all the authorities contacted by the Team at both national and local level expressed a firm support for the use of renewable energy resources and to the reduction of emissions of greenhouse gases.

It is important to emphasize that the Cuban Government has no intention to supply more funds for the development of renewable energy sources beyond those included in this project; the government policy is to finance renewable energies through private (foreign) investments. The only exception to this policy would be the granting of long term loans by the corresponding Ministry.

Clearly the project goal, objectives and activities reflect priorities of the Cuban government in the field of energy. Nevertheless the Team considers that a sound Renewable Energy Policy contained clear objectives and milestones should have been developed and implemented. Beside this, as indicated elsewhere in this report, the main concern of industrial stakeholders is to reduce consumption of liquid fuels, and not reduction of emissions of greenhouse gases; reduction of emissions of GHGS is certainly a consequence of reduction of liquid fuels consumption, but not an objective in itself (on the other side, Cuban energy authorities have emphasized their commitment to reduction of GHG emissions).

**Rating for Country Ownership and Driven-ness: Moderately Unsatisfactory (MU)**

## **2.6.Achievement of outputs and activities**

The already completed activities consist of the creation of the project team and of institutional reinforcement and training of the main stakeholders. All these activities have been adequately carried out; the project team was created, and the stakeholders have been adequately trained and informed about the project objectives and tasks. Nevertheless some remarks have to be made:

- There have been four different Project Directors during the project lifetime up to now; these changes have resulted in delays and have affected the due coordination among the different activities and bodies involved. No clear reasons were given for these changes. It is highly desirable that no more changes in relevant positions take place until the end of the project.
- The Evaluation Team has observed that some personnel should be hired to give direct support to the Project Director.
- The delays in implementation of demonstration activities and business models has resulted in the fact that in some cases, persons already trained on the physical realization of the corresponding activities have not been given any “on the spot” training; it is advisable that some practical update of the received training is given to these persons as soon as the corresponding installations are available.

As for the feasibility of completion of planned outputs (as defined in January 2010), the present situation has been summarized in Sub-Chapter 1.1.2 above. In the following paragraphs the perspectives of each of the milestones are discussed:

- Demo 1 (Cocodrilo 50 kW Biomass Power Plant). The installation is almost completed, the most relevant pending issue being that of the regular supply of biomass. The signature of the supply agreement between Flora and Fauna and UNE requires the supply to Flora y Fauna of the necessary equipment for biomass collection and supply to the plant. The tender procedure for acquisition of the equipment is being carried out by UNIDO; it seems possible to finish it on time to make the plant operational and to evaluate the first performance data before the end of the year, but a fluid and frequent communication between NPD and UNIDO is necessary. The English

manual is being translated into Spanish and needs a final revision prior to formal approval. Furthermore, a monitoring and evaluation plan has to be prepared by CubaEnergía to determine the operational performance of the plant; the results are an important tool for replication of similar projects.

- Demo 2 (Radar Punta del Este). The agreement for transfer of technology has not yet been signed, and this is a basic requisite for the system design, also affecting to other activities and very important from the viewpoint of replicability. It does not seem possible that the procurement for the complete system is ready by December 2010. **NB: this demonstration activity has been recently dropped.**
- Demo 3 (Marabu Cutter and Biomass Processing). The type of tractor in which the cutter is to be installed needs to be known before the rest of the equipment can be designed. The tender procedure for both the tractor and the rest of the equipment is to be carried out by UNIDO. Specifications for the tractor were submitted to UNIDO in Spanish in December 2009 (apparently without English translation). CICMA has indicated to the Evaluation Team that in twelve months from now the machine could be tested, if UNIDO completes the tender procedure within a short time. It will be clearly not possible to reach the December milestone; a delay of six months has to be reckoned with.
- Demo 4 (Small Wind Turbines). Complete specifications for two prototypes (1,5 and 3 kW) were submitted to UNIDO in November 2009 to carry out the corresponding process of acquisition of the imported components. It will be clearly impossible to have prototypes tested and operational by December 2010. A delay of at least 6 months can be expected.
- Demo 5 (Biomass Gasification Compact Plants – Local Manufacturing). The agreement for transfer of technology should have been signed by June, but only preliminary conversations have taken place. It is an extremely difficult challenge to have the design for local manufacturing finished by December 2010; to have the transfer of technology agreed and carried out would be a remarkable achievement.
- Investment 1 (Biomass Boiler Meat Processing Plant in Nueva Gerona). The corresponding investment proposal (March milestone) was submitted to The Ministry of Economy and Planning (MEP) for approval and inclusion in the Plan of Activities for 2011; this approval is a basic pre-requisite to initiate activities. It is also necessary to sign an agreement with Compañía Fiduciaria to get the necessary project funds. The contract for supply of the boiler has not been signed. To start civil works in December 2010 – January 2011 seems to be quite difficult, but possible.
- Investment 2 (Biomass Boiler Dairy Industry in Nueva Gerona). The situation is exactly the same as Investment 1 above.
- Investment 3 (La Melvis Biomass Gasifier and Power Plant). The submission proposal was submitted to the MEP. The loan agreement with Compañía Fiduciaria has not been signed. The technology to be used has not yet been defined, the execution schedule is not ready and the biomass supply contracts have not been signed. It seems possible that preliminary civil works could be in progress by December, but many relevant issues have to

be solved (design, tender procedure, etc.). It seems difficult, but possible, that the plant can be finished by December 2011.

- Investment 4 (Biomass Processing – Empresa Forestal). This is the most important Business Plan, since it is in charge of supplying biomass to all others. The specifications for the necessary equipment were prepared, but the tender process has been initiated only for field equipment (tractors, chain saws, etc.) but not for industrial installations to prepare the biomass for supply to La Melvis power plant and to the meat and dairy industries. Supply contracts cannot be agreed by June 2010 (June milestone). Plantations (December milestone) can be carried out from the existing nursery, but not from the new one (it is extremely important that the new nursery is available before November, which is the starting time for the nursery operation).
- Others 1 (Compañía Fiduciaria). No milestone is contemplated for December 2010, but the June milestone (to complete all loan procedures) has not been reached. It is of the utmost importance to define these procedures immediately, since they are the basis to make funds available to carry out Investments 1, 2, 3 and 4 above.

Compañía Fiduciaria seems to have clear ideas about how to build the loan mechanism to guarantee that loans from future projects are returned on a revolving basis and about the guarantees to be required, but no draft has been prepared. It is to be discussed whether loans for projects not included under this one should be charged a low rate of interest. Another issue to be discussed is whether UNEP-UNIDO should remain in the Technical Committee after the end of the project; since the only possible sources of funds are foreign investments, the permanence seems reasonable.

- Others 2 (Meteo Towers). The three remaining towers have not yet been installed and the software is not operational (June milestone). Nevertheless the December milestone (to have a first analysis ready) seems to be perfectly achievable.
- Others 3 (Forestry Management Support). It is extremely important that the new nursery is available by November 2010 (see Investment 4 three bullet points above this one). This seems difficult to achieve, given that three months are necessary to manufacture, transport to Cuba and install all the necessary equipment; only two months are left to finish the UNIDO tender process.
- Others 4 (Equipment for Sustainable Biomass Supply to Cocodrilo). No milestone for December is contemplated; the regular supply should have been operative by June, and this milestone has not been reached (see Demo 1 (first bullet point of this list)).

**Rating for Achievement of Outputs and Activities: Highly Unsatisfactory (HU)**

## **2.7.Preparation and readiness**

Given the situation of the energy sector in Cuba at the time of the project implementation (2005), it is obvious that the project objectives stated in the Project Document were defined after a careful analysis of the Cuban energy outlook and in particular of the special characteristics of Isla de la Juventud. The fact that many different authorities and bodies are involved and that the Cuban procedures are slow and time-consuming was obviously considered when the time length of the project was defined; the project objectives are clear, practicable and perfectly feasible to be carried out in six years.

The executing institution was adequately selected, and all the Cuban counterparts were chosen according to reasonable criteria, taking into consideration the project tasks and objectives. It is true that many Cuban institutions are involved, and this makes the process to take decisions complicated and time-consuming, but this cannot be avoided due to the nature of the tasks and objectives, the structure of the Cuban state and the limited degree of development of renewable energy resources in Cuba.

As stated in the Project Document, the projects objectives reflect that consideration was given whenever possible to past experiences and data obtained from several relevant projects or related activities (UNEP/GEF SWERA, UNEP/GEF Project on Cogeneration using sugar cane and trash, CREDP-UNDP-CARICOM, UNIDO PDF/B).

Due to the effects of the two hurricanes of 2008, and to the consequent reduction of available funds from the side of the Cuban government, the Project Steering Committee decided to make an important reduction of the project objectives, which seems reasonable given the prevailing situation and circumstances.

The roles played by the different institutions involved seem to have been clearly defined and agreed at the time of project implementation, but in fact there are many different bodies involved in each of the activities, and, as indicated above, the coordination of all of them has proved difficult in practice. Nevertheless this is a characteristic of the Cuban system, and the project approach had to be adapted to it.

Counterpart resources were adequate at the time of the project start-up, and an adequate project management structure had been defined. Later, the project faced difficulties derived from excessive changes in the project staff (the Project Director has been replaced three times) and slowness in the process of management.

**Rating for Preparation and Readiness: Satisfactory (S)**

## **2.8.Assessment monitoring and evaluation system**

### **2.8.1. M&E design**

The project monitoring and evaluation indicators and means of verification contemplated in the Project Document were in general well designed and seemed adequate to give clear and concise information about the project outputs and outcomes. The responsibilities of the project management entities regarding monitoring and reporting were clearly defined.

The project design of M&E fulfils the minimum requirements of GEF projects:

- Although some of them are of a general nature, it can be said that the indicators for project implementation cover the SMART requirements (Specific, Measurable, Achievable, Relevant & Realistic and Time-bound & Timely & Track able & Targeted). There are sufficient relevant indicators for each of the project outcomes. Not all of them are quantifiable, but this is a logical consequence of the very nature of some of the project outcomes.
- The same can be said of indicators for outputs.
- The project baseline is described in the Project Document, and clearly defines the problems to be addressed, and establishes indicator data (amount of liquid fuels replaced by renewable energy sources).
- The Project Document contains an M&E plan which identifies the reviews and evaluations to be undertaken.
- Evaluations are at present adequately budgeted (mid – term and terminal evaluations), but there is no specific budget line for monitoring.
- Responsibilities for M&E have been adequately defined.
- The time frame for M&E was designed, but it has experienced some delays (the present Mid-Term evaluation was postponed several times).
- No specific targets were defined for the time of evaluations (in fact, the Mid Term Evaluation has been carried out after almost five of the six years of project duration). The desired level of achievements have in general been only defined at the level of project end.
- The external factors (both assumptions and risks) indicated in the Project Document covered all the reasonable possibilities at the time of project start. Some assumptions have proved erroneous: :
  - It was assumed that a *policy and regulatory framework is in place that is fully supportive of renewable energy technologies based power projects in Cuba*. It is true that Cuban authorities have shown their support to technologies based on renewable energy sources, but no policy as such still exists (a draft policy is in preparation).
  - *International financing remains committed to investments in renewable energy sector in Cuba*. This assumption has proved erroneous; it has not been possible to find foreign investments, and this has been one of the reasons for some of the changes in the project approved by the Steering Committee. A successful implementation of the remaining three Business Models could have a positive impact on possible new investors.

### **Rating for M&E Design: Satisfactory (S)**

#### **2.8.2. M&E plan implementation**

The M&E plan was defined in the Project Document, and was designed to allow a clear tracking of results. Project Implementation Reports (PIR) are complete and the ratings are in general reasonable (those from the Task Manager are in general more realistic than those of the Project Director). Half – year reports are a little too brief to give a clear idea of the general situation of each activity.

It was established in the Project Document that progress reports should be prepared on a half – yearly basis. The last one (a copy of which was made available to the Evaluation Team) covered the second half of the year 2009. Given the present situation of the project, it is recommended to carry out a closer monitoring: progress reports should be prepared at least on a quarterly basis. Beside this, frequent and fluid communications between UNIDO and the Cuban counterpart (especially the Project Director) are a clear necessity if the project activities are to be finalized in 2011, as envisaged.

A project website has not yet been created, although there is a budget line with this purpose. In the webpage of CubaEnergia, the present main counterpart agency for the project (the initial counterpart was GEPROP, renamed after a reorganization), a brief mention of the project is made. The number of visitors to a project webpage could have been a good indicator of the interest created around the project activities. The website should include an English version.

**Rating for M&E Plan Implementation: Moderately Satisfactory (MS)**

**2.8.3. Budgeting and Funding for M&E activities**

The project budget only contains lines for Mid-Term and Final Evaluations, but there is no specific budget line for monitoring; these activities are supposed to be embedded in other budget lines.

The budget for Mid Term Evaluation was very low, and had to be increased later. This has resulted in a negative balance for the Evaluation budget line (5500)

**Rating for Budgeting and Funding for M&E Activities: Moderately Unsatisfactory (MU)**

**Global Rating for Assessment Monitoring and Evaluation Systems: Moderately Satisfactory (MS)**

## **2.9.Implementation approach**

The project management framework was adequately designed at the time of project definition, and properly described the project organization, objectives, M&E mechanisms, etc.

**2.9.1. Project implementation mechanisms**

In general, the mechanisms defined in the Project Document for its implementation were clear and concise, and adequately defined the roles and responsibilities of the different entities and organizations involved.

The Steering Committee has reacted adequately to the changing environment derived from the effects of hurricanes, which changed the priorities of the Cuban authorities and required a large amount of money to rebuild the infrastructures of Isla de la Juventud. It was necessary to reduce the scope of the project, eliminating certain activities, and re-distribute the project budget.



Seven Ministries, ten Agencies based in Havana and seven other agencies, companies and institutions based in Isla de la Juventud are involved in the project. Co-ordination of so many stakeholders is complicated, and has resulted in important delays in the project activities. Given the structure of the Cuban public administration, it cannot be avoided to have so many institutions involved, but this situation makes the role of project co-ordination especially relevant. It is important to create a sense of “community” in all the institutions involved in each of the project activities, instead of having them acting independently of each other and with few contacts among them apart from the official co-ordination meetings.

It is worth noting that the project has had four different Project Directors in five years, and all these changes have also resulted in delays. Certainly the mechanisms defined in the Project Document did not contain any limitation relative to the number of persons occupying each position, but clearly so many replacements make co-ordination difficult. Since the project is at present facing delays, it is strongly recommended that no more substitutions take place in key positions.

UNIDO is in charge of some tendering procedures for acquisition of equipment, and the Evaluation Team has observed that the tender procedures have not been sufficiently explained to the corresponding stakeholders. This has resulted in misunderstandings and delays. In general, it can be said that a common cause of delay is that each stakeholder is waiting for the other to act, and there is a lack of initiatives to unblock the different processes and to try to make some progress independently of the attitude adopted by other stakeholders.

#### 2.9.2. Effectiveness, efficiency and adaptability of project management

As indicated above, the Steering Committee has reacted adequately to a changing environment due to the impact of hurricanes in 2008. The recently (May 2009) adopted policy to establish concrete milestones to be reached at certain times is positive since it helps to clearly define priorities and adequately indicate responsibilities. In January 2010 new milestones were defined; most of those corresponding to June 2010 have not been reached (details are given in Sub-Chapter 2.6 above).

As for the day to day management, it has already indicated that the large number of institutions involved makes co-ordination difficult, and the three replacements registered for the position of Project Director has worsened the situation. The new Project Director (from January 2010) is in acute need of some auxiliary staff if the project activities have to be finished in 2011 without further delays.

In general, the Cuban executing agencies have shown support for the project, but the co-ordination among them has not been optimal. Especially important is the case of Compañía Fiduciaria, which plays the very relevant role of administration of the RRMF; the loan procedures for the Business Models have not been signed (in two cases the corresponding drafts have not been initiated). It is necessary to improve the co-ordination with other stakeholders and to advance in the preparation of draft loan agreements).

#### 2.9.3. Administrative, operational and/or technical problems and constraints

Apart from those indicated in the above paragraphs, no other problems have been observed.

Since it is necessary to acquire equipments abroad (both for the present activities and for future projects to be financed through RRMF), it seems adequate to put a part of the RRMF resources in a bank account outside Cuba; in this way the procedures for payments would be much easier and shorter. An authorization from the Central Bank of Cuba is necessary for this, but the corresponding application has not yet been filed (time for response is about 30 days).

#### 2.9.4. M&E during project implementation

The project log frame contains specific indicators for all the project objectives and outcomes. These indicators are clear and relevant to each of the objectives and outcomes, and the Evaluation Team considers that they are sufficient to give clear references for the evaluation and quantification of results.

The baseline information is sufficient for a project which has as their immediate objectives to replace liquid fuel for generation of electricity, but the consumption of fossil fuels in industries for heat (steam) is not mentioned as a reference for the activities related to dairy and meat industries.

As for the time frame, it has suffered modifications due to the delays experienced by the project activities (the timeline for the present Mid – Term Evaluation was delayed).

Specific targets were defined for all the project outputs, and the desired level of achievement was clearly specified in the Project Document.

The Project Document included an M&E system which was followed with some modifications during the project implementation up to now (see Sub – Chapter 2.8 above for more details). The responsibilities have been clearly defined. The initial project budget, included as Annex 1A to the Project Document, did not contained any budget line for monitoring and evaluation, but Line 550 was added later to contemplate mid – term and terminal evaluations (but not project monitoring).

Annual project reports were prepared, and the information provided by reports was used to adapt the project to changing needs and circumstances.

#### **Rating for Implementation Approach: Moderately Unsatisfactory (MU)**

### **2.10. Financial planning**

The initial project budget (in UNEP format) was well structured and in general contained adequate funding for each of its lines (one exception to this is the budget line for mid-term evaluation, which was too low). The budget by project activity contemplated 8660 MUS\$ in private investments (more than a half of the total budget of 16041 MMUS\$); this amount had been estimated after consultations with private investors and companies during the PDF phase, which resulted in the corresponding letters of interest). But all these private investments failed to materialize.

Beside this, two hurricanes reached Isla de la Juventud in 2008, with disastrous effects, and the Cuban government had to devote a large amount of financial resources to

reconstruction purposes. This situation made necessary to modify and reduce the project objectives, and the Steering Committee, quite realistically, approved the necessary changes and subsequent budget reduction.

The project budget has been modified twice. The present project financial situation indicates that expenditures are below schedule (most of the equipment for the demonstration activities and business models has not yet been purchased).

#### 2.10.1. Assessment of financial controls

The Project Document established that quarterly financial reports had to be prepared and submitted. A financial report model was included in the Project Document, and it was adequately designed and structured to give a clear idea of the financial situation of the project at any time.

The present budget situation (at the end of 2009) indicates that there have been only three cases in which budget lines have been surpassed: Line 2001 (GEPROP, in 2007), Line 4220 (Non – Expendable equipment – unspecified, in 2007, 2008 and 2009)), and Line 5501 (Mid – Term Review, in 2010). Clearly, adequate financial controls have been properly carried out and the Project Management has always been in a good position to make informed decisions regarding budget and flow of funds.

As for the yearly expenditure, the effects of the delays experienced by the project (which have been described elsewhere in this report) have resulted in expenditures well below schedule in the years 2008 and 2009. The reason for this is that only a small amount of the contemplated equipment has been already purchased; it is expected that equilibrium will be reached by the end of the project.

#### 2.10.2. Co - financing

As indicated above, the initial project budget contemplated 8660 MMUS\$ of private investments, which have failed to materialize. This has been one of the main causes of reduction of project size and objectives, together with the effects of the hurricanes which reached Isla de la Juventud in 2008.

On the other side, the Cuban government had to change its priorities for investments after the hurricanes in 2008 and the starting of the economic crisis; this resulted in budget modifications, which were approved by the Steering Committee. Nevertheless, all Business Models and Demonstration Projects have secured co – financing in local currency from Cuban Ministries, duly expressed in the National Economy Plan. GEF funds will be mainly used for imports in hard currencies

#### 2.10.3. Diligence

The management of funds seem to have been adequately performed, and only small deviations from the current budget have been detected.

No financial audits have been carried out since the time of the project start in 2005 (it actually started in 2006; no funds were spent in 2005).

#### 2.10.4. Actual costs and co - financing

No co-finance reports have been submitted by UNIDO to UNEP up to now.

No leveraged resources (private funding was not obtained). Financial difficulties due to effects of the hurricanes in Isla de la Juventud in 2008 forced the Cuban government to ask to consider Los Canarreos and Holguín wind farms as contributions to the project, and this was approved by the Steering Committee.

**Rating for Financial Planning: Satisfactory (S)**

**2.11. UNEP supervision and backstopping**

As indicated elsewhere in this report, the project monitoring plans were adequately defined at the time of project design, taking due consideration to the special characteristics of the project, its duration and the low degree of use of renewable energy sources in Cuba at the time of project start up. In the same way, the design of the project implementation review reports (PIR) is adequate to give a clear and detailed outlook of the situation of the project at a certain time. These PIR were to be prepared on a yearly basis (the last one covers the period from 1/7/2008 to 30/6/2009).

Besides the above, progress reports were to be prepared every six months. These reports have a format much simpler than that of PIR, and are devoted to give a quick view of the general situation of the project.

The Evaluation Team considers that the initial mechanism adopted by UNEP to supervise the project was well designed.

The most recent Progress Report covers the period from July to December 2009, but by end May 2010 it had not yet been submitted to UNEP. These delays are highly undesirable, since they retard the adoption of corrective measures in case of any problem. Nevertheless it is worth noting that both UNEP and UNIDO officers have visited Cuba and the project sites in Isla de la Juventud and made a close follow up of the project development.

It is recommended that Progress Reports are prepared more frequently (at least on a quarterly basis) and supplied no more than ten days after the end of the corresponding reporting period.

The last available PIR (July 2008 to June 2009) gives an adequate and realistic view of the situation at that time, and the Task Manager ratings seem to be adequate and more realistic than those of the Project Manager, in view of the present situation, almost one year later.

The impacts of two hurricanes in 2008 put a severe blow on the project activities and forced to a revision (reduction) of the project objectives. UNEP took a realistic approach to adequate the project to the new circumstances, reducing its objectives and creating sets of milestones to try to have a clearer control of the project achievements. UNEP backstopping can be considered adequate.

**Rating of UNEP Supervision and Backstopping: Satisfactory (S)**

**2.12. Complementarities with UNEP Medium Term Strategy and Programme of Work**

The in the UNEP Medium Term Strategy considers six thematic focal areas (Climate Change, Disasters and Conflicts, Ecosystem Management, Environmental Governance, Harmful Substances and Hazardous Waste and Resource Efficiency – Sustainable Consumption and Production). Although the project was not designed as a part of this Strategy, it can make a tangible contribution to some of the expected accomplishments of the UNEP Strategy. In the following paragraphs the potential contribution of the project activities to the six areas is analyzed (since the project realizations are not finished, the following analysis is only indicative of the complementarities with UNEP Medium Term Strategy which can be reasonably expected):

#### 2.12.1. Climate change

The main objective of the project is to reduce GHGs in Cuba by promoting environmentally sound renewable energy technologies. It is obvious that there is a clear relationship between the project objective and this thematic area, especially in terms of two of the expected accomplishments:

1. Project activities have resulted in a high degree of consciousness among stakeholders of the advantages of use of renewable energy sources. Cuban authorities are preparing renewable energy policies which will result in reduction of GHGs and other benefits.
2. When successfully finished, the biomass – related project activities will imply improvements in land use and reduced land degradation.

#### 2.12.2. Disasters and conflicts

Not applicable

#### 2.12.3. Ecosystem management

The supply of biomass fuel to the Cocodrilo plant will result in a more adequate management of the surrounding ecosystem which is a National Park with a delicate environment.

In the same way, the creation of a new forest nursery to supply biomass fuel to La Melvis electric plant and to the dairy and meat industries will also have a positive impact in the management of ecosystems in Isla de la Juventud. Beside this, the potential for replication of these types of activities is high, not also in Isla de la Juventud, but also in the main island, and this will result in an increase of integration of ecosystem management approach into development and planning processes.

#### 2.12.4. Environmental governance

Cuban stakeholders are clearly having access to sound technical and policy advice for decision-making through the different project activities. Apart from the diffusion activities, sound technical advice has been given about the types of equipment to be used in the plants using biomass gas as fuel.

#### 2.12.5. Harmful substances and hazardous waste

Not applicable

#### 2.12.6. Resource efficiency – sustainable consumption and production

The realization of the project activities will result in a more efficient use of resources and a reduction of pollution both over plant life cycles (due to the use of renewable energy sources) and supply chains (due to the subsequent reduction of use of liquid fuels).

From the viewpoint of increases of investments in efficient, clean and safe industrial production methods through public policies and private sector action, it is necessary to distinguish between public policies and private sector actions:

- From the viewpoint of public policies, the project is clearly already having a positive impact; the attitude of both national and local public authorities in Cuba is in favour of use of renewable energy sources and clearly committed to the project objectives; possibilities for replication of some activities in other parts of the country is being considered.
- As for private sector actions, it must be considered that in Cuba no industrial private sector exists, apart from foreign companies. The project has up to now failed in attracting foreign investments on renewable energy projects in Cuba and on the other side, the Cuban government has decided not to invest in the development of renewable energy resources in Cuba, which is to be financed through foreign investments. The role and successful implementation RRMF is therefore crucial.

### 3. CONCLUSIONS AND RATING

In general terms and taking into consideration its general objectives, the project has been adequately designed, is well suited to the situation in Isla de la Juventud, has created a good atmosphere in favour of use of renewable energy sources among stakeholders and local and national authorities, and has an important potential for replication.

From the viewpoint of practical implementation, the projects has faced important delays due to the impact of the hurricanes of 2008 and to lack of the necessary coordination among the different stakeholders (including UNIDO), Cuban authorities, etc. The effects of the hurricanes and the subsequent scarcity of funds in the Cuban side forced to a reduction of the project objectives. The Steering Committee adopted a realistic approach and approved a number of changes, and at the same time defined three sets of milestones to be reached in March, June and December 2010 respectively. The project is now facing new delays, which are attributable among other causes (change of Project Director, bureaucracy, ..) to a lack of the necessary coordination among stakeholders (including UNIDO). Nevertheless, the Evaluation Team considers that if a strong commitment to improve coordination and collaboration among stakeholders is adopted, most of the project outputs can be achieved at the time of the project end.

The global rating for the project is **Moderately Unsatisfactory (MU)**

The following table summarizes the ratings of the different evaluation criteria. Each of them were considered in detail in the respective sub- Chapters of Chapter 2 above.

Criterion	Evaluator's Summary Comments	Evaluator's Rating
<b>A. Attainment of project objectives and results (overall rating)</b> Sub criteria (below)	Objectives are reasonable and well defined: attainment depends heavily on successful and timely realization of activities	<b>MS</b>
A. 1. Effectiveness - overall likelihood of impact achievement (ROtl rating)	The global project objectives will be reached, probably with some delay <b>ML</b>	<b>MS</b>
A. 2. Relevance	The project outcomes are consistent with focal areas.	<b>S</b>
A. 3. Efficiency	Impact of project delays due to hurricanes. No other relevant inefficiencies detected	<b>MS</b>
<b>B. Sustainability of Project outcomes (overall rating)</b> Sub criteria (below)	Successful implementation of RRMF is essential to guarantee sustainability	<b>ML</b>
B. 1. Financial	Uncertainties derived from the Cuban monetary system and economical situation	<b>ML</b>
B. 2. Socio Political	Very well received	<b>HL</b>
B. 3. Institutional framework and governance	Essential to carry out technology transfers	<b>L</b>
B. 4. Environmental	Very limited economical risks	<b>L</b>
<b>C. Catalytic Role</b>	Project activities have provided incentives to catalyze changes in stakeholders, and have contributed to improve institutional behaviors and policy evolution in favor of RES	<b>MS</b>
<b>D. Stakeholders involvement</b>	The local authorities and direct beneficiaries are happy with the project activities	<b>S</b>
<b>E. Country ownership / drivenness</b>	Government has declared support for renewable energy sources. No renewable energy policy promulgated	<b>MU</b>
<b>F. Achievement of outputs and activities</b>	Important delays after the modification of objectives approved in January 2010.	<b>HU</b>
<b>G. Preparation and readiness</b>	Project objectives feasible, counterparts adequately selected	<b>S</b>
<b>H. Implementation approach</b>	Project mechanisms adequate.. Steering Committee adequately reacted to new situations. Coordination among stakeholders unsatisfactory	<b>MU</b>
<b>I. Financial planning</b>	Budget adequately designed; few budget lines surpassed	<b>S</b>
<b>J. Monitoring and Evaluation (overall rating)</b> Sub criteria (below)		<b>MS</b>
E. 1. M&E Design	Adequately designed, responsibilities established	<b>S</b>
E. 2. M&E Plan Implementation (use for adaptive management)	Project reports too succinct. Should be produced on a quarterly basis	<b>MS</b>
E. 3. Budgeting and Funding for M&E activities	Budget line only for Evaluations (modified)	<b>MU</b>
<b>K. UNEP Supervision and backstopping</b>	Mechanisms adequately defined. Positive attitude of UNEP after hurricanes	<b>S</b>

#### 4. LESSONS LEARNED

The way in which the Cuban economy is organized makes it difficult the coordination of projects. The Evaluation Team considers that insufficient attention was paid to this issue at the time of project design; the project design is adequate for a complex project involving many stakeholders, but not for a project involving many stakeholders in Cuba. A detailed analysis of the Cuban conditions, the role played by each Ministry or organization, their responsibilities and the relationships among them should have been carried out.

If UNEP (or any other UN body) is performing future activities in Cuba, it is advisable to carry out a general analysis about the above issues; this analysis should be updated from time to time to cater with changes in the Cuban system. This should be done in collaboration with Cuban counterparts.

UNIDO tender procedures have also caused trouble; clearly the Cuban counterparts did not know these procedures and ignored how to prepare the bidding procedures; a clear and concise written description should be made available to counterparts, as well as clear instructions about why and in which cases a tender procedure must be carried out directly by UNIDO or directly from Cuba (or any other country in future projects).

Lack of initiative from stakeholders has also been a major cause of delay; the most frequent tendency is to do nothing until the other parts have completely made their tasks, although something could be done in the meantime (a clear example of this is the lack of preparation of loan procedures by Compañía Fiduciaria, arguing that they cannot make a loan until the corresponding funds are available, or until the modified contract with UNIDO is signed). It is difficult to say how this could be avoided, since it depends on the willingness of the respective parties.

The Evaluation team has observed that biomass gasification is an entirely new technology in Cuba, hence at the present stage expertise is still scarce among stakeholders.

## **5. RECOMMENDATIONS**

In the ToR of the Mid – Term Evaluation it is stated that the Evaluation Team will give no more than a few general recommendations, but during the visit to Cuba it has been observed that a certain number of concrete recommendations for concrete activities is necessary. Therefore, distinction has been made between general recommendations (some of which can also be useful for other projects) and other specific recommendations for some project activities. A table containing a brief summary of all the recommendations is included at the end of this Section.

### **5.1. General recommendations**

- To maintain more fluid and frequent communications between UNIDO (including UNIDO Focal Point) and the Cuban main counterpart. The first objective of these communications should be to unblock the tender procedures affecting acquisition of equipments for supply of biomass to Cocodrilo, construction of the marabu cutting machine, supply of biomass the business models, wind generators (see table in Sub –Chapter 2.1 above).
- To continue periodically defining milestones, and to carry out (by UNIDO) a rigid control over their realization.
- To unblock the situation in Compañía Fiduciaria, by updating the contract with UNIDO and accelerating the process of granting funds to the Business Models.
- To keep UNIDO as a member of the RRMF Steering Committee after the end of the project. This will improve the possibilities of RRMF being able to attract funding from other sources for future projects (it makes little sense to



pretend that the RRMF can be of any practical use with funds from this project only).

- To increase the frequency of the Progress reports (at least quarterly).
- To develop a replication and dissemination strategy plan to promote renewable energy technologies on the Island of Juventud, the main Island and the region. Priority should be given to develop a project website (in Spanish and English) showing the background/objectives of the project, involved partners, project progress, project deliverables, project location, invitation to investors, etc. Development of a website is included in the project budget, but it has not yet been created.
- To provide external expertise/support to the project team in the field of biomass gasification.

## 5.2.Recommendations for concrete activities

In the table in Sub – Chapter 2.1 a general overview of the project activities is given, with more details in Sub – Chapter 2.6. It is recommended to consider both sub – chapters as a guideline for actions to be taken to successfully bring the project to its end.

### 5.2.1. Cocodrilo power plant

- The Terms of Reference for Cocodrilo power plant requested for a monitoring and evaluation plan for the gasification plant to be supplied by the manufacturer. Aim of this M&E plan is to determine the performance and use positive results for promotion activities and replication projects of the technology. The M&E plan was not supplied, and the electric utility (OBE IJ) is expecting a M&E plan from Cubaenergia.

**Recommendation:** A M&E plan should be prepared as soon as possible because it would be good to have operational data from the early start of operation (which can be expected when the civil works are completed). Moreover, the M&E plan for Cocodrilo can be used as basis for a M&E for the La Melvis plant as well as future plants.

CubaEnergia should prepare an M&E plan for the Cocodrilo plant. External expertise/support seems necessary. This task should be initiated immediately.

- Although the Cocodrilo gasification plant is already installed and commissioned, it is still not in operation. The Evaluation Team observed that, besides the fact that the civil work is not completely finished, a major reason is the lack of feedstock. This is caused by the fact that Flora & Fauna has no equipment for cutting, handling and transporting wood from the forest of the National Park to the village. As the necessary equipment has to be acquired through UNIDO, again the communication needs to be intensified immediately.

**Recommendation:** the civil works should be completed as soon as possible and supply feedstock should be secured. As long as the necessary equipment for Flora & Fauna is not available, it is still recommended to operate the plant. A solution should be found to

collect wood from the surrounding area. Only 3 m<sup>3</sup> wood are needed per day at full load operation. It is recommended to make the operators more familiar with the operation and maintenance of the plant. Villagers can assist in collecting wood, perhaps through some incentives. It is important to maintain the support of the villagers; in case of too long a delay and no proper functioning of the plant, the support of villagers will decline or become even negative.

This recommendation is related to the first general recommendation indicated in Sub – Chapter 5.1 above (improvements of communications between UNIDO and the Cuban counterparts to unblock bidding procedures).

- Operating a gasification plant is much more cumbersome than running a diesel genset only. Operators have to do additional and sometimes dirty/heavy work. Experience from the UNDP/WB biomass monitoring program learned that operators are not very keen to operate and maintain the gasifier properly if no incentives are in place to operate the gasifier, and in case of malfunctioning, they easily switch to full diesel mode

**Recommendation:** Introduce some sort of a bonus system for operators in case of 50%, 60%, 70% and 80% diesel replacement. An agreed procedure to monitor the diesel replacement must be in place.

CubaEnergia has to initiate such system in cooperation with OBE, the local power utility. Operators need to be informed and need to agree on the procedure.

This recommendation should also be applicable to La Melvis (see below).

#### 5.2.2. La Melvis power plant

- For La Melvis, INEL is considering to request the gasifier supplier to deliver full-gas engines instead of dual-fuel (diesel) engines. Gas engines are not commonly used in Cuba and there the infrastructure is not appropriate to install gas engines; spare-parts and technical know-how has to come from abroad. Results of the UNDP/WB biomass gasification monitoring project showed that installing gas engines in countries without a proper infrastructure is a big problem.

**Recommendation:** INEL should request for dual fuel engine in their Terms of Reference for the supply of gasification equipment to La Melvis.

- Some projects and investments are delayed because the equipment cannot be acquired due to lack of financing agreements or to blockages in the bidding procedures. This is in particular the case for the detailed engineering of the La Melvis plant and for the design of the marabu cutting machine.

**Recommendation:** it is of utmost importance to select the technologies as soon as possible. In the case of La Melvis, reference is made to the next issue. In the case of the Marabu cutting machine, the communication with UNIDO needs to be intensified immediately to speed up the selection and procurement procedure.

- INEL and CubaEnergia intent to start a new bidding process for the La Melvis plant like they did in 2006. About 45 manufacturers were contacted at that time, but only four responded: Ankur, Aruna, Suntronics and Arya Hi-Tech. The latter three are license holders of the IISc technology.

INEL and CubaEnergia like to have offers from European suppliers. However, such bidding process is superfluous for several reasons:

- ✓ It delays the decision to select a technology substantially, and subsequently such tendering procedure and the associated delay will demand time and money.
- ✓ The Indians might get confused or even upset to make a new quotation as nothing happened with their offer in 2006.
- ✓ No quotations from European suppliers can be expected, as they are at present only interested in the internal (national) market; they want to develop a mature product first which can be commercialized before thinking about exporting.

**Recommendation:** A new bidding process for La Melvis should not be considered. Clearly there is no time for that, and moreover any kind of bureaucratic delays must be avoided. The gasification technology to be selected should be similar to the Cocodrilo design as several suppliers can supply such design (through the different license holders) and the local institutions involved on the Isle de La Juventud will gain experience with this technology from the Cocodrilo plant. When another technology is going to be selected, expertise and knowledge has to be learned on at least two technologies. This is not recommended for such small Island. Moreover, this Indian technology is one of the cheapest among the world and has proven to be suitable for tropical areas. The scientist at the Indian Institute of Science (IISc) in Bangalore, India should be contacted directly in order to discuss which licensee holder(s) is/are the most appropriate candidate to supply the equipment.

INEL should contact IISc for a suitable supplier according to the ToR of equipment recommended before.

- The ToR for Cocodrilo were incomplete, the acceptance tests was not convincing, as well as the commissioning. There were limited performance data, limited operating time (four hours during five days), no tar & dust content measurements in the produced gas. Furthermore, the plant design was not complete (no oxygen sensor) and the ash extraction and water treatment facility could not be tested due to the short operating period. Despite this fact, the Cocodrilo plant was accepted by OBE IJ / UNE.

The La Melvis plant is an industrial facility and the plant should perform according to commercial standards and requires a decent ToR for the supply of equipment. INEL is responsible for the implementation of this investment (Business Model 2, Investment 3).

**Recommendation:** Adequate ToR have to be prepared for La Melvis. More attention should be paid to Health, Safety and Environmental issues like wearing by operators of a portable CO monitor (these are very cheap), save disposal of waste water, etc.

INEL should prepare the ToR immediately. As INEL expertise is particularly on wind energy technologies, external assistance/support seems necessary to prepare such ToR.

### 5.2.3. Biomass supply

- The Support Activity 2 and Business Model 1 should result in the supply of fuel for La Melvis and the heat gasifiers. According to GEAM, the forest nursery activities and forest plantation will provide the fuel after six years at the earliest (in the meantime, the fuel will be provided from the existing forest). GEAM intends to supply the wood fuel by using the thinning of the planted forest. It is important to know that the fuel specifications for La Melvis and the heat gasifiers are completely different in size, can be seen from the two pictures below. Marabu bushes are not suitable as fuel for the heat gasifiers.

**Recommendation:** GEAM and EFI IJ should be fully aware that the power and heat gasifiers require totally different feedstock; they have to prepare a plan how to supply the fuel from the forest during the first six years.

There is a large budget involved in the forestry activity, which was based on a 3,5 MWe power plant in La Melvis. It is questionable whether the current budget is justified for a 500 kWe power plant.

The following can be considered, as this is common practice in Europe; introduce a penalty system in case insufficient wood fuel is supplied. Long-term supply contracts are desirable between the local forestry company and the gasification plant owner.

CubaEnergia has to discuss the above issues with GEAM to ensure that sufficient wood of the required dimensions and quality for all three gasification plants is guaranteed. This can be started immediately.



Up to 50 cm wood logs for heat generation



Small wood pieces needed for La Melvis

- In general, securing wood supply is a critical issue in biomass gasification plants. This is well addressed in the project. However, the forestry business is

delayed and the first wood supply from these new forests cannot be expected before 2016. As more renewable biomass projects are developed (replicated), the future demand for sufficient wood supply will increase. There is a risk that with the increasing demand for wood, future price of wood will also increase if no proper measures are taken. This might be detrimental to the operational viability of newly installed gasification plants.

**Recommendation:** a business plan should be prepared how to provide the whole Island of Juventud with sufficient wood in case a larger share of electricity demand has to be supplied by wood gasifiers (apart from La Melvis). This should preferably be in long-term contracts of for instance 10 yrs. Such agreement will be very beneficial to attract private (foreign) investors.

This issue should be addressed by MINAGR, GEAM and EFI IJ. This recommendation is beyond the immediate objectives of the project, and hence has no high priority, but discussions on this subject could already be initiated within the framework of this project.

- The replication potential of biomass gasifiers is large, both on the Island of Juventud and the main island. Investment needed for replication can be reduced by retrofitting diesel engines to dual fuel engines; this saves the investment for new engine-genset, which is normally about 40% of the total investment.

**Recommendation:** consider retrofitting existing diesel gensets for dual fuel operation.

This recommendation is also beyond the immediate project objectives, and should be considered after project completion.

#### 5.2.4. Dairy and meat complexes

- For heat generation at the dairy and meat factory, the company Berkes from Uruguay is the recommended supplier. Also in this case, a complicated bidding process should be avoided as this will only delay the investment. Berkes has about 100 references in South American countries including at dairy and meat factories. They should also deliver the boiler and a diesel burner for back-up. If bidding is required, an Indian manufacturer can be asked. The only alternative would be PRM Energy from the USA, who is experienced in rice husk gasification but this might become complicated.

**Recommendation:** prepare ToR for heat generation and request for an offer from Berkes. Priority should be given to the dairy factory as the potential savings are higher compared to the meat factory (higher capacity, more operating hours, more space available). For future heat generation projects, the ceramic industry has the biggest potential.

CubaEnergi should prepare ToR and contact the suppliers. This can be initiated immediately. External expertise/support is necessary.

#### 5.2.5. Others

- The demo project Compact plant (DP5 according the Milestone listing) includes the technology transfer, design and construction of a complete 25

kWe gasification power plant. This project should fulfill the replication desires. Technology transfer can be in the form of a licensee or know-how and technical assistance by the supplier. This is normally a time - consuming process, which still needs to be initiated. Successful completion of this project cannot be expected before the end of the project because the different activities ((i) technology transfer, (ii) local design, (iii) local construction) cannot be conducted in parallel but have to be conducted consecutively. Moreover, initiating a 'compact duplication' of the Cocodrilo technology is not logic at this stage of the project as the Cocodrilo plant is still not in operation yet and still has to prove its maturity.

Furthermore, there is no proper justification for the need to construct a more compact plant; experience from the 1980's in Indonesia with an Italian technology showed that compact plants are not easily accessible for maintenance and monitoring purposes, which is quite important. Moreover, there is no lack of space at most places on the Island of Juventud.

**Recommendation:** DP5 should be reduced to the Technology Transfer (TT) component only. Obtaining an agreement for TT would be a major result already in itself. Designing and construction of replication plants should be initiated afterwards and only when the Cocodrilo plant performs according to expectations; positive performing results will also attract potential investors. The need for a more compact design should be re-evaluated.

CubaEnergia should initiate contacts regarding TT of the IISc technology. The budget left from this demo project regarding the hardware component can be used for other projects or new Support Activities.

- Demonstration project 2 (of the Milestone list) *Radar Punta del Este – Hybrid* includes a combination of other demo projects (DP5 and DP4) and solar PV. As DP5 and DP4 are already difficult to achieve in the project lifetime, it will be almost impossible to complete this demo project before the end of the year of 2011.

**Recommendation:** The possibility of removing DP5 from the milestone list should be considered.

**NB: this demonstration activity has been recently dropped.**

The table below shows a brief summary of all the above recommendations.

**Summary of Recommendations**

<b>General</b>	<ul style="list-style-type: none"> <li>- To maintain more fluid and frequent communications between UNIDO and the Cuban team; to unblock tendering procedures</li> <li>- To prepare an Action Plan, including milestones</li> <li>- To unblock the situation in Compañía Fiduciaria, updating the agreement with UNIDO</li> <li>- To keep UNIDO as a member of the RRMF Steering Committee after the project end</li> <li>- To increase the frequency of the Progress Reports</li> </ul>
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	<p>(quarterly)</p> <ul style="list-style-type: none"> <li>- To develop a replication and dissemination strategy plan, including preparation of a website</li> <li>- To provide external expertise/support to the project team in the field of biomass gasification</li> </ul>
<b>Cocodrilo</b>	<ul style="list-style-type: none"> <li>- To prepare a Monitoring &amp; Evaluation plan</li> <li>- To start operation of the plant without awaiting for the biomass collecting equipment</li> <li>- To create a bonus system for plant operators</li> </ul>
<b>La Melvis</b>	<ul style="list-style-type: none"> <li>- To use dual fuel engines</li> <li>- To select technologies to be used</li> <li>- To avoid a new bidding process, using a gasification technology similar to that of Cocodrilo</li> <li>- To prepare adequate ToR</li> <li>- To consider retrofitting existing diesel gensets for future plants (other than La Melvis)</li> </ul>
<b>Biomass supply</b>	<ul style="list-style-type: none"> <li>- To prepare a plan for all the different types of biomass to be supplied</li> <li>- To prepare a business plan to supply the whole Isla de la Juventud with sufficient biomass for future replications</li> </ul>
<b>Dairy and Meat</b>	<ul style="list-style-type: none"> <li>- To prepare ToR for heat generation and request for an offer</li> </ul>
<b>Others</b>	<ul style="list-style-type: none"> <li>- To reduce the demo project Compact Plant to the Technology Transfer component only</li> <li>- To drop the Radar Punta del Este activity (already done)</li> </ul>

## **6. ANNEXES**



## **6.1. Annex 1: Evaluation Terms of Reference**

### TERMS OF REFERENCE

Mid-Term Evaluation of UNEP/GEF project GF/4040-05-10 (4837) "Generation and Delivery of Renewable Energy Based Modern Energy Services in Cuba; the Case of Isla de la Juventud" GEF ID 1361

### PROJECT BACKGROUND AND OVERVIEW

#### Project rationale

UNEP is implementing a 6 years GEF-funded project which main objective is to reduce the Greenhouse Gas Emissions (GHGs) in Cuba by promoting environmentally sound renewable energy technologies for power and heat generation as well as for providing modern energy services on a commercial basis in the Isla de la Juventud. The project addresses the key barriers that constrain the use of renewable energy technologies (biomass and wind) for power and heat generation on the Isla de la Juventud, and promotes business models for sustainable harnessing of renewable energy resources in Cuba.

The project started in July 2005 and is supposed to be completed by end of June 2011. The Executing Agency of this project is UNIDO and the National operational counterpart in Cuba is CUBAENERGIA, under the Ministry of Science, Technology and Environment (CITMA). UNEP seeks to conduct a mandatory, independent mid-term evaluation of the project progress and performance, early 2010.

#### 2. Country context

Cuba is an island country with an area of 110,860 sq. km and a long coastline of 3735 km. It has a population of about 11 million with terrain mostly flat to rolling plains, with rugged hills and mountains in the southeast on the main island. The country is composed of several islands, Isla de la Juventud being the second largest island outside the main island, with tourism potential as well as agricultural prospects.

Provision of reliable electricity at affordable prices to all households, services and industries is an integral component of the national development plan of the Government of Cuba. In 2001, over 90 percent of Cuba's electricity generation capacity was based on fossil fuel. Currently, Cuba produces 50 percent of oil for its domestic consumption while rest is imported. The national grid has covered about 95% of total population at present while 5% of the population located in far and remote places, mainly in the eastern province, is yet to be provided with reliable electricity services. Electricity tariffs for the household sector and agriculture are highly subsidized by the Government while export earning industries face full cost tariffs.

The National Program for Development of Local Energy Sources in Cuba places a high priority on the development of indigenous and environmentally benign renewable resources/options for rural/urban areas. These options, among others, include biomass, wind, solar, and small hydro technologies in order to meet growing demand for electricity, reducing oil imports and preserving the environment.

Since the beginning of the 1990s, Cuba has been in a critical period of development caused by the sudden collapse of commercial and financial relations with the former COMECON economies along with the reinforcement of the economic, financial and trade embargo that the country is facing. In

addition, the Cuban industrial and energy sectors are historically over-dependent on imported fuels. Despite an enduring fall in Gross Domestic Product and the lack of hard currency, fuel imports are maintained at about 6 million tonnes annually (with an additional national production of nearly 3 million tonnes)<sup>6</sup>.

Like most Caribbean island states, high priced oil imports, while minimized through conservation strategies, are constraining the ability of Cubans to develop sustainable livelihoods. The private sector (national as well as international) independent power producers are an opportunity being pursued to fill this gap.

The critical importance of fossil fuels for Cuban electricity sector can be appreciated in details given at Table 1:

Table 1 Installed Capacity and Generation in the National Electric System (NES) of Cuba, 2001

Source	Installed capacity, MW	Generation, GWh	Percentage of Total Generation
Fossil Fuel	3,505	14,372	85.5%
Hydroelectric	57	75	0.5%
Natural Gas	145	1,258	8%
Biomass	704	929	6%
TOTAL	4,411	16,634	100%

## 2. Background

### *Energy Scenario on Isla de la Juventud*

The Isla de la Juventud, an island located southwest of the main island, is the second island in the extension of the Cuban archipelago. Although 350 islands make up the Archipiélago de los Canarreos, Isla de la Juventud is by far the biggest of them, and is administered from the island's capital, Nueva Gerona. Much of the island is flat and a part of it - the Ciénaga de Lanier - is Cuba's second-largest swamp. The island is also the least populated region of Cuba, with most people living in the north of the island. The local economy and employment opportunities of the island mainly depend upon small and medium scale industries. To reduce over-dependence on fossil fuels to meet its growing energy needs, renewable sources of energy offer a viable alternative to enterprises and households on the Isla de la Juventud to achieve their potential.

The Isla de la Juventud has a population of about 85,000, with almost 92 percent of this population living in urban areas and 8 percent living in rural areas. The island's installed electricity generation capacity at present is totally fuel-oil and diesel-based. The main economic activities in Isla de la Juventud are fishing, agriculture, in particular citrus plantations, and dairy, meat and ceramics industries. Tourism is increasing on the island and a number of new economic opportunities for the local population are beginning to emerge. These new activities however, will also lead to increased demand for energy. Even at present, availability of energy services at economic price acts as a constraint for the industrial sector (power for the household sector is subsidized by the Government) on the island. The island possesses abundant natural and renewable resources that could be commercially harnessed to meet the growing needs for energy. These resources, among others,

include biomass residues from the forest products and agricultural crops, and wind power located along the coastal areas.

Although the present demand for electricity on the Isla de la Juventud is currently being met by the mixed quality fuel-oil generators (diesel generators are also being used for peak production or as back up), most of the enterprises are operating below capacity for the want of electricity and fossil fuels for process heat at affordable prices. Further, the increasing use of high sulphur fuel oil and diesel as the main energy fuels on the island is causing many socio-economic and environmental problems. The negative economic effect due to non-availability of adequate modern energy services at affordable prices is manifested in limited employment opportunities and lack of income generation activities on the island.

The key issues impacting upon the energy scenario on the Island are:

- a) fossil fuels meet primary energy supply for power generation on the island, and the fuel wood partially meets industrial and domestic demand for fuel;
- b) most of the enterprises operate at sub-optimal level because of their inability to meet costs on fuel-oil and diesel at commercial rates in foreign exchange (obsolete technologies and lack of market linkages further compound their problems);
- c) supply of both, fuel-oil and diesel, is by ships from the main island, hence transshipment remains unreliable, especially during the hurricane season;
- d) energy conservation and efficiency measures can play a significant role in enhancing industrial competitiveness<sup>9</sup> ; and
- e) excessive emissions from fossil fuels continue to degrade the local environment.

The expansion in tourism activities and related services on the island, along with the necessity of more reliable and efficient power generation is drawing the attention of planners to the need of substituting old diesel engines by new efficient ones, and pursuing the introduction of renewable energy based technologies based power generation on the island.

Resource assessment conducted under the UNEP/GEF SWERA project and the UNIDO PDF/B have identified more than enough wind and biomass resources for a sustainable commercial market in competition with diesel based IPPs and aging state facilities.

Energy demand and supply on Isla de la Juventud

As of 2001, the island’s installed electricity generation capacity was entirely met by fuel-oil and diesel based generators. Against a peak demand for 16.1 MW, total electricity generation was 94.9 GWh.

Table 2 Power demand and supply on the Isla de la Juventud

1999		2000	2001
Gross Power Generation, GWh	89.9	92.5	94.9
Maximum Demand, MW	15.1	15.6	16.1

The use of electricity on the island can be broken down into four main sectors: residential (households), commercial, agriculture and industrial. Electricity generation accounts for 54 percent of the island's primary energy use, and a majority of commercial energy imports. Three fuel oil MAN generators, 3.5 MW each, supply the main electrical grid, which covers 99 percent of the island's population with only the village of Cocodrilo not being connected to the main grid. The residents of Cocodrilo are supplied with electricity (peak demand 25 kW) for 12 hours every day produced from two 37 kW diesel generators.

The remaining 46 percent of total primary energy use was consumed in the following way: 23 percent by the transport sector (15 percent in the form of diesel for trucking activities and 8 percent in the form of gasoline for use in private cars); 6 percent in the form of fuel and diesel oil to fuel industrial boilers and cookers, 6 percent by the residential sector in the form of LPG for cooking, and the remaining 11 percent is consumed by other industrial and agricultural uses. The residential sector also consumed the renewable energy resources in the form of fuel wood and charcoal to partially meet their energy needs on the island.

According to the Planning Authority of the Island, two commercial activities - tourism and industries - account for increased demand for electricity. The tourism industry will show a robust growth in the next 15 years and generate an additional estimated 10-20% demand for electricity or about 4 MW, and consumption increase of 19 GWh which is a growth scenario that should be planned for.

The development of the tourist industry will also increase the consumption of electricity by the industrial, commercial and agriculture sectors. In addition, the industrial sector has the potential for food processing and ceramics industries to work at full capacity. The agricultural sector has further potential for developing small- scale industries based on the tobacco and citrus crops.

Under these conditions the Isla de la Juventud should have represented a ripe opportunity to accelerate private sector engagement in sustainable development.

#### *Renewable Energy Resources on the Isla de la Juventud*

The Isla de la Juventud has abundant renewable energy sources, which are yet to be harnessed. In combination, the estimated renewable energy resources available on the island are sufficient to replace fossil fuels used in electricity production and heat generation.

#### *Wind*

As part of field studies undertaken during the PDF phase and UNEP/GEF supported SWERA project, a wind map has been drawn for the entire Isla de la Juventud. Results obtained show wind speed up to 6.5 m/s at 50 meters height, and the possibility of achieving, on systems with wind turbines of 300 to 700 kW, a Capacity Factor ranging from 20 to 30%. The consistency and reliability of the results were based on the use of the Danish Risoe Laboratory's WASP software to the specific site conditions. The SWERA project terminated its project activities in 2006.

#### *Solar*

SWERA project has developed a high-resolution solar radiation map for the country including Isla de la Juventud. The range of global horizontal solar irradiation is 195 to 280 W/m<sup>2</sup> or 5 to 7 kWh/m<sup>2</sup> per day. Validation is underway by GEPRO, Ecosol Solar and the Institute for Meteorology Cuba.

#### *Biomass*

A large part of the island is covered in thick forests (more than 100,000 ha.), and the field studies have revealed that it was possible to raise "energy plantations" as well as utilise forest residues. Biomass fuel could also be produced through sustainable harvesting of forests to feed the

gasification based power generation and process heat. Biomass has been identified as most important renewable energy resource available locally that has several commercial applications in power generation and production of the process heat. As a part of the eco-spatial studies in Geographical Information System (GIS), an inventory of the forest resources of the island has been prepared using aerial photographs. The Local Forestry Company on the island is responsible for management of 32,500 ha of woodland of which 22,100 ha are production forests and 10,400 ha are new plantations raised under a reforestation programme that began in 1961. In addition there are 3,300 ha of deforested land of which 2,300 ha have a prevalent woody weed - Marabú (*Dichrostachys Cynerea*). In terms of biomass resources, the field results revealed a usable biomass resource of 48,200 tones' available annually on sustainable basis from the following tree species: *Pinus sp.*, *Eucalyptus sp.*, *Casuarina sp.*, *Albizia sp.*, and Marabu. Hence, it is possible that adequate chipped and dried biomass fuel could be produced in a sustainable manner to feed biomass gasification plants that can replace or reduce use of fuel-oil for power generation and production of the process heat. While the biomass assessment study identified weed species and waste forestry production for use in the biomass gasifiers as opportunities, this resource is in addition to the planned sustainable forest harvest. The Marabú biomass resource potential would be tested by this project providing both a safety option and a potential new opportunity.

Unlike the mainland Cuba, absence of sugarcane and sugar mills on the island rules out use of bagasse for cogeneration or bagasse based biomass gasification plant.

An in-depth analysis of availability of renewable resources and corresponding productive use activities on the island as well as feedback from the key stakeholders revealed that biomass and wind energy have large potential to meet energy needs of the island for power generation and process heat on commercial basis, while in comparison, solar energy was found to have limited commercial potential for field applications except water heating in hotels.

#### Recent issues for project implementation

Several recent events have had a significant impact on the implementation of the project. Three hurricanes that struck Cuba (particularly the Isla de la Juventud) in 2008 which obliged the Government to change their priorities and to allocate the scarce financial resources to the reconstruction of all basic infrastructures (hospitals, schools, electrical grid; etc). In addition, the world financial crises have severely affected the economy of the country, increasing the internal financial difficulties, and obliged the Government of Cuba to request some changes (basically a quantitative reduction) to the initial project objectives.

During the Steering Committee meeting of 27/5/09, and the months after, it became more and more clear that not only there were difficulties in securing the international co-financing needed for the implementation of the 4 Business Models, but also that the Government of Cuba could not guarantee the investments needed (co-financing of the 4 BMs). Due to this, it was agreed to: 1) reduce significantly the level of some project objectives; and 2) proceed with a comprehensive "Project Revision" to be discussed and approved during the next Steering Committee meeting planned in January 2010. This Project Revision has to show a realistic approach vis-a-vis the achievable results by end of the project (June 2011), taking into consideration all factors (external and internal) that can determine the success or the failure of the project in the future. The main idea is, to maintain the project approach and the general objectives (reduction of GHGs and implementation of the Business Models on a commercial basis) and to maximize the use of the available project resources to achieve certain agreed upon demonstrative as well business models activities (as stated in the original project document).

According to the Government of Cuba the "maximization of the use of the available project resources" can be achieved changing the scope and the funding mechanism of the Risk and

Replication Management Fund (RRMF), managed by the Compania Fiduciaria (CF), specifically for the initial funding mechanism of the 3 Business Models (1- Forestry management; 2- Electricity production from biomass; and 3- Heat-production from biomass). The new role and function of the RRMF managed by the CF, also taking into consideration that CF has already received an initial allocation to co-finance the Business Models and how to warrant that these loans (in convertible CUC's?) shall indeed be returned on a revolving basis for future Renewable Energy projects.

The project is need of an independent assessment of the achievability of these expected project results by June 2011 (end of the project), taking into consideration the “indicative work plan 2010 – 2011” and the new milestones (see Annex 8) as well as the limited time left. Especially the 2 x 250 kW biomass gasifier power plant of Melvin is a point of concern. The size was already scaled down by the SCM of May 2009, but the installation and commissioning of a 2 x 250 kW power plant within 12 months is considered a serious challenge, yet to a large extent, will determine the success of this project.

Within the project’s financial arrangements, the Compania Fiduciaria (CF), was supposed to establish and to manage an “innovative financial mechanism” for the co-funding of the Business Models related to the commercial component of RETs in the Isla de la Juventud (IJ). An in-depth analysis of the “innovative financial mechanism” formulated by CF and the status of its implementation is needed. Any actions and measures to ensure its correct formulation/implementation for the future need to be identified promptly. As private sector investments have remained at large during the first 4 years of project execution, the Steering Committee of January 29, 2009 recommended the Compania Fiduciaria to focus on direct project financing of the business models. Funds are to be loaned for Renewable Energy projects against 0% interest. Returning funds should be re-invested in future Renewable Energy projects. When considering actions to ensure the future sustainability of the project outcomes, the evaluation team should recommend future strategies for this emerging revolving Renewable Energy fund.

According to the actual “organisational structure” of the Project, it is evident that a lot of Ministries and Government Institutions are fully involved not only in the direct/indirect implementation of the project activities, but all of them are involved in the “decision chain” related to each one of the activities that need to receive any specific authorization or/and endorsement or/and approval. It has been recognised during the Steering Committee meeting of May 2009, that: a) it is quite complex and difficult to manage to get quick decisions about project activities to be implemented according to an established schedule; b) this “project structure” is cumbersome and represents one of the major causes of the actual delay in the implementation faced by the project in the past.

One of the more important aspects of the Project is related to the support to be provided to the Government of Cuba for the formulation of an enabling policy to attract private investment on commercial basis in the area of Renewable Energy Technologies in Cuba. The Government of Cuba has reiterated that they have already formulated such “enabling policy” for private investment in RETs in Cuba. The evaluation Team needs to critically appraise the RE policy, and provide recommendations on additional support, if needed.

## TERMS OF REFERENCE FOR THE EVALUATION

### Objective and Scope of the Evaluation

The objective of this mid-term review (MTR) is to assess operational aspects, such as project management and implementation of activities and also the level of progress towards the achievement of the objectives. The review will assess project performance and the implementation of planned project activities and planned outputs against actual results. The risks to achievement of project outcomes and objectives will also be appraised (see Annex 5).

The Mid-Term Evaluation, will make an in-depth assessment of the actual situation of the project implementation and the results achieved so far, with respect to the original project objectives as indicated in the original project document, and with respect to the “project milestones – end 2009” approved by the Steering Committee on May 2009 and evaluate the general performance of the project respect to the objectives indicated in:

the “Demonstrative component” of the project;

the “Investment/Commercial component” (the 4 “Business Models”); and;

the reduction of GHGs so far achieved through the project.

A revised project work plan and expected results (milestones), together with the relevant status of implementation, is summarised in the tables appended as Annex 7. The evaluation should propose a set of recommendations in order to achieve the expected project results as discussed and approved by the Steering Committee meetings of May 2009 and January 2010. In short, *the Mid Term Evaluation will focus on identifying the corrective actions needed for the project to achieve maximum impact. Review findings will feed back into project management processes through specific recommendations and ‘lessons learned’ to date.*

Specifically, the evaluation should include an assessment of the following:

the involvement of the local (Isla de la Juventud) Authorities and direct Beneficiaries during the formulation and implementation of the project;

the effectiveness of the “local decision process” taking into consideration the local internal and inter-ministerial bureaucracy;

the effectiveness of the “foreign regulatory policy concerning private investment in RETs” set up by the Government of Cuba;

the effectiveness of the financial mechanism established by the Compania Fiduciaria for the co-financing of the “Business Models” considered by the project including the of the RRMF; there are revolving funds to be used for similar initiatives in Cuba;

the willingness and capacity of the Government in relation to the financial commitments for co-funding and investments foreseen in the original project document;

the capacity of the project to achieve the revised/reduced project objectives as discussed and approved during by the Steering Committee of January 2010.

The likelihood of and potential for replication of the project in other parts of the main Island.

### Methods

This mid-term evaluation will be conducted as an in-depth evaluation using a participatory approach whereby the UNEP/DGEF Task Manager, key representatives of UNEP and other relevant staff are kept informed and regularly consulted throughout the evaluation. The consultant will liaise with the UNEP Evaluation Office and the UNEP/DGEF Task Manager on any logistic and/or methodological issues to properly conduct the review in as independent a way as possible, given the circumstances and resources offered. The draft report will be circulated to UNEP/DGEF Task Manager and the UNEP/EOU. Any comments or responses to the draft report will be sent to UNEP / EOU for collation and the consultant will be advised of any necessary revisions.

The findings of the evaluation will be based on the following:

A desk review of project documents including, but not limited to:

The project documents, outputs, monitoring reports (such as progress and financial reports to UNEP and GEF annual Project Implementation Review reports) and relevant correspondence.

Notes from the Steering Group meetings.

Other project -related material produced by the project staff or partners.

Interviews with project management and Government personnel to understand the commitment of the different Institutions involved in the project vis a vis the project objectives.

Interviews and Telephone interviews with intended beneficiaries (industries and people) other stakeholders involved with this project.

The Consultants shall determine whether to seek additional information and opinions from representatives of donor agencies and other organisations. As appropriate, these interviews could be combined with an email questionnaire.

Interviews with the UNEP/DGEF project task manager and Fund Management Officer, and other relevant staff in UNEP dealing with climate change-related activities as necessary. The Consultants may also gain broader perspectives from discussions with relevant GEF Secretariat staff.

Key Evaluation principles.

In attempting to evaluate any outcomes and impacts that the project may have achieved, evaluators should remember that the project's performance should be assessed by considering the difference between the answers to two simple questions "*what happened?*" and "*what would have happened anyway?*". These questions imply that there should be consideration of the baseline conditions and trends in relation to the intended project outcomes and impacts. In addition it implies that there should be plausible evidence to attribute such outcomes and impacts to the actions of the project.

Sometimes, adequate information on baseline conditions and trends is lacking. In such cases this should be clearly highlighted by the evaluator, along with any simplifying assumptions that were taken to enable the evaluator to make informed judgements about project performance.

#### Assessment of project assumptions, objectives and design

The mid-term evaluation will examine the following:

Project theory

Assessment of the assumptions and of the theory of change (causal pathways) underpinning the project idea and design, including its coherence, internal and external validity. The ROTI method described in Annex 6 provides useful guidance on establishing the Theory of Change for the project.



Analysis of the project Logical Framework and variations over time if any, including:

the links and causal relationships between inputs, activities, outputs, outcomes and impact (specific and development objectives);

relevance and appropriateness of indicators;

validity of assumptions and risks

existence of formal approvals to any modifications of the logical framework

Project design

Analysis of the project strategy and structure including:

approach and methodology;

time frame and resources;

institutional set-up;

management arrangements;

stakeholders and beneficiaries identification.

#### Project Evaluation Parameters and Ratings

The success of project implementation will be rated on a scale from 'highly unsatisfactory' to 'highly satisfactory'. In particular the evaluation shall assess and rate the project with respect to the eleven categories defined below<sup>1</sup>.

It should be noted that many of the evaluation parameters are interrelated. For example, the 'achievement of objectives and planned results' is closely linked to the issue of 'sustainability'. Sustainability is understood as the probability of continued long-term project-derived outcomes and impacts and is, in turn, linked to the issues of 'catalytic effects / replication' and, often, 'country ownership' and 'stakeholder participation'.

Attainment of objectives and planned results:

The evaluation should assess the extent to which the project's major relevant objectives were effectively and efficiently achieved or are expected to be achieved and their relevance.

*Effectiveness:* Evaluate the overall likelihood of impact achievement, taking into account the "achievement indicators", the achievement of outcomes and the progress made towards impacts. UNEP's Evaluation Office advocates the use of the Review of Outcomes to Impacts (ROtI) method (described in Annex 6) to establish this rating.

*Relevance:* In retrospect, were the project's outcomes consistent with the focal areas/operational program strategies? Ascertain the nature and significance of the contribution of the project outcomes to the wider portfolio of the GEF.

*Efficiency:* Was the project cost effective? Was the project the least cost option? Was the project implementation delayed and if it was, then did that affect cost-effectiveness? Assess the contribution

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<sup>1</sup> However, the views and comments expressed by the evaluator need not be restricted to these items.

of cash and in-kind co-financing, and any additional resources leveraged by the project, to the project's achievements. Did the project build on earlier initiatives; did it make effective use of available scientific and / or technical information? Wherever possible, the evaluator should also compare the cost-time vs. outcomes relationship of the project with that of other similar projects.

Specifically, the evaluation will assess the following (note that some of these issues are also linked to the project's potential sustainability):

*the effectiveness of the "local decision process" taking into consideration the local internal and inter-ministerial bureaucracy;*

*the effectiveness of the "foreign regulatory policy concerning private investment in RETs" set up by the Government of Cuba;*

*the effectiveness of the financial mechanism established by the Compania Fiduciaria for the co-financing of the "Business Models" considered by the project including the of the RRMF; there are revolving funds to be used for similar initiatives in Cuba;*

*the willingness and capacity of the Government in relation to the financial commitments for co-funding and investments foreseen in the original project document;*

*the reasons of the delay in the project implementation and the feasibility of the workplan 2010/2011 given remaining project duration, taking into consideration the original project objectives and the reduced project objectives(May 2009) and new milestones – January 2010*

Sustainability:

Sustainability is understood as the probability of continued long-term project-derived outcomes and impacts after the GEF project funding ends. The evaluation will identify and assess the key conditions or factors that are likely to contribute or undermine the persistence of benefits after the project ends. Some of these factors might be outcomes of the project, e.g. stronger institutional capacities or better informed decision-making. Other factors will include contextual circumstances or developments that are not outcomes of the project but that are relevant to the sustainability of outcomes. The evaluation should ascertain how it is intended that project outcomes will be sustained and enhanced over time. Application of the ROTI method described in Annex 6, and completion of the risk factor table presented in Annex 7 will also assist in the evaluation of sustainability.

Five aspects of sustainability should be addressed: financial, socio-political, institutional frameworks and governance, environmental (if applicable). The following questions provide guidance on the assessment of these aspects:

*Financial resources.* Are there any financial risks that may jeopardize sustenance of project outcomes and onward progress towards impact? What is the likelihood that financial and economic resources will not be available once the GEF assistance ends (resources can be from multiple sources, such as the public and private sectors, income generating activities, and trends that may indicate that it is likely that in future there will be adequate financial resources for sustaining project's outcomes)? To what extent are the outcomes and eventual impact of the project dependent on continued financial support?

*Socio-political:* Are there any social or political risks that may jeopardize sustenance of project outcomes and onward progress towards impacts? What is the risk that the level of stakeholder ownership will be insufficient to allow for the project outcomes to be sustained? Do the various key stakeholders see that it is in their interest that the project benefits continue to flow? Is there sufficient public / stakeholder awareness in support of the long term objectives of the project?

*Institutional framework and governance.* To what extent is the sustenance of the outcomes and onward progress towards impacts dependent on issues relating to institutional frameworks and governance? What is the likelihood that institutional and technical achievements, legal frameworks, policies and governance structures and processes will allow for, the project outcomes/benefits to be sustained? While responding to these questions consider if the required systems for accountability and transparency and the required technical know-how are in place.

*Environmental.* Are there any environmental risks that can undermine the future flow of project environmental benefits? The TE should assess whether certain activities in the project area will pose a threat to the sustainability of the project outcomes. For example; construction of dam in a protected area could inundate a sizable area and thereby neutralize the biodiversity-related gains made by the project; or, a newly established pulp mill might jeopardise the viability of nearby protected forest areas by increasing logging pressures; or a vector control intervention may be made less effective by changes in climate and consequent alterations to the incidence and distribution of malarial mosquitoes. Would these risks apply in other contexts where the project may be replicated?

**Catalytic Role and Replication**

The catalytic role of the GEF is embodied in its approach of supporting the creation an enabling environment, investing in activities which are innovative and show how new approaches and market changes can work, and supporting activities that upscale new approaches to a national (or regional) level to sustainably achieve global environmental benefits.

In general this catalytic approach can be separated into are three broad categories of GEF activities: (1) “foundational” and enabling activities, focusing on policy, regulatory frameworks, and national priority setting and relevant capacity (2) demonstration activities, which focus on demonstration, capacity development, innovation, and market barrier removal; and (3) investment activities, full-size projects with high rates of cofunding, catalyzing investments or implementing a new strategic approach at the national level.

The three categories approach combines all the elements that have been shown to catalyze results in international cooperation. Evaluations in the bilateral and multilateral aid community have shown time and again that activities at the micro level of skills transfer—piloting new technologies and demonstrating new approaches—will fail if these activities are not supported at the institutional or market level as well. Evaluations have also consistently shown that institutional capacity development or market interventions on a larger scale will fail if governmental laws, regulatory frameworks, and policies are not in place to support and sustain these improvements. And they show that demonstration, innovation and market barrier removal do not work if there is no

In this context the evaluation should assess the catalytic role played by this project by consideration of the following questions:

**INCENTIVES:** To what extent have the project activities provided incentives (socio-economic / market based) to contribute to catalyzing changes in stakeholder behaviours?

**INSTITUTIONAL CHANGE:** To what extent have the project activities contributed to changing institutional behaviors?

**POLICY CHANGE:** To what extent have project activities contributed to policy changes (and implementation of policy)?

**CATALYTIC FINANCING:** To what extent did the project contribute to sustained follow-on financing from Government and / or other donors? (this is different from co-financing)

**PROJECT CHAMPIONS:** To what extent have changes (listed above) been catalyzed by particular individuals or institutions (without which the project would not have achieved results)?

(Note: the ROtI analysis should contribute useful information to address these questions)

Replication approach, in the context of GEF projects, is defined as lessons and experiences coming out of the project that are replicated or scaled up in the design and implementation of other projects. Replication can have two aspects, replication proper (lessons and experiences are replicated in different geographic area) or scaling up (lessons and experiences are replicated within the same geographic area but funded by other sources).

Is the project suitable for replication? If so, has the project approach been replicated in other parts of the island? If no effects are identified, the evaluation will describe the strategy / approach adopted by the project to promote replication effects.

Stakeholder participation / public awareness:

This consists of three related and often overlapping processes: information dissemination, consultation, and “stakeholder” participation. Stakeholders are the individuals, groups, institutions, or other bodies that have an interest or stake in the outcome of the GEF- financed project. The term also applies to those potentially adversely affected by a project. The evaluation will specifically:

Assess the involvement of the local (Isla de la Juventud) Authorities and direct Beneficiaries during project formulation and implementation.

Assess the mechanisms put in place by the project for identification and engagement of stakeholders and establish, in consultation with the stakeholders, whether this mechanism was successful, and identify its strengths and weaknesses.

Assess the degree and effectiveness of collaboration/interactions between the various project partners and institutions during the course of implementation of the project.

Assess the degree and effectiveness of any various public awareness activities that were undertaken during the course of implementation of the project.

Country ownership / driven-ness:

This is the relevance of the project to national development and environmental agendas, recipient country commitment, and regional and international agreements. The evaluation will:

Assess the level of country ownership of the project goal and objectives. to reduce the Greenhouse Gas Emissions (GHGs) in Cuba by promoting environmentally sound renewable energy technologies for power and heat generation as well as for providing modern energy services on a commercial basis in the Isla de la Juventud.

Achievement of outputs and activities:

Delivered outputs: Assessment of the project’s success in producing each of the programmed outputs, both in quantity and quality as well as usefulness and timeliness.

Assess the feasibility of completing the outputs activities and milestones set out by the project steering committee of January 2010.

Preparation and Readiness

Were the project's objectives and components clear, practicable and feasible within its timeframe? Were the capacities of executing institution and counterparts properly considered when the project was designed? Were lessons from other relevant projects properly incorporated in the project design? Were the partnership arrangements properly identified and the roles and responsibilities negotiated prior to project implementation? Were counterpart resources (funding, staff, and facilities), enabling legislation, and adequate project management arrangements in place?

Assessment monitoring and evaluation systems.

The evaluation shall include an assessment of the quality, application and effectiveness of project monitoring and evaluation plans and tools, including an assessment of risk management based on the assumptions and risks identified in the project document. The Terminal Evaluation will assess whether the project met the minimum requirements for 'project design of M&E' and 'the application of the Project M&E plan' (see minimum requirements 1&2 in Annex 4). GEF projects must budget adequately for execution of the M&E plan, and provide adequate resources during implementation of the M&E plan. Project managers are also expected to use the information generated by the M&E system during project implementation to adapt and improve the project.

Implementation approach:

This includes an analysis of the project's management framework, adaptation to changing conditions (adaptive management), partnerships in implementation arrangements, changes in project design, and overall project management. The evaluation will:

Ascertain to what extent the project implementation mechanisms outlined in the project document have been closely followed. In particular, assess the role of the various committees established and whether the project document was clear and realistic to enable effective and efficient implementation, whether the project was executed according to the plan and how well the management was able to adapt to changes during the life of the project to enable the implementation of the project.

Assess the extent to which the project responded the mid term review / evaluation (if any).

Evaluate the effectiveness and efficiency and adaptability of project management and the supervision of project activities / project execution arrangements at all levels (1) policy decisions: Steering Group; (2) day to day project management in each of the country executing agencies.

Identify administrative, operational and/or technical problems and constraints that influenced the effective implementation of the project.

M&E during project implementation

*M&E design.* Projects should have sound M&E plans to monitor results and track progress towards achieving project objectives. An M&E plan should include a baseline (including data, methodology, etc.), SMART indicators (see Annex 4) and data analysis systems, and evaluation studies at specific times to assess results. The time frame for various M&E activities and standards for outputs should have been specified.

The evaluator should use the following questions to help assess the M&E design aspects:

SMART-ness of Indicators

Are there specific indicators in the log frame for each of the project objectives and outcomes?

Are the indicators relevant to the objectives and outcomes?

Are the indicators for the objectives and outcomes sufficient?

Are the indicators quantifiable?

Adequacy of Baseline Information

Is there baseline information?

Has the methodology for the baseline data collection been explained?

Is desired level of achievement for indicators based on a reasoned estimate of baseline?

Arrangements for Monitoring of Implementation

Has a budget been allocated for M&E activities?

Have the responsibility centers for M&E activities been clearly defined?

Has the time frame for M&E activities been specified?

Arrangements for Evaluation

Have specific targets been specified for project outputs?

Has the desired level of achievement been specified for all Indicators of Objectives and Outcomes?

*M&E plan implementation.* The Evaluation should verify that:

an M&E system was in place and facilitated timely tracking of results and progress towards projects objectives throughout the project implementation period (perhaps through use of a logframe or similar);

annual project reports and Progress Implementation Review (PIR) reports were complete, accurate and with well justified ratings;

that the information provided by the M&E system was used during the project to improve project performance and to adapt to changing needs;

and that projects had an M&E system in place with proper training for parties responsible for M&E activities.

*Budgeting and Funding for M&E activities.* The terminal evaluation should determine whether support for M&E was budgeted adequately and was funded in a timely fashion during implementation.

Financial Planning

Evaluation of financial planning requires assessment of the quality and effectiveness of financial planning and control of financial resources throughout the project's lifetime. Evaluation includes actual project costs by activities compared to budget (variances), financial management (including disbursement issues), and co- financing. The evaluation should:

Assess the strength and utility of financial controls, including reporting, and planning to allow the project management to make informed decisions regarding the budget and allow for a proper and timely flow of funds for the payment of satisfactory project deliverables.

Present the major findings from the financial audit if one has been conducted.

Identify and verify the sources of co- financing as well as leveraged and associated financing (in co-operation with the IA and EA).

Assess whether the project has applied appropriate standards of due diligence in the management of funds and financial audits.

The evaluation should also include a breakdown of final actual costs and co-financing for the project prepared in consultation with the relevant UNEP Fund Management Officer of the project (table attached in Annex 1 Co-financing and leveraged resources).

#### UNEP Supervision and Backstopping

The purpose of supervision is to work with the executing agency in identifying and dealing with problems which arise during implementation of the project itself. Such problems may be related to project management but may also involve technical/substantive issues in which UNEP has a major contribution to make. The evaluator should assess the effectiveness of supervision and administrative and financial support provided by UNEP/DGEF including:

the adequacy of project supervision plans, inputs and processes;

the emphasis given to outcome monitoring (results-based project management);

the realism / candor of project reporting and rating (i.e. are PIR ratings an accurate reflection of the project realities and risks);

the quality of documentation of project supervision activities; and

financial, administrative and other fiduciary aspects of project implementation supervision.

In summary, accountability and implementation support through technical assistance and problem solving are the main elements of project supervision (Annex 5).

#### Complementarity with UNEP Medium Term Strategy and Programme of Work

UNEP aims to undertake GEF funded projects that are aligned with its strategy. Whilst it is recognised that UNEP GEF projects designed prior to the production of the UNEP Medium Term Strategy (MTS)<sup>2</sup> / Programme of Work (POW) 2010/11 would not necessarily be aligned with the Expected Accomplishments articulated in those documents, complementarity may exist nevertheless. For this reason, the complementarity of GEF projects with UNEP's MTS / POW will not be formally rated, however, the evaluation should present a brief narrative to cover the following issues:

*Linkage to UNEP's Expected Accomplishments.* The UNEP Medium Term Strategy specifies desired results in six thematic focal areas. The desired results are termed Expected Accomplishments. Using the completed ROTI analysis, the evaluation should comment on whether the project makes a tangible contribution to any of the Expected Accomplishments specified in the UNEP MTS. The magnitude and extent any contributions, and the causal linkages should be fully described.

*Project contributions that are in-line with the Bali Strategic Plan (BSP)*<sup>3</sup>. The outcomes and achievements of the project should be briefly discussed in relation to the objectives of the UNEP BSP.

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<sup>2</sup> <http://www.unep.org/PDF/FinalMTSGCSS-X-8.pdf>

<sup>3</sup> <http://www.unep.org/GC/GC23/documents/GC23-6-add-1.pdf>

*South-South Cooperation* is regarded as the exchange of resources, technology, and knowledge between developing countries. Briefly describe any aspects of the project that could be considered as examples of South-South Cooperation.

The *ratings for the parameters A - K will be presented in the form of a table (Annex 1)*. Each of the eleven categories should be rated separately with brief justifications based on the findings of the main analysis. An overall rating for the project should also be given. The following rating system is to be applied:

HS	= Highly Satisfactory
S	= Satisfactory
MS	= Moderately Satisfactory
MU	= Moderately Unsatisfactory
U	= Unsatisfactory
HU	= Highly Unsatisfactory

#### Evaluation Report Format and Review Procedures

The report should be brief, to the point and easy to understand. It must explain; the purpose of the evaluation, exactly what was evaluated and the methods used. The report must highlight any methodological limitations, identify key concerns and present evidence-based findings, consequent conclusions, recommendations and lessons. The report should be presented in a way that makes the information accessible and comprehensible and include an executive summary that encapsulates the essence of the information contained in the report to facilitate dissemination and distillation of lessons.

The evaluation will rate the overall implementation success of the project and provide individual ratings of the eleven implementation aspects as described in Section 1 of this TOR. *The ratings will be presented in the format of a table with brief justifications based on the findings of the main analysis.*

Evidence, findings, conclusions and recommendations should be presented in a complete and balanced manner. Any dissident views in response to evaluation findings will be appended in an annex. The evaluation report shall be written in English, be of no more than 50 pages (excluding annexes), use numbered paragraphs and include:

An executive summary (no more than 3 pages) providing a brief overview of the main conclusions and recommendations of the evaluation;

Introduction and background giving a brief overview of the evaluated project, for example, the objective and status of activities; The GEF Monitoring and Evaluation Policy, 2006, requires that a TE report will provide summary information on when the evaluation took place; places visited; who was involved; the key questions; and, the methodology.

Scope, objective and methods presenting the evaluation's purpose, the evaluation criteria used and questions to be addressed;

Project Performance and Impact providing *factual evidence* relevant to the questions asked by the evaluator and interpretations of such evidence. This is the main substantive section of the report.



The evaluator should provide a commentary and analysis on all eleven evaluation aspects (A – K above).

Conclusions and rating of project implementation success giving the evaluator's concluding assessments and ratings of the project against given evaluation criteria and standards of performance. The conclusions should provide answers to questions about whether the project is considered good or bad, and whether the results are considered positive or negative. The ratings should be provided with a brief narrative comment in a table (see Annex 1);

Lessons (to be) learned presenting general conclusions from the standpoint of the design and implementation of the project, based on good practices and successes or problems and mistakes. Lessons should have the potential for wider application and use. All lessons should 'stand alone' and should:

Briefly describe the context from which they are derived

State or imply some prescriptive action;

Specify the contexts in which they may be applied (if possible, who when and where)

Recommendations suggesting *actionable* proposals for improvement of the current project. In general, Terminal Evaluations are likely to have very few (perhaps two or three) actionable recommendations.

*Prior to each recommendation*, the issue(s) or problem(s) to be addressed by the recommendation should be clearly stated.

A high quality recommendation is an actionable proposal that is:

1. Feasible to implement within the timeframe and resources available
2. Commensurate with the available capacities of project team and partners
3. Specific in terms of who would do what and when
4. Contains results-based language (i.e. a measurable performance target)
5. Includes a trade-off analysis, when its implementation may require utilizing significant resources that would otherwise be used for other project purposes.

Annexes may include additional material deemed relevant by the evaluator but must include:

1. The Evaluation Terms of Reference,
2. A list of interviewees, the evaluation plan and timeline
3. A list of documents reviewed / consulted
4. Summary co-finance information and a statement of project expenditure by activity
5. Details of the project's 'impact pathways' and the 'ROtI' analysis
6. The expertise of the evaluation team. (brief CV).

TE reports will also include any formal response / comments from the project management team and/or the country focal point regarding the evaluation findings or conclusions as an annex to the report, however, such will be appended to the report by UNEP Evaluation Office.

Examples of UNEP GEF Terminal Evaluation Reports are available at [www.unep.org/eou](http://www.unep.org/eou)

#### Review of the Draft Evaluation Report

Draft reports shall be submitted to the Chief of Evaluation. The Chief of Evaluation will share the report with the corresponding Programme or Project Officer and his or her supervisor for initial review and consultation. The DGEF staff and senior Executing Agency staff are allowed to comment on the draft evaluation report. They may provide feedback on any errors of fact and may highlight the significance of such errors in any conclusions. Where, possible, a consultation is held between the evaluator, Evaluation Office Staff, the Task Manager and key members of the project execution team. The consultation seeks feedback on the proposed recommendations and lessons. UNEP Evaluation Office collates all review comments and provides them to the evaluator(s) for their consideration in preparing the final version of the report.

#### Submission of Final Terminal Evaluation Reports.

The final report shall be submitted in electronic form in MS Word format and should be sent directly to:

Segbedzi Norgbey, Chief,  
UNEP Evaluation Office  
P.O. Box 30552-00100  
Nairobi, Kenya  
Tel.: (254-20) 7623387  
Fax: (254-20) 7623158  
Email: [segbedzi.norgbey@unep.org](mailto:segbedzi.norgbey@unep.org)

The Chief of Evaluation will share the report with the following individuals:

Maryam Niamir-Fuller, Director  
UNEP/Division of GEF Coordination  
P.O. Box 30552-00100  
Nairobi, Kenya  
Tel: + 254-20-7624686  
Fax: + 254-20-623158/4042  
Email: [Maryam.Niamir-Fuller@unep.org](mailto:Maryam.Niamir-Fuller@unep.org)

Mr. Geordie Colville  
UNEP/GEF Climate Change SPO

United Nations Environment Programme (UNEP)

Division of GEF Coordination (DGEF)

PO Box 30552-00100

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Tel: 254 20 7625077

Fax: 254 20 7624041/2

Email: [geordie.colville@unep.org](mailto:geordie.colville@unep.org)

Peerke de Bakker

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UNEP/Division of GEF Coordination

P.O. Box 30552-00100, Nairobi, Kenya

Tel: +254 20 7623 257

Fax: +254 20 7624 041/2

E-mail : [peerke.bakker@unep.org](mailto:peerke.bakker@unep.org)

The evaluation report will also be copied to the following GEF Operational Focal Points.

Jorge L. Fernandez Chamero

Director of International Cooperation

Ministry of Science Technology & Environment (CITMA)

Havana, Cuba

Email: [chamero@citma.cu](mailto:chamero@citma.cu)

Dagmar Ganzalez Grau

Advisor to the Ministers Office

Ministry of International Cooperation (MINCEX)

Havana, Cuba

Email: [dagmar@mincex.cu](mailto:dagmar@mincex.cu)

The final evaluation report will be published on the Evaluation Office web-site [www.unep.org/eou](http://www.unep.org/eou) and may be printed in hard copy. Subsequently, the report will be sent to the GEF Office of Evaluation for their review, appraisal and inclusion on the GEF website.

#### Resources and Schedule of the Evaluation

This mid term evaluation will be undertaken by an evaluation team composed of an International Evaluator and a Supporting Evaluator contracted by the UNEP Evaluation Office. The International Evaluator will also be responsible for coordinating and leading the review process and, prepare the final evaluation report covering the TOR.

The contract for the lead evaluator will begin on 6<sup>th</sup> April 2010 and end on 6<sup>th</sup> June 2010 (1 month and 12 days spread over 2 months).

The contract for the Supporting Evaluator will begin on 6<sup>th</sup> April 2010 and end on 6<sup>th</sup> June 2010 (1 month and 9 days spread over 2 months). The Supporting Evaluator will submit his report to the Lead Evaluator by 14<sup>th</sup> May 2010.

The lead evaluator will submit a draft report on 21<sup>st</sup> May 2010 to UNEP/Evaluation Office. The Evaluation Office will circulate the report to the UNEP/DGEF Task Manager and key representatives of the executing agencies. Any comments or responses to the draft report will be sent to UNEP / Evaluation Office for collation and the consultant will be advised of any necessary revisions. Comments to the final draft report will be sent to the consultant by 28<sup>th</sup> May 2010 after which, the consultant will submit the final report no later than 6<sup>th</sup> June 2010.

The evaluators will after an initial telephone briefing with the staff of the UNEP Evaluation Office and UNEP/GEF Task Manager conduct initial desk review work and later travel Cuba and meet with project staff.

In accordance with the evaluation policies of UNEP and the GEF, all GEF projects are evaluated by independently contracted evaluators. A team of two evaluators will be utilized. The members of the Evaluation Team must be independent from both the policy-making process and the delivery and management of the UNIDO/GEF assistance. Therefore, candidates who had any direct involvement with the design and implementation of the UNIDO/GEF project will not be considered. The evaluators will work under the overall supervision of the Chief, Evaluation Office, UNEP.

Lead Evaluator – RETs Financing/Institutional Expert:

The lead evaluator should be an expert with international experience and have the following minimum qualifications: i) Post-graduate degree with specialisation in Energy related business; ii) at least five years experience in RETs financing/co-financing in Developing Countries; iii) Practical experience in energy/RETs related business/financing in countries with a centralised economy; iv) a minimum of five years of RETs project management experience, including direct experience in similar economic context; v) Fluency in oral and written English and Spanish and excellent report writing skills essential.

Supporting Evaluator: Renewable Energy Expert

The Supporting evaluator should be an international expert and have the following minimum qualifications: i) Post-graduate degree in Renewable Energy Technologies and an up-to date knowledge of about RETs; ii) a high level of theoretical and practical experience in Biomass electro/heat generation; iii) a minimum of ten years accumulated and recognised experience in relevant project and at least five years of project evaluation in RETs and/or implementation experience in a results-based management framework; iv) familiarity with the country or regional

context; v) Fluency in Spanish desirable, fluency in oral and written English and excellent report writing skills essential.

#### Fee-only Option

The evaluator will receive an initial payment of 40% of the total amount upon submission of draft report. Final payment of 60% will be made upon satisfactory completion of work. The fee is payable under the individual SSAs of the evaluator and is NOT inclusive of all expenses such as travel, accommodation and incidental expenses. Ticket and DSA will be paid separately.

In case, the evaluator cannot provide the products in accordance with the TORs, the timeframe agreed, or his products are substandard, the payment to the evaluator could be withheld, until such a time the products are modified to meet UNEP's standard. In case the evaluator fails to submit a satisfactory final product to UNEP, the product prepared by the evaluator may not constitute the evaluation report.

## Annex 1. OVERALL RATINGS TABLE

Criterion	Evaluator's Summary Comments	Evaluator's Rating
A. Attainment of project objectives and results (overall rating) Sub criteria (below)		
A. 1. Effectiveness - overall likelihood of impact achievement (ROtI rating)		
A. 2. Relevance		
A. 3. Efficiency		
B. Sustainability of Project outcomes (overall rating) Sub criteria (below)		
B. 1. Financial		
B. 2. Socio Political		
B. 3. Institutional framework and governance		
B. 4. Environmental		
C. Catalytic Role		
D. Stakeholders involvement		
E. Country ownership / drivenness		
F. Achievement of outputs and activities		
G. Preparation and readiness		
H. Implementation approach		
I. Financial planning		
J. Monitoring and Evaluation (overall rating) Sub criteria (below)		
E. 1. M&E Design		
E. 2. M&E Plan Implementation (use for adaptive management)		
E. 3. Budgeting and Funding for M&E activities		
K. UNEP Supervision and backstopping		

### RATING OF PROJECT OBJECTIVES AND RESULTS

Highly Satisfactory (HS): The project had no shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Satisfactory (S): The project had minor shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Moderately Satisfactory (MS): The project had moderate shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Moderately Unsatisfactory (MU): The project had significant shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Unsatisfactory (U) The project had major shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Highly Unsatisfactory (HU): The project had severe shortcomings in the achievement of its objectives, in terms of relevance, effectiveness or efficiency.

Please note: Relevance and effectiveness will be considered as critical criteria. The overall rating of the project for achievement of objectives and results may not be higher than the lowest rating on

either of these two criteria. Thus, to have an overall satisfactory rating for outcomes a project must have at least satisfactory ratings on both relevance and effectiveness.

#### RATINGS ON SUSTAINABILITY

Sustainability will be understood as the probability of continued long-term outcomes and impacts after the GEF project funding ends. The Terminal evaluation will identify and assess the key conditions or factors that are likely to contribute or undermine the persistence of benefits after the project ends. Some of these factors might be outcomes of the project, i.e. stronger institutional capacities, legal frameworks, socio-economic incentives /or public awareness. Other factors will include contextual circumstances or developments that are not outcomes of the project but that are relevant to the sustainability of outcomes..

#### Rating system for sustainability sub-criteria

On each of the dimensions of sustainability of the project outcomes will be rated as follows.

Likely (L): There are no risks affecting this dimension of sustainability.

Moderately Likely (ML). There are moderate risks that affect this dimension of sustainability.

Moderately Unlikely (MU): There are significant risks that affect this dimension of sustainability

Unlikely (U): There are severe risks that affect this dimension of sustainability.

According to the GEF Office of Evaluation, all the risk dimensions of sustainability are deemed critical. Therefore, overall rating for sustainability will not be higher than the rating of the dimension with lowest ratings. For example, if a project has an Unlikely rating in any of the dimensions then its overall rating cannot be higher than Unlikely, regardless of whether higher ratings in other dimensions of sustainability produce a higher average.

#### RATINGS OF PROJECT M&E

Monitoring is a continuing function that uses systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing project with indications of the extent of progress and achievement of objectives and progress in the use of allocated funds. Evaluation is the systematic and objective assessment of an on-going or completed project, its design, implementation and results. Project evaluation may involve the definition of appropriate standards, the examination of performance against those standards, and an assessment of actual and expected results.

The Project monitoring and evaluation system will be rated on 'M&E Design', 'M&E Plan Implementation' and 'Budgeting and Funding for M&E activities' as follows:

Highly Satisfactory (HS): There were no shortcomings in the project M&E system.

Satisfactory(S): There were minor shortcomings in the project M&E system.

Moderately Satisfactory (MS): There were moderate shortcomings in the project M&E system.

Moderately Unsatisfactory (MU): There were significant shortcomings in the project M&E system.

Unsatisfactory (U): There were major shortcomings in the project M&E system.

Highly Unsatisfactory (HU): The Project had no M&E system.

“M&E plan implementation” will be considered a critical parameter for the overall assessment of the M&E system. The overall rating for the M&E systems will not be higher than the rating on “M&E plan implementation.”

All other ratings will be on the GEF six point scale.

GEF Performance Description	
HS	= Highly Satisfactory
S	= Satisfactory
MS	= Moderately Satisfactory
MU	= Moderately Unsatisfactory
U	= Unsatisfactory
HU	= Highly Unsatisfactory



Annex 2. Co-financing and Leveraged Resources

Co-financing (basic data to be supplied to the consultant for verification)

Co Financing (Type/Source)	IA own Financing (mill US\$)		Government (mill US\$)		Other* (mill US\$)		Total (mill US\$)		Total Disbursement (mill US\$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Grants										
Loans/Concessional (compared to market rate)										
Credits										
Equity investments										
In-kind support										
Other (*)										
-										
-										
-										
-										
-										

Totals										
--------	--	--	--	--	--	--	--	--	--	--

\* Other is referred to contributions mobilized for the project from other multilateral agencies, bilateral development cooperation agencies, NGOs, the private sector and beneficiaries.

*Leveraged Resources*

Leveraged resources are additional resources—beyond those committed to the project itself at the time of approval—that are mobilized later as a direct result of the project. Leveraged resources can be financial or in-kind and they may be from other donors, NGO’s, foundations, governments, communities or the private sector. Please briefly describe the resources the project has leveraged since inception and indicate how these resources are contributing to the project’s ultimate objective.

Table showing final actual project expenditure by activity to be supplied by the UNEP Fund management Officer. (insert here)

## Annex 3

### Review of the Draft Report

Draft reports submitted to the UNEP Evaluation Office are shared with the corresponding Programme or Project Officer and his or her supervisor for initial review and consultation. The DGEF staff and senior Executing Agency staff provide comments on the draft evaluation report. They may provide feedback on any errors of fact and may highlight the significance of such errors in any conclusions. The consultation also seeks agreement on the findings and recommendations. UNEP Evaluation Office collates the review comments and provides them to the evaluators for their consideration in preparing the final version of the report. General comments on the draft report with respect to compliance with these TOR are shared with the reviewer.

### Quality Assessment of the Evaluation Report

All UNEP Evaluation reports are subject to quality assessments by the Evaluation Office. These are used as a tool for providing structured feedback to the evaluator.

The quality of the draft evaluation report is assessed and rated against the following criteria:

GEF Report Quality Criteria	UNEP EO Assessment	Rating
A. Did the report present an assessment of relevant outcomes and achievement of project objectives in the context of the focal area program indicators if applicable?		
B. Was the report consistent and the evidence complete and convincing and were the ratings substantiated when used?		
C. Did the report present a sound assessment of sustainability of outcomes?		
D. Were the lessons and recommendations supported by the evidence presented?		
E. Did the report include the actual project costs (total and per activity) and actual co-financing used?		
F. Did the report include an assessment of the quality of the project M&E system and its use for project management?		
UNEP additional Report Quality Criteria	UNEP EO Assessment	Rating
G. Quality of the lessons: Were lessons readily applicable in other contexts? Did they suggest prescriptive action?		
H. Quality of the recommendations: Did recommendations specify the actions necessary to correct existing conditions or improve operations ('who?' 'what?' 'where?' 'when?'). Can they be implemented? Did the recommendations specify a goal and an associated performance indicator?		

I. Was the report well written? (clear English language and grammar)		
J. Did the report structure follow EOU guidelines, were all requested Annexes included?		
K. Were all evaluation aspects specified in the TORs adequately addressed?		
L. Was the report delivered in a timely manner		

$$\text{Quality} = (2 * (0.3 * (A + B) + 0.1 * (C + D + E + F)) + 0.3 * (G + H) + 0.1 * (I + J + K + L)) / 3$$

The Totals are rounded and converted to the scale of HS to HU

Rating system for quality of terminal evaluation reports

A number rating 1-6 is used for each criterion: Highly Satisfactory = 6, Satisfactory = 5, Moderately Satisfactory = 4, Moderately Unsatisfactory = 3, Unsatisfactory = 2, Highly Unsatisfactory = 1, and unable to assess = 0.

Annex 4 List of intended additional recipients for the Terminal Evaluation (to be completed by the IA Task Manager)

Name	Affiliation	Email
<b>GEF Officials</b>		
<b>Government Officials</b>		
<b>GEF Focal Point(s)</b>		
<b>Executing Agency</b>		
<b>Implementing Agency</b>		

Annex 5: Expectations regarding the role of DGEF Task Managers in GEF Project Supervision and a list of Documentation relevant for the evaluation of Project Supervision (provided to Evaluator by DGEF)

Project start up phase

Pink File preparation and signature (including detailed project supervision plan)

Co-financing arrangements

Bank account opened and/or information provided

Initial cash advance

Supervision of recruitment of project staff

Office set up (office space, procurement of equipment, host agreements)

Establishment of project steering committee and any other advisory/governing structures

Inception mission and workshop

Preparation

Review of institutional arrangements and project implementation responsibilities

Workshop including providing training (important to discuss at inception how project will be evaluated at exit)

First Steering Committee meeting

Revised project implementation, M&E or supervision plan as necessary

Project implementation

Project financial and substantive reporting (includes audited statements, inventories of non-expendable equipment)

Active monitoring of progress in achieving outcomes

Liaising with co-implementing agency if applicable

Steering committee meeting preparation and attendance

Field visits as relevant/required

Risk monitoring (social and environmental safeguards)

Preparation and coordination of MTR (or support to MTE)

Adaptive management to respond to risk and problems (includes follow up to MTR/MTE recommendations, and risk mitigation plan if applicable)

Revisions

Other technical assistance (e.g., output review, support to communications efforts)

Database maintenance

Knowledge management

Project completion

Review/clearance of outputs

Clearance of terminal report and review of audited financial statement

Completion revision

Request for disposal of equipment

Support to Evaluation Office for terminal evaluation (review of draft evaluation TOR, project information, comments to draft TE, completion of management response / implementation plan, follow up on recommendations [if any])

Knowledge management

Documents to inform evaluation of project supervision

Project supervision plan, with associated budget

Correspondence related to project

Supervision mission reports

Steering Committee meeting documents, including agendas, meeting minutes, and any summary reports

Project progress reports, including financial reports submitted

Cash advance requests documenting disbursements

Annual Project Implementation Reports (PIRs)

Mid-term evaluation and associated action plans, (if any)

Management memos related to project

Other documentation of supervision feedback on project outputs and processes (e.g. comments on draft progress reports, etc.)

Possible additional documents:

Has a project extension occurred?

Extension documentation

Has a formal revision of project activities or objectives occurred? (Beyond modifications to project plans based on normal adaptive management procedures)

Project revision documentation

Has a formal budget revision occurred?

Budget revision documentation



## Annex 6 –Introduction to Theory of Change / impact pathways, the ROti Method and the ROti Results Scoresheet

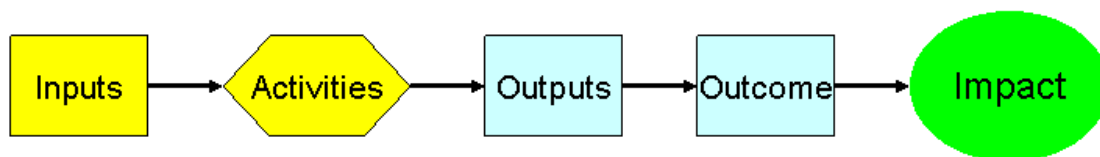
Terminal evaluations of projects are conducted at, or shortly after, project completion. At this stage it is normally possible to assess the achievement of the project's outputs. However, the possibilities for evaluation of the project's outcomes are often more limited and the feasibility of assessing project impacts at this time is usually severely constrained. Full impacts often accrue only after considerable time-lags, and it is common for there to be a lack of long-term baseline and monitoring information to aid their evaluation. Consequently, substantial resources are often needed to support the extensive primary field data collection required for assessing impact and there are concomitant practical difficulties because project resources are seldom available to support the assessment of such impacts when they have accrued – often several years after completion of activities and closure of the project.

Despite these difficulties, it is possible to enhance the scope and depth of information available from Terminal Evaluations on the achievement of results through rigorous review of project progress along the pathways from outcome to impact. Such reviews identify the sequence of conditions and factors deemed necessary for project outcomes to yield impact and assess the current status of and future prospects for results. In evaluation literature these relationships can be variously described as 'Theories of Change', Impact 'Pathways', 'Results Chains', 'Intervention logic', and 'Causal Pathways' (to name only some!).

### Theory of Change (TOC) / impact pathways

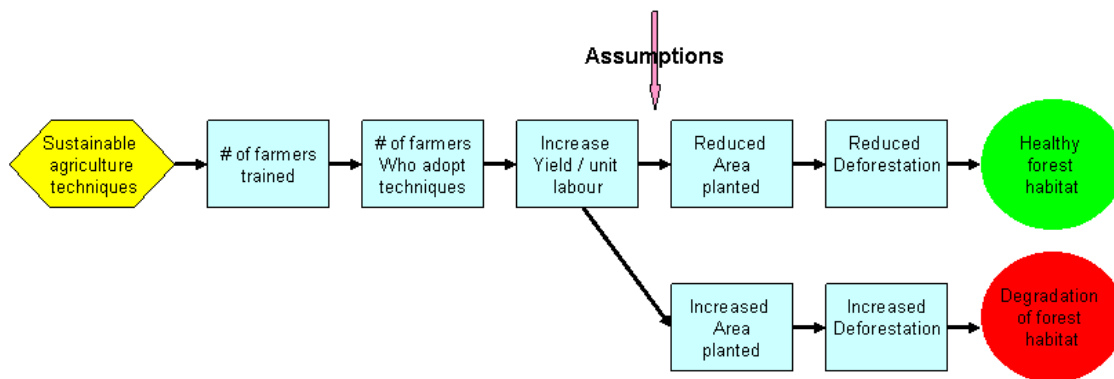
Figure 1 shows a generic impact pathway which links the standard elements of project logical frameworks in a graphical representation of causal linkages. When specified with more detail, for example including the key users of outputs, the processes (the arrows) that lead to outcomes and with details of performance indicators, analysis of impact pathways can be invaluable as a tool for both project planning and evaluation.

Figure 1. A generic results chain, which can also be termed an 'Impact Pathway' or Theory of Change.



The pathways summarise casual relationships and help identify or clarify the assumptions in the intervention logic of the project. For example, in the Figure 2 below the eventual impact depends upon the behaviour of the farmers in using the new agricultural techniques they have learnt from the training. The project design for the intervention might be based on the upper pathway assuming that the farmers can now meet their needs from more efficient management of a given area therefore reducing the need for an expansion of cultivated area and ultimately reducing pressure on nearby forest habitat, whereas the evidence gathered in the evaluation may in some locations follow the lower of the two pathways; the improved faming methods offer the possibility for increased profits and create an incentive for farmers to cultivate more land resulting in clearance or degradation of the nearby forest habitat.

Figure 2. An impact pathway / TOC for a training intervention intended to aid forest conservation.



The GEF Evaluation Office has recently developed an approach that builds on the concepts of theory of change / causal chains / impact pathways. The method is known as Review of Outcomes to Impacts (ROtI)<sup>4</sup> and has three distinct stages:

Identifying the project's intended impacts

Review of the project's logical framework

Analysis and modeling of the project's outcomes-impact pathways

The identification of the projects intended impacts should be possible from the 'objectives' statements specified in the official project document. The next stage is to review the project's logical framework to assess whether the design of the project is consistent with, and appropriate for, the delivery of the intended impact. The method requires verification of the causal logic between the different hierarchical levels of the logical framework moving 'backwards' from impacts through outcomes to the outputs; the activities level is not formally considered in the ROtI method<sup>5</sup>. The aim of this stage is to develop and understanding of the causal logic of the project intervention and to identify the key 'impact pathways'. In reality such process are often complex; they often involve multiple actors and decision-processes an are subject to time-lags, meaning that project impact often accrue long after the completion of project activities.

The third stage involves analysis of the 'impact pathways' that link project outcomes to impacts. The pathways are analysed in terms of the 'assumptions' and 'impact drivers' that underpin the processes involved in the transformation of outcomes to impacts via intermediate states (see Figure 3). Project outcomes are the direct intended results stemming from the outputs, and they are likely to occur either towards the end of the project or in the short term following project completion. Intermediate states are the transitional conditions between the project's immediate outcomes and the intended impact. They are necessary conditions for the achievement of the intended impacts and there may be more than one intermediate state between the immediate project outcome and the eventual impact.

<sup>4</sup> GEF Evaluation Office (2009). ROtI: Review of Outcomes to Impacts Practitioners Handbook. [http://www.gefweb.org/uploadedFiles/Evaluation\\_Office/OPS4/Roti%20Practitioners%20Handbook%2015%20June%202009.pdf](http://www.gefweb.org/uploadedFiles/Evaluation_Office/OPS4/Roti%20Practitioners%20Handbook%2015%20June%202009.pdf)

<sup>5</sup> Evaluation of the efficiency and effectiveness in the use of resources to generate outputs is already a major focus within UNEP Terminal Evaluations.

Impact drivers are defined as the significant factors that if present are expected to contribute to the realization of the intended impacts and can be influenced by the project / project partners & stakeholders. Assumptions are the significant factors that if present are expected to contribute to the realization of the intended impacts but are largely beyond the control of the project / project partners & stakeholders. The impact drivers and assumptions are ordinarily considered in Terminal Evaluations when assessing the sustainability of the project.

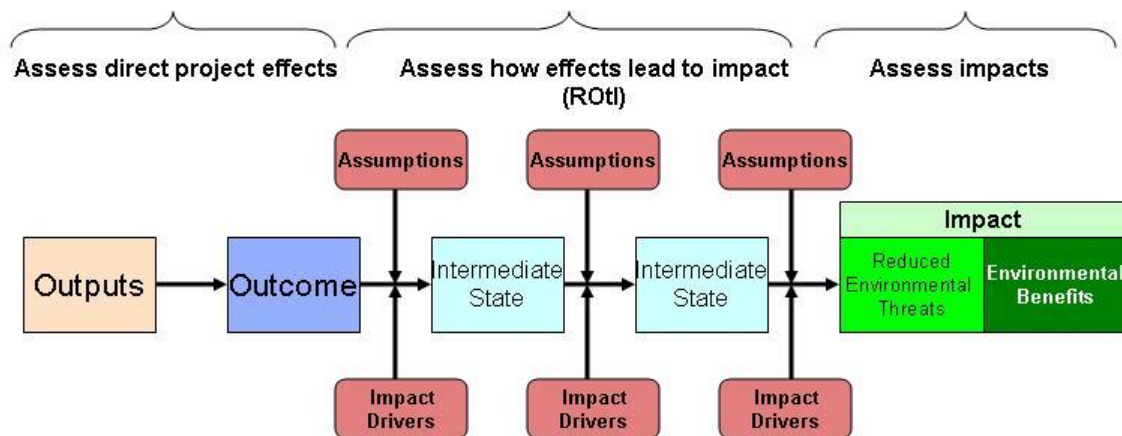
Since project logical frameworks do not often provide comprehensive information on the processes by which project outputs yield outcomes and eventually lead, via ‘intermediate states’ to impacts, the impact pathways need to be carefully examined and the following questions addressed:

Are there other causal pathways that would stem from the use of project outputs by other potential user groups?

Is (each) impact pathway complete? Are there any missing intermediate states between project outcomes and impacts?

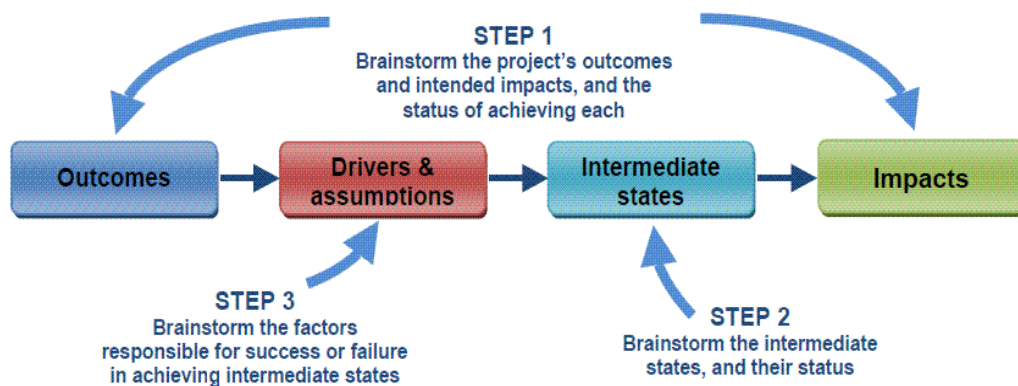
Have the key impact drivers and assumptions been identified for each ‘step’ in the impact pathway.

Figure 3. A schematic ‘impact pathway’ showing intermediate states, assumptions and impact drivers (adapted from GEF EO 2009).



The process of identifying the impact pathways and specifying the impact drivers and assumptions can be done as a desk exercise by the evaluator or, preferably, as a group exercise, led by the evaluator with a cross-section of project stakeholders as part of an evaluation field mission or both. Ideally, the evaluator would have done a desk-based assessment of the project’s theory of change and then use this understanding to facilitate a group exercise. The group exercise is best done through collective discussions to develop a visual model of the impact pathways using a card exercise. The component elements (outputs, outcomes, impact drivers, assumptions intended impacts etc.) of the impact pathways are written on individual cards and arranged and discussed as a group activity. Figure 4 below shows the suggested sequence of the group discussions needed to develop the TOC for the project.

Figure 4. Suggested sequencing of group discussions (from GEF EO 2009)



Once the theory of change model for the project is complete the evaluator can assess the design of the project intervention and collate evidence that will inform judgments on the extent and effectiveness of implementation, through the evaluation process. Performance judgments are made always noting that project contexts can change and that adaptive management is required during project implementation.

The ROTI method requires ratings for outcomes achieved by the project and the progress made towards the ‘intermediate states’ at the time of the evaluation. According to the GEF guidance on the method; *“The rating system is intended to recognize project preparation and conceptualization that considers its own assumptions, and that seeks to remove barriers to future scaling up and out. Projects that are a part of a long-term process need not at all be “penalized” for not achieving impacts in the lifetime of the project: the system recognizes projects’ forward thinking to eventual impacts, even if those impacts are eventually achieved by other partners and stakeholders, albeit with achievements based on present day, present project building blocks.”* For example, a project receiving an “AA” rating appears likely to deliver impacts, while for a project receiving a “DD” this would seem unlikely, due to low achievement in outcomes and the limited likelihood of achieving the intermediate states needed for eventual impact (see Table 1).

Table 1. Rating scale for outcomes and progress towards ‘intermediate states’

Outcome Rating	Rating on progress toward Intermediate States
D: The project’s intended outcomes were not delivered	D: No measures taken to move towards intermediate states.
C: The project’s intended outcomes were delivered, but were not designed to feed into a continuing process after project funding	C: The measures designed to move towards intermediate states have started, but have not produced results.
B: The project’s intended outcomes were delivered, and were designed to feed into a continuing process, but with no prior allocation of responsibilities after project funding	B: The measures designed to move towards intermediate states have started and have produced results, which give no indication that they can progress towards the intended long term impact.
A: The project’s intended outcomes were delivered, and were designed to feed into a continuing process, with specific allocation of responsibilities after project funding.	A: The measures designed to move towards intermediate states have started and have produced results, which clearly indicate that they can progress towards the intended long term impact.

Thus a project will end up with a two letter rating e.g. AB, CD, BB etc. In addition the rating is given a ‘+’ notation if there is evidence of impacts accruing within the life of the project. The

possible rating permutations are then translated onto the usual six point rating scale used in all UNEP project evaluations in the following way.

Table 2. Shows how the ratings for ‘achievement of outcomes’ and ‘progress towards intermediate states translate to ratings for the ‘Overall likelihood of impact achievement’ on a six point scale.

Highly Likely	Likely	Moderately Likely	Moderately Unlikely	Unlikely	Highly Unlikely
AA AB BA CA BB+ CB+ DA+ DB+	BB CB DA DB AC+ BC+	AC BC CC+ DC+	CC DC AD+ BD+	AD BD CD+ DD+	CD DD

In addition, projects that achieve documented changes in environmental status during the project’s lifetime receive a positive impact rating, indicated by a “+”. The overall likelihood of achieving impacts is shown in Table 11 below (a + score above moves the double letter rating up one space in the 6-point scale).

The ROTI method provides a basis for comparisons across projects through application of a rating system that can indicate the expected impact. However it should be noted that whilst this will provide a relative scoring for all projects assessed, it does not imply that the results from projects can necessarily be aggregated. Nevertheless, since the approach yields greater clarity in the ‘results metrics’ for a project, opportunities where aggregation of project results might be possible can more readily be identified.

Results rating of project entitled:							
		Rating (D – A)		Rating (D – A)		Rating (+)	Overall
Outputs	Outcomes		Intermediary		Impact (GEBs)		
1.	1.		1.		1.		
2.	2.		2.		2.		
3.	3.	3.	3.				
	Rating justification:		Rating justification:		Rating justification:		

## Scoring Guidelines

The achievement of Outputs is largely assumed. Outputs are such concrete things as training courses held, numbers of persons trained, studies conducted, networks established, websites developed, and many others. Outputs reflect where and for what project funds were used. These were not rated: projects generally succeed in spending their funding.

### Outcomes:

Outcomes, on the other hand, are the first level of intended results stemming from the outputs. Not so much the number of persons trained; but how many persons who then demonstrated that they had gained the intended knowledge or skills. Not a study conducted; but one that could change the evolution or development of the project. Not so much a network of NGOs established; but that the network showed potential for functioning as intended. A sound outcome might be genuinely improved strategic planning in SLM stemming from workshops, training courses, and networking.

### Examples

*Funds were spent, outputs were produced, but nothing in terms of outcomes was achieved.* People attended training courses but there is no evidence of increased capacity. A website was developed, but no one used it. (Score – D)

*Outcomes achieved but are dead ends; no forward linkages to intermediary stages in the future.* People attended training courses, increased their capacities, but all left for other jobs shortly after; or were not given opportunities to apply their new skills. A website was developed and was used, but achieved little or nothing of what was intended because intended end users had no access to computers. People had meetings that led nowhere. Outcomes hypothesized or achieved, but either insignificant and/or *no evident linkages forward* to intermediary stages leading towards impacts. (Score – C)

*Outcomes plus implicit linkages forward.* Outcomes achieved and have *implicit forward linkages* to intermediary stages and impacts. Collaboration as evidenced by meetings and decisions made among a loose network is documented that should lead to better planning. Improved capacity is in place and should lead to desired intermediate outcomes. Providing implicit linkages to intermediary stages is probably the most common case when outcomes have been achieved. (Score - B)

*Outcomes plus explicit linkages forward.* Outcomes have *definite and explicit forward linkages* to intermediary stages and impacts. An alternative energy project may result in solar panels installed that reduced reliance on local wood fuels, with the outcome quantified in terms of reduced C emissions. Explicit forward linkages are easy to recognize in being concrete, but are relatively uncommon. (Score A)

### Intermediary stages:

The intermediate stage indicates achievements that lead to Global Environmental Benefits, especially if the potential for scaling up is established.

*“Outcomes” scored C or D.* If the outcomes above scored C or D, there is no need to continue forward to score intermediate stages given that achievement of such is then not possible.

*In spite of outcomes and implicit linkages, and follow-up actions, the project dead-ends.* Although outcomes achieved have *implicit forward linkages* to intermediary stages and impacts, the project dead-ends. Outcomes turn out to be insufficient to move the project towards intermediate stages and to the eventual achievement of GEBs. Collaboration as evidenced by meetings and among participants in a network never progresses further. The implicit linkage based on follow-up never materializes. Although outcomes involve, for example, further participation and discussion, such actions do not take the project forward towards intended intermediate impacts. People have fun getting together and talking more, but nothing, based on the implicit forward linkages, actually eventuates. (Score = D)

*The measures designed to move towards intermediate states have started, but have not produced result, barriers and/or unmet assumptions may still exist.* In spite of sound outputs and in spite of explicit forward linkages, there is limited possibility of intermediary stage achievement due to barriers not removed or unmet assumptions. This may be the fate of several policy related, capacity building, and networking projects: people work together, but fail to develop a way forward towards concrete results, or fail to successfully address inherent barriers. The project may increase ground cover and or carbon stocks, may reduce grazing or GHG emissions; and may have project level recommendations regarding scaling up; but barrier removal or the addressing of fatal assumptions means that scaling up remains limited and unlikely to be achieved at larger scales. Barriers can be policy and institutional limitations; (mis-) assumptions may have to do with markets or public – private sector relationships. (Score = C)

*Barriers and assumptions are successfully addressed.* Intermediary stage(s) planned or conceived have feasible direct and explicit forward linkages to impact achievement; barriers and assumptions are successfully addressed. The project achieves measurable intermediate impacts, and works to scale up and out, but falls well short of scaling up to global levels such that achievement of GEBs still lies in doubt. (Score = B)

*Scaling up and out over time is possible.* Measurable intermediary stage impacts achieved, scaling up to global levels and the achievement of GEBs appears to be well in reach over time. (Score = A)

Impact: Actual changes in environmental status

“Intermediary stages” scored B to A.

Measurable impacts achieved at a globally significant level within the project life-span. . (Score = ‘+’)

## ANNEX 7 RISK FACTOR TABLE

Evaluators will use this table to summarize risks identified in the Project Document and reflect also any new risks identified in the course of the evaluation in regard to project implementation. The Notes column should be used to provide additional details concerning manifestation of the risk as relevant.

INTERNAL RISK Project management										
Risk Factor	Indicator of Low Risk	Indicator of Medium Risk	Indicator of High Risk	Low	Medium	Substantial	High	Not Applicable	To be determined	NOTES
Management structure	Stable with roles and responsibilities clearly defined and understood	Individuals understand their own role but are unsure of responsibilities of others	Unclear responsibilities or overlapping functions which lead to management problems							
Governance structure	Steering Committee and/or other project bodies meet periodically and provide effective direction/inputs	Body(ies) meets periodically but guidance/input provided to project is inadequate	Members lack commitment (seldom meet) and therefore the Committee/body does not fulfil its function							
Internal communications	Fluid and cordial	Communication process deficient although relationships between team members are good	Lack of adequate communication between team members leading to deterioration of relationships and resentment / factions							
Work flow	Project progressing according to work plan	Some changes in project work plan but without major effect on overall implementation	Major delays or changes in work plan or method of implementation							
Co-financing	Co-financing is secured and payments are received on time	Is secured but payments are slow and bureaucratic	A substantial part of pledged co-financing may not materialize							
Budget	Activities are progressing within planned budget	Minor budget reallocation needed	Reallocation between budget lines exceeding 30% of original budget							
Financial management	Funds are correctly managed and transparently accounted for	Financial reporting slow or deficient	Serious financial reporting problems or indication of mismanagement of funds							
Reporting	Substantive reports are presented in a	Reports are complete and accurate but	Serious concerns about quality and							



	timely manner and are complete and accurate with a good analysis of project progress and implementation issues	often delayed or lack critical analysis of progress and implementation issues	timeliness of project reporting								
Stakeholder involvement	Stakeholder analysis done and positive feedback from critical stakeholders and partners	Consultation and participation process seems strong but misses some groups or relevant partners	Symptoms of conflict with critical stakeholders or evidence of apathy and lack of interest from partners or other stakeholders								
External communications	Evidence that stakeholders, practitioners and/or the general public understand project and are regularly updated on progress	Communications efforts are taking place but not yet evidence that message is successfully transmitted	Project existence is not known beyond implementation partners or misunderstandings concerning objectives and activities evident								
Short term/long term balance	Project is meeting short term needs and results within a long term perspective, particularly sustainability and replicability	Project is interested in the short term with little understanding of or interest in the long term	Longer term issues are deliberately ignored or neglected								
Science and technological issues	Project based on sound science and well established technologies	Project testing approaches, methods or technologies but based on sound analysis of options and risks	Many scientific and /or technological uncertainties								
Political influences	Project decisions and choices are not particularly politically driven	Signs that some project decisions are politically motivated	Project is subject to a variety of political influences that may jeopardize project objectives								
Other, please specify. Add rows as necessary											

## ANNEX 8. Revised workplan and milestones for the project.

### Plan de actividades, salidas y tareas del Proyecto para el periodo 2010-2011

Salida	Presupuesto disponible (M USD)	Tareas 2010	Presupuesto 2010 (MUSD)	Tareas 2011	Presupuesto 2011 (MUSD)
Actividad 1. Establecimiento de normas de calidad y directrices, sobre la base de las políticas y marco regulatorio formulado por el gobierno.					
1.1 Las normas nacionales de aseguramiento de la calidad, referentes a la biomasa y los recursos eólicos (utilizadas en el marco del proyecto) han sido establecidas.	5.00	-	0.00	Normas concluida	5.00
1.2 Las directrices para la valoración del impacto ambiental para las tecnologías de biomasa y eólica han sido formuladas.	5.00	-	0.00	Directrices concluidas	5.00
Subtotal Actividad 1	10.00		0.00		10.00
Actividad 2. Fortalecimiento institucional y entrenamiento de los principales implicados (Nacionales y locales). CONCLUIDA					
2.1 Principales partes interesadas adiestradas en la evaluación de tecnologías de ER. (CONCLUIDA)	0.00		0.00		0.00
2.2 Principales partes interesadas adiestradas en la gestión de energías renovables para la producción de calor y electricidad. (CONCLUIDA)					
2.3 Los expertos y planificadores entrenados en el manejo de servicios técnicos y financieros, previstos en el proyecto. (CONCLUIDA)					
Actividad 3. Creación de nuevos e innovativos mecanismos financieros para el manejo de la inversión en TER. CONCLUIDA					
3.1 Mecanismo innovativo para el manejo del Fondo para las inversiones.	0.00		0.00		0.00
3.2 Capacidad de los bancos nacionales y las instituciones financieras para evaluar y analizar tecnologías de ER en plantas					

eléctricas creadas.					
Actividad 4. Implantación de 4 modelos de negocios para demostrar factibilidad comercial de tecnologías de energías renovables para la generación de energía y calor.					
4.1 MN1 – Desarrollo forestal para el suministro de biomasa (36,423 t/año en régimen completo).	1000.00	Equipamiento previsto adquirido	1000.00	Plantadas 800 hs de área boscosa.	0.00
4.2 MN 2: Generación eléctrica a partir de biomasa (Planta La Melvis) 0.5 MW	1410.00	Tecnología contratada  Ingeniería de detalle concluida  Construcción civil iniciada	372.00	Construcción civil concluida  Montaje tecnológico concluido  Puesta a punto ejecutada	1038.00
4.3 MN3: Generación de calor a partir de biomasa (Lácteo y Cárnico)	510.00	Tecnología contratada  Ingeniería de detalle concluida  Construcción civil concluida	330.00	Calderas funcionando	180.00
Subtotal Actividad 4.	2920.00  (1920.00 Del FRR para los MN 1; 2; y 3. A ello se adiciona 1 millón de USD comprometido en el 2009 y no ejecutado aun)		1702.00		1218.00
Actividad 5. Establecimiento de estructuras de dirección del proyecto para la coordinación, supervisión y difusión de los resultados del proyecto.					
5.1 Equipo del proyecto seleccionado y establecida la estructura de gestión (CONCLUIDO)  5.2 Concluido el fortalecimiento institucional y capacitados los actores claves (CONCLUIDO)	0.00		0.00		0.00
5.3 Establecida una estrecha supervisión y evaluación de las actividades del proyecto	100.00	Visitas de campo periódicas ejecutadas  Efectuadas reuniones periódicas con los	50.00	Visitas de campo periódicas ejecutadas  Efectuadas reuniones periódicas con los	50.00

		responsables involucrados  Elaborados y remitidos los informes periódicos		responsables involucrados  Elaborados y remitidos los informes periódicos	
5.4 Desarrollados e implementados efectivos programas de disseminación de la información.		Diseñados los programas de disseminación.	Aportes PNUMA ONUDI	Ejecutados los programas de disseminación	Aportes PNUMA ONUDI
5.5 Lecciones aprendidas, disseminados los resultados y creada red regional.			Aportes PNUMA ONUDI	Disseminados los resultados y creada red	Aportes PNUMA ONUDI
Subtotal Actividad 5.	100.00		50.00		50.00
Actividad 6. Implementación del componente demostrativo para fortalecer la capacidad nacional de fabricación, montaje y mantenimiento de sistemas de gasificación de biomasa y sistemas eólicos.					
6.1. Planta eléctrica en base a biomasa en Cocodrilo	0.00	Planta en funcionamiento	0.00		
6.2. Sistema de corte de marabú	180.00	Máquina cortadora fabricada.  Contratadas alzadora y astilladora.	95.00	Sistema de corte en funcionamiento	85.00
6.3. Pequeños aerogeneradores de hasta 5 KW.	120.00	Concluido y evaluado funcionamiento del primer prototipos	60.00	Fabricados y evaluados los 3 prototipos restantes.  Informe de recomendaciones elaborado.	60.00
6.4. Fabricación local de plantas compactas de gasificación de biomasa para comunidades aisladas	280.00	Concluidas las negociaciones para la transferencia de tecnología con los indios.  Concluido el estudio de factibilidad.  Concluidos los diseños de planta compacta.  Adquiridos los componentes principales para la	200.0	Fabricación y puesta en marcha de prototipos de planta compacta	80.00

		fabricación.			
6.5. Sistema híbrido para el radar meteorológico de Punta del Este, en base al gasificador compacto	170.00	Adquiridos los componentes principales para la fabricación.	150.00	Fabricado, instalado y funcionando prototipo de planta compacta en el radar meteorológico.	20.00
Subtotal Actividad 6.	850.00 (100.00 Para costos adicionales imprevistos)		505.00		345.00
Actividad 7. Actividades de apoyo a los componentes comercial y demostrativo.					
7.1. Instalación de 4 torres de medición eólica	7.59	Instalación de las tres torres restantes  Puesta a punto del sistema de transmisión automática	7.59		
7.2. Vivero forestal y equipamiento para el estudio de los bosques	168.00	Contratación, montaje y puesta en funcionamiento de vivero forestal  Compra de equipamiento para estudio de bosques	168.00		
7.3. Equipamiento e insumos para el suministro de biomasa a la planta de Cocodrilo	75.00	Adquisición de equipos e insumos para suministro estable de biomasa a Planta Cocodrilo	75.00		
		Identificadas las actividades (inversiones y proyectos demostrativos) que requieren apoyo adicional		Ejecutadas las actividades de apoyo a inversiones y proyectos demostrativos identificadas	184.3
Subtotal Actividad 7.	434.857 (184.3 Para costos adicionales imprevistos)		250.59		184.3
Otras contribuciones y gastos					

Costos ONUDI (5%)	165.743		75.38		90.363
TOTAL	4480.60 (Se ha adicionado 1 millón de USD comprometido en el 2009 y no ejecutado aun)		2582.97		1897.66
Contribución del Gobierno de Cuba	815.00	Destinadas adicionalmente a las actividades 4, 5, 6 y 7.			
Actividades en apoyo a la aplicación de diferentes subcomponentes del proyecto, incluyendo la difusión de los resultados obtenidos en Cuba en la Región del Caribe (pequeños Estados insulares)	420.00	Destinadas a financiar las salidas 5.4 y 5.5.			
TOTAL GENERAL	4715.60 (+ 1 millón comprometido en 2009 con el FRR y no ejecutado aun)= 5715.60				

ISLA DE LA JUVENTUD

Subproject	Milestone March 2010	Milestone June 2010	Milestone Dec 2010	Responsible/Remarks
<b>Demo</b>				
1 - Cocodrillo 50 kW Biomass Gasifier	System installed, test run & calibration	System operational & biomass supply secured	First performance data evaluated	UNIDO: secure immediate technical assistance from India (Febr 2010); UNE for construction, assembly, commissioning & operation; Flora y Fauna for biomass supply; Cuba Energia for overall project supervision.
2 - Radar Punta del Este - Hybrid		Engineering Design complete	Procurement for complete system ready	Project depends on TT Agreement Biomass Gasification (see 5); CMIJ Centro Meteorologico for request, investment, installation, operation. CubaEnergia for project supervision & validation
3 - Marabu Cutter - Biomass Processing	Specifications formulated	Latest arrival of all components for assembly & field testing	Cutter, locally assembled/manufactured & operational	UNIDO procurement & supply of components; CICMA for manufacturing; CubaEnergia for supervision validation & reporting
4 - Small Windturbines: Local Manufacturing	UNE/CubaEnergia to identify equipment. UNIDO supply of imported components	Latest arrival of all components for assembly & field testing	Prototype operational	UNIDO to facilitate Tech. Trans and timely procurement & supply; UNE & INEL for engineering design, manufacturing & testing; CubaEnergy for project supervision & evaluation
5 - Biomass Gasification Compact Plants – Local Manufacturing	UNIDO to facilitate processing TT Agreement not later than March	Agreements signed	Design for local manufacturing finished	Depends on agreement re. Technology Transfer from India. UNE Engineering Design & Manufacturing
<b>Investments</b>				
1 - Biomass Boiler Meat Processing Plant Gerona	Submission Investment proposal to MEP	Engineering design complete; Financial Agreement ready; Supply Contract Boiler agreed & signed.	Start Civil Works	MINAL (Min for Food industry) for investment (incl. request to MEP), procurement. RRMF by Comp Fiduciaria; CubaEnergia for project supervision and validation
2 - Biomass Boiler Dairy Industry Gerona	Submission Investment proposal to MEP	Engineering design complete; Supply Contract Boiler agreed & signed	Start of Civil Works	MINAL (Min for Food industry) for investment (incl. request to MEP), procurement. RRMF by Comp Fiduc; CubaEnergia for project

				supervision and validation
3 - Biomass Gasifier Melvis 2 x 250 kW	Submission of investment docs to MEP by UNE. Loan Agreement with Comp.Fid. Preferably Supply Contract to include Technology Transfer for demo -5?	Start of detailed Engineering design; Supply contracts agreed; execution schedule ready	Civil works in progress	UNE for all activities from request, investment to operation. CubaEnergia for project supervision and validation
4 - Biomass Processing - Empresa Forestal	Specifications ready & Tender initiated	Technical Equipment Supply contracts agreed	Plantations started	GEAM/MINAC for entire project. CubaEnergia for project supervision and validation.
Others				
1 - Compania Fiduciaria	Terms & Conditions adapted for project financing for all IdIJ investment projects.	All loan procedures complete		Comp. Fiduc.
2 - 4 Meteo Towers		Installation of remaining 3 towers completed & operational (incl. software)	First analysis ready	CMIJ – Meteo Center Isla dela Juventud; Cuba Energia for project supervision and validation.
3 - Forestry Management Support	Supply Contract (UNIDO) for nursery & equipment	Equipment Supply	Nursery in operation	GEAM & UNIDO for supply. CubaEnergia for project supervision and validation.
4 - Equipment for sustainable biomass supply to Cocodrillo	Commercial Contracts agreed and signed	In operation		UNIDO/Flora y Fauna; CubaEnergia for project supervision & validation.

*CMIJ – Centro Meteorologico Isla de la Juventud MINAL – Ministerio de la Industria Alimenticia*

*CICMA –Centro de Investigaciones de Mecanizacion*

*Agricultura GEAM – Grupo Empresarial de Agricultura de Montana*

*UNE –Union Electrica*

*INEL – Empresa de Ingenieria dela UNE*

*MINAG – Ministerio de la Agricultura*



## 6.2. Annex 2: List of interviewees

The evaluation plan consisted of:

- A detailed analysis of project documentation, supplied by UNEP - UNIDO before the field trip to Cuba.
- Phone conference with UNE – UNIDO officials to clarify details.
- Upon arrival to Havana, a first set of interviews with the Project Director and representatives of some relevant stakeholders.
- A three days trip to Isla de la Juventud, including visits to the sites corresponding to the different project activities and meetings with all the relevant local stakeholders and local authorities.
- A second set of interviews with the rest of relevant stakeholders (including UNIDO), as well with national authorities in Havana.
- Revision of project documentation facilitated by the Cuban counterparts.
- Final discussions with the Project Director and other relevant actors.
- Preparation of the Draft Report, after the end of the stay in Havana.

The Evaluation team arrived to Havana on Tuesday 8 June 2010, flew to Isla de la Juventud on Friday 11, back to Havana on Monday 14, and back home on Thursday 24 June 2010.

The following list specifies names, titles and organizations of persons contacted during the stays in Havana and Isla de la Juventud.

NAME	TITLE - ORGANIZATION
Jorge Luis Isaac Pino	Project Director Senior Advisor – Unión Eléctrica (UNE)
Daniel López Aldama	Director - CubaEnergía
Alfredo Curbelo Alonso	Project Director- CubaEnergía
Oscar Jiménez Cabezas	Energy project Manager - CubaEnergía
Marisela Ferreira de la Gándara	Executive President - Compañía Fiduciaria
Irma Arzola Martínez	Gerente – Compañía Fiduciaria
Iliana González Vega	Asesora Jurídica – Compañía Fiduciaria
Luis San Juan Suárez	Director Renewable Energy - INEL
Guillermo Leyva	Wind Energy Specialist - INEL
Oscar Hernández Jiménez	Investment Specialist - UNE
Roberto A. Alboniga Gil	Director Research&Development - CICMA
Carmen Rico López	Director Generation IJ Electric Utility
Dolores Marrero	Commercial Policy Specialist - MINCEX
Juan Manuel Presa Sague	Vice Minister - MINBAS
Hector Eligio Amigo Carcasés	President, Energy & Environment Commission, National Assembly of Cuba
Argelia Balboa Monzón	Senior Adviser Renewable Energy -

	MINBAS
Mario Muñiz	Senior Adviser Renewable Energy - MINBAS
Diego Masera	Chief Renewable and Rural Energy Unit - UNIDO
Sylvia Alvarez Rosell	Focal Point – UNIDO Havana
Alberto Rodríguez Carrillo	Project Manager - INEL
Celso Carpio	Director, Development - MINAGRI
A. Díaz González	Director, Investments - MINAL
Ramón Tusted	MINAL
Marilyn Infante	MINAL
Ricardo González	Deputy Director - UNE
Arelis Casañola Quintana	Vice – President – AMPP IJ
Karel Suárez Rodríguez	Advisor – AMPP IJ
Emilia Gómez	Delegate in IJ - MINCEX
Juan Carlos Almenares López	Specialist – MINCEX IJ
Leonardo Marrero Marcel	Specialist – MINCEX IJ
Leonardo Cruz Cabrera	Delegate in IJ - CITMA
Omar Moralez Gómez	Chief Group ERIJ OBE
Ana Delia Hernández Leiva	CMP CITMA
Cándido Colomar Hernández	Forestry Enterprise MINAGRI IJ
Tomas Betancourt López	Flora & Fauna IJ
Raúl Fernández González	Flora & Fauna IJ
Gerardo Hidalgo Gil	Meat Complex IJ
Angel Abderol Cordovis	Dairy Complex IJ
Angel Alonso Ojeda	Coordinator ERIJ
Román Rivero Magaña	Wind Energy Specialist CMP IJ
A. Guevara Mesicón	Basic Systems Specialist CMP IJ
Dania M. Hernández R.	Director – Meat Complex
Norberto Cuza Peña	Sub director – Meat Complex
Gerardo Hidalgo C.	Meat Complex
Sara Caledrava	Meat Complex

### 6.3. Annex 3: List of consulted documents

- ✓ Project Action Sheet (23-06-2005)
- ✓ Project General Data (undated)
- ✓ Project Budget (22-06-2006)
- ✓ Contract between UNIDO and Compañía Fiduciaria
- ✓ Terms of Reference for the Sub-contracting Authority (11-08-2006)
- ✓ Project working plan for the year 2007
- ✓ Half year progress report to UNEP ((July – December 2007)
- ✓ Project working plan for the year 2008
- ✓ Funding Resume 2008
- ✓ Project Revision Document (undated draft)
- ✓ Minutes of the GRZ/UNIDO/GEF Renewable Energy Based Electricity Generation for Isolated Mini-grids in Zambia Project Steering Committee (19-03-2008)
- ✓ Half year progress report to UNEP ((January – June 2008)
- ✓ UNEP GEF PIR FY 2008 (1 July 2007 to 30 June 2008)
- ✓ Minutes of the GRZ/UNIDO/GEF Renewable Energy Based Electricity Generation for Isolated Mini-grids in Zambia Project Steering Committee (19-08-2008)
- ✓ Half year progress report to UNEP ((July – December 2008)
- ✓ UNEP GEF PIR FY 2008 (1 July 2008 to 31 December 2008)
- ✓ Work Plan 2009
- ✓ Report of the Steering Committee Meeting (27-5-2009)
- ✓ Minutes of the Steering Committee Meeting (27-5-2009)
- ✓ Junta Directiva del Proyecto (27-5-2009)
- ✓ Minutes of the Meeting with UNIDO and GEF Officers Mr. Massimo Garzelli and Mr. Peerke de Bakker for the Concluding Remarks (29-5-2009)
- ✓ Project Mission Report M. Garzelli (19 to 29 May 2009)
- ✓ Mission Report (19 to 29 May 2009)
- ✓ UNEP GEF PIR FY 2009 (1 July 2008 to 30 June 2009)
- ✓ Calculating replication and Indirect Impacts for Energy Efficiency Projects. Top-Down Approach (undated)
- ✓ Letter from Ms. Dagmar González to Mr. Pradeep Monga (26-8-2009)
- ✓ Letter from Ms. Maryam Niamir-Fuller to Mr. Jorge Luis Fernández Chamero (24-9-2009)
- ✓ Project Revision. Final version (15-12-2009)
- ✓ Plan de Actividades, Salidas y Tareas del Proyecto para el período 2010-2011
- ✓ Generation and Delivery of Renewable Energy Based Modern Energy Services in Cuba: the Case of Isla de la Juventud (Draft MTE ToR, 8-1-2010)
- ✓ Steering Committee Meeting of the GEF/UNIDO Project (29-1-2010)
- ✓ Peerke de Bakker Mission Report (23 January to 1 February 2010)
- ✓ New milestones January 2010

- ✓ Letter from Mr. Chamero to Ms. Maryam Niamir Fuller (18-1-2010)
- ✓ Letter from Ms. Maryam Niamir Fuller to Mr. Chamero (22-1-2010)
- ✓ Generation and Delivery of Renewable Energy Based Modern Energy Services in Cuba: the Case of Isla de la Juventud (Draft MTE ToR, 8-2-2010)
- ✓ Letter from Ms. Maryam Niamir Fuller to Mr. Chamero (8-4-2010)

#### **6.4. Annex 4: Summary of co-finance information (project expenditure by activity)**

The table in the following pages below summarizes the present level of project expenditure by activity. As indicated in the main text of the report, due to the effects of the hurricanes which reached Isla de la Juventud in 2010, the Cuban government had to devote large amounts of money to reconstruction purposes, hence it asked for modifications in the scope of the project. These modifications were agreed by the Project Steering Committee and resulted, among other things, in the inclusion of the Los Canarreos wind farm as a contribution to the project from the Cuban side. In general, and due to the above reasons, contributions from the Cuban government will mainly come in the form of in kind contributions.

Apart from the Cocodrilo power plant, practically no expenditures have been made in acquisition of equipment for the demonstration units and business models (1 MUS\$ has been supplied to Compañía Fiduciaria, but it has not yet been given as a loan to any stakeholder, the reason given for this being that the contract between UNIDO and Compañía Fiduciaria has not yet been modified to consider the project changes. Moreover, the loan contracts between Compañía Fiduciaria and the corresponding business stakeholders have not been signed (only one contract has been partially defined).

The initial Project Document contemplated large private investments in the development of renewable energy projects in Cuba. These investments have failed to materialize, and this has put a heavy burden on the project and has been a major cause for reduction of the project initial objectives. Given that the Cuban government is not giving any direct financial support to renewable and has decided to leave it in private hands, the future role to be played by the Risk and Replication Management Fund contemplated in the project becomes especially relevant.

No co-finance reports have been submitted by UNIDO to UNEP up to now.

## Project Budget Revision by Activities/Budget Lines x 2010-2011

(Expenditures as at 30/4/10)

Draft 5 - (12/5/10)

This Budget Revision (by Activities) has been formulated on the basis of discussions between the NPD (Mr. Wenceslao Carrera), CITMA, MINCEX and Garzelli in July 2009 and the Project Revision document approved by the SC on 29/1/10.

Finalization of a jointly formulated and agreed upon "Technical/financial summary table" – 28/7/2009.

No	Number and Description of the Activity	Budget Line	Full Budget Allocation US\$ (2=3+4)	Expenditures US\$ 30/4/10 (3)	Remaining US\$ 30/4/10 (4)	Remarks/Comments
		(1)				
1	<b>Act. 1:</b> Establishment of a policy for RETs in Cuba.	11:53	<b>10,000.0</b>	<b>0.0</b>	<b>10,000.0</b>	RETs policy already formulated by the Gov.. This amount has been allocated for an International short term expertise, if requested by the Gov..
2	<b>Act. 2:</b> Capacity Building to utilize commercial potential of RETs	32:01-06	<b>62,510.0</b>	<b>62,510.5</b>	<b>0.0</b>	No need of additional capacity building (study tours etc.) for local Technicians.
3	<b>Act. 3:</b> Setting up new financial mechanism x investment in RETs	21:03	<b>216,956.0</b>	<b>216,956.0</b>	<b>0.0</b>	Subcontract with ADEME. Ongoing negotiations with ADEME to amicably terminate the contract
4	<b>Act. 4:</b> Implementation of Business Models: <b>Sub-Total</b> *		<b>2,920,000.0</b>	<b>1,000,000.0</b>	<b>1,920,000.0</b>	Commercial component of the Project
	<b>BM 1:</b> Forestry Management (36,423 tonnes/year)	-----	0.0	0.0	0.0	Production unchanged with respect to the original Project document.
	<b>BM 2:</b> Electro prod. (0.5 MW - La Melvis plant)	-----	0.0	0.0	0.0	Electro-production requested to be reduced from the original planned level of 3.5 MW to 0.5 MW.
	<b>BM 3:</b> Heat prod. (Meat - 2.4 MWth + Dairy – 1.4 MWth)	-----	0.0	0.0	0.0	Heat production reduced from the original level of 5.7 MWth to 3.8 MWth. Excluded the Fish and Ceramic ind.s

	<b>BM 4: Wind farm (1.6 MW) **</b>	-----	-----	-----	-----	The Gov. has already erected the Wind Farm of 1.65 MW at Los Canarreos in the Isla de la Juventud.
	<b>Compania Fiduciaria ***</b>	21:02	2,920,000	1,000,000.0	1,920,000	The 3 remaining BMs (1; 2; and 3) will be totally funded under the direct responsibility of the Compania Fiduciaria.
5	<b>Act. 5: Project Management, monitoring, dissemination: Sub-Total</b>		<b>411,948.7</b>	<b>312,053.7</b>	<b>99,895.0</b>	
	Project support	11:01-06-51-52	89,950.7	89,950.7	0.0	All needed support will be provided by the Gov.
	Project Assistant	13:01	7,687.5	7,687.5	0.0	
	Project travel (UNIDO Staff)	15:01+10	59,904.9	44,904.9	15,000.0	
	UNIDO Staff travel	16:01	56,857.6	36,857.6	20,000.0	Foreseen 4 man/missions (1 week each)
	Information/dissemination	53:06 32:06	19,895.0 10,000.0	0.0 0.0	19,895.0 10,000.0	- Cost of routine items to be purchased for the project office. - Allocated for meetings and workshops (as limited as possible, as requested by Cuban Counterpart).
	Premises	43:02	12,553.3	2,553.3	10,000.0	Allocated to face possible repair costs of project premises
	Project Cars (1 Toyota Land Cruiser and 1 small car for the IJ + 1 small car for La Habana)	45:05	62,581.9	62,581.9	0.0	- Already purchased 1 Toyota Land Cruiser Prado Station (actually at the IJ). - Requested to purchase additional 2 smaller cars (1 for La Habana and 1 for the IJ)
	Project equipments	45:01+02+03	59,736.1	59,736.1	0.0	No need of additional equipments (hardware; etc).
	Sundries	53:10	32,781.7	7,781.7	25,000.0	To cover the cost of maintenance and rent of equipments.
6	<b>Act. 6: Implementation of Demonstrative Component: Sub-Total</b>		<b>899,601.0</b>	<b>99,601.0</b>	<b>800,000.0</b>	
	Cocodrilo plant	21:10	99,601.0	99,601.0	0.0	Subcontract with the <b>IISc</b> of India. Biomass plant already erected and commissioned in April 2010.
	Marabou cutting machine	45:08	180,000.0	0.0	180,000.0	Locally manufactured/assembled. Subcontract with <b>CICMA / SIME</b>
	Small Aerogenerators (up to 5 KW)	45:07	120,000.0	0.0	120,000.0	Locally manufactured/assembled. Subcontract with <b>INEL / EMCE</b>
	Compact biomass power plant for isolated communities.	45:10	280,000.0	0.0	280,000.0	Locally manufactured/assembled. Subcontract with <b>IISc (India) -- INEL / EMCE (Cuba)</b>
	Hybrid system for meteorological radar of Punta del Este.	45:11	170,000.0	0.0	170,000.0	Locally manufactured/assembled. Subcontract with <b>IISc (India) -- INEL / EMCE (Cuba)</b>
	Unforeseen Expenditure	45:12	50,000.0	0.0	50,000.0	To face unforeseen additional costs related to the different demonstrative sub-components.

7	<b>Act. 7: Support to BMs and Demonstr. components:</b>					
	<b>Sub-Total</b>		<b>561,841.3</b>	<b>105,465.0</b>	<b>456,376.3</b>	
	Install. 4 Wind measurement towers	45:04	113,051.0	105,465.0	7,586.0	All towers are in the IJ; 1 has already been erected/tested.
	Nursery forest plant.	45:06	168,000.0	0.0	168,000.0	For forestry development and research.
	Equip./tools x Cocodrilo plant	45:09	75,000.0	0.0	75,000.0	To complete Cocodrilo biomass plant with tools/equipments
	Reserve for potential increase of the power of La Melvis plant (BM 2)	45:13	205,790.3	0.0	205,790.3	This amount will be added to other savings (if made) /termination of ADEME contract, to increase the allocation made available for BM 2 (electro-production) in order to increase its electrical power generation from 0.5 MW to 1.0 MW.
8	UNIDO overhead cost (5%)	93:01	<b>254,143.0</b>	<b>89,594.4</b>	<b>164,549</b>	
	<b>TOTAL</b>		<b>5,337,000.0</b>	<b>1,886,180</b>	<b>3,450,820</b>	

\* \$ 1,000,000.0 already at disposal of CF: US\$ 0.5 Mn already disbursed + US\$ 0.5 Mn obligated.

\*\* Gov. has already erected the Wind farm at Los Canarreos (1.65 MW)

\*\*\* CF will directly fund the implementation of: BM1 - Forestry management (US\$ 1,000,000); BM2 – Electro production (US\$ 1,410,000);

and BM3 – Heat production (US\$ 510,000). The contracts will be omni-comprehensive (equipments, training for local technicians and commissioning).



## 6.5. Annex 5: Details of the project “impact pathways” and ROTI analysis

The ROTI analysis is designed to be used at the time of Final Evaluation of the corresponding project. Since the present report corresponds to a Mid – Term Evaluation, the application of the ROTI analysis can only be focused on reasonable assumptions made at the time of the evaluation. Moreover, since many activities (especially those related to demonstration and business models) have not yet been carried out, the possible impacts and outcomes are difficult to evaluate.

As stated in the Project Document, the project objectives impacts are:

- To remove barriers to the development of renewable energy technologies for power and heat generation.
- To reduce energy – related CO<sub>2</sub> emissions by replacing fuel – oil use in power and heat generation through renewable energy technologies.

The project intended general impacts are clearly to pave the way for development of renewable energy technologies in Cuba and to reduce use of fossil fuels. The project design, as specified in the Project Document, is adequate for the delivery of these intended impacts. The project matrix define a number of project outcomes which, in order to give a clearer perspective, are considered independently.

- *Strengthened enabling policy environment for the promotion of renewable energy technologies in Cuba and the region.* In certain aspects the situation is favourable for the realization of this outcome: the attitude of both local and national authorities towards renewable energy source has improved since the project start, and the general tendency of the Cuban authorities is to move towards a progressive decentralization. But the Cuban authorities are at present not giving any financial support to renewable energy other than long term loans, and no renewable policy as such has been created. The national authorities contemplate some scenarios but no systematic policy has been adopted, and the development of renewable energy sources is to be financed through foreign investments.

A draft renewable energy policy (the so-called Marco Regulatorio) is under preparation and has been submitted to the Council of Ministers, but the Evaluation Team was not given access to the draft.

An Intermediate state could be the definition of a sound Renewable Energy Policy in Cuba. Successful implementation of the project demonstration activities and business models will be an important impact driver in this direction.

- *Established national capacities to utilize the commercial potential of renewable energy technologies.* The Evaluation Team observed a clear interest from the side of the Cuban authorities in having participation of

the Cuban industry in the manufacturing of biomass gasifiers and other devices for use of renewable energy sources, but the necessary transfer of technology agreement has not yet been defined, nor signed. It is extremely important that the activities related to installation of biomass gas-fired boilers and of power gasifiers are successful if this outcome is to appear. Successful implementation of RRMF is important.

- *Development of an IPP sector.* Since the Cuban economy system is centralized, this outcome must be understood as the development of a group of producers other than the present vertically integrated electric utility Unión Eléctrica (UNE). The question of introduction of private property is currently being debated, but it seems highly improbable that it is extended to relatively large enterprises such as independent power producers. There are already some companies supplying electricity to UNE, most of them using bagasse from sugar cane as fuel (these cogeneration installations were designed with the basic purpose of elimination of bagasse, not of efficient production of electricity and heat, hence the bagasse is burned very inefficiently).

Development of a private sector in Cuba would be favourable for the extension of use of renewable energy sources, but it does not seem a realistic assumption in the short term.

Successful implementation of RRMF will be a very important impact driver towards creation of an IPP sector.

- *Recognized options innovative financial mechanisms to encourage private sector investments in renewable energy projects in Cuba.* Since private sector does not exist in Cuba, this outcome must be understood in terms of encouragement of foreign investments in renewable energy projects in Cuba. This outcome coincide with the intentions of the Cuban government, and seems reachable. The role and performance of RRMF are essential to support the future development of more renewable energy projects in Cuba.

See above bullet point.

- *To remove the key barriers that constrain widespread use of renewable energy technologies (biomass and wind) through business models on Isla de la Juventud and rest of the country.* Creation of business models is still far from complete, but seems reachable. Successful implementation of the business models contemplated in the project is essential for future developments. The replication potential of these first Business Models being currently prepared is large, both in Isla de la Juventud and in the main island.

Given that the main renewable resource in Isla de la Juventud is biomass, the successful creation of a business model to guarantee a sustainable and rationally organizes supply of biomass is a basic impact driver.

Support from local authorities to renewable is a reality, more than an assumption.

- *To develop a replication and information strategy to promote renewable energy technologies in the region.* The existence of this outcome can be already partially detected; the dissemination activities carried out by the project have created interest in further development of use of renewable energy sources, being the possibility of reduction in consumption of liquid fuels a strong motivation for this interest. Particular interest for replication has been detected in the field of food industry.

Again, successful implementation of RRMF is essential is a basic impact driver.

## 6.6. Annex 6: Remarks from stakeholders

After preparation and submission of the Mid – Term Evaluation Draft Report, a number of observations and remarks were received from UNEP, UNIDO and the Cuban counterpart. Whereas many of them were referred to concrete issues and were duly considered in the main text of the present report, others were of a more general nature and are dealt with in the following paragraphs.

### **Comment:**

A) It should be included a second cause to changes in Government priorities and hence of further delay of the project implementation: the extremely negative impact of the international financial crises.

B) We believe that some progress has been made since the last SCM in January (in particular regarding communications between UNIDO and Cuba) and that the report should acknowledge at least 3 months (in the last 7) were lost due uncertainties in the MTE preparation process.

### **Response:**

- A) The negative influence of the economic crisis is mentioned several times in the report as one of the causes of the project delay.
- B) The Evaluation Team has no doubt that the situation has improved since January 2010, but improvements in communications are still necessary. And the Mid – Term Evaluation was certainly delayed several times, but there are no apparent reasons to consider that this has been a cause of delays in project activities.

### **Comment:**

The high number of Ministries and local Institutions involved in the project (and on the relevant decision processes) were very well known and accepted since the conceptualisation time of the project and cannot be overcome now. Actually the dialogue between UNIDO and the Cubans Ministries/Institutions is very good, but the decision process is lengthy and cumbersome due to the large number of institutions and people involved. The report should reflect on the complexities of the project design.

### **Response:**

It is indicated in the report that the large number of Ministries and institutions involved in the project activities is considered an obstacle, and the Evaluation Team realizes that this cannot be overcome now. This is a characteristic of the Cuban system, and nobody is to be blamed for it (changes to these lengthy decision processes are beyond the scope of the project).

**Comment:**

The Compañía Fiduciaria has already \$0.5M available in Cuba and an additional \$0.5M committed for its use.

**Response:**

Yes, right.

**Comment:**

All Project staff (in Cuba) are fully aware about the UNIDO procedures for the purchasing of equipments. They received the full set of "Rules and procedures" regulating the bidding procedures for the purchasing of equipments. The UNIDO Focal Point in Cuba is providing all assistance needed to carry out the purchase processes (for what it concerns Cuba side).

**Response:**

The Evaluation Team has no doubt that a set of UNIDO Rules and Procedures was duly submitted to the Cuban staff, but it has been observed that some misunderstandings had taken place, hence the necessity to clarify this issue and to solve the problems arisen in some bidding procedures.

**Comment:**

The negative impact of the 2 hurricanes continued also in 2010. This negative period, coincided with the period of the major negative impact of the international financial crisis on the economy of the Country.

**Response:**

It is not specified what effects of the hurricanes have continued during 2010. In the January 2010 Steering Committee meeting a number of measures were agreed to consider all the negative effects of the hurricanes and the economic crisis.

**Comment:**

Demo activities: No funds were available, except for the "Tools x integration of Cocodrilo plant", which initially had to be purchased locally, but no local suppliers were identified. Additional funds to be transferred from UNEP are necessary to implement the rest of the Demo-activities.

**Response:**

According to information facilitated by the Cuban counterparts, there is at present an UNIDO bidding procedure for the acquisition of equipment for biomass recollection for the Cocodrilo plant. As for the necessity to transfer more funds, this should be discussed between UNEP and UNIDO.

**Comment:**

Official information on the cancellation of this activity (Radar Punta del Este) needs to be sent to UNIDO.

**Response:**

OK.

**Comment:**

Technical specification have been provided in Spanish (for the marabu cutter). Relevant translation to be done.

**Response:**

This translation, as well as any other requirement, should be made quickly to avoid more delays.

**Comment:**

Project design included a quite cumbersome number of Ministries/Institutions involved in the project and hence the complications consequently of the relevant implementation, are a consequence of its design. We think that the project design was adequate.

**Response:**

The Evaluation Team considers that the project was adequately designed, and so is it stated in the report. Given the nature of the project and the structure of the Cuban system, it is unavoidable that many institutions are involved and hence the bureaucratic complications.

**Comment:**

Coordination between the NPD/Project Team and UNIDO is quite good, but too many NPDs have been in charge of the project (4 NPDs in 5 years).

**Response:**

Four different NPD (two of them part-time) in five years seems certainly excessive. Future changes in key staff positions should be avoided.

**Comment:**

It has to be clarified that the Gov. foreseen contribution will be only in kind; no investment funds will be made available from the Gov. side. In the past, the Gov. has made available to the project an investment of around \$4.5 Mn regarding the Business Model 4 – Wind farm 1.65 Mw of Los Canarreos.

**Response:**

Yes, in several paragraphs of the report it is noted that no direct financial support for renewable energy is provided by the Cuban Government. The Los Canarreos issue is also mentioned.

**Comment:**

Training courses have been organised in the past years and additional training to local personnel, has been provided during the installation of Cocodrilo biomass plant.

**Response:**

All the Evaluation Team is saying about this issue is that some practical update of the received training can be necessary.

**Comment:**

It seems too much reductive and too simple to indicate as cause of the “new delays” only to the “lack of coordination among the Stakeholders including UNIDO”.

**Response:**

There are certainly other causes (changes in key staff positions, bureaucracy, ..). The report wording has been modified to avoid to give the impression that the Evaluation Team considers only one cause of delay.

**Comment:**

We believe that the rating HU of box F (Achievement of outputs and activities) may correspond to the reality if comparing the project achievements with respect to the objectives as stated in the original project documents, but not appropriate (it does not reflect the real rating) if we compare the achievements to the implementation of the project under the prevailing Country conditions, problems and changes. The realistic rating could be U/MU.

**Response:**

The Evaluation Team has rated the situation at the time of the Mid Term Evaluation, and unfortunately none of the June 2010 milestones has been reached. Since the milestones were approved taking into consideration the effects of hurricanes, the country situation and the changes in the project objectives, the present situation has to be considered as highly unsatisfactory. The last replacement of NPD and the changes in the UNIDO structure had also certainly had a negative impact on delays. Nevertheless it has to be emphasized that the December 2010 milestones can still be reached, at least partially, and if this is the case a more favourable rating should be applied.

**Comment:**

On the revolving fund concept of Compania Fiduciaria: How to make sure that loan repayments are received in convertible CUCs? If these loans are paid back in Pesos than the revolving fund is depleted upon the moment these repayments are made. If this

mechanism is not secured than there will probably never be any repayments made and certainly not after the project is terminated by the end of 2011.

**Response:**

The necessity to receive the loan repayments in convertible currency was emphasized to Compañía Fiduciaria during the field mission in Havana. Since the loan mechanisms have not yet been defined, it is necessary to pay close attention to this issue during the forthcoming months.

**Comment:**

S rating is too high for the catalytic role and replication: certainly the technical potential is there but given current economic conditions in Cuba as well as reluctance from abroad to invest in Cuba today make the prospects for replication today rather dubious.

**Response:**

Given the present Cuban policy, foreign investments are certainly of the utmost importance for the development of renewable energy sources in Cuba; MS rating is probably more adequate.

**Comment:**

On procurement following UN rules: We all are aware about the need for such rules to exist. But we must also realize when these rules are becoming a serious obstacle to timely project execution that we need to look for transparent alternatives in order to speed up the process. The evaluators should justify and detail such moves that will help UNIDO officers to speed up the procurement (waiver?).

**Response:**

Existence of rules for procurement is certainly a necessity. Given that only a small number of tendering procedures are necessary under this project, the Evaluation Team suggest that each of them is dealt with separately. In some cases a disaggregation of lines could be necessary (not to surpass the defined monetary limits for each procedure). This can be done through an adequate exchange of e-mail messages or on the phone. In other cases a waiver can be necessary.

**Comment:**

This can be confusing (status of construction of the Cocodrilo plant). Civil works are completed and only some "cosmetics" finishing works are in progress to give a better external view of the plant.

**Response:**



The report wording has been modified for a better description of the situation. Nevertheless, the Evaluation Team considers that at the time of the site visit the pending works were not only cosmetic; access to the upper plant was difficult.

**Comment:**

We appreciate the recommendation (use of dual fuel engines in La Melvis) but it cannot be accepted. The main goal in using biomass is full replacement of fossil fuels, especially in Isla de la Juventud. Project is intended to obtain necessary experiences.

**Response:**

The role of the Evaluation Team is to make recommendations. For the reasons indicated in the report, the use dual fuel engines is advisable.

**Comment:**

Forestry activities where designed for a long - term sustainable supply of biomass, not only for La Melvis.

**Response:**

OK, that is a good approach.

**Comment:**

Seems to be a misunderstanding. Supply of biomass from existing forest exploitations can start immediately. Forest plantations is to secure the future.

**Response:**

The situation was not misunderstood, but the report wording has been modified for more clarity.

## 6.7. Annex 7: Evaluation team

**Proposed role in the project: Team leader**

1. **Family name:** Blasco
2. **First names:** Manuel
3. **Date of birth:** June 6<sup>th</sup>, 1950
4. **Nationality:** Spanish
5. **Civil status:** Divorced
6. **Education:**

Institution (Date from - Date to)	Degree(s) or Diploma(s) obtained:
Superior Technical School of Industrial Engineering, Polytechnic University of Madrid(1970-1976)	Mechanical Engineer

7. **Language skills:** Indicate competence on a scale of 1 to 5 (1 - excellent; 5 - basic)

Language	Reading	Speaking	Writing
Spanish (mother tongue)	1	1	1
English	1	1	1
German	3	3	4

8. **Membership of professional bodies:**

Member of the Professional Association of Industrial Engineers, Madrid

9. **Other skills:** (e.g. Computer literacy, etc.)

Microsoft Office in WINDOWS environment (at user's level). INTERNET

10. **Present position:**

Independent energy consultant

11. **Years within the firm:** 10 as independent consultant

12. **Key qualifications:** (Relevant to the project)

Highly qualified energy expert with over 25 years' experience in the electricity industry and extensive knowledge of the technical and economic characteristics of energy technologies. Solid background as a consultant in the field of, as well as in the fields of **renewable energy sources and energy efficiency**. Large experience in international projects, both as **consultant, trainer and as team leader**.

**Experience in the field of project monitoring and evaluation in the field of use of renewable energy sources.**

Acted for 12 years as Head of Division in UNESA, the Spanish electric utility association (see below). UNESA acted as an assistant for the Spanish government and the Regulatory Agency in the deregulation process of the Spanish electricity sector, analyzing mechanisms applied in other European countries to guarantee free private sector participation in a **competitive and free market**, as well as regulatory issues related to **unbundling** of generation, transmission, distribution and final supply of electricity. This framework included a large number of legal dispositions, including the analysis of model supply contracts, the definition of methodologies to define tariffs for electricity and the **treatment to be given to independent power producers using renewable energy sources**.

Experience in harmonization of energy legislation and regulatory framework with the EU acquis, including mechanisms to encourage use of renewable energy sources for electricity generation. In-depth econometric evaluation of the costs of Spain's electricity activities (covering all of generation, transmission, distribution, voltage and frequency regulation and supply), including a review of the quality of actual quantitative cost data.

Experience as Technical Director of a centre devoted to research, development and demonstration activities in the fields of **photovoltaic, biomass, and wind**. Technical assistance to **electricity generation units using renewable energy sources**.

Solid understanding of unbundling of activities in the energy sector (generation, transmission, distribution and final supply) and of measures devoted to guarantee free access to electric networks.

Experience in transition from systems based on vertically integrated utilities to liberalized markets in SEE countries (Romania, Bulgaria, Hungary, and Bosnia and Herzegovina). Large international experience in several other countries. Solid understanding of and knowledge of electricity consumption markets in Europe, including deregulation processes and their effects.

Member (and co-ordinator in some cases) of several committees and working groups, both at national and international level. These committees studied various topics, such as photovoltaic energy, thermal generation, fuel cells, and competitiveness of energy technologies.

**13. Specific experience in the region:**

Country	Date from - Date to
Cuba	June 2010 – July 2010
Honduras	December 2005 – January 2006
Argentina	March 2001 – April 2001

(Experience in more countries is summarized below).

14. Professional experience

From-To	Location	Company	Position	Description
June 2010 – July 2010	Cuba	United Nations Environmental Programme (UNEP) Michael Spilsbury <a href="mailto:michael.spilsbury@unep.org">michael.spilsbury@unep.org</a> (254) [20] 7625097	<b>Team Leader</b>	Mid-Term evaluation of a project devoted to <b>encourage use de renewable energy sources (biomass, wind) for generation of electricity (grid-connected and isolated) and thermal energy for industrial purposes</b> in Isla de la Juventud (Cuba)
August 2009 – July 2010	South Africa, Gambia	AETS Magdalena Wancowicz <a href="mailto:Magdalena.wancowicz@aets-europe.fr">Magdalena.wancowicz@aets-europe.fr</a> +33 559724323	<b>Senior Consultant</b>	Strengthening the capacity of the African Forum for Utility Regulators (AFUR). Organization of power market structures, training on economic fundamentals related to regulation and on public-private partnership and on regulatory aspects concerning quality of service, and encouragement of South- South cooperation.
May 2009 – May 2010	Bosnia - Herzegovina	BESEL, S.A. Guillermo Lopez <a href="mailto:glopez@besel.es">glopez@besel.es</a> +34 917025233	<b>Senior Consultant</b>	Support to the BiH institutions in implementation of the EU Directive on promotion of <b>green electricity</b> .
January – June 2009	Bosnia - Herzegovina	SOGES, S.p.A. <a href="mailto:elisabeta.pop@sogesnetwork.eu">elisabeta.pop@sogesnetwork.eu</a>	<b>Senior Consultant</b>	Definition of projects to be funded under IPA 2010 devoted to reinforcement of regulatory bodies, creation and liberalization of markets, <b>energy efficiency and use of renewable energy sources</b>
Oct 2007 – March 2008	Republic of the Marshall Islands, Federated States of Micronesia, Republic of Palau and Fiji Islands	EPU-NTUA David Moissis <a href="mailto:Fwc-epu@epu-ntua.gr">Fwc-epu@epu-ntua.gr</a>	<b>Team Leader</b>	<b>Definition and identification of projects devoted to use of renewable energy sources (solar and mini hydro) and to improvements in energy efficiency, including DSM in the residential sector.</b> 10 <sup>th</sup> European Development Fund. First phase: definition of projects to be funded under EDF 10 <sup>th</sup> Program. Output: projects recommended in each country (stand-alone PV in the RMI, Pohnpei (FSM) and Chuuk (FSM). Mini-grids using solar PV in Yap (FSM). Small hydro in Kosrae (FSM) and Pohnpei. Second phase: realization of the projects (2008-2012). Total funding 13 M€.
May 2005 –	Sofia, Bulgaria and Madrid,	BESEL, S.A	<b>Senior technical advisor</b>	Assistance to the Energy Regulatory Authority. Development of secondary legislation in the fields of electricity and gas, including methodologies for tariffs, ancillary services and <b>use of</b>

Jan 2007	Spain	(see above)		<b>renewable energy.</b> Review of technical codes for transmission and distribution of electricity. Analysis of impact on distribution grids of renewable energy plants (wind and grid connected solar PV) carried out by independent power producers). Output: creation of a set of pieces of law related to remuneration and requisites for connection of renewable projects, ancillary services and tariffs. Total project funding 1M€.
Oct 2005 – Jan 2009	Madrid, Spain	Carlos III University	<b>Associated professor</b>	<b>Teaching of Energy and Environment Engineering. Solar thermal and photovoltaic technologies.</b> Lay out and characteristics of renewable energy plants (wind and PV, both stand alone and grid connected). Definition of components. Evaluation of renewable energy resources. Connection to transmission or distribution grids.
Dec 2005 – Jan 2006	Honduras	SOFRECO Carlos Zamorano <a href="mailto:Carlos.zamorano@sofreco.com">Carlos.zamorano@sofreco.com</a>	<b>Team Leader</b>	<b>Rural electrification (solar photovoltaic and small hydro). Improvement of distribution grids for electricity.</b> Medium term monitoring of a project devoted to rural electrification (stand alone PV and small hydro in different areas), analysis and improvement of a distribution network. Head of a team of 4 technicians. Total project funding 6M€.
Sep 2003 – July 2005	Pamplona and Madrid, Spain	CENER (National Centre for Renewable Energy)	<b>Technical Director</b>	<b>Research, development and demonstration activities in the fields of photovoltaic, biomass, and wind. Technical assistance to electricity generation units using renewable energy sources.</b> Head of a team of 60 technicians and workers. Evaluation of renewable energy resources (wind, solar and biomass). Characterization of PV panels. Definition and supervision of PV projects (from 100 to 800 kW). Monitoring of existing grid-connected PV plants.
June 2003 – Jan 2004	Budapest, Hungary and Madrid, Spain	BESEL, S.A.  (see above)	<b>Senior technical advisor</b>	Twinning EU Project. Assistance to the Hungarian Energy Authority related to EU legislation and <b>energy policies for use of renewable energy.</b> Twinning project. Adequation of the Hungarian energy law to the <i>acquis communautaire</i> . Assessment in the field of connection of renewable energy plants to the grid; problems involved, voltage and frequency stability).
Nov 2001 – Aug 2003	Madrid, Spain	EMVS (Empresa Municipal de la Vivienda y Suelo de Madrid)	<b>Senior Engineer</b>	Definition of installations for heating, cooling and warm water systems in multi-family dwellings using both <b>conventional and renewable energy sources.</b> Analysis of available renewable energy sources. Definition of back up natural gas fuelled systems to guarantee supply. Head of a team composed by 6 technicians.
March 2001	Mar del Plata, Argentina	EDEA (Empresa Distribuidora de Energía Atlántica)	<b>Senior External Consultant</b>	Assessment related to tariffs, power purchase agreements, supply options and DSM programs. Definition of standard contracts for purchases of power generated by independent power producers, using either conventional or renewable energy sources.
April	Bucharest,	IDOM, S.A.	<b>Long Term tariff</b>	Assistance to the Romanian Energy Authority. Elaboration of tariff methodologies for

2000 – Dec 2000	Romania		<b>and Institutional Expert</b>	electricity and heat, including transmission, distribution, ancillary services, independent power producers and self-producers, end-users and splitting of costs between electricity and heat in cogeneration plants. Analysis and review of technical codes for transmission, distribution and connections for independent power producers Outputs: pieces of law according to the EU acquis. Total funding 1,5 M€.
April 1999 – March 2000	Madrid, Spain	Weder & Weather	<b>Technical Director</b>	Managing and control of projects and build-up of cogeneration plants. <b>Head</b> of a team of 10 technicians. Cogeneration plants of up to 500 kW.
Feb 1979 – Oct 1998	Madrid, Spain	Unidad Eléctrica, S.A. (UNESA)	<b>Head of Technical Division</b>	Works related to the entire process of deregulation of the Spanish electricity market and to the follow up of evolution of electrical markets in other IEA <b>countries</b> . Control of working groups on <b>energy planning, new renewable technologies</b> , refurbishment of thermal plants, role of electricity in the energy spectrum.
1974 – 1978	Madrid	Superior Technical School of Industrial Engineering.	Auxiliary Staff, Teacher	Turbines, internal combustion engines and fluid mechanics. Work on performance improvement of internal combustion engines.
Feb – Dec 1979	Jülich, Germany	KFA (Forschungszentrum)	Collaborator, Systemforschung und Technologische Entwicklung Group	Impact analysis of the oil crises in the energy supply of IEA member countries. Evaluation of <b>technical, economic and environmental characteristics of energy technologies</b> .

## 15. Other relevant information (e.g., Publications)

- Member (and co-ordinator) of several committees and working groups, both at national and international level. These committees studied various topics, such as **photovoltaic energy, thermal generation, fuel cells**, and competitiveness of **energy technologies**.
- Spanish representative in the **Solar Photovoltaic Program of the International Energy Agency**.
- Co-author of the MARKAL model for the **International Energy Agency (IEA)**. This model was created to be used as a tool to mitigate the effects of the oil crises of 1973 and 1979, and its purpose was to perform econometric analysis of the most adequate ways to guarantee the energy supply of IEA member countries. The model was designed for use of different objective functions, such as minimise oil imports, minimise cost of **energy supply**, maximise use of **renewable forms of energy**, etc. as well as different combinations among them.
- Spanish representative in the IEA working team in charge of the “**Energy after the Eighties**” study, which analysed the future energy outlook for IEA member countries after the oil crises.
- Advisor at the IEA headquarters in Paris, collaborating in a study devoted to analyse the future evolution of the penetration rate of electricity in the **global energy consumption** of IEA member countries. The required analysis included an assessment on electricity final costs, covering all

kinds of technologies for generation of electricity, as well as transmission and distribution costs and environmental advantages of electricity use, among other aspects.

Publications:

- **Energy Technology Data Handbook**. Vol. 1 (Conversion Technologies), January 1980. Jülich (Germany)
- **Energy Technology Data Handbook**. Vol. 2 (End-use Technologies), October 1980. Jülich
- **Energy Scenarios and Impact of New Technologies** for Spain. April 1981. Jülich
- **Summary Report on Technology Characterizations**. December 1982. Jülich
- **Energy After the Eighties**. Elsevier, Amsterdam 19
- Environmental Impact of **Energy Technologies**
- NOx Control Technologies. March 1993
- Emissions of Trace Species by Coal-fired Power Plants in Europe. February 1997
- Selective Catalytic Reduction. February 1997
- Co-firing of **Biomass** and Waste with Coal. March 1997
- The Effect of Coal Quality on NOx Emissions. April 1997
- Gas Turbine Emissions. October 1997
- Continuous Emission Monitoring in Power Stations and CHP Plants. October 1997
- **Analysis of Cost-efficient CO2 Reduction Options**. Country Report for Spain. Karlsruhe, January 1991
- Fuel Cells. State of the Art and Perspectives. 1993 y 1998. Spanish and English versions
- Status Report on **PV Power Applications** in Spain. 1995 and 1997

## CURRICULUM VITAE

1. Family name: Knoef
2. First names: Hermanus Aloisius Maria
3. Date of birth: 18<sup>th</sup> January 1957
4. Nationality: Dutch
5. Civil status: Married
6. Education:

Institution	Polytechnic Hengelo, The Netherlands
From	1974
To	1980
Degree	B.Sc. (Chemistry)

Institution	University of Twente, Enschede, The Netherlands
From	1980
To	1984
Degree	M. Eng. (Chemical Technology)

### 7. Language skills

Language	Reading	Speaking	Writing
Dutch	5	5	5



English	5	5	5
German	5	5	4
Indonesian	3	3	3

8. Membership of professional bodies:
9. Other skills: Fully familiar with various spreadsheets, word processing and graphic programmes as well as various industrial energy modelling programmes.
10. Present position: Senior Consultant and International Gasification expert
11. Years with firm: 24

12. Key qualifications:

Harrie Knoef is a process engineer/project manager specialised in biomass energy systems, industrial energy conservation and in particular in biomass gasification, with more than 25 years experience.

**Being involved in a number of research and development programmes he has a thorough understanding of biomass conversion processes. In addition, he gained a wealth of practical experience with the design, construction and operation of biomass systems during his assignments in Europe, Africa and Asia (including a three-year posting in Indonesia).**

As head of BTG's Project Engineering and Implementation unit he was in charge of a variety of biomass gasification projects, ranging from policy studies to implementation and dissemination. A prime example of his authority in the field is his leadership of the European GasNet Cluster, which serves as a platform for information exchange and policy formation for all major European stakeholders in biomass gasification.

In 2005, Mr Knoef published the Handbook on Biomass Gasification, a comprehensive publication covering technical, economic, environmental and policy issues requiring consideration for the establishment of a successful European biomass gasification industry. He organised several seminars and workshop to inform the market on the prospects of biomass gasification.

13. Country experience:

Region:	Countries:
Europe	Estonia, Poland, Croatia, Czech Republic, Bulgaria, Turkey, etc
Asia/Pacific	Indonesia, Thailand, Malaysia, Sri Lanka, South Korea, Japan
Africa	Burundi, Mali, Seychelles, South Africa, Kenya
America	Costa Rica, USA, Canada, Cuba

14. Professional Experience

Date	1984 - date
Location	Enschede, The Netherlands
Company	BTG
Position	Senior Consultant
Description	<p><b>2009-</b></p> <p>Capacity building on sustainable energy in Indonesia; training of staff at Ministry of Energy (MEMR) and Technical Education Development Centre (TEDC)</p> <p>For: SenterNovem</p> <p>Feasibility study on implementation of a combined heat and power plant at a Penitentiare Inrichting, Ter Peel, The Netherlands</p> <p>For: Rijksgebouwendienst</p> <p>Ontwikkeling van de warmte- en kansenkaart in de Provincie Overijssel</p> <p>For: Province of Overijssel</p> <p><b>2006-2009</b></p> <p>Evaluation of large scale waste gasification technologies in Japan</p> <p>For: Private industry</p> <p>Beoordeling conventionele vergassingstechnologie ten opzichte van plasmavergassing</p> <p>For: Meerlanden Rijsenhout, Netherlands</p> <p>Feasibility study for biomass gasification co-generation plant at a tea estate in Kenya. For Sotik Tea Company</p> <p>Technical due diligence biomass energy systems Thenergo</p>

	<p>For: Private Industry</p> <p>Technical due diligence waste to energy technology</p> <p>For: Private Industry</p> <p>Geelong Waste to Energy Project</p> <p>For: SKM Recycling Pty. Ltd., Australia</p> <p>Development of a PID (Photo Ionization Detector) for online tar measurements in biomass poducergas. For EraNet Bioenergy</p> <p>Due diligence assessment of three innovative biomass gasification technologies for CHP production in South Korea</p> <p>Due diligence assessment of innovative large-scale technologies for the production of syngas and synthetic liquid biofuels.</p> <p>For: private industries</p> <p>Biomassa vergassingsnetwerk in Nederland; a Dutch network on biomass gasification</p> <p>For: SenterNovem</p> <p>Co-leader of ThermalNet, a Network on biomass gasification, pyrolysis and combustion</p> <p>For: European Commission</p> <p>Investigations targeted to the creation of legislative instruments and the reduction of administrative barriers for the use of biogas for heating, cooling and power generation</p> <p>For: European Commission</p> <p>Coordinator of a European project on Safety, Health and Environmental aspects of biomass gasification plants</p> <p>For: European Commission</p> <p><b>2005-2006</b></p> <p>Optimisation of a 50 tonnes/day pyrolysis oil from biomass plant in Malaysia</p> <p>For: Industrial client</p> <p>Evaluation of three waste-to-energy gasification and plasma technologies</p> <p>For: Industrial client</p> <p>Bigpower project on biomass gasification</p>
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	<p>Upgrading Turkish institute</p> <p>For: European Commission</p> <p>Handbook Biomass Gasification published in September 2005</p> <p>Monitoring CHP biomass plants. Within this European project, at least 60 biomass CHP plants in Europe are monitored over a 3 years period to establish best practice and guidance for future role of biomass CHP.</p> <p>For: European Commission</p> <p>Ecological sanitation for excreta management</p> <p>For: Industrial client, Netherlands</p> <p>Study trip to biomass energy plants in Czech Republic</p> <p>For: SenterNovem</p> <p>Multi-stage gasification; overview of existing processes</p> <p>For: SenterNovem</p> <p><b>2003-2005</b></p> <p><i>Production of synthesis gas from biomass and pyrolysis oil through entrained flow gasification</i></p> <p>For: SenterNovem</p> <p>Feasibility study for replacing fossil fuel-fired boilers with biomass at a starch factory in Croatia</p> <p>For: Industrial client</p> <p>Feasibility study on replacing fossil fuel-fired cement and lime kilns with biomass with visits to Swedish, French, Italian and German producers</p> <p>For: Industrial client, Canada</p> <p>Feasibility study on replacement of cokes at Rockwool, a company producing fire-safe insulation material</p> <p>For: Industrial client</p> <p>Development of a international standard for measuring tar and particulates in producer gas. This is an extension of the tar protocol guideline project. Aim is to come to a standard in co-operation with CEN.</p> <p>For: European Commission</p> <p>Evaluation of small scale biomass gasifiers. Different European gasifier suppliers have been evaluated for their suitability to enter on the Japanese market.</p>
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For: Industrial client.

**2001-2004**

Thermal Biomass Conversion Network Cluster. Within this cluster two networks will be established, one on pyrolysis (PyNe) and one on gasification (GasNet). Both networks will cooperate together where possible on overlapping issues like non-technical items. This three years project will identify problems with the implementation of pyrolysis and gasifier installations and prepare recommendations to overcome the bottlenecks. It should be a promoting forum for both technologies. Data are published in bi-annual newsletters and at the internet under [www.gasnet.uk.net](http://www.gasnet.uk.net)

For: European Commission and Novem (EWAB programme)

Research and development of a fixed bed gasifier plant coupled to a Stirling engine. The project aim to implement a farm-based CHP power plant for the conversion of different biomass residues. The gasifier has been developed in the 1980's and is patented. It has been successfully operated on various materials including wood, straw, manure, etc. Waste heat is used to dry the feedstock and/or buildings. Power can be used or delivered to the grid. It is foreseen to market modular units of five different capacities up to 250 kWe each.

For: Euregio (Interreg III programme)

**2001**

State of the art emission. Aim of the project is to prepare an overview of all emissions from biomass gasifier plants. Data are to be collected from existing installations and verified against emission legislation. The study will give insight in the possibilities to meet the rules and recommendations to lower emission levels or adjust existing legislation.

For: IEA Gasification task group/Novem (EWAB programme)

State of the art of feeding systems. Feeding biomass into a gasifier installation is known to be the most crucial problem in operating such plant. This project aims to list all existing feeding systems and select the most promising one based on practical experience.

For: IEA Gasification task group/Novem (EWAB programme)

**2000**

Studytour to biomass gasifier installations in Germany. Aim of the studytour was to learn from the experience of German projects on implementation of biomass gasifier installations. Besides technical aspects also infrastructural aspects and German policy towards biomass energy production were addressed. Some 50 participants from different backgrounds were attending the three-days tour.

For: Novem (EWAB Programme)

Implementation of a chicken litter gasifier plant. Within this project a farm-based CHP gasifier plant is being constructed and operated for conversion of chicken litter. The 65 kWe plant consist of a fluid bed gasifier, rotating particle separator thermal catalytic tar cracker, particle filter, heat exchanger and a MAN gas engine. Operation will start in Summer 2001.

For: farmer and Novem (EWAB programme)

Emission measurement of biomass gasifier installations. This project aims to determine the gaseous, liquid and solid emissions of two biomass gasifier installations and validate the results with existing emission standards.

For VROM/Novem (RLB programme)

Implementation of two biomass gasifier plants at ONS. Two existing 140 kWe each wood gasifiers are to be implemented and commercially operated at a small utility in Schiedam, the Netherlands. Waste wood is being used as feedstock for both downdraft gasifiers. Aim is to determine whether fixed bed gasifiers can be a technical and environmental sound solution for small scale power production from biomass.

For: ONS, Schiedam and Novem (EWAB programme)

#### **1999**

Inventory of biomass gasifier installations and manufacturers. The scope of the project is to identify all installations and manufacturers in Europe, Switzerland, USA and Canada and distribute this information through the internet. The information is being collected in a standard format, implemented in a database and subsequently distributed on internet. Data are published at [www.gasifiers.org](http://www.gasifiers.org)

For Commission of European Communities and Novem.

Development of an international standard for tar determination in producer gas. Establishment of a reliable and comprehensive set of standard procedures for the testing of producer gas quality from biomass gasifiers. The project includes experimental work to determine the significant parameters and to develop standard protocols for tests and gas quality specification. Detailed analyses will be conducted of various existing test procedures applied worldwide. This will be the basis for the further development of an international accepted standard. Information on this project is available at [www.tarweb.net](http://www.tarweb.net)

For: Commission of European Communities and Novem

Optimization of a 3 MW<sub>e</sub> wood gasifier installation. Duties include the re-engineering of a thermal tar cracker, the steam reformer and the downstream gas cleaning section. Final purpose is to connect three gas

	<p>engines to the gasifier plant. For: Private Industry</p> <p>Development of a ceramic heat exchanger to be used in a indirectly fired gas turbine cycle. In a previous R&amp;D project, the feasibility of a indirectly fired gas turbine cycle was investigated. The metal heat exchanger appeared to be a critical component regarding corrosion and costs. In this project the feasibility of a ceramic heat exchanger is investigated which is not sensitive to corrosion and can be manufactured at lower costs. For: Novem (NECT program)</p>
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Date	1987 - date (continued)
Location	Enschede, The Netherlands
Company	BTG
Position	Senior Consultant/Project Manager Biomass Projects, Energy Conservation
Description	<p>Demonstration of a 400 kW<sub>e</sub> wood gasifier at a horticulture firm. Within this project a downdraft gasifier in combination with a thermal catalytic tar cracker is being demonstrated. Both technologies were developed in two separate R&amp;D project of the EU-Joule programme. The system will be connected to a CHP gas engine. For: private industry</p> <p>Thermal conversion of chicken litter. This is a feasibility study is being conducted for a utility company and aims to investigate different thermal conversion technologies for energy production from chicken litter. Besides power production also utilization of the ash as raw material for the production of fertilizer is being investigated. For: Novem, (EWAB program)</p> <p>Value engineering study of a 150 kW<sub>e</sub> biomass gasifier installation. Aim of this project is to reduce the capital costs of the gasifier installation considerably by applying new design features, new materials and improvement of the efficiency. The system will be applied in rural areas, in industrial areas as stand-alone units and as grid-connected units. This calls for a different level of automation degree. For: Private industry</p> <p>The behaviour of tar in biomass gasification systems, the tar-related problems and their solutions. The aim of this study is to address the main problems, and to generate possible solutions for different gasifier configurations and the gas cleaning section in particular. In order to link the identified problems and possible solution with the practice, a</p>



	<p>workshop was organized where the findings were presented to an audience of experts in the field of gasification. For: Novem.</p> <p><b>1998</b></p> <p>Realisation of a standard procedure for tar and particle content determination in producer gas from biomass gasifiers. For: Novem (EWAB programme)</p> <p>Testing coconut and eucalyptus wood as gasifying fuel. Within this project the feasibility of gaifying both fuels was investigated in comparison to a standard wood fuel. Main parameters were determined to compare the technical performance. For: Private Industry</p> <p>Parallel tar measurements at two gasifier installations in Denmark. Parallel measurements by four institutes were conducted to compare the measurement results, get insight in the applicability of the methods as well as the costs and contribute to reach consensus on a common protocol to be used in future projects. For: Novem</p> <p>Biomass to Power Study - Volume II: Gasification Technologies. Within this study the prospects of large scale wood gasification systems was investigated in comparison to other thermal conversion technologies. Specific duties included to prepare a updated status of current gasifier technologies and installations. For: Private Industry.</p>
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Date	1987 - date (continued)
Location	Enschede, The Netherlands
Company	BTG
Position	Senior Consultant/ Project Manager Biomass Projects, Energy Conservation
Description	<p><b>1997-1999</b></p> <p>Turbulence chamber gasification with combustion-optimized gas engine and turbulence chamber treatment. This is a R&amp;D project within the EU-Joule program which aims to develop an innovative gasifier installation. The technology can be compared to fluid bed systems, however no bed material is used in this system. In this project also the gas engine is optimized by modifying the cylinders for optimal combustion. For: Commission of European Communities.</p> <p>Research feasibility study on the production of Standardised Biomass Fuel. Aim of this project is to investigate different options for producing a standard fuel for different thermal conversion processes. As a follow-up large-scale production of the standard fuel is proposed to be tested for different applications. For: LRZ/ EU-JOULE</p> <p>Development of an integral small scale combined heat and power fixed bed gasification system fuelled by standard gasifier fuel. Duties included project formulation, project management &amp; coordination and specific technical tasks.</p> <p>For: Commission of European Communities.</p> <p>Project Manager of EC FAIR Research Programme "Indirectly fired gas turbine for rural electricity production from biomass". Duties included project formulation/description, project management &amp; coordination and specific technical tasks.</p> <p>For: Commission of European Communities.</p> <p>Review of the current state of the art on small scale biomass gasification technology in Europe and elsewhere. This project resulted in a database of all existing cq. Operational small scale gasifier installations with the main characteristics like technical performance and costs. For: Novem</p>

Date	1987 - date (continued)
Location	Enschede, The Netherlands
Company	BTG
Position	Senior Consultant/ Project Manager Biomass Projects, Energy Conservation
Description	<p><b>1995-1996</b></p> <p>Utilization of waste wood from a waste recycling plant for energy generation. The focus in this project to investigate the feasibility of wood waste from a composting plant for gasification. Duties included an experimental gasifier test program in France.</p> <p>For: Veluwe Afvalrecycling (VAR) and Netherlands Organisation for Energy and Environment (NOVEM).</p> <p>Pyrolysis of briquetted wood fuels. In the early 90's a wood briquetting technology was successfully commercialized. In order to penetrate in different markets, the transformation of the wood briquettes into charcoal was investigated within this project. Also the utilization of the pyrolysis products for drying purposes of the raw material was investigated.</p> <p>For: Senter, PBTS-program</p> <p>Assistant Project Manager on a comparison study between biomass combustion and gasification systems. The study reports on full technical and economical performance of both combustion and gasification technology as well as the prospects for different applications.</p> <p>For: World Bank.</p> <p>Project Manager of a study on fixed bed gasification: system definition and conceptual design. The study describes a system for which a CHP fixed bed gasifier unit can operate successfully under the Dutch circumstances.</p> <p>For: Netherlands Organisation for Energy and Environment (NOVEM).</p> <p>Project Manager in the preparation of project proposals for the EC/INCO-</p>

	<p>DC Programme (EC-International Cooperation with Third World Countries). Two major proposals have been formulated, i.e. "Concerted Action on the manufacture of biofuels from agricultural and forestry products in South-East Asia" and "Concerted Action on the manufacture of biofuels from agricultural and forestry products in China".</p>
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Date	1987 - date (continued)
Location	Enschede, The Netherlands
Company	BTG
Position	Senior Consultant/ Project Manager Biomass Projects, Energy Conservation
Description	<p><b>1994-1995</b></p> <p>Project Manager of EC Joule Research Programme on the development of standard procedures for quality testing in biomass gasifier systems. Establishment of a reliable and comprehensive set of standard procedures for the testing of producer gas quality from biomass gasifiers. The project included experimental work to determine the significant parameters and to develop standard protocols for tests and gas quality specification. Detailed analyses were conducted of various existing test procedures applied worldwide.</p> <p>For: Commission of European Communities.</p> <p><b>1994</b></p> <p>Assistant Project Manager Energy Audit Project in Poland. Duties included executing of an extensive measuring programme at three heat/power stations and the identification of suitable no-cost and low cost measures to reduce fossil fuel use and emissions to atmosphere.</p> <p>For: Ministry of Economic Affairs, the Netherlands.</p> <p>Assistant Project Manager Wood and Peat Utilisation Project in Estonia. This project involved the design of an implementation programme for the conversion of gas and oil fuelled district heating boilers to wood and peat based units. Specific duties involved the assessment of systems currently used and the capability of the local industry to participate in large scale conversion of heating systems.</p> <p>For: European Bank for Reconstruction and Development.</p> <p><b>1993</b></p>

	<p>Project Manager of a project on logistic aspects of co-firing waste wood in large scale pulverized coal fired power plant in The Netherlands. In charge of technical and economical aspects.</p> <p>Assistant Project manager for the WB/UNDP Small-Scale Biomass Gasifier Monitoring Project. Preparation of report summarising the findings of monitoring results on biomass gasifiers, installed worldwide and over a ten years period.</p>
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Date	1987 - date (continued)
Location	Enschede, The Netherlands
Company	BTG
Position	Consultant
Description	<p><b>1989 - 1992</b></p> <p>Consultant to the Industrial Biomass Energy Conversion Project on utilization of coir dust in Sri Lanka. Specifically in charge of technology development of fuel preparation systems</p> <p>Project Manager of a project on co-firing of waste wood in large scale pulverized coal fired power plant in The Netherlands. Main topics: pulverization technologies, combustion experiments (medium scale), economic evaluation.</p> <p>Back-stopping officer for the EC Lomé II Pacific Regional Energy Program PREP. The EC-funded PREP aims at introducing renewable energy based technologies in Pacific countries. Specific projects:</p> <ul style="list-style-type: none"> <li>N Biomass waste based power and industrial heat generation</li> <li>N Energy saving equipment for domestic use (lighting and cooking appliances).</li> </ul> <p>For: European Communities</p> <p>Project Manager feasibility study industrial biomass gasification and briquetting technologies in Malaysia.</p> <p>For: European Communities.</p> <p>Project Manager for the technical and economical evaluation - including environmental impact assessment - of co-combustion of waste wood in large-scale pulverized coal fired power stations.</p> <p>For: The Netherlands Agency for Energy and Environment.</p> <p>Research coordinator on thermal/catalytic tar cracking of biomass-derived producer gas</p> <p>For: The Netherlands Ministry of Economic Affairs.</p> <p>Project Manager of the ferrocement charcoal gasification technology. As</p>

	<p>such in charge of:</p> <p>N Supervision on the monitoring of the ferrocement gasifier at the Asian Institute of Technology (AIT) Bangkok, Thailand</p> <p>N Project Coordination of the ferrocement charcoal gasifier technology transfer project from AIT to the Institute of Technology Bandung (ITB)</p> <p>For: UNDP/World Bank</p> <p>Project Coordinator on the State of the Art of Rice Husk Gasification Technology. A study covering the world-wide experience on rice husk gasification. The study included the preparation of seven country reports. The outcome was a report describing the state of the art of rice husk gasification.</p> <p>For: DGIS, The Netherlands</p>
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Date	1987 - 1989
Location	Bandung, Indonesia
Company	BTG
Position	Project Manager
Description	<p>Project Manager in charge of WB/UNDP Biomass Gasifier Monitoring Project (rice husk and wood conversion equipment) Indonesia. Technical and financial assessment of the performance of existing gasifiers using the detailed UNDP/World Bank monitoring procedures. Knowledge transfer to the Bandung Institute of Technology. Long term assignment in Bandung.</p> <p>For: UNDP/World Bank</p>

Date	1984 - 1987
Location	Enschede, The Netherlands



